# MK15

## MINI HANDHELD GROUND STATION USER MANUAL

**V1.3**

**Mar 2023**



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Thank you for purchasing SIYI's product.

MK15 is a 15-kilometer-range mini handheld ground station based on the dual HD low latency image transmission technology, which is completely and independently developed by SIYI Technology. The system is deeply optimized and integrated with Qualcomm 8-core CPU platform. Optional combos of MK15 system can have dual operator and RC relay feature. MK15'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 store (https://shop.siyi.biz). You can also write an email to SIYI official A/S center (support@siyi.biz).


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## SIYI User Group - Facebook

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# CONTENT

READ TIPS ..... 1
Icons ..... 1
Safety ..... 1
Battery ..... 3
Memory Card (SD/TF) ..... 4
Storage / Carrying / Recycling ..... 4
1 INTRODUCTION ..... 6
1.1 Product Features ..... 6
1.2 Parts ..... 8
1.2.1 At a Glance ..... 8
1.2.2 Button / Switch Types and Default Channel Definitions ..... 10
1.2.3 Ports on Remote Controller ..... 11
1.2.4 Ports on Air Unit ..... 12
1.3 Technical Specification ..... 13
1.4 Packing List ..... 16
1.5 MK15 Data Stream Diagram ..... 19
1.6 MK15 Dual Version Data Stream Diagram ..... 21
1.7 Indicator Definition ..... 22
1.7.1 Transmitter Indicator ..... 23
1.7.2 Air Unit Indicator ..... 24
2 GET READY TO USE MK15 ..... 26
2.1 Remote Controller ..... 26
2.1.1 Power On / Off ..... 26
2.1.2 Charging ..... 27
2.1.3 Charging Indicator ..... 27
2.1.4 Change System Language ..... 28
2.2 Important Instructions on Promotion to MK32 / MK15 Communication Range and Video Fluency 31
2.2.1 General Precautions ..... 31
2.2.2 General Antenna Options and Wireless Mode Configuration for Different Range ..... 32
2.2.3 How to Place the Standard Omni Antennas on Ground Unit ..... 33
2.2.4 How to Place the Long-Range Patch Antennas on Ground Unit ..... 34


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2.2.5 How to Place Air Unit Antennas ..... 35
3 SIYI TX APP ..... 38
3.1 Channels ..... 39
3.1.1 End Point ..... 40
3.1.2 Middle Point ..... 40
3.1.3 Channel Reverse ..... 41
3.1.4 Channel Mapping ..... 41
3.2 Datalink ..... 42
3.2.1 Connection ..... 43
3.2.2 Flight Controller ..... 44
3.2.3 Baud Rate ..... 45
3.3 System ..... 46
3.3.1 Bind ..... 47
3.3.2 Frequency Self-Adapting ..... 48
3.3.3 Throttle Type ..... 48
3.3.4 Channel 15 ..... 49
3.3.5 Wireless Mode ..... 49
3.3.6 Joystick Deadzone ..... 50
3.4 Link Status ..... 51
3.5 Failsafe ..... 52
3.6 Buttons / Dials ..... 55
3.6.1 Buttons ..... 55
3.6.2 Dials ..... 56
3.7 Joystick Calibration ..... 57
3.8 Dial Calibration ..... 60
3.9 Multiple Links ..... 63
3.9.1 RC Relay ..... 64
3.9.2 Dual RC ..... 65
3.10 Device Info ..... 67
4 DATALINKS ..... 69
4.1 Communication with GCS through UART (Taking JIYI Agri-Assistant as an Example) ..... 69
4.2 Communication with GCS through USB COM (Taking QGC as an Example) ..... 71

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4.3 Communication with GCS via Bluetooth (Taking QGC as an Example) ..... 72
4.4 Communication with Windows GCS through Upgrade Port (Taking Mission Planner as an Example) ..... 74
4.5 Communication with GCS by UDP (Taking Android QGC as an Example) ..... 75
4.6 Solutions to Disconnection ..... 77
4.7 SDK Communication Protocol for Datalink ..... 78
5 SIYI FPV APP ..... 88
5.1 Settings ..... 90
5.2 Link Status ..... 91
5.3 Gimbal Camera ..... 91
5.4 About SIYI FPV ..... 93
6 IMAGE TRANSMISSION ..... 94
6.1 Using SIYI Cameras or Gimbals (Taking A8 mini gimbal as an Example) ..... 94
6.1.1 Preparation ..... 94
6.1.2 Gimbal Pitch and Yaw Rotation ..... 96
6.1.3 Zoom ..... 96
6.1.4 Take pictures and Record Video ..... 96
6.2 Using Third-Party IP Cameras / Pods ..... 97
6.3 Using HDMI Cameras / Pods ..... 98
6.4 Dual Video Stream Connection ..... 99
6.4.1 Dual SIYI Cameras, Gimbals, Air Unit HDMI Input Converters ..... 99
6.4.2 Dual Third-Party IP Cameras / Pods ..... 99
6.4.3 SIYI HDMI Converter and Third-Party IP Camera ..... 99
6.5 Common IP Addresses ..... 100
6.6 Solutions to No Image ..... 101
6.7 Output Video Stream to Other Device ..... 102
6.7.1 Through Ground Unit HDMI Port ..... 102
6.7.2 Through WiFi Hotspot ..... 102
7 ANDROID OS ..... 105
7.1 Download App ..... 105
7.2 Import and Install App ..... 105
7.2.1 Through TF Card ..... 105
7.2.2 Through USB Disk ..... 105

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7.2.2 Through Type-C by File Transfer ..... 106
8 Firmware Upgrade ..... 107
9 After-sale Service ..... 111
9.1 Repair Service ..... 111
9.2 Warranty ..... 112
9.2.1 7-Day Return & Refund ..... 112
9.2.2 15-Day Replacement ..... 113
9.2.3 1-Year Warranty Repair ..... 115
10 FCC STATEMENT ..... 117


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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

MK15 Mini Handheld Ground Station is designed for professional application in specific industries, users who approach to the device should have at least the basic knowledge to operate it. Irregular or irresponsible manipulations to the device may cause damage, property loss, or human injuries, and SIYI Technology is not obliged to any of the damage, loss, or injury. It is prohibited to use SIYI products for military purpose. Users under 14 years' old should follow an experienced trainer's guide. Disassembling or modification to the system is prohibited without permission from its manufacturer, SIYI Technology.


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⊘ Do not use any SIYI products to operate your aircraft / vehicle / model at places where are many people around (a square, a park), or at places with many obstacles (a street, a parking lot), or in fields with strong magnetic interference or wireless interference (an electricity plant, a radar station, railways), or in any other fields where an abnormal flight / operation may cause property loss or human injuries.

⊘ Do not hold or cover antenna or block transmission by any means in a flight or an operation.

⊘ Never point your remote controller antenna's top straightly to your aircraft / vehicle while it is working, where are the weakest parts for transmission.

⊘ Do not start your aircraft / vehicle / model when you are tired, drunk, in sickness or under any circumstances that you are not feeling good.

⊘ Do not fly an aircraft / model when it is rainy, windy, or at night.

⊘ Do not power off the remote controller while your aircraft's / vehicle's / model's engine or motors are still working.

! Please always try to operate your aircraft / vehicle / model in line of sight.

! Do not forget to check battery level for the remote controller and for the power battery connected to the air unit before starting your aircraft / vehicle / model.

! Always disconnect (cut power of) air unit the first and turn off remote controller the second.


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Before configuring on remote controller, make sure that the air unit is disconnected and the aircraft's / vehicle's / model's engine or motors is cut power, in case of a sudden switch-on.

Before you start your aircraft / vehicle for the first time, make sure that the fail-safe settings on the remote controller is activated.

Always turn on remote controller first and make the joysticks stay in center position, then start your aircraft / vehicle / model.

## Battery

MK15 remote controller is equipped with a built-in and chargeable 10200mAh Li-on battery and a 20W PD fast charger. Please do read the precautions below.

Always turn off the remote controller before charging. The remote controller does not charge while it is working.

Stop charging immediately if you found the charger damaged, broken or overheat.

Stop charging immediately if there was a peculiar smell, smoke, or leak. In such cases you shall contact your seller for after-sales service immediately.

Do not charge the remote controller when it is hot, or battery temperature is over 60℃.


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## Memory Card (SD/TF)

The memory card slot at bottom MK15 remote controller is compatible with high-speed SD / TF card. Please pay attention to the precautions below.

Do not disassemble, bend, crush, abandon, or cause damage to your memory card by any means.

Stop using the memory card if you find it soaked by water, by oil, or by any other chemical liquid.

### CAUTION

A memory card is also an electronic product, keep it away from static electricity.

Keep the memory card slot clean in case of blocking by sand or dirt.

Keep the memory card in slot while you are downloading or uploading data, taking out it mistakenly, hitting it, or shattering it may cause damage or data loss.

Keep the memory card away from places that a baby or a kid may reach in case that it was swallowed mistakenly by the baby/kid.

## Storage / Carrying / Recycling

When your SIYI system is standby, or you are to bring it outdoors, or the system has expired of its service life, please do read the precautions below.

### CAUTION


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

## ⚠ DANGER

SIYI remote controller should be placed as below:

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

Not under direct sunshine or too dusty or too wet.

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

Not nearby steam or other heat sources.


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# 1 INTRODUCTION

## 1.1 Product Features

### 15 KM Wireless Digital Image Transmission

### Dual Full HD Image Real-Time Display

The link of MK15 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.*

### 5.5-Inch High-Definition Monitor

### 1000-Nit High Brightness Display

MK15 remote controller 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.

### Android OS, Superior Performance

MK15 remote controller carries Qualcomm 8-core CPU, which can smoothly decode 1080p 60 fps video stream by hardware in either H264 or H265 format and can efficiently run various ground control software.


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**MK15 Android platform also comes with full band 4G network and supports streaming HD video to cloud server by SDK development.*

**Dual Operator, Remote Control Relay**

For the great interests of enterprises, relying on wireless HD image transmission technology, SIYI grants MK15 of the multiple link features.

Dual operator feature, obviously, makes it possible that two MK15 remote controller can control the same air unit. Thus, one MK15 remote controller controls the drone's flight attitude, another one controls payloads like gimbal cameras or pods. In dual operator mode, two ground stations can acquire images from the same camera and from different cameras.

Remote control relay feature is designed for very long-range flight. One MK15 remote controller can relay control from another MK15 through the same air unit to reach up to two times of the range of a single MK15 system. The feature can be widely used for UAV inspection and surveillance, UAV remote delivery, and so on.

**Dual operator and remote-control relay feature come with MK15 dual combo.*


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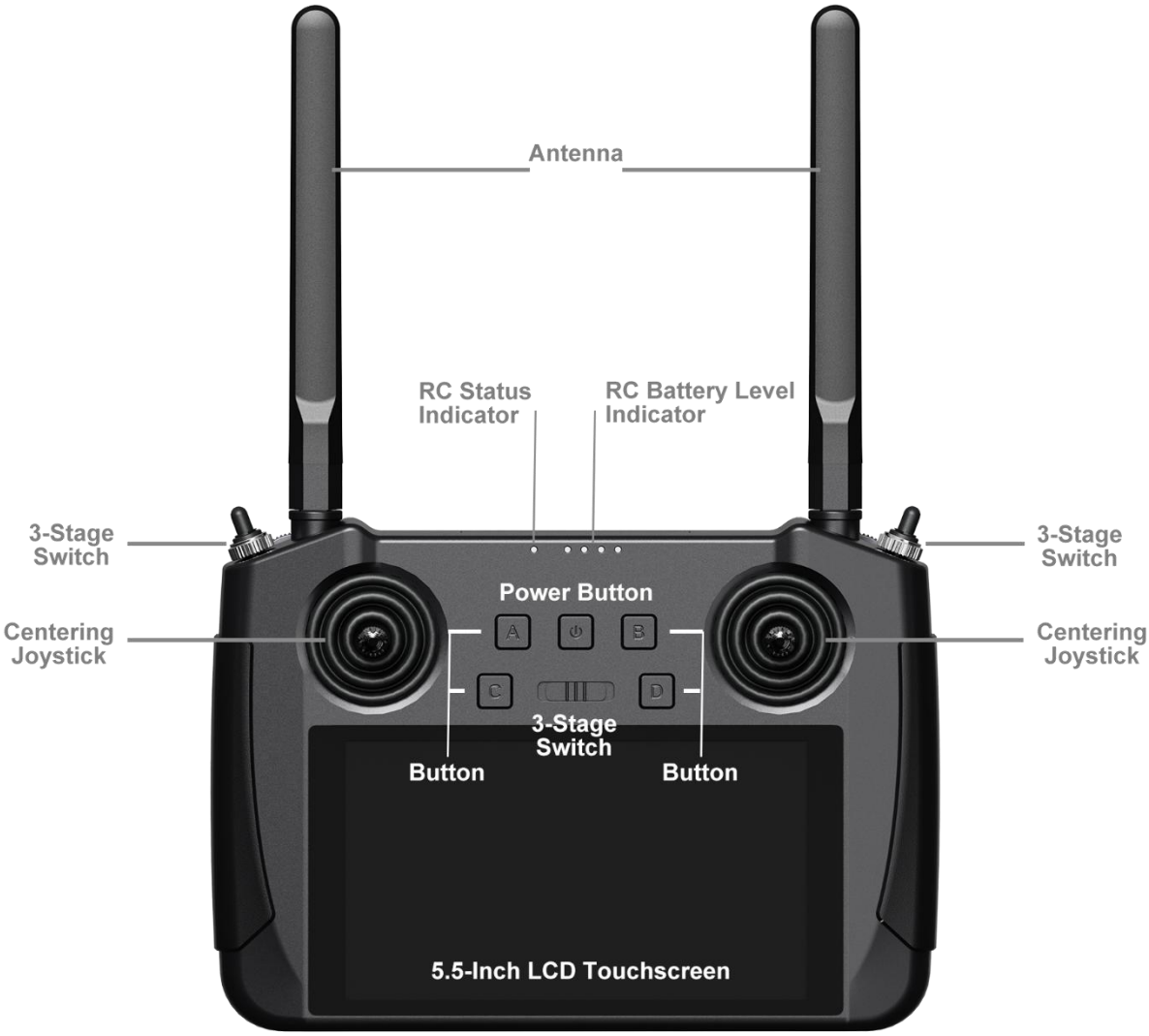
## 1.2 Parts

### 1.2.1 At a Glance




Overview – Remote Controller Front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Overview – Remote Controller Back


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### 1.2.2 Button / Switch Types and Default Channel Definitions

MK15 remote controller comes with 13 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 | | Button A | |
| 9 | | Button B | |
| 10 | | Button C | PWM 1 |
| 11 | | Button D | PWM 2 |
| 12 | | Left Dial LD | PWM 3 |
| 13 | | Right Dial RD | PWM 4 |
| 14 | | | PWM 5 |
| 15 | | | Searchlight A Gimbal Pitch |
| 16 | | | Searchlight B Gimbal Centering |


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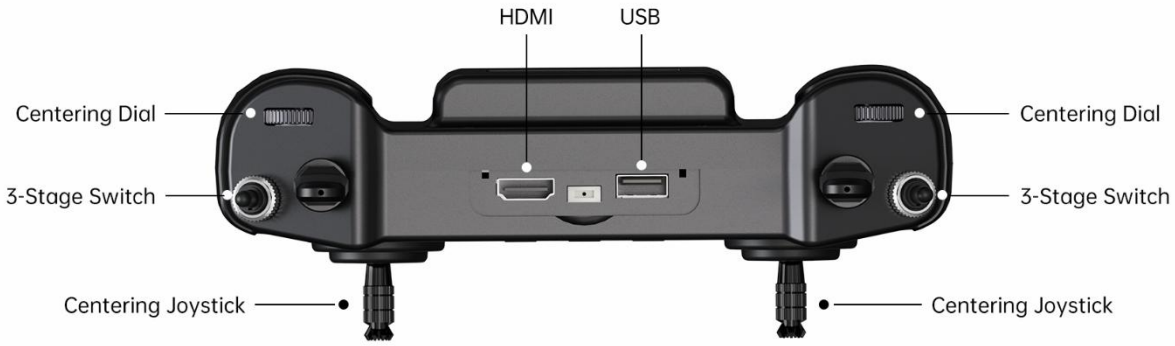
### 1.2.3 Ports on Remote Controller



