A8 mini

GIMBAL CAMERA
USER MANUAL

SIYI Technology (Shenzhen) Co., Ltd.

SIYI.biz/en

Thank you for purchasing SIYI product.

A8 mini is a lightweight and elegant gimbal camera, carrying a 4K 1/1.7-inch Sony starlight sensor, max 6X digital zoom. 4K video recording and photography, abundant gimbal control interface compatible with both SIYI links and third-party links. High accuracy and high collaboration control algorithms ensure stable imaging and zooming ability during flight. HDR and starlight night vision extend the application scenarios to both day and night. In addition, it has CVBS (AV) output for analog FPV. In a word, A8 mini can be widely used for small-size drones, UGV, USV, robotics, RC hobby planes.

To ensure you a good experience of the product, please read this manual carefully. If you encounter any issue using the product, please consult the manual or check the online pages of this product on SIYI official store (https://shop.siyi.biz). You can also write an email to SIYI official A/S center (support@siyi.biz).

Contact Us: **SIYI Official Website** *(https://SIYI.biz/en)*

SIYI User Group - Facebook	
Facebook	
Linkedln	
YouTube	

User Manual Update Log

Version	Date	Updates
1.8	2025.3	1. Update technical specifications 2. Remove SDK command section
1.7	2024.5	1. Main firmware update log. 2. SIYI PC Assistant update log. 3. SIYI FPV Windows update log. 4. SIYI FPV Android update log.
1.6	2024.3	1. Instruction for SIYI FPV Windows software 2. SIYI Gimbal SDK 3. Instruction for AI follow function. 4. Main firmware update log. 5. SIYI FPV app update log. 6. Product introduction. 7. Technical specification.
1.5	2023.8	1. Trouble shooting for abnormal gimbal attitude. 2. User manual update log. 3. Main firmware update log. 4. SIYI FPV app update log.
1.4	2023.6	1. Instruction for gimbal Mavlink control. 2. Instruction for integrating Mavlink flight attitude data.

CONTENT

READ TIPS

Icons

Please pay more attention to content indicated with the following marks:

DANGER Dangerous manipulation probably leads to human injuries.

WARNING Warnings on manipulation possibly leads to human injuries.

CAUTION Cautions on what manipulation may lead to property loss.

Prohibited **Mandatory** **Mark**

Safety

A8 mini gimbal camera is designed for professional application in specific scenes, which has been done necessary configuration before delivery, it is forbidden to disassemble the gimbal or to change its mechanical structure. And don't add more payload to the gimbal other than its own camera. Gimbal camera is designed with very precise structure, users who approach to the equipment should have the basic knowledge of how to operate it. Irregular or irresponsible manipulations to the device may cause damage, property loss, or human injuries, and SIYI Technology is not obliged to any of the damage, loss, or injury. It is prohibited to use SIYI products for military purpose. Users under 14 years' old should follow an experienced trainer's guide. Disassembling or modification to the system is prohibited without permission from its manufacturer, SIYI Technology.

Storage/Carrying/Recycling

When your SIYI products are stand idle, or you are bringing it outdoors, or the system reached service life, then please do read the precautions below.

⚠ CAUTION

Always place your SIYI products at places where babies or kids do not reach.

⚠ DANGER

SIYI products should be placed in places with below conditions:

Not too hot (above 60℃) or too cold (under -20℃).

Not under direct sunshine or too dusty or too wet.

Not on an unstable holder which lacks solid supports or may cause vibration.

Not nearby steam or other heat sources.

1 INTRODUCTION

1.1 Product Features

Powerful Imaging System

A8 mini carries an 1/1.7-inch Sony image sensor, an 8 megapixels CMOS with remarkable photosensitivity ability, impressive 4K video recording and photography. Up to 6x digital zoom. The scenery is clear, making it easy to produce grand pictures.

*The picture files captured by A8 mini can be written with GPS location information and time attributes.

Starlight Night Vision

The ultra-sensitive starlight CMOS keep images bright in low light environment.

HDR

HDR (High Dynamic Range) precisely captures good details of highlights and shadows in dynamic scenes to get true colors and natural brightness.

AI Enhanced Smart Identify and Tracking

A8 mini works with the optional SIYI AI tracking module, which combines SIYI's self-developed AI algorithm and collaborate with SIYI optical pods (gimbal cameras) to achieve real-time tracking and capture of targets, and real-time focusing and zooming to highlight the selected object in the picture. The target will always be in the center of the picture and maintain a clearly visible proportion of the picture.

It supports the anti-lost function. During the following process, if the target is blocked or briefly leaves the monitoring screen, the AI tracking module can automatically recognize and continue tracking when it re-enters the monitoring screen.

Incomparable Gimbal Control Interface

SIYI optical pods' (gimbal cameras') powerful compatibility contribute to smart robotics ecology in all dimensions. They can be controlled through traditional S.Bus signal by switches and dials, or through Ethernet by touchscreen or by UDP / TCP commands based on SIYI gimbal SDK, or through UART by SIYI gimbal SDK or by mainstream open-source protocols ArduPilot and PX4 (Mavlink).

Gimbal Motion Mode

Nose Mode

Gimbal mounted on the head of the plane at an angle of 90 degrees to the horizon will automatically enter the nose mode, which is easy for installation on VTOL drones and planes to achieve an excellent angle and a wider field of view.

Upside Down Mode

Gimbal automatically activates upside down mode when it is placed upside down, very convenient to be mounted on multiple kinds of vehicles like UGV, USV, robot dog, and more robotics.

Follow Mode

Horizontally, gimbal follows when aircraft rotates.

Lock Mode

Horizontally, gimbal does not follow when aircraft rotates.

FPV Mode

Gimbal rotates simultaneously as aircraft rolls to get FPV view, and output enhanced stable images.

High Accuracy and High Collaboration Control Algorithms

SIYI has done even more in control algorithms and stabilization algorithms.**IMU Calibration Algorithms**

Compensate and correct errors of the inertial measurement unit, reduce interference factors such as zero bias, scale factor, inter-axis error, temperature drift, noise, etc., greatly improve the measurement accuracy of IMU, and improve the stability of the gimbal in large temperature differences, wide margin steering, and strong vibration environments.

Attitude Fusion Algorithms

Comprehensively utilize the data of sensors such as accelerometers and gyroscopes, obtain the pitch angle, roll angle, and yaw angle of the gimbal through mathematical models and filtering algorithms, and fuse this information to effectively improve system performance, stability, and robustness.

Industry-Level 3-Axis Stabilization Algorithms

Deeply integrate and utilize 3-axis gyroscopes, 3-axis accelerometers, PID controllers, motors, and magnetic encoders to achieve gimbal attitude stabilization control and continuously output stable high-definition video images during motion.

High-Precision FOC Motor Control Algorithms

Control the current components of the motor to control torque and magnetic field respectively, thereby achieving decoupling control of the brushless motor and greatly reducing picture jitter.

1.2 Ports, Interface & Definition

① Power Input
(3S to 6S)

② Control Signal Input & Output
(S.Bus / UART)

③ Control Signal Input & Output
(S.Bus / UART)

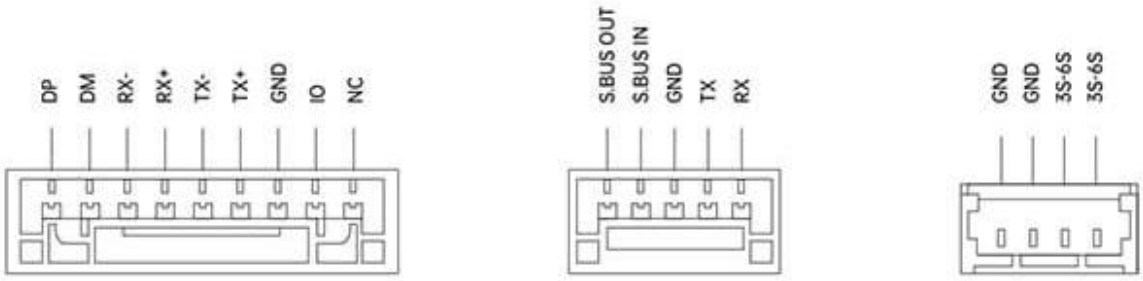
④ Ethernet
(Ethernet video stream and SDK protocol control)

⑤ Micro-HDMI
(Video output)

⑥ Type-C
(Upgrade and configure)

⑦ TF Card Slot
(File storage and copy)

⑧ Status Indicator



Video & Protocol

Gimbal Control

Power

1.3 Technical Specification

Overall

Video Output Port	Ethernet / CVBS Micro-HDMI
Control Signal Input Port	S.Bus UART Ethernet UDP / TCP
Control Signal Output Port	S.Bus
High Accuracy 3 Axis Stabilization	Yaw Pitch Roll
Working Voltage	11 ~ 25.2 V (3S to 6S) *Early manufacturing lots before June of 2023 may not support 25.2V, please carefully confirm
Power Consumption	Average 5 W Summit 12 W
Waterproof Level	IP4X
Working Temperature	-10 ~ 50 ℃
Dimension	55 x 55 x 70 mm
Weight	95 g

Gimbal

Angular Vibration Range	±0.01°
Controllable Pitch Angle	-90° ~ +25°
Controllable Yaw Angle	-135° ~ +135°
Rotatable Roll Angle	-30° ~ +30°

Camera

Lens	Fixed Focal Length 6X Digital Zoom

Equivalent Focal Length	21 mm
Image Sensor	Sony 1/1.7-inch 8 MP Effective Resolution
Aperture	F2.8
FOV	Diagonal: 93° Horizontal: 81°
Video Recording Resolution	4K (3840 x 2160) @ 25 fps 2K (2560 x 1440) @ 25 fps 1080p (1920 x 1080) @ 25 fps 720p (1280 x 720) @ 25 fps
Still Photo Resolution	4K (3840 x 2160) Follow video recording resolution
Video Storage Bitrate (H.265 Codec)	4K / 2K: 20 Mbps 1080p / 720p: 15 Mbps
File Storage Format	FAT32 ExFAT
Image Format	JPG
Video Format	MP4
Supported MicroSD Cards	MicroSD Class10, max 256 GB
Still Photography Mode	Single
White Balance	Auto

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To make sure that you get smoothly recorded video, please format the SD card, and make the minimum storage unit as 64 KB before recording.

Please format the SD card to FAT32 before camera firmware upgrade.

1.4 Packing List

1 x A8 mini Gimbal Camera

1 x MK15 / HM30 Air Unit S.Bus Y Cable
(Connect SIYI MK15 and HM30 air unit's S.Bus port to acquire control signal, then one connector of the cable goes to SIYI gimbal, another goes to flight controller)

1 x 3 in 1 Control Cable
(A universal cable for ZT30, ZT6, ZR30, and A8 mini, it connects SIYI gimbal's control signal port with SIYI link and controller, including UART control input, S.Bus input and output)

1 x SIYI Gimbal Power Cable
(Power supply cable for SIYI gimbal)

1 x SIYI Gimbal Ethernet Cable
(A backup cable for customer DIY purpose to connect SIYI gimbal to third-party Ethernet devices)

1 x SIYI Gimbal to SIYI Link Cable
(An all-in-one cable for only touch screen control to SIYI gimbal through SIYI link, it can power SIYI gimbal and can also transfer video stream and control signal)

1 x SIYI Gimbal Ethernet to RJ45 Cable
(Connect SIYI gimbal with RJ45 device directly)

1 x SIYI Gimbal to PX4 / ArduPilot Flight Controller UART Cable
(A universal cable for ZT30, ZT6, ZR30, and A8 mini, it connects SIYI gimbal to the UART port on PX4 / ArduPilot flight controller for data communication and gimbal control)

1 x A8 mini Screw Pack
(Using with the fixing board to mount the gimbal, including 6 x Hex Socket Cap Screw M2.5*5, 10 x Cross Recessed Flat Head Screw M2.5*10, 8 x M2.5 Nut Black)

1 x A8 mini Mounting Board & Damper Pack
(For mounting and fixing gimbal and stabilization)

1.5 Indicator Definition

The status indicator on SIYI gimbal uses three different colors and different blinking frequencies to indicate the system's working or abnormal status.

Solid Green: Normally working.

Slow Green Blinks: S.Bus signal input is normal.

Double Green Blinks: Integrating flight controller attitude data is normal.

Slow Red Blinks: Firmware does not match (camera firmware or gimbal firmware or neither).

Triple Red Blinks: Failed to identify zoom module (for optical zoom gimbal camera only).

Red-Red-Yellow Blinks Continuously: Fail to identify camera board.

Yellow Blinks: Power input voltage is low (lower than 10 V).

Double Red Blinks: IMU temperature rising is abnormal.

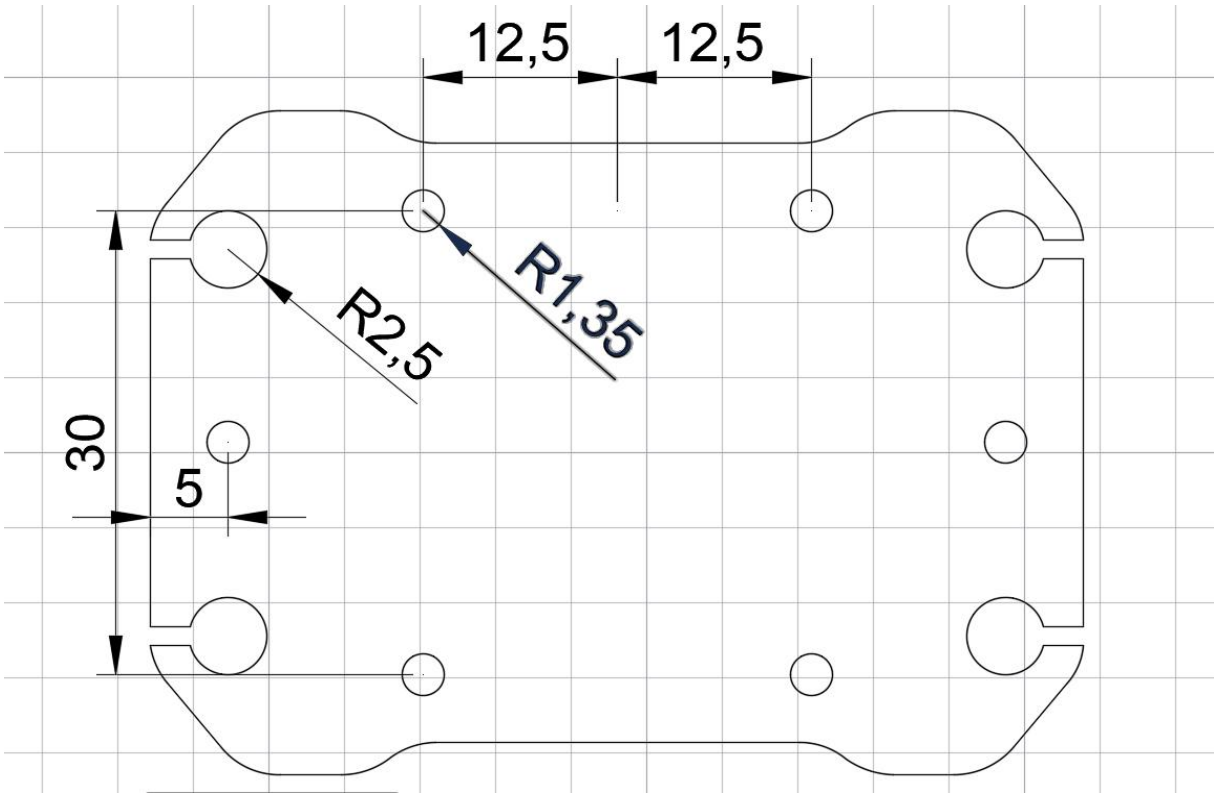
Double Yellow Blinks: IMU temperature is rising.

Triple Yellow Blinks: IMU temperature is abnormal.

2 GET READY TO USE A8 MINI

2.1 Installation

Screw Holes' Position and Distance



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The specs of the screws for fixing the four tube screws are M2.5*8 mm. Quantity: 4.

Welcome to contact SIYI to get the SIYI Gimbal 3D Model for pre-installation.

2.2 Connection and Power

SIYI optical pod and gimbal camera can be powered in many ways. If you plan to carry SIYI gimbal by your plane and the plane may roll in a wide margin, then please use connect SIYI gimbal's power port directly by a 3S to 6S power battery, not through power distribution board or air unit.

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The early manufacturing lots of A8 mini before June 2023 may not support 6S input, please carefully confirm.

2.3 Interesting Functions and Cautions

SIYI optical pod and gimbal camera support abundant interesting functions.

2.3.1 Capture with Time and Location Information

SIYI optical pod and gimbal camera can save time and location information into captured pictures in EXIF format. The preconditions that the function will work are:

- Time Information: The ground station must connect to internet and run the latest SIYI FPV app.
- Location Information: Gimbal must be communicating with the flight controller through UART.

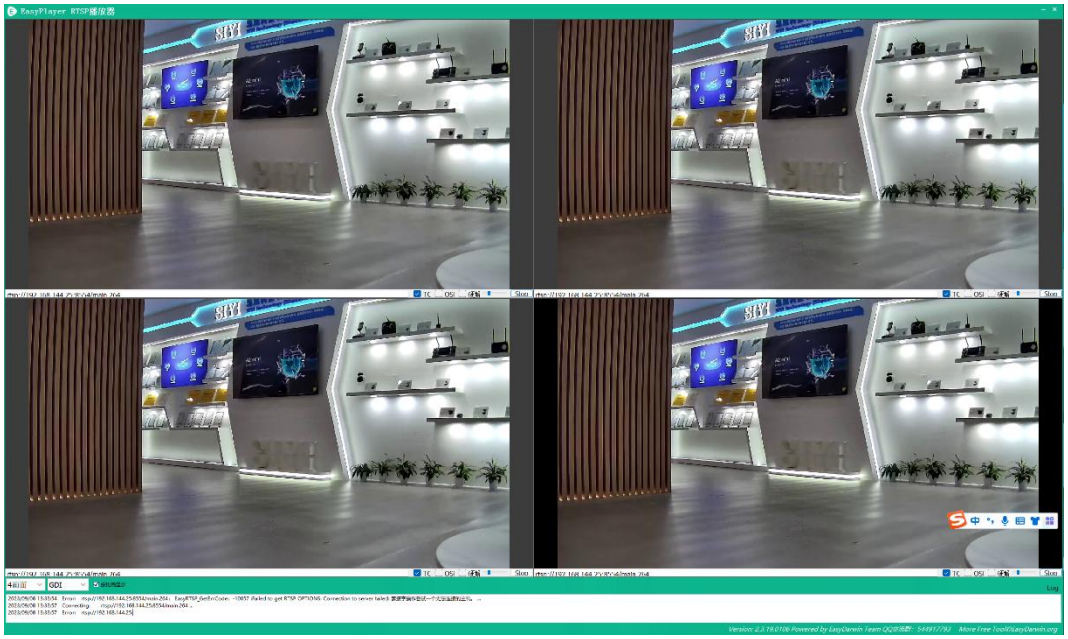
Mark

Location information can only be acquired from Mavlink protocol at this moment.

The above functions are only available in SIYI optical pods and gimbal cameras which support capturing pictures and TF card recording and can communicate with the flight controller (ZT30, ZT6, ZR30, ZR10, A8 mini).

2.3.2 Output Four Video Streams from the Same RTSP Addresses

SIYI optical pods and gimbal cameras can output up to four video streams from the same RTSP addresses.



3 GIMBAL CONTROL

SIYI optical pods and gimbal cameras support multiple methods to control.

3.1 Enable AI Recognition, Tracking, and Follow through SIYI AI Tracking Module Using SIYI Optical Pod (Gimbal Camera) and SIYI Link

SIYI optical pod (gimbal camera) can connect to SIYI link through SIYI AI tracking module and enable AI recognition, tracking, and follow feature through SIYI FPV app or SIYI QGC app while the air unit is communicating with the ground unit.

It is necessary to prepare the tools, firmware, and software below before controlling gimbal camera in this way.

- SIYI Links (MK32 Standard Combo / HM30 / MK15 Enterprise Standard Combo is suggested for excellent compatibility with SIYI gimbal cameras)
- SIYI Optical Pod (Gimbal Camera)
- Flight Controller
- SIYI AI Tracking Module

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Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal to SIYI Link Cable

Mark

Above tools come with product package.

