SIYI

MK32 ENTERPRISE HANDHELD GROUND STATION USER MANUAL

SIYI Technology (Shenzhen) Co., Ltd.

siyi.biz/en

Thank you for purchasing SIYI's product.

MK32 enterprise handheld ground station is the latest member of the family of SIYI links. It carries a 7-inch high-definition and high brightness monitor, and a dual way full HD image transmission system which can be expanded to up to 30 kilometers range. MK32's Android system is upgraded to 4G RAM and 64G ROM. Optional combos of MK32 system can have dual operator and RC relay feature. MK32's abundant features and powerful performance make it a commonly used equipment of smooth image transmission, stable datalink, and solid control for UAV commercial drones, UGV unmanned vehicles, USV unmanned boats, and robotics.

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 website (https://siyi.biz/en). You can also write an email to SIYI official A/S center (support@siyi.biz).

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

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Linkedln	
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User Manual Update Log

Version	Date	Updates
1.5	2026.7	1. Added some new warning messages.
1.4	2026.3	1. Modify known issues.
1.3	2025.3	1. Modify known issues.
1.2	2024.2	1. User guide for wireless repeater. 2. Main firmware update log. 3. SIYI Datalink SDK update.
1.1	2023.10	1. Necessary update for product introduction. 2. Necessary update for SIYI FPV app. 3. User manual update log. 4. Main firmware update log. 5. SIYI FPV app update log. 6. Necessary update for technical specification. 7. Necessary update for packing list. 8. Necessary update for “Important Instructions on Promotion to Communication Range and Video Fluency”. 9. Necessary update for “SIYI TX App”. 10. Instruction in “Datalink” for connection to multiple GCS.

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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

MK32 enterprise handheld ground station is designed and manufactured for professional application scenarios. Operators need to have certain basic skills, so please use it with caution. SIYI Technology does not assume any responsibility for any unnecessary product damage caused by irregular or irresponsible operation of this product, economic losses or even personal injury to the user or others. Minors must have professionals present to supervise and guide minors when using this product. SIYI Technology's products are designed for commercial use, and it is prohibited to use SIYI products for military purposes. It is prohibited to disassemble or modify this product without SIYI Technology's permission.

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To jointly maintain flight safety and allow you to better utilize the features of this product, please pay special attention to the following matters:

⊘ It is prohibited to operate in crowded places (squares, parks, etc.), places with many obstacles (streets, parking lots, etc.), places with strong magnetic fields or signal interference sources (high-voltage lines, railway lines, radar stations, etc.) or other places that may cause using SIYI products to control aircraft, vehicles or models in areas where unnecessary economic losses or even personal injuries will occur.

⊘ During operation, never cover the remote controller antenna or otherwise block signal transmission.

⊘ The top of the standard omni-directional antenna on the remote controller is the part where signal transmission is weakest. Avoid pointing it at your aircraft, vehicle or model while working.

⊘ It is prohibited to use SIYI products to control aircraft, vehicles, or models when you are tired, drunk, or unwell.

⊘ Without special operation permission, it is prohibited to use SIYI products to control aircraft, vehicles, or models in rainy days, at night or in strong wind environments.

⊘ When the engine or motor on your aircraft, vehicle or model is still running, do not cut off the power to the remote controller in advance.

! For flight safety, please keep the aircraft within sight when operating the aircraft.

! When working, be sure to return to the main page from the system parameter setting page.

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Before starting the operation, be sure to check the power of the remote controller and the power supply voltage of the air unit.

When finishing the operation, first power off the air unit and then the remote controller.

Before setting the remote controller parameters, be sure to power off the engine and motor to prevent accidental start.

Before starting the operation, be sure to pre-set the fail-safe function on the remote control or in the ground station software.

When installing, please avoid installing the air unit and GPS module too close to avoid interference. It is recommended that the distance between the air unit and the GPS module be longer than 20 cm.

The air unit voltage regulator module supplied with this remote controller is a custom- designed component with electrical parameters matching only this system. Do not use this module with any other device.

Battery

MK32 handheld ground station is equipped with a built-in and chargeable Li-on battery. Please do read the precautions below before using.

The remote controller cannot be charged when it is powered on. Before charging the remote control, please turn off the remote control.

If you find that the battery is smoking, overheating, or bulging, please stop using it immediately.

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If you find smoke or a strange smell coming from the remote controller, please stop using it immediately and contact your reseller or SIYI after-sales service center directly.

If the remote controller overheats (above 60 degrees Celsius), please stop using it immediately and cut off the power supply.

Storage / Carrying / Recycling

When your SIYI product is not in use, or you want to take the SIYI product out for work, or the product has reached the end of its service life, please pay special attention to the following matters:

DANGER

When SIYI products are not in use, they should be kept away from areas easily accessible to children.

Please avoid placing SIYI products in an environment that is too hot (above 60 degrees Celsius) or too cold (below minus 20 degrees Celsius).

CAUTION

Please avoid placing SIYI products in humid or sandy environments.

When carrying and transporting SIYI products, please avoid operations that may damage components such as vibration or impact.

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1 INTRODUCTION

1.1 Product Features

7-Inch High-Definition Monitor

1000-Nit High Brightness Display

MK32 enterprise handheld ground station comes with a built-in 7-inch high-definition and high brightness monitor. Max 1000 nit (cd/m²) of brightness presents high clear screen display information from ground control software and high-quality images.

15 KM Wireless Digital Image Transmission

Dual-Channel Full HD Video Stream

The link of MK32 is based on SIYI's independent wireless HD image transmission technology, which is an all-in-one link integrated with remote control, datalink, and video streaming. The technology has a smart feature that the transmission can automatically adapt to the frequency band with least interference.

**With standard omni antennas, the transmission range is up to 15 kilometers.*
**With directional antennas, the transmission range is up to 30 kilometers.*
**To experience the lowest latency, it is suggested to use SIYI FPV app (choosing SIYI camera protocol) or SIYI QGC app (integrated SIYI camera protocol).*

Android OS, Superior Performance

MK32 handheld ground station carries Qualcomm 8-core CPU, which can smoothly decode 1080p 60 fps video stream by hardware in either H264 or H265 format. MK32's

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Android system is upgraded to impressive 4G RAM and 64G ROM which can efficiently run various ground control software.

**MK32 Android platform also comes with full band 4G network and supports streaming HD video to cloud server by SDK development.*

OSD Telemetry Display

SIYI link supports to display data telemetry and OSD information display based on the Mavlink protocol in SIYI FPV app. The OSD display style can be adjusted, and combined with high-definition image transmission, you can enjoy the endless fun of first-person view.

Dual Operator, Efficient Collaboration

Targeting popular industry application fields, relying on wireless high-definition image transmission technology, SIYI has given the MK32 / HM30 / MK15 link the feature of dual operator.

The "dual operator" function is developed for dual-operator scenarios and supports up to two ground units to establish links with the same air unit at the same time. One can be used to control the flight attitude of the drone, and the other can be used to control the gimbal camera, optical pod, and other payloads. In dual operator mode, two ground units can simultaneously acquire images from the same camera source or display images from different camera sources separately.

**To use the "dual operator" "Remote Control Relay" "Wireless Repeater" function, you need to purchase a dual & repeater combo. Ordinary combos are not equipped with this function.*

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Remote Control Relay, Remote Delivery

Targeting the field of drone logistics, relying on wireless high-definition image transmission technology, SIYI has endowed the MK32 / HM30 / MK15 link with the feature of remote-control relay.

The "remote-control relay" function is developed for ultra-long-distance flight missions. It supports two ground units to relay control the same air unit to reach a maximum transmission distance twice that of a single standard transmission system. It can be widely used in cruise line inspection, unmanned distribution, unmanned logistics and other fields.

**To use the "dual operator" "Remote Control Relay" "Wireless Repeater" function, you need to purchase a dual & repeater combo. Ordinary combos are not equipped with this function.*

Wireless Repeater, Range Extender

Targeting deep industry application fields, relying on wireless high-definition image transmission technology, SIYI has given the MK32 / HM30 / MK15 link wireless repeater features.

The "wireless repeater" function is developed for scenarios that cannot be fully covered by the traditional end-to-end paired transmission system. It supports one ground unit to relay transmission to the air unit through another ground unit, achieving up to twice the standard transmission of a single system. The repeater system can bypass obstacles or other obstructions, which can effectively solve the painful needs in tunnel inspection, mountainous drone applications and other fields.

**To use the "dual operator" "Remote Control Relay" "Wireless Repeater" function, you need to purchase a repeater combo. Ordinary combos are not equipped with this function.*

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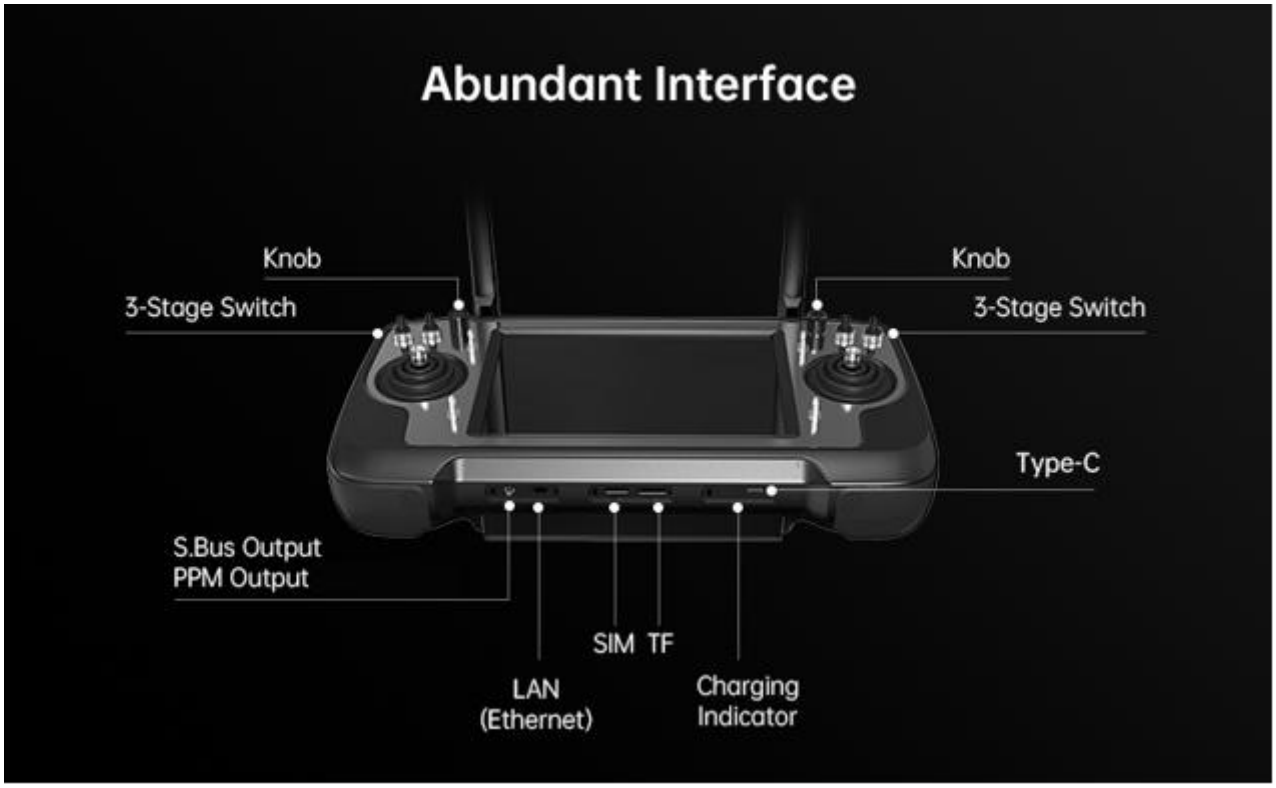
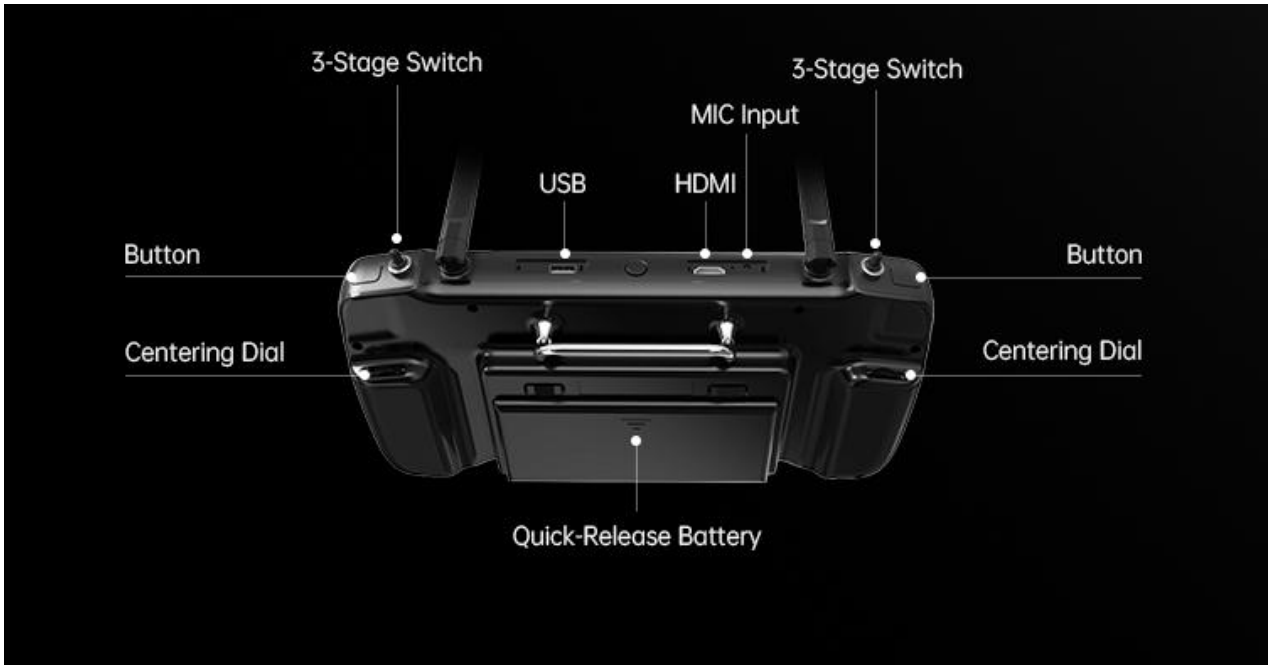
1.2 Parts

1.2.1 Overview





Ground Unit Interface & Pinouts

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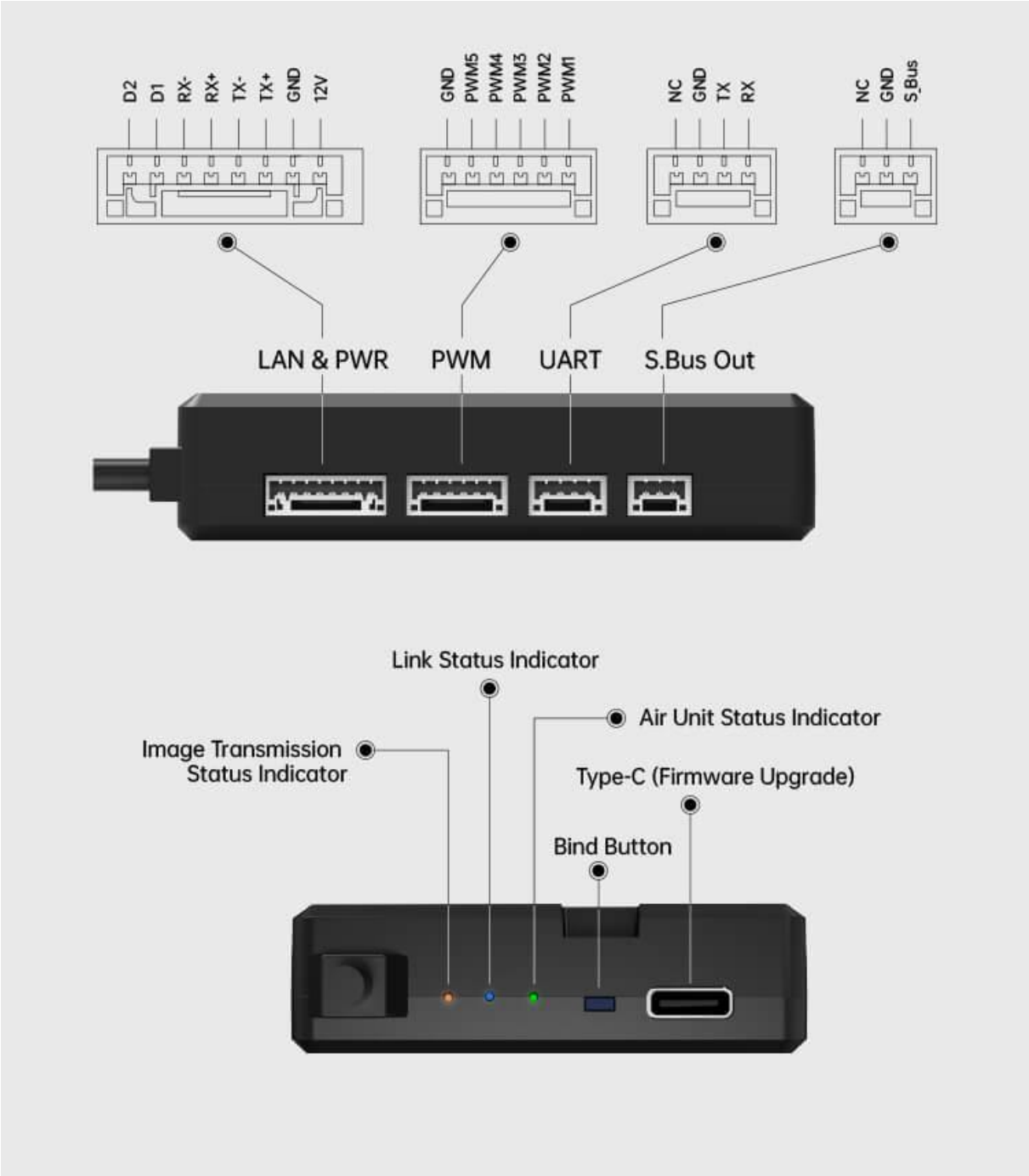

Air Unit Interface & Pinouts

Mark

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

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1.2.2 Button / Switch Types and Default Channel Definitions

MK32 handheld ground station comes with 16 physical channels and 16 communication channels in total. Communication channel 10 to 14 are also PWM channel 1 to 5 in default.

Channel No.	Physical Channel Type	Default Mapping	Remark
1	Aileron	Joystick J1	
2	Elevator (Mode 2)	Joystick J2	
3	Throttle (Mode 2)	Joystick J3	
4	Rudder	Joystick J4	
5		3-Stage Switch SA	
6		3-Stage Switch SB	
7		3-Stage Switch SC	
8		3-Stage Switch SD	
9		3-Stage Switch SE	
10		3-Stage Switch SF	PWM 1
11		Left Dial LD1	PWM 2
12		Right Dial RD1	PWM 3
13		Left Dial LD2	PWM 4
14		Right Dial RD2	PWM 5
15		Button S1	Searchlight A Gimbal Pitch
16		Button S2	Searchlight B Gimbal Centering

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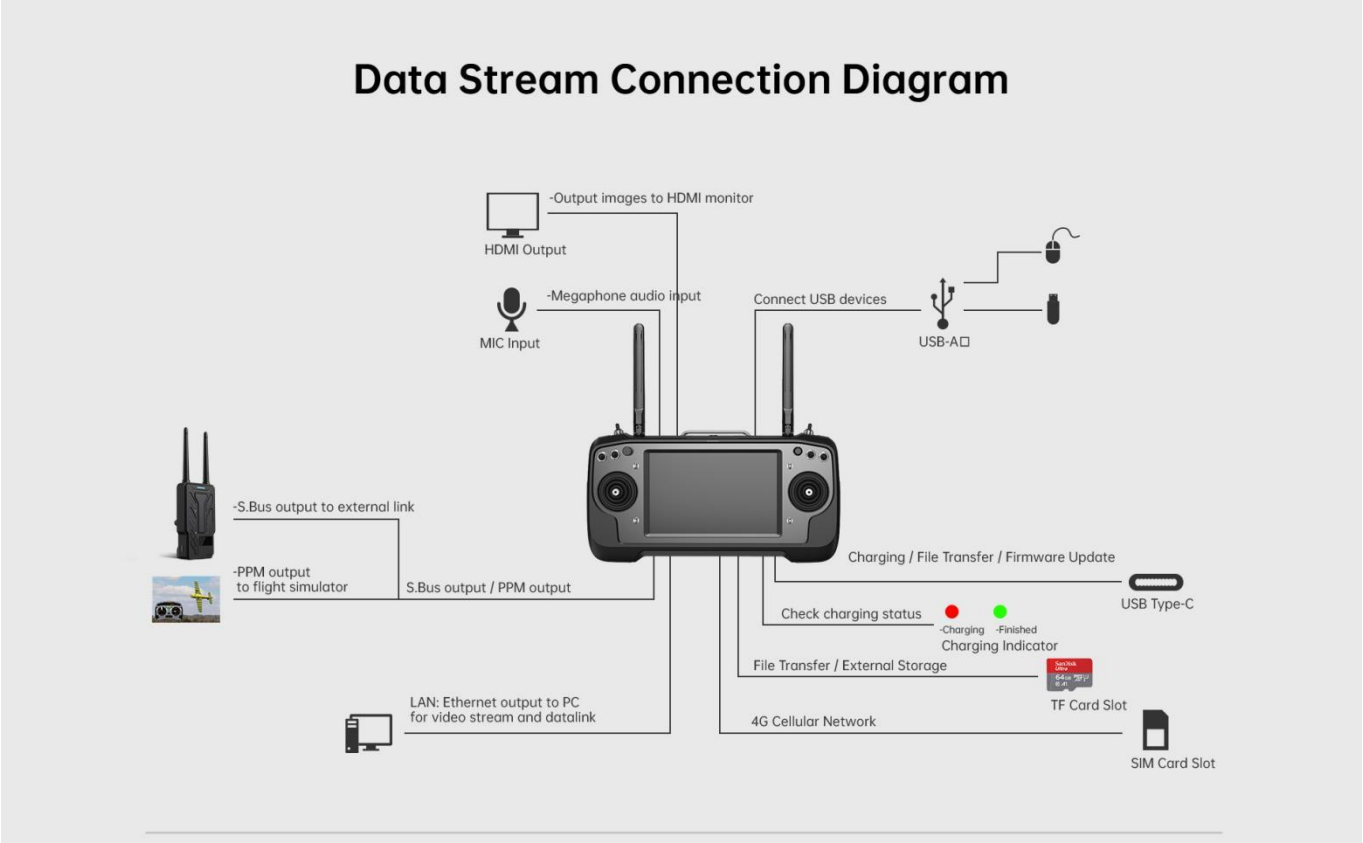
1.2.3 Data Stream Diagram



Ground Unit

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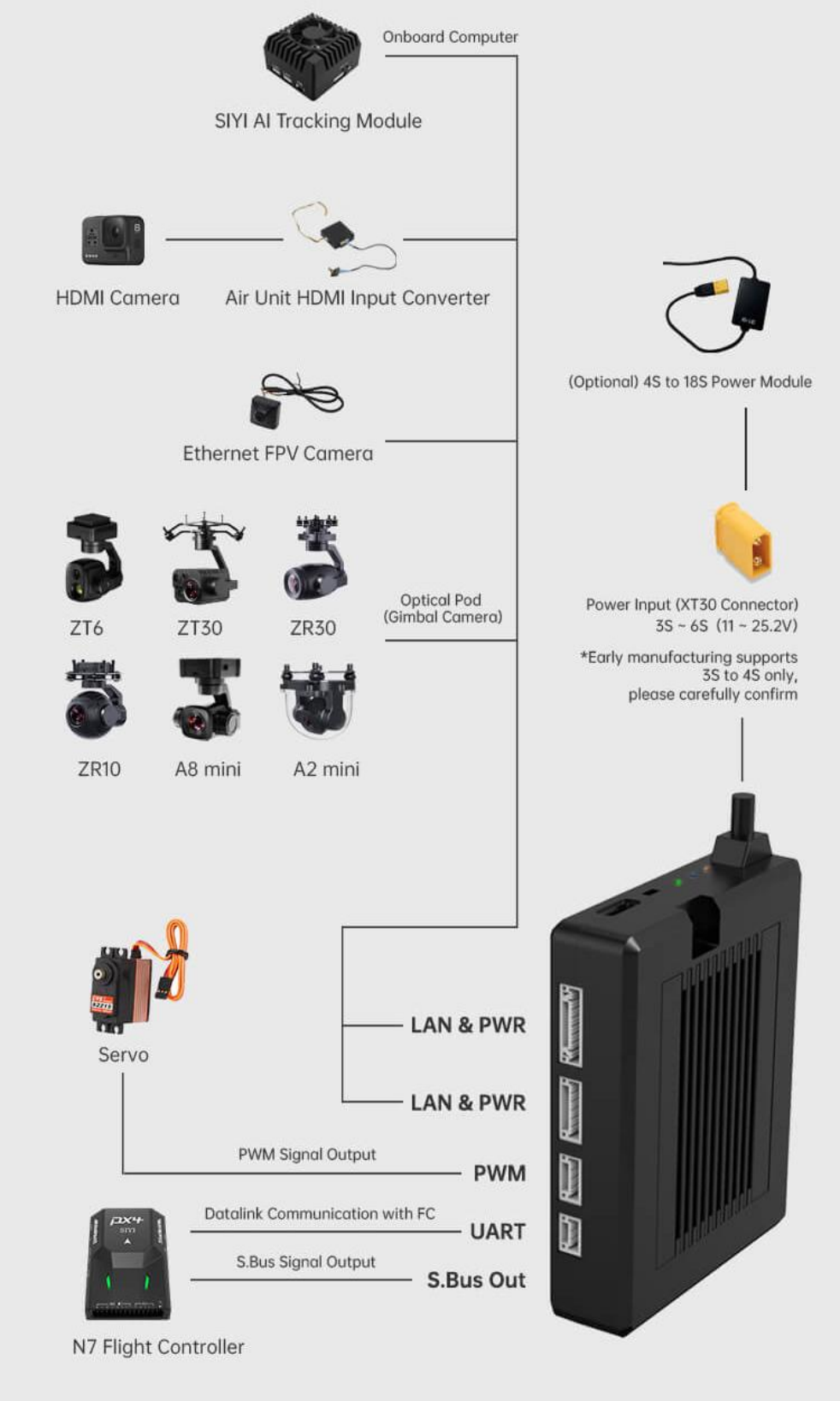

Air Unit

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1.3 Technical Specification

Overall

Max Transmission Range	15 km (Unobstructed, free of interference)
Channels	16 physical channels 16 communication channels
Datalink Compatible Flight Controllers	PX4 / ArduPilot Open-source Flight Controllers: SIYI N7 Autopilot, etc. Agriculture Flight Controllers: BOYING Paladin V2 JIYI K++ V2 / K3A Pro VK V7 AG / V9 AG
Video Stream Compatible Android GCS	SIYI Original App: SIYI FPV Open-source GCS: QGroundControl Mission Planner Agriculture GCS: BOYING Agriculture JIYI Agri-Assistant / IFLY VK Agriculture
Video Stream Compatible Windows GCS	Open-source GCS: QGroundControl Mission Planner (H264 only)

Ground Unit

Monitor Display	7-inch High Definition and High Brightness LCD Touchscreen
System	Android 9.0 OS 4G RAM, 64G ROM
Battery Capacity & Type	10200 mAh 7.4V 2S Li-ion 75.48 Wh
Fast Charging Protocol	PD 30W
Charging Time	3.5 hours (PD 30W)
Battery Life	10 hours

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Antenna Gain	Omni Antenna: 5 dBi Long Range Antenna: 11 dBi Lollipop Antenna: 5 dBi (optional)
Interface & Ports	Video Output: Standard HDMI External Device (Mouse, USB Disk): USB-A Charging: Type-C Firmware Upgrade: Type-C File Transfer: Type-C / USB-A Mobile Network: SIM Card Slot External Storage: TF Card Slot / USB-A Communication Port: LAN (Ethernet) RC Signal Input / Output: Bottom Audio Port
Dimensions (Antenna Overlapped)	308 x 148 x 72 mm
Weight (Battery & Antennas Included)	1440 g
Waterproof Level	IP4X
Working Temperature	-10 ~ 50℃

Air Unit

Signal Output	16 channels of S.Bus 5 channels of PWM
Interface & Ports	S.Bus RC Signal Output: S.Bus Out (GH1.25 3-Pin) Datalink (to FC): UART (GH1.25 4-Pin) PWM Channel 1 to 5: PWM (GH1.25 6-Pin) Video Input / Network Communication: LAN & PWR (GH1.25 8-Pin) Firmware Upgrade: Type-C
Antenna Gain	Omni Antenna: 5 dBi Lollipop Antenna: 5 dBi (optional)
Working Voltage	HM30 Air Unit: 3S ~ 6S / 12.6 ~ 25.2 V 4S to 18S Power Module: 16.8 ~ 75.6 V
Power Consumption	HM30 Air Unit: - Average: 2.8 W - Summit: 12 W HM30 Air Unit + 4S to 18S Power Module: - Average: 3.2 W - Summit: 12 W
Dimensions (Antenna Excluded)	70 x 55 x 22.5 mm (fan included) 70 x 55 x 16 mm (fan excluded)

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Weight (Antenna Excluded)	HM30 Air Unit: 74 g HM30 Air Unit + 4S to 18S Power Module: 109 g
Working Temperature	-10 ~ 50℃

Air Unit HDMI Input Converter

(Optional, Packed with HDMI Combo)

Video Input	Micro HDMI
Video Output	Ethernet
Working Voltage	12 V
Power Consumption	3 W
Video Recording Resolution	1080p (1920*1080) @ 30 fps 720p (1280*720) @ 30 fps
Video Recording Bitrate	12 Mbps (H265 codec)
Supported File System	FAT32
Video Recording Format	H265
Supported TF / SD Card Type	MicroSD Class10 Less than 32GB
Dimensions	42 x 41 x 11 mm
Weight	26 g
Working Temperature	-10 ~ 50℃

R1M Recording FPV Camera

Video Output	Ethernet
Image Sensor	1/2.9 Inch, 2 MP
FOV	Diagonal: 90° Horizontal: 80°
Working Voltage	12 V

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Power Consumption	2.5 W
Video Recording Resolution	1080p (1920*1080) @ 30 fps 720p (1280*720) @ 30 fps
Video Recording Bitrate	12 Mbps
Video Recording Format	MP4
Supported TF / SD Card Type	MicroSD Class10 Less than 32GB
Supported File System	FAT32
Dimensions	42 x 42 x 25 mm
Weight	23 g
Working Temperature	-10 ~ 50℃

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1.4 Packing List

Normal Edition

Standard Combo	HDMI Combo
1 x MK32 Ground Unit 2 x Standard Omni Antenna 2 x Long Range Antenna	
1 x HM30 Air Unit 1 x 4S to 18S Power Module 2 x Standard Omni Antenna	
	1 x Air Unit HDMI Input Converter
1 x PX4 / ArduPilot Flight Controller Telemetry Cable 1 x Air Unit S.Bus Cable 1 x PWM Cable 1 x Ethernet Cable	
1 x 30W PD Fast Charger (Type-C, US Plug) 1 x PD Fast Charging Cable (Type-C to Type-C) 1 x Type-C to USB-A Converter	
1 x Carrying Case 1 x Strap for Handheld Ground Station	

Dual & Repeater Edition

Dual Combo
2 x MK32 Standard Combo (Dual & Repeater Edition)

Repeater Combo
1 x MK32 Standard Combo (Dual & Repeater Edition) **1 x HM30 Fly More Combo (Dual & Repeater Edition)**

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The major difference between dual & repeater edition and normal edition are:

Dual & repeater edition comes with “Dual Operator”, “Remote Control Relay”, and “Wireless Repeater” features. Normal edition does not.