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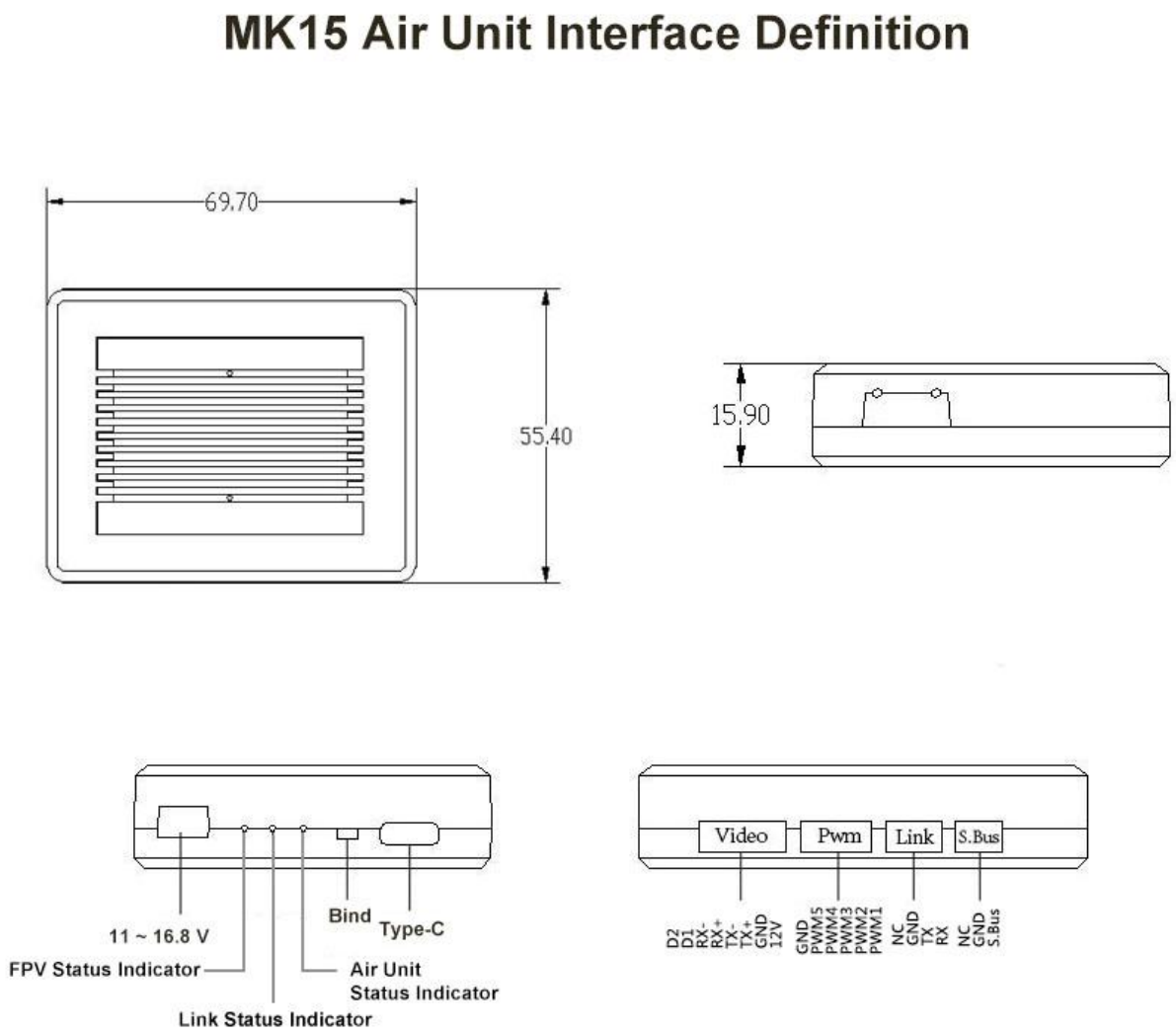
### 1.2.4 Ports on Air Unit





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## 1.3 Technical Specification

### Overall

| | |
|---|---|
| **Max Transmission Range** | 15 km<br>(Unobstructed, free of interference) |
| **Agriculture Drone Control Range** | 3.5 km<br>(Flying at 3-meter's altitude) |
| **Channels** | 13 physical, 16 communication |
| **Datalink Compatible Flight Controllers** | Boying Paladin V2<br>JIYI KX / K++ V2 / K3A Pro<br>VK V7AG<br>Open-Source Flight Controllers: Pixhawk, APM, etc<br>or any flight controllers with UART datalink output |
| **Video Stream Compatible Android GCS** | QGroundControl<br>SIYI FPV<br>BOYING Agriculture<br>JIYI Agri-Assistant / IFLY<br>VK V7 Pro |
| **Video Stream Compatible Windows GCS** | QGroundControl<br>Mission Planner (H264 only) |

### Remote Controller (Ground Unit)

| | |
|---|---|
| **Monitor** | 5.5-inch High Definition and High Brightness LCD Touchscreen |
| **System** | Android 9.0 OS<br>2G RAM, 16G ROM |
| **Dimensions** (Antenna Overlapped) | 189 x 138 x 41 mm |
| **Weight** | 850 g |
| **Battery Capacity & Type** | 10200 mAh 7.4V 2S Li-ion, 75.48 Wh |
| **Fast Charging Protocol** | PD 30W |
| **Battery Life** | 15 hours |


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| | |
|---|---|
| **Interface & Ports** | Video Output: Standard HDMI *Enterprise version only<br>External Device: USB-A<br>Charging: Type-C<br>Firmware Upgrade: Upgrade (Bottom GH1.25 4Pin)<br>File Transfer: Type-C / USB-A<br>Mobile Network: SIM Card Slot<br>External Storage: TF Card Slot / USB-A<br>Tripod Mount: 1/4-inch Screw Hole |
| **Waterproof Level** | IP53 |
| **Working Temperature** | -10℃ ~ 50℃ |

## Air Unit

| | |
|---|---|
| **Signal Output** | 16 channels of SBUS<br>5 channels of PWM |
| **Interface & Ports** | Remote Control: S.BUS (GH1.25 3-Pin)<br>Datalink (to FC): UART (GH1.25 4-Pin)<br>PWM Channel 1 to 5: GH1.25 6-Pin<br>Video Input / Network Communication: Ethernet (GH1.25 8-Pin)<br>Firmware Upgrade: Type-C |
| **Dimensions** (Antenna Excluded) | 70 x 55 x 16 mm (fan included) |
| **Weight** (Antenna Excluded) | 100 g (BEC included) |
| **Antenna Gain** | Standard Omni: 5 dBi |
| **Power Input** | 14.8 ~ 58.8 V<br>(4S ~ 14S) |
| **Working Temperature** | -10℃ ~ 50℃ |

## IP67 FPV Camera

**(Optional, Packed with Agriculture Combo)**

| | |
|---|---|
| **Camera Angle** | FOV 105° |
| **Dimensions** | 106 x 25 x 41 mm |
| **Weight** | 108 g |


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| | |
|---|---|
| **Searchlight Power Consumption** | 8 W |
| **Luminous Flux** | 1 W / 120 ~ 140 lm |
| **LED Type** | Transparent |
| **LED Angle** | 120° |
| **Waterproof Level** | IP67 |
| **Working Temperature** | -10℃ ~ 55℃ |

## Air Unit HDMI Input Converter

**(Optional, Packed with HDMI Combo)**

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


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## 1.4 Packing List

### Agriculture Version

| Agriculture FPV Gimbal Sales Bundle | Agriculture FPV Sales Bundle | Agriculture Dual FPV Sales Bundle |
|---|---|---|
| 1 x MK15 Remote Controller<br>2 x Standard Omni Antenna | | |
| 1 x MK15 Air Unit<br>2 x Standard Omni Antenna | | |
| 1 x A2 mini FPV Gimbal | 1 x IP67 FPV Camera (A) | 1 x IP67 FPV Camera (B)<br>1 x FPV Hub |
| 1 x Telemetry Cable<br>1 x S.Bus Cable (Male)<br>1 x PWM Cable<br>1 x Ethernet Cable | | |
| 1 x 20W PD Fast Charger (Type-C, US Plug)<br>1 x PD Fast Charging Cable (Type-C to Type-C)<br>1 x Type-C to USB-A Converter | | |
| 1 x Carrying Case | | |


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**Enterprise Version**

| Standard Combo | HDMI Combo |
|---|---|
| 1 x MK15 Ground Unit<br>2 x Standard Omni Antenna<br>2 x Long Range Antenna | |
| 1 x MK15 Air Unit<br>2 x Standard Omni Antenna | |
| | 1 x Air Unit HDMI Input Converter |
| 1 x Telemetry Cable<br>1 x S.Bus Cable (Male)<br>1 x PWM Cable<br>1 x Ethernet Cable | |
| 1 x 20W PD Fast Charger (Type-C, US Plug)<br>1 x PD Fast Charging Cable (Type-C to Type-C)<br>1 x Type-C to USB-A Converter | |
| 1 x Carrying Case | |

**Mark**

The difference between agriculture version and enterprise version are:

1. Agriculture remote controller has no HDMI output.
2. The range of agriculture version is mostly optimized for ground-to-ground transmission, while the range of enterprise version is mostly optimized for ground-to-air transmission.


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## Dual Version

| Dual Combo |
| --- |
| 2 x MK15 DUAL Ground Unit<br>4 x Standard Omni Antenna<br>4 x Long Range Antenna |
| 2 x MK15 DUAL Air Unit<br>2 x Standard Omni Antenna |
| 2 x Telemetry Cable<br>2 x S.Bus Cable (Male)<br>2 x PWM Cable<br>2 x Ethernet Cable |
| 2 x 20W PD Fast Charger (Type-C, US Plug)<br>2 x PD Fast Charging Cable (Type-C to Type-C)<br>2 x Type-C to USB-A Converter |
| 2 x Carrying Box |

**Mark**

The difference between dual version and normal version are:

Dual version comes with “Dual Operator” and “RC Relay” features. Normal version does not.


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## 1.5 MK15 Data Stream Diagram

**Ground Unit Data Stream**


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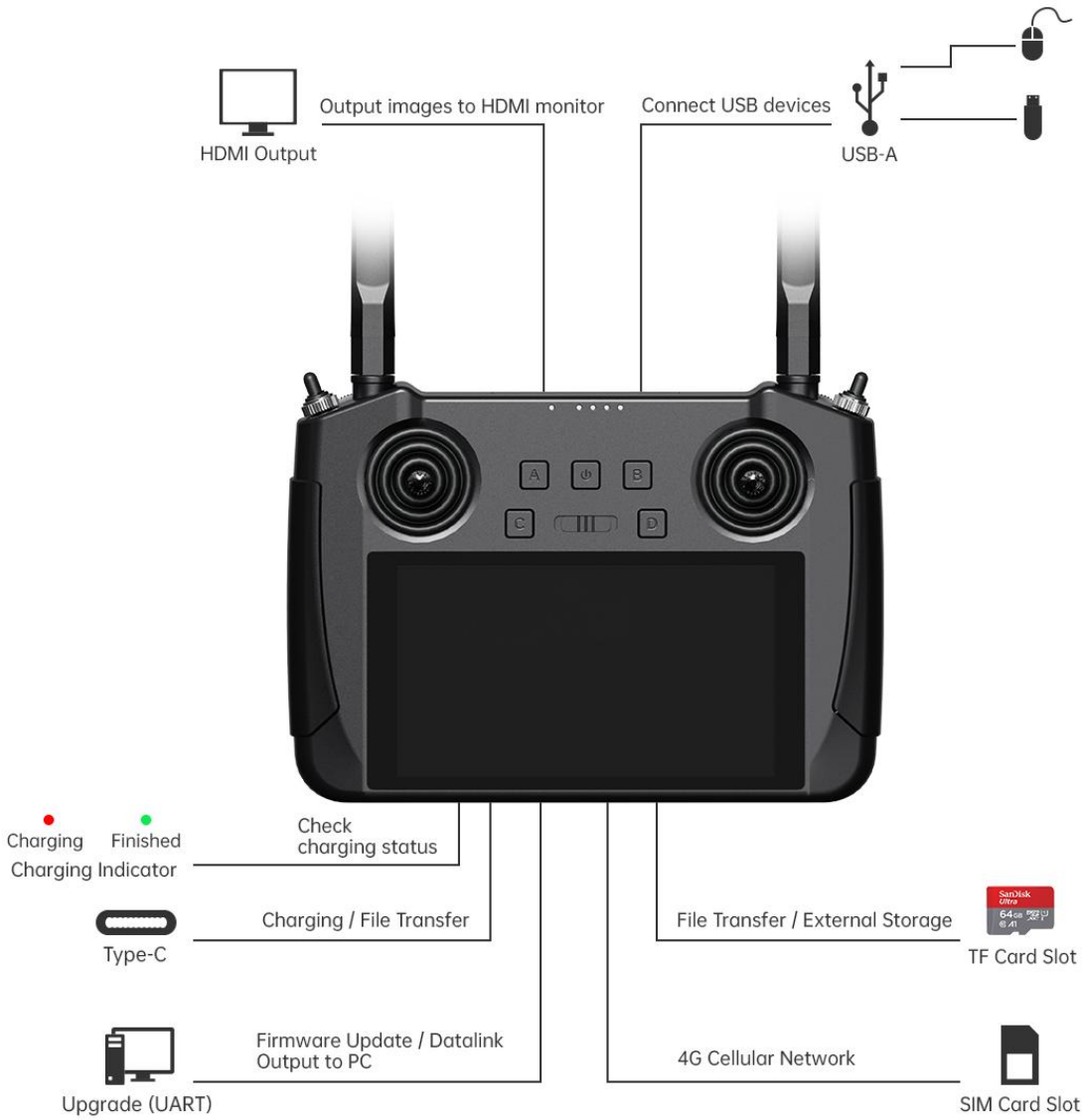
# Data Stream Diagram




**Air Unit Data Stream**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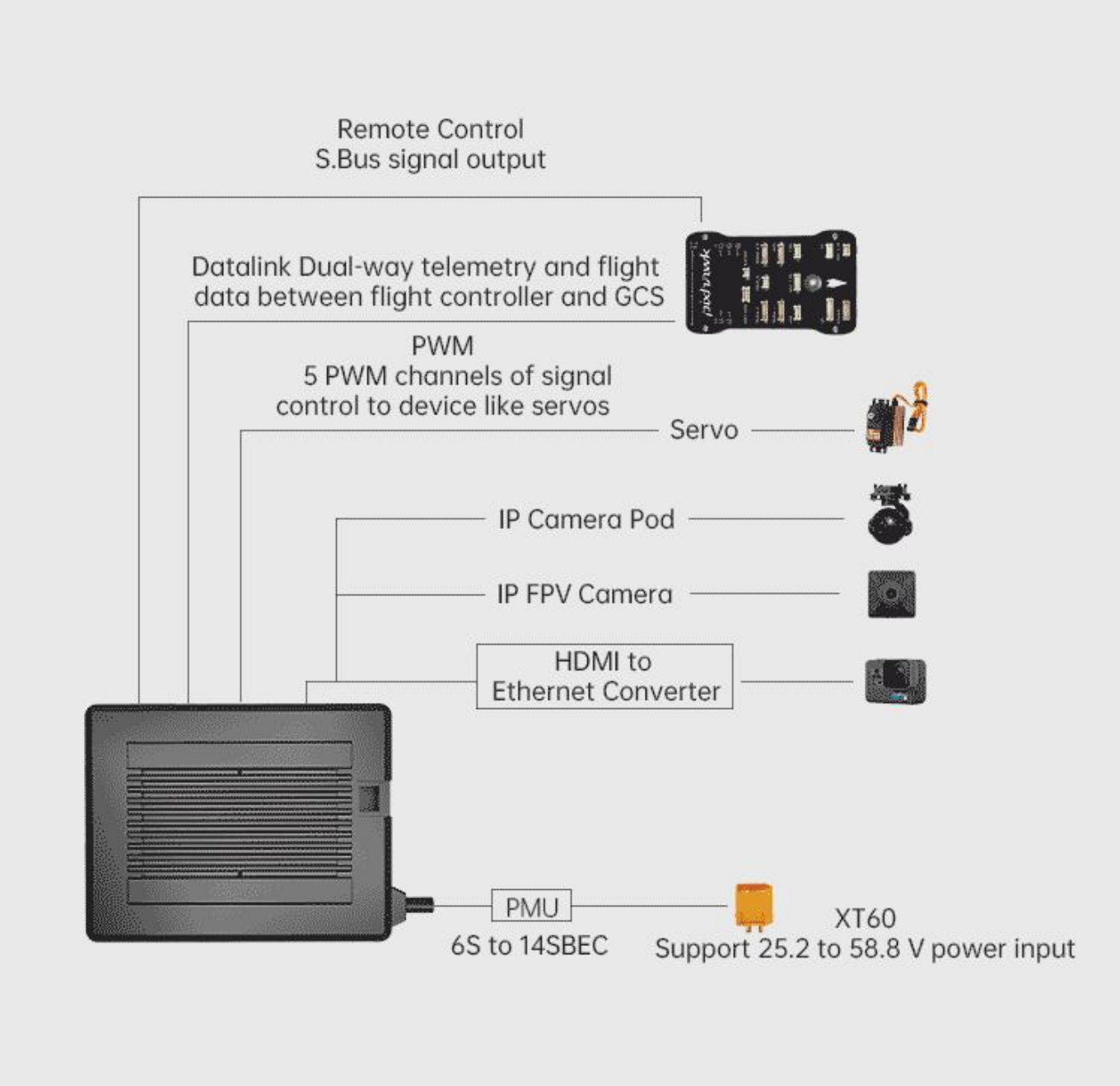


## 1.6 MK15 Dual Version Data Stream Diagram


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## 1.7 Indicator Definition

The status indicators on MK15 remote controller and air unit use three different colors and different blinking frequencies to indicate the system's working or


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abnormal status.

### 1.7.1 Transmitter Indicator

🔴 Solid Red: No communication between transmitter and Air Unit.

🔴 Fast Red Blinks: Transmitter is binding to Air Unit.

🔴 Slow Red Blinks: Firmware does not match.

🔴🔴🔴 Triple Red Blinks: Image transmission initialization failed.

🔴🔴🔴🔴 Four-time Red Blinks: Transmitter requires calibration.

🔴🟢🔴🟢🔴 Red-Green-Red-Green-Red Blinks: Unexpected power off of MK15 Android system.

🟡 Slow Yellow Blinks: Transmitter power voltage abnormal.

🟡🟡 Double Yellow Blinks: Transmitter Bluetooth is not identified.

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

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

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

🟢 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: 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.


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Green-Red Blinks: Air Unit high-temperature alert, level one.

Green-Red Blinks: Air Unit high-temperature alert, level two.

Green-Red Blinks: Air Unit high-temperature alert, level three.

Slow Red-Green-Yellow Blinks: Image transmission is starting.

### 1.7.2 Air Unit Indicator

Solid Red: No communication between transmitter and Air Unit.

Fast Red Blinks: Transmitter is binding to Air Unit.

Slow Red Blinks: Firmware does not match.

Triple Red Blinks: Image transmission initialization failed.