- SIYI FPV App (v2.5.15.695 or latest version)
- SIYI QGC App

Mark

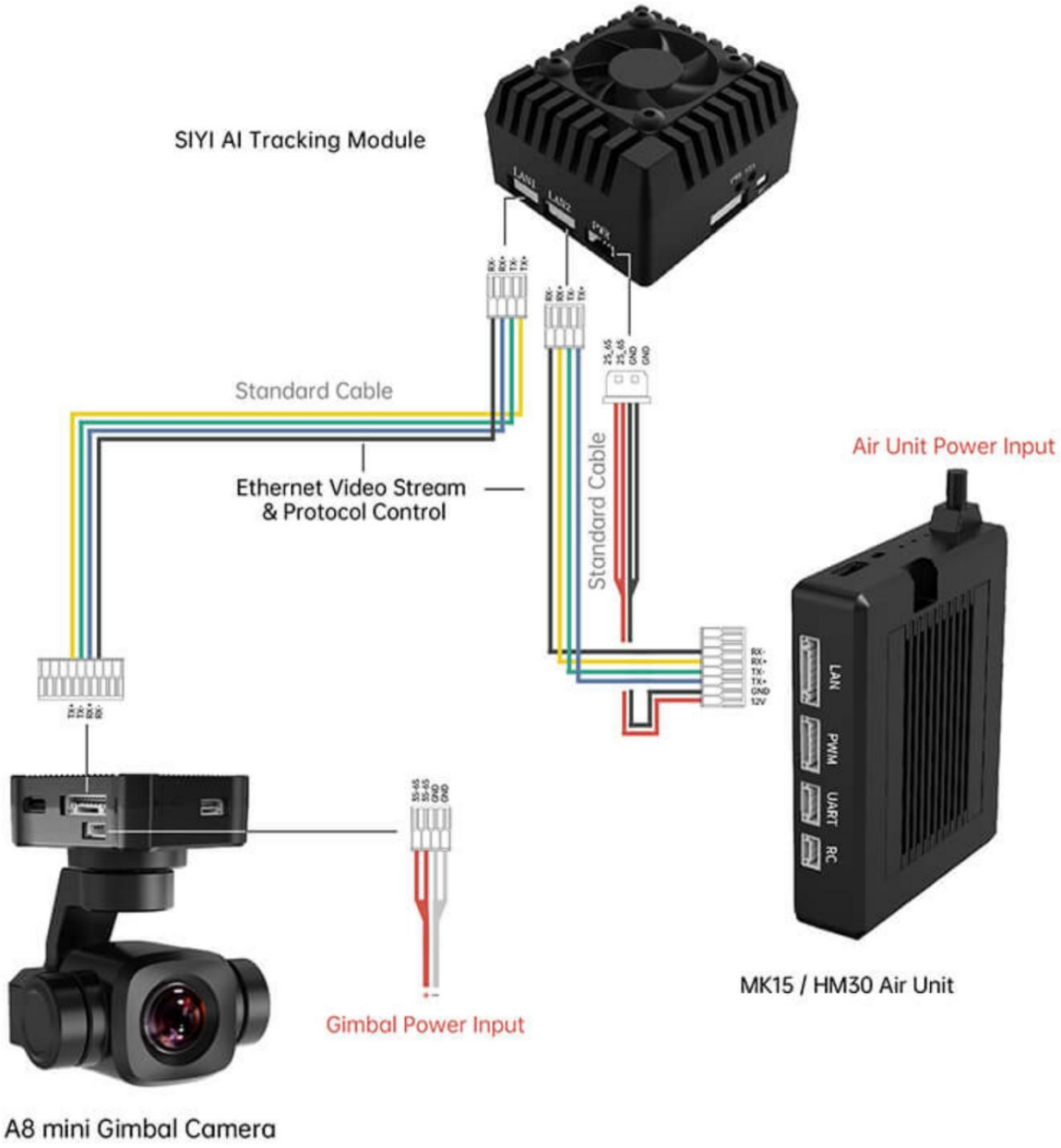
Above software can be downloaded from relevant product page on SIYI official website.

Steps

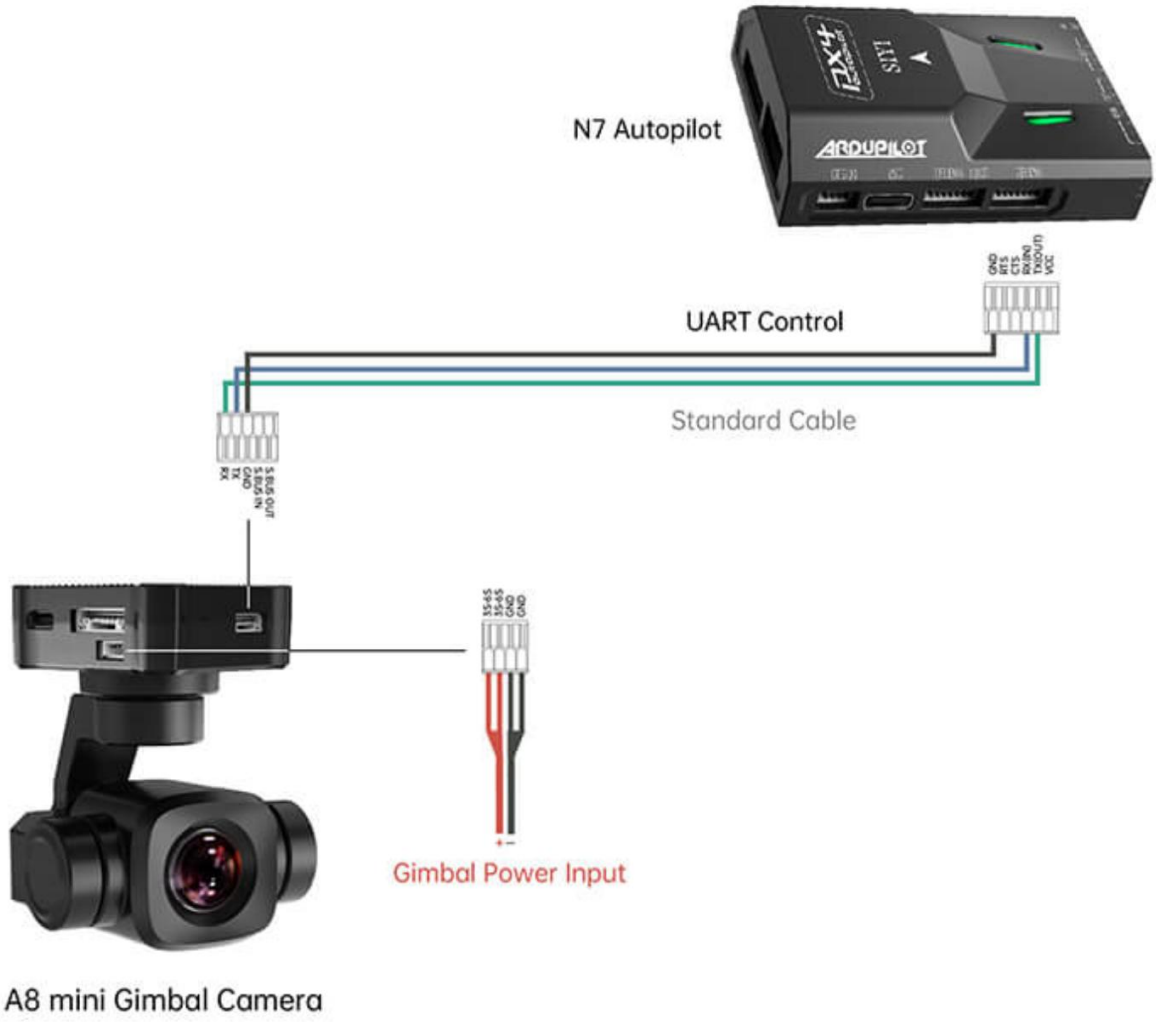
1. Confirm if gimbal camera's firmware has been upgraded to be compatible with SIYI AI tracking module and the AI follow function.

2. Confirm if SIYI FPV app has been upgraded to be compatible with SIYI AI tracking module and the AI follow function.

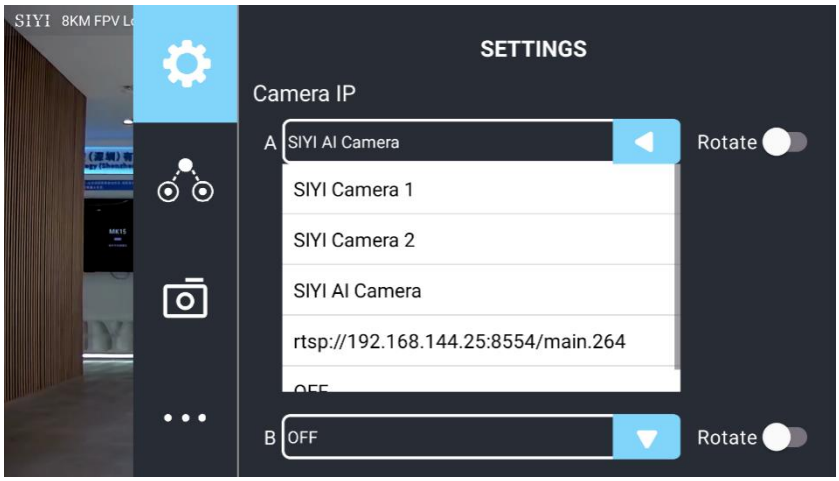
3. Please refer to the picture below to connect SIYI AI tracking module with SIYI gimbal camera and SIYI link.



4. Please refer to the picture below to connect SIYI gimbal camera with flight controller and integrate attitude data.



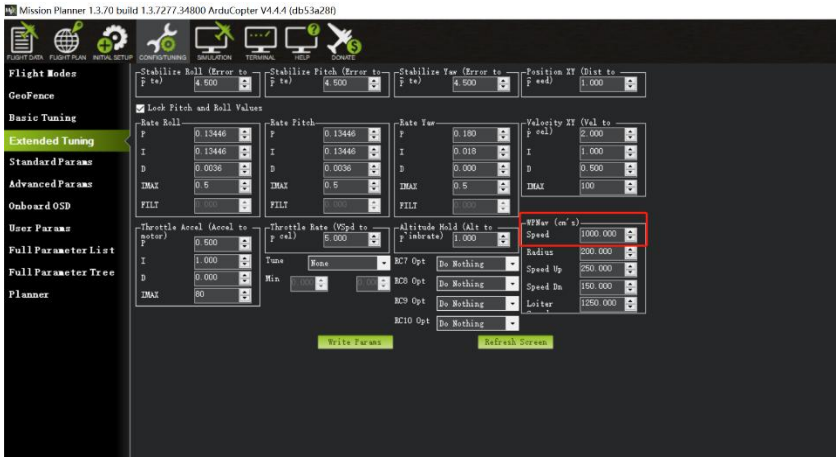
5. Run SIYI FPV app, go to “Settings - Addresses”, and select “SIYI AI Camera”.



6. Return to main image, touch the AI tracking function button to enable the function.

7. Confirm if the flight controller integration button shows up (which means flight controller attitude data is integrated).

8. Switch flight mode to “Guided” and configure the max flight speed.



9. Touch the AI follow button to enable target follow function.

10. Touch the AI tracking / follow button again to disable the function.

DANGER

Considering flight safety, it is recommended to use the AI follow function and obstacle avoidance function together.

When the AI follow function is activated, the operator will not be able to manually control the flight, and the ground station cannot use the guided mode to control the aircraft. Switching flight mode can regain control.

When the AI follow function is activated, please ensure that the view on the follow route is clear and free of obstacles, and always pay attention to flight safety. When encountering obstacles, please immediately take over the flight manually and re-plan the route.

When the tracking target is lost, the aircraft will hover.

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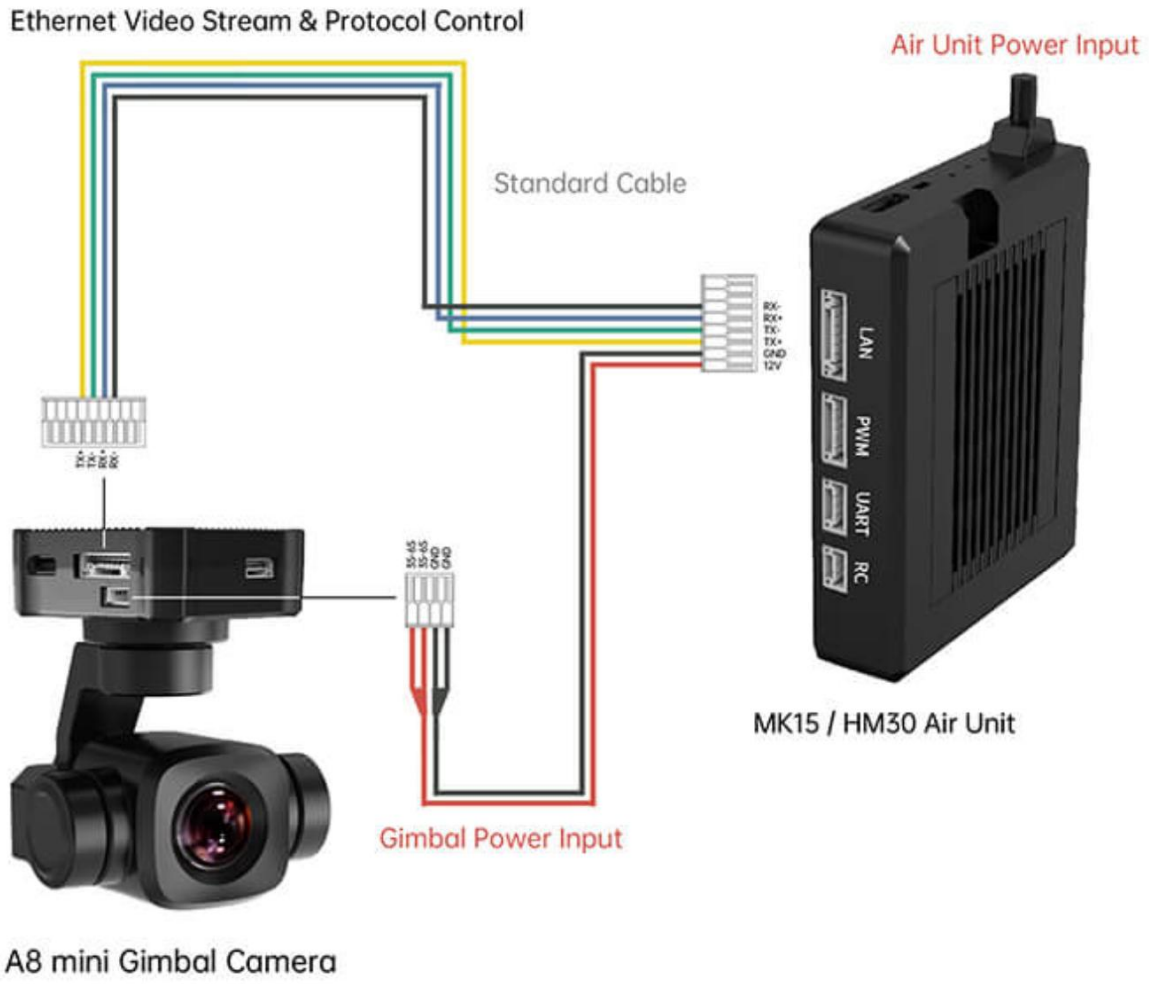
Using SIYI AI tracking module with multiple-sensor optical pods, in SIYI FPV app, the main stream of the optical pod should be configured as zoom camera.

When the tracked object is higher than the multi-rotor drone on the horizontal plane, AI follow function does not work; when the tracked object and the multi-rotor drone are on the same horizontal plane, AI follow function works best.

3.2 Control SIYI Optical Pod (Gimbal Camera) in SIYI FPV App or SIYI QGC App through SIYI link

SIYI optical pod (gimbal camera) can connect to SIYI link directly to control gimbal

rotation, gimbal functions, and video display in SIYI FPV app or SIYI QGC app when the air unit is communicating with the ground unit.



3.2.1 Preparation

It is necessary to prepare the tools, firmware, and software below before controlling gimbal camera in this way.

- SIYI Links (MK32 Standard Combo / HM30 / MK15 Enterprise Standard Combo is suggested for excellent compatibility with SIYI gimbal cameras)
- SIYI Optical Pod (Gimbal Camera)

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Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal to SIYI Link Cable

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Above tools come with product package.

- SIYI FPV App (v2.5.15.691 or latest version)
- SIYI QGC App

Mark

Above software can be downloaded from relevant product page on SIYI official website.

SIYI FPV App Steps

1. Power the air unit and bind it with the ground unit.
2. Use SIYI Gimbal to SIYI Link Cable to connect the air unit's Ethernet port to the gimbal camera's Ethernet port.
3. Update SIYI FPV app to the latest.
4. Run SIYI FPV app, go to "Settings" and select the relevant SIYI camera type with main / sub stream, video stream will display. Gimbal motion and camera functions can

be controlled by the application.

SIYI QGC App Steps

1. Power the air unit and bind it with the ground unit.
2. Use SIYI Gimbal to SIYI Link Cable to connect the air unit's Ethernet port to the gimbal camera's Ethernet port.
3. Run SIYI QGC app, go to "Comm Links – Video Settings", and select "RTSP Video Stream" for "Source", then enter the default RTSP addresses of SIYI gimbal camera, video stream will display. Gimbal motion and camera functions can be controlled by the application.

3.2.2 Gimbal Pitch and Yaw Rotation

While SIYI FPV App or SIYI QGC app is running,

Sliding on touchscreen can control gimbal rotation. Sliding left and right are yaw rotation, up and down are gimbal pitch rotation.

Double tap touchscreen, gimbal will automatically center.

Mark

Slide on touchscreen and hold it, gimbal will continue rotating till it reaches physical limit. Farther that you hold it from the center of the screen, faster the gimbal rotates.

3.2.3 Zoom and Focus

While SIYI FPV App or SIYI QGC app is running,

Touching “Zoom in” or “Zoom out” icon on can control the zoom camera.

Click the touchscreen once, optical zoom gimbal camera will focus automatically.

3.2.4 Take pictures and Record Video

While SIYI FPV App or SIYI QGC app is running,

Touch “Photo” icon once on to take a picture. Touch “Record” icon to start video recording. Touch “Recording” icon to stop video recording.

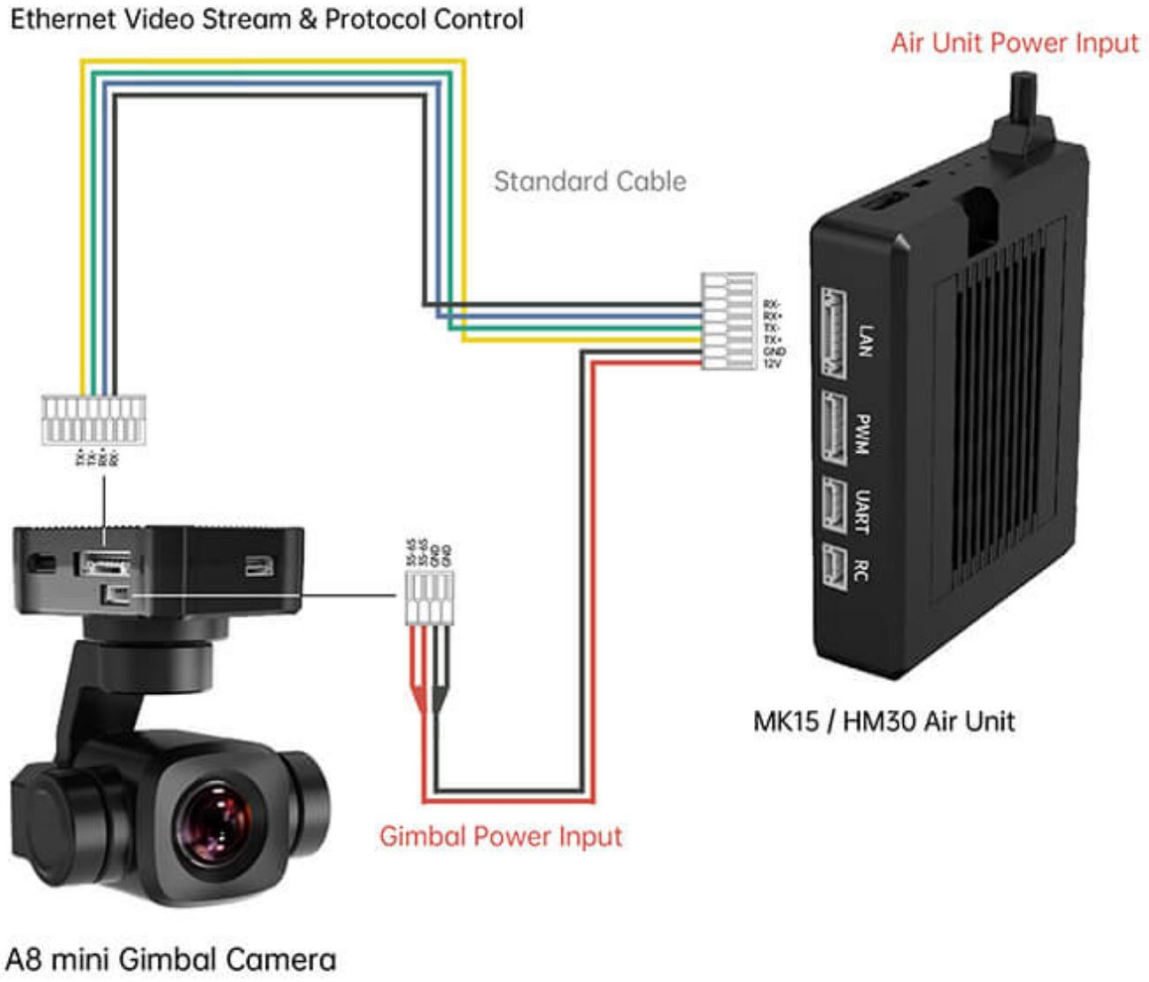
Mark

Before taking a picture or recording video, it is necessary to insert SD card into the camera.

3.3 Control SIYI Optical Pod (Gimbal Camera) in SIYI QGC (Windows) Software through SIYI Link

SIYI optical pod (gimbal camera) can connect to SIYI link directly to control gimbal

rotation, gimbal functions, and video display in SIYI QGC Windows software when the air unit is communicating with the ground unit.



3.3.1 Preparation

It is necessary to prepare tools, firmware, and software below before controlling gimbal camera in this way.

- SIYI Links (MK32 Standard Combo / HM30 / MK15 Enterprise Standard Combo is suggested for excellent compatibility with SIYI gimbal cameras)
- SIYI Optical Pod (Gimbal Camera)

Mark

Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal to SIYI Link Cable

Mark

Above tools come with product package.