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1.5 Status Indicator Definition

The status indicat

ors on ground unit and air unit use different colors and different blinking frequencies to indicate the system's working or abnormal status.

1.5.1 Ground Unit Indicator

🔴 Solid Red: No communication between ground unit and air unit.

🔴 Fast Red Blinks: Ground unit is binding to air unit.

🔴 Slow Red Blinks: Ground unit firmware does not match to air unit firmware.

🔴🔴🔴 Triple Red Blinks: System initialization failed.

🔴🔴🔴🔴 Four-time Red Blinks: Joysticks require calibration.

🔴🟢 Red-Green Blinks: Android system unexpected power off.

🔴🟢🟡 Slow Red-Green-Yellow Blinks: Image transmission system is starting.

🔴🟢🟡 Fast Red-Blue-Yellow Blinks: Firmware is updating.

🟡 Slow Yellow Blinks: Ground unit voltage abnormal.

🟡🟡 Double Yellow Blinks: Ground unit Bluetooth is not identified.

🟡🟡🟡 Triple Yellow Blinks: Transmission system data overload alert, level one.

🟡🟡🟡🟡 Slow Yellow Blinks: Transmission system data overload alert, level two.

🟡🔴 Yellow-Red Blinks: Ground unit high-temperature alert, level one.

🟡🔴🔴 Yellow-Red-Red Blinks: Ground unit high-temperature alert, level two.

🟡🔴🔴🔴 Yellow-Red Blinks: Transmitter high-temperature alert, level three.

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🟢 Solid Green: Perfect communication, receiving 100% data package. Green Blinks: Blinking frequency indicates the system's signal quality. More frequently it blinks, worse the signal quality is.

🟢 Slow Green Blinks (1 Hz): Receiving 95% to 99% data package.

🟢 Green Blinks (every 3/5 second): Receiving 50% to 75% data package.

🟢 Green Blinks (every 3/10 second): Receiving 25% to 50% data package.

🟢 Green Blinks (every 1/25 second): Receiving less than 25% data package.

🟢🔴 Blue-Red Blinks: Air unit overheat alert, level one.

🟢🔴🔴 Blue-Red Blinks: Air unit overheat alert, level two.

🟢🔴🔴🔴 Blue-Red Blinks: Air unit overheat alert, level three.

🟢🟡 Yellow-green flashing: Adaptive frequency point enabled, searching for frequency point.

1.5.2 Air Unit Indicator

🔴 Solid Red: No communication between ground unit and air unit.

🔴 Fast Red Blinks: Air unit is binding to ground unit.

🔴 Slow Red Blinks: Air unit firmware does not match to ground unit firmware.

🔴🔴🔴 Triple Red Blinks: System initialization failed.

🔴🟢🟡 Slow Red-Green-Yellow Blinks: System is starting.

🔴🟢🟡 Fast Red-Green-Yellow Blinks: Firmware is updating.

🟡 Yellow Blinks: Air unit low voltage alert (voltage input lower than 12V).

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🟢 Solid Green: Perfect communication, 100% data package received. Green Blinks: Blinking speed indicates the system's signal strength. More frequently it blinks, worse the signal quality is.

🟢 Slow Green Blinks (1 Hz): 95% to 99% data package received.

🟢 Green Blinks (every 3/5 second): 50% to 75% data package received.

🟢 Green Blinks (every 3/10 second): 25% to 50% data package received.

🟢 Green Blinks (every 1/25 second): less than 25% data package received.

🟢🔴 Fast Green-Red Blinks: Air unit starts to bind wirelessly (plug power three times to trigger).

🟢🔴 Green-Red Blinks: Air unit overheat alert, level one.

🟢🔴🔴 Green-Red-Red Blinks: Air unit overheat alert, level two.

🟢🔴🔴🔴 Green-Red-Red-Red Blinks: Air unit overheat alert, level three.

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2 GET READY TO USE

2.1 Ground Unit

2.1.1 Power On / Off

Power On:

When the ground unit is off power, press the power button once, battery level indicators light on. Then immediately press and hold the power button for about two seconds and the ground unit is powered on.

Power Off:

When the ground unit is working, press and hold the power button for about two seconds, ground unit monitor will pop up a window with some buttons. Tap the power-off button to power off the ground unit.

CAUTION

Mandatory Power Off: When the ground unit is working, press and hold the power button for about eight seconds, ground unit will be forced to power off.

Mark

Screenshot: When the ground unit is working, press and hold the power button for about two seconds, ground unit monitor will pop up a window with some buttons. Touch the screenshot button to take a screenshot of current screen display.

Screen Off: When the ground unit is working, press the power button once, ground unit

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monitor will be off for energy saving.

2.1.2 Charging

You can charge the ground unit only when it is powered off and only by using the original PD fast charger.

Steps

1. Connect the ground unit to the PD charger and plug it into power supply.
2. Charging indicator lights on red, ground unit starts charging.
3. Charging indicator lights on green, charging is finished.

⚠ CAUTION

Normal 5V charger adapter cannot charge the ground unit, please do use SIYI original PD fast charger.

Ground unit cannot be charged when it is working. Please do power off the ground unit before charging.

2.1.3 Charging Indicator

🔴 Solid Red: Ground unit under charging.

🟢 Solid Green: Charging finished.

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2.1.4 Change System Language

SIYI handheld ground station's Android system supports almost all available languages, which can be switched in system settings easily.

Mark

The default language of the Android system is "Chinese (Simplified)".

Steps

1. Go to Android system settings.

2. Slide down to find "System (Language, Time, Backup, Update)" and enter.

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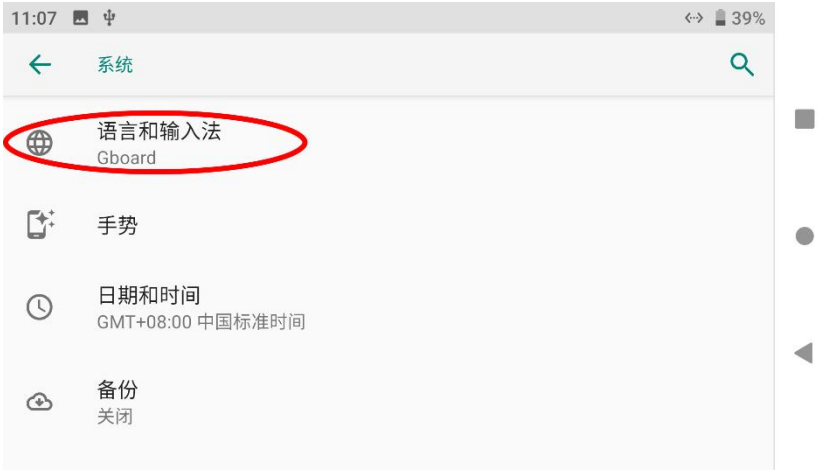
3. Go to “Language and Input” and choose “Language”, then “Add Language”.



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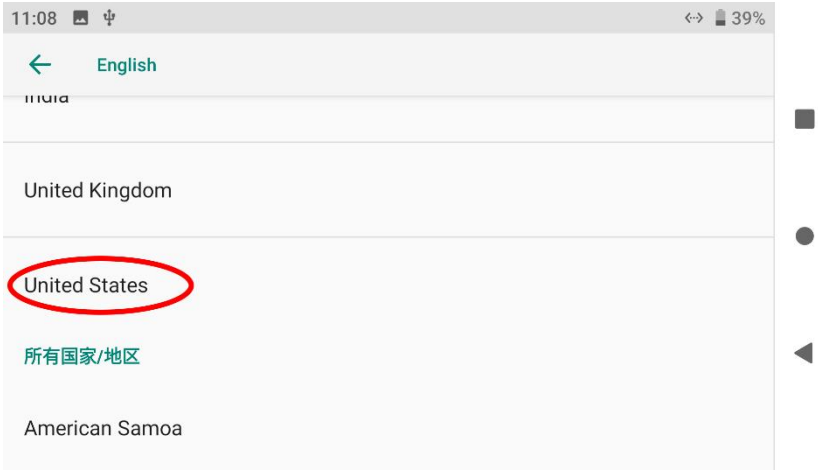
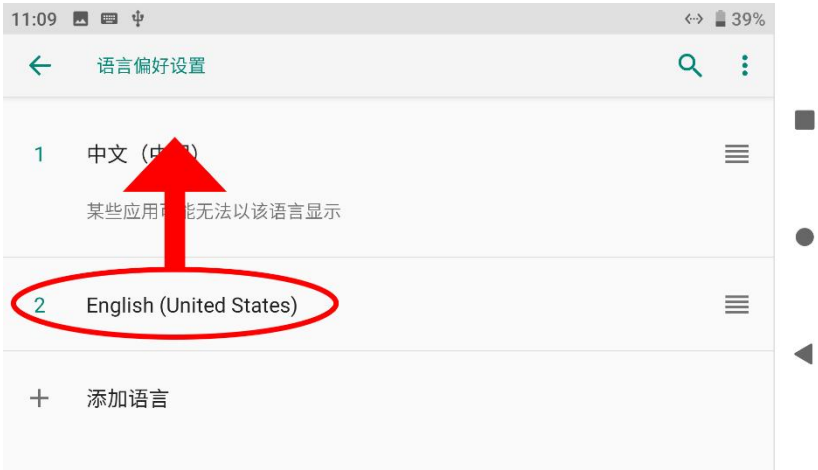
4. Let's take an example of "English (US)". Slide down to find "English", then choose "United States". The page will jump back to "Language and Preference".



5. Drag the just added "English (US)" language bar to the first line, system language will change to English (US) automatically.



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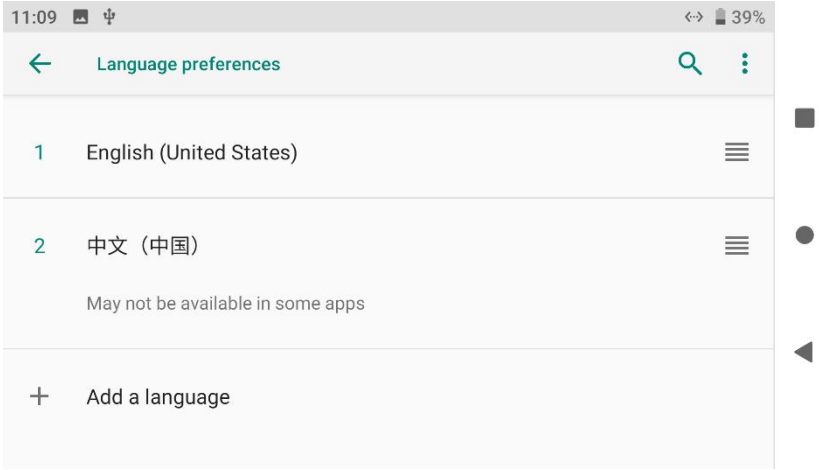

2.2 Important Instructions on Promotion to Communication Range and Video Fluency

To have the best communication range and video fluency with MK32 / MK15 system, please carefully read the below tips for antenna options, antenna setup, and link configuration.

2.2.1 General Precautions

1. It is suggested that not to run SIYI FPV app and QGroundControl app simultaneously with video streaming, not even running one at backstage, as it still occupies bandwidth thereby lower the communication range.

2. Only power batteries are allowed to power the air unit. HD image transmission system requires very high standard to the current of power supply, the instancy of the current response, and the current ripple. Power supply from a third-party power module,

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modified power module or from PDB may interfere the link stability and the communication range. If you do not need the power module, it is suggested to use the HM30 air unit.

2.2.2 General Antenna Options and Wireless Mode Configuration for Different Range

1. **0 to 8 Kilometers Range**

   Two standard omni antennas on ground unit.

   Wireless mode: 5 km or 8 km low latency.

2. **8 to 15 Kilometers Range**

   Two standard omni antennas or two standard long-range antennas on ground unit.

   Wireless mode: 15 km GCS.

3. **15 to 24 Kilometers GCS Flight**

   Two standard long-range antennas or higher gain patch antennas on ground unit.

   Wireless mode: 24 km GCS.

   Mission control suggested in GCS!

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4. The signal at the top of the standard omnidirectional antenna is weak. When flying directly above the ground, the flying height of the aircraft should be as low as 100 meters.

5. When the ground unit is working with long range antennas or patch antennas, the aircraft should always be in front of the antenna panel instead of being vertical of the antenna or on opposite.

6. Only the standard omni antennas are suggested for the air unit. If your aircraft is too small to mount the omni antennas, or you worry about the weak signal of the top part, then you can consider using SIYI lollipop antennas. Lollipop antennas performs shorter range than the standard omni antennas.

2.2.3 How to Place the Standard Omni Antennas on Ground Unit

1. The SMA connectors should be screwed tightly.
2. The antennas should stand vertically from the control panel of the ground unit, and the antennas' flat side should always point to the aircraft or the vehicle. Do not cross or overlap the antennas during mission.

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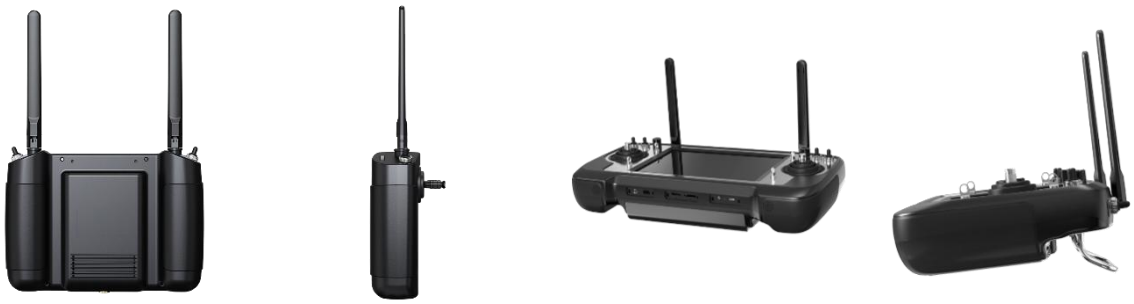

2.2.4 How to Place the Long-Range Patch Antennas on Ground Unit

1. The SMA connectors should be screwed tightly.
2. Long-range patch antennas are directional, which should always be pointing to the aircraft during flight.
3. When you are using SIYI standard long-range antennas, please make its short side be parallel with horizon and its long side be vertical of the control panel to get the best signal quality.

2.2.5 How to Place Air Unit Antennas

1. The SMA connectors should be screwed tightly.
2. On multirotor, the standard omni antennas should be hanging vertically from the drone arms with the antenna heads pointing to ground, and the antenna flat side should always point to the ground unit during flight. On plane, the standard omni antenna can stand vertically above the wings, and the antenna flat side should always point to the ground unit during flight.

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3. The air unit antenna feeder wire should be placed away from E.S.C and motors, and any other equipment with heavy current or interference. Do not cross or overlap the antenna feeder wires.
4. The antenna body, feeder wire, and the SMA connectors should not touch the metal / carbon-fiber structure parts directly. Please reserve at least 10 mm distance between these parts and the structure parts.
5. The two air unit antennas should be placed away from each other for at least 50 mm distance. And try your best to avoid any kinds of obstruction between the ground unit and the aircraft during flight.
6. Please be very careful with the antenna wire's SMA connectors and its solder connectors. Do not drag them or bend them in case of any damage. To adjust the position of the antenna, please always try to bend the middle part of the antenna feeder wires.

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⚠ CAUTION

As shown in the picture below, for small and medium-sized multi-rotor drones, the air unit antenna should be placed downward perpendicular to the arm to keep the flat surface of the antenna facing the direction of the remote controller.

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As shown in the figure below, for large multi-rotor drones, the air unit antenna should be placed vertically downwards from the motor base to keep the flat surface of the antenna facing the direction of the remote control.

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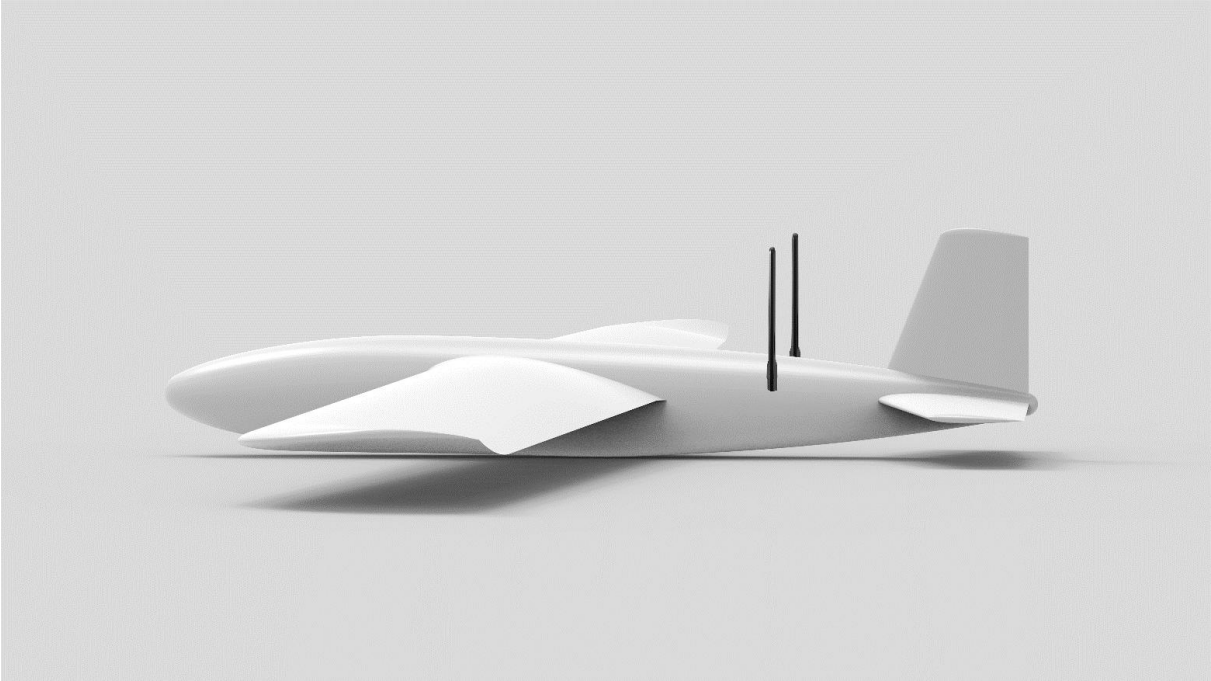
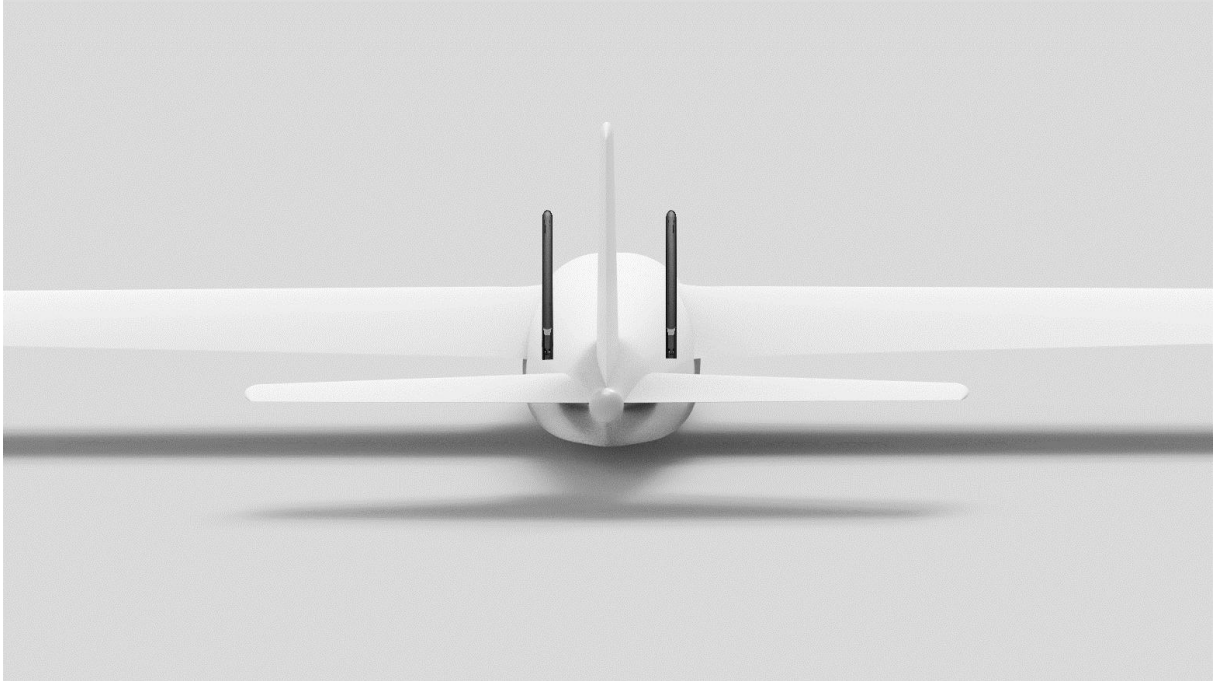
As shown in the figure below, for fixed-wing aircraft, the air unit antenna can be placed vertically to the wings or vertical tail upwards and try to keep the flat surface of the antenna facing the direction of the remote controller.





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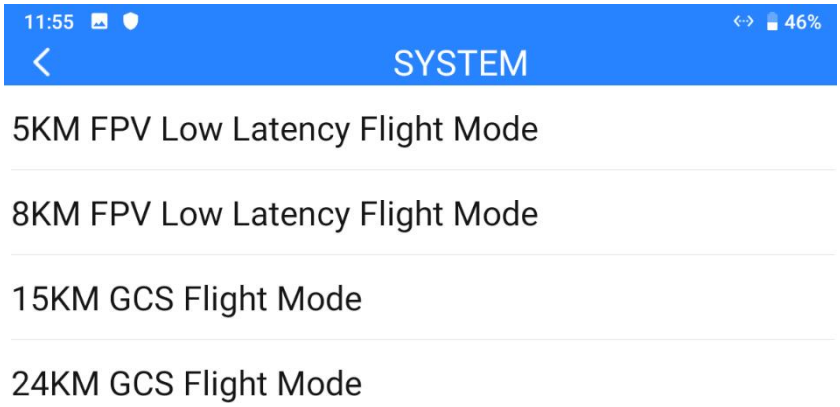
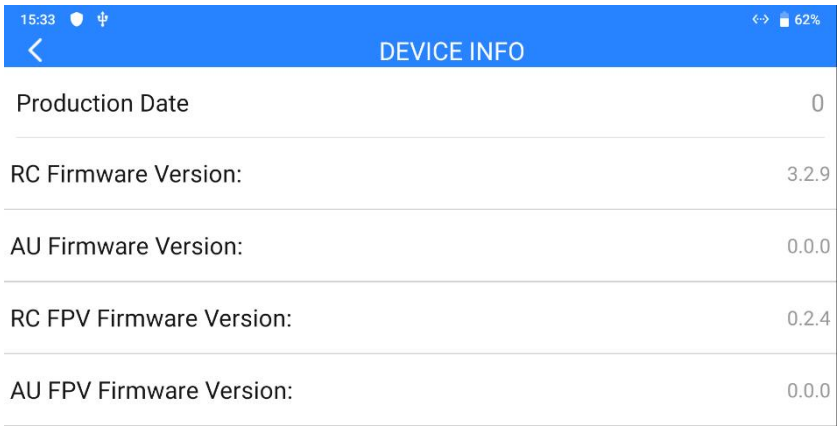
2.2.6 The Communication Range Is Not as Expected and You Need Factory Support, Here Are the Necessary Information We Need

1. The obvious things that make you think about range is not good.
   - Signal Loss: Image disappears, and RC status indicator is red.
   - Only image disappears (RC status indicator is green).
2. Flight altitude and distance of your drone when you observe the above things.
3. Flight test environment (pictures or videos taken in the orientation of the flight).
4. Check software information relevant to communication.
   - Wireless Mode



   - Ground and Air Unit Firmware Version



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- SIYI FPV app version

5. Check hardware configuration relevant to communication.
   - Ground Unit Antenna Type, Antenna Installation, Operating Angle (all with pictures)
   - Air Unit Antenna Type, Antenna Installation (both with pictures)
   - Air Unit Power Supply / Voltage and if the original BEC is removed / modified.
6. If all above trouble shooting still didn't help find the cause to unexpected range, please provide a screenshot of SIYI FPV app with all OSD turned on when the drone is flying closely to the range limit that you have experienced, or provide a screen recorded video of the running SIYI FPV app during the whole flight.

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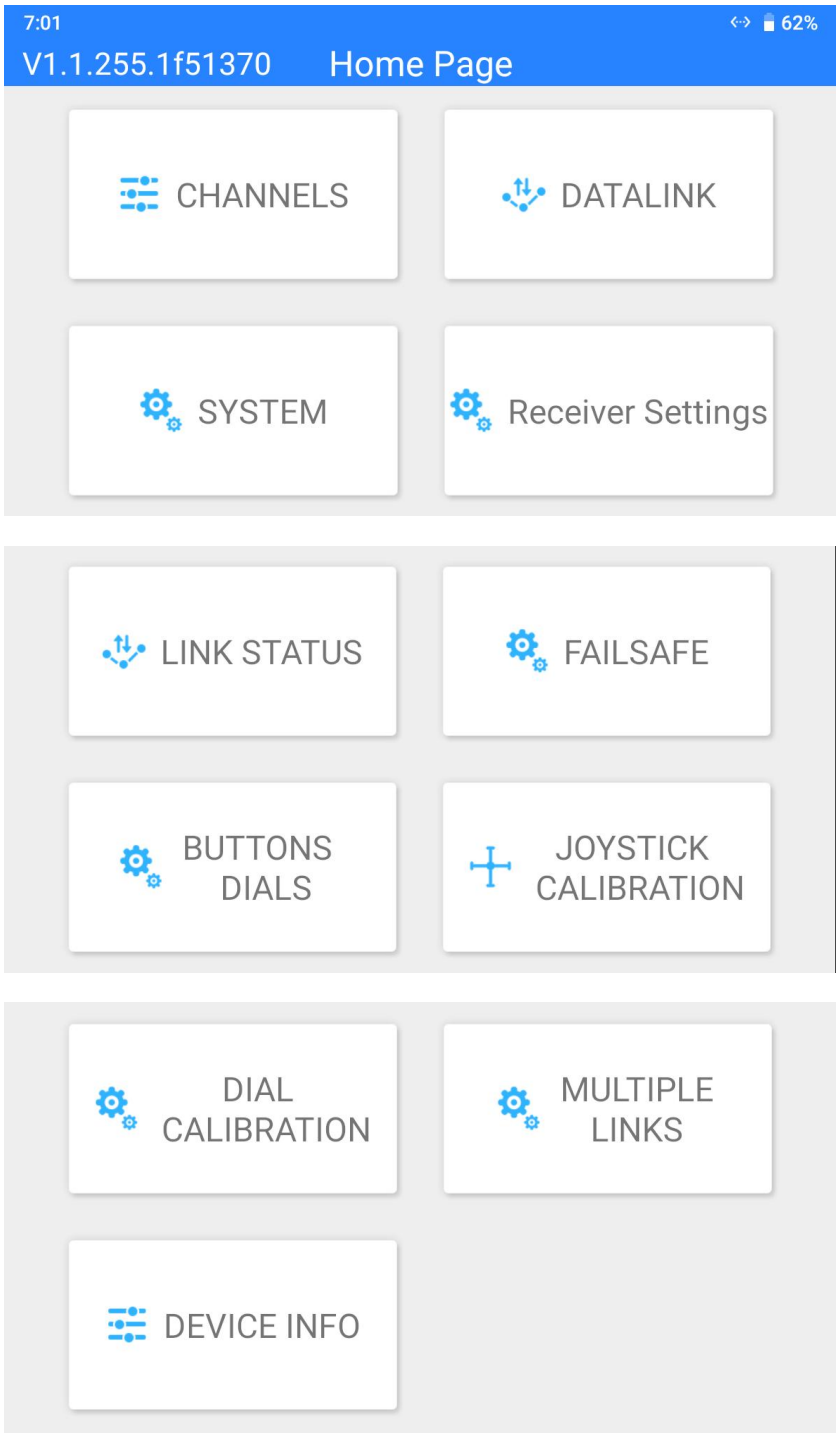
3 SIYI TX APP

Users can configure remote controller in “SIYI TX” app.