Yellow Blinks: Low voltage alert (voltage input from PMU is lower than 12V).

Solid Green: Perfect communication, 100% data package received.

Green Blinks: Blinking speed indicates MK15 system's signal strength. The faster it blinks, the worse the signal is.

Slow Green Blinks: 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.

Green-Red Blinks: Air Unit high-temperature alert, level one.

Green-Red Blinks: Air Unit high-temperature alert, level two.

Green-Red Blinks: Air Unit high-temperature alert, level three.

Fast Green-Red-Green-Red-Green-Red Blinks: Wireless binding is


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starting (activated by power on/off three times).

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


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# 2 GET READY TO USE MK15

## 2.1 Remote Controller

### 2.1.1 Power On / Off

Power On:

When the remote controller 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, battery indictors will light on again but one by one this time. And remote controller is powered on.

Power Off:

When the remote controller is working, press and hold the power button for about two seconds, remote controller 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 remote controller is working, press and hold the power button for about eight seconds, ground unit will be forced to power off.

**Mark**

Screenshot: When the remote controller is working, press and hold the power button for about two seconds, remote controller monitor will pop up a window with some icons. Touch the screenshot icon to make a screenshot of current screen display.


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Screen Off: When the remote controller is working, press the power button once, remote controller monitor will be off for energy saving.

### 2.1.2 Charging

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

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

**CAUTION**

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

MK15 remote controller cannot be charged when it is working. Please do power off the remote controller before charging.

### 2.1.3 Charging Indicator

- Solid Red: Remote controller under charging.
- Solid Green: Charging finished.


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### 2.1.4 Change System Language

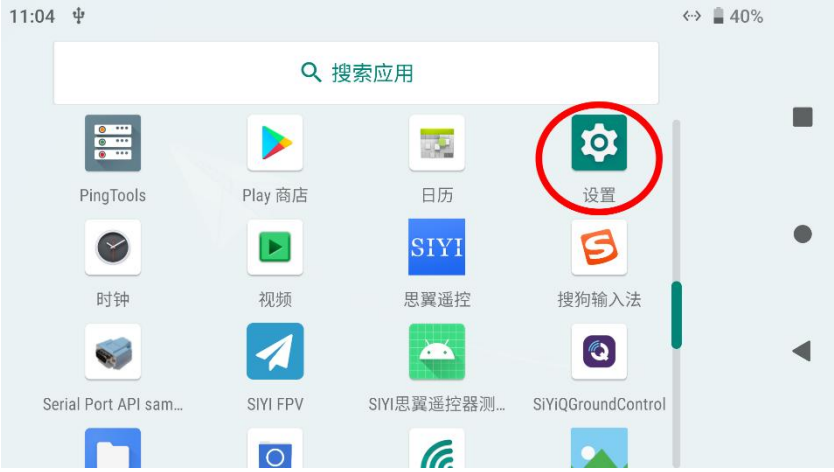
MK15 Android system supports almost all available languages, which can be switched in system settings easily.

**Mark**

The factory language of MK15 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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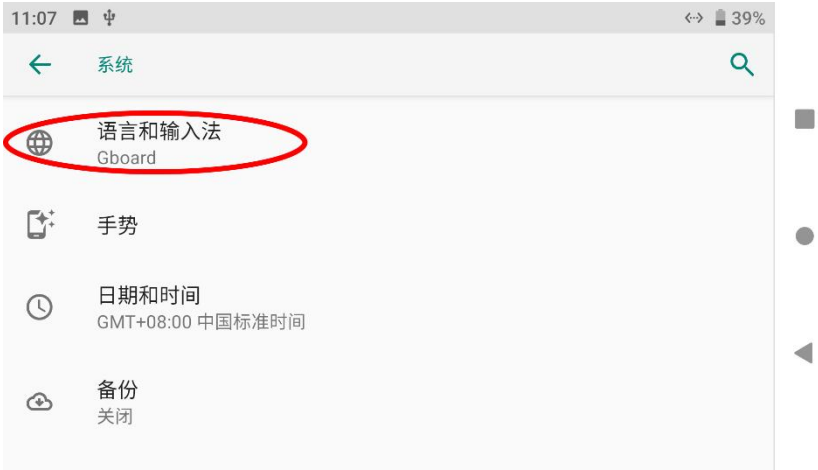
3. Go to “Language and Input” and choose “Language”, then “Add Language”.



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”.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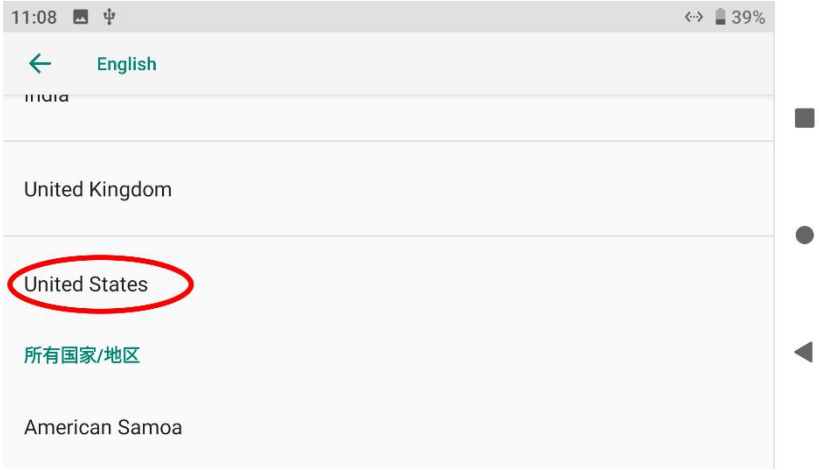
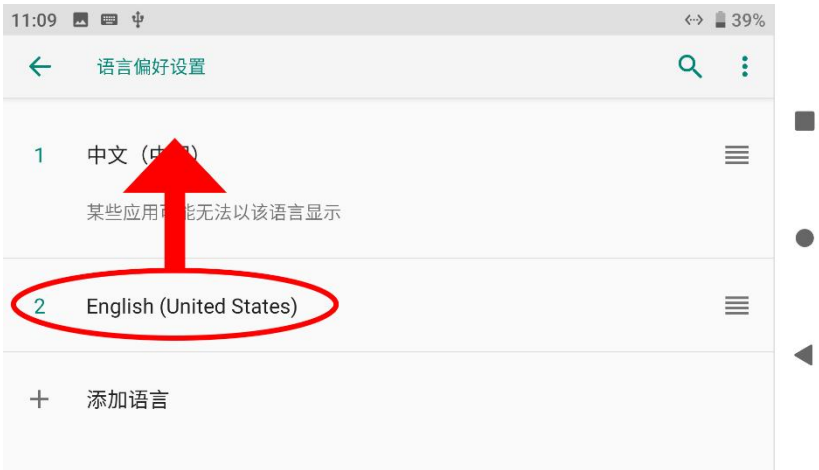



5. Drag the just added “English (US)” language bar to the first line, system language will change to English (US) automatically.





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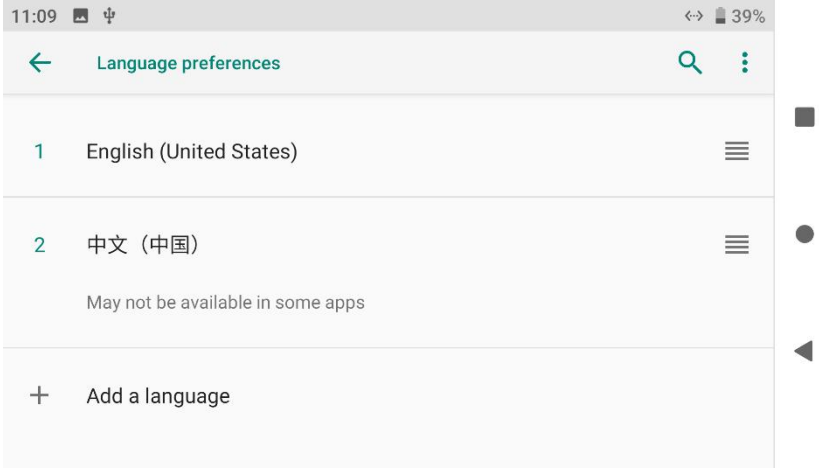


## 2.2 Important Instructions on Promotion to MK32 / MK15 Communication Range and Video Fluency

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 XT60 connector on MK15 air unit. HD image transmission requires very high standard to the current of power supply, the instancy of the current response, and the current ripple. Power


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supply from the third-party / modified BEC or from PDB may interfere the link stability and the communication range. If you do not need the BEC, it is suggested that you use the HM30 air unit.

3. The default decode type of SIYI FPV app should be hardware decoding. Software decoding may increase latency.

### 2.2.2 General Antenna Options and Wireless Mode Configuration for Different Range

**1. 0 to 10 Kilometers Range**

Two standard omni antennas on ground unit.

Wireless mode: 5 km or 8 km low latency.

**2. 10 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 30 Kilometers GCS Flight**

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


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Wireless mode: 24 km GCS.

4. Signal is weak on top of the standard omni antenna. When the aircraft is flying on top of the ground unit, flying altitude should be lower than 100 meters as less as possible.

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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3. The distance between two standard omni antennas on ground unit should be 10 cm, at least not less than 5 cm, otherwise the signal quality will be bad.

### 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.
4. The distance between two standard omni antennas on ground unit should be 10 cm, at least not less than 5 cm, otherwise the signal quality will be bad.


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### 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.
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 1 cm distance between these parts and the structure parts.
5. The two air unit antennas should be placed away from each other for at least 5 cm 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 below pictures, 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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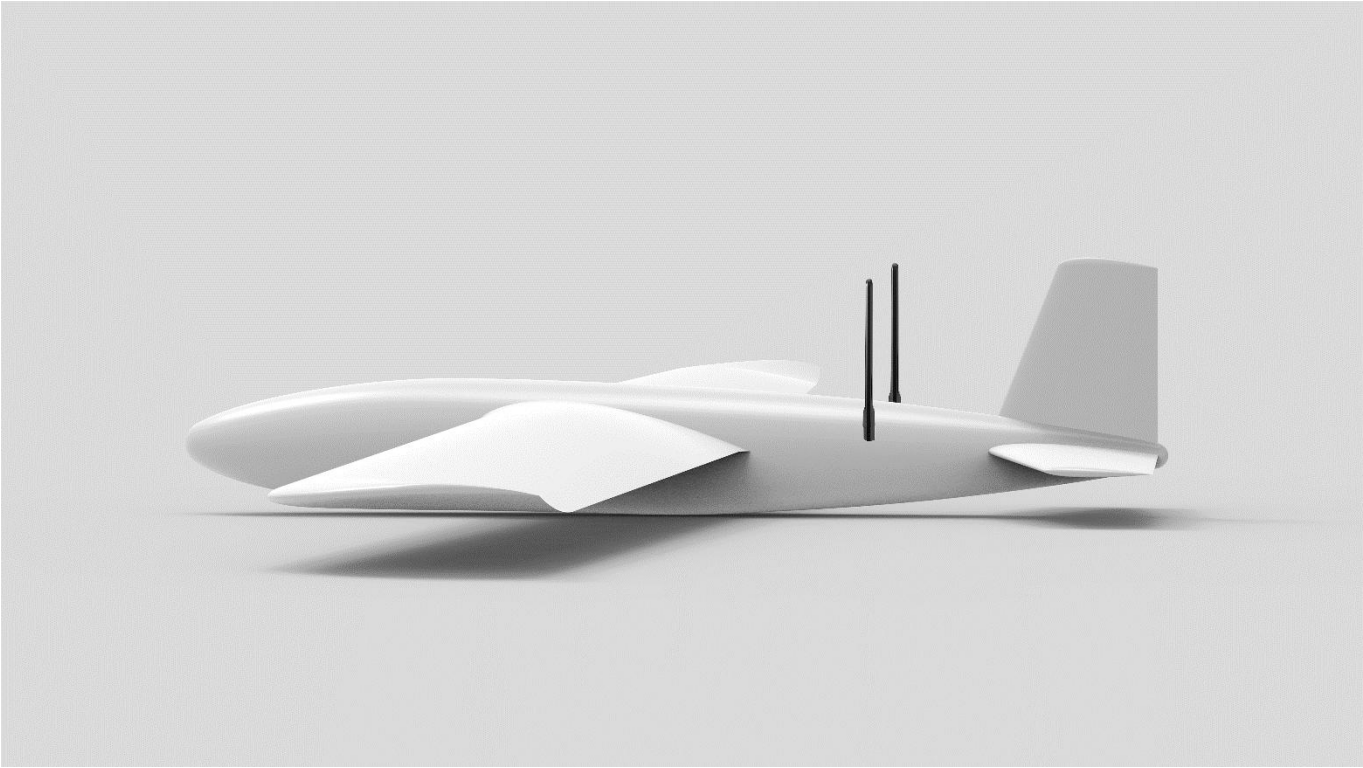

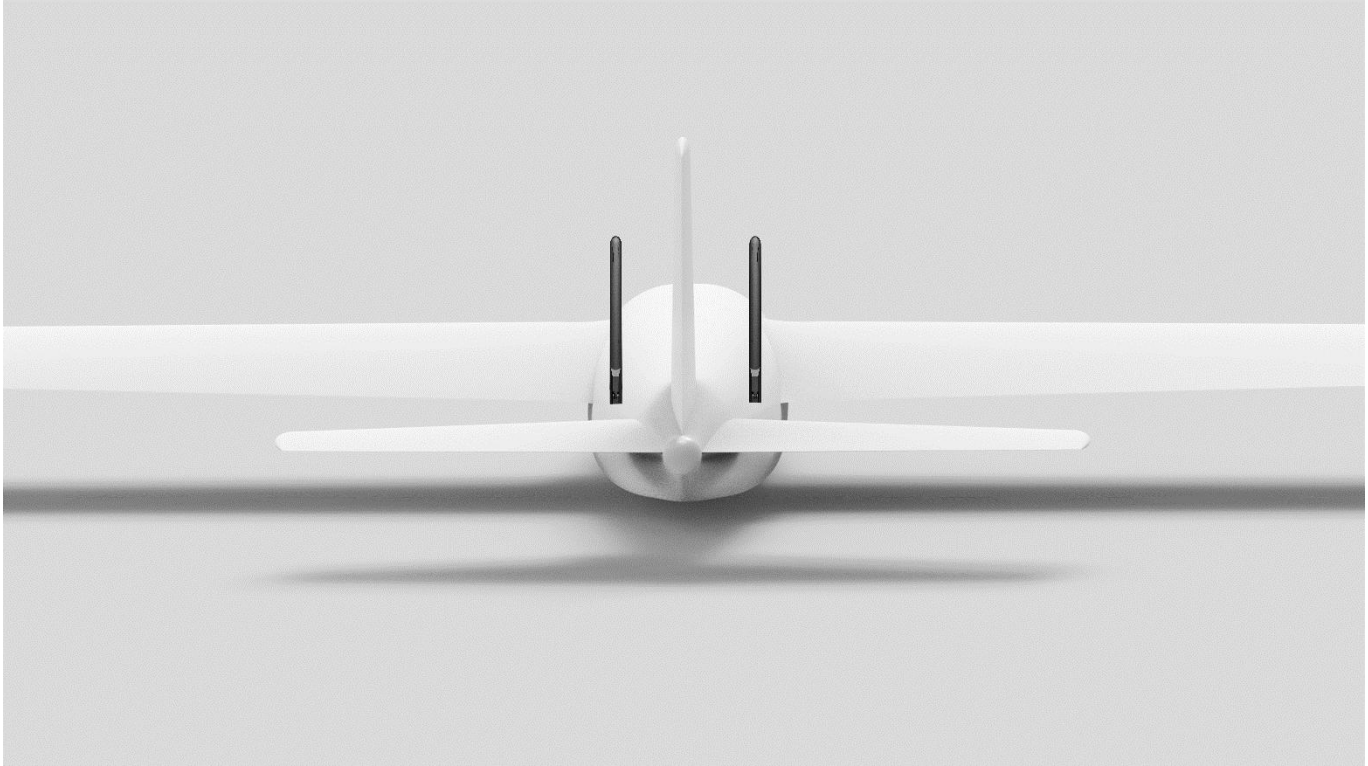


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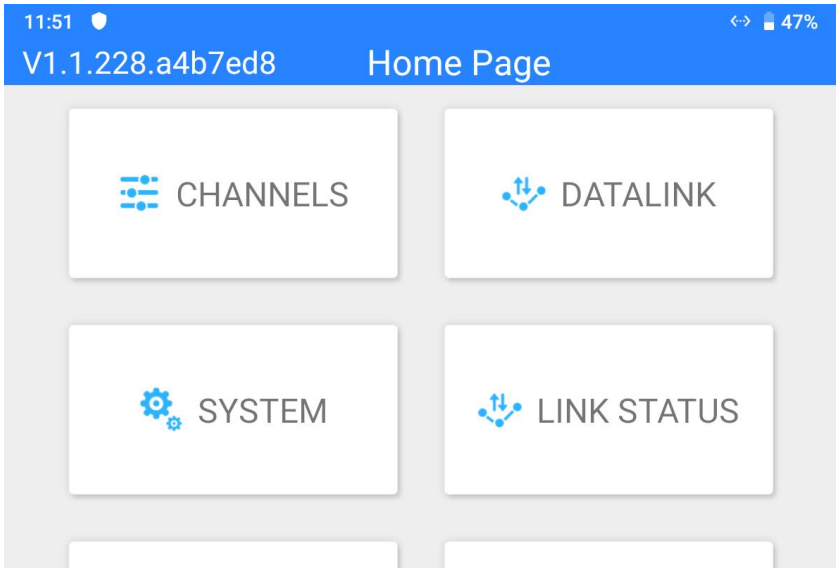
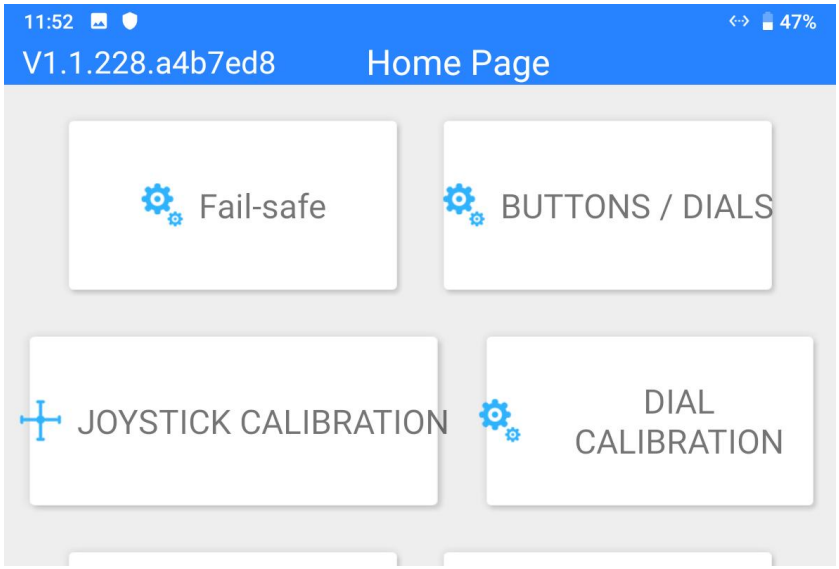
# 3 SIYI TX APP

Users can configure MK15 system in “SIYI TX” app.