- SIYI QGC Windows Software

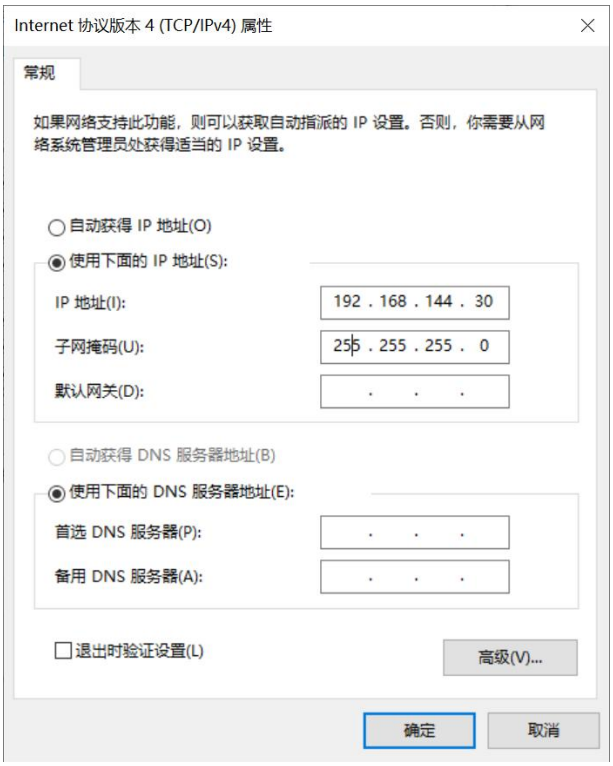
Mark

Above software can be downloaded from relevant product page on SIYI official website.

Steps

1. Power the air unit and bind it with the ground unit.
2. Use SIYI Gimbal to SIYI Link Cable to connect the air unit's Ethernet port with the gimbal's Ethernet port.
3. Then connect the ground unit of the SIYI link to the Windows computer.
4. Modify the computer's Ethernet settings to have the same gateway with SIYI link and avoid IP addresses conflict.

   For example, let's assign "192.168.144.30" for the computer IP addresses.



5. Run SIYI QGC Windows software, go to “Comm Links – Video Settings”, and select “RTSP Video Stream” for “Source”, then enter the default RTSP addresses of SIYI gimbal camera, video stream will display. Gimbal motion and camera functions can be controlled by mouse in QGroundControl.

3.3.2 Gimbal Pitch and Yaw Rotation

While SIYI QGC Windows software is running,

Drag the mouse on screen can control gimbal rotation. Dragging the mouse left and right are yaw rotation, up and down are pitch rotation.

Double click the mouse on screen, gimbal will automatically center.

Mark

Drag the mouse on screen and hold it, gimbal will continue rotating unless there is a physical stop. Farther you hold it from the center of the screen, faster the gimbal rotates.

3.3.3 Zoom and Focus

While SIYI QGC Windows software is running,

Clicking “Zoom in” or “Zoom out” icon on can control the zoom camera.

Click on screen, optical zoom camera will focus automatically.

3.3.4 Take pictures and Record Video

While SIYI QGC Windows software is running,

Click “Photo” icon once on to take a picture. Click “Record” icon to start video recording.

Click “Recording” icon to stop video recording.

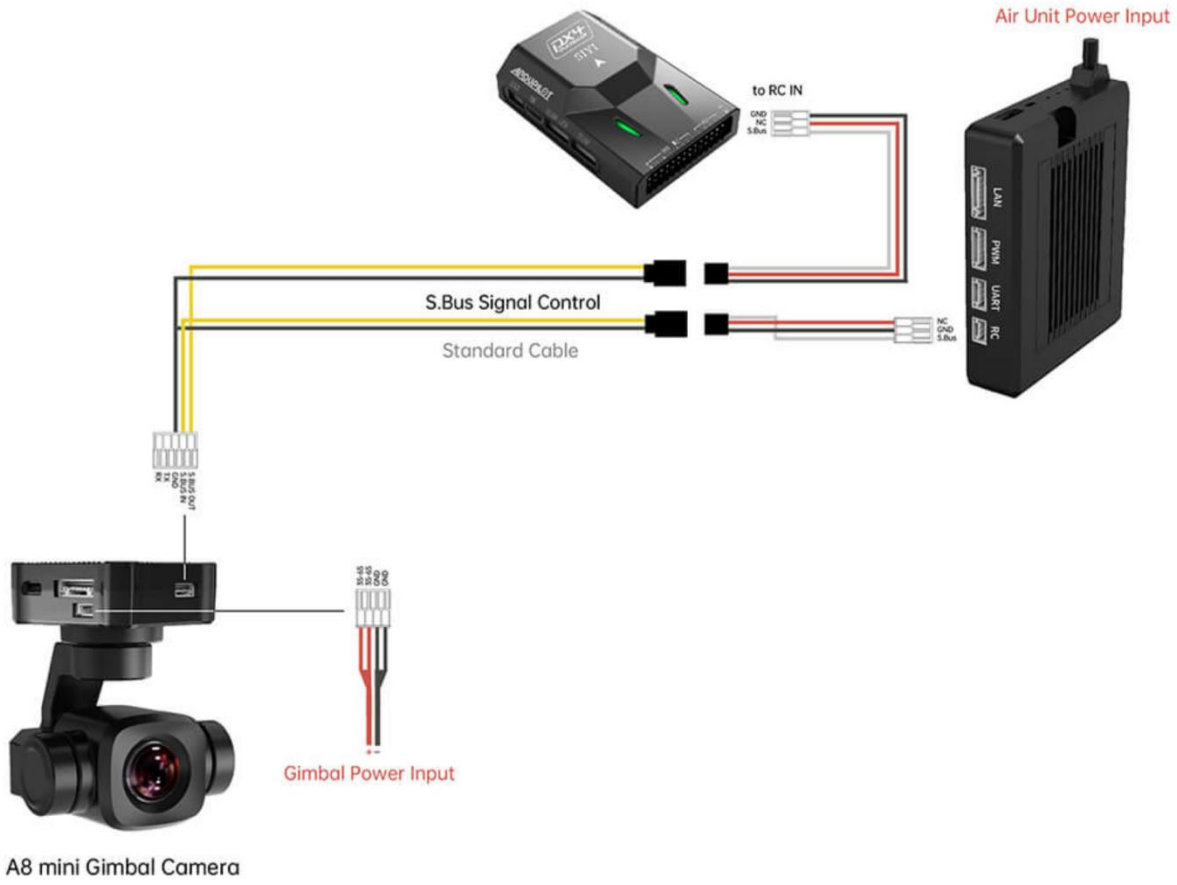
Mark

Before taking a picture or recording video, it is necessary to insert SD card into gimbal camera.

3.4 Control SIYI Optical Pod (Gimbal Camera) by S.Bus Signal and Forward S.Bus Signal to Flight Controller through SIYI Link

SIYI optical pod (gimbal camera) can be connected to the air unit of SIYI link and the flight controller simultaneously for attitude control through joysticks, dials, switches, and

buttons on a remote controller or on an SIYI handheld ground station.



3.4.1 Preparation

It is necessary to prepare tools, firmware, and software below before controlling gimbal camera in this way.

- SIYI Links (MK32 Standard Combo / HM30 / MK15 Enterprise Standard Combo is suggested for excellent compatibility with SIYI gimbal cameras)
- SIYI Optical Pod (Gimbal Camera)

Mark

Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal to SIYI Link Cable
- 3 in 1 Control Cable (For ZT30, ZT6, ZR30, and A8 mini)
- MK15 / HM30 Air Unit S.Bus Y Cable

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Above tools come with product package.

- Cable (USB-C to USB-A)

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Above tools should be prepared by customer.

- SIYI PC Assistant (v1.3.9 or latest version)

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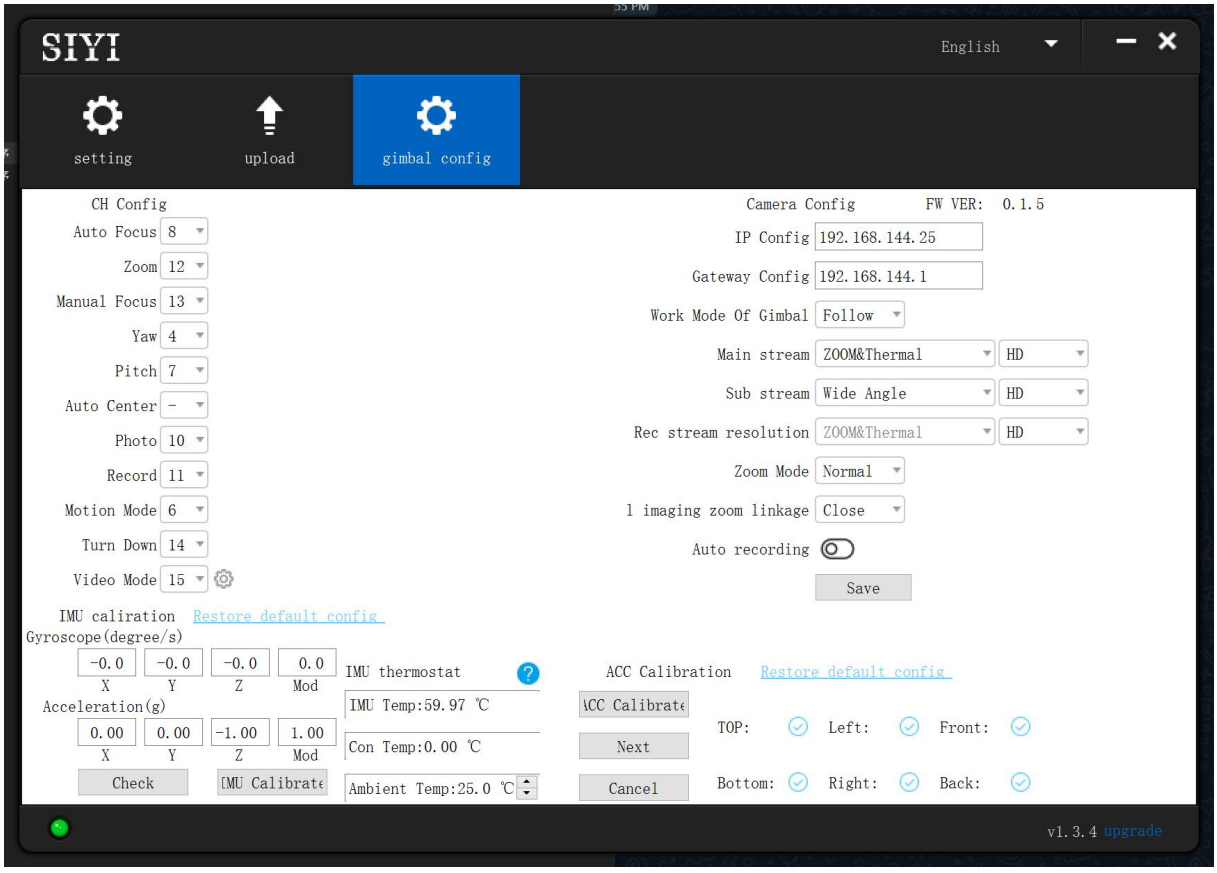
Above software can be downloaded from relevant product page on SIYI official website.

Steps

1. Power the air unit and bind it with the ground unit.
2. Use SIYI Gimbal to SIYI Link Cable to connect the air unit's Ethernet port with

gimbal's Ethernet port.

3. Wire the 3 in 1 Control Cable with the MK15 / HM30 Air Unit S.Bus Y Cable.
4. Then use the combined cable to connect the air unit's RC port and the gimbal's control signal port.
5. Install and run SIYI PC Assistant on Windows computer.
6. Use the USB-C to USB-A cable to connect the gimbal to the computer, then run SIYI PC Assistant and go to "Gimbal Config" page.



7. Under "Channel Config" page, assign the communication channel 1 to 16 to target gimbal and camera functions according to your requirement.
8. For the assigned channels, operate their mapped joysticks, dials, switches, and buttons on the handheld ground station to confirm if they are working normally.

3.4.2 Gimbal Pitch and Yaw Rotation (Taking an example of Dial Control)

Below is suggested channel mapping settings for testing, customers are free to assign channel mappings as required through SIYI TX app.

- Channel 7 = Left Dial (Reversed)
- Channel 8 = Right Dial
- Channel 12 = Any Button

In SIYI PC Assistant, map “Yaw” function to channel 7 and “Pitch” to channel 8, “Center” to channel 12.

Then, if you operate the left dial, gimbal will rotate on yaw axis. If you operate the right dial, gimbal will rotate on pitch axis. Press the button, gimbal will center itself automatically.

Mark

Hold the dial from its center position, gimbal will keep rotating unless there was a physical limit. Farther you hold it away from center, faster gimbal rotates.

3.4.3 Zoom and Focus (Taking an Example of Switch Control)

Below are the suggested channel mapping settings for testing, customers are free to assign channel mappings as required through SIYI TX app.

- Channel 13 = A Switch

- Channel 14 = B Switch

In SIYI PC Assistant, map “Zoom” function to channel 13, map “Auto Focus” function to channel 14.

Then, if you operate switch A, camera will zoom in or zoom out. If you operate switch B, optical zoom camera will focus automatically.

3.4.4 Take Pictures and Record Video (Taking an Example of Button Control)

Below are the suggested channel mapping settings for testing, customers are free to assign channel mappings as required through SIYI TX app.

- Channel 9 = Button A
- Channel 10 = Button B

In SIYI PC Assistant, map “Photo” function to channel 9 and “Record” to channel 10.

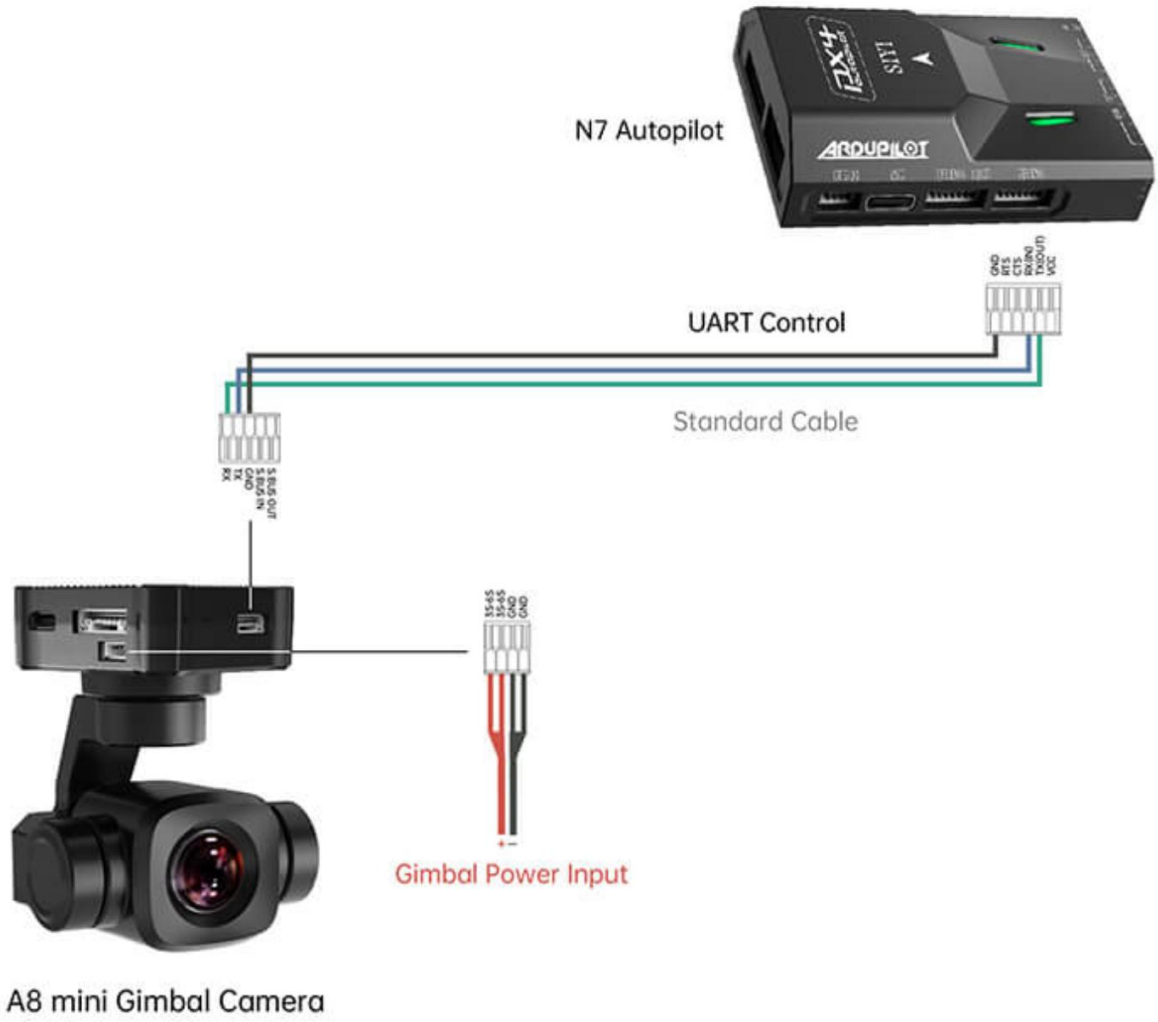
Then, if you press button A, camera will take a picture. If you press button B, camera will start or stop video recording.

Mark

Before taking pictures or recording video, it is necessary to insert SD card into the camera.

3.5 Control SIYI Gimbal Camera by the ArduPilot Driver through UART and Integrate Flight Controller Attitude Data

Gimbal camera's UART port connects to ArduPilot flight controller's UART port directly to communicate with the flight controller and to control gimbal rotation, gimbal functions, and camera functions.



Preparation

It is necessary to prepare the tools, firmware, and software below before controlling gimbal camera in this way.

- ArduPilot Flight Controller (v4.4.4 and above firmware)
- SIYI Optical Pod (Gimbal Camera)

Mark

Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal to PX4 / Ardupilot Flight Controller UART Cable

Mark

Above tools come with product package.

- Mission Planner (Windows) Software

Steps

1. Power SIYI gimbal camera and ArduPilot flight controller.
2. Connect gimbal camera's UART port to ArduPilot flight controller's UART port and make sure they are communicating with each other.
3. Run ground station and set the following parameters.

   Gimbal Control

   The params below assume the autopilot's telem2 port is used and the Camera1 control

instance.

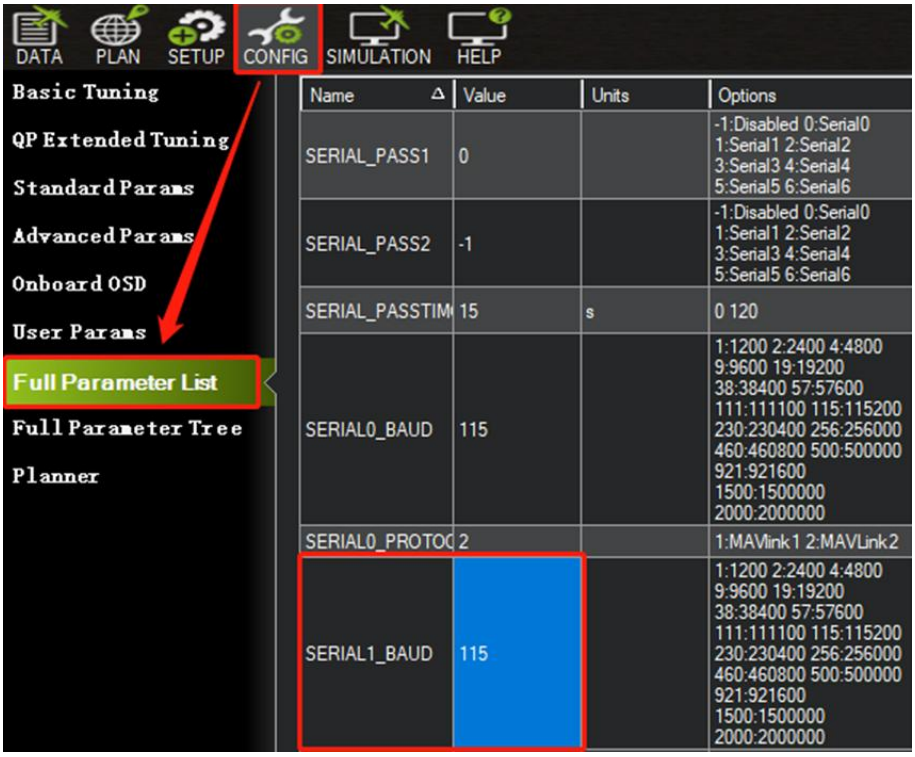
- SERIAL2_PROTOCOL to 8 (“SToRM32 Gimbal Serial”)
- SERIAL2_BAUD to “115” for 115200 bps
- MNT1_TYPE to “8” (“SIYI”) and reboot the ardupilot
- MNT1_PITCH_MIN to -90
- MNT1_PITCH_MAX to 25
- MNT1_YAW_MIN to -80
- MNT1_YAW_MAX to 80
- MNT1_RC_RATE to 90 (deg/s) to control speed of gimbal when using RC targetting
- CAM1_TYPE to 4 (Mount / SIYI) to allow control of the camera.
- RC6_OPTION = 213 (“Mount Pitch”) to control the gimbal’s pitch angle with RC channel 6
- RC7_OPTION = 214 (“Mount Yaw”) to control the gimbal’s yaw angle with RC channel 7
- RC8_OPTION = 163 (“Mount Lock”) to switch between “lock” and “follow” mode with RC channel 8

  Optionally these auxiliary functions are also available.
- RC9_OPTION = 166 (“Camera Record Video”) to start/stop recording of video
- RC9_OPTION = 167 (“Camera Zoom”) to zoom in and out
- RC9_OPTION = 168 (“Camera Manual Focus”) to adjust focus in and out
- RC9_OPTION = 169 (“Camera Auto Focus”) to trigger auto focus

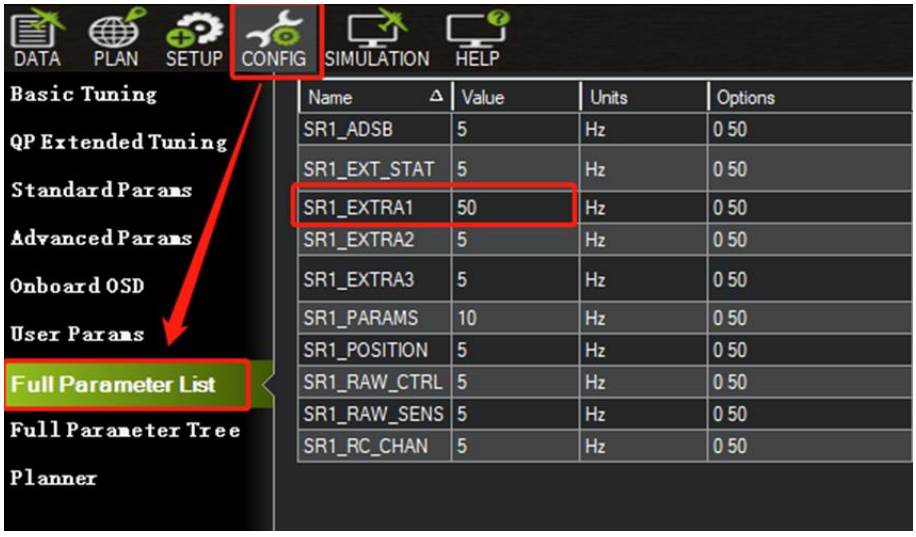
Integrate Flight Controller Attitude Data

The params below assume the autopilot's telem2 port is used and the Camera1 control instance.