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This chapter was made according to “SIYI TX” v1.1.255.

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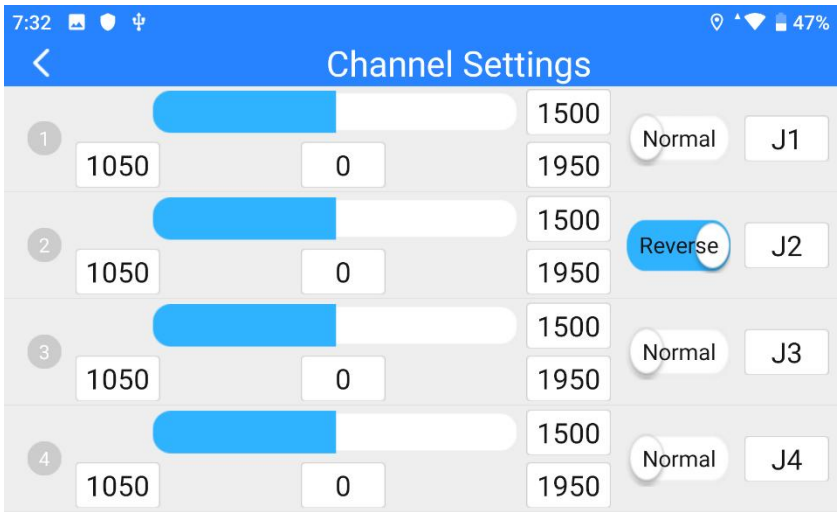
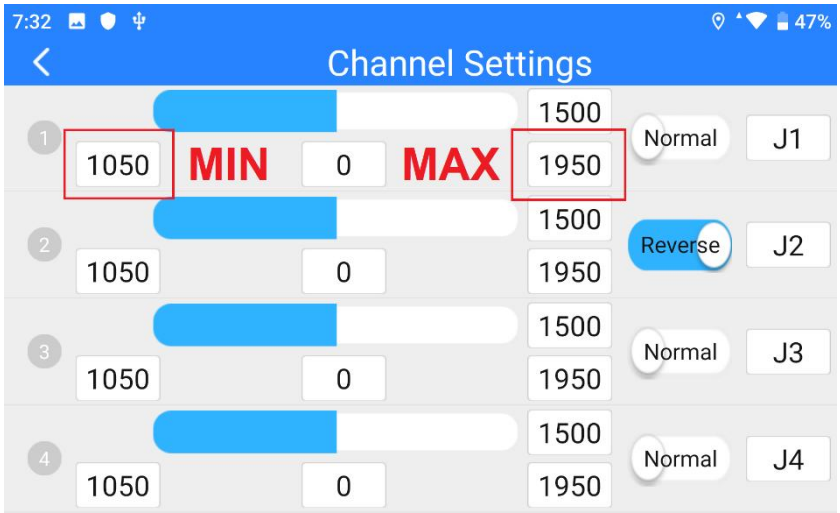
3.1 Channels

Channel settings of End Point, Middle Point, Channel Reverse, and Channel Mapping.



3.1.1 End Point

Handheld ground station's default end point range is between 1050 and 1950.



Select a target channel and input your required maximum or minimum channel value. It's done.

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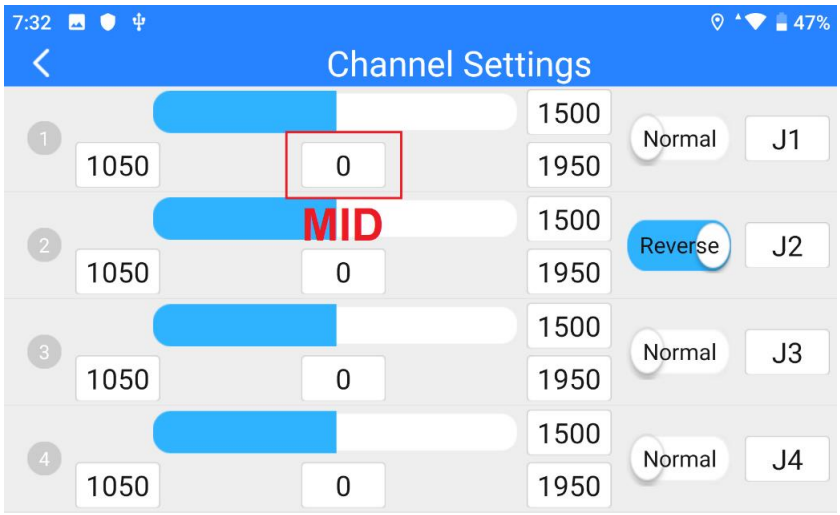
3.1.2 Middle Point

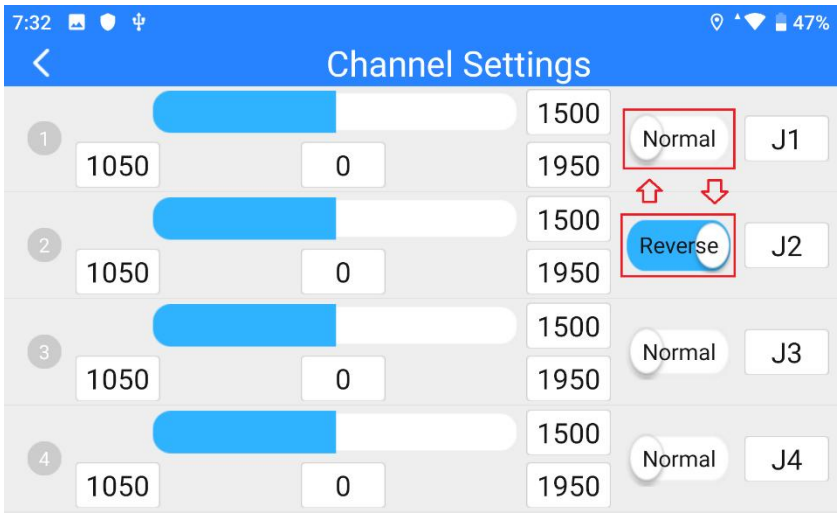
The default Middle Point value is “1500”.



Select a target channel and input your required middle point value. It’s done.

3.1.3 Channel Reverse

Channel Reverse is to reverse a channel’s output direction.



Select a target channel. Then touch the “Normal” or “Reversed” button. It’s done.

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3.1.4 Channel Mapping

MK32 handheld ground station provides 16 physical channels, an RSSI channel, and 16 communication channels. Users are allowed to define or to map the physical channels (buttons, switches, joysticks) and the RSSI channel to the communication channels freely.

Select a target channel. Then touch a mapped button / switch / joystick, it will pop up a list of all physical channels. Select the button / switch / joystick you want to re-map to. It's done.

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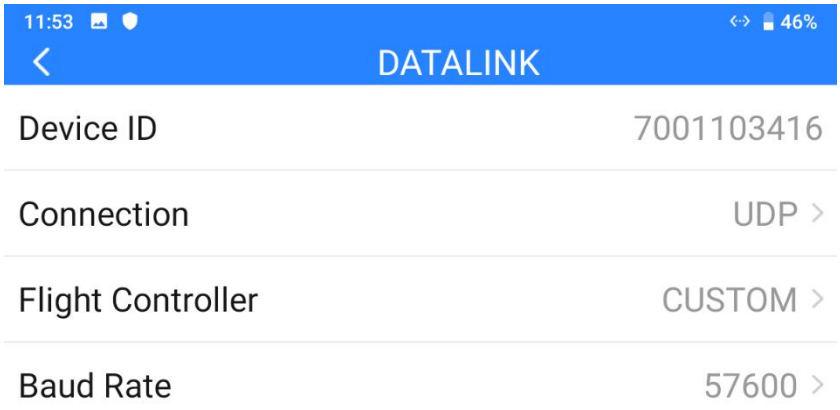
3.2 Datalink

In Datalink Settings you can check the device ID, switch datalink connection and flight controller type, and configure customized baud rate.



About Datalink Settings

Device ID: Display the unique device ID of the integrated Bluetooth module in the handheld ground station. It also shows as the Bluetooth name before pairing.

Connection: Available datalink ports in the handheld ground station.

Flight Controller: Compatible flight controller types.

Baud Rate: The baud rate here must match the baud rate of PX4 / ArduPilot flight controller's TELEM port which is used for datalink and configured in GCS.

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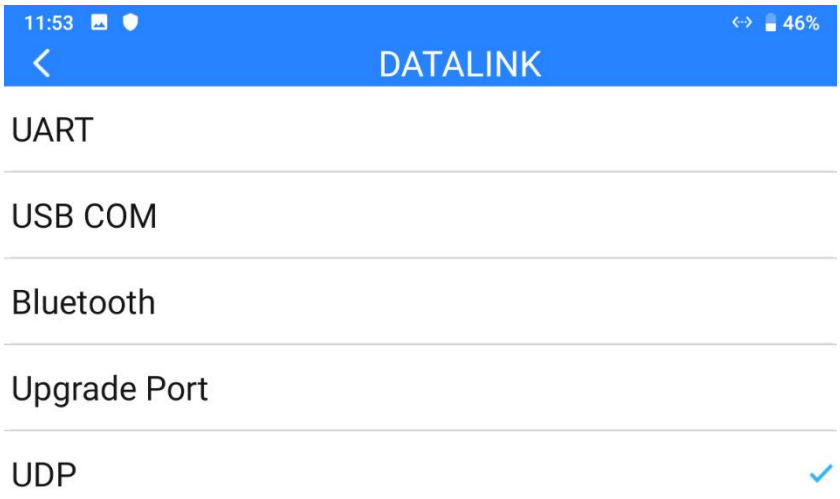
3.2.1 Connection

Available datalink connection types in MK32 handheld ground station are: UART, USB COM, Bluetooth, Type-C Upgrade Port, and UDP.



About Datalink Connection

UART: Telemetry data goes through the built-in UART port in the ground unit.

*Compatible with specific Android GCS, such as BOYING, JIYI, and VK.

*Developers can refer to Chapter 4.8 in this manual for their GCS.

USB COM: Telemetry data goes through the built-in CP2102 port in the ground unit.

*Compatible with Android QGroundControl.

Bluetooth: Telemetry data goes wirelessly through the built-in Bluetooth connection.

*Compatible with most Android and Windows GCS.

Type-C Upgrade Port: Telemetry data goes to Windows GCS through the Type-C port on handheld ground station.

UDP: Telemetry data goes through UDP network protocol.

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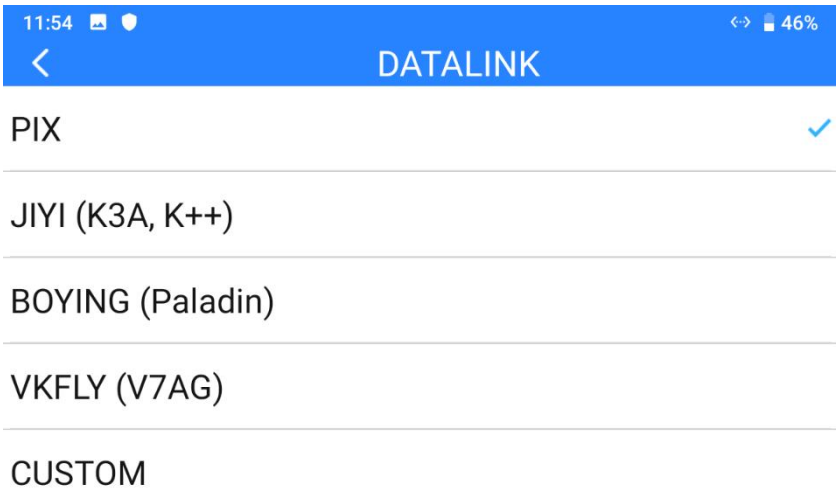
3.2.2 Flight Controller

Select your required flight controller type for datalink connection in the provided list.

Currently supported flight controller models are: SIYI N7 Autopilot, PX4 / ArduPilot Flight Open-source Controllers, JIYI (K3A or K++), BOYING (Paladin), VK (V7AG) agriculture flight controllers, and customized flight controllers.



Mark

Please make sure that the ground unit has been bound to the air unit before switching flight controller type, otherwise it would fail.

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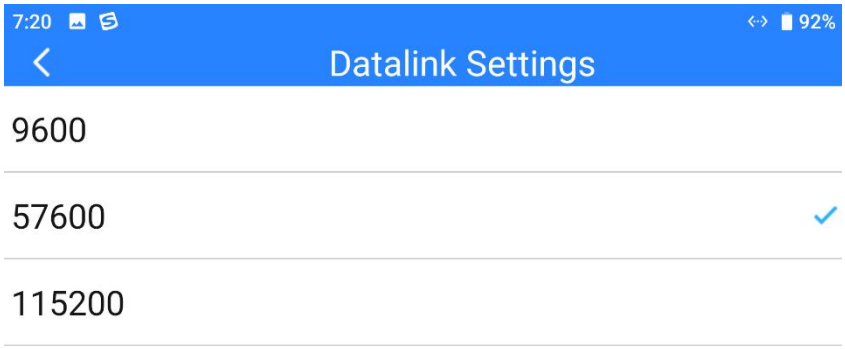
3.2.3 Baud Rate

If your flight controller model was not found in the list, please choose “Custom” and manually configure the baud rate of your flight controller in this page.

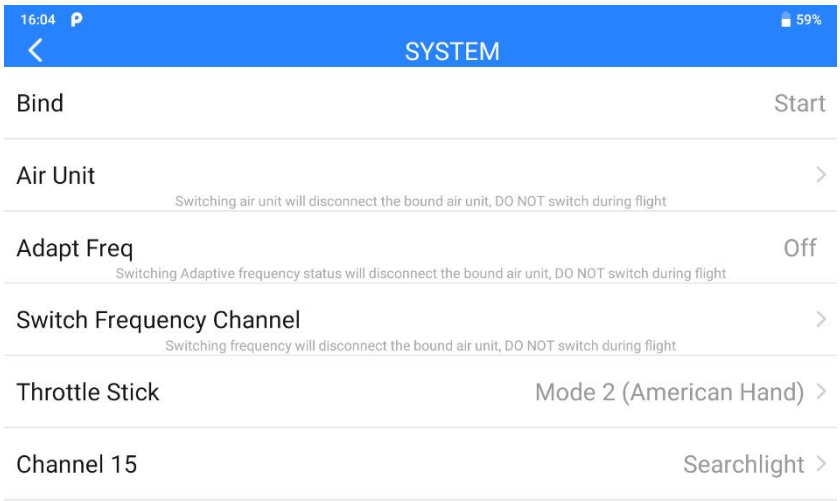


Mark

Please make sure that the ground unit has been bound to the air unit before configuring baud rate, otherwise it would fail.

3.3 System

Configure the essential system functions for the handheld ground station.



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About System Settings

Bind: Check current binding status or start binding process on ground unit.

Multiple Air Unit: Ground unit can save up to five bound air units for switching quickly with no need to bind them again.

Adapt Frequency: When binding, SIYI link searches and switches to the frequency band with the lowest interference automatically.

Switch Frequency Channel: Manually switch the working frequency to a channel.

Throttle Stick: Switch throttle types among Mode 1, Mode 2, Mode 3, and Custom.

Channel 15: Switch controlling channel 15 between the searchlight switch of the IP67 camera and the pitch axis rotation of the A2 mini gimbal.

Wireless Mode: Switch wireless mode for different communication range.

Joystick Deadzone: Configure the joystick deadzone value for smooth control based on your habit.

RC Output Mode: Switch MK32 ground unit's RC signal output mode.

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3.3.1 Bind

Please follow the steps below to bind the ground unit to the air unit.

1. In “SIYI TX” application, go to “System” page, then touch “Bind - Start”.
2. Ground unit status indicator will turn to “Red Fast Blinking”. And in “Bind” menu, it displays “Binding”.
3. Press and hold the binding button on the air unit for about two seconds, air unit status indicator will turn to “Red Fast Blinking” as well.
4. Then wait for 5 to 10 seconds till both ground unit and air unit status indicators have turned to “Solid Green”. Binding is done.

3.3.2 Multiple Air Unit

The multiple air unit function supports saving multiple bounded air unit and corresponding channel setting data on the same ground unit. In this way, after each air unit and ground unit are bound for the first time, users no longer need to re-bind to switch between them.

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DANGER

It is forbidden to switch the air unit during flight. Switching the air unit during flight will cause the link to go out of control!

3.3.3 Frequency Self-Adapting

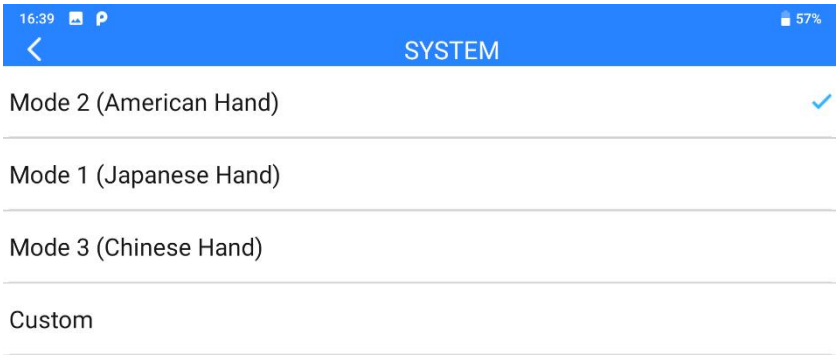
In strong-interference environment, turn on the function, SIYI link will automatically search for the frequency band with least interference to get the best transmission quality.

Mark

After turning on the function in “SIYI TX”, please restart the link, otherwise it would fail.

3.3.4 Throttle Stick

Switch throttle joystick type. Available types are Mode 1 (Japanese Hand), Mode 2 (American Hand), Mode 3 (Chinese Hand), and Customize Hand.



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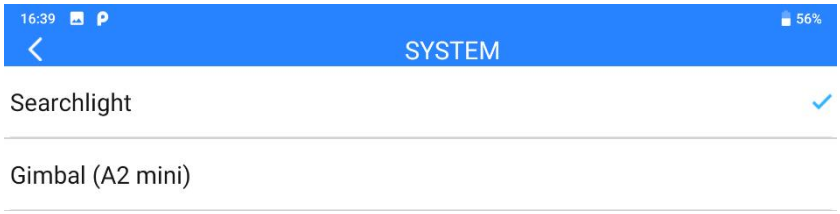
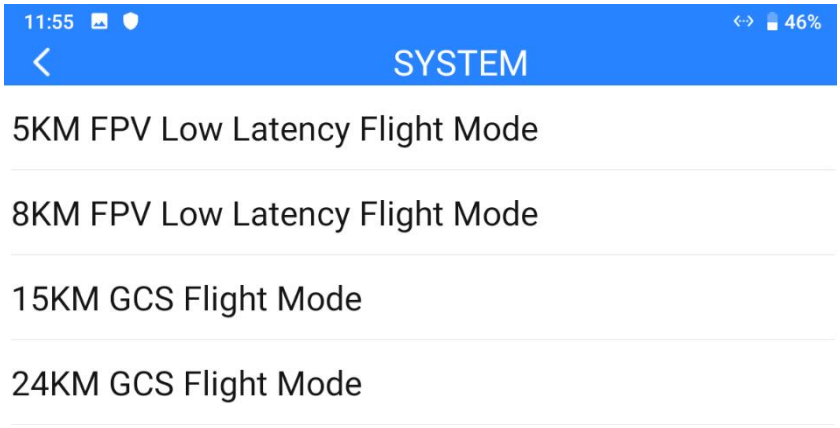
3.3.5 Channel 15

Switch controlling channel 15 to the IP67 camera's searchlight function or the A2 mini gimbal's pitch axis rotation.



3.3.6 Wireless Mode

SIYI link supports switching wireless communication modes and cooperates with different types and different gain antennas to achieve the conditions most conducive to wireless communication and the ultimate communication distance.



Mark

Before configuring wireless modes, please carefully read the chapter 2.2 in this manual "Important Instructions on Promotion to Communication Range and Video Fluency".

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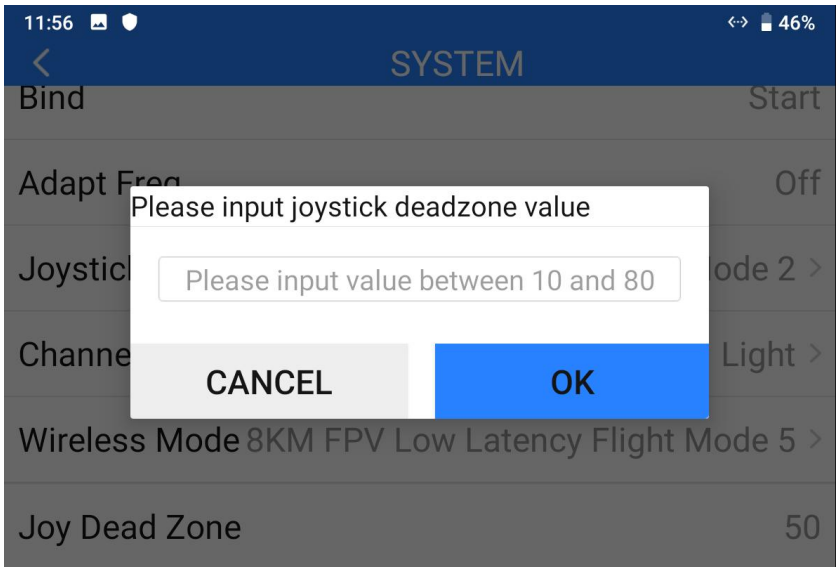
3.3.7 Joystick Deadzone

Adjust the joystick dead zone to adapt to various control feels.



3.3.8 RC Output Mode

Switch MK32 ground unit's RC signal output mode between PPM and S.Bus or turning off.

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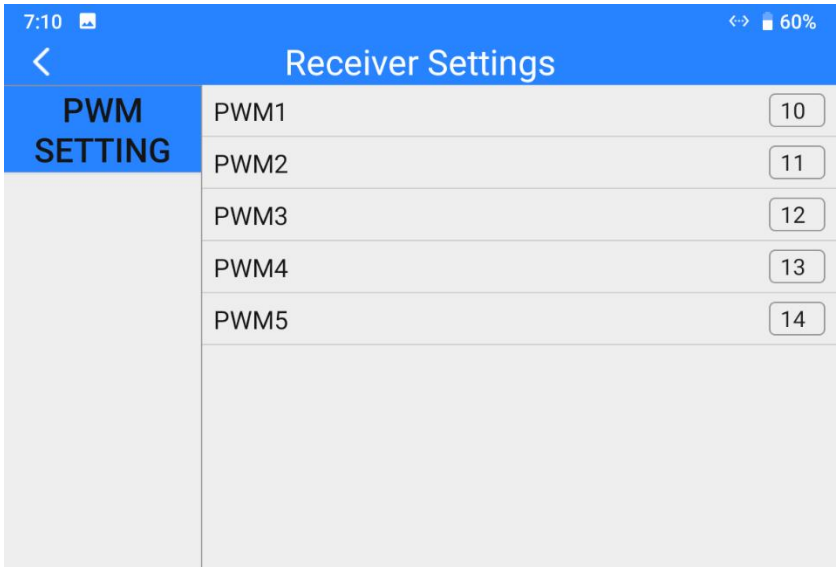
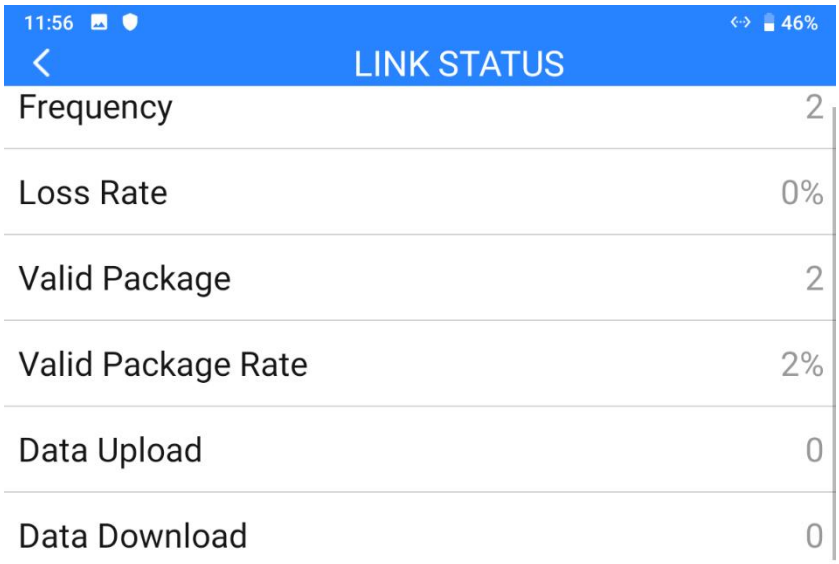
3.4 Air Unit PWM Channels

Assign communication channels for the five pins in air unit's PWM port.



3.5 Link Status

Link Status page digitalized the system's transmission quality by displaying the link's real-time status in numbers and percentage.



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About Link Status

Frequency: The current frequency channel that the system is working at.

Loss Rate: Loss percentage of data package which failed to be received by the ground unit per second.

Valid Pack: Quantity of data package which are successfully received by the ground unit per second.

Valid Pack Rate: Received percentage of data package which are successfully received by the ground unit per second.

Upload: Data uploaded to the air unit per second by bit.

Download: Data downloaded from the air unit per second by bit.

3.6 Failsafe

After finishing binding the ground unit to the air unit for the first time, please do configure the system with Failsafe function immediately.

Failsafe function is to avoid aircraft crash by keeping the air unit outputting the pre-configured channel value when the air unit lost communication with the ground unit.

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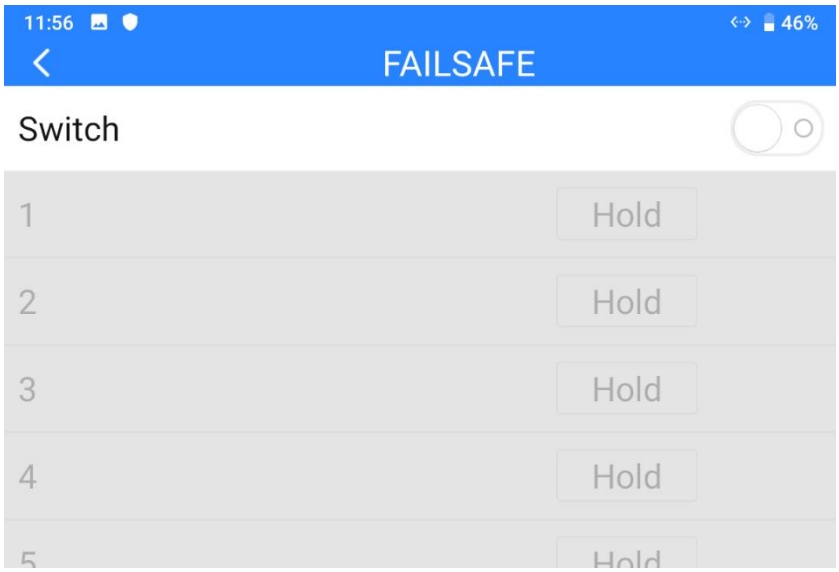
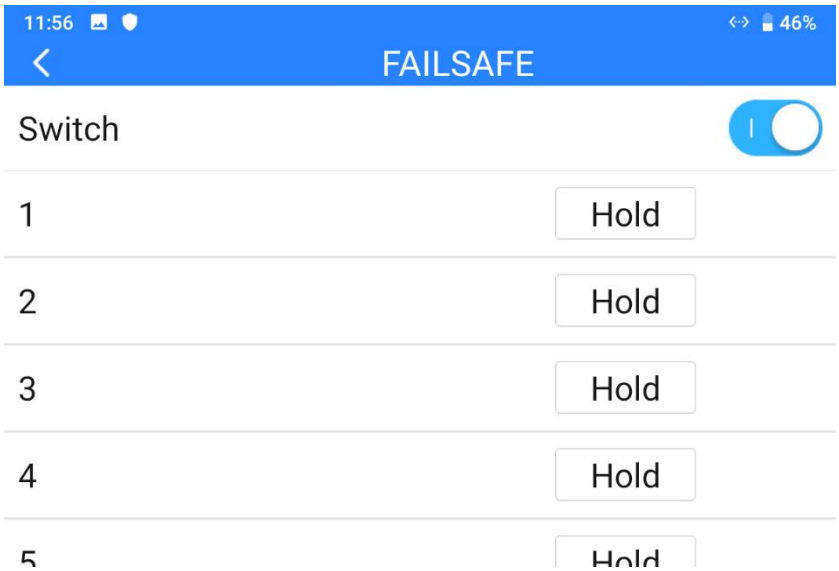


Please follow the steps below to configure your system with Failsafe function.

1. Make sure that the ground unit is bound to the air unit.

2. Go to “Failsafe” page.



3. Failsafe function is not activated in default. The numbers on left represent channels. Channels display “Hold” when no channel value was input.