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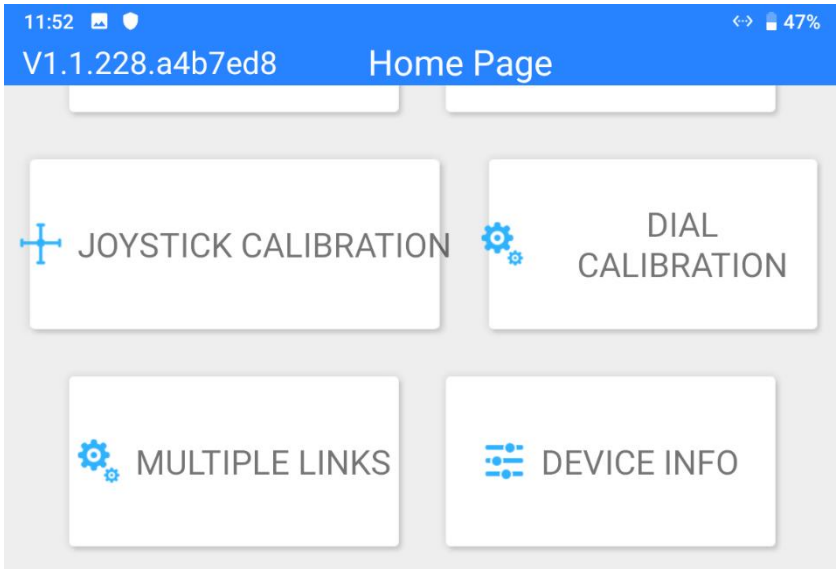
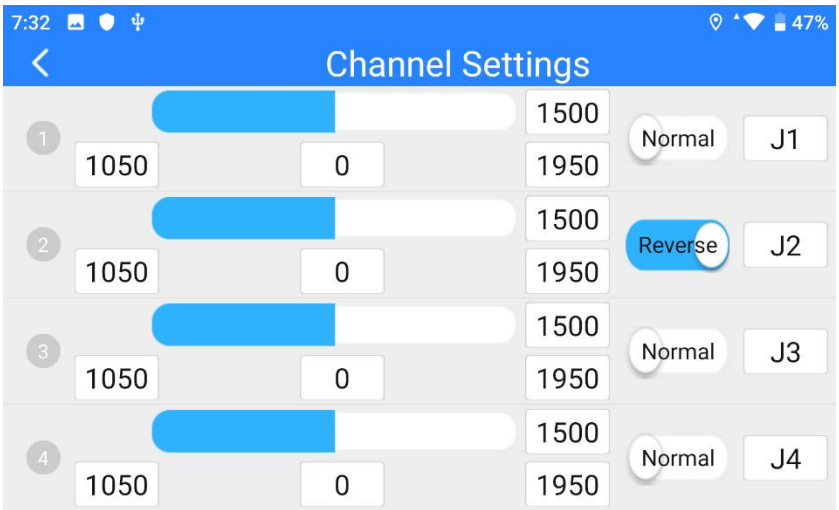



**Mark**

This chapter was made according to "SIYI TX" v1.1.228.

## 3.1 Channels

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





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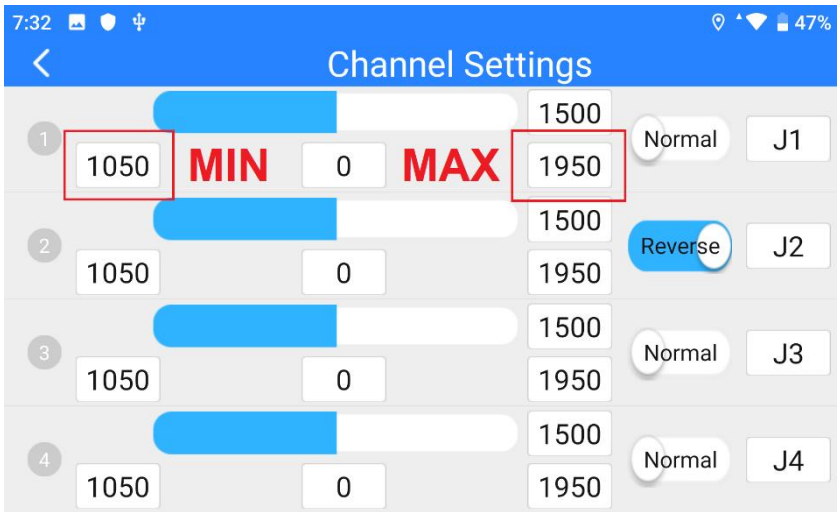
### 3.1.1 End Point

MK15 transmitter'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.

### 3.1.2 Middle Point

The default Middle Point value is "0".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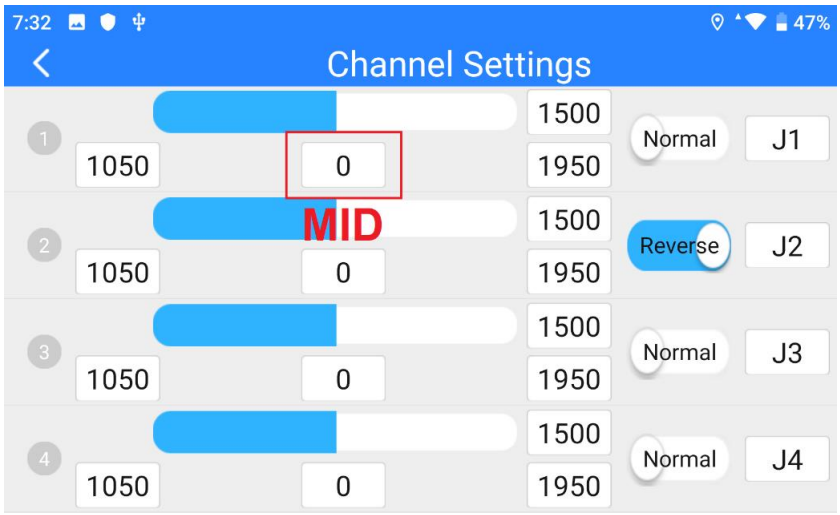
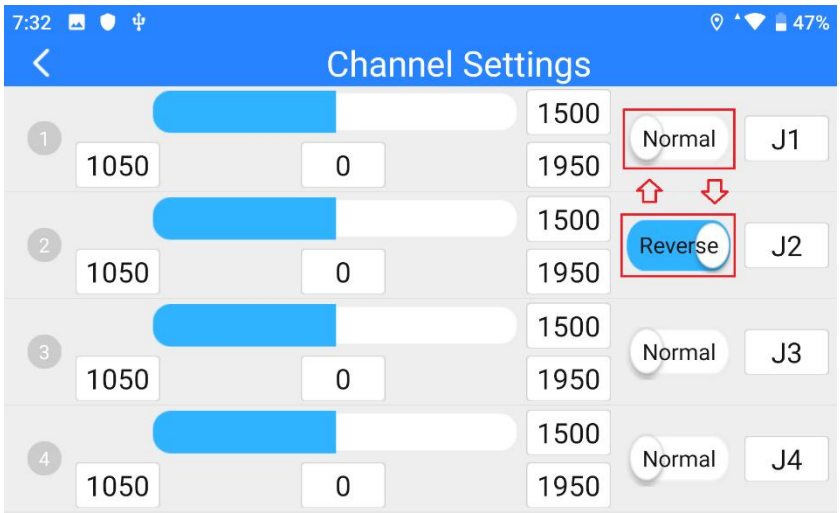



Select a target channel and input your required middle point value. It's done.

### 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.

### 3.1.4 Channel Mapping

MK15 remote controller has 13 physical channels, an RSSI channel, and 16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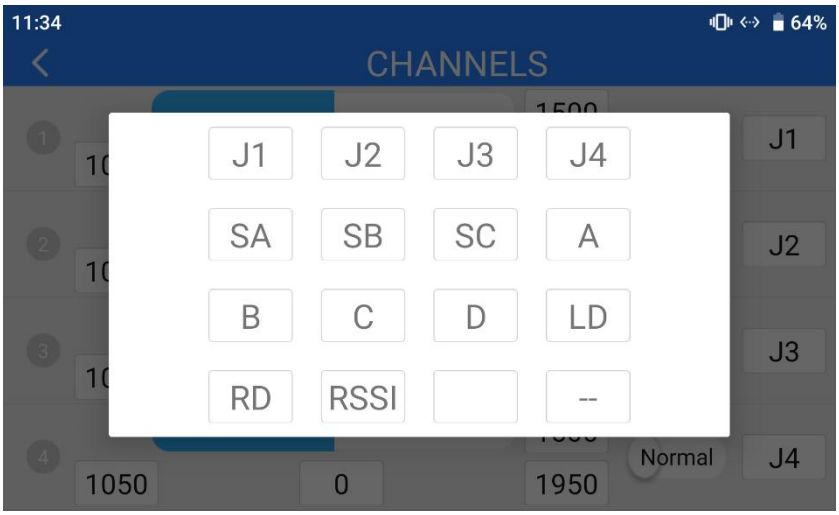
communication channels. Users are allowed to define or to map the physical channels (buttons, switches, joysticks) and the RSSI channel to the communication channels freely.




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.

## 3.2 Datalink

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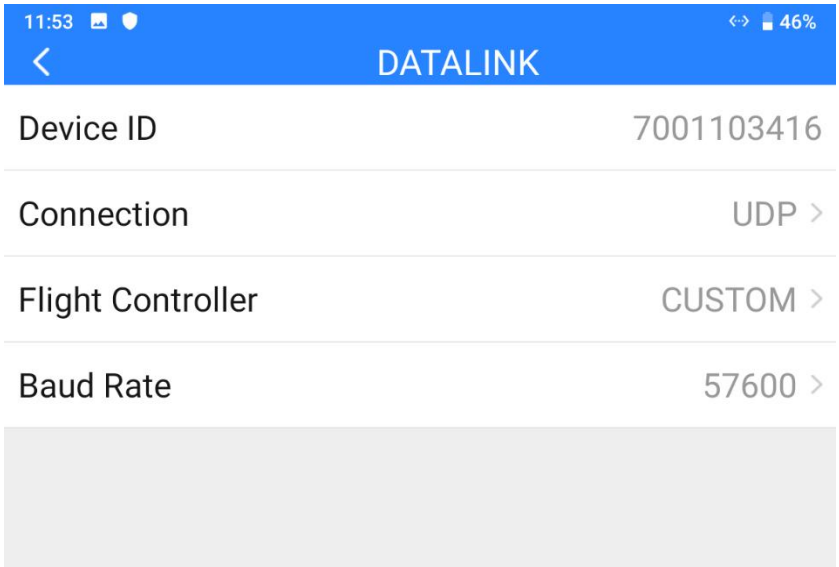


**About Datalink Settings**

Device ID: Display the device ID of the integrated Bluetooth module in MK15 remote controller. It also shows as the Bluetooth name before pairing.

Connection: Available datalink ports in MK15 remote controller.

Flight Controller: Compatible flight controller models by MK15 system.

Baud Rate: To configure required baud rate when you use customized flight controller.

### 3.2.1 Connection

Available datalink connection types in MK15 system are: UART, USB COM, Bluetooth, Upgrade Port, and UDP.


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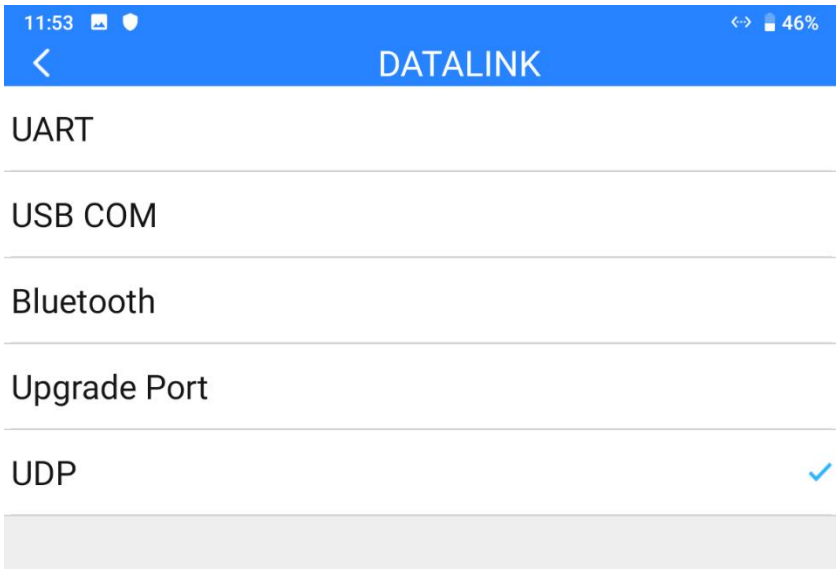


**About Datalink Connection**

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

*Only for specific GCS, such as BOYING, JIYI, and VKFLY.

*Developers can acquire SDK from SIYI to use the port for their GCS.

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

*For QGroundControl.

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

*For most GCS.

Upgrade Port: Telemetry data be output to PC GCS through the Type-C port at bottom MK15 ground unit.

UDP: Telemetry data goes through UDP network protocol.

### 3.2.2 Flight Controller

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


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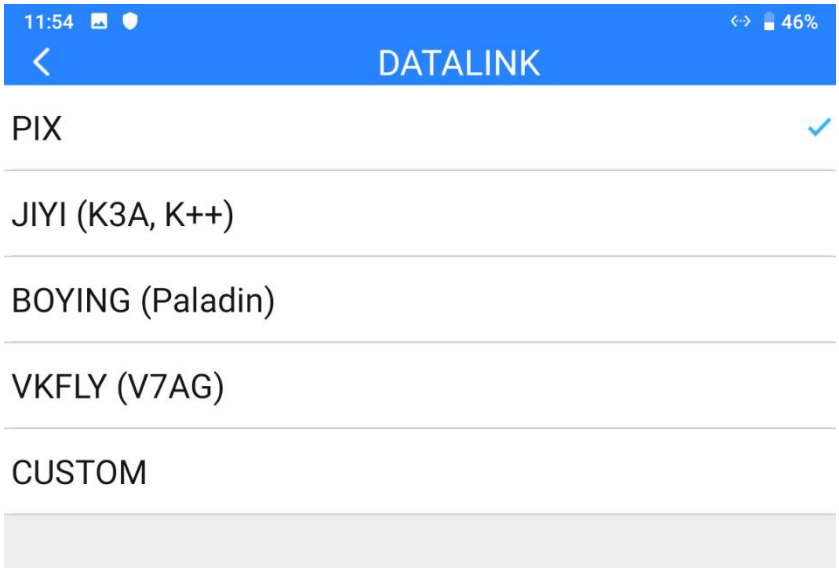
of all supported flight controller models.

Currently supported flight controller models are: JIYI (K3A or K++), BOYING (Paladin), PIX, VKFLY (V7AG), and Customized flight controllers.




**Mark**

Please make sure that the remote controller has been bound to the air unit before switching flight controller type.