- SERIAL2_BAUD to "115" for 115200 bps



- SR2_EXTRA1 to "50" to set flight controller attitude angle data sending frequency.



After configuration, it is necessary to “Write Parameters” and reboot the flight controller to take effect.

Mark

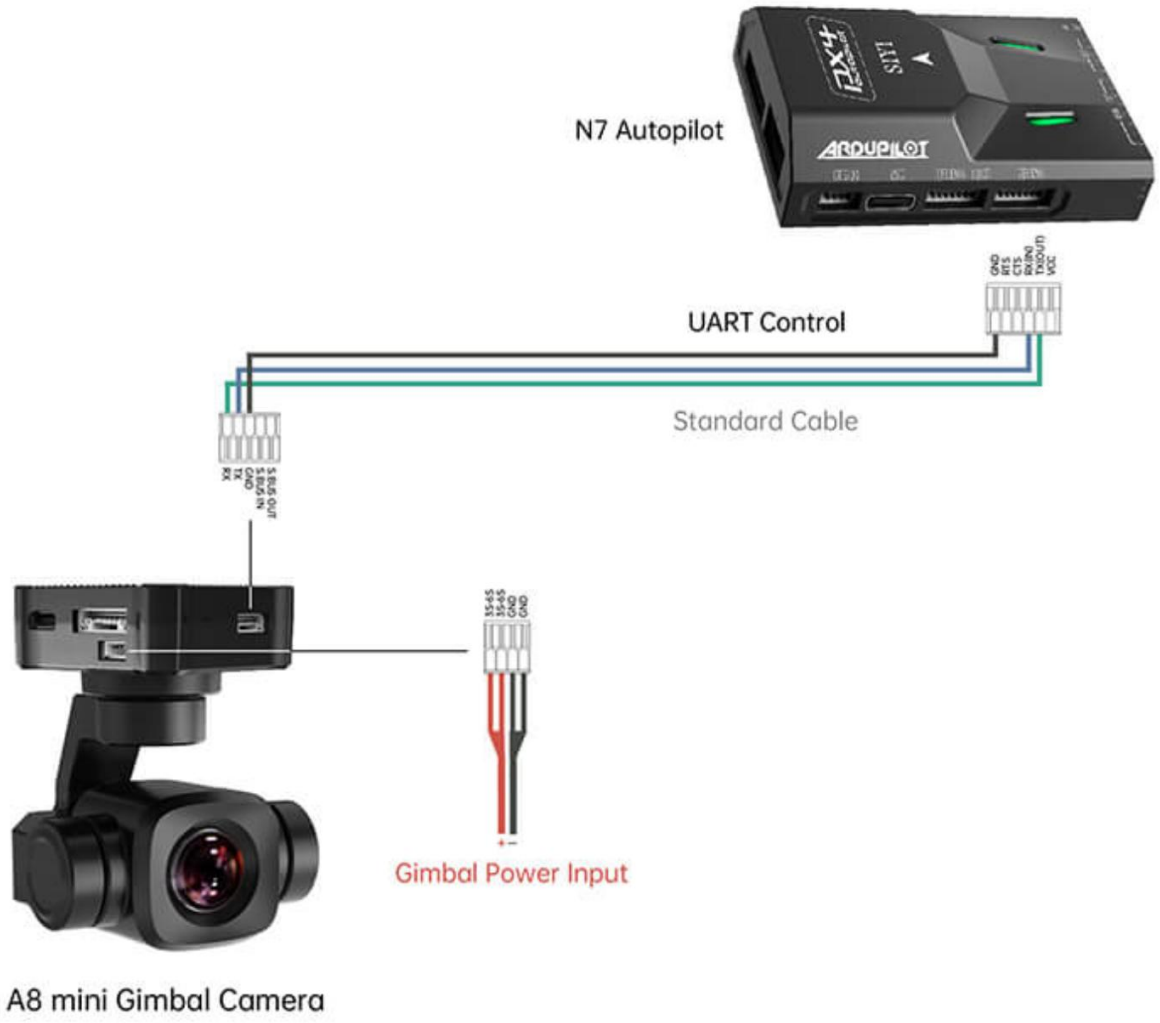
Integrate flight controller attitude data can effectively promote gimbal performance while drone attitude is changing fast.

Welcome to visit ArduPilot official documentation for SIYI gimbal as well.

https://ardupilot.org/copter/docs/common-siyi-zr10-gimbal.html

3.6 Control SIYI Gimbal Camera by Mavlink Gimbal Protocol through UART and Integrate Flight Controller Attitude Data

Gimbal camera's UART port connects to PX4 flight controller's UART port directly to communicate with the flight controller and to control gimbal rotation, gimbal functions, and camera functions.



Preparation

It is necessary to prepare the tools, firmware, and software below before controlling gimbal camera in this way.

- PX4 Flight Controller
- SIYI Optical Pod (Gimbal Camera)

Mark

Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal to PX4 / Ardupilot Flight Controller UART Cable

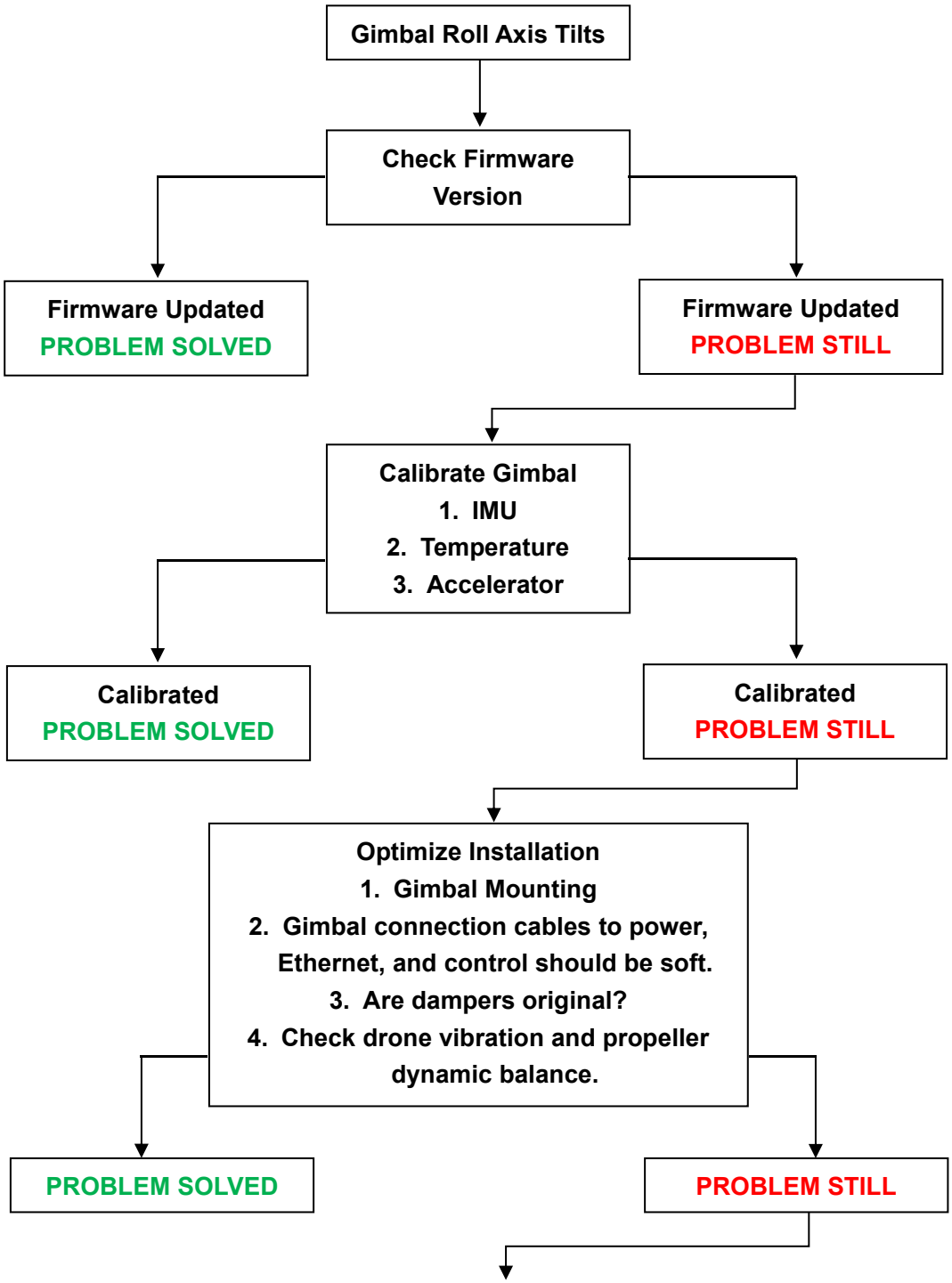
Mark

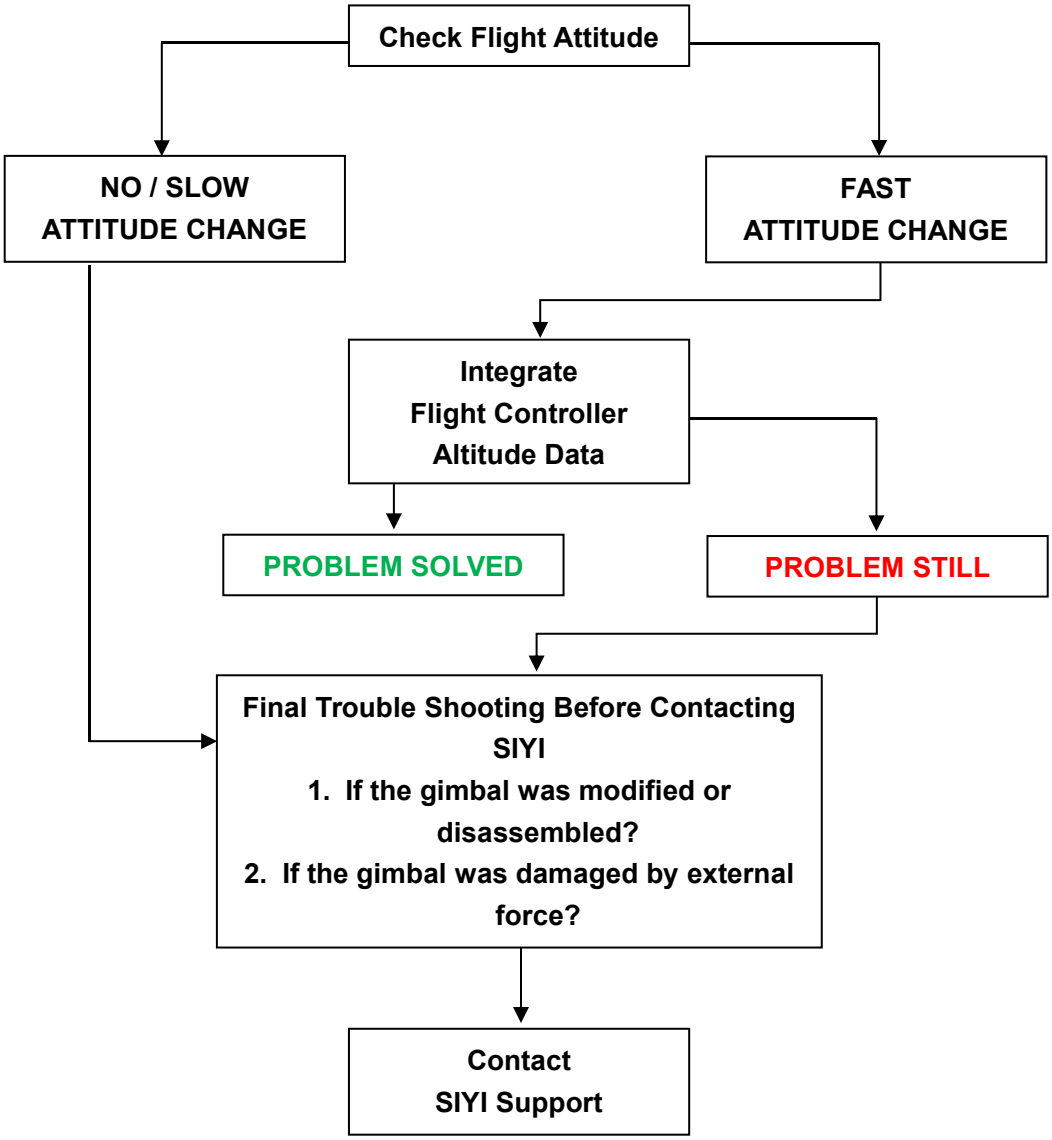
Above tools come with product package.

- QGroundControl Windows GCS

3.7 Necessary Trouble Shooting Steps When Gimbal Attitude Control Is Abnormal

Let's take an example of the problem that gimbal roll axis tilts abnormally.



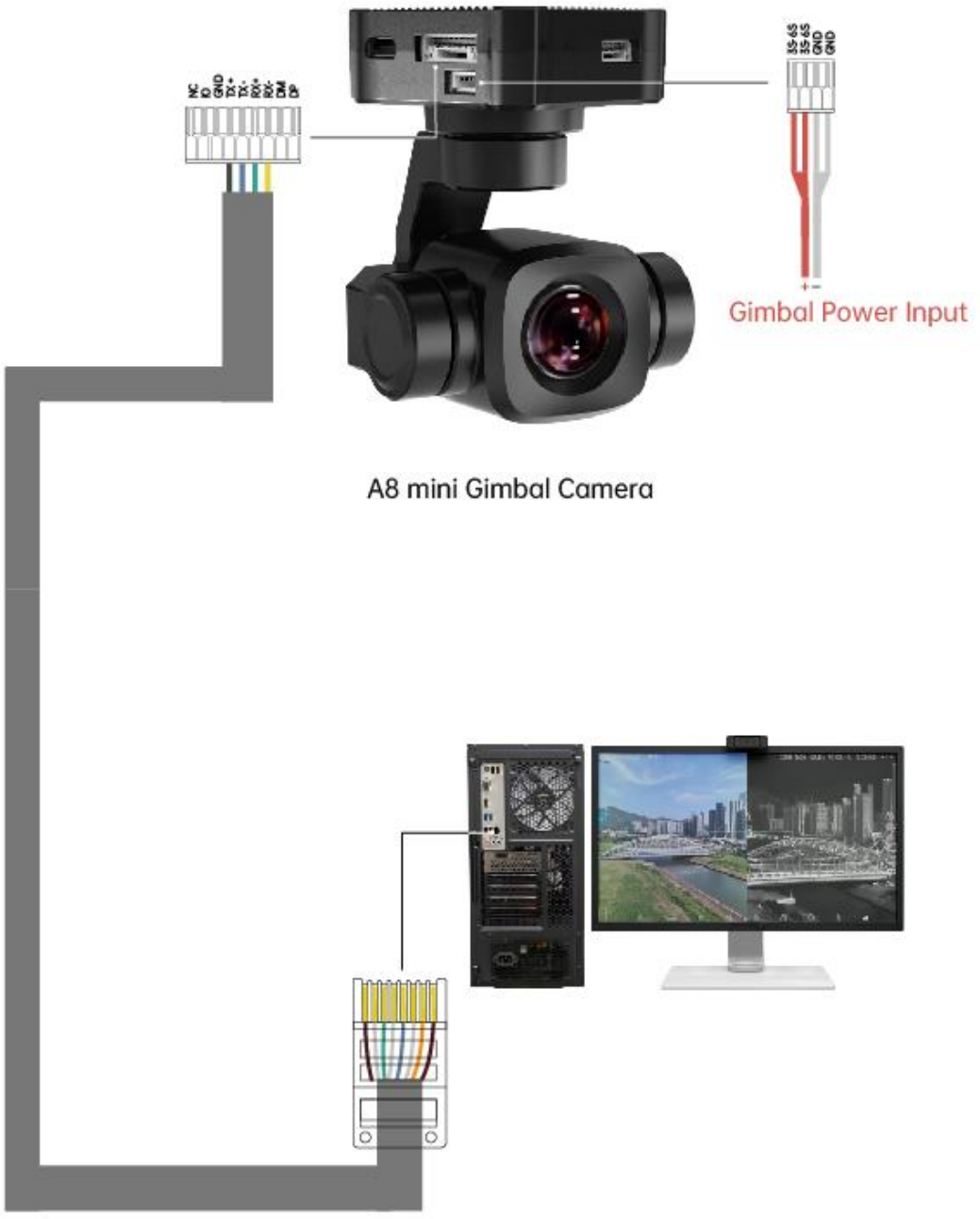


4 VIDEO OUTPUT

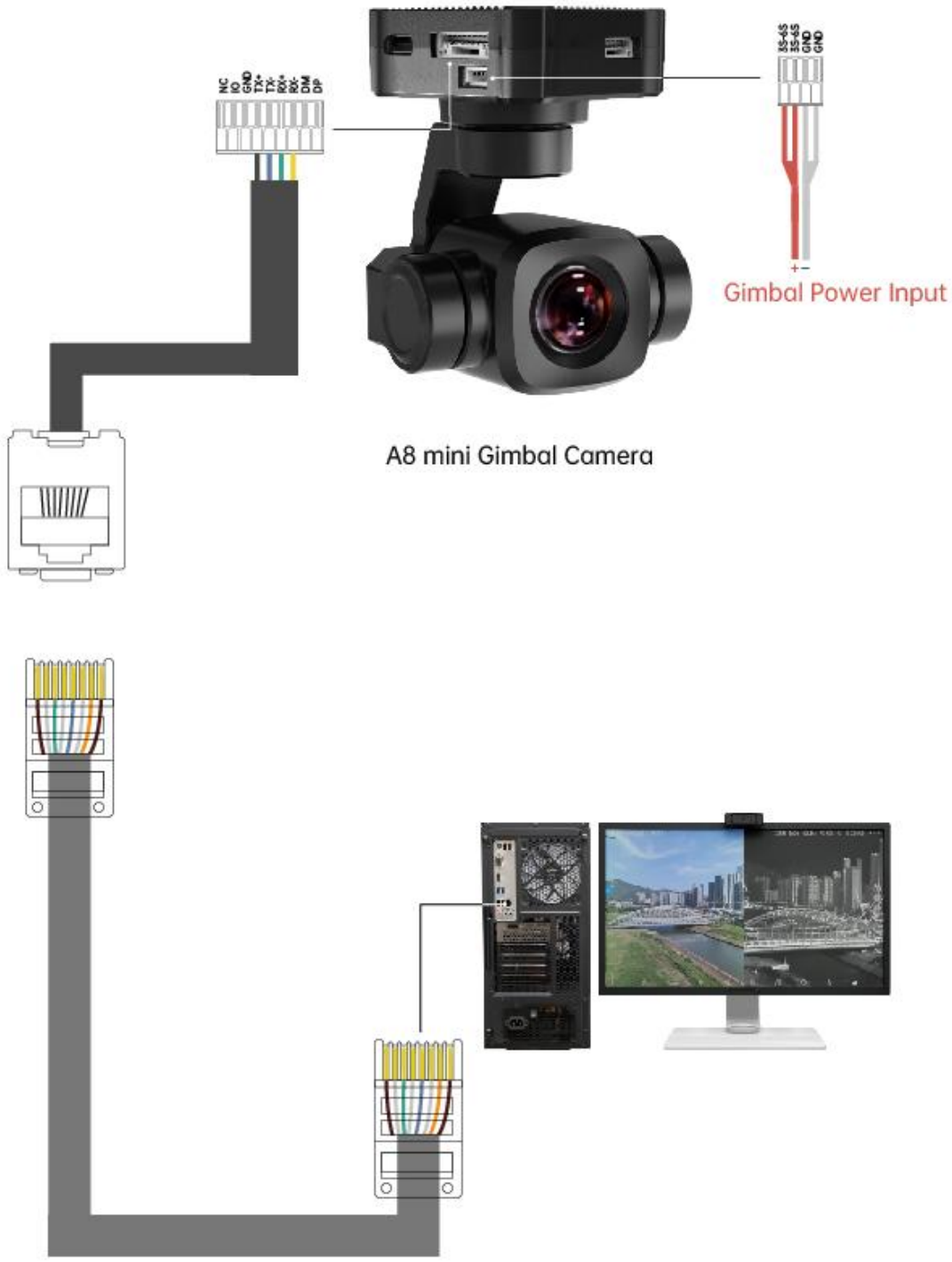
A8 mini gimbal camera comes with three video output methods: Ethernet, HDMI, and CVBS(AV).