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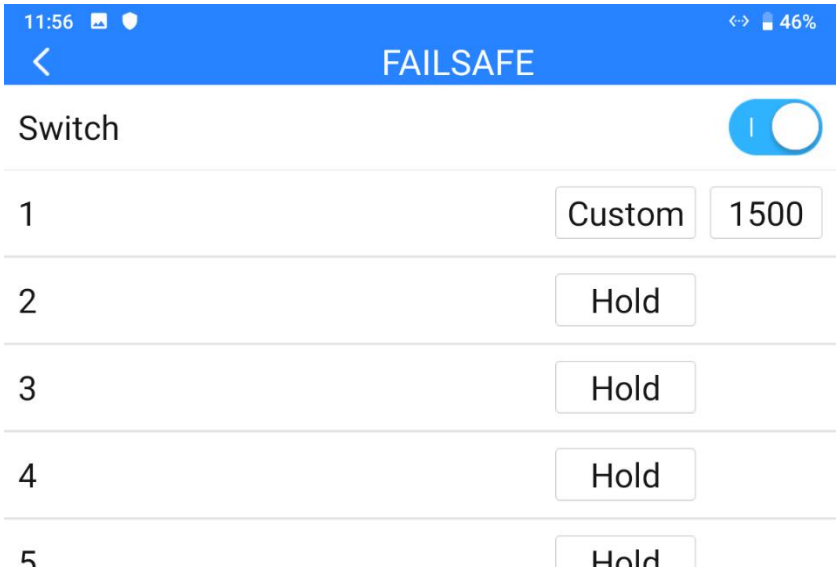
4. If you require a specific value in the channel, please turn on Failsafe switch first and switch from the “Hold” button to “Custom”. Then input your required channel value for Failsafe.



5. After configuration, the channel would output the value if the air unit lost communication with the ground unit during flight.

⚠ CAUTION

Please be sure to set up the fail-safe function in the handheld ground station or in the flight controller & GCS after the ground unit and the air unit are bound for the first time!

Failsafe function means that when the communication between the ground unit and the air end is lost, the air unit continues to output the preset channel value to avoid a crash to the greatest extent.

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Mark

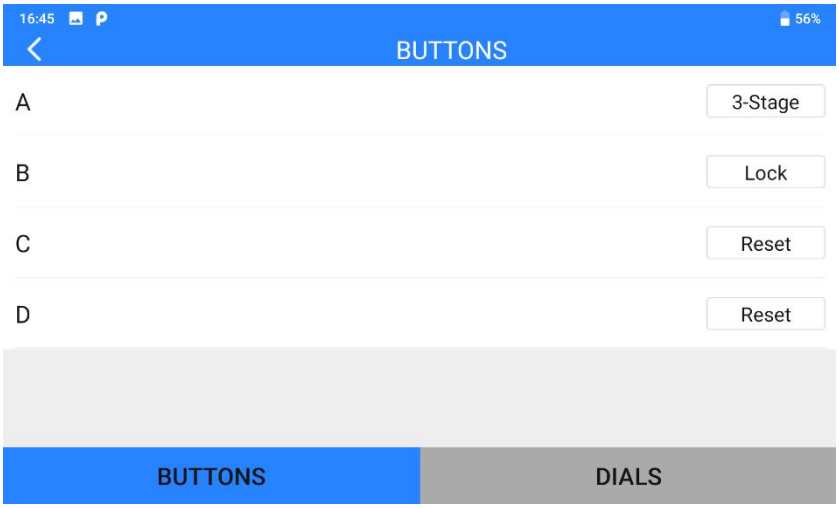
If the ground unit was not in communication with the air unit, failsafe configuration does not take effect.

3.7 Buttons / Dials

Handheld ground station supports changing the way that the buttons and the dials work.

3.7.1 Buttons

The function changes the way that the buttons (A, B, C, D) works.



About Buttons

Lock: After pressing, the button bounces back but the channel will keep outputting 1950. Press the button again to reset channel output to 1050.

Reset: Press and hold the button, the channel will output 1950. Release the button, channel

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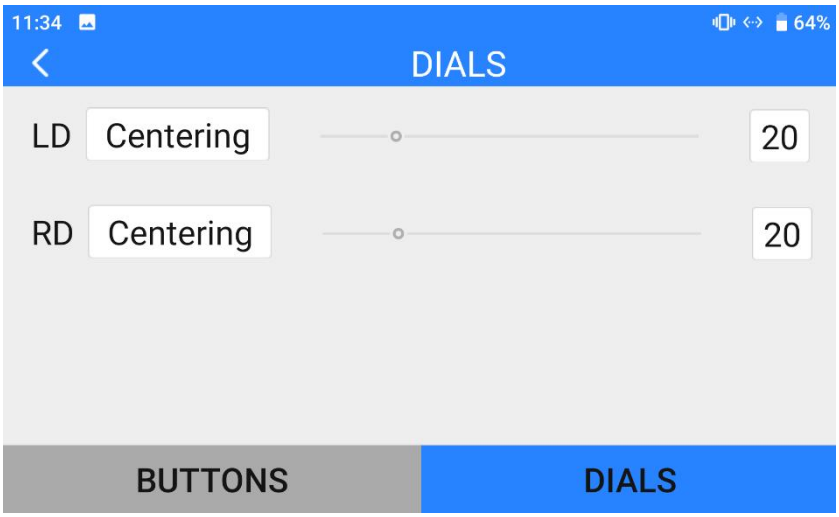
output resets to 1050.

3-Stage: After pressing, the button will bounce back but the channel will keep outputting 1950. Press and hold the button for two seconds, the channel will output 1500. Press the button again to reset channel output to 1050.

3.7.2 Dials

The function changes the way that the two dials (LD, RD) work.



About Dials

Centering: Under “Centering” mode, when you push the dial and release, the dial’s outputting value will return to the initial value (middle point of the channel).

Thumb-slide: Under “Thumb-slide” mode, when you push the dial and release, the dial’s outputting value will stay at the current value.

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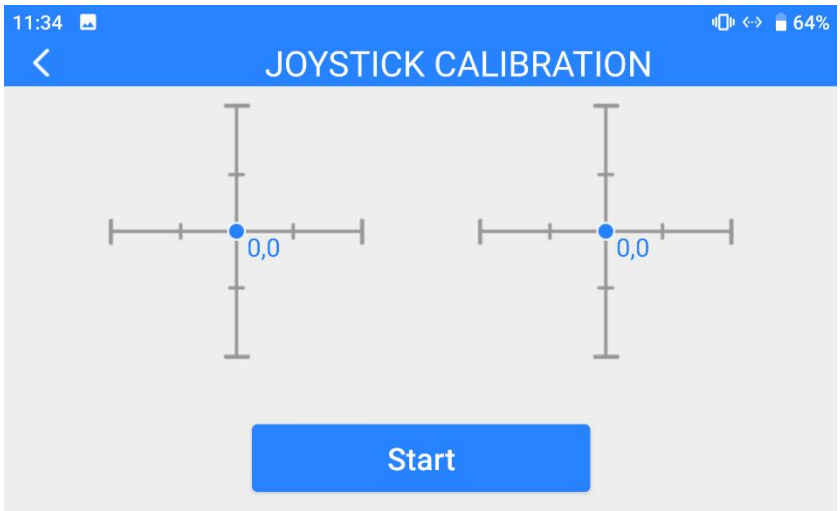
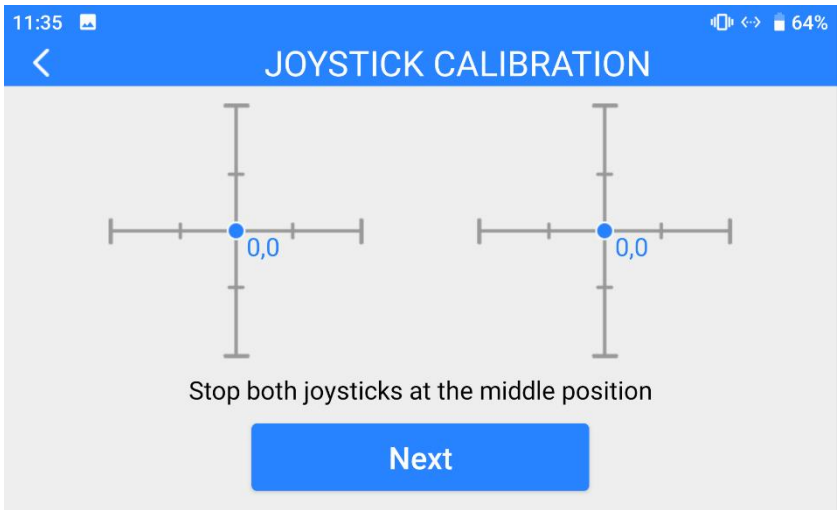
3.8 Joystick Calibration

Joystick calibration function help users calibrate both joysticks' middle positions and maximum / minimum positions. Regular calibration helps maintain the control accuracy of the joysticks.



Steps

1. Before calibrating the joysticks, please make sure that both joysticks are naturally standstill, not displaced by any force.
2. In "Joystick Calibration" page, touch "Start", the page shows as below.



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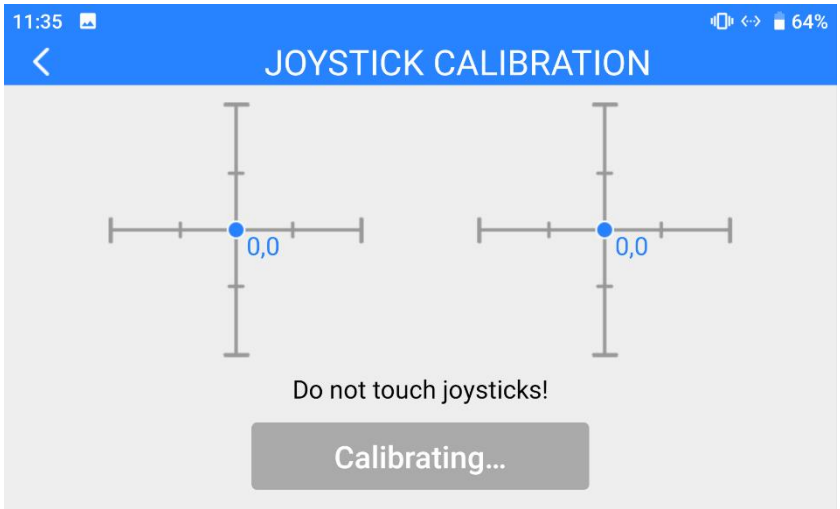
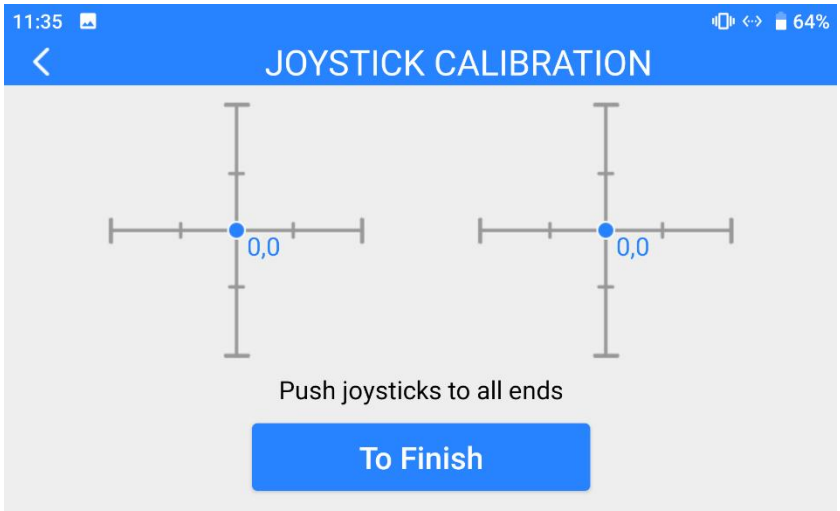
3. According to the tips, if joystick coordinates are not “(0, 0)” when both joysticks are standstill, it shows that joystick middle points are displaced. Please touch “next” and do not touch joysticks.



4. Calibration of joystick middle points are finished. The next step is to calibrate joystick maximum and minimum positions.

Please follow the tips again to push each joystick to its maximum/minimum positions on all four dimensions.



Up: 0, 100

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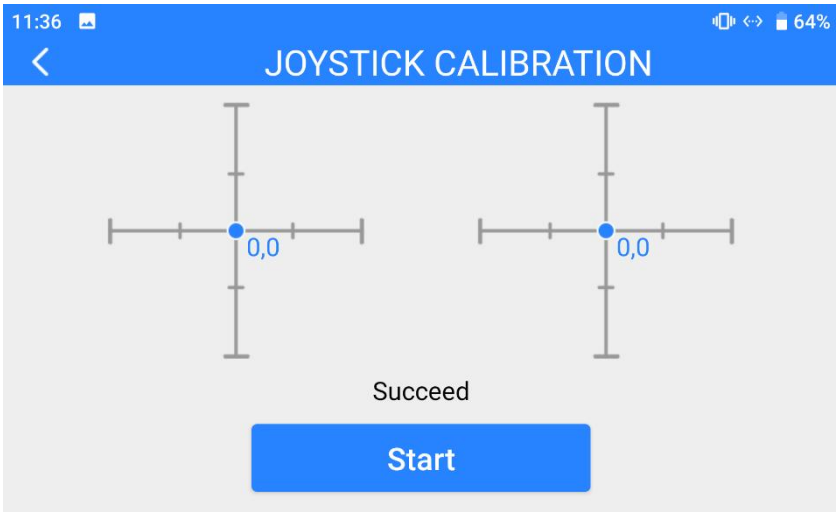
Down: 0, -100

Left: -100, 0

Right: 100, 0

Then touch “Finish”.

5. The Joystick Calibration page will turn to its initial page. Joystick calibration is finished.



Mark

If the joysticks do not stay in middle (coordinates are not (0, 0)) or do not output maximum/minimum value (-100 or 100), you shall calibrate them immediately.

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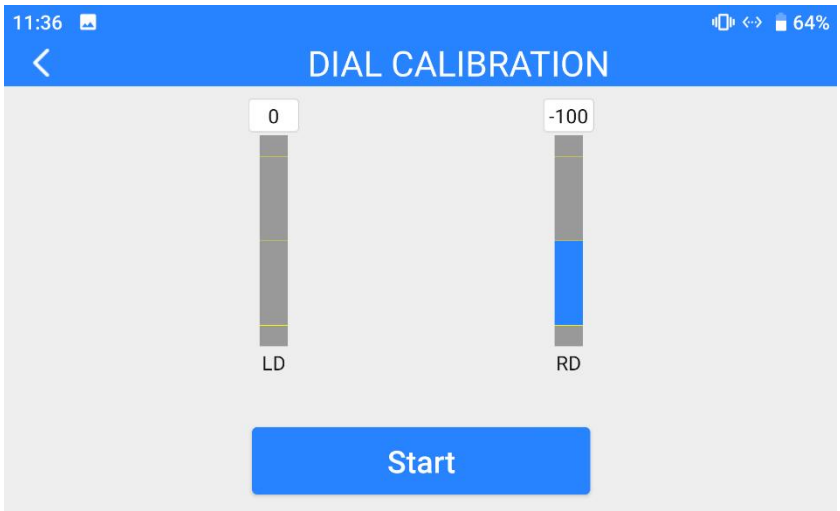
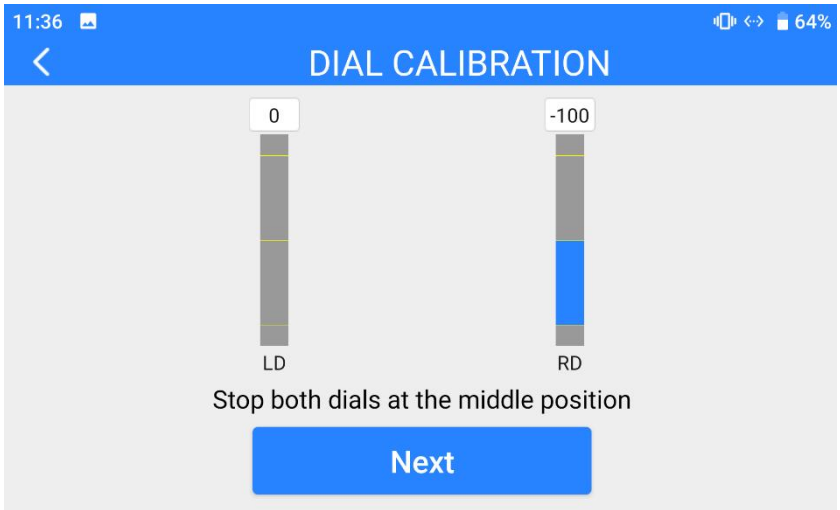
3.9 Dial Calibration

Dial calibration function help users calibrate both dials' middle positions and maximum/minimum positions. Regular calibration helps maintain control accuracy of the dials.



Steps

1. Before calibrating the dials, please make sure that both dials are naturally standstill, not displaced by any force.
2. In "Dial Calibration" page, touch "Start", the page shows as below.



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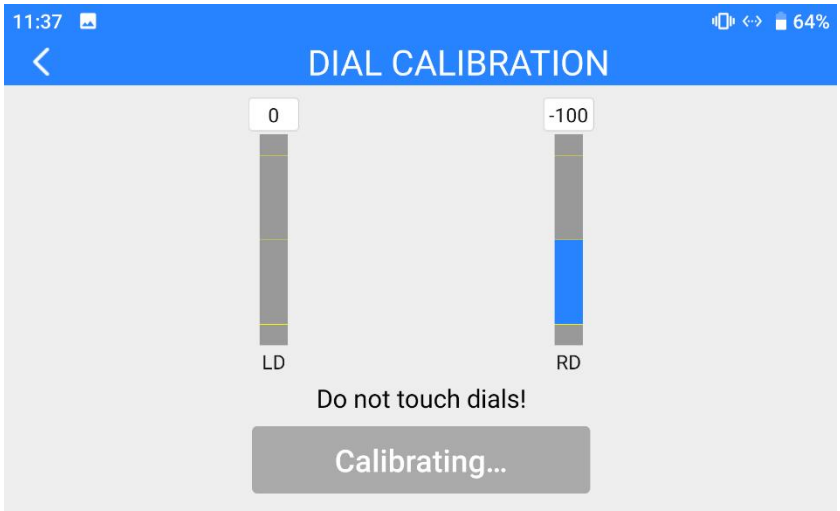
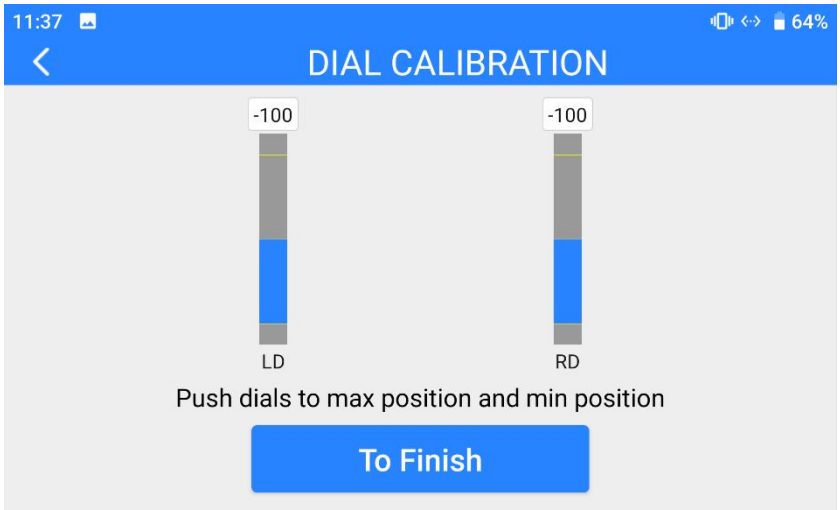
3. According to the tips, if dials' coordinates are not "(0, 0)" when both dials are standstill, it means that dial middle points are displaced. Please touch "next" and do not touch the dials.



4. Calibration of dial middle points is finished. The next step is to calibrate dial maximum and minimum positions.



Please follow the tips again and push each dial to its maximum and minimum position. Then touch "Finish".

5. Dial Calibration page will return to its initial page. Dial calibration is finished.

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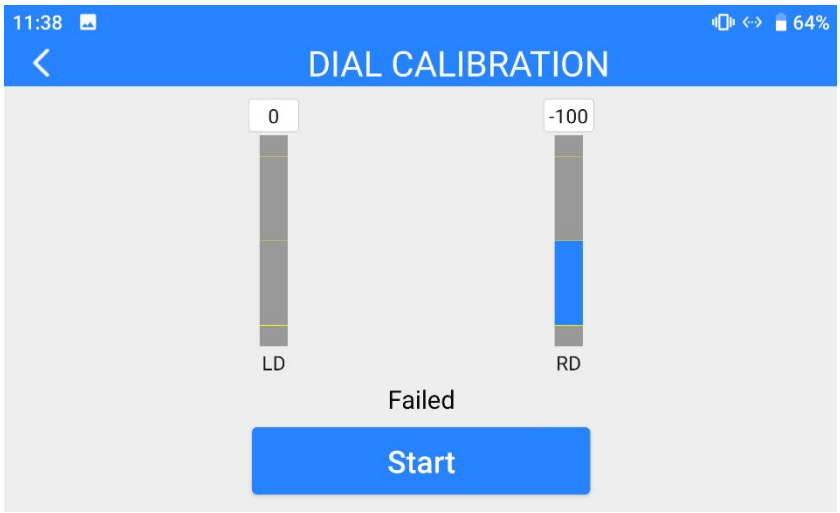
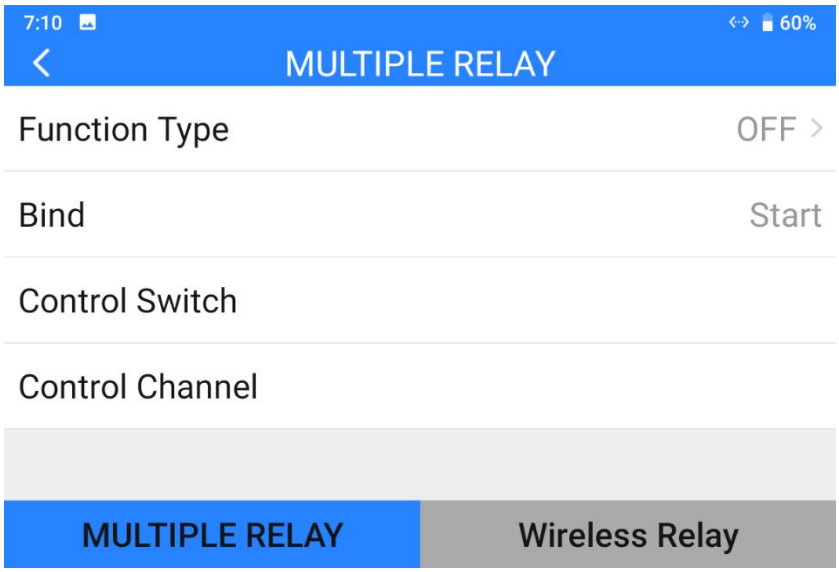


Mark

If the dials do not stay in middle (coordinates are not 0) or do not output maximum / minimum value (-100 or 100), you shall calibrate them immediately.

3.10 Multiple Links

The multiple links feature only comes with the dual & repeater edition, including “Dual Operator”, “Remote Control Relay”, and “Wireless Repeater”.



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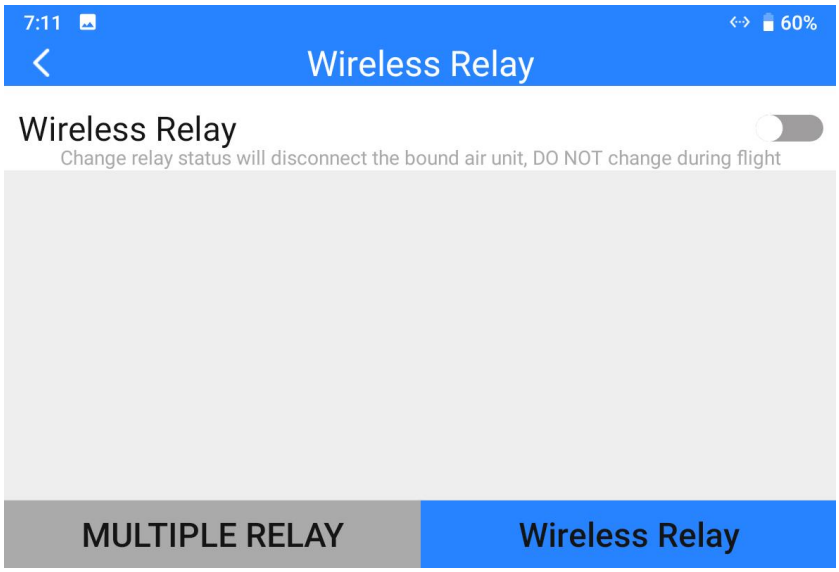

About Multiple Links

Function Type: Switch the function between “Dual Operator” and “Remote Control Relay”, and between “TX-A” and “TX-B”.

Bind: Bind “TX-A” and “TX-B” to the same air unit in turns after configuring the function type.

Control Switch: Define a button or a switch to take over control between “TX-A” and “TX-B” in “Dual Operator” or “Remote Control Relay” mode.

Control Channel: In “Dual Operator” mode, assign channel mapping for TX-A and TX-B.

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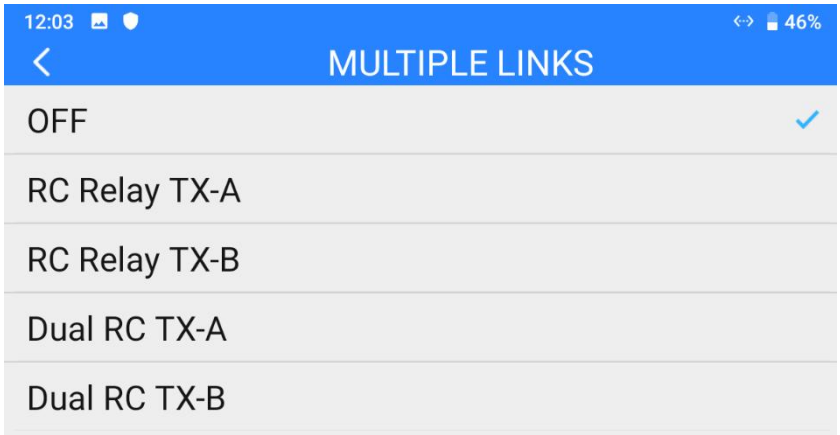
3.10.1 Dual Operator

The "dual operator" function is developed for dual-operator scenarios and supports up to two ground units to establish links with the same air unit at the same time. One can be used to control the flight attitude of the drone, and the other can be used to control the gimbal camera, optical pod, and other payloads.

Steps

1. Prepare two ground units (dual & repeater edition).
2. Go to “Multiple Links – Function Type”, assign the two ground units as “Dual RC TX-A” and “Dual RC TX-B”.



3. Bind “TX-A” and “TX-B” to the same air unit in turns.
4. In “Control Switch” page, assign a switch / a button / a dial for switching control to the air unit between “TX-A” and “TX-B”.

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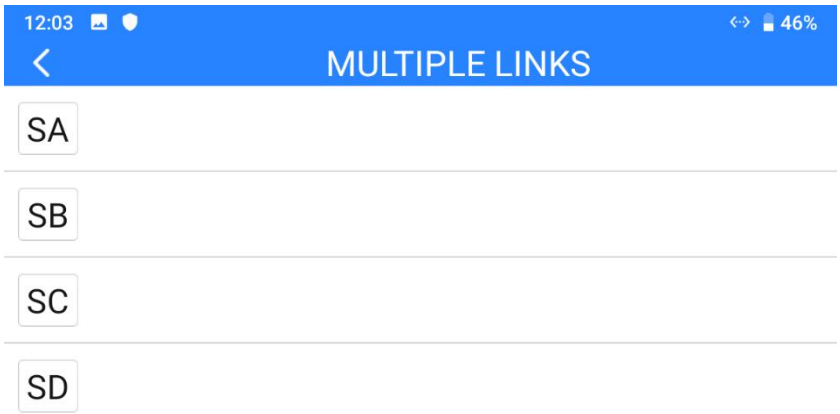
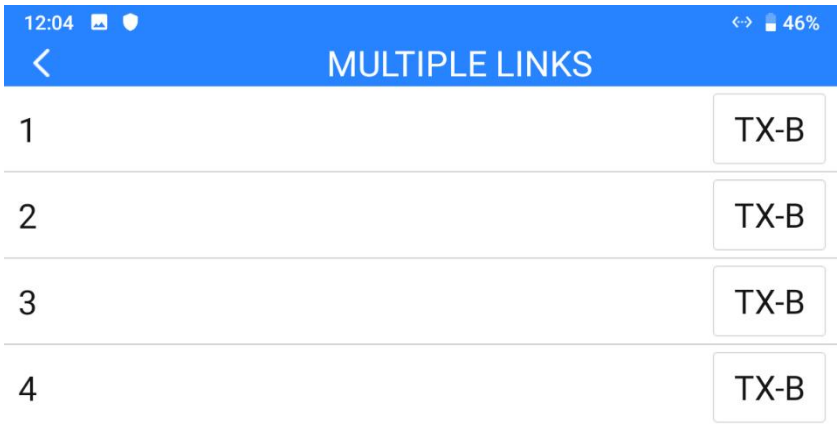


5. In “Control Channels” page, configure channel mappings for “TX-A” and “TX-B”. Then, when the dual operator function is enabled, “TX-A” can permit “TX-B” or withdraw from “TX-B” the control through the assigned channels.



6. The dual operator feature is configured.

Mark

The “Dual Operator” function works similarly to “Wireless Coach” function. Thus, the dual editions can also be used for drone training and education.