### 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.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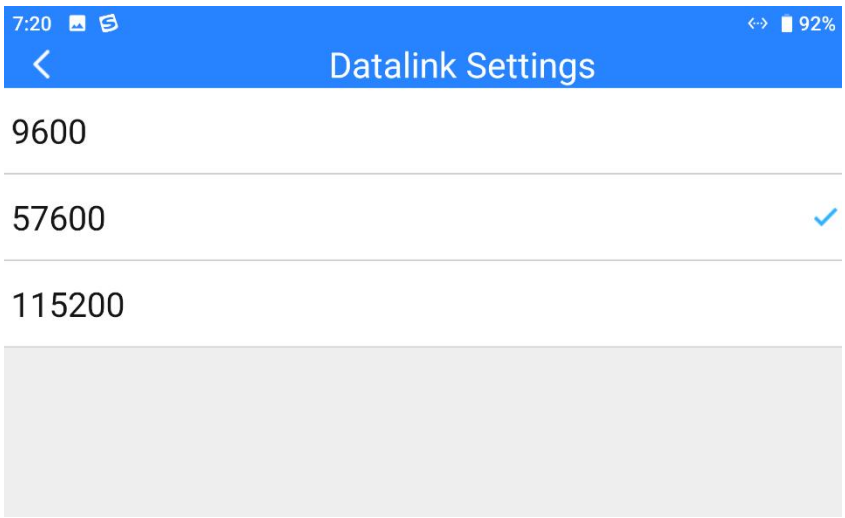
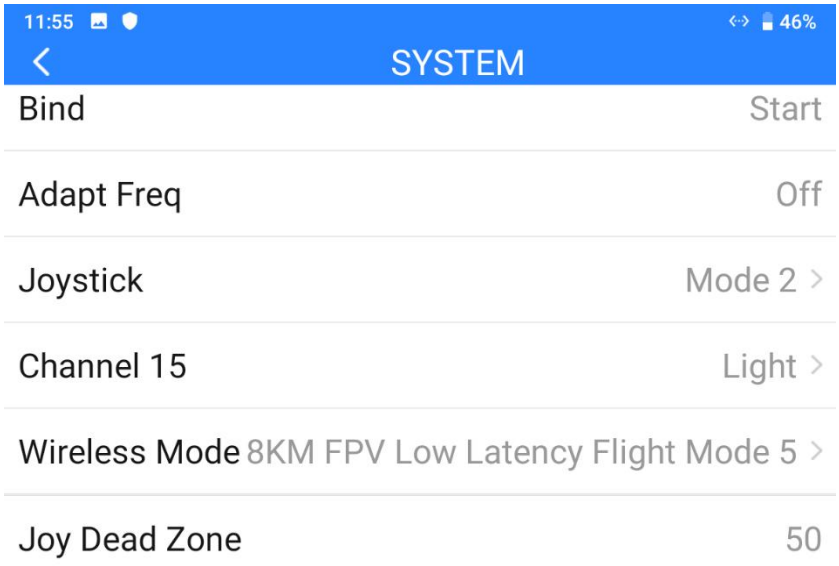



**Mark**

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

## 3.3 System

Configure some important system functions for MK15 system.





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**About System Settings**

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

Adapt Frequency: Search and switch to the frequency band with lowest interference automatically.

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

Channel 15: Switch the control of channel 15 to the searchlight switch of the SIYI IP67 camera or the pitch axis of the A2 mini gimbal.

Wireless Mode: Choose the proper wireless mode for requirement of different range.

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

### 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.


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### 3.3.2 Frequency Self-Adapting

In strong-interference environment, turn on the function, remote controller will automatically search for the frequency band with least interference to get the best transmission strength.

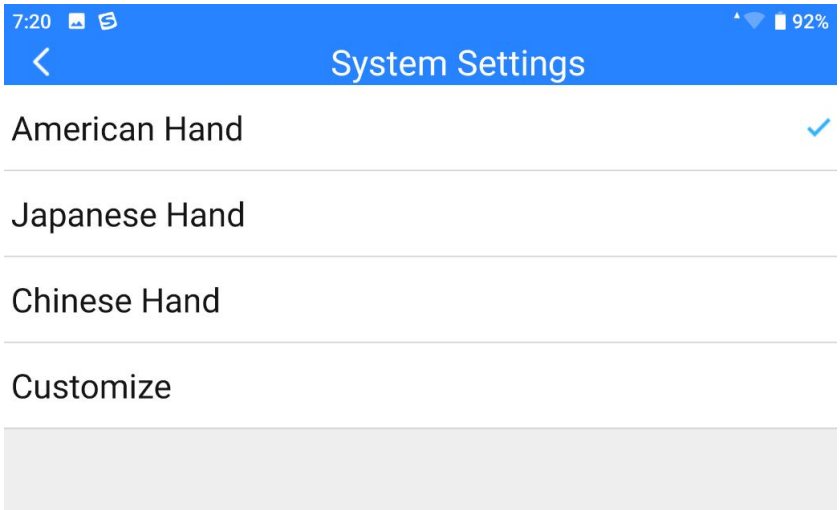
**Mark**

After turning on the function in "SIYI TX", please restart the remote controller, otherwise it won't take effect.

The function is not implemented at this moment.

### 3.3.3 Throttle Type

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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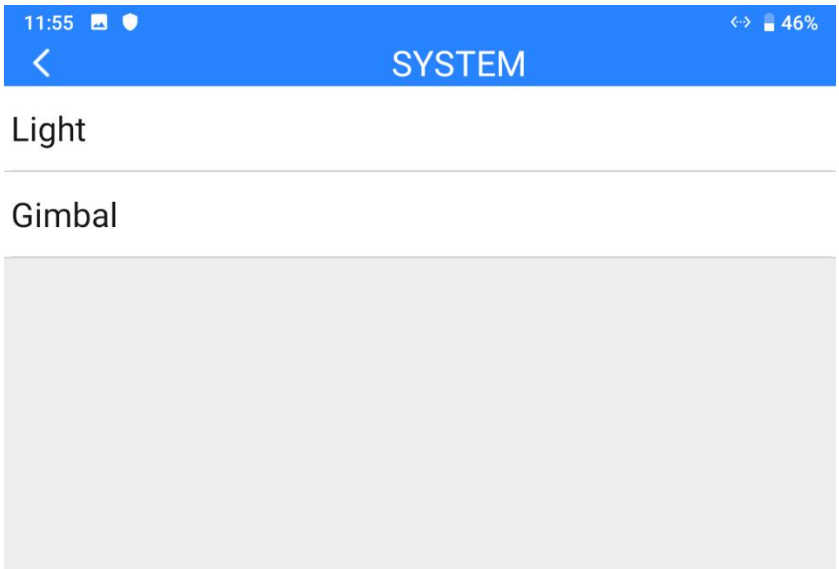
### 3.3.4 Channel 15

Switch the control of channel 15 to SIYI IP67 camera's searchlight function or A2 mini gimbal's pitch axis.




### 3.3.5 Wireless Mode

On MK15 system you can switch among different wireless communication modes to be compatible with different type of antennas with different gains. In this way, the system can have the best communication range.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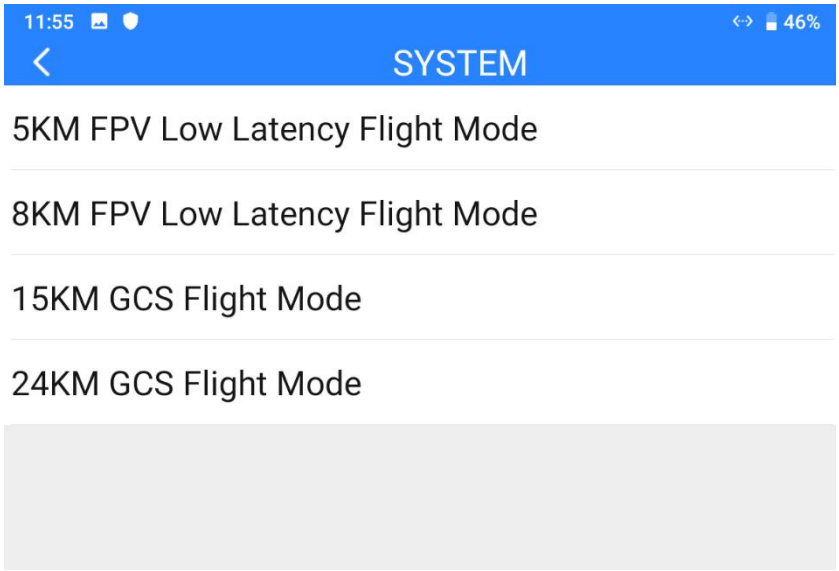


**About Wireless Mode**

- 5KM FPV Low Latency Flight Mode
- 8KM FPV Low Latency Flight Mode
- 15KM GCS Flight Mode
- 24KM GCS Flight Mode

**Mark**

Before configuring wireless modes, please carefully read the chapter 2.2 of this manual "Important Instructions on Promotion to MK32 / MK15 Communication Range and Video Fluency".

### 3.3.6 Joystick Deadzone

Configure deadzone for remote controller joysticks.


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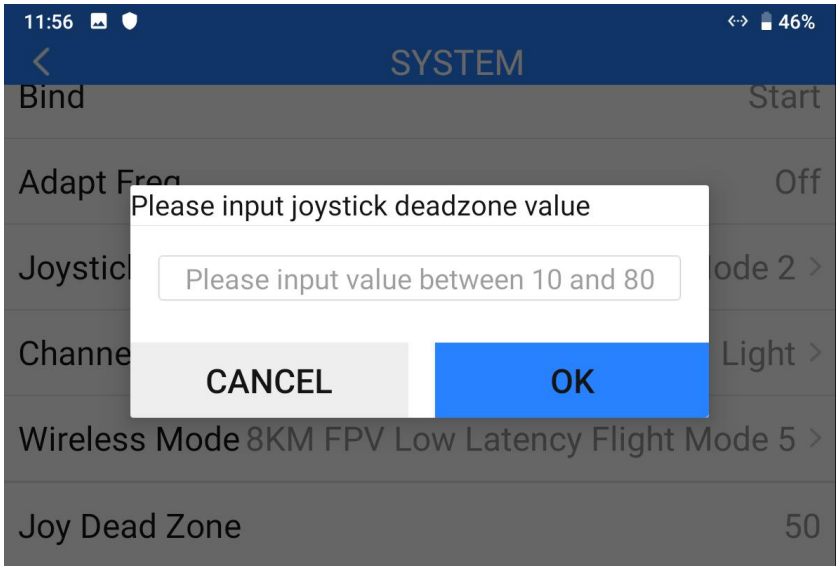
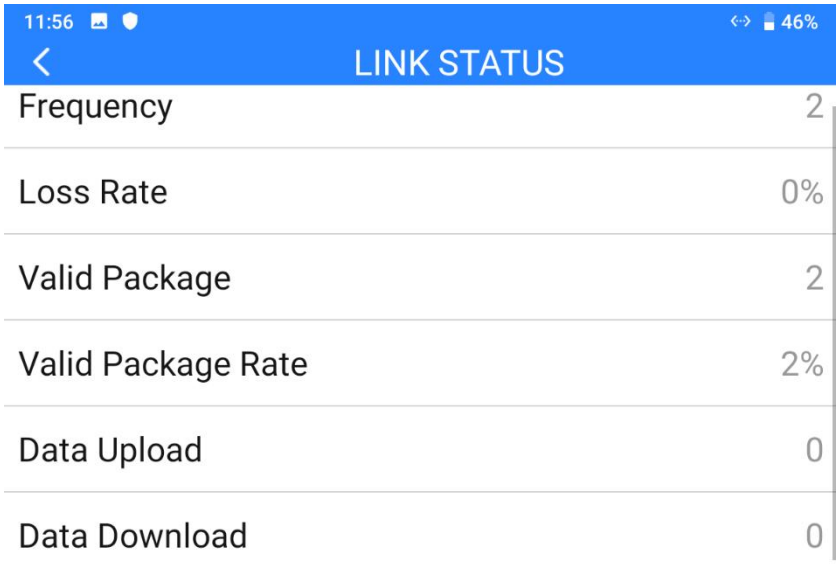



## 3.4 Link Status

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




**About Link Status**

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

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

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

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

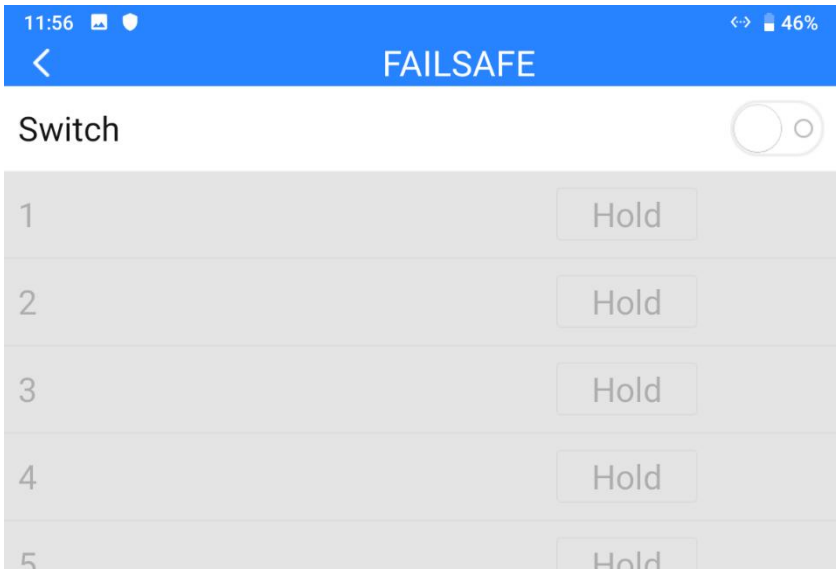
Upload: Data uploaded to the air unit per second by bit.

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

## 3.5 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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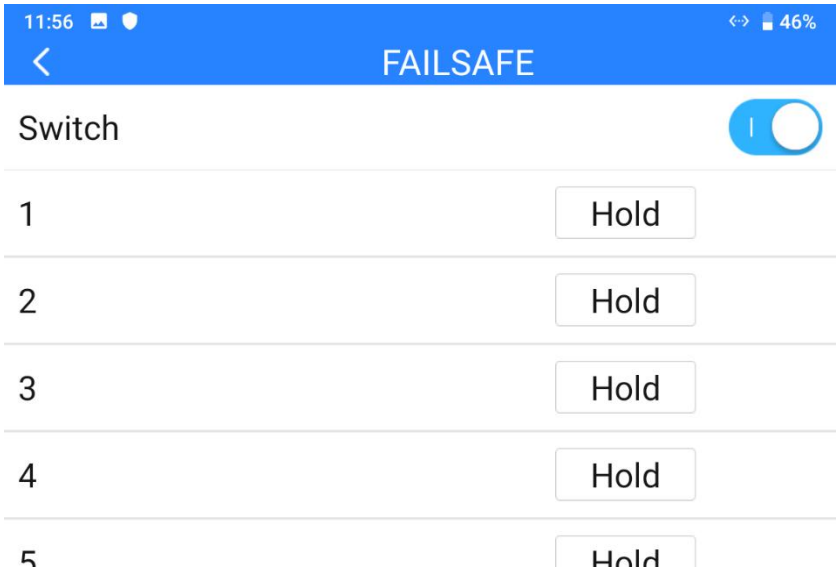
Please follow the steps below to configure your system with Failsafe function.

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.

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.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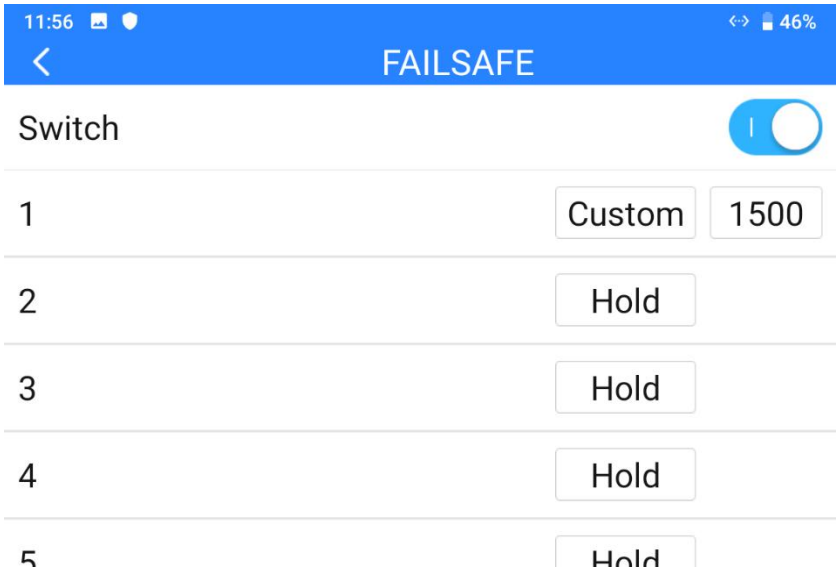


5. After configuration, the channel would output the value if the air unit lost communication with the ground unit during flight.

**Mark**

If your flight controller communicates with the air unit through S.Bus protocol, then it is unnecessary to configure your system with Failsafe function (unless it is specially required by flight controller to activate Failsafe function and switch to RTH, by holding a specific value in a channel). You just configure your GCS with protection measures, because there are Out-of-Control marks in S.Bus protocol which tells the flight controller what situations belong to Out-of-Control.


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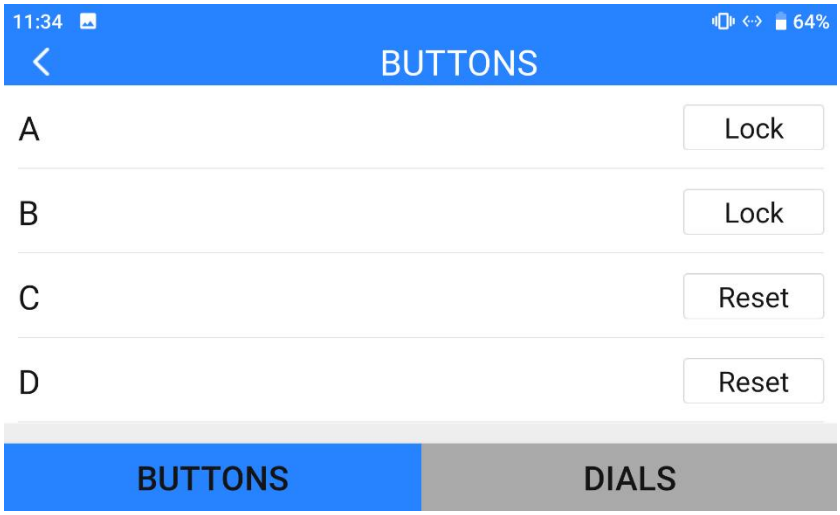
## 3.6 Buttons / Dials

MK15 remote controller supports changing the way that the buttons and the dials work by software.