4.1 Output Video to Windows Device Directly through Ethernet

Gimbal camera connects to Windows device directly, then video will be displayed in SIYI QGC Windows software.



SIYI Gimbal Ethernet to RJ45 Cable (New)



SIYI Gimbal Ethernet to RJ45 Cable (Old)

Preparation

It is necessary to prepare the tools, firmware, and software below before outputting video

stream in this way.

- SIYI Optical Pod (Gimbal Camera)

Mark

Above products can be purchased from SIYI directly or from SIYI authorized dealers.

- SIYI Gimbal Ethernet to RJ45 Cable

Mark

Above tools come with product package.

- SIYI QGC Windows Software

Mark

Above software can be downloaded from relevant product page on SIYI official website.

Steps

1. Power gimbal camera.
2. Use SIYI Gimbal Ethernet to RJ45 Cable to connect the gimbal quick release board's Ethernet port to Windows device's RJ45 port. If your computer does not come with RJ45 port, it is suggested to use an RJ45 to USB converter.
3. Modify the computer's Ethernet settings to have the same gateway with SIYI link and

avoid IP addresses conflict.

For example, let's assign "192.168.144.30" for the computer IP addresses.

4. Run SIYI QGC Windows software, go to "Comm Links – Video Settings", and select "RTSP Video Stream" for "Source", then enter the default RTSP addresses of SIYI gimbal camera, video stream will display. Gimbal motion and camera functions can be controlled by mouse in QGroundControl.

4.2 Output Video to Third-Party Link through Ethernet

SIYI gimbal camera can output video to any third-party link which provides Ethernet port and is compatible with RTSP video stream.

In this way, it is necessary to prepare a customized video cable for connection between SIYI gimbal camera and the third-party link.

CAUTION

SIYI gimbal camera Ethernet port's "RX-" pinout should connect to the third-party link Ethernet port's "RX-" pinout, and "RX+" pinout to "RX+" pinout. Do not cross the pinouts, otherwise it will cause damage to the device.

Steps

1. Power the air unit of the third-party link and bind it with the ground unit.
2. Use the video cable to connect SIYI gimbal camera's Ethernet port and the third-party link's Ethernet port.
3. Open RTSP video player and input SIYI gimbal camera's default RTSP addresses, if connection is successful, video will display normally.

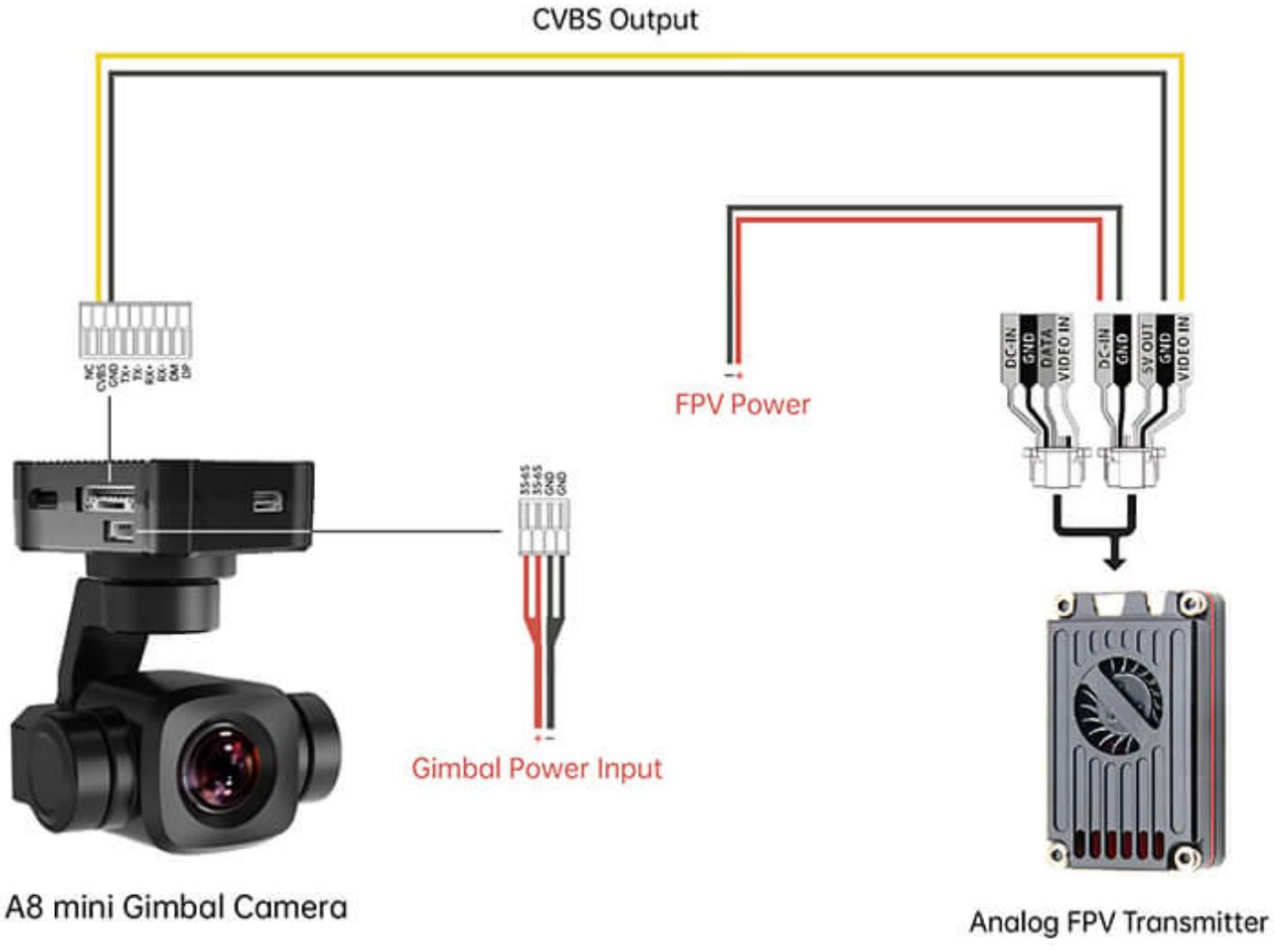
Mark

SIYI QGC Android app and Windows software support video display from third-party links as well.

4.3 Output CVBS Video to Analog Transmitter

A8 mini gimbal camera can output CVBS video to analog transmitter directly though the Ethernet port.

Before using ZT6 in this way, users should prepare the video cable by themselves, then connect ZT6 to the FPV transmitter and power both.



Steps

1. Please refer to the above picture to connect ZT6 to your analog transmitter and power the gimbal.

2. Connect ZT6 to PC and run SIYI Assistant. Switch video output mode to “CVBS” under the “Gimbal Config” page.
3. Power the analog transmitter and bind it with the ground unit.
4. Turn on the FPV monitor, if video shows up, the connection is successful.

4.4 Output Video through Micro-HDMI

A8 mini gimbal camera can output video directly though the Micro-HDMI port.

Steps

1. Power A8 mini and connect it to PC. Run SIYI Assistant, switch video output mode to “HDMI” under the “Gimbal Config” page.
2. Connect ZT6 to the HDMI monitor.
3. If video shows up, the connection is successful.

4.5 Solutions to No Image through Ethernet

If gimbal camera failed to output video or the video cannot be displayed properly, please follow the steps below for trouble shooting.

1. Confirm if the link's ground unit is communicating with the air unit and if the camera is connected to the air unit.
2. Check Camera IP addresses and RTSP addresses.
3. If you are using SIYI FPV app, check the connection status, app version, video stream settings.
4. If you are using SIYI handheld ground stations, check the Ethernet switch in Android system.
5. Please double check if the gimbal camera's IP addresses was modified accidentally.

If video still does not show up, please follow the steps below and make a deep investigation according to the video output mode, the video display device, and the application / software you are using.

4.5.1 Video Output to Android Device

1. Input SIYI gimbal's default IP addresses "192.168.144.25" in the "Ping Tools" app and check if the network communication is successful. If the tool responds, then check if the RTSP address in the application / software is correct.

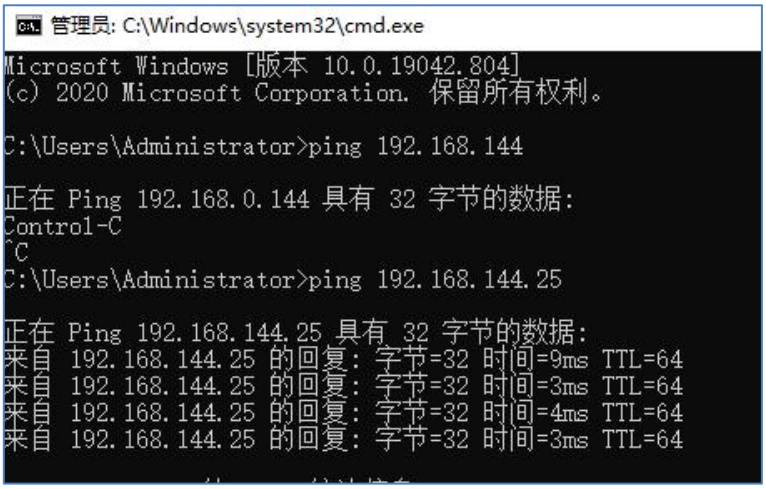
Successful Network Communication

Network Communication Failed

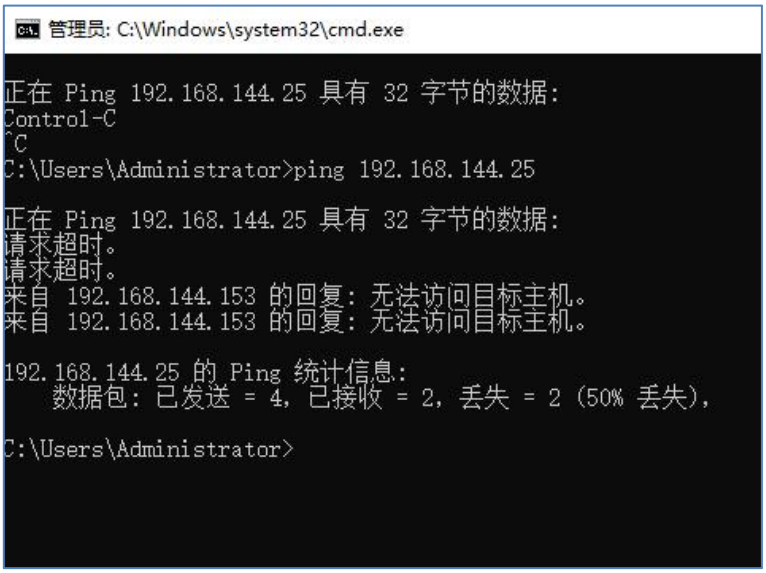
2. If the network communication is failed, then check the communication between the link's ground unit and the air unit. If the communication is good, then check if the video cable between the camera and the link's air unit is good, and if the voltage input is in normal range.

4.5.2 Video Output to Windows Device

1. Use the “Win + R” key combo to wake up the “Run” program and input the command “cmd”.



Successful Network Communication



Network Communication Failed

2. Input SIYI gimbal camera’s default IP addresses “192.168.144.25” and press the “Enter” key to check if the communication is successful. If it is, please check the RTSP addresses in the software or try to switch to another software.

3. If the network didn’t connect, then check the communication between the link’s ground unit and the air unit. If the communication is successful, then check if the video cable between the camera and the link’s air unit is good, and if the voltage input is in normal range.

Mark

If you have done all trouble shooting by following the steps above and still didn’t solve the problem, then please contact your dealer, or contact SIYI Support directly.

4.6 Common IP Addresses

SIYI Air Unit IP Address: 192.168.144.11

SIYI Ground Unit IP Address: 192.168.144.12

SIYI Handheld Ground Station Android System IP Address: 192.168.144.20

SIYI Ethernet to HDMI Output Converter IP Add: 192.168.144.50

SIYI AI Camera IP Address: 192.168.144.60

SIYI Optical Pod / Gimbal Camera's Default IP Addresses: 192.168.144.25

(NEW) SIYI Optical Pod / Gimbal Camera's Default RTSP Addresses:

- SIYI AI Camera: rtsp://192.168.144.25:8554/video0
- Main Stream: rtsp://192.168.144.25:8554/video1
- Sub Stream: rtsp://192.168.144.25:8554/video2

(NEW) SIYI FPV App's Private Video Stream Protocol's Addresses:

- SIYI Camera 1 Main Stream: 192.168.144.25: 37256
- SIYI Camera 1 Sub Stream: 192.168.144.25: 37255
- SIYI Camera 2 Main Stream: 192.168.144.26: 37256
- SIYI Camera 2 Sub Stream: 192.168.144.26: 37255

SIYI IP67 Camera A's IP Address: 192.168.144.25

SIYI IP67 Camera B's IP Address: 192.168.144.26

SIYI Air Unit HDMI Input Converter's IP Address: 192.168.144.25

SIYI IP67 Camera A's RTSP Address: rtsp://192.168.144.25:8554/main.264

SIYI IP67 Camera B's RTSP Address: rtsp://192.168.144.26:8554/main.264

SIYI Air Unit HDMI Input Converter's RTSP Address:

rtsp://192.168.144.25:8554/main.264

Common Video Player: SIYI FPV, QGroundControl, EasyPlayer

Network Diagnosis Tool: Ping Tools

Mark

SIYI cameras released after ZT30 (including ZT30 and ZT6) start to use the new addresses.

SIYI cameras released before ZT30 (including ZR30, A2 mini, A8 mini, ZR10, and R1M) are stilling using the old addresses.

5 SIYI FPV ANDROID APP

SIYI FPV is an Android application developed by SIYI to configure many SIYI products for video display, camera stream settings, and communication link status monitoring.

Mark

This chapter is edited based on SIYI FPV App v2.5.15.691.

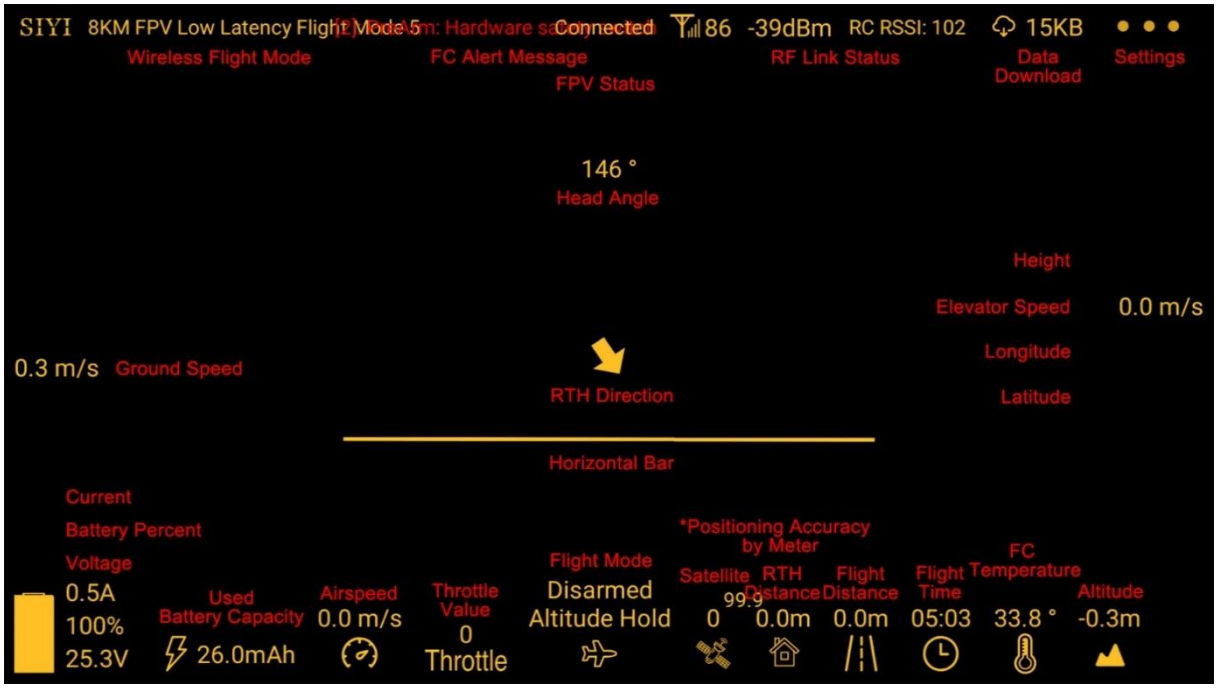
SIYI FPV App can be downloaded from SIYI official website:

https://siyi.biz/en/index.php?id=downloads&asd=22

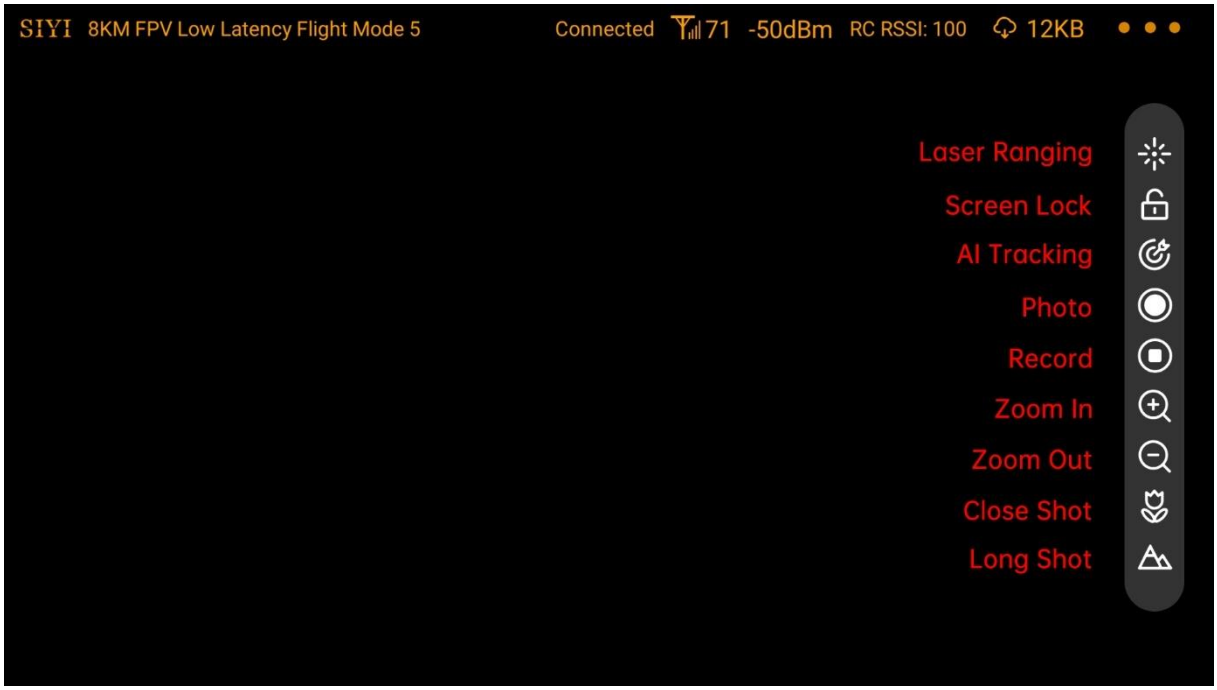
SIYI FPV App compatible SIYI devices

- ZT6 Mini Dual-Sensor Optical Pod
- SIYI AI Tracking Module
- ZT30 Four-Sensor Optical Pod
- ZR30 4K AI 180X Hybrid Zoom Optical Pod
- A2 mini Ultra-Wide-Angle FPV Gimbal
- MK32 / MK32E Enterprise Handheld Ground Station
- A8 mini AI Zoom Gimbal Camera
- ZR10 2K 30X Hybrid Zoom Optical Pod
- R1M HD Recording FPV Camera
- Air Unit HDMI Input Converter
- HM30 Full HD Image Transmission System
- MK15 / MK15E Mini Handheld Ground Station

SIYI FPV App OSD Information Definition

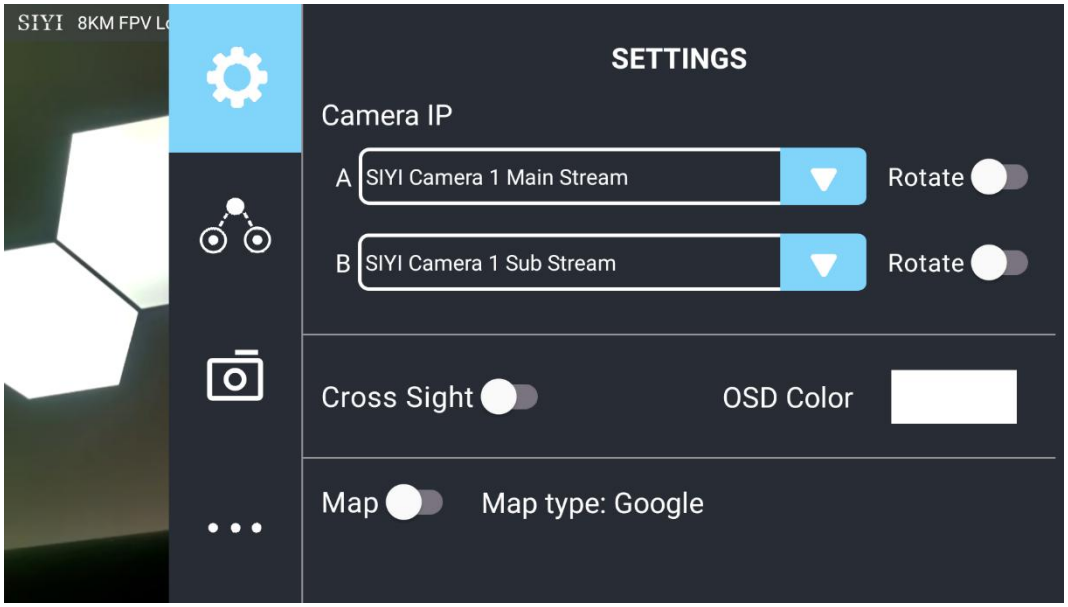


SIYI FPV Camera Function Icon Definition



5.1 Settings

In “Settings” page, you can select camera type with stream type, select or input video stream IP addresses, custom app interface, and switch video decoding type.