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DANGER

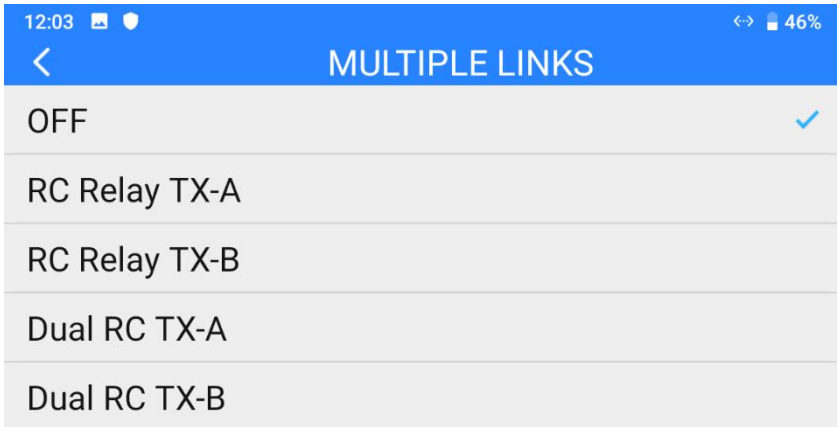
When the “Dual Operator” function is enabled and “TX-A” lost control to the air unit, “TX-B” will lose control to the air unit, either.

3.10.2 Remote Control Relay

The "remote-control relay" function is developed for ultra-long-distance flight missions. It supports two ground units to relay control the same air unit to reach a maximum transmission distance twice that of a single standard transmission system. It can be widely used in cruise line inspection, unmanned distribution, unmanned logistics and other fields.

Steps

1. Prepare two ground units (dual and repeater edition).
2. Go to “Multiple Links – Function Type”, assign the two ground units as “RC Relay TX-A” and “RC Relay TX-B”.



3. Bind “TX-A” and “TX-B” to the same air unit in turns.
4. In “Control Switch” page, assign a switch / a button / a dial for switching control to the air unit between “TX-A” to “TX-B”.

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5. Remote control relay feature is configured.

3.10.3 Wireless Repeater

The "wireless repeater" function is developed for scenarios that cannot be fully covered by the traditional end-to-end paired transmission system. It supports one ground unit to relay transmission to the air unit through another ground unit, achieving up to twice the standard transmission of a single system. The repeater system can bypass obstacles or other obstructions, which can effectively solve the painful needs in tunnel inspection, mountainous drone applications and other fields.

Steps

1. Prepare MK32 ground unit (dual and repeater edition) and HM30 ground unit (dual and repeater edition). Turn on repeater function switch on the HM30 ground unit and set it as “Repeater”. Turn on repeater function switch on the MK32 ground unit under the “Multiple Links” page as well.
2. Starting binding on all three devices: the MK32 ground unit, the HM30 ground unit, and the relevant air unit.

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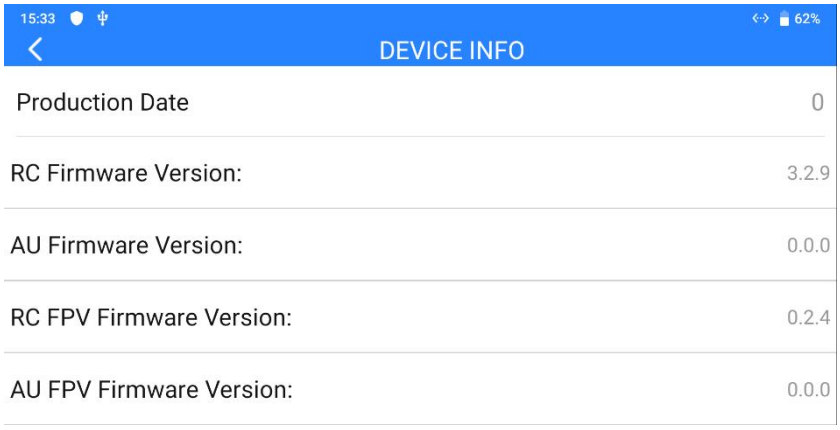
3. Wireless repeater function is configured after successful binding.

3.11 Device Info

Displays the major factory information of the system.



About Device Info

Production Date: Displays the manufacturing date of the system.

RC Firmware Version: Displays the function firmware version of the ground unit.

AU Firmware Version: Displays the function firmware version of the air unit.

RC FPV Firmware Version: Displays the FPV firmware version of the ground unit.

AU FPV Firmware Version: Displays the FPV firmware version of the air unit.

Mark

The ground unit and air unit FPV firmware are not open for customer upgrade.

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3.12 SIYI TX App Update Log

Date	2024-01-26
Version	1.1.255
Updates	1. Improve: English translation.

Date	2023-10-13
Version	1.1.248
Updates	1. New: Add a switch for wireless repeater. 2. New: Add notification for wireless repeater switch.

Date	2023-07-18
Version	1.1.240
Updates	1. New (MK32): Support remote controller signal output.

Date	2023-07-11
Version	1.1.239
Updates	1. Improve: Frequency self-adapting support searching for the best channel. 2. Fix: System settings do not display setting status. 3. New: Support manually switching frequency channel.

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4 DATALINK

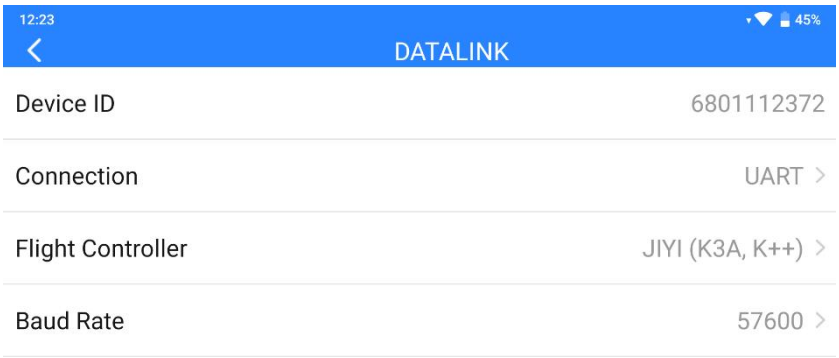
Datalink is one of the core features in most SIYI links.

SIYI links and handheld ground stations support communication with different ground control software through various hardware interface.

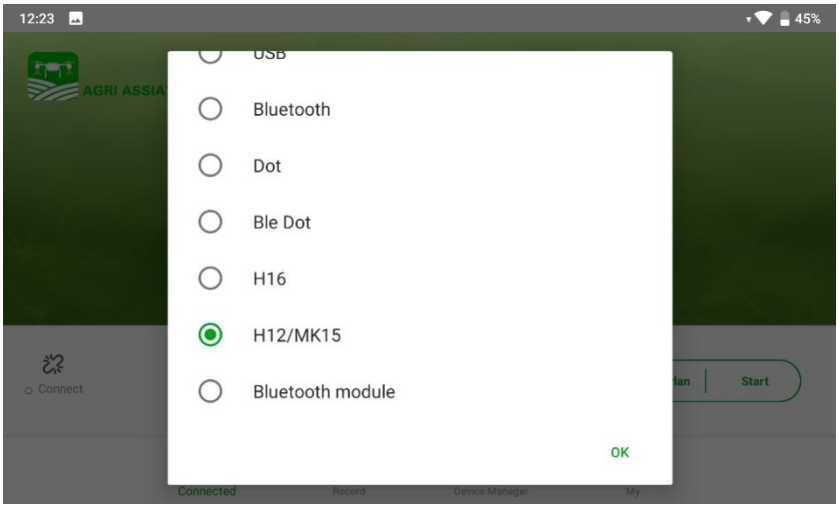
4.1 Communication with Android GCS through UART

4.1.1 JIYI Agri-Assistant

1. In “SIYI TX” app, go to “Datalink”, and choose “UART” in “Connection”, “JIYI (K3A / K++)” in “Flight Controller”, and “57600” in “Baud Rate”.



2. Run JIYI Agri-Assistant, choose “MK15” as the connection method.



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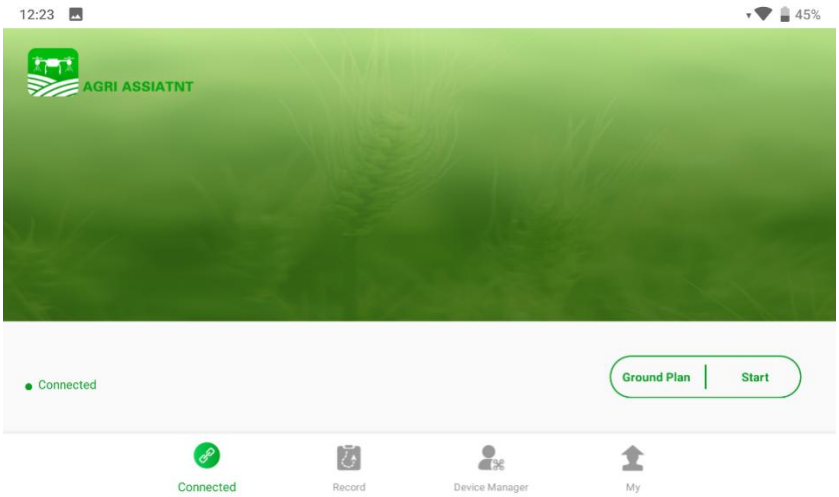
3. After confirming, remote controller will communicate with JIYI app automatically and shows “device connected”. Datalink connection is established.

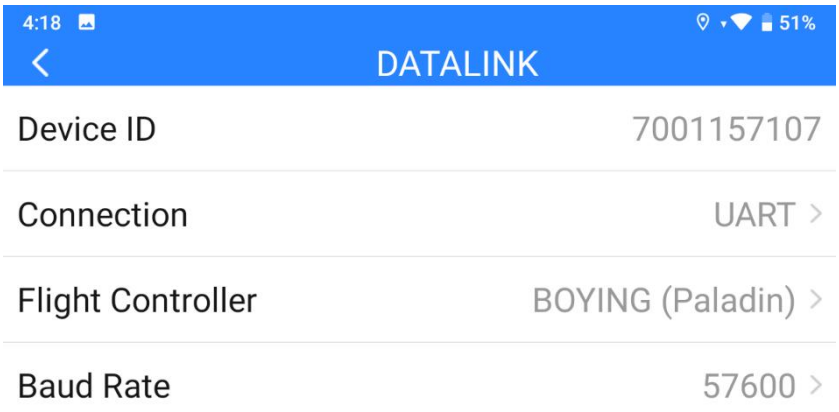


Mark

SIYI links also support datalink connection to JIYI Agri-Assistant through Bluetooth.

4.1.2 BOYING Agriculture

1. In “SIYI TX” app, go to “Datalink”, and choose “UART” in “Connection”, “BOYING (Paladin)” in “Flight Controller”, and “57600” in “Baud Rate”.



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2. Run BOYING agriculture, choose “MK15” as the connection method.

3. After confirming, handheld ground station will communicate with the BOYING app automatically and shows “device connected”. Datalink connection is established.

Mark

SIYI links also support datalink connection to BOYING GCS through Bluetooth.

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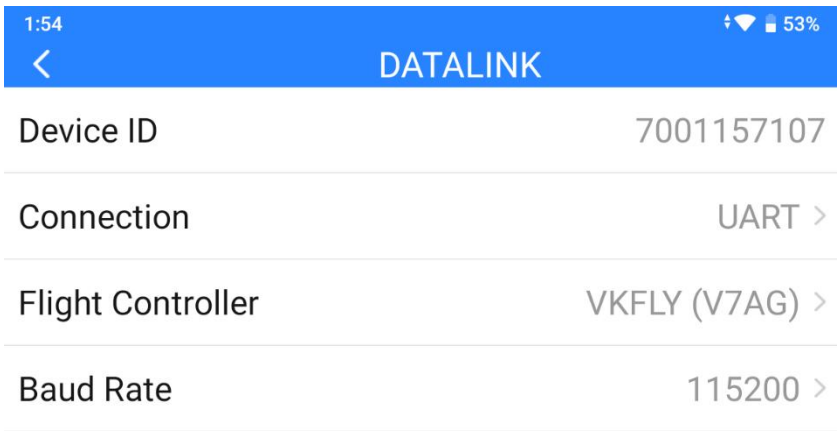
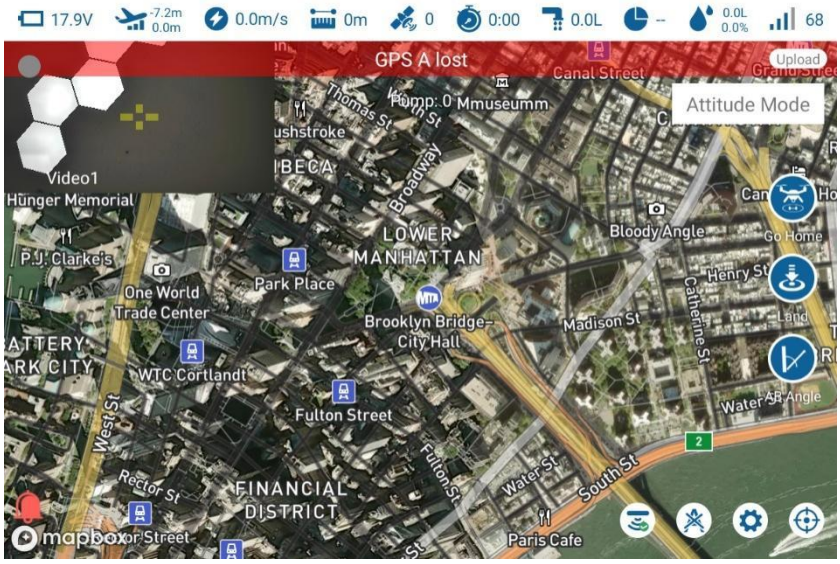
4.1.3 VK Agriculture

1. In “SIYI TX” app, go to “Datalink”, and choose “UART” in “Connection”, “VK (V7AG / V9AG)” in “Flight Controller”. The baud rate will automatically adapt to “115200”.



2. Run VK GCS, handheld ground station will communicate with the VK app automatically and shows “device connected”. Datalink connection is established.



Mark

SIYI links also support datalink connection to VK GCS through Bluetooth.

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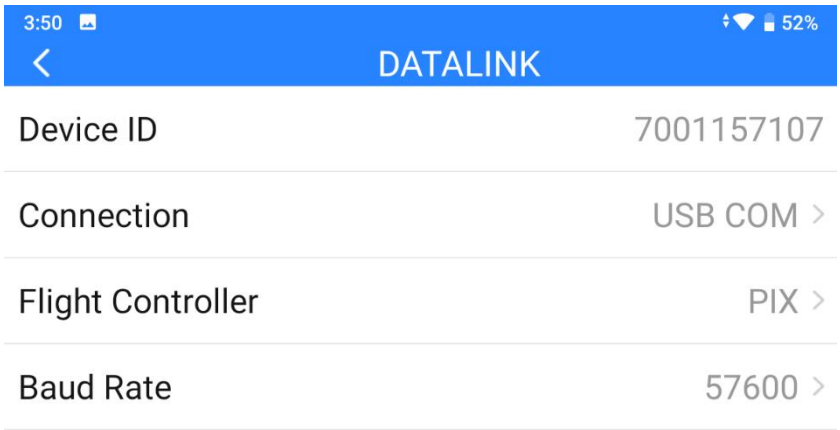
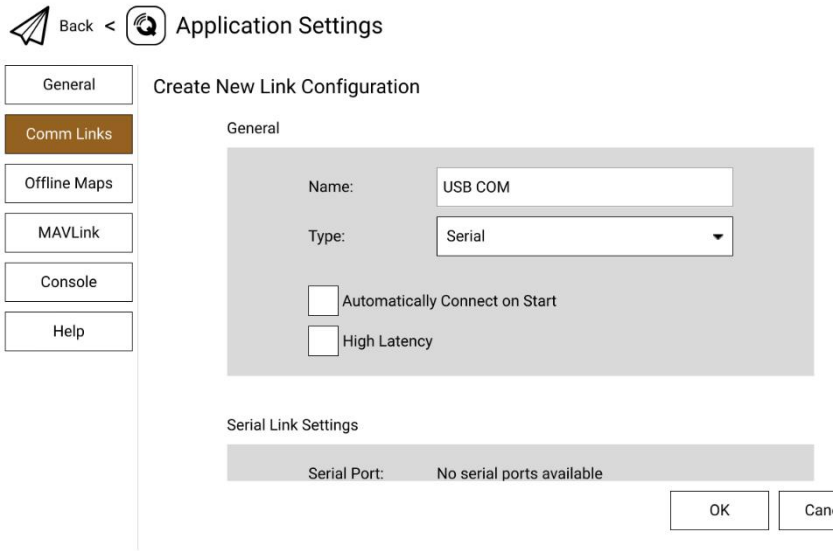
4.2 Communication with Android GCS through USB COM

4.2.1 QGroundControl

1. In “SIYI TX” app, go to “Datalink”, and choose “USB COM” in “Connection”, “PX4 / ArduPilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port.



2. Run QGroundControl, go to “Application Settings – Comm Links” and “Add” a new connection. Name it as “USB-COM”. Connection “Type” as “Serial”. Match the baud rate.



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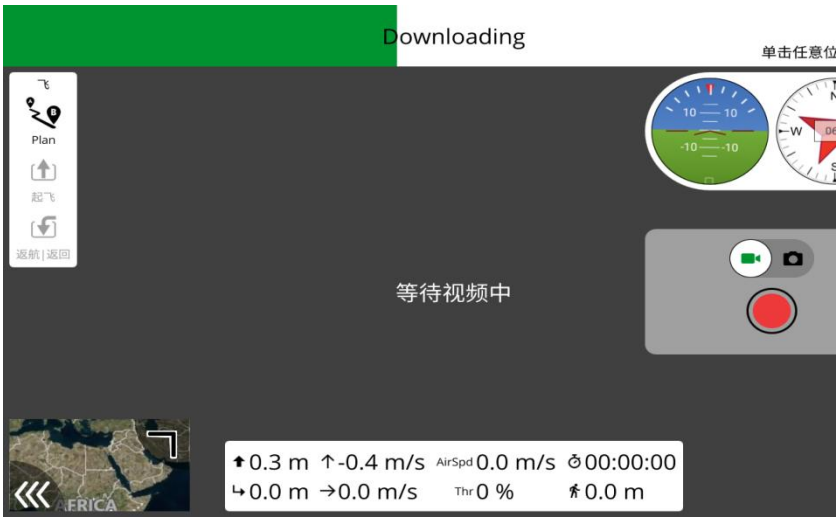
3. Confirm and start to “Connect”. The top progress bar in QGC starts to move, which means the handheld ground station is communicating with QGC automatically. Please wait until the datalink connection is established.



Mark

If it is your first time adding a new connection in QGC, please do not check the option “Automatically Connect on Start”. It can be checked later when you confirm that the datalink is connected successfully.

4.2.2 Mission Planner

1. In “SIYI TX” app, go to “Datalink”, and choose “USB COM” in “Connection”, “PX4 / ArduPilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port.

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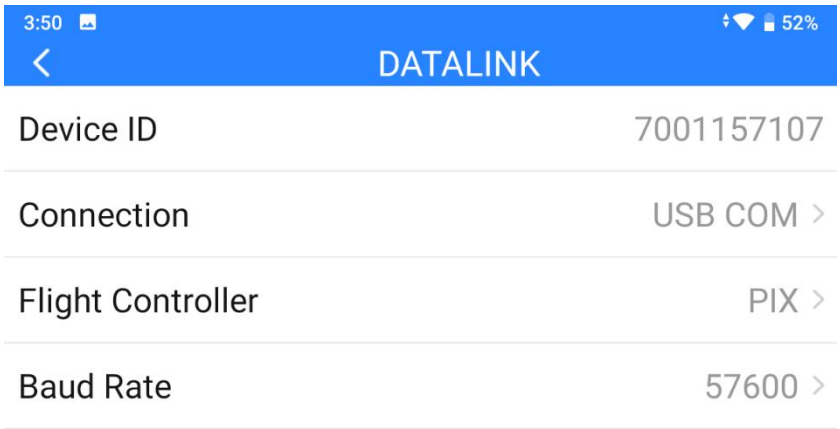

2. Run Mission Planner, select the relevant port and match the baud rate.

3. Please wait until the datalink connection is established.

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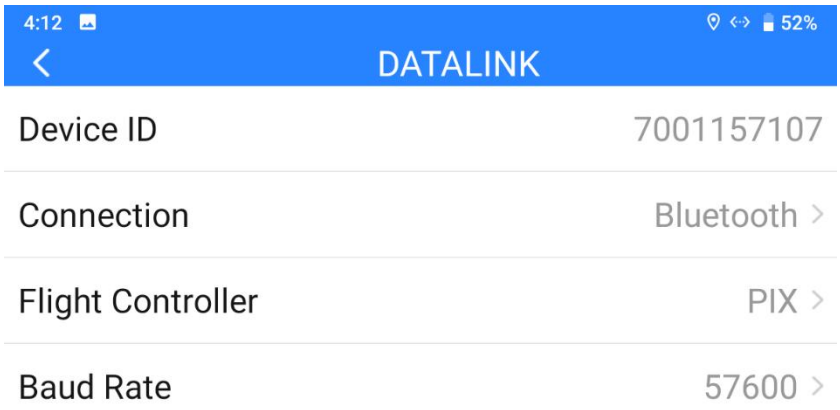
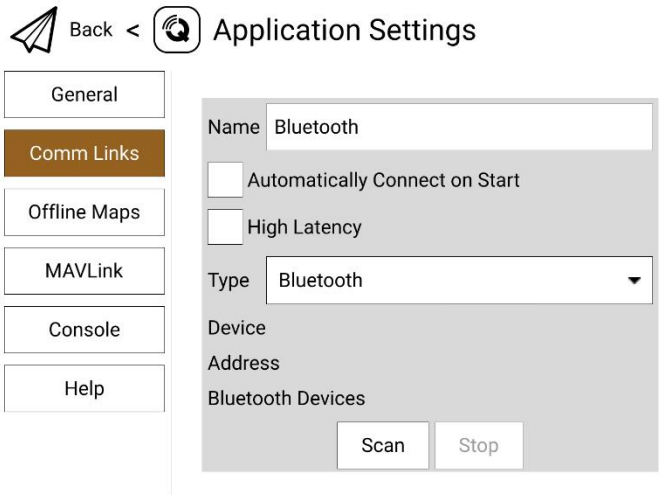
4.3 Communication with Android GCS via Bluetooth

4.3.1 QGroundControl

1. In “SIYI TX” app, go to “Datalink”, and choose “Bluetooth” in “Connection”, “PX4 / ArduPilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port.



2. In Android OS, go to “System Settings - Bluetooth”, search the Bluetooth device with the same ID shown in “Device ID” (“SIYI 68********”), and pair.
3. Run QGroundControl, go to “Application Settings - Comm Links” page, and “Add” a new connection. Name it as “Bluetooth”.



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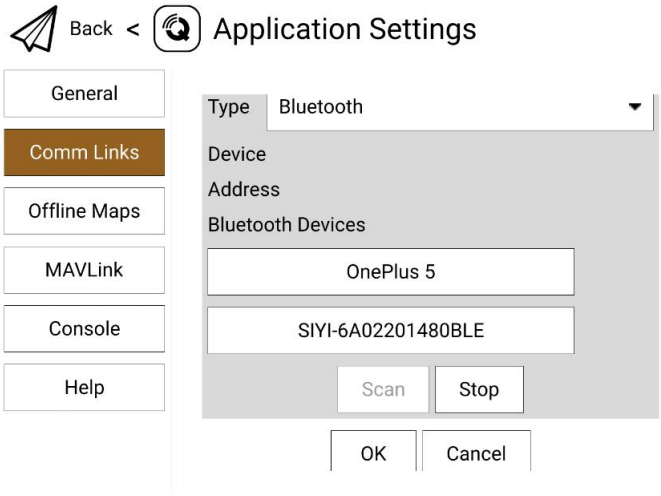
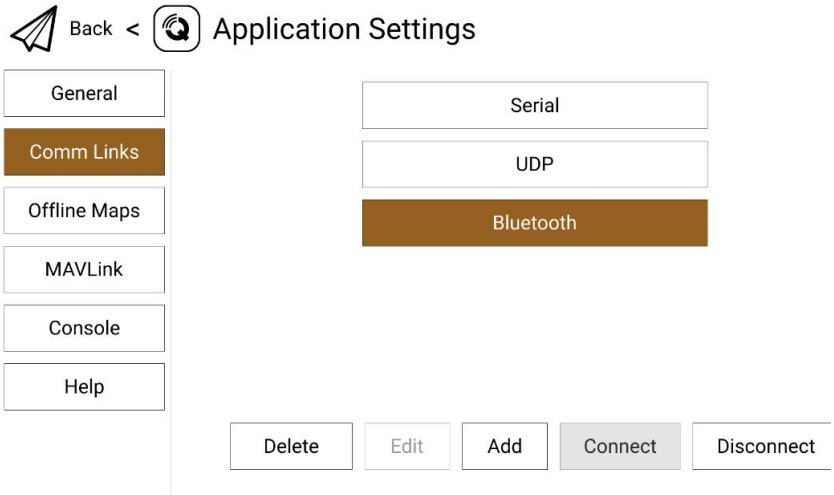
4. Set the type as “Bluetooth”, then touch “Scan”.



5. Touch the Bluetooth device of which the name is starting with “SIYI-XXXXXXX”, then touch “OK” to go back to the Comm Links page.



6. Confirm and start to “Connect”. The top progress bar in QGC starts to move, which means the handheld ground station is communicating with QGC automatically. Please wait until the datalink connection is established.

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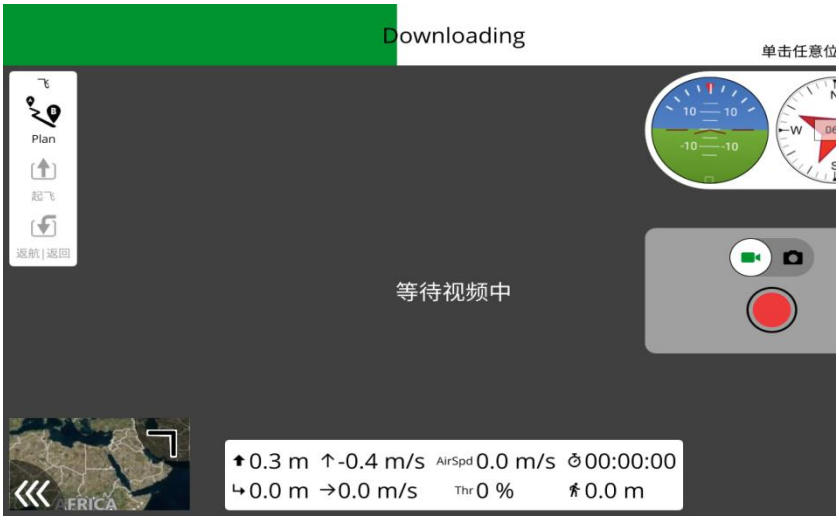

Mark

Step 1 and 2 have been finished before delivery.

If it is your first time adding a new connection in QGC, please do not check the option "Automatically Connect on Start". It can be checked later when you confirm that the datalink is connected successfully.

4.3.2 Mission Planner

1. In "SIYI TX" app, go to "Datalink", and choose "Bluetooth" in "Connection", "PX4 / ArduPilot" in "Flight Controller", and match the baud rate with the flight controller TELEM port.

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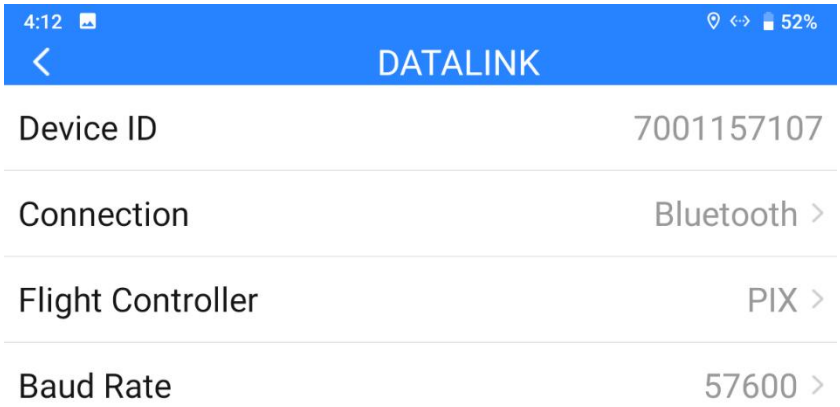

2. Run Mission Planner, select the relevant port (COM-xx Bluetooth) and match the baud rate.

3. Please wait until the datalink connection is established.

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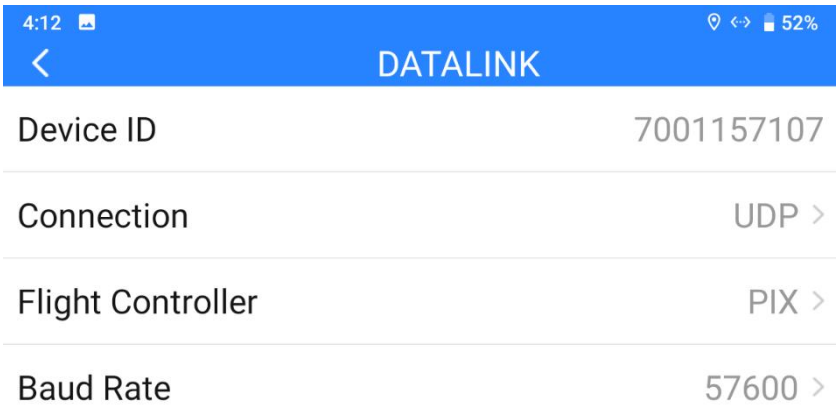
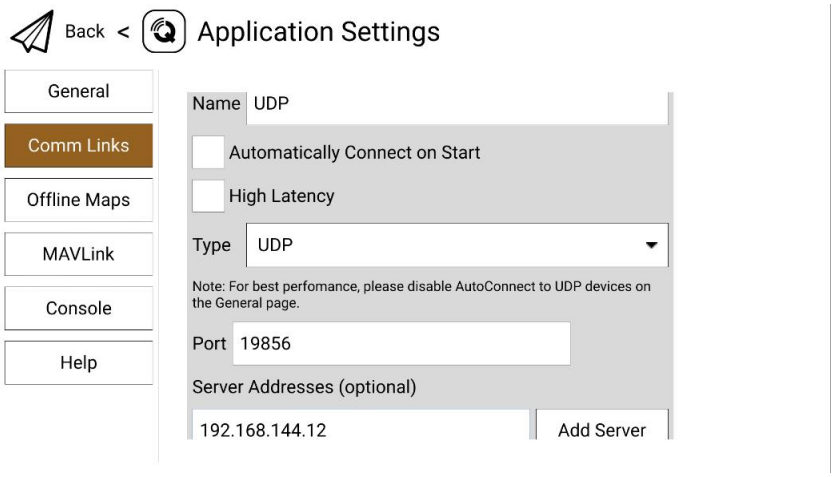
4.4 Communication with Android GCS through UDP

4.4.1 QGroundControl

1. In “SIYI TX” app, go to “Datalink”, and choose “UDP” in “Connection”, “PX4 / ArduPilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port’s.