### 3.6.1 Buttons

The function changes the way that the four buttons (A, B, C, D) on MK15 transmitter 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 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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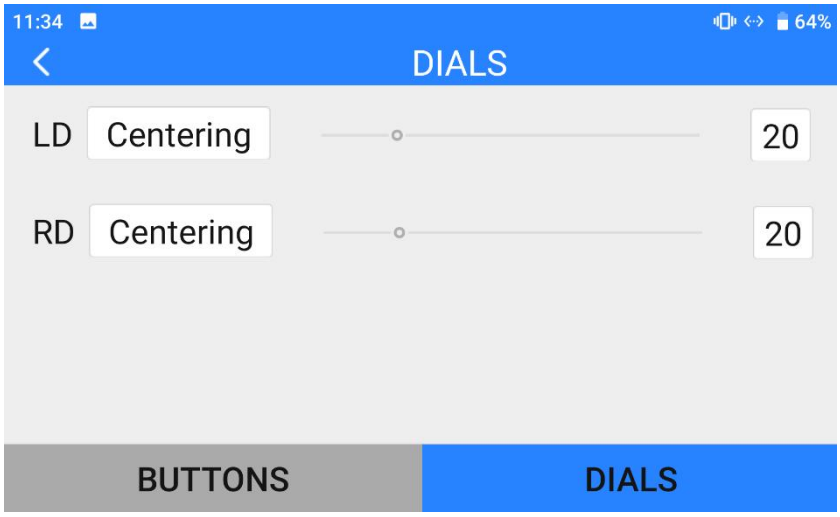
button again to reset channel output to 1050.

**Mark**

Press and hold the button, which means the channel outputs 1050, LED under the button will light on. If the button is under “Lock” status, the LED will be on still until the next pressing. If the button is under “3-Stage” status and is in middle position, the LED will blink.

### 3.6.2 Dials

The function changes the way that the two dials (LD, RD) work on MK15 remote controller.




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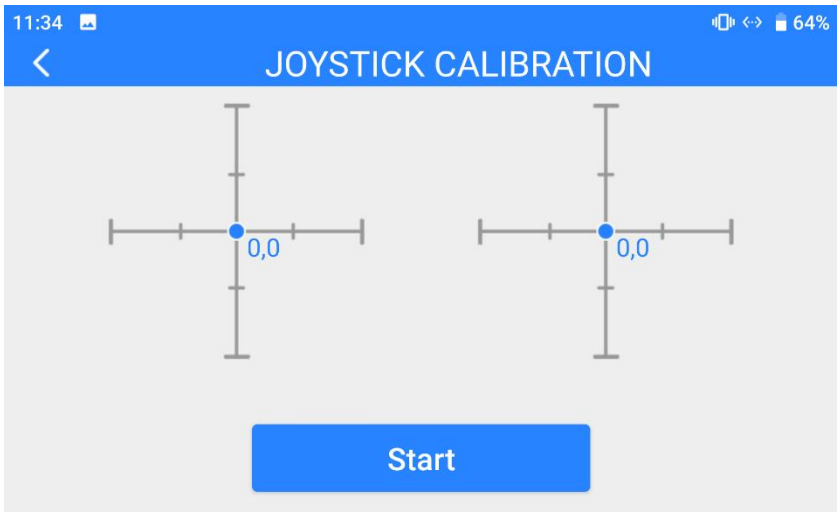
Thumb-slide: Under “Thumb-slide” mode, when you push the dial and release, the dial’s outputting value will stay at the current value.

## 3.7 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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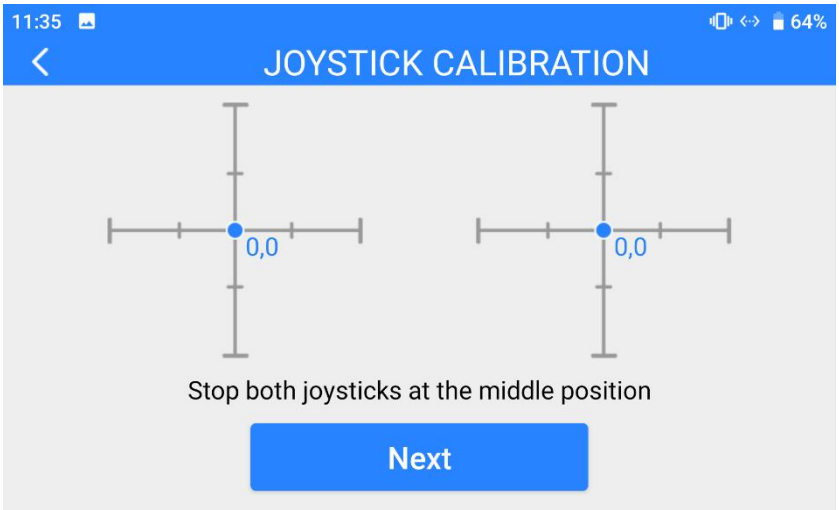
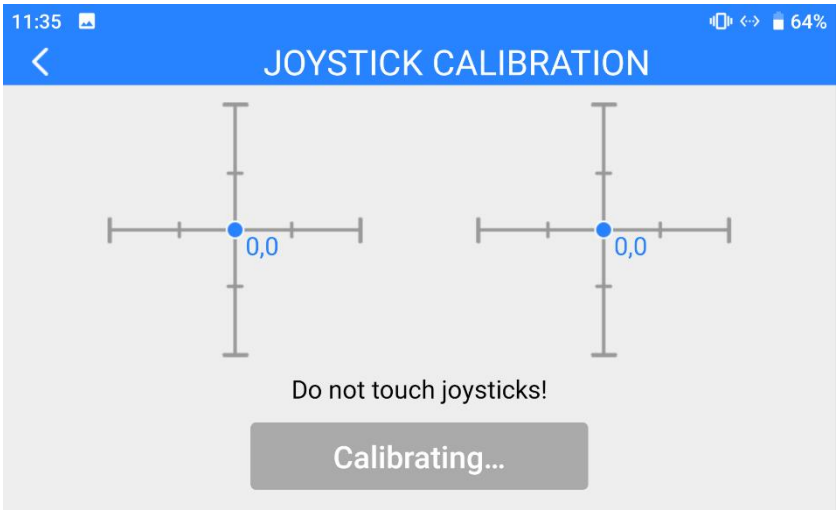



3. According to the tips, if joystick coordinates are not “(0, 0)” when both joysticks are standstill, it shows that joystick middle points are displaced. Please touch “next” and do not touch joysticks.




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.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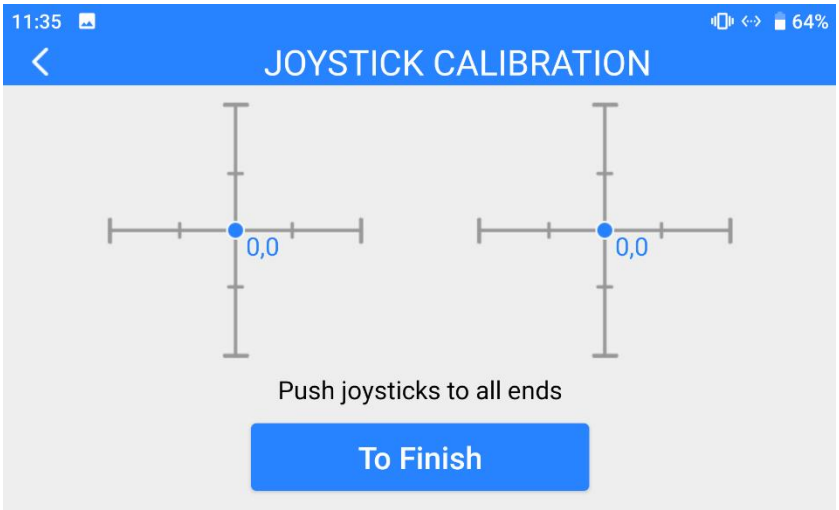



*Up: 0, 100*

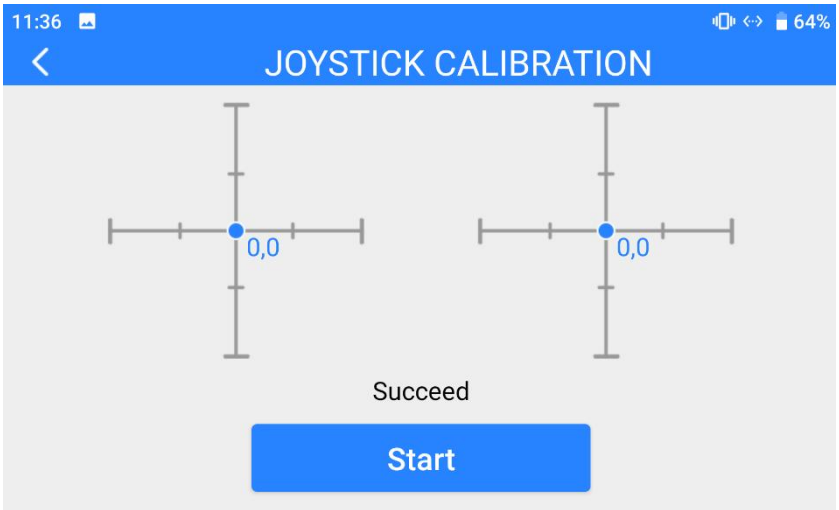
*Down: 0, -100*

*Left: -100, 0*

*Right: 100, 0*

Then touch “Finish”.

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





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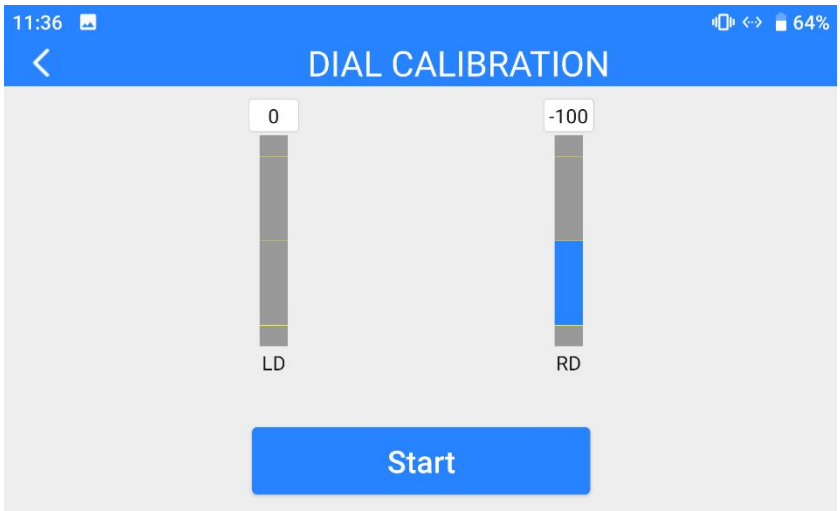
**Mark**

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.

## 3.8 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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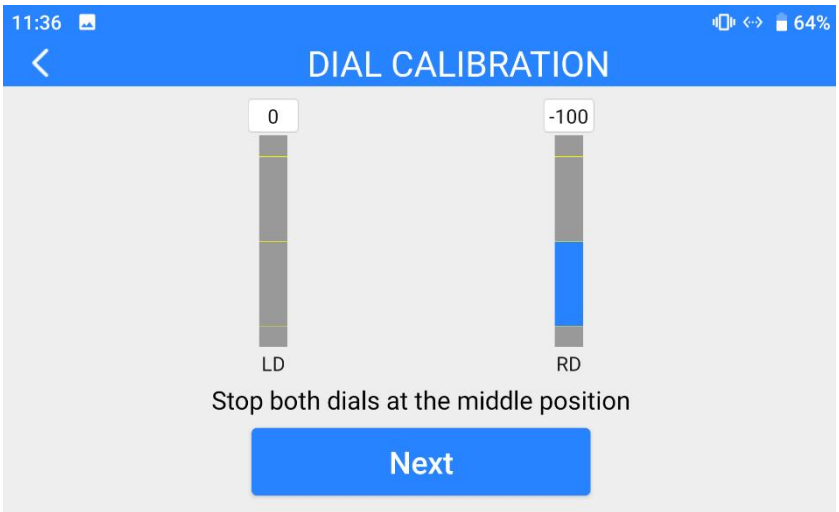
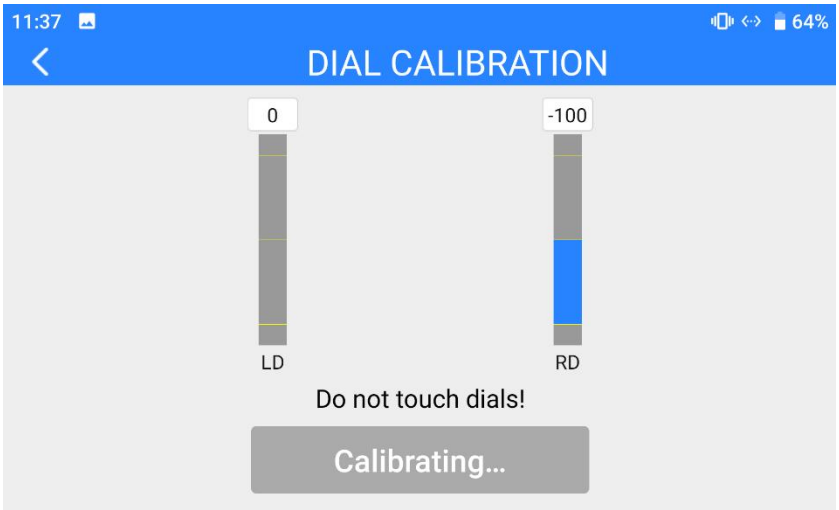



3. According to the tips, if dials' coordinates are not "(0, 0)" when both dials are standstill, it means that dial middle points are displaced. Please touch "next" and do not touch the dials.




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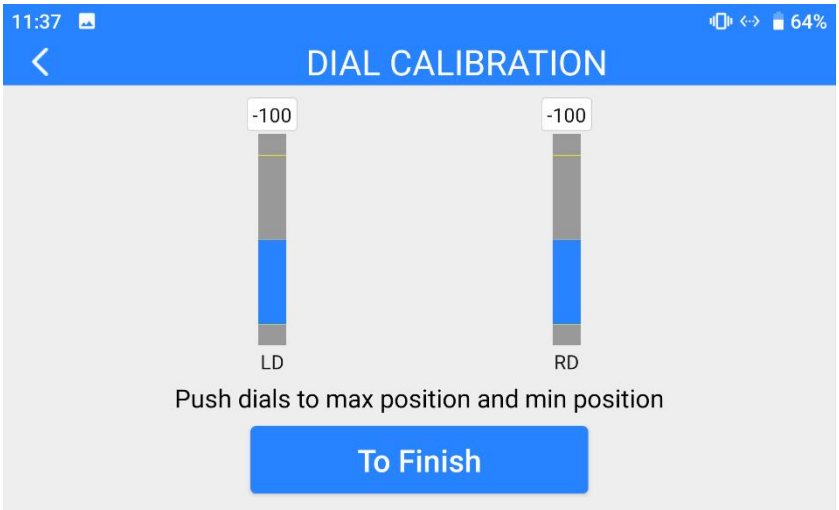
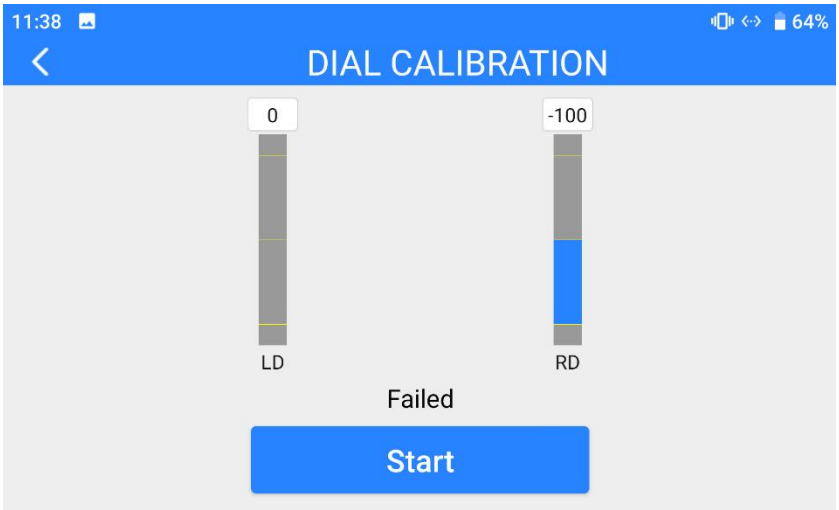



Please follow the tips again and push each dial to its maximum and minimum position.

Then touch “Finish”.

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




**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.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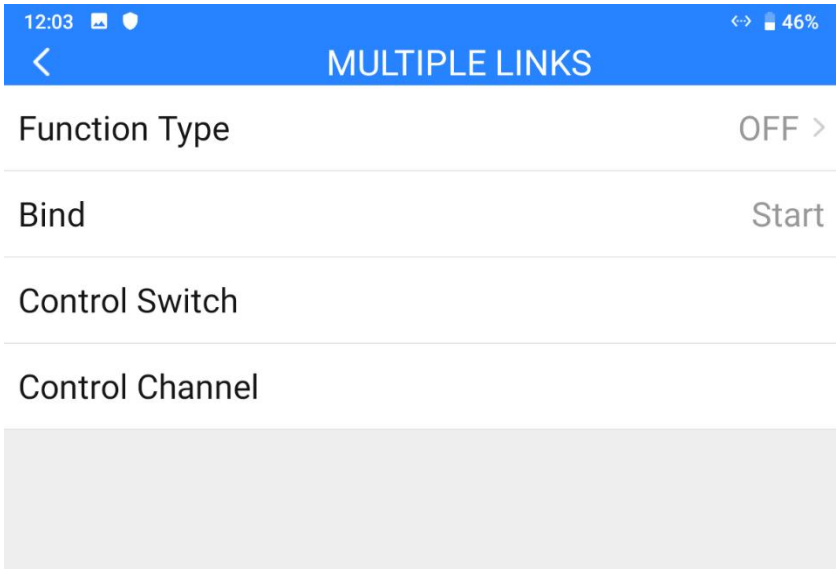
## 3.9 Multiple Links

The Multiple Links feature only comes with MK15 Dual versions, which includes details of its two main function “RC Relay” and “Dual RC”.