About Settings

Camera IP: Select among SIYI AI Camera, SIYI Camera 1 and SIYI Camera 2, between main stream and sub stream, select or input video stream RTSP addresses, disable image, or rotate the relevant image in 180 degrees.

Cross Sight: Enable / disable a cross sight in the center of the image.

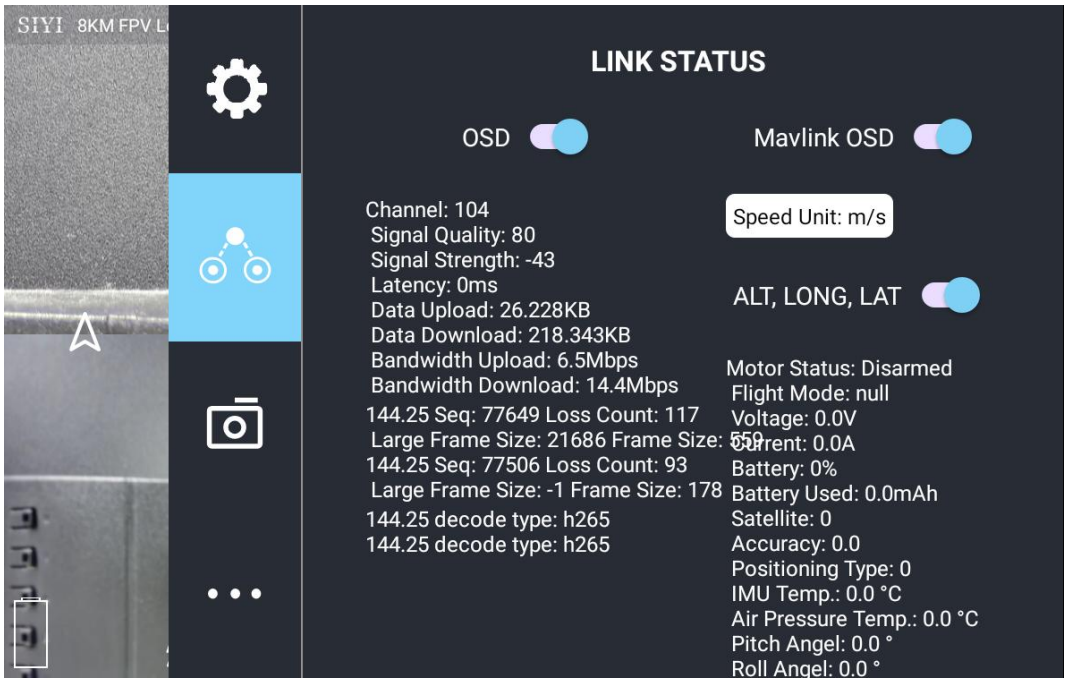
OSD Color: Custom the color of all OSD information.

Map: Enable / disable the map box over the left-bottom corner of the image.

Map Type: Switch map type (currently between Baidu and Google).

5.2 Link Status

Display the link status directly over the FPV image.



About Link Status

OSD: Enable / disable standard OSD information.

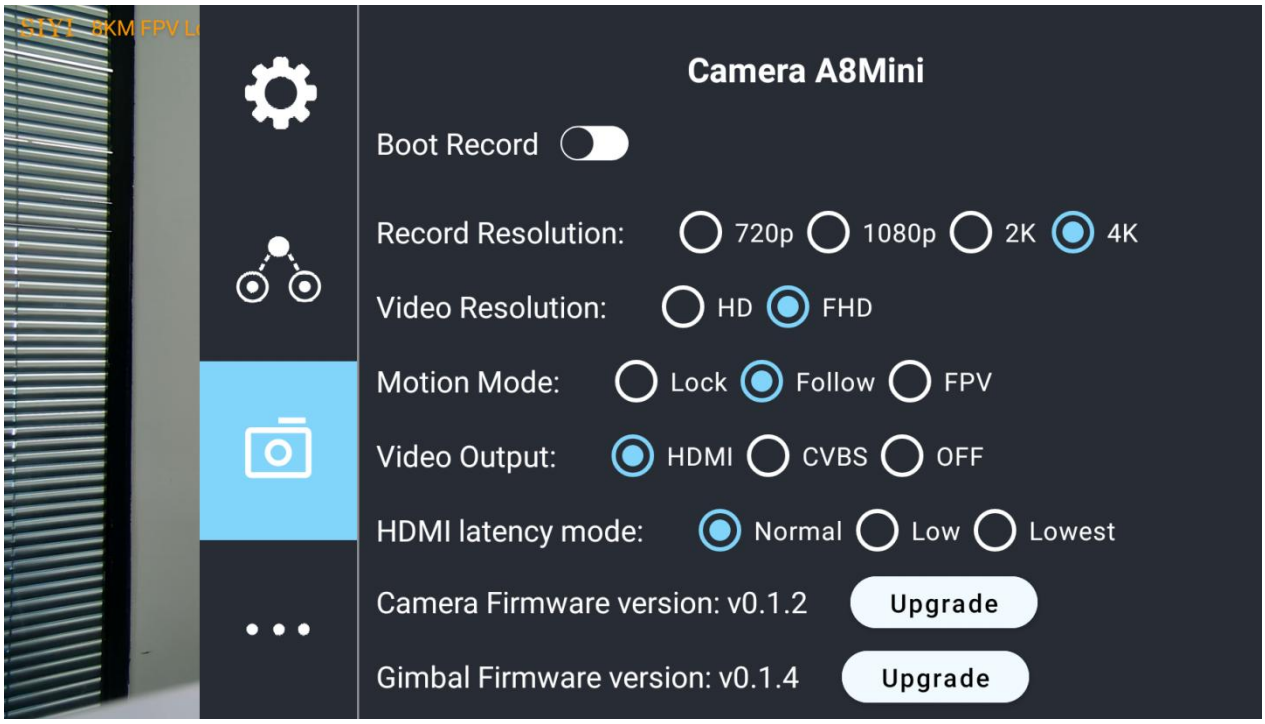
Mavlink OSD: Enable / disable Mavlink OSD information.

Speed Unit: Switch speed unit between meter per seconds and kilometer per hour.

Longitude and Latitude: Enable / disable information.

5.3 Gimbal Camera

Configure the basic functions for SIYI gimbal cameras and cameras.



About Gimbal Camera

Boot Record: Enable / disable automatic video recording by SD card as soon as the camera is powered.

File Manager: Preview stored images in TF card. Format the TF card.

Main / Sub Stream: Configure the main stream and the sub stream separately for their camera source and parameters.

Image Mode: Select the video stream's image type and camera source. Single image or split image. Zoom camera, wide angle camera, or thermal imaging camera.

Stream Resolution: Decide to switch the output resolution of the current video stream or not according to camera source. Max output resolution is Ultra HD (1080p).

Record Resolution: Decide to switch the recording resolution or not according to camera source. Max record resolution is 4K.

Video Output Port: Switch the video outputting ports.

- HDMI: Through the gimbal camera's Micro-HDMI port.
- CVBS: Through the CVBS pin in the gimbal camera's Ethernet port to output videos in analog signal (Only available for ZT6 and A8 mini).
- OFF: Through the gimbal camera's Ethernet only.

Gimbal Working Mode: Switch gimbal working mode among Lock Mode, Follow Mode, and FPV Mode.

- Lock Mode: Horizontally, gimbal does not follow when aircraft rotates.
- Follow Mode: Horizontally, gimbal follows when aircraft rotates.
- FPV Mode: Gimbal rotates simultaneously as aircraft rolls to get FPV view, and output images with enhanced stability.
- AI Tracking: When the gimbal is connected to the AI tracking module and the AI tracking function is activated. It will be AI tracking mode only.

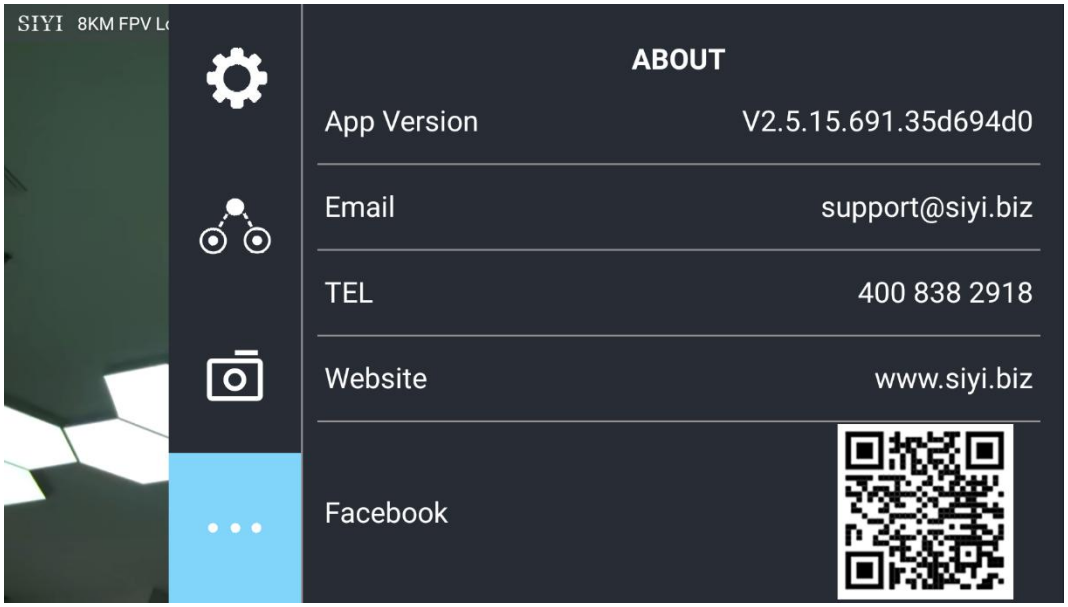
Camera Firmware Version: Display current camera firmware version.

Gimbal Firmware Version: Display current gimbal firmware version.

Zoom Firmware Version: Display current gimbal firmware version (Only available for optical zoom cameras).

5.4 About SIYI FPV

Displays the software version of SIYI FPV and common contact information of SIYI Technology.



5.5 SIYI FPV App Update Log

Date	2024-01-26
Version	2.5.15.695
Updates	1. New: Support AI follow function.

Date	2023-12-18
Version	2.5.15.691
Updates	2. Fix: Temperature data still shows on image after switching to optical cameras from thermal camera. 3. New (A8 mini): Enable OSD watermark on recording images. 4. New: Both video streams can turn on / off recording. 5. New (SIYI AI Tracking Module): A switch for flight tracking. 6. New (Thermal): A switch for thermal gain. 7. New (Thermal): A switch for thermal calibration. 8. New (Thermal): A switch for thermal RAW. 9. Fix: Camera control interface bug when two different cameras are plugged.

Date	2023-10-20
Version	2.5.15.679
Updates	10. New: AI recognition and tracking function control interface. 11. New (ZT30): Zoom & thermal camera simultaneous recording function control interface. 12. New: Add the AI tracking module to IP addresses settings. 13. Improve: Occasionally video stream does not recover when the link is disconnected under SIYI camera protocol.

Date	2023-08-24
Version	2.5.15.660
Updates	1. New (ZT30): Laser calibration. Display laser ranging target’s coordinates. 2. New: Support TF format. 3. New (ZT30): Thermal color palette. 4. New: File manager to preview stored pictures in TF card. 5. Improve: New icon indication for missing TF card.

Date	2023-07-31
Version	2.5.14.644
Updates	14. New: Status indication for successfully integrated flight controller attitude data. 15. New: Google map is supported. 16. Fix: Flight controller location was no accurate. New icons for flight controller location and device location. 17. New: Status indication for missing TF card.

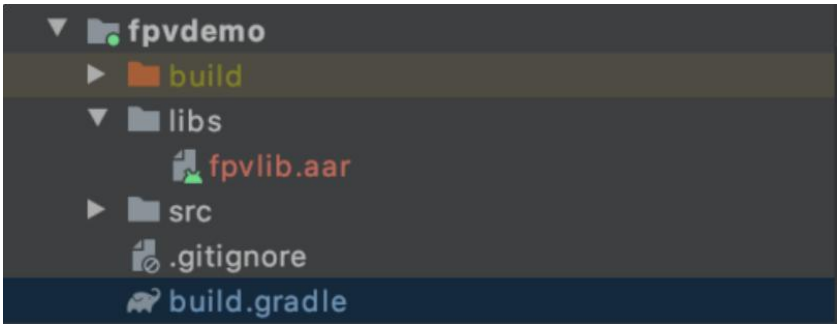
5.6 SIYI FPV SDK Guide

SIYI provides the SIYI FPV SDK to help professional Android application developers to integrate the unique features in SIYI FPV app to their own GCS.

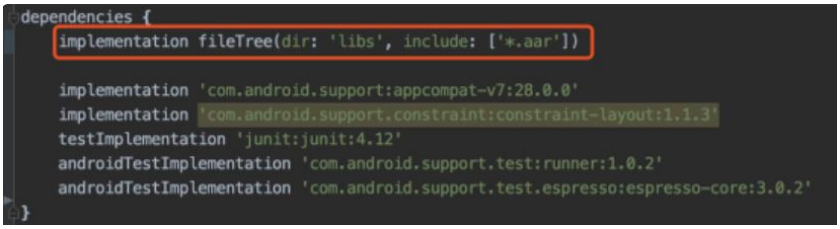
5.6.1 Access Method

a) Add "fpvlib" into Your Project

Copy the "fpvlib.aar" file to the "libs" folder in your "module" like below:



Revise the "build.gradle" file:



b) Configure "AndroidManifest" File

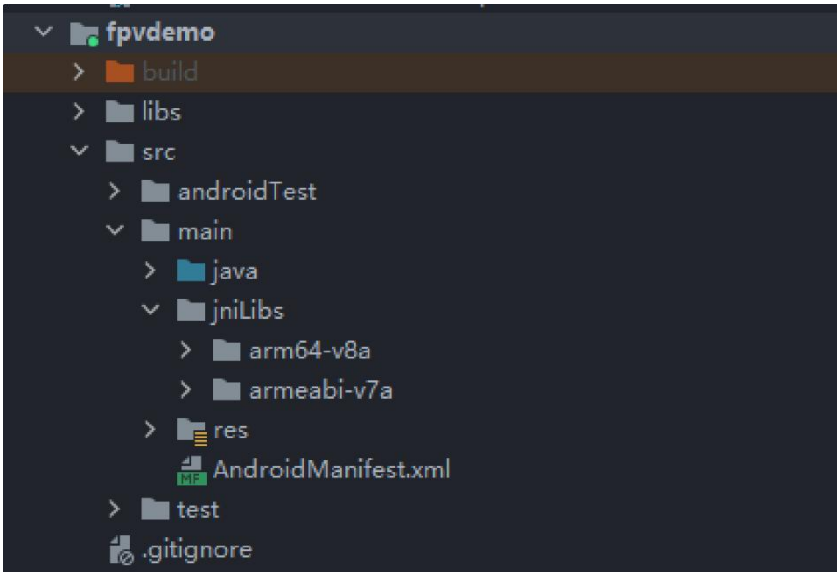
Add USB reading authorization to the "AndroidManifest" file in your "module" and configure the "intent-filter" file.

```
package="com.siyi.fpvdemo">
<uses-feature android:name="android.hardware.usb.host"/>

<application
    android:allowBackup="true"
    android:icon="@mipmap/ic_launcher"
    android:label="fpvdemo"
    android:roundIcon="@mipmap/ic_launcher_round"
    android:supportsRtl="true"
    android:theme="@style/AppTheme">
    <activity android:name=".MainActivity"
        android:launchMode="singleTask"
        android:screenOrientation="landscape">
        <intent-filter>
            <action android:name="android.intent.action.MAIN" />

            <category android:name="android.intent.category.LAUNCHER" />
        </intent-filter>
        <intent-filter>
            <action android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED" />
        </intent-filter>
        <meta-data android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED"
            android:resource="@xml/usb_device_filter" />

        <intent-filter>
            <action android:name="android.hardware.usb.action.USB_ACCESSORY_ATTACHED" />
        </intent-filter>
        <meta-data android:name="android.hardware.usb.action.USB_ACCESSORY_ATTACHED"
            android:resource="@xml/usb_accessory_filter" />
    </activity>
```

c) Add FPV Display Function into Code

Add JNI Library

Like the example below, add JNI library file into the “main” directory, then the “so” library file can be copied from “demo” to your project directory.



Add FPV Video Display to Code

Please pay attention to the below points for your code:

- Firstly, use the static method “getInstances()” of “ConnectionManager” to get the “ConnectionManager” object. Then call the “ConnectionManager.checkConnectWithIntent()” method in the lifecycle method “onCreate()” and “onNewIntent()”.
- Video stream should be displayed through “SurfaceView”. So, we create an “SurfaceView” object and need to call “ConntionManager.notifySurfaceCreate()” and “notifySurfaceDestroy” method from “surfaceCreated()” and “surfaceDestroy()”.

```
mSurfaceView.getHolder().addCallback(new SurfaceHolder.Callback() {
  @Override
  public void surfaceCreated(SurfaceHolder holder) {
  Logcat.d(TAG, "onSurfaceCreated...");
  mConnectionManager.notifySurfaceCreate(holder.getSurface());
  }
  @Override
  public void surfaceChanged(SurfaceHolder holder, int format, int width
, int height) {
  }
  @Override
  public void surfaceDestroyed(SurfaceHolder holder) {
  mConnectionManager.notifySurfaceDestroy(holder.getSurface());
  }
});
```

- Dual-Channel FPV Display:

Dual-channel FPV display supports Ethernet connection only. It does not support AOA or USB connection. For dual-channel FPV display, we should configure the IP addresses first, then create two "SurfaceView" for image display. Whether the second video stream is required or not can be judged by the connection type through connection status. You can refer to "demo" for detail.

- When you quit the application, please do not forget to call the "UsbConnectionManager.release()" method.

For more detail, please refer to the codes in "demo".

5.6.2 Interface Instructions

ConnectionManager

Name	Description
getInstance(Context context)	Single case method for "ConnectionManager"
setWirelessUrl(String url1, String url2)	Set the addresses for video stream.
checkConnectWithIntent(Intent intent)	Initial the connection.
notifySurfaceCreate(Surface surface)	Notify that the first "Surface" is created, the "Surface" is for video display.
notifySurfaceDestroy(Surface surface)	Notify that the first "Surface" is destroyed.
notifySecondSurfaceCreate(Surface surface)	Notify that the second "Surface" is created, the "Surface" is for video

	display.
notifySecondSurfaceDestroy(Surface surface)	Notify that the second “Surface” is destroyed.
setConnectionListener(ConnectionListener listener)	Set callback for the connection status.
setFrameListeners(FrameListener frameListener, FrameListener secondFrameListener)	Set callback for video stream.
getSDKVersion()	Request SDK version.
release()	Release SDK.

SettingsConfig

Name	**Description**
SettingsConfig.getInstance().initConfig(context)	**Initialize the settigns. This method must be called.**
setLogEnable(boolean)	Set if print the log in the sdk. It is suggested to disable print in the “release” version.
setDecodeType(Context context, @IDecodeListener.DecodeType int decodeType)	Set decoding type. In default it is hardware decoding.
setSupportWirelessConnection(Context context, boolean supportWireless)	Set if to support Ethernet connection method.
setRectify(Context context, boolean rectify)	Set if to activate the video stream distortion correction function. The function is disabled in default and is only for A2 mini FPV gimbal at this moment. It works only when the video stream addresses is “RtspConstants.DEFAULT_TCP_VIDEO_URL” “SUB_TCP_VIDEO_URL”. Attention： If distortion correction is activated, when you switch from SIYI camera addresses “RtspConstants.DEFAULT_TCP_VIDEO_URL” “SUB_TCP_VIDEO_URL” to RTSP addresses, new surface objects should be imported. One way to do this is to remove “SurfaceView” and add a

	new “SurfaceView” through “addView”, then import the “Surface” object again in “SurfaceHolder.Callback”.
getCameraManager()	Request camera control objects. SYSDKCameraManager

SYSDKCameraManager

Name	Description
/** * Set Camera Resolution * @param streamType： * [CameraInfo.STREAM_MAIN], [CameraInfo.STREAM_SUB]. * @param resolution： [CAMERA_RESOLUTION_SD] 480p, [CAMERA_RESOLUTION_HD] 720p, [CAMERA_RESOLUTION_FHD] 1080p. * [CAMERA_RESOLUTION_2K] 2K, [CAMERA_RESOLUTION_4K] 4K, */ fun setResolution(cameraIndex: Int, @CameraInfo.StreamType streamType: Int, @CameraResolution resolution: Int)	Set camera resolution.