2. Run QGroundControl, go to “Application Settings - Comm Links” page, and “Add” a new connection. Name it as “UDP”.



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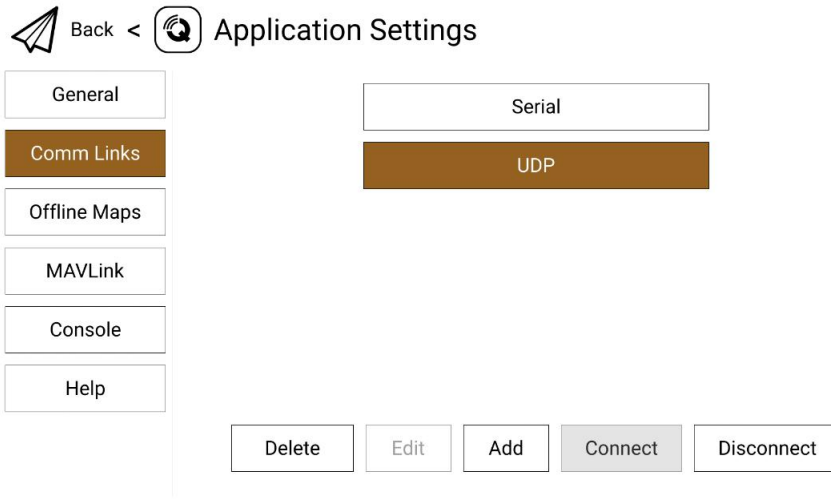
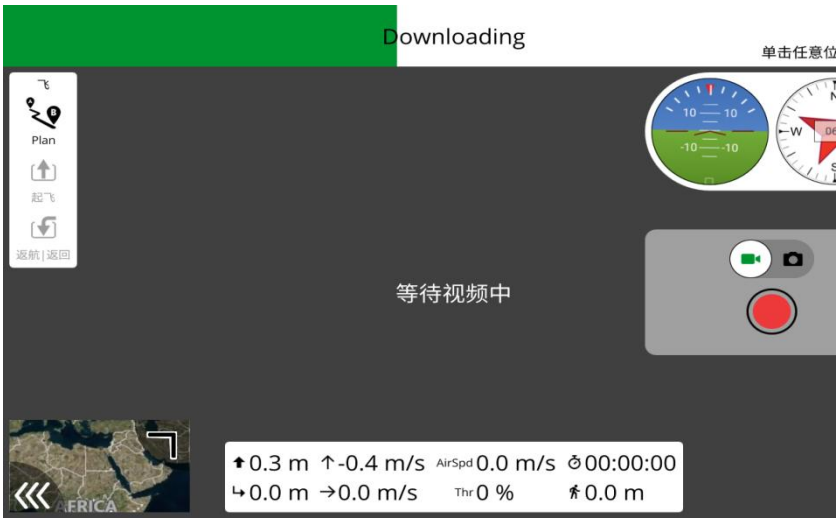
3. Set the connection “Type” as “UDP”, “Port” as “19856”, “Server Addresses” as “192.168.144.12” and “Add Server”.



4. Confirm and start to “Connect”. The top progress bar in QGC starts to move, which means the handheld ground station is communicating with QGC automatically. Please wait until the datalink connection is established.



Mark

If it is your first time adding a new connection in QGC, please do not check the option “Automatically Connect on Start”. It can be checked later when you confirm that the datalink is connected successfully.

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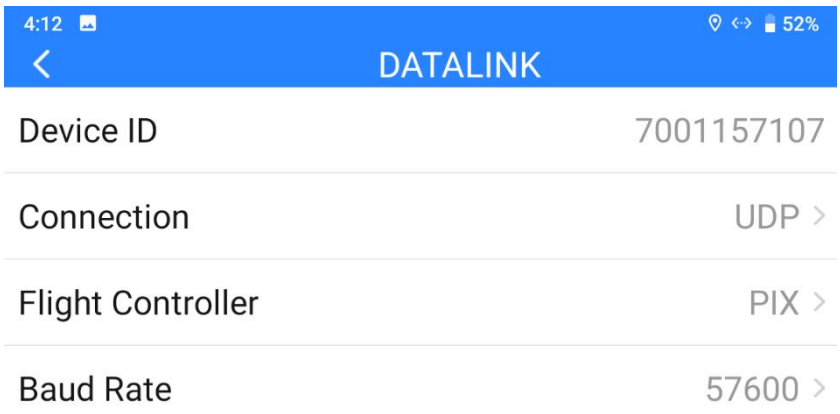
4.4.2 Mission Planner

1. In “SIYI TX” app, go to “Datalink”, and choose “UDP” in “Connection”, “PX4 / ArduPilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port’s.



2. Run Mission Planner, select the relevant port (UDPCl) and match the baud rate. “Port” as “19856”. “Server addresses” as “192.168.144.12”. Then connect.

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3. Please wait until the datalink connection is established.

Mark

To use UDP datalink connection in Mission Planner, the ground unit FPV firmware should be v0.2.6 and above.

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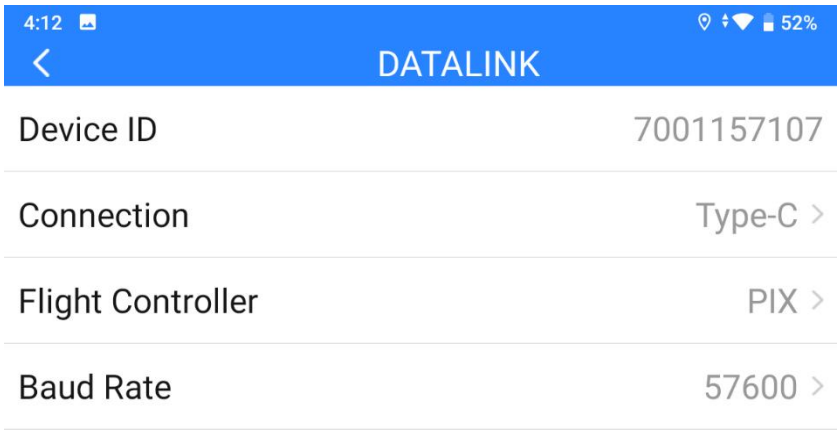
4.5 Communication with Windows GCS through Upgrade Port

4.5.1 QGroundControl

1. Connect the ground unit's upgrade port to the Windows computer, the Windows system will generate a communication port for the ground unit.
2. In "SIYI TX" app, go to "Datalink", and choose "Upgrade Port (MK15) / Type-C (MK32)" in "Connection", "PX4 / ArduPilot" in "Flight Controller", and match the baud rate with the flight controller TELEM port.



3. Run QGroundControl, go to "Application Settings – Comm Links" and "Add" a new connection. Name it as "USB-COM". Connection "Type" as "Serial". Match the baud rate.

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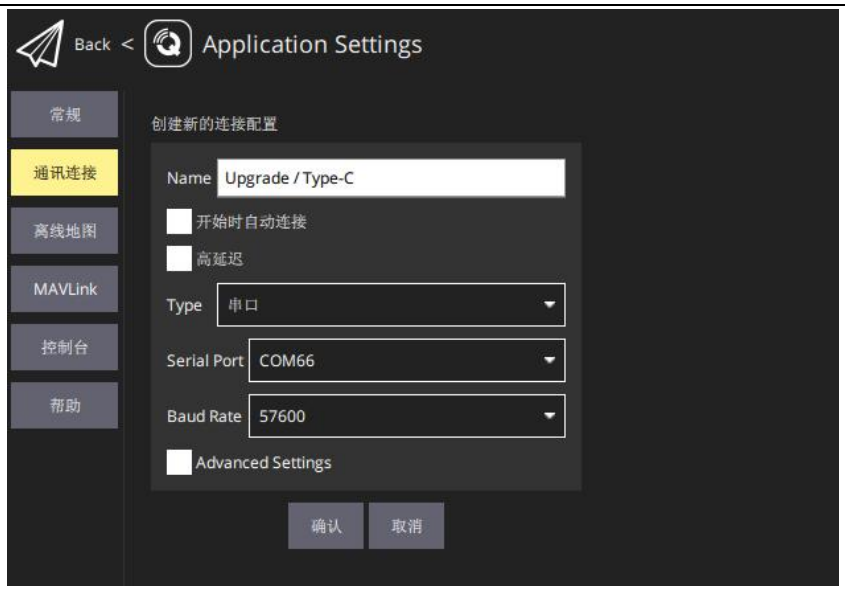
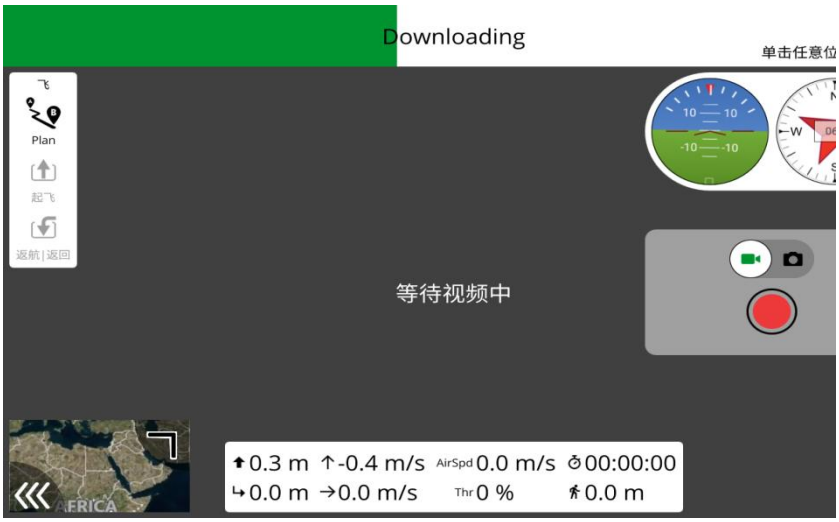


4. Confirm and start to "Connect". The top progress bar in QGC starts to move, which means the handheld ground station is communicating with QGC automatically. Please wait until the datalink connection is established.



Mark

If it is your first time adding a new connection in QGC, please do not check the option "Automatically Connect on Start". It can be checked later when you confirm that the datalink is connected successfully.

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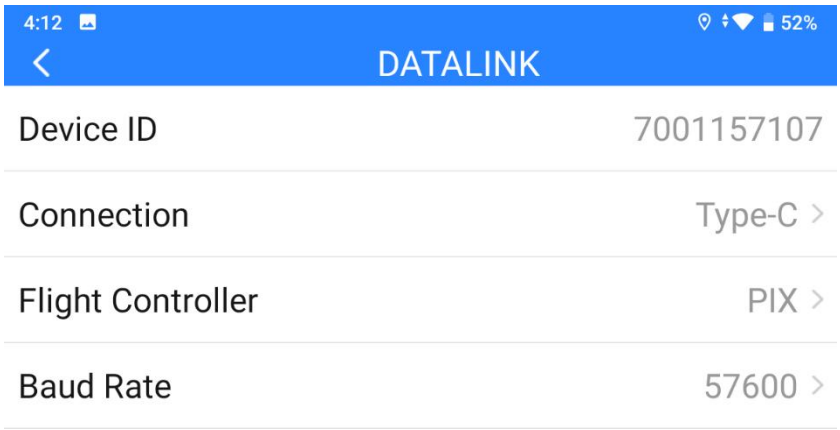
4.5.2 Mission Planner

1. Connect the remote controller's upgrade port to the Windows computer, the Windows system will generate a communication port for the remote controller.
2. In "SIYI TX" app, go to "Datalink", and choose "Upgrade Port (MK15) / Type-C (MK32)" in "Connection", "PX4 / ArduPilot" in "Flight Controller", and match the baud rate with the flight controller TELEM port.



3. Run Mission Planner, select the relevant port and match the baud rate.

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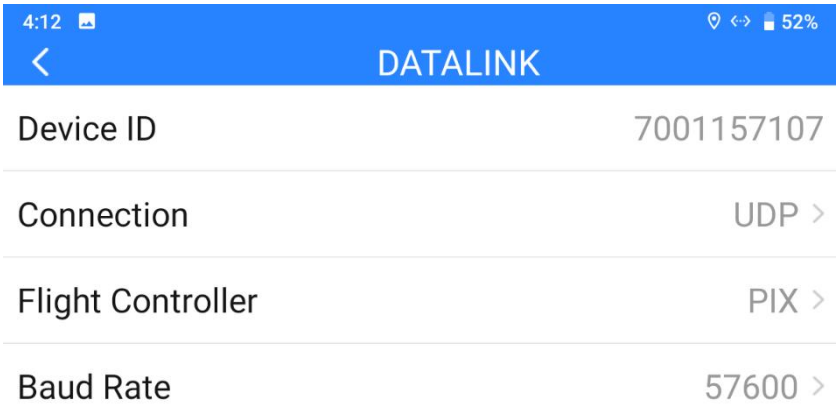
4. Please wait until the datalink connection is established.

4.6 Communication with Windows GCS by UDP through Ground Unit WiFi Hotspot

4.6.1 QGroundControl

1. In “SIYI TX” app, go to “Datalink”, and choose “UDP” in “Connection”, “PIX / PX4 / Ardupilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port.



2. Enable the WiFi hotspot in ground unit Android system, connect the ground unit with the Windows computer through WiFi.

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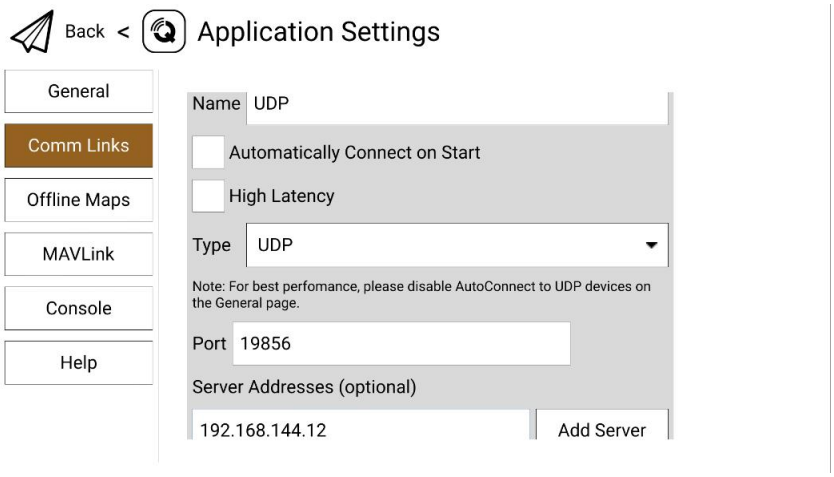
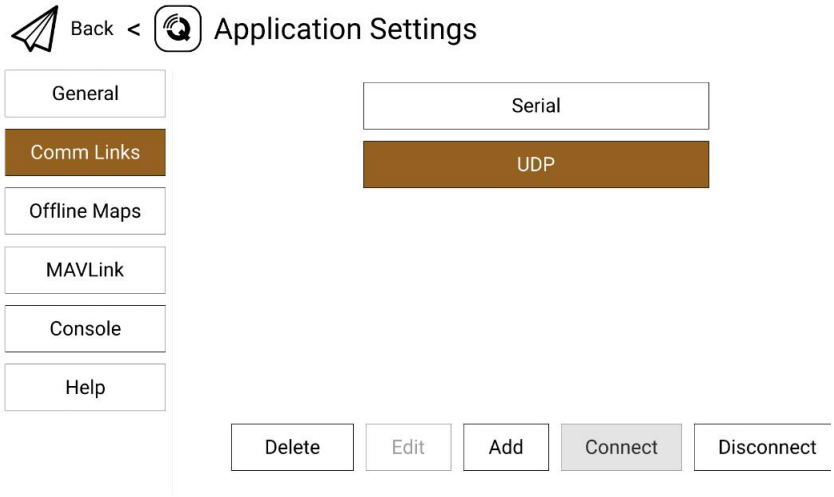
3. Run QGroundControl, go to “Application Settings - Comm Links” page, and “Add” a new connection. Name it as “UDP”.



4. Set the connection “Type” as “UDP”, “Port” as “19856”, “Server Addresses” as “192.168.144.12” and “Add Server”.



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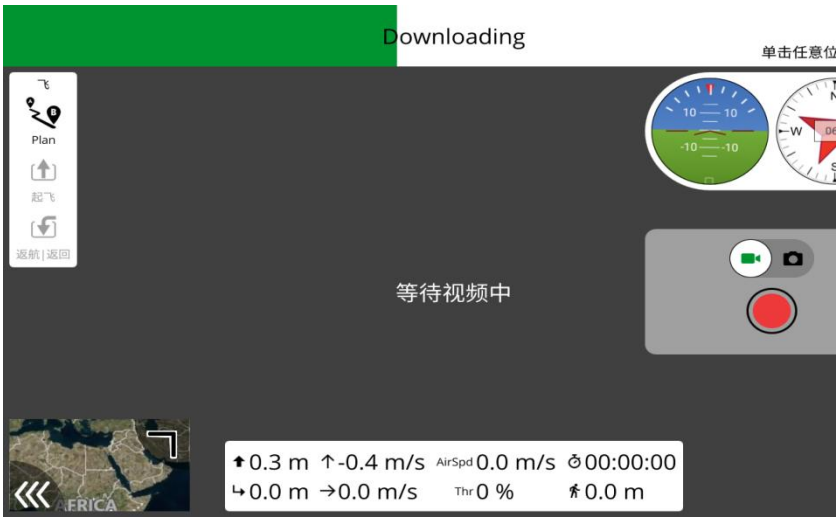
5. Confirm and start to “Connect”. The top progress bar in QGC starts to move, which means the remote controller is communicate with QGC automatically. Please wait until the datalink connection is established.



Mark

If it is your first time adding a new connection in QGC, please do not check the option “Automatically Connect on Start”. It can be checked later when you confirm that the datalink is connected successfully.

4.6.2 Mission Planner

1. In “SIYI TX” app, go to “Datalink”, and choose “UDP” in “Connection”, “PX4 / ArduPilot” in “Flight Controller”, and match the baud rate with the flight controller TELEM port.

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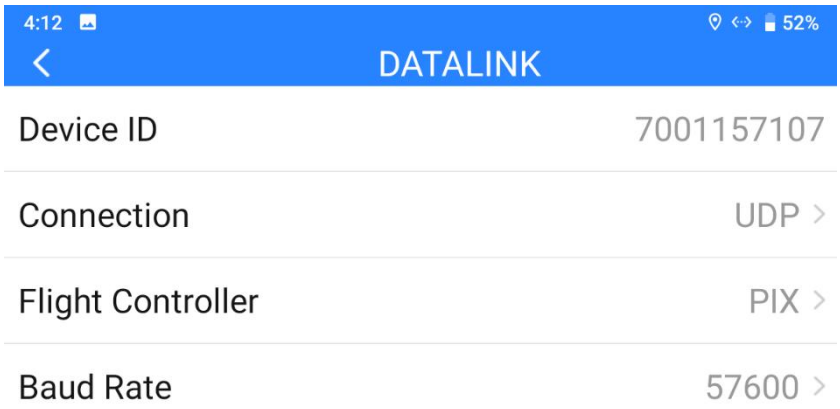

2. Enable the WiFi hotspot in handheld ground station's Android system, connect the ground unit with the Windows computer through WiFi.

3. Run Mission Planner, select the relevant port (UDPCl) and match the baud rate. "Port" as "19856". "Server addresses" as "192.168.144.12". Then connect.

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4. Please wait until the datalink connection is established.

Mark

To use UDP datalink connection in Mission Planner, the ground unit FPV firmware should be v0.2.6 and above.

4.7 Solutions to Disconnection

When the ground unit is in good communication with the air unit, but it fails to establish datalink connection with GCS, please try to follow the steps below for troubleshooting.

1. Confirm if the air unit is wired to the flight controller by correct telemetry cable.
2. If you are using a customized telemetry cable, please check:
   - If cable pin map is correct?
   - If the TX and RX pins in the flight controller and air unit telemetry port are swapped?

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3. In “SIYI TX” app, go to the “Link Status” page to check communication status. When the communication is good, “data download” is not 0. If it is “0”, please go back to check step 1 and 2.
4. In “SIYI TX” app, go to the “Datalink” page and check:
   - If “Connection” is correctly configured?
   - If “Flight Controller” is correctly configured?
   - If “Baud Rate” matches with your flight controller?
   - In the GCS, check if the datalink settings are correctly configured.
5. If it is PX4 / ArduPilot open-source flight controller, please try to switch telemetry cable connection between the TELEM 1 port and the TELEM 2 port on flight controller.
6. If both the ground unit and air unit are the latest firmware?

Mark

If you have done trouble shooting by following all steps above, but there are still no clues, please contact your reseller or SIYI after-sale service.

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4.8 SIYI Datalink SDK

SIYI links can be integrated to customers' own network or ground station by acquiring SDK communication protocol.

4.8.1 Format

Field	Index	Bytes	Description
STX	0	2	0x5566: starting mark
CTRL	2	1	0: need_ack (if the current package need "ack") 1: ack_pack (if the package is an "ack" package) 2-7: Reserved
Data_len	3	2	Data field byte length. Low byte in the front.
SEQ	5	2	Frame sequence (0~65535) . Low byte in the front.
CMD_ID	7	1	Command ID
DATA	8	Data_len	Data
CRC16		2	CRC16 check to the complete data package. Low byte in the front.

4.8.2 Commands

Request Hardware ID

CMD_ID:0x40 ------ Request Hardware ID			
Send data format			
No.	Data Type	Data Name	Data Description
ACK data format			
	uint8_t	hardware_id[12]	Hard ID String (10 digits)

Example:
Send (HEX): 55 66 01 00 00 00 00 40 81 9c
Response (HEX): 55 66 02 0C 00 09 00 40 36 38 30 31 31 33 30 31 31 31 00 00 7b 8b

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Request System Settings

CMD_ID:0x16 ------ Request Remote Controller System Settings			
Send data format (10 Hz)			
No.	Data Type	Data Name	Data Description
ACK data format			
	Uint8_t	match	Bind: 0: Start 1, 2: Binding 3: Finished
	Uint8_t	Baud_type	Telemetry Baud Rate: 0: BAUD_4800 1: BAUD_9600 2: BAUD_38400 3: BAUD_57600 4: BAUD_76800 5: BAUD_115200 6: BAUD_230400
	Uint8_t	Joy_type	Joystick Type: 0: Mode 1 1: Mode 2 2: Mode 3 3: Custom
	Uint8_t	Rc_bat	Ground Unit Battery Level x 10V

Send System Settings Commands to Ground Unit

CMD_ID:0x17 ------ Send System Settings Commands to Ground Unit			
Send data format			
No.	Data Type	Data Name	Data Description
	Uint8_t	match	Bind: 0: Start 1, 2: Binding 3: Finished
	Uint8_t	Baud_type	Telemetry Baud Rate: 0: BAUD_4800 1: BAUD_9600 2: BAUD_38400 3: BAUD_57600 4: BAUD_76800 5: BAUD_115200 6: BAUD_230400
	Uint8_t	Joy_type	Joystick Type: 0: Mode 1 1: Mode 2 2: Mode 3 3: Custom
	Uint8_t	reserved	
ACK Data Format			
	int8_t	sta	1: ok Negative number means error

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Request Channel Data

CMD_ID:0x42 ------ Request Channel Data			
Send data format			
No.	Data Type	Data Name	Data Description
	Uint8_t	freq	Output Frequency 0: OFF 1: 2Hz 2: 4Hz 3: 5Hz 4: 10Hz 5: 20Hz 6: 50Hz 7: 100Hz
ACK data format			
1	int16_t	CH1	Two bytes in each channel (default 1050~1950)
2	int16_t	CH2	
3	int16_t	CH3	
…….	int16_t	……..	
16	int16_t	CH16	

Mark:
Enabling RC channel output will affect telemetry communication as they are using the same port.

Example:

Send (HEX):

55 66 01 01 00 00 00 42 02 B5 C0 (4 Hz)

55 66 01 01 00 00 00 42 00 F7 E0（OFF）

Response (HEX) (2 Hz):

55 66 00 20 00 99 00 42 DC 05 DC 00 DC 05 DC 05 DC 05 DC 05 DC 05 DC 05 DC 05 DC 05 DC 05 1A 04 DC 05 DC 05 1A 04 1A 04 FF 88

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Request Datalink Status

CMD_ID:0x43 ------ Request Datalink Status			
Send data format			
No.	Data Type	Data Name	Date Description
ACK data format			
	uint16_t	freq	Frequency
	uint8_t	pack_loss_rate	Loss Rate
	uint16_t	real_pack	Valid Package
	uint16_t	real_pack_rate	Valid Package Rate
	uint32_t	data_up	Data upload byte/s
	uint32_t	data_down	Data download byte/s

Example:

Send (HEX): 55 66 01 00 00 00 00 43 e2 ac

Response (HEX): 55 66 02 0F 00 01 00 43 02 00 00 02 00 02 00 00 00 00 00 00 00 00 00 2E 5C

Request Image Transmission Link Status

CMD_ID:0x44 ------ Request Image Transmission Link Status			
Send data format			
No.	Data Type	Data Name	Data Description
ACK Data Format			
	int32_t	signal	Signal percentage: %
	int32_t	inactive_time	--
	int32_t	upstream	Data upload: byte/s
	int32_t	downstream	Data download: byte/s
	int32_t	txbandwidth	Upload bandwidth (txbandwidth / 1000 Mbps)
	int32_t	rxbandwidth	Download bandwidth (rxbandwidth / 1000 Mbps)
	int32_t	rssi	RF power: dBm
	int32_t	freq	Current frequency: Mhz
	int32_t	channel	Current Channel

Example:

Send (HEX): 55 66 01 00 00 00 00 44 05 dc

Response (HEX): 55 66 02 24 00 02 00 44 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 A4 15 00 00 6C 00 00 00 2C D9

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Request All Channel Mappings

CMD_ID:0x48 ------ Request All Channel Mappings			
Send data format			
No.	Data Type	Data Name	Data Description
ACK Data Format			
1	uint8_t	CH1_type	Physical Channel Type 0: Joystick, Dials 1: Buttons, Switches
1	uint8_t	CH1_entity_id	Physical Channel ID
2	uint8_t	CH2_type	Physical Channel Type 0: Joystick, Dials 1: Buttons, Switches
2	uint8_t	CH2_entity_id	Physical Channel ID
3	uint8_t	CH3_type	Physical Channel Type 0: Joystick, Dials 1: Buttons, Switches
3	uint8_t	CH3_entity_id	Physical Channel ID
4	uint8_t	CH4_type	Physical Channel Type 0: Joystick, Dials 1: Buttons, Switches
4	uint8_t	CH4_entity_id	Physical Channel ID
.....	uint8_t	.....	Current Channel

Example:

Send (HEX): 55 66 01 00 00 00 00 48 89 1d

Response (HEX): 55 66 02 20 00 16 00 48 00 00 00 01 00 02 00 03 05 00 05 01 05 02 01 00 01 01 01 02 01 03 00 04 00 05 02 01 02 00 03 00 C1 28

Request A Specific Channel Mapping

CMD_ID:0x49 ------ Request A Specific Channel Mapping			
Send data format			
No.	Data Type	Data Name	Data Description
	uint8_t	rc_ch	RC Channel (1 to 16)
ACK Data Format			
1	uint8_t	rc_ch	RC Channel (1 to 16)
1	uint8	type	Physical Channel Type 0: Joystick, Dials 1: Buttons, Switches
2	uint8_t	entity_id	Physical Channel ID

Example:

Send (HEX): 55 66 01 01 00 00 00 49 02 4F 1C

Response (HEX): 55 66 02 03 00 17 00 49 02 00 01 33 9F

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MK15 Handheld Ground Station

Physical Channel	Type	entity_id	Channel Definition
Joystick	0	0	J1
	0	1	J2
	0	2	J3
	0	3	J4
Dial	0	4	LD
	0	5	RD
3-Stage Switch	5	0	SA
	5	1	SB
	5	2	SC
Button	1	0	A
	1	1	B
	1	2	C
	1	3	D
Virtual Channel	2	0	
No physical channel is mapped	3	0	NULL

MK32 Handheld Ground Station

Physical Channel	Type	entity_id	Channel Definition
Joystick	0	0	J1
	0	1	J2
	0	2	J3
	0	3	J4
Dial	0	4	LD1
	0	5	RD1
	0	6	LD2
	0	7	RD2
3-Stage Switch	5	0	SA
	5	1	SB
	5	2	SC
	5	3	SD
	5	4	SE
	5	5	SF
Button	1	0	S1
	1	1	S2
Virtual Channel	2	0	
No physical channel is mapped	3	0	NULL

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Send Channel Mapping to Ground Unit

CMD_ID:0x4A ------ Send Channel Mapping to Ground Unit			
Send data format			
No.	Data Type	Data Name	Data Description
	uint8_t	rc_ch	RC Channel (1 to 16)
	uint8	type	Physical Channel Type 0: Joystick, Dials 1: Buttons, Switches
	uint8_t	entity_id	Physical Channel ID
ACK Data Format			
	uint8_t	rc_ch	RC Channel (1 to 16)
	int8_t	sta	1: OK Negative Number: Error Code

Example:

Send (HEX): 55 66 01 03 00 00 00 4A 02 00 00 4F EB

Response (HEX): 55 66 02 02 00 18 00 4A 02 01 4C C3

Request All Channel Reverse

CMD_ID:0x4B ------ Request All Channel Reverse			
Send data format			
No.	Data Type	Data Name	Data Description
ACK Data Format			
1	int8_t	CH1_reverse	Reverse Channel 1 1: Normal -1: Reversed
2	int8_t	CH2_reverse	Reverse Channel 2 1: Normal -1: Reversed
3	int8_t	CH3_reverse	Reverse Channel 3 1: Normal -1: Reversed
4	int8_t	CH4_reverse	Reverse Channel 4 1: Normal -1: Reversed
5	int8_t	CH5_reverse	Reverse Channel 5 1: Normal -1: Reversed
.....	int8_t	.....	