**About Multiple Links**

Function Type: Switch the function between “RC Relay” and “Dual RC” and switching between “TX-A” and “TX-B” at the same time.

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

Control Switch: Define a button or a switch to take over control in “RC Relay” mode, or to switch control of certain channels between “TX-A” and “TX-B” in “Dual RC” mode.

Control Channel: In “Dual RC” mode, define channel mapping for TX-A and assign channels to TX-B according to your requirement.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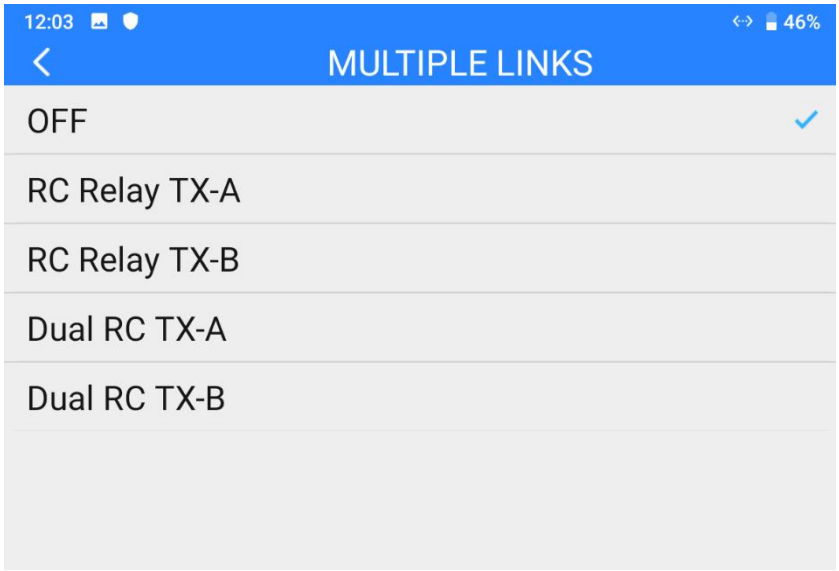
### 3.9.1 RC Relay

RC Relay function is specially developed for very long-range drone flight. In this mode, two ground units can relay control through the same air unit to reach twice of the range limit of a single system. The function can be widely used in enterprise drones for inspecting power lines, drone delivery, and cargo shipping.

**Steps**

1. Prepare two MK15 Dual versions.
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 / button / dial to switch control of the air unit from “TX-A” to “TX-B”.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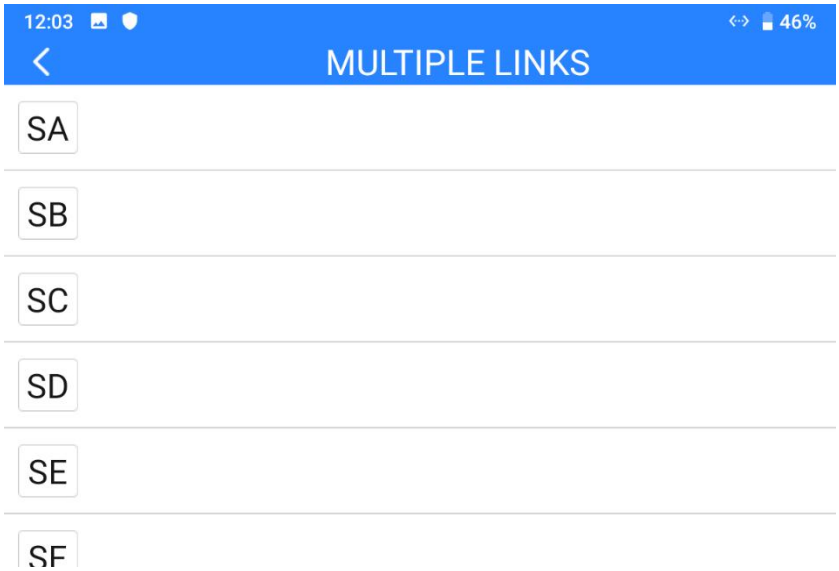


5. RC Relay settings are finished.

### 3.9.2 Dual RC

Dual RC function is developed for certain enterprise applications. In this mode, two ground units control one air unit. One ground unit can be assigned to control drone motors, and the other ground unit can be assigned to control payloads / gimbal / servos.

**Steps**

1. Prepare two MK15 Dual versions.
2. Go to “Multiple Links – Function Type”, assign the two ground units as “Dual RC TX-A” and “Dual RC TX-B”.


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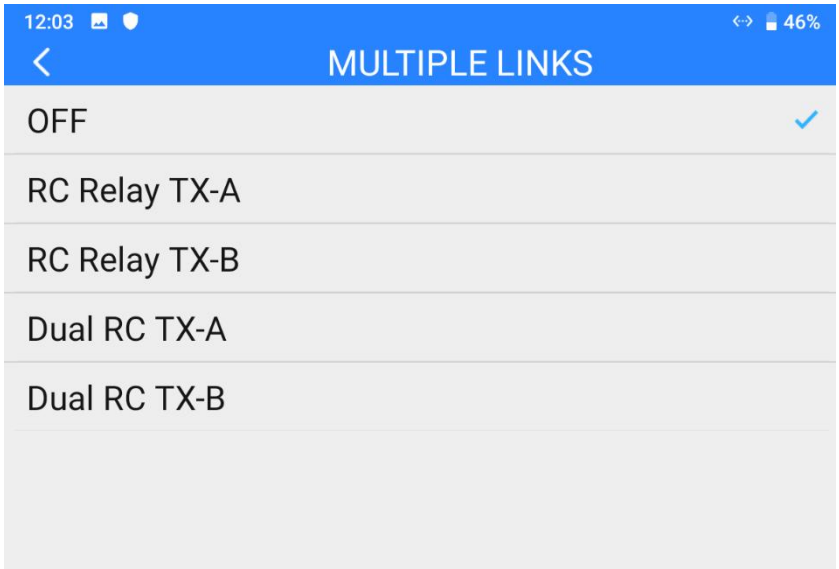
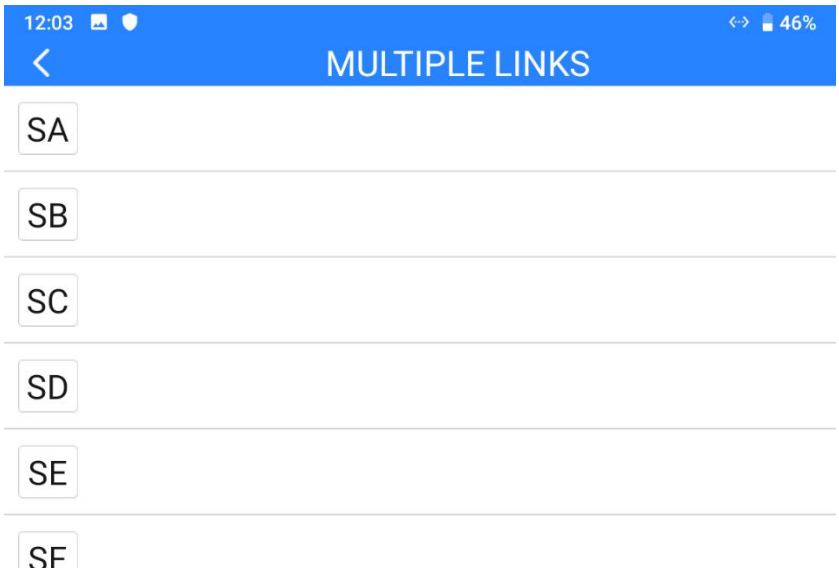



3. Bind “TX-A” and “TX-B” with the same air unit in turns.
4. In “Control Switch” page, assign a switch / button / dial to switch control to the air unit from “TX-A” to “TX-B”.




5. In “Control Channels” page, configure channel mappings for “TX-A”, then assign the decided channels to “TX-B”. Thus, when the Dual RC function is enabled, “TX-A” can authorize to “TX-B” or withdraw from “TX-B” the control of the assigned channels.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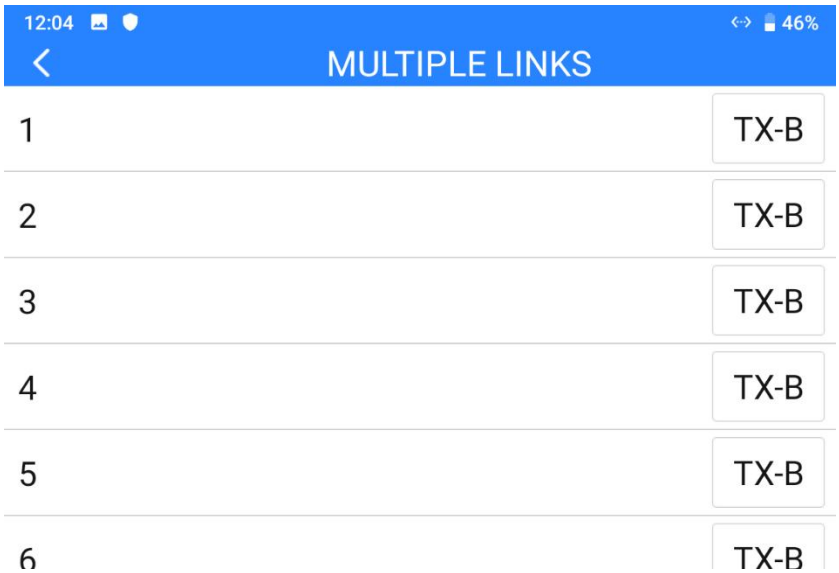


6. Dual RC settings are finished.

**Mark**

Dual RC function works similarly to Wireless Coach function. Thus, MK15 Dual versions can also be used for drone training and education.

**DANGER**

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

## 3.10 Device Info

Displays the major factory information of the system.


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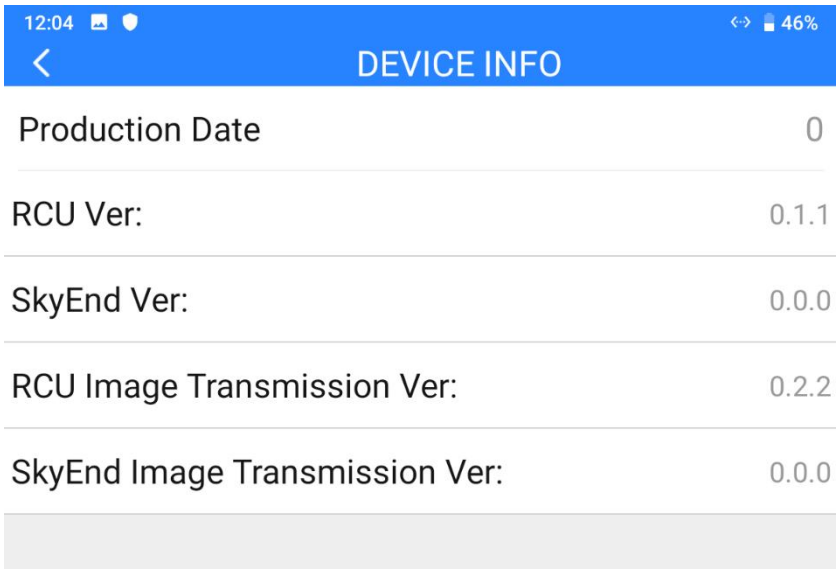


**About Device Info**

Production Date: Displays the manufacturing date of the system.

RC Firmware Version: Displays the MCU firmware version of the remote controller.

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

RC FPV Firmware Version: Displays the FPV firmware version of the remote controller.

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


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# 4 DATALINKS

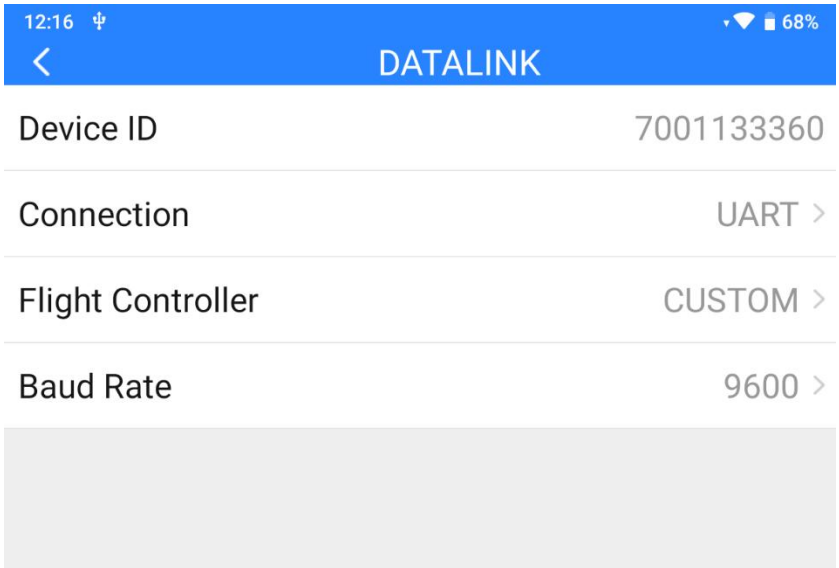
Datalink is one of the core features of most SIYI radio systems.

MK15 remote controller supports communication with different ground control software through various hardware interface.

## 4.1 Communication with GCS through UART (Taking JIYI Agri-Assistant as an Example)

Let's take JIYI Agri-Assistant as an example.

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, the application will pop up a window for datalink connection options, choose "MK15" and "OK".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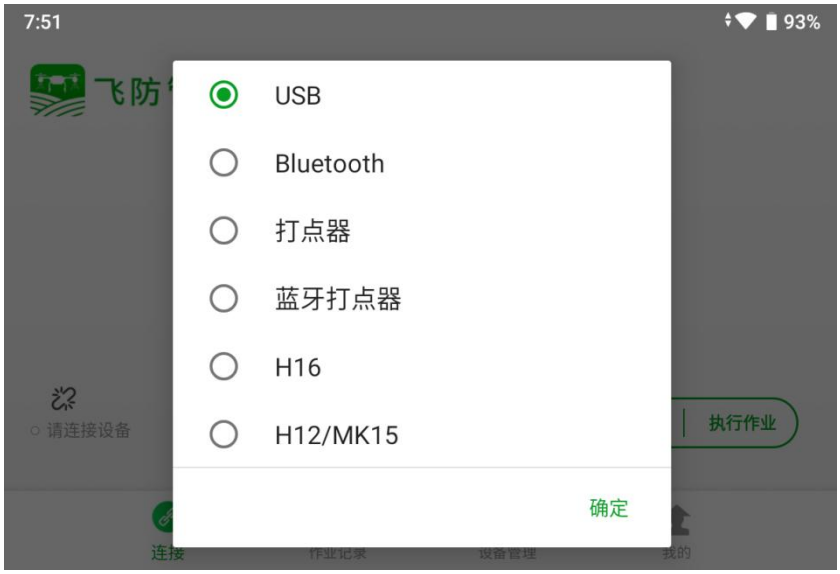


3. After confirming, remote controller will communicate with JIYI app automatically and shows “device connected”. Datalink connection is established.

**Mark**

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


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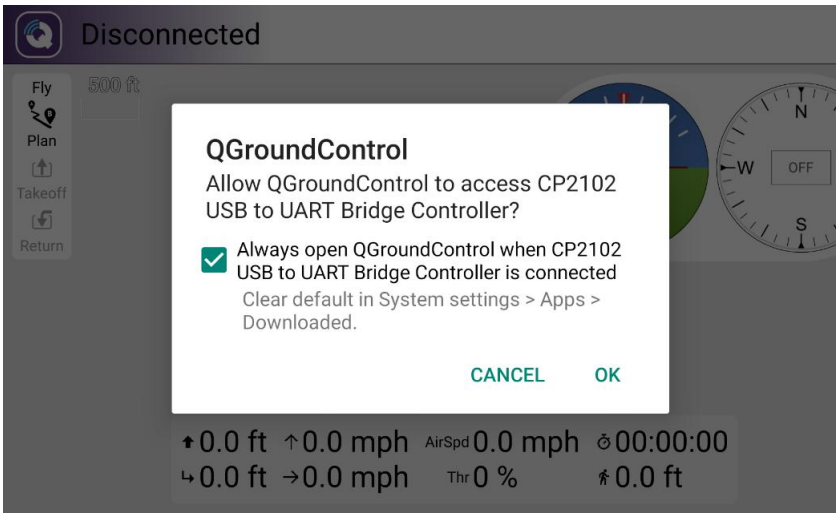
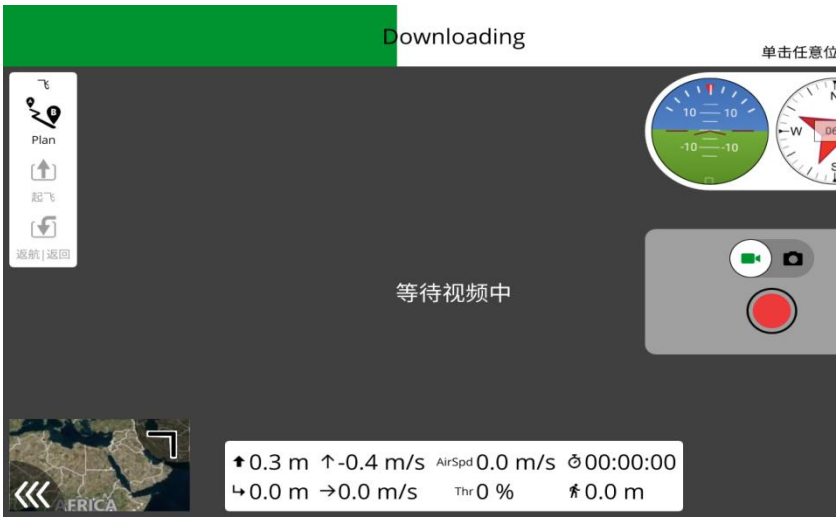
## 4.2 Communication with GCS through USB COM (Taking QGC as an Example)

Let's take QGroundControl as an example.