5.7 SIYI FPV SDK Update Log

Version	2.5.15
Updates	1. Fix the issue that RTSP stream may blurr. 2. Add camera control interface. 3. Fix some other known issues. Mark: It is necessary to update the “so” and “aar” file, which can be updated frm the “aar_so” folder.

Version	2.5.14
Updates	1. Fix some issues which causes anormal in JNI library (need to update “so” library). 2. Fix some other known issues. Mark: It is necessary to update the “so” and “aar” file, which can be updated frm the “aar_so” folder.

Version	2.5.13
Updates	1. Fix the issue that the video stream of some IP65 cameras may blurr. 2. Add to support ZT30 camera video stream. Mark: It is necessary to update the “so” and “aar” file, which can be updated frm the “aar_so” folder.

6 SIYI FPV WINDOWS APP

SIYI FPV Windows is a Windows OS based application developed by SIYI to support many SIYI link products, optical pods (gimbal cameras), and autopilot (flight controller) for their abundant function, configuration, and device status monitoring.

Mark

This chapter is edited based on SIYI FPV Windows app v0.0.6.

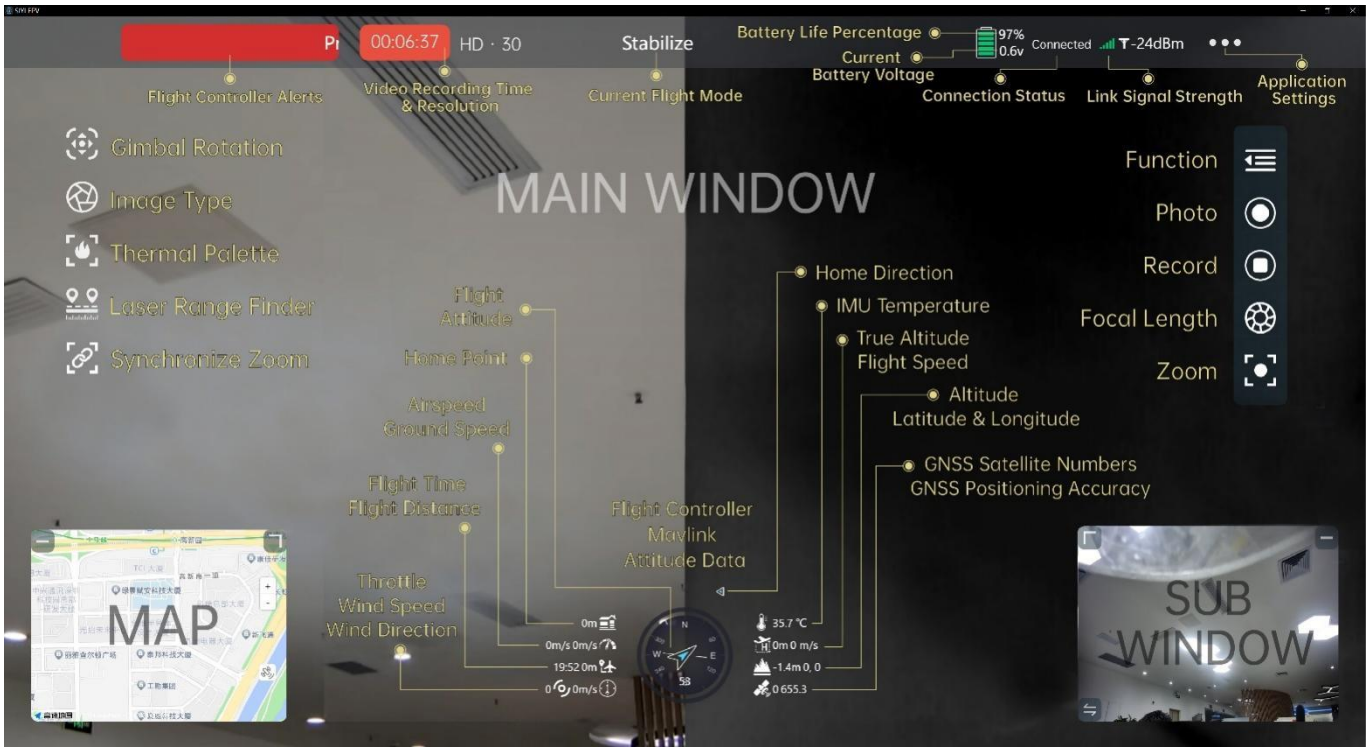
SIYI FPV Windows app can be downloaded from SIYI official website:

https://siyi.biz/en/index.php?id=downloads&asd=602

SIYI FPV App compatible SIYI devices

- ZT6 Mini Dual-Sensor Optical Pod
- ZT30 Four-Sensor Optical Pod
- ZR30 4K 180X Hybrid Zoom Optical Pod
- MK32 Enterprise Handheld Ground Station
- A8 mini Zoom Gimbal Camera
- ZR10 2K 30X Hybrid Zoom Optical Pod
- HM30 Full HD Image Transmission System
- MK15 Mini Handheld Ground Station

SIYI FPV Windows App Function Definition



6.1 UI Function & Definition

6.1.1 Top Status Bar

Top status bar is to display the system's working status.

About Top Status Bar

Flight Controller Alerts: Alert messages from flight controller.

Flight Mode: Currently activated flight mode.

Current Voltage: Current voltage from aircraft power battery.

Battery Life Percentage: Current battery level from aircraft power battery in percentage.

Connection Status: Connection status of video stream.

Link Signal Strength: Signal strength of the communication link in dBm.

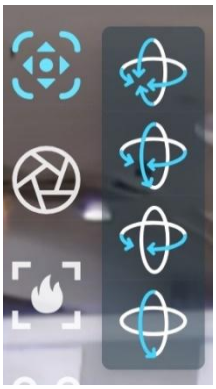
Application Settings: Some basic application settings.

6.1.2 Left Tools Bar

Left tools bar is to control the basic function of optical pod (gimbal camera).

Gimbal Rotation

Provide some quick actions to control gimbal attitude.



About Gimbal Rotation

Center: Gimbal camera centers in both yaw axis and pitch axis.

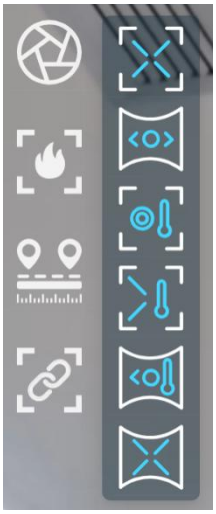
Yaw Center & Pitch Down: Gimbal camera centers in yaw axis and points down in pitch axis.

Yaw Center: Gimbal camera centers in yaw axis.

Pitch Down: Gimbal camera points down in pitch axis.

Image Type

Switch image type for multi-sensor optical pods.



About Image Type

Singe Image (Zoom Camera): Main windows displays image from zoom camera only.

Singe Image (Wide Angle Camera): Main windows displays image from wide angle camera only.

Singe Image (Thermal Camera): Main windows displays image from thermal camera only.

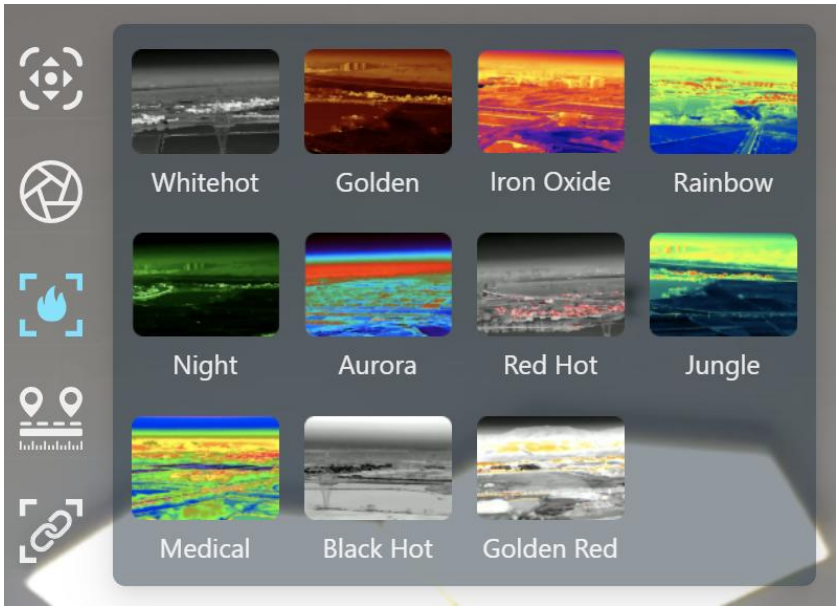
Split Image (Zoom & Thermal): Main windows displays image from zoom camera in left and thermal camera in right.

Split Image (Wide Angle & Thermal): Main windows displays image from wide angle camera in left and thermal camera in right.

Split Image (Zoom & Wide Angle): Main windows displays image from zoom camera in left and wide-angle camera in right.

Thermal Palette

Switch thermal image type in multiple-sensor optical pods.



Laser Range Finder

Turn on / off the laser range finder in multiple-sensor optical pods.

Synchronize Zoom

Turn on / off synchronize zoom of zoom camera and thermal camera from 1X to 2X under split image in in multiple-sensor optical pods.

6.1.3 Right Tools Bar

Right tools bar is to control the basic function of camera.

Function

Basic settings for optical cameras.

About Optical Camera Basic Settings

Boot Record: Enable / disable automatic video recording by SD card as soon as the camera is powered.

Record Sub Stream: Turn on video recording for the sub stream.

Stream Resolution: Decide to switch the output resolution of the current video stream or not according to camera source. Max output resolution is Ultra HD (1080p).

Record Resolution: Decide to switch the recording resolution or not according to camera

source. Max record resolution is 4K.

Basic settings for thermal camera.

About Thermal Camera Basic Settings

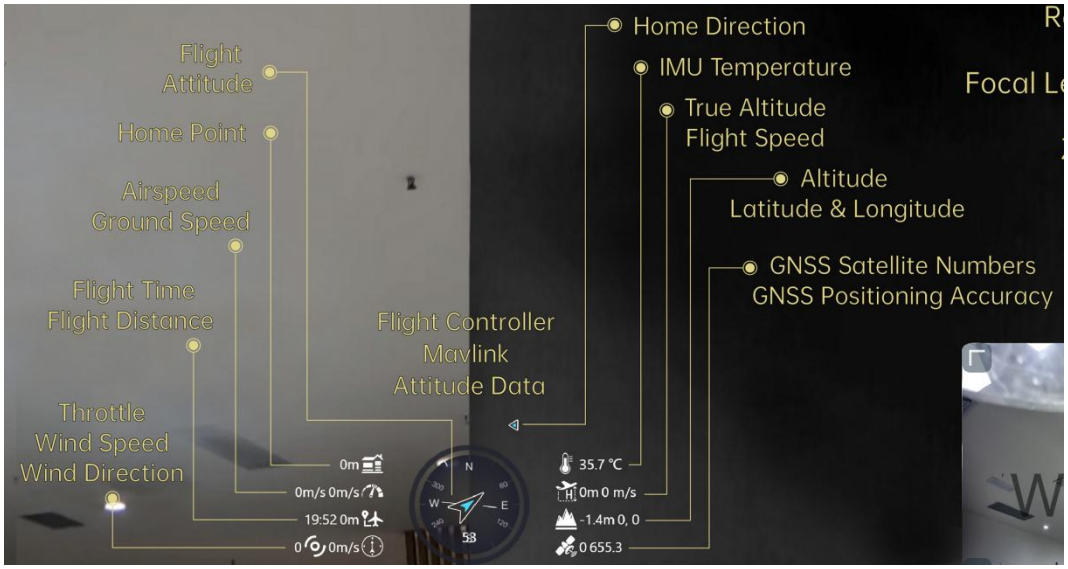
Thermal RAW: Choose to include the RAW data in thermal images or not.

Thermal Calibration: To calibrate the thermal camera by changing environment elements.

Thermal Gain: Switch between low gain and high gain for the thermal imaging camera.

6.1.4 Flight Controller Mavlink Attitude Data

Displays Mavlink flight attitude data telemetry from flight controller in real-time.



About Flight Controller Mavlink Attitude Data

Flight Attitude: Aircraft flight direction and yaw angle.

Home Point: Direct distance between the projection of the current position of the aircraft on the ground and the home point.

Airspeed: The speed of the aircraft relative to the surrounding air during flight (Unit: m/s or km/h).

Ground Speed: The speed of the aircraft relative to ground during flight (Unit: m/s or km/h).

Flight Time: Accumulated flight time of aircraft.

Flight Distance: Accumulated flight distance of aircraft relative to ground.

Throttle: Current throttle output (0 ~ 100).

Wind Speed: The velocity of air flow around the aircraft (Unit: m/s or km/h).

Wind Direction: The direction of air flow around the aircraft.

IMU Temperature: Flight controller IMU temperature.

True Altitude: The current flight altitude of the aircraft relative to the home point.

Flight Speed: The absolute flight speed of the aircraft in real time.

Altitude: The absolute altitude of the aircraft in real time.

Latitude & Longitude: Latitude and longitude of the aircraft's current location.

GNSS Satellite Number: The current number of satellites captured by the global positioning and navigation system.

GNSS Positioning Accuracy: The current positioning accuracy of the global positioning and navigation system.

Mark

Ground speed depends on the airspeed of the aircraft, the wind speed around the aircraft, and the direction of the wind. If the aircraft flies downwind, the ground speed will be higher than the air speed; If the aircraft flies against the wind, the ground speed will be lower than the airspeed. Ground speed is usually provided by the aircraft navigation system or flight controller.

6.1.5 Map

Map box locates in the left-down corner of the main window which can be displayed / hided, and the size can be adjusted.

6.1.6 Sub Window

Sub window locates in the right-down corner of the main window which displays video stream from sub stream. Sub window can be displayed or hided, and the size can be adjusted. Sub window and main window can be switched for image display.

6.2 System Settings

6.2.1 Camera Settings

Check current camera model, camera network addresses, and camera firmware version.

About Camera Settings

Camera Addresses: Select camera model, default camera network addresses, or input RTSP addresses for main stream and sub stream, or disable image.

Camera Firmware Version: Display current camera firmware version.

6.2.2 Gimbal Settings

Set gimbal motion mode, check gimbal firmware version, and zoom firmware version.

About Gimbal Settings

Gimbal Motion Mode: Switch gimbal working mode among Lock Mode, Follow Mode, and FPV Mode.

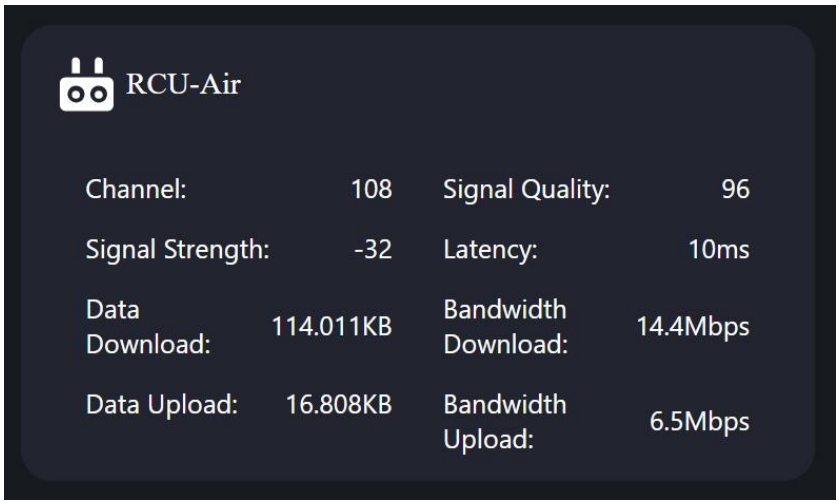
- Lock Mode: Horizontally, gimbal does not follow when aircraft rotates.
- Follow Mode: Horizontally, gimbal follows when aircraft rotates.
- FPV Mode: Gimbal rotates simultaneously as aircraft rolls to get FPV view, and output images with enhanced stability.

Gimbal Firmware Version: Display current gimbal firmware version.

Zoom Firmware Version: Display current gimbal firmware version (Only available for optical zoom cameras).

6.2.3 Link Status

Monitor SIYI image transmission link's status.



About Link Status

Channel: Current frequency channel of the transmission link under current working frequency.

Signal Quality: Current signal quality of the link in percentage (0 ~ 100).

Signal Strength: Current signal strength of the link in dBm.

Latency: Current signal transmission latency of the link (Unit: ms).

Data Download: Downloading data of the transmission link from air unit per second (Unit: KB).

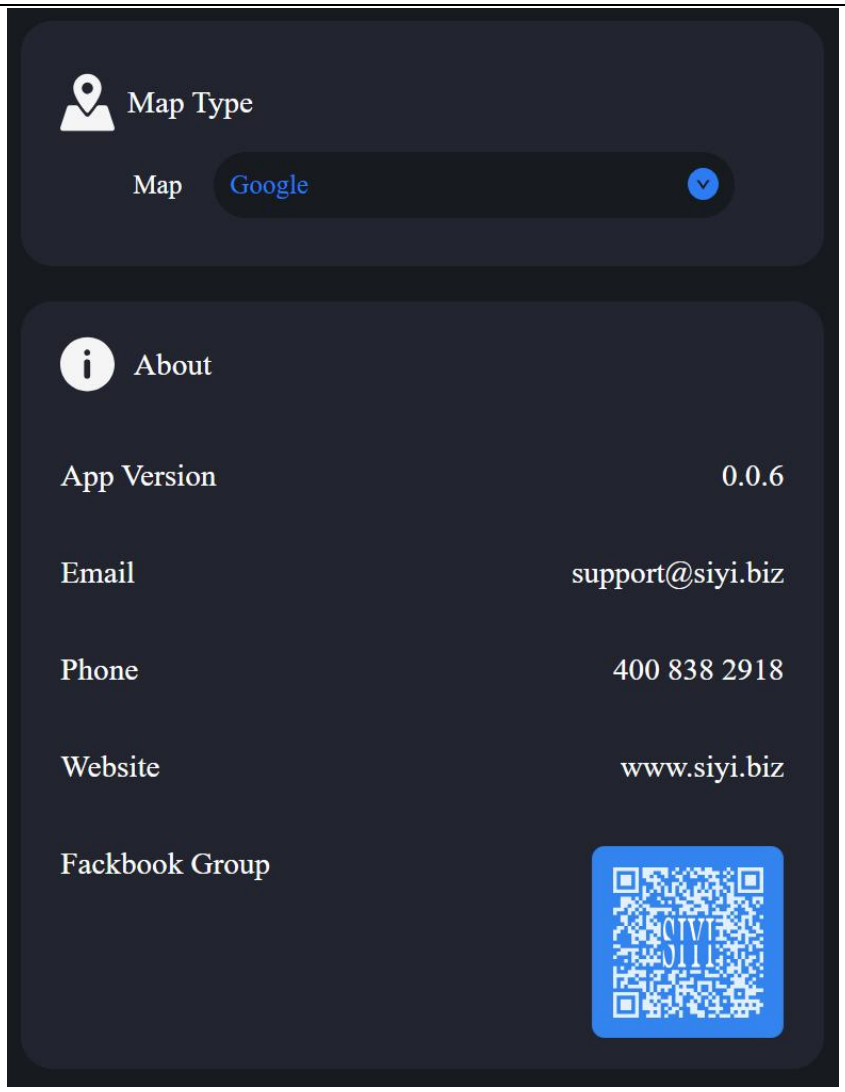
Bandwidth Download: Downloading bandwidth of the transmission link from air unit (Unit: Mbps).

Data Upload: Uploading data of the transmission link to air unit per second (Unit: KB).

Bandwidth Upload: Uploading bandwidth of the transmission link to air unit (Unit: Mbps).

6.2.4 Others

Switch map type, check application version and SIYI contact information.



6.3 SIYI FPV App Update Log

No update is available.

7 SIYI ASSISTANT

SIYI PC Assistant is a Windows software developed by SIYI to configure many SIYI products for configuration, firmware update, and calibration.

Mark

The manual is edited based on SIYI PC Assistant v1.3.9.

SIYI PC Assistant and the relevant firmware pack can be downloaded from SIYI official website:

https://siyi.biz/en/index.php?id=downloads&asd=22

7.1 Gimbal / Zoom Firmware Update

SIYI gimbal camera connects to SIYI PC Assistant for gimbal firmware and zoom firmware update.

Mark

Zoom firmware update is only available for optical zoom gimbal cameras.

Before upgrading, it is necessary to prepare the tools, software, and firmware below.

- SIYI PC Assistant (v1.3.9 or latest version)
- Gimbal Firmware
- Zoom Firmware

Mark

Above software and firmware can be downloaded from relevant product page on SIYI official website.