Example:

Send (HEX): 55 66 01 00 00 00 00 4B EA 2D

Response (HEX): 55 66 02 10 00 19 00 4B 01 FF 01 01 01 01 01 01 01 01 01 01 01 01 01 01 D1 F9

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Request Channel Reverse

CMD_ID:0x4C ------ Request Channel Reverse			
Send data format			
No.	Data Type	Data Name	Data Description
	uint8_t	rc_ch	Channel 1 to 16
ACK Data Format			
1	uint8_t	rc_ch	Channel 1 to 16
2	int8_t	reverse	Channel Reverse 1: Normal -1: Reversed

Example:

Send (HEX): 55 66 01 01 00 00 00 4C 02 BA E3

Response (HEX): 55 66 02 02 00 1C 00 4C 02 FF 3B F6

Send Channel Reverse to Ground Unit

CMD_ID:0x4D ------ Send Channel Reverse to Ground Unit			
Send data format			
No.	Data Type	Data Name	Data Description
	uint8_t	rc_ch	Channel 1 to 16
	int8_t	reverse	Channel Reverse 1: Normal -1: Reversed

Example:

Send (HEX): 55 66 01 02 00 00 00 4D 02 FF 0F 86

Response (HEX): 55 66 02 02 00 1D 00 4D 02 01 8B 65

Request Firmware Version

CMD_ID:0x47 ------ Request Firmware Version			
Send data format			
No.	Data Type	Data Name	Data Description
ACK Data Format			
	uint32_t	rc_version	Remote controller function firmware version
	uint32_t	rf_version	Air unit function firmware version
	uint32_t	ground_version	Remote controller FPV firmware version
	uint32_t	sky_version	Air unit FPV firmware version

Mark:

The request firmware version is four bytes in hexadecimal, with the first byte in the low bit and the last byte in the high

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bit. The first byte is the product ID, and the remaining three bytes are the version number.

For example, 0x00 0x03 0x05 0x68, the product ID is 0x68, and the version number is 5.3.0. The same applies to other version numbers.

Example:

Send (HEX): 55 66 01 00 00 00 00 47 66 ec

Response (HEX): 55 66 02 10 00 02 00 47 00 03 05 68 07 02 05 69 02 02 00 56 02 02 00 56 6d 21

4.8.3 Communication Interface

SIYI datalink SDK supports four interfaces, which can be switched in SIYI TX app.

1) UART Serial Port

Port Name: /dev/ttyHS0
Baud Rate: 115200

2) USB COM (USB to Serial) (Baud rate is the same with datalink baud rate)

3) Bluetooth

4) **MK15 RC Upgrade Port / MK32 RC Type-C Port** (Virtual serial port based on USB port)

4.8.4 SDK CRC16 Check Code

```
const uint16_t crc16_tab[256];


/*********************************************************
CRC16 Coding & Decoding G(X) = X^16+X^12+X^5+1
*********************************************************/
uint16_t CRC16_cal(uint8_t *ptr, uint32_t len, uint16_t crc_init)
```


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```
{
   uint16_t crc,   oldcrc16;
   uint8_t  temp;
   crc = crc_init;
   while (len--!=0)
   {
      temp=(crc>>8)&0xff;
      oldcrc16=crc16_tab[*ptr^temp];
      crc=(crc<<8)^oldcrc16;
      ptr++;

   }
   //crc=~crc;      //??
   return(crc);
}

uint8_t crc_check_16bites(uint8_t* pbuf, uint32_t len,uint32_t* p_result)
{
      uint16_t crc_result = 0;
      crc_result= CRC16_cal(pbuf,len, 0);
      *p_result = crc_result;

      return 2;
}


const uint16_t crc16_tab[256]= {0x0,0x1021,0x2042,0x3063,0x4084,0x50a5,0x60c6,0x70e7,
                                0x8108,0x9129,0xa14a,0xb16b,0xc18c,0xd1ad,0xe1ce,0xf1ef,
                                0x1231,0x210,0x3273,0x2252,0x52b5,0x4294,0x72f7,0x62d6,
                                0x9339,0x8318,0xb37b,0xa35a,0xd3bd,0xc39c,0xf3ff,0xe3de,
                                0x2462,0x3443,0x420,0x1401,0x64e6,0x74c7,0x44a4,0x5485,
                                0xa56a,0xb54b,0x8528,0x9509,0xe5ee,0xf5cf,0xc5ac,0xd58d,
                                0x3653,0x2672,0x1611,0x630,0x76d7,0x66f6,0x5695,0x46b4,
                                0xb75b,0xa77a,0x9719,0x8738,0xf7df,0xe7fe,0xd79d,0xc7bc,
                                0x48c4,0x58e5,0x6886,0x78a7,0x840,0x1861,0x2802,0x3823,
                                0xc9cc,0xd9ed,0xe98e,0xf9af,0x8948,0x9969,0xa90a,0xb92b,
                                0x5af5,0x4ad4,0x7ab7,0x6a96,0x1a71,0xa50,0x3a33,0x2a12,
                                0xdbfd,0xcbdc,0xfbbf,0xeb9e,0x9b79,0x8b58,0xbb3b,0xab1a,
                                0x6ca6,0x7c87,0x4ce4,0x5cc5,0x2c22,0x3c03,0xc60,0x1c41,
                                0xedae,0xfd8f,0xcdec,0xddcd,0xad2a,0xbd0b,0x8d68,0x9d49,
                                0x7e97,0x6eb6,0x5ed5,0x4ef4,0x3e13,0x2e32,0x1e51,0xe70,
                                0xff9f,0xefbe,0xdfdd,0xcffc,0xbf1b,0xaf3a,0x9f59,0x8f78,
                                0x9188,0x81a9,0xb1ca,0xa1eb,0xd10c,0xc12d,0xf14e,0xe16f,
                                0x1080,0xa1,0x30c2,0x20e3,0x5004,0x4025,0x7046,0x6067,
```


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```
0x83b9,0x9398,0xa3fb,0xb3da,0xc33d,0xd31c,0xe37f,0xf35e,
0x2b1,0x1290,0x22f3,0x32d2,0x4235,0x5214,0x6277,0x7256,
0xb5ea,0xa5cb,0x95a8,0x8589,0xf56e,0xe54f,0xd52c,0xc50d,
0x34e2,0x24c3,0x14a0,0x481,0x7466,0x6447,0x5424,0x4405,
0xa7db,0xb7fa,0x8799,0x97b8,0xe75f,0xf77e,0xc71d,0xd73c,
0x26d3,0x36f2,0x691,0x16b0,0x6657,0x7676,0x4615,0x5634,
0xd94c,0xc96d,0xf90e,0xe92f,0x99c8,0x89e9,0xb98a,0xa9ab,
0x5844,0x4865,0x7806,0x6827,0x18c0,0x8e1,0x3882,0x28a3,
0xcb7d,0xdb5c,0xeb3f,0xfb1e,0x8bf9,0x9bd8,0xabbb,0xbb9a,
0x4a75,0x5a54,0x6a37,0x7a16,0xaf1,0x1ad0,0x2ab3,0x3a92,
0xfd2e,0xed0f,0xdd6c,0xcd4d,0xbdaa,0xad8b,0x9de8,0x8dc9,
0x7c26,0x6c07,0x5c64,0x4c45,0x3ca2,0x2c83,0x1ce0,0xcc1,
0xef1f,0xff3e,0xcf5d,0xdf7c,0xaf9b,0xbfba,0x8fd9,0x9ff8,
0x6e17,0x7e36,0x4e55,0x5e74,0x2e93,0x3eb2,0xed1,0x1ef0
};
```


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5 SIYI FPV 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=427

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

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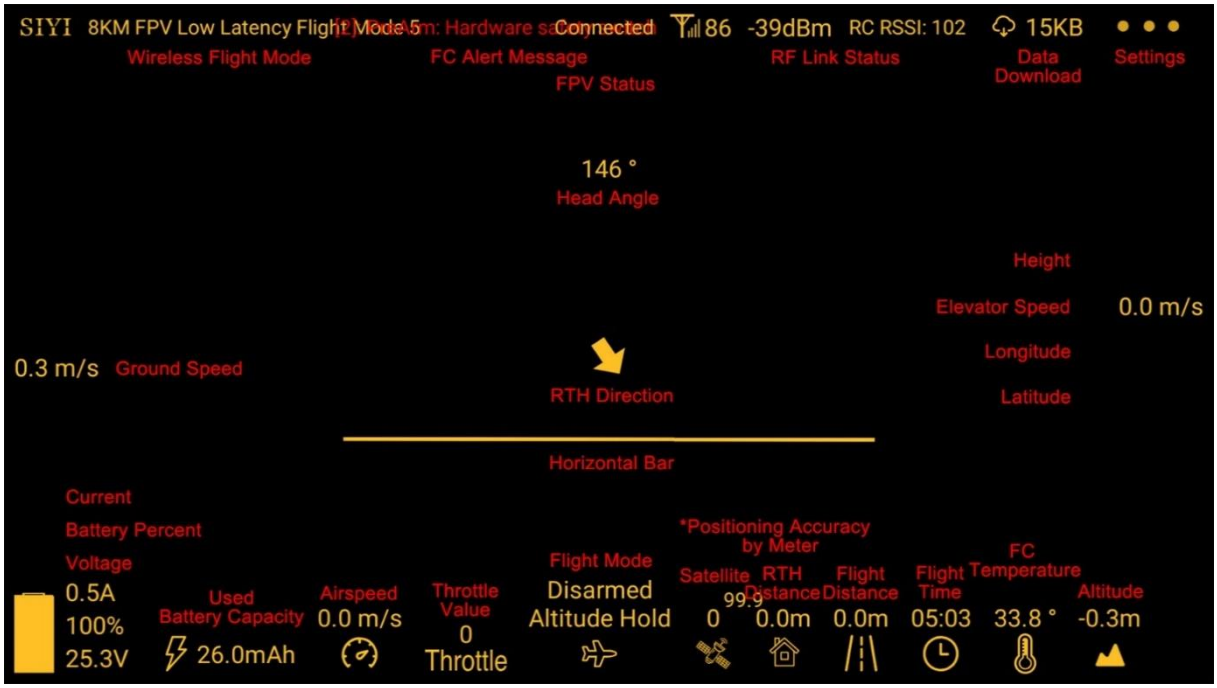
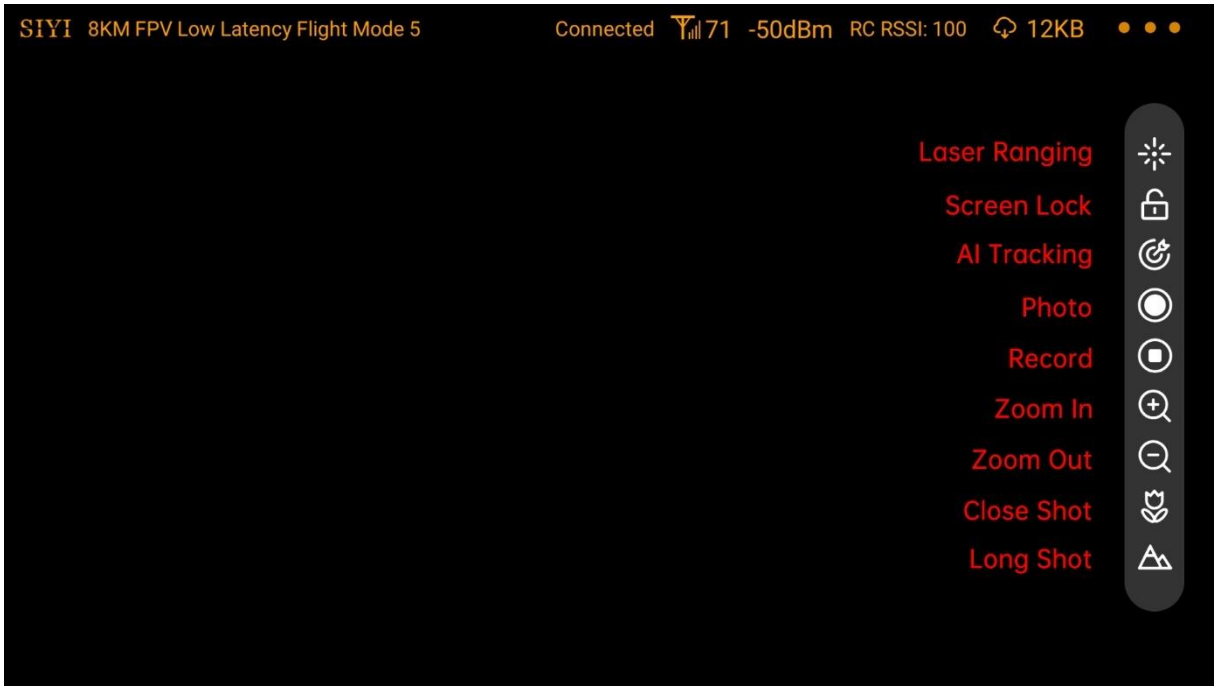
SIYI FPV App OSD Information Definition



SIYI FPV Camera Function Icon Definition



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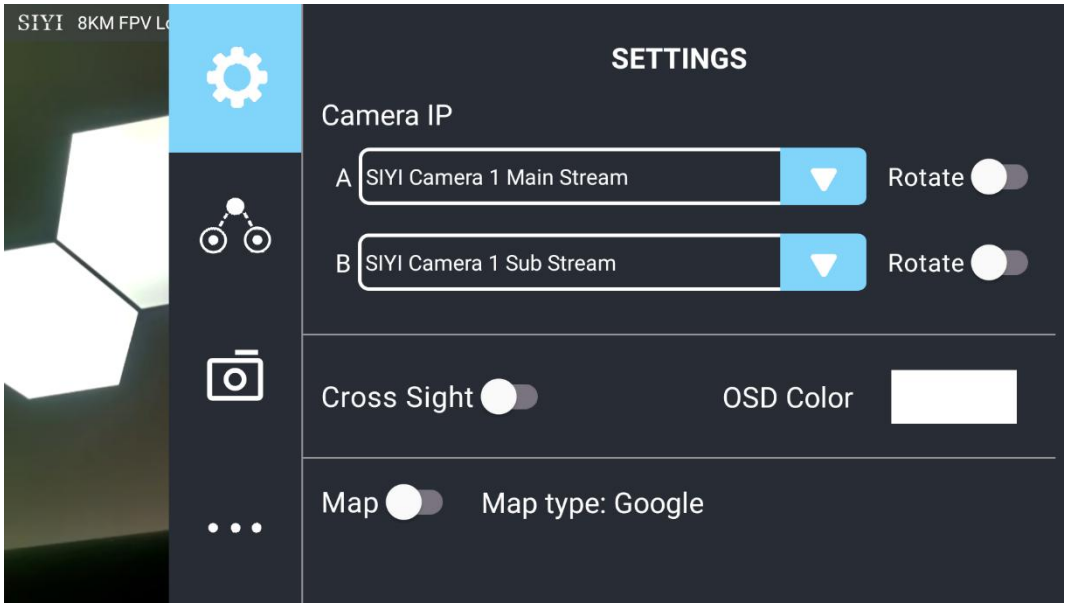
5.1 Settings

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).

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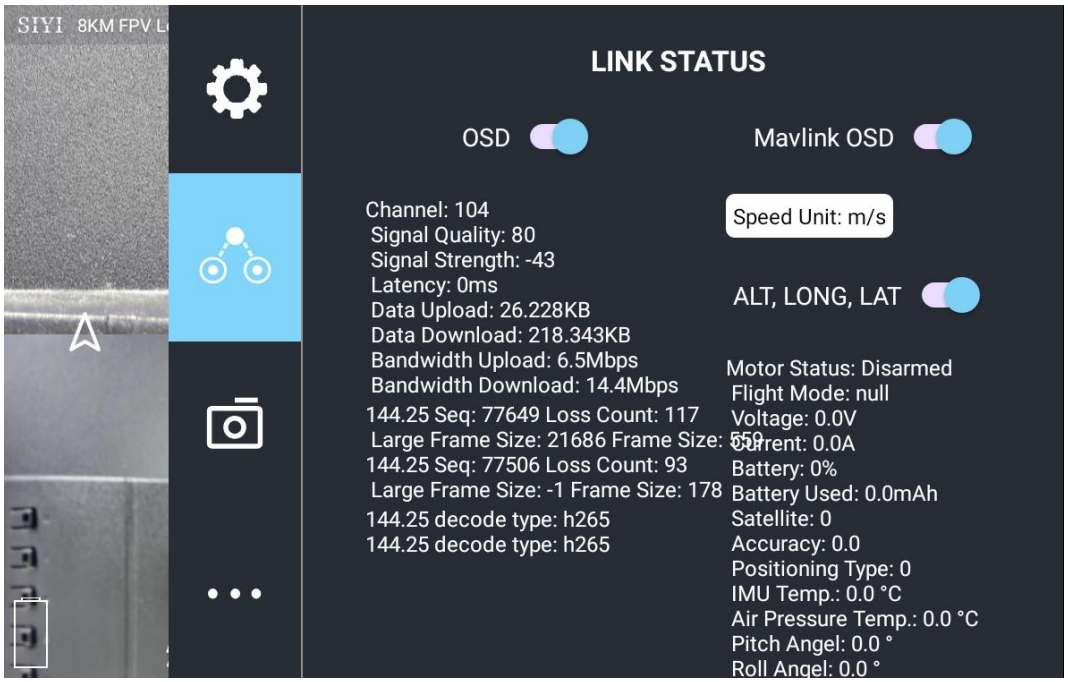
5.2 Link Status

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.

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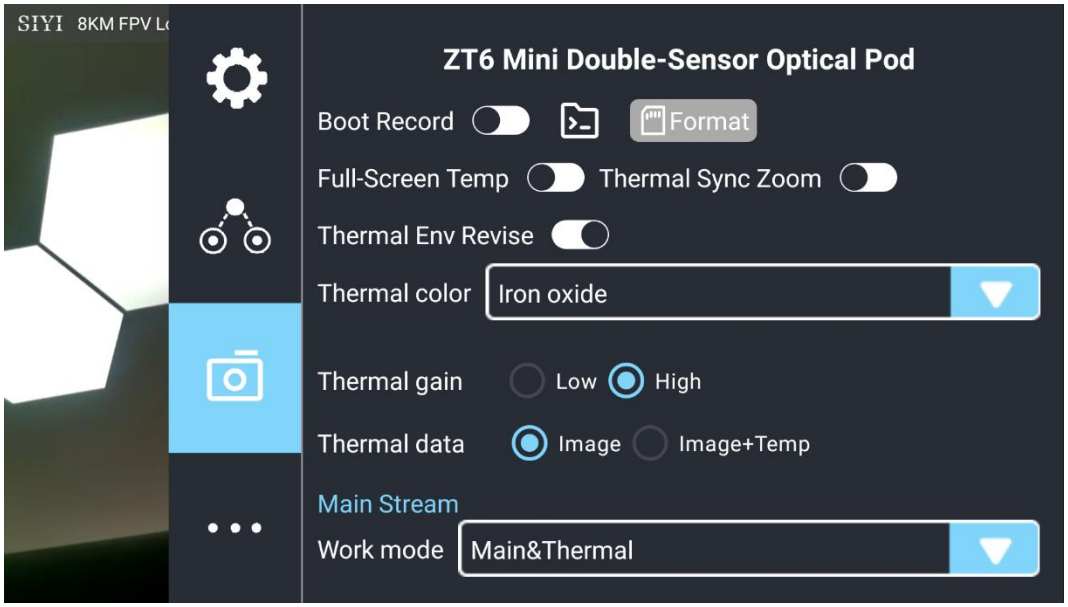
5.3 Gimbal Camera

Configure the abundant functions of SIYI optical pod and gimbal camera.



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.

Laser Calibration: The target position in the camera image may need to be calibrated to

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match the accurate laser rangefinder orientation. (Only available for ZT30)

Full Image Thermometric: Enable / disable the full image temperature measurement feature in the thermal imaging camera.

Synchronize Zoom: Enable / disable simultaneous zooming of the thermal camera and the zoom camera.

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

Thermal Palette: Assign different color solutions for the thermal imaging camera.

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

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

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.

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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).

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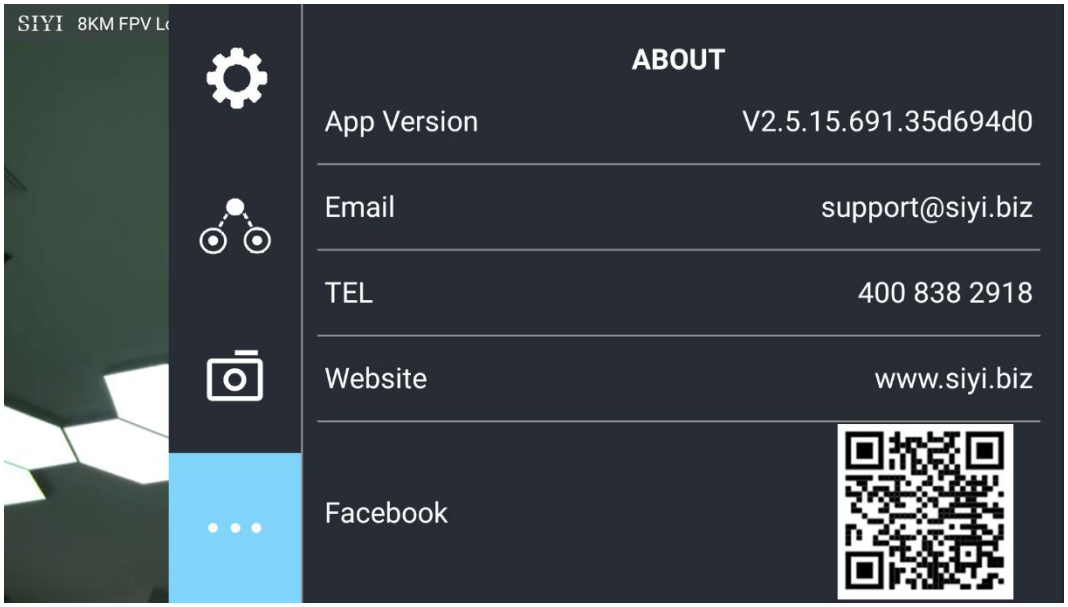
5.4 About SIYI FPV

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

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Date	2023-10-20
Version	2.5.15.679
Updates	1. New: AI recognition and tracking function control interface. 2. New (ZT30): Zoom & thermal camera simultaneous recording function control interface. 3. New: Add the AI tracking module to IP addresses settings. 4. 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	1. New: Status indication for successfully integrated flight controller attitude data. 2. New: Google map is supported. 3. Fix: Flight controller location was no accurate. New icons for flight controller location and device location. 4. 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:

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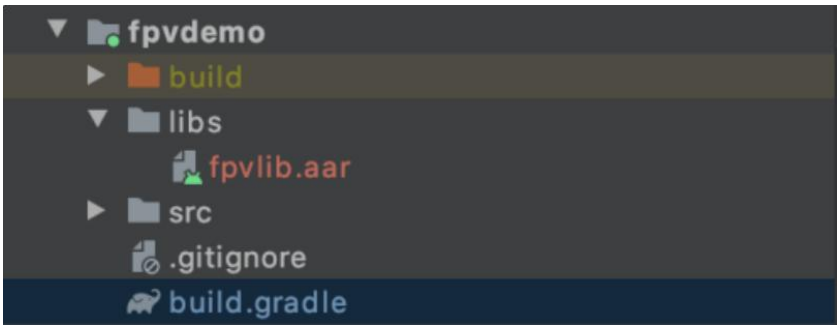

Revise the “build.gradle” file:

```
dependencies {
    implementation fileTree(dir: 'libs', include: ['*.aar'])

    implementation 'com.android.support:appcompat-v7:28.0.0'
    implementation 'com.android.support.constraint:constraint-layout:1.1.3'
    testImplementation 'junit:junit:4.12'
    androidTestImplementation 'com.android.support.test:runner:1.0.2'
    androidTestImplementation 'com.android.support.test.espresso:espresso-core:3.0.2'
}
```

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.

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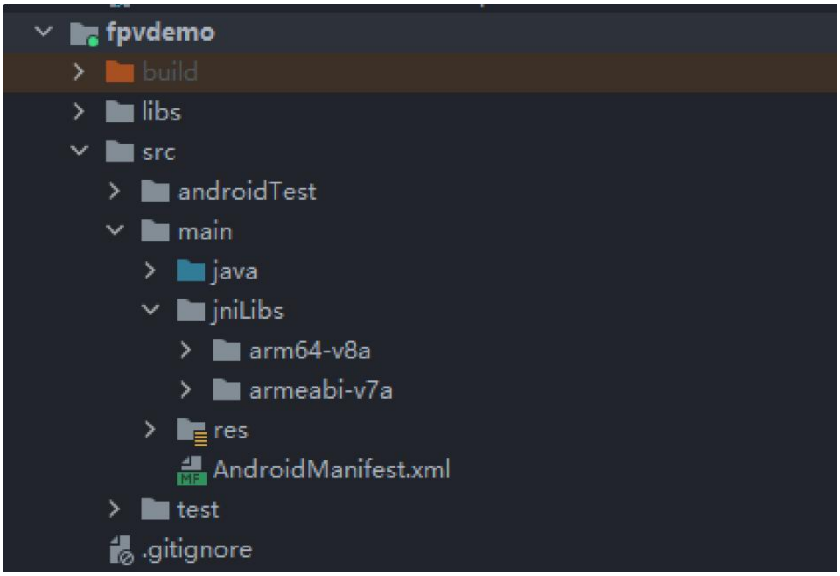

Add FPV Video Display to Code

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

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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	Set if to support Ethernet connection

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context, boolean supportWireless)	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.

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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.

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6 IMAGE TRANSMISSION

SIYI MK32 / HM30 / MK15 links support up to 1080p resolution, 60 fps, and real-time image transmission with a latency as low as 150 milliseconds. It is suitable for SIYI optical pods and gimbal cameras and supports connecting to third-party optical pods and gimbal cameras. The external air unit HDMI input converter can be expanded to support cameras with HDMI input. The external multi-camera adapter module (FPV Hub) can expand the connection to support multiple video stream inputs.

6.1 Control Gimbal Camera from SIYI FPV App or SIYI QGC App on SIYI Handheld Ground Station

Gimbal connects to air unit 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 station.

6.1.1 Preparation

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

- SIYI Handheld Ground Station (MK32 Standard Combo / MK15 Enterprise Standard Combo is suggested for excellent compatibility with SIYI gimbal cameras)
- A8 mini Gimbal Camera

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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 FPV App (v2.5.15.660 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 air unit and bind it with ground station.
2. Use SIYI Gimbal to SIYI Link Cable to connect the air unit's Ethernet port with 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 ground station touchscreen.

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SIYI QGC App Steps

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

6.1.2 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.

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6.1.3 Zoom

While SIYI FPV App or SIYI QGC app is running,

Touching “Zoom in” or “Zoom out” icon on can control the zoom camera, up to 6X digital zoom.

6.1.4 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.

6.2 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.

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6.2.1 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)

Mark

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

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- SIYI Gimbal to SIYI Link Cable

Mark

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.

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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.

6.2.2 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.

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6.2.3 Zoom

While SIYI FPV App or SIYI QGC app is running,

Touching “Zoom in” or “Zoom out” icon on can control the zoom camera, up to 6X digital zoom.

6.2.4 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.

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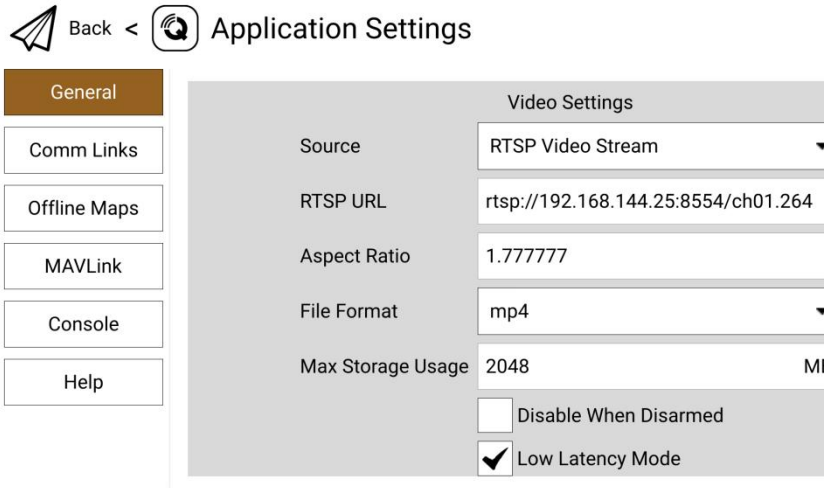
6.3 Input Third-Party IP Cameras / Optical Pods

Before connecting a third-party camera to the air unit, please change its IP address to “192.168.144.X”. The X should not be “11”, “12”, or “20”, otherwise it won’t work. The three addresses have been occupied by the air unit, the ground unit, and the Android system.

Steps

1. In camera settings, check and copy the RTSP address of your camera.
2. Let’s take SIYI QGroundControl as an example. Run QGC, go to “General – Video Settings”.