1. In "SIYI TX" app, go to "Datalink", and choose "USB COM" in "Connection".
2. Open QGC, the software will pop up a window to ask if "Allow QGroundControl to access CP2102 USB to UART Bridge Controller?" Check and touch "OK".




3. The top progress bar in QGC starts to move, which means the remote controller is trying to communicate with QGroundControl. After that the datalink connection will be established.





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**Mark**

SIYI links support multiple baud rates. This guide uses common baud rate “57600” for your reference.

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 Communication with GCS via Bluetooth (Taking QGC as an Example)

Let’s take QGroundControl as an example.

1. In “SIYI TX” app, go to “Datalink”, and choose “Bluetooth” in “Connection”.
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. Open QGC, go to “Application Settings” page, touch “Comm Links” and “Add” a new connection.


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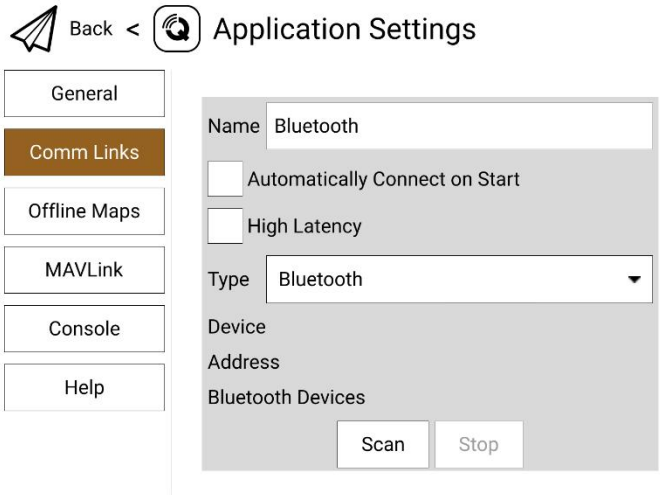
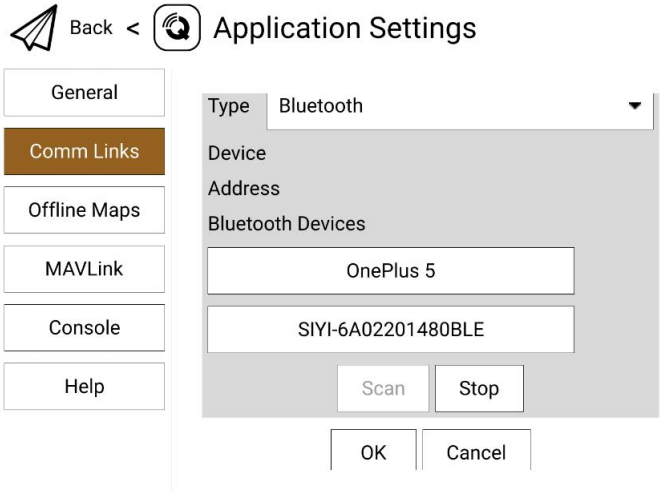
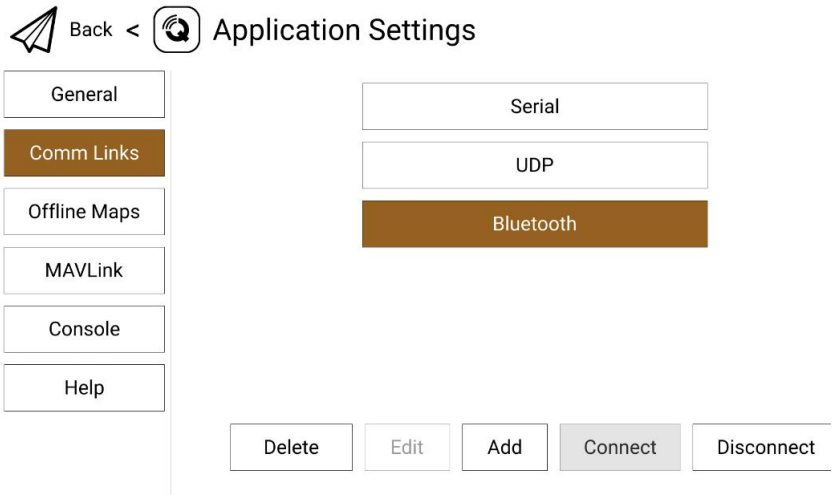



4. Set the type as “Bluetooth”, then touch “Scan”.




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.





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6. Touch the configured “Bluetooth” connection and touch “Connect”, Bluetooth connection is finished.

**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.

## 4.4 Communication with Windows GCS through Upgrade Port (Taking Mission Planner as an Example)

Let’s take Windows Mission Planner as an example.

1. In “SIYI TX” app, go to “Datalink”, and choose “Upgrade Port” in “Connection”.
2. Connect MK15 remote controller’s upgrade port to the Windows computer, the Windows computer will generate a communication port for MK15 ground unit.
3. Run Mission Planner on Windows and select the relevant port and baud rate for the connection. Then click to connect.


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4. Wait till the connection is established.

## 4.5 Communication with GCS by UDP (Taking Android QGC as an Example)

Let's take QGroundControl as an example.

1. In "SIYI TX" app, go to "Datalink", and choose "UDP" in "Connection".
2. Go to "Application Settings" in QGC, touch "Comm Links" and "Add" a new connection.


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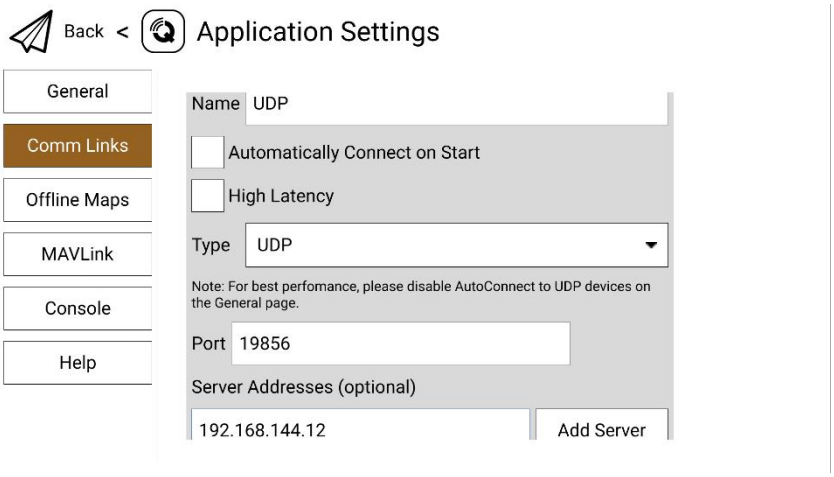
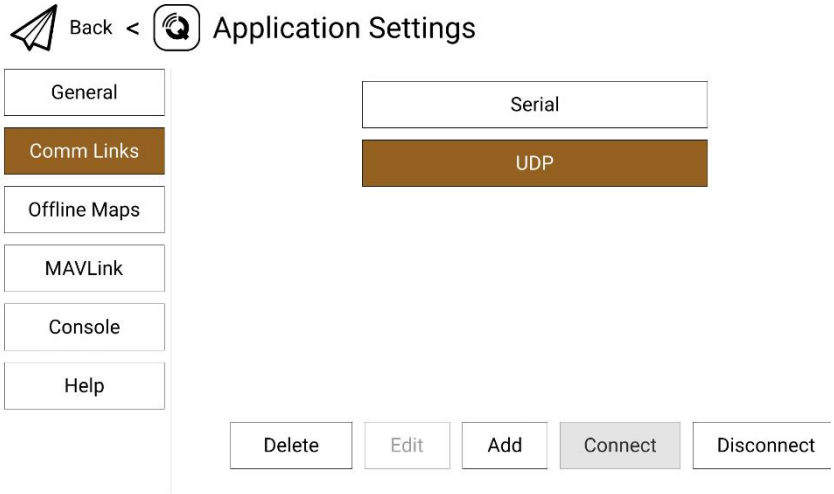



3. Name the connection as “UDP”, set the type as “UDP”, the port as “19856”, the server address as “192.168.144.12” and “Add Server”, then touch “OK” to return to the Comm Links page.




4. Touch the configured “UDP” connection and touch “Connect”, UDP connection is finished.

## 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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## 4.6 Solutions to Disconnection

If SIYI system failed to establish datalink connection with GCS, please try to follow the steps below to investigate possible reasons.

1. Confirm if the ground unit is bound with the air unit.
2. Confirm if the air unit is connected to the flight controller through telemetry cable.
3. In “SIYI TX” app, go to “Link Status” page to check connection status between the ground unit and the air unit. When connection is normal, data “download” is not 0. If it is “0”, please go back to check step 1 and 2.
4. Then go to “Datalink” page in SIYI TX app and check:
   - If “Connection” is correctly configured?
   - If “Flight Controller” is correctly configured?
   - If “Baud Rate” is correct when you use customized flight controller.
   - In your GCS, check if “Datalink” port is correctly configured.
5. If the flight controller is from Pixhawk family, please try to switch telemetry cable connection between the TELEM 1 port and the TELEM 2 port.

**Mark**

If you have done investigation by following all steps above, but the reason is still not located, please contact your dealer or SIYI immediately.


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## 4.7 SDK Communication Protocol for Datalink

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

### 4.7.1 Format

| Field | Index | Bytes | Description |
|---|---|---|---|
| STX | 0 | 2 | 0x5566: starting mark |
| CTRL | 2 | 1 | 0: need_ack (if the current package need "ack")<br>1: ack_pack (if the package is an "ack" package)<br>2-7: Reserved |
| Data_len | 3 | 2 | Data field byte length.<br>Low byte in the front. |
| SEQ | 5 | 2 | Frame sequence (0~65535) .<br>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.<br>Low byte in the front. |

### 4.7.2 Command

**Acquire the Hardware ID of the Ground Unit**

| CMD_ID:0x40 ------ Hardware ID | | | |
|---|---|---|---|
| Send data format | | | |
| No. | Data Type | Data Name | Data Description |


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

## Acquire System Settings

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


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## System Settings

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

## Remote Control Channels

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

| CMD_ID:0x42 ------ RC Channel Data | | | |
|---|---|---|---|
| Send data format | | | |
| No. | Data Type | Data | Data Description |


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| | | Name | |
|---|---|---|---|
| | Uint8_t | freq | Output Frequency<br>0: OFF<br>1: 2Hz<br>2: 4Hz<br>3: 5Hz<br>4: 10Hz<br>5: 20Hz<br>6: 50Hz<br>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 | |

## Acquire RC Link Status

| CMD_ID:0x43 ------ | | | |
|---|---|---|---|
| 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 |


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

## Acquire FPV Link Status

| CMD_ID:0x44------ | | | |
|---|---|---|---|
| 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


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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 00 00 00 00 00 A4 15 00 00 6C 00 00 00 2C D9


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### 4.7.3 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 UART)** (Baud rate is the same with datalink baud rate)

**3) Bluetooth**

**4) MK15 Remote Controller Upgrade Port or MK32 Ground Unit Type-C Port (Virtual serial port based on USB port)**


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### 4.7.4 Communication Interface

```
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)
{
	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,
```


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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,

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,


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```
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 multiple SIYI devices for image transmission settings, camera settings, video stream display, and link status monitor.

**Mark**

The manual is edited based on SIYI FPV App v2.5.498.

SIYI FPV App can be download from the SIYI official links.

SIYI FPV App compatible SIYI devices.

- ZR30 4K AI 180X Hybrid Zoom Optical Pod
- A2 mini Ultra-Wide-Angle FPV Gimbal
- MK32 Enterprise Handheld Ground Station
- A8 mini AI Mini Zoom Gimbal Camera
- ZR10 2K 30X Hybrid Zoom Optical Pod
- R1 / R1M HD Recording FPV Camera
- Air Unit HDMI Input Converter
- HM30 Full HD Image Transmission System
- MK15 Mini HD Handheld Smart Controller


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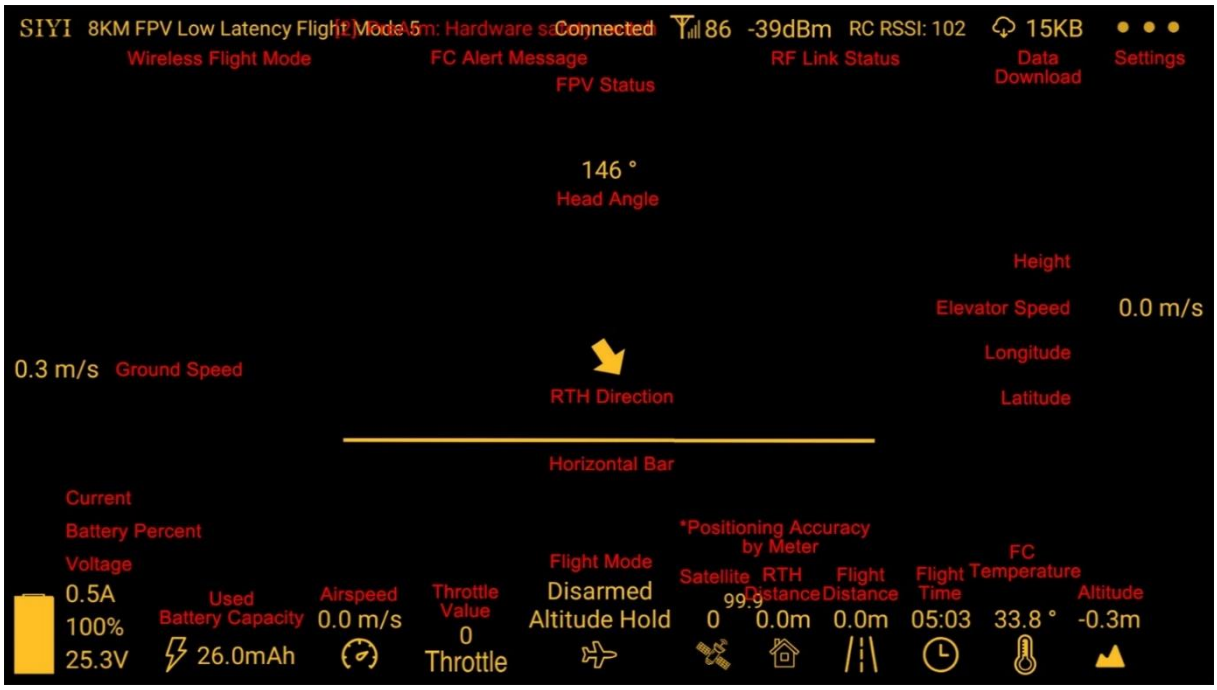
## SIYI FPV App OSD Information Definition




## SIYI FPV Camera Function Icon Definition

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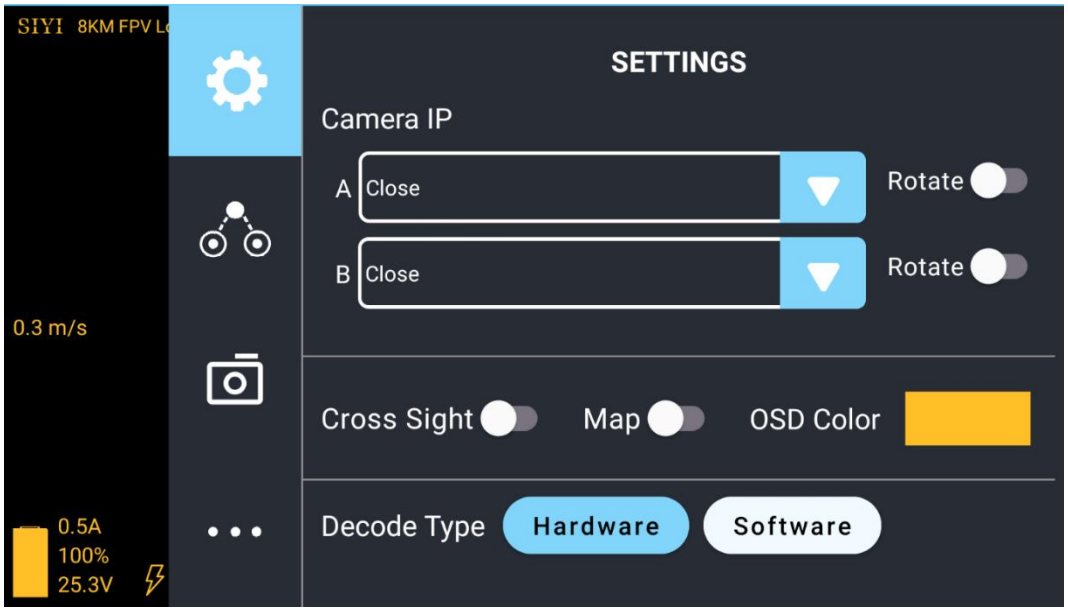
## 5.1 Settings

In the “Settings” page, you can configure camera IP Addresses, configure application interface, switch decoding type.




**About Settings**

Camera IP: Select SIYI Camera 1 and SIYI Camera 2, or input camera RTSP addresses manually, or disable image. The “Rotate” buttons can rotate the image in 180 degrees.

Cross Sight: Display a cross sight in the center of the image.

Map: Display the flight map at the left-bottom corner of the app.

OSD Color: Adjust the color of all OSD information.

Decoding Type: Switch between “Hardware Decoding” and “Software Decoding