- Cable (USB-C to USB-A)

Mark

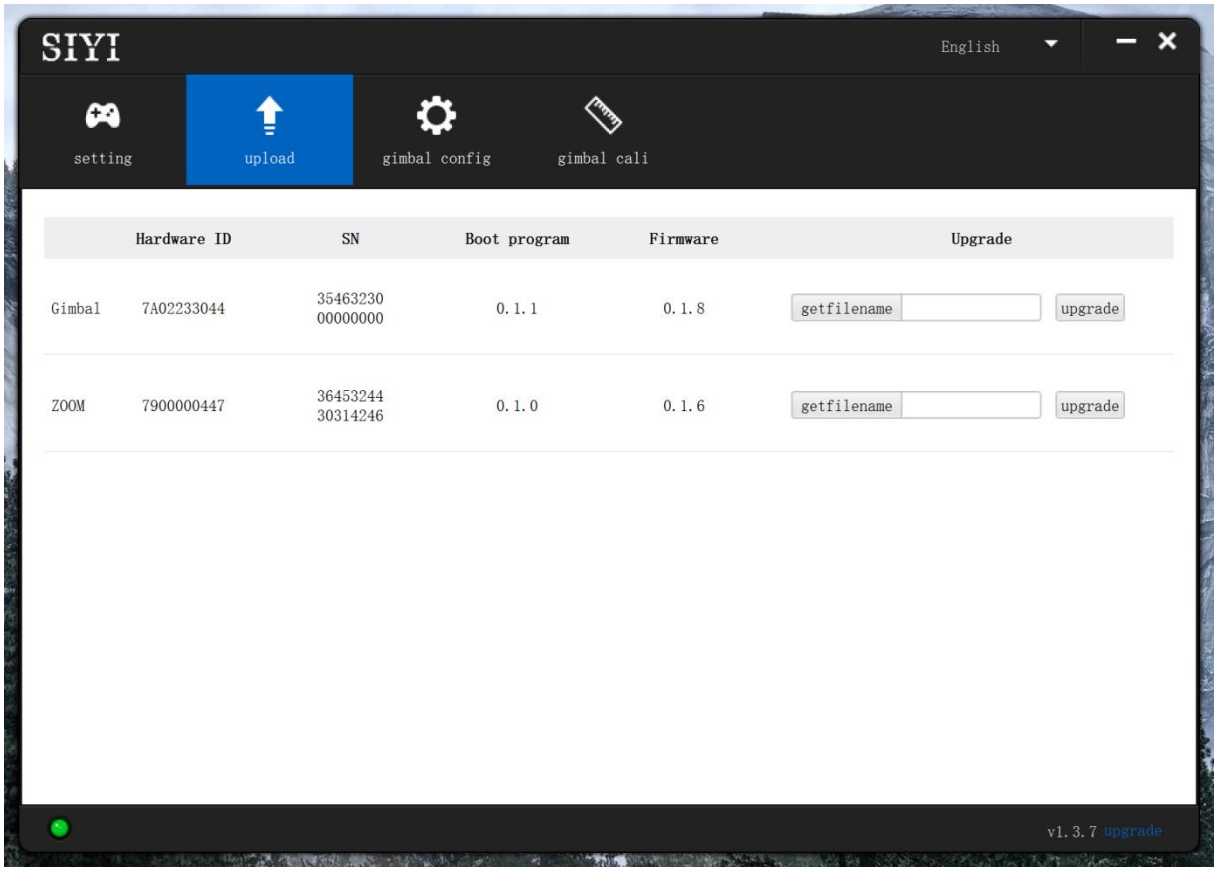
Customers should prepare the above tools.

Firmware Upgrade Steps

1. Install “SIYI PC Assistant” on your Windows device.

2. Use the USB-C to USB-A cable to connect Windows device’s USB-A port to gimbal camera’s USB-C port.

3. Run “SIYI PC Assistant” and switch to “Upload” page to check gimbal camera’s current firmware version.



4. If the firmware is not latest, then click the “Select File” button in the “Gimbal” to import the latest firmware. And click “Upgrade” and wait till it is “100%” finished.

Mark

Before updating any firmware, gimbal camera should be powered.

It is the same process for both gimbal firmware and zoom firmware.

7.2 Camera Firmware Update

The camera firmware of SIYI gimbal camera should be upgraded by SD card.

Before upgrading, it is necessary to prepare the tools, software, and firmware below.

- Micro-SD Card

Mark

Customers should prepare the above tools.

Please make sure that the TF card has been formatted to FAT32 before camera firmware upgrade.

- Camera Firmware

Mark

Above software and firmware can be downloaded from relevant product page on SIYI official website.

Firmware Upgrade Steps

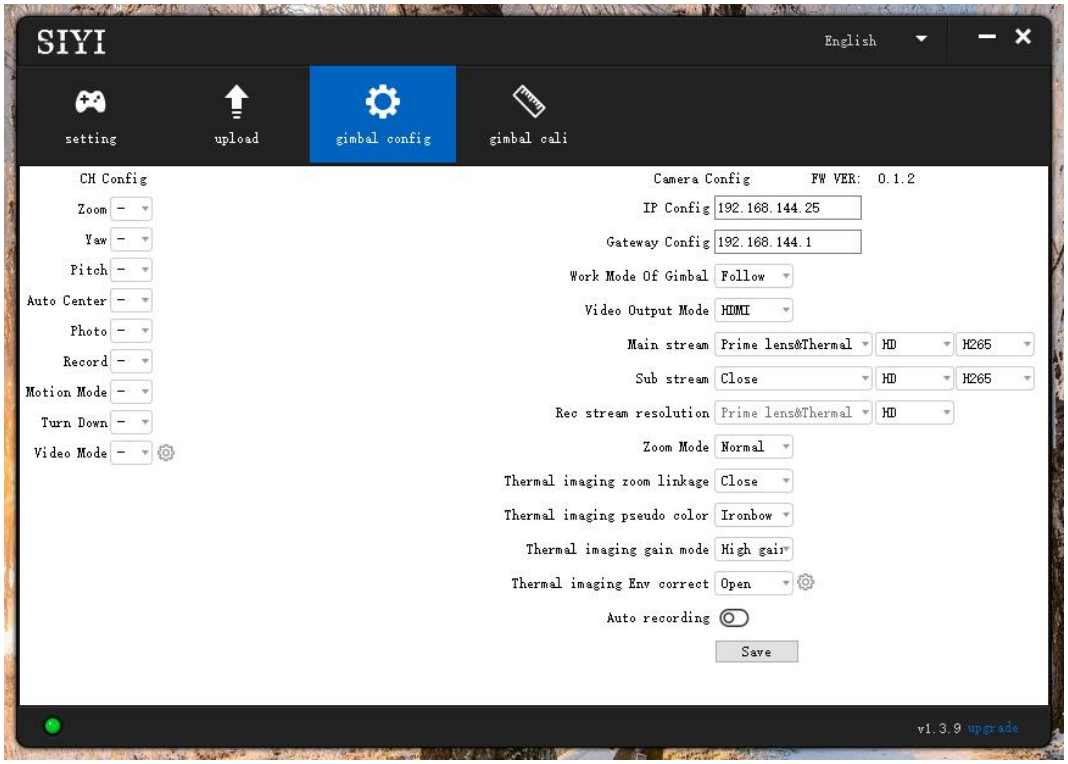
1. Save camera firmware's ".bin" file to the SD card's root directory and do not change the file name.

2. Restart gimbal camera and wait for 3 to 5 minutes. Camera firmware will be flashed automatically.

3. Run SIYI FPV app or SIYI PC Assistant software to check if camera firmware is updated successfully.

7.3 Gimbal Camera Configuration

SIYI gimbal camera can be connected to SIYI PC Assistant for channel settings and camera settings.



7.3.1 Channel Configuration

The “Channel Config” menu under “Gimbal Config” menu can assign the below gimbal camera functions to up to 16 channels and an idle channel (disabled).

Gimbal Functions and Description

- Auto Focus: Control zoom camera for automatic focus.
- Zoom: Control camera for optical zoom and digital zoom.
- Manual Focus: Adjust zoom camera focal length for manual focus.
- Yaw: Control gimbal rotation on yaw axis.
- Pitch: Control gimbal rotation on pitch axis.
- Auto Center: Control gimbal to reset to initial position. Coordinates (0, 0).
- Photo: Control camera to take a picture.
- Record: Enable / disable video recording.
- Motion Mode: Switch gimbal working mode (follow mode, lock mode, FPV mode).
- Auto Down: Control gimbal pitch axis to point downward vertically. Coordinates (0, -90).

7.3.2 Camera Configuration

The “Gimbal Config” menu also supports abundant and core features of SIYI gimbal camera, such as, checking camera firmware version, modifying camera IP addresses, selecting camera source for main / sub stream and video recording, switching camera resolution or zoom mode, enabling / disabling thermal camera’s synchronized zoom, enabling / disabling boot recording.

About Camera Configuration

- IP Config: Modify camera IP addresses.
- Gateway Config: Modify camera gateway.
- Gimbal Working Mode: Switch gimbal working mode (Follow Mode / Lock Mode / FPV Mode)
- Main Stream: Select camera source and switch output resolution for the main stream.
- Sub Stream: Select camera source and switch output resolution for the sub stream.
- Record Resolution: Select camera source and switch video resolution for recording.
- Zoom Mode: Switch zoom camera’s zoom mode (Normal / Absolute Zoom).
- Boot Record: Enable / disable automatic video recording by TF card as soon as gimbal camera is powered.

Mark

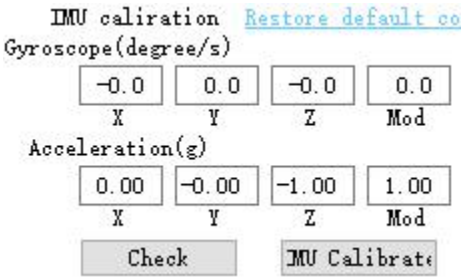
The source of the recording stream is the main stream.

7.4 Gimbal Calibration

The “Gimbal Calibration” can help users do IMU calibration, IMU Constant temperature calibration, and accelerator hexahedral calibration.

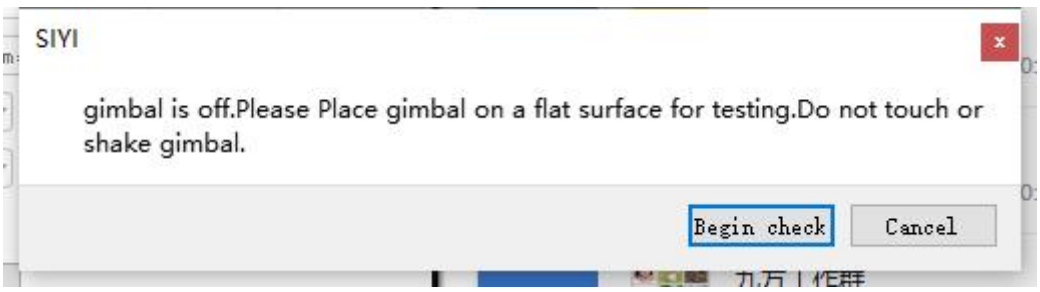
7.4.1 IMU Calibration

IMU calibration can keep the inertial measuring unit’s accuracy and reliability.

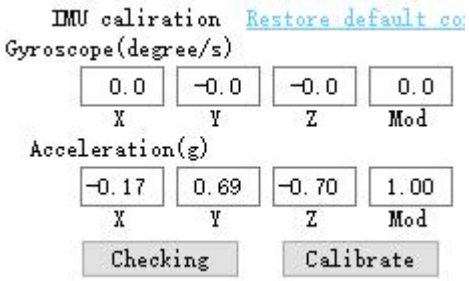


Steps

1. Click “Check”, gimbal camera will power off automatically. Meanwhile, please follow the message box and place the gimbal camera on a flat surface and make sure that the IMU is static. Do not touch or vibrate the gimbal camera. Then go for “Start Checking”.

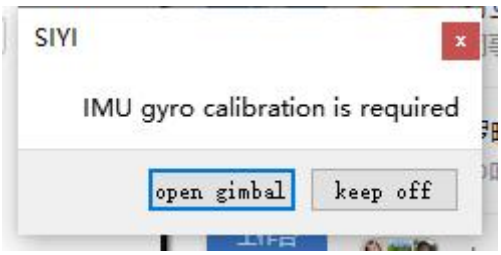


2. The PC assistant start to check IMU status automatically to determine if the gimbal should be calibrated.



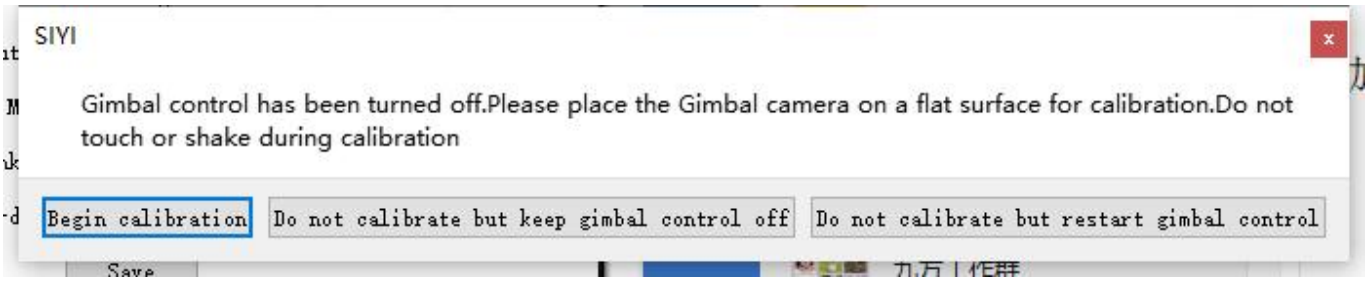
3. If IMU is working normally, there will be a message box to indicate “not necessary to calibrate”.

4. If IMU is not working normally, there will be a message box to indicate “calibration is necessary”.

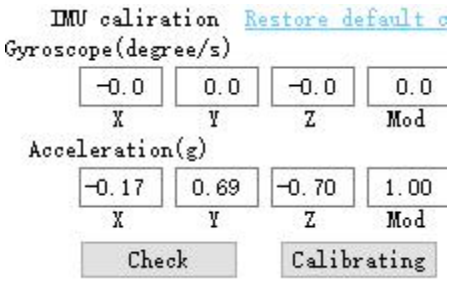


5. Click “Start Gimbal” and “Calibrate”.

6. The message box will say again “please follow the message box and place the gimbal camera on a flat surface and make sure that the IMU is static. Do not touch or vibrate the gimbal camera”.



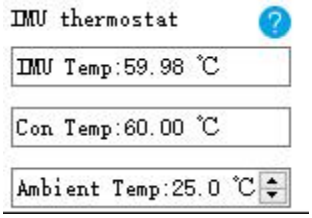
7. IMU calibration menu will display “calibrating”.



8. After a few seconds, IMU calibration will be finished.

7.4.2 IMU Constant Temperature Calibration

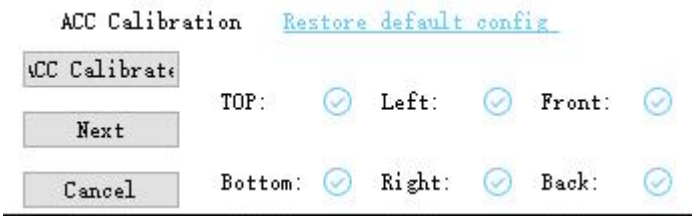
Specially designed for using gimbals in scenarios with big difference in temperature to avoid the situation that gimbal behaves abnormally because IMU cannot reach constant temperature normally and fast when the environment temperature is far from IMU constant temperature.



Before calibration, please input the environment temperature of your operating field, the software will start to calculate the target IMU constant temperature so that IMU can reach the temperature fast after powering on gimbal camera. The software is showing IMU temperature in real-time.

7.4.3 Accelerator Hexahedral Calibration

Accelerator hexahedral calibration can calibrate the accelerator's sensitivity, zero bias, and inter axis error, etc. During calibration, the gimbal should be placed in all hexahedrons to record accelerator's output value on each orientation and build the error model. Hexahedral calibration can keep the accelerator's accuracy and reliability.



7.5 Main Firmware Update Log

Date	2024-05-06
Camera Firmware	0.2.6
Gimbal Firmware	0.3.7
SIYI FPV Android	2.5.15.709
SIYI FPV Windows	0.0.10
SIYI PC Assistant	1.4.3
Updates	1. Fix: Occasionally recording issue. 2. Improve: Nose mode can integrate flight controller altitude data. 3. New: SIYI gimbal SDK supports enable / disable the OSD display through HDMI output.

Date	2024-03-07
Camera Firmware	0.3.4
Gimbal Firmware	0.3.6
SIYI FPV Android	2.5.15.696
SIYI FPV Windows	0.0.6
SIYI PC Assistant	1.4.0
Updates	1. New: AI following function (only for SIYI AI tracking module and multi-rotor drones) 2. New: Adapt to Mavlink protocol control and support the integration of PX4 flight controller attitude data 3. New: Support SIYI FPV (Windows) version 4. New: SIYI Assistant support adjust gimbal following speed 5. New: SIYI gimbal SDK supports obtaining attitude data from external devices for flight controller integration 6. New: Nose mode. 7. New: Video recording support Mavlink data OSD and turning on / off. 8. Improve: HDMI / CVBS video output is changed to dynamic switch. 9. New: SIYI Gimbal SDK supports formatting SD card 10. New: SIYI Gimbal SDK supports gimbal soft restarting. 11. New: SIYI Gimbal SDK supports gimbal single axis attitude control. 12. New: SIYI Gimbal SDK supports acquiring GPS data and making correction. 13. New: SIYI Gimbal SDK supports acquiring UTC time and acquiring UT time sent

	from gimbal. 14. New: SIYI gimbal SDK supports obtaining GPS information and adding it to photo EXIF format 15. New: Support DCIM standard file system and EXIF information format

Date	2023-10-20
Camera Firmware	0.2.3
Gimbal Firmware	0.3.4
SIYI FPV	2.5.15.679
SIYI PC Assistant	1.3.8
Updates	1. New: Support SIYI AI tracking module. 2. New: SIYI gimbal SDK supports configuring camera specs (bit rate, codec format, etc.).

Date	2023-09-09
Camera Firmware	0.2.2 svn1084
Gimbal Firmware	0.3.2 svn6978
SIYI FPV Version	2.5.15.665
Updates	1. Fix: S.Bus control may lost if Mavlink is connected simultaneously.New: Motor stuck logic algorithm (When motor stuck was detected, motor will be shut down and stabilization be stopped, restart gimbal to reset). 2. Improve: The current gimbal working mode will be saved after power off. 3. New: Now customers can preview stored camera pictures and videos through SIYI FPV app.

Date	2023-07-28
Camera Firmware Version	0.2.1 svn968
Gimbal Firmware Version	0.3.0 svn6899
SIYI FPV Version	2.5.14.644
Updates	1. Improve: Algorithm to avoid motor stuck. 2. Fix: Occasionally influent image in 1080p streaming. 3. Fix: Camera stopped streaming when recording is turned off.

	4. Fix: All SDK commands are supported. 5. Improve: Status indication of successfully integrated flight controller attitude data through gimbal indicator and SIYI FPV app. 6. New: Integrate Mavlink gimbal control. 7. New: 64G / 128G / 256G / 512G storage is supported by TF card.

Date	2023-07-11
Camera Firmware Version	0.2.0 svn932
Gimbal Firmware Version	0.2.8 svn6849
SIYI FPV Version	2.5.14.604
Updates	1. New: Integrate Mavlink flight controller attitude data to fix abnormal gimbal attitude while drone attitude is changing fast. 2. Improve: Pictures will be taken at 5 Hz speed and saved. 3. Improve: RTSP streaming supports up to 4 streams from the same IP addresses. 4. Improve: Recording creates video file in every 30 minutes. 5. New: Algorithm to avoid motor stuck. 6. New: Recording status display in OSD under HDMI / CVBS output. 7. New: SDK commands support TCP protocol. 8. New: SDK commands support acquiring current zoom multiples and max zoom multiples.

Date	2023-05-05
Camera Firmware Version	0.1.9 svn675
Gimbal Firmware Version	0.2.7 svn6666
SIYI PC Assistant Version	1.3.4 svn6679
Updates	1. Improve: Sync time through SIYI FPV. 2. New: Support EXIF file information processing. 3. New: 1080p streaming is supported. 4. Improve: No limit for picture saving quantity. 5. New: Accelerator hexahedral calibration, user IMU calibration. 6. Fix: Occasional vibration when gimbal is heading down. 7. New: Absolute zoom is supported by S.Bus control and SDK commands. 8. Improve: Gimbal control deadzone is reduced to ±1 from ±4.

	9. Improve: No temperature detection unless gimbal is under constant temperature calibration. 10. Improve: Gimbal will not center when it hits roll limit. 11. Fix: Roll angle will keep when gimbal is heading down during flight.

7.6 SIYI PC Assistant Update Log

Date	2024-04-16
Version	1.4.3
Updates	1. New: A8 mini can enable / disable the OSD information through HDMI output.

Date	2024-04-16
Version	1.4.2
Updates	1. New: ZT30, ZR30, ZR10 can adjust gimbal follow speed now.

Date	2024-01-06
Version	1.4.0
Updates	1. New: Support AI follow function and adjusting follow speed.

Date	2024-01-06
Version	1.4.0
Updates	1. New: Support AI follow function and adjusting follow speed.

Date	2023-12-18
Version	1.3.9
Updates	1. New (ZT30, ZT6): An activation process for thermal imaging function.

Date	2023-11-02
Version	1.3.8
Updates	1. New: Compatibility to ZT6 Mini Dual-Sensor Optical Pod. 2. New: A switch to enable zoom camera and thermal camera recording simultaneously (only in non-split-image mode and main / sub stream should be zoom / thermal camera). 3. Fix: ZT30 does not record video after setting recording resolution. 4. Fix: ZT30 does not set main stream resolution.

Date	2023-08-24
Version	v1.3.7
Updates	1. New: Compatibility to a new model. 2. New: Support ZT30 to switch between H265 and H264 codec. 3. Improve: Gimbal calibration function has its own page now. 4. New: Gimbal configuration (thermal synchronize zoom, thermal color palette)

8 AFTER-SALE SERVICE

Please visit the SIYI Technology support page at Service and Support - SIYI Technology | Empowering and Building an Intelligent Robot Ecology for the latest after-sales and warranty information.