3. Configure “Source” as “RTSP Video Stream”. Then input the copied RTSP address of your camera after “RTSP URL”.
4. Go back to QGC home page to check image display.

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6.4 Input HDMI Camera

HDMI camera must be through the SIYI air unit HDMI input converter to output to the SIYI air unit, please refer to the steps below for detail.

1. Let's take SIYI QGroundControl as an example. Run QGC, go to "General - Video Settings".
2. Configure "Source" as "RTSP Video Stream". Then input the RTSP addresses of the SIYI HDMI converter for "RTSP URL".
3. Go back to QGC home page to check image display.

6.5 Input Dual-Channel Video Streams

Input dual-channel video stream to the air unit must be through the FPV Hub. Dual-channel video stream can work in multiple ways.

Mark

Dual video stream does not work when the two cameras use the same IP address.

For more details about the IP addresses of SIYI links and gimbal cameras, please refer to the chapter 6.5 in this manual.

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6.5.1 Input Dual SIYI Cameras / Gimbals / Air Unit HDMI Input Converters

Please assign different IP addresses to SIYI cameras, gimbals, and air unit input converters. It is suggested to use “192.168.144.25” and “192.168.144.26”. Then, after connecting both cameras / converters to the FPV Hub and running SIYI FPV app, you can see dual video stream when the IP addresses are selected as “SIYI Camera 1” and “SIYI Camera 2”.

6.5.2 Input Dual Third-Party IP Cameras / Optical Pods

Make sure that the two IP cameras / pods use different IP addresses and connect them to the FPV Hub. Then open SIYI FPV app, input the RTSP addresses, and you will see two video streams.

6.5.3 Input an SIYI HDMI Converter and a Third-Party IP Camera

Make sure that the IP camera use a different IP address from the HDMI converter and connect them to the FPV Hub. Then open SIYI FPV app, input the RTSP addresses, and you will see two video streams.

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6.6 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

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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.

6.7 Solutions to No Image

If MK15 remote controller failed to display image, please try to follow the steps below to investigate possible reasons.

1. Check communication:
   - If the remote controller is bound with the air unit (remote controller and air unit status indicator is green)?
   - If the camera is well connected to the air unit (remote controller successfully pings to the air unit and to the camera IP addresses)?

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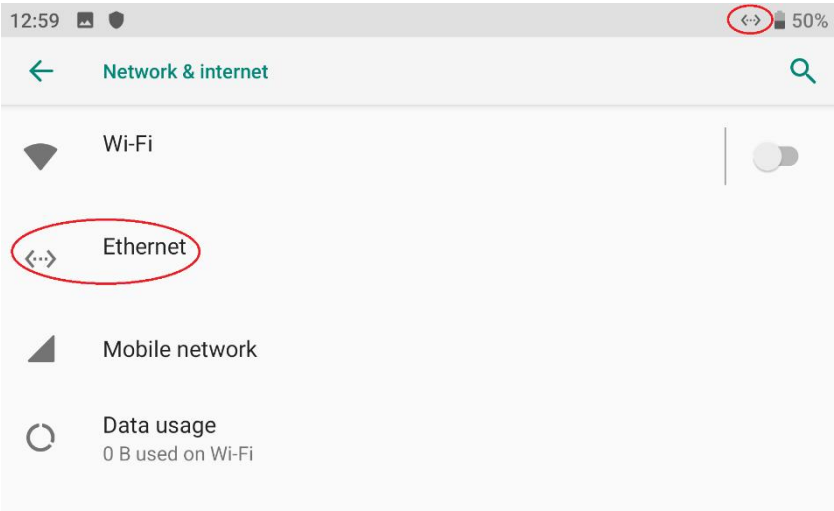
2. Check software settings:

- SIYI FPV App: If camera IP addresses are correct?
- QGroundControl App: If RTSP addresses are correct?

3. Check network:

Ethernet Switch: In Android system status bar, check if the Ethernet icon exists. If not, please enable Ethernet function in Android system settings.



Mark

If you have done trouble shooting by following all steps above, but there are still no clues, please contact your reseller or SIYI after-sale service.

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6.8 Output Video Stream from Remote Controller to Other Device

There are multiple ways to output video stream from remote controller.

6.8.1 Through HDMI

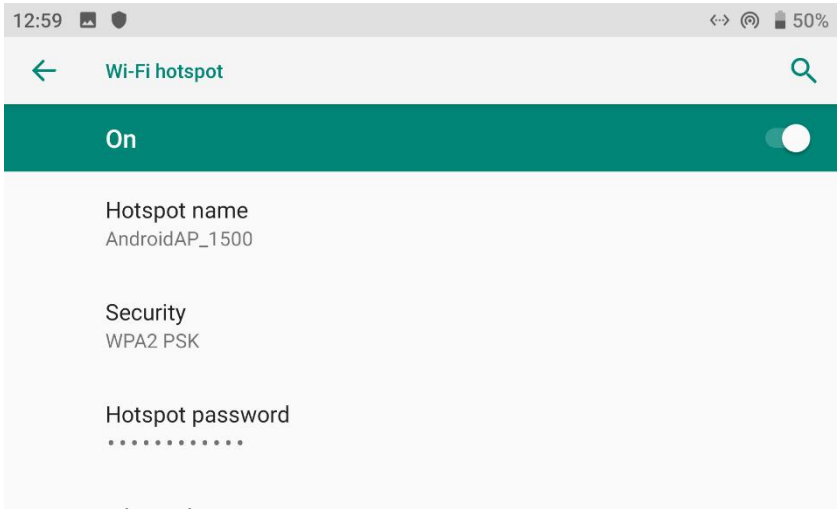
It's just one step outputting video stream to an HDMI monitor.

Use a standard HDMI cable to connect remote controller's HDMI port to the monitor's HDMI port, the video stream will display.

6.8.2 Through WiFi Hotspot

Let's take an example of outputting video stream to a Windows laptop, running SIYI QGroundControl.

1. Go to Android system settings "Network & Internet – Hotspot & Tethering – Wi-Fi Hotspot".



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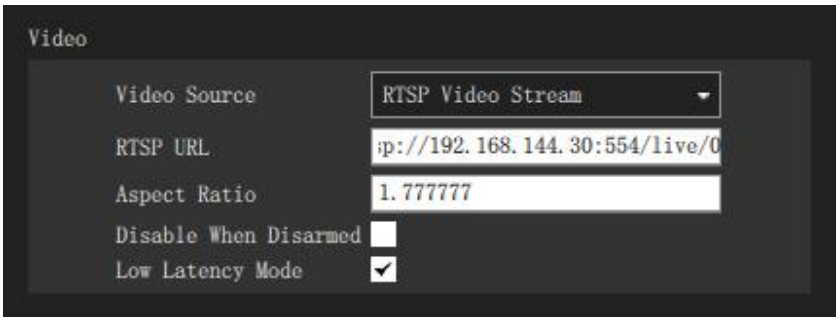
2. Enable “Wi-Fi Hotspot”, configure the hotspot name and its password.
3. Connect the Windows laptop’s with the remote controller through WiFi.
4. Run SIYI QGroundControl on the laptop, go to “Application Settings - Video”. Switch the video source to “RTSP Video Stream”.



5. In “RTSP URL”, input the RTSP addresses of the camera, return to QGC homepage and you will see the video stream.

Mark

If the same video source is used in the laptop and the remote controller simultaneously, one of the video streams may delay or stuck due to bandwidth limit. If it happens, you can assign one video stream as “SIYI Camera 1 / 2” protocol, and another video stream as standard RTSP protocol.

6.8.3 Through LAN Port

Let’s take an example of outputting video stream to a Windows laptop, running Easyplayer.

1. Connect MK32 ground unit’s bottom LAN port to a Windows computer’s RJ45 port. Then go to Ethernet settings in Windows settings.

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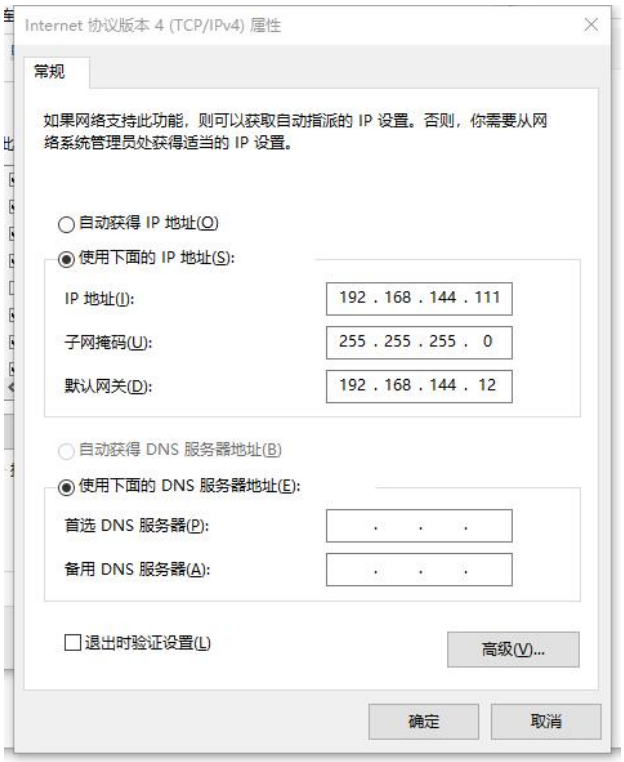
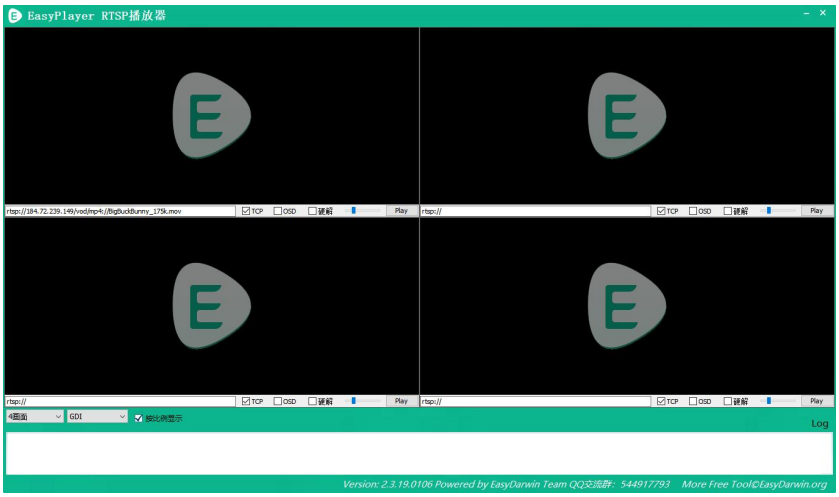
2. Go to “Internet Protocol Version 4 (TCP / IPv4)” and change IP addresses as below. Then confirm.



3. Run Easyplayer on Windows.



4. Input the complete RTSP addresses of the connected camera or gimbal in Easyplayer to display the video stream.

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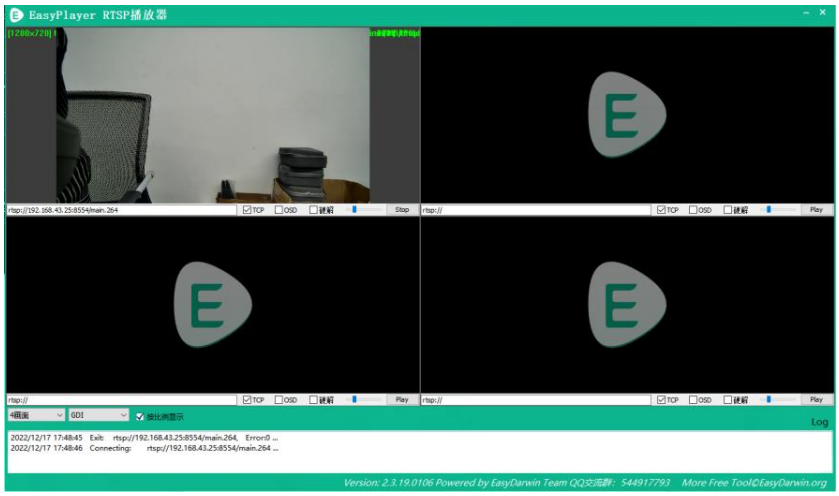

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7 ANDROID OS

7.1 Download Apps

Pre-installed applications in the remote controller are:

- SIYI TX
- SIYI FPV
- SIYI QGroundControl
- Ping Tools

If you need to download the above apps, please visit the relevant product pages on SIYI Official Sites (www.siyi.biz).

7.2 Import and Install App

7.2.1 Through TF Card

Save the files into your TF card and insert the card into the remote conroller. Copy the files from the TF card to the Android system storage. Then go to “File Manger” in the Android system and find the files to install.

7.2.2 Through USB Disk

Save the files into your USB disk and plug the disk onto the remote controller. Copy the

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files from the disk to the Android system storage. Then go to “File Manger” in the Android system and find the files to install.

⚠ CAUTION

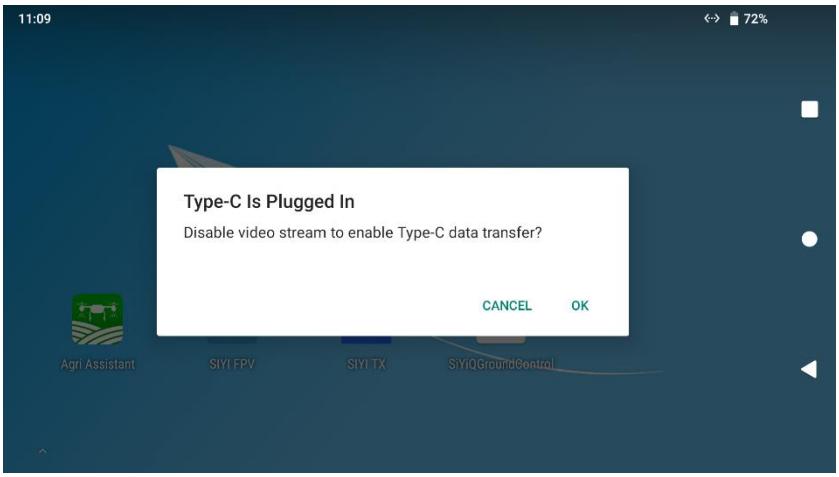
Please try to simplify the Android system as much as possible and avoid installing useless apps to avoid possible system overwhelming during flight.

7.2.3 Through Type-C File Transfer

Remote controller can be connected to Windows computer directly through the Type-C port as file transfer mode.

Steps

1. Connect the remote controller to the Windows computer through the Type-C port.
2. Confirm to “Disable video stream to enable Type-C data transfer”.



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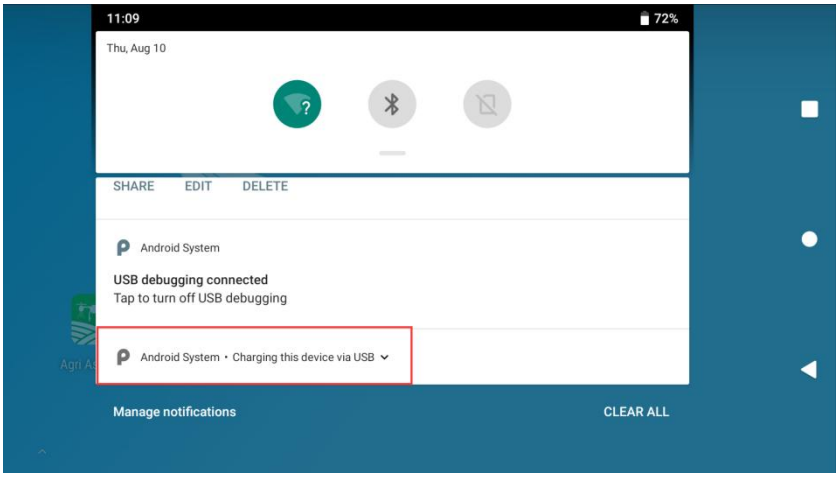
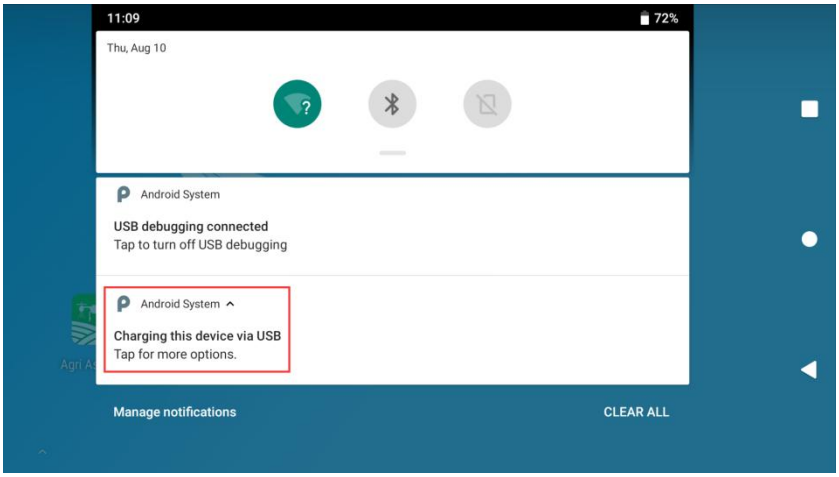
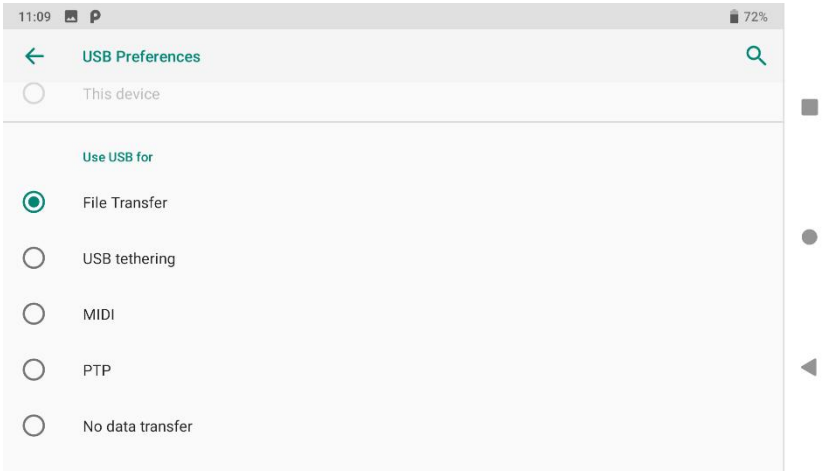
3. Tap “Android System – Charging this device via USB”.



4. Keep tap for more information.



5. Choose “File Transfer”.



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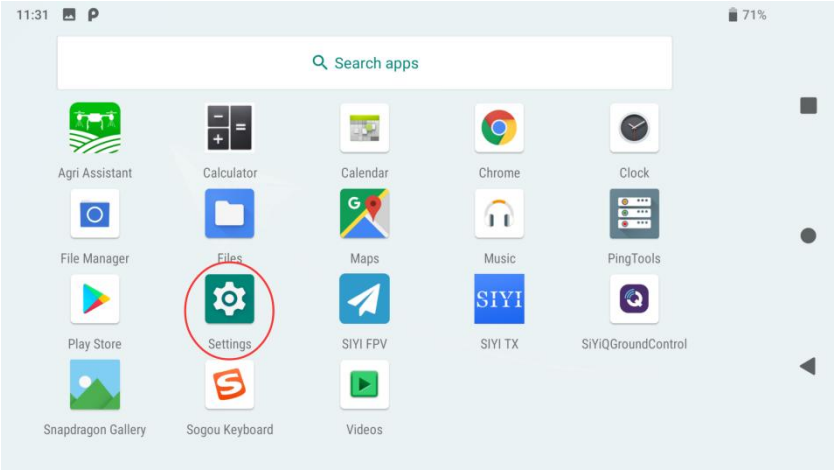
6. You will see the remote controller as a storage device in your Windows computer.

7.3 Check Android Firmware Version

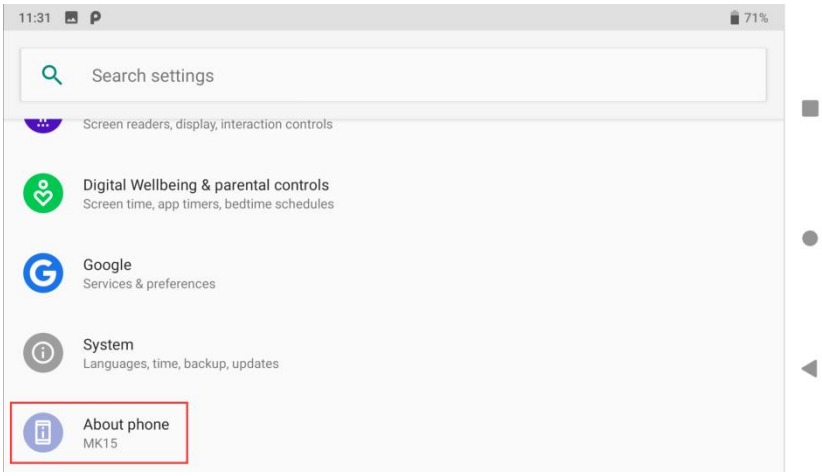
Remote controller carries a specialized Android system.

Steps

1. Go to Android system settings.



2. Slide down to the “About Phone” settings.



3. Slide down to the last option to check the Android firmware version.

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8 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=downloads1&asd=193

8.1 Firmware Update

SIYI remote controller and air unit can be connected to Windows computer and be upgraded through SIYI Assistant.

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

- SIYI PC Assistant (v1.3.7 or latest version)
- Remote Controller Firmware
- Air Unit Firmware

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Mark

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

- Cable (USB-C to USB-A)

Mark

Above tools come with product package.

Firmware Upgrade Steps

1. Install “SIYI Assistant” on your Windows device.
2. Use the upgrade cable to connect the remote controller’s upgrade port to the Windows computer’s USB port.
3. Run “SIYI Assistant” and switch to the “Upload” page to check the current firmware version of the remote controller and the air unit.

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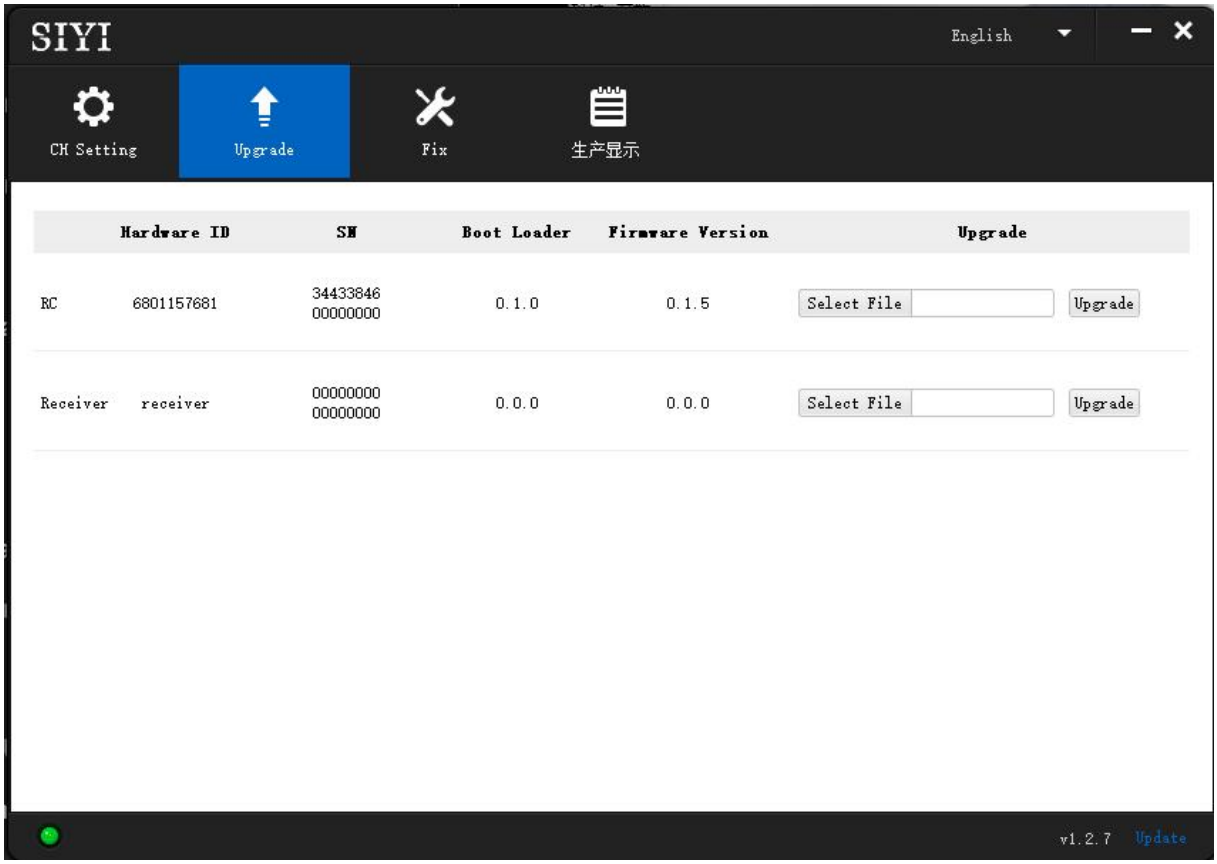

4. If the firmware is not the latest, then click the “Select File” button in the “RC” line to import the latest remote controller firmware. Then click “Upgrade” and wait till it is “100%” finished.

5. Disconnect the ground unit from the Windows device. Connect the air unit’s Type-C port to your Windows device’s USB port. Then repeat the above steps to upgrade air unit firmware.

Mark

Please choose the correct firmware according to the initial number in the boot loader number version. For instance, if the boot loader number is 5.1.0, then please choose the

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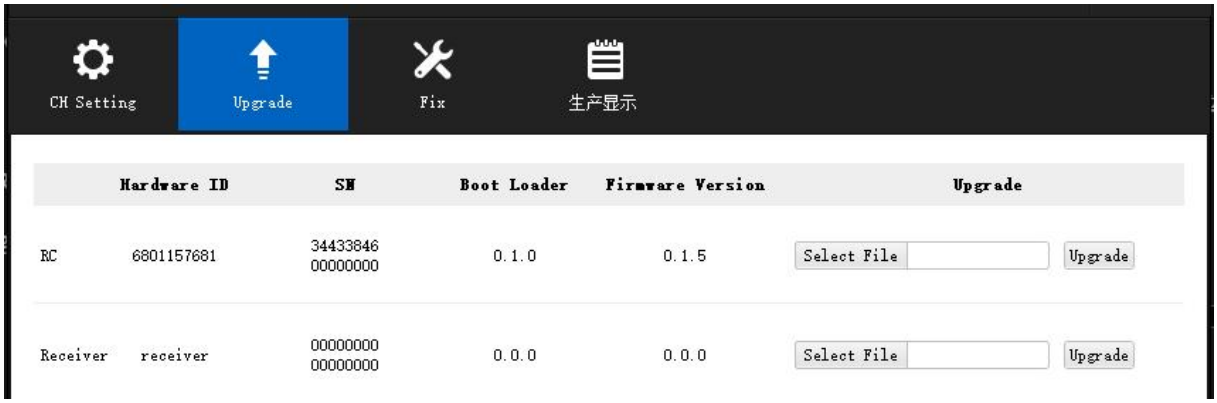
firmware version starting with number 5. If the boot loader number is 0.1.0, then please choose the RF firmware version with number 0.



Don’t worry if the ground unit firmware and the air unit firmware are different in initial numbers, they can still bind and work normally if their firmware version match.

8.2 Main Firmware Update Log

Date	2023-12-15
Ground Unit Firmware	0.2.1
SIYI TX App	1.1.253
SIYI FPV	2.5.15.691
Updates	1. New: SIYI Datalink SDK supports UDP protocol. 2. New: SIYI Datalink SDK supports requesting channel mapping. 3. New: Support air unit PWM channel configuration.

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Date	2023-11-02
Ground Unit Firmware	0.2.0
Air Unit Firmware	5.3.1
HD-Ground	0.2.6
SIYI TX App	1.1.248
SIYI FPV	2.5.15.679
Updates	1. Improve: Manual frequency channel switching works in real-time (HD-Ground must be 0.2.6).

Date	2023-08-31
Ground Unit Firmware	0.1.7
Air Unit Firmware	5.3.0
HD-Ground	0.2.4
SIYI TX App	1.1.240
SIYI FPV	2.5.15.660
Updates	1. New: Support establishing UDP datalink with other network device through Android WiFi hotspot (HD-Ground should be 0.2.4 and above). 2. New: Support establishing UDP datalink with Mission Planner (HD-Ground should be 0.2.4 and above). 3. New: Now SIYI datalink SDK can request remote controller and air unit firmware version. 4. New: Compatible with A2 mini gimbal pitch rotation control. 5. New: Support switch RC signal output type in “SIYI TX” app. 6. Fix: Binding failure caused by baud rate change did not sync. 7. New: Support auto frequency channel adaptive and manual switching frequency channel (HD-Ground should be 0.2.4 and above). 8. New: Triple commands to acquire remote controller channel data output.

Date	2023-04-17
Ground Unit Firmware	0.1.3
Updates	1. New: Compatible with a new Bluetooth chip.

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Date	2023-04-03
Ground Unit Firmware	0.1.2
Updates	1. New: Support binding to up to five air units in turns.

Date	2022-11-24
Ground Unit Firmware	0.1.1
Updates	1. Fix: Dial calibration may fail unintentionally.

8.3 SIYI Assistant Update Log

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	1.3.7
Updates	1. New: Support ZT30 to switch between H265 and H264 codec. 2. Improve: Gimbal calibration function has its own page now. 3. New: Gimbal configuration (thermal synchronize zoom, thermal color palette)

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9 After-sale Service

Please visit SIYI Technology's official website at

https://siyi.biz/en/index.php?id=support for the latest after-sales service and warranty information.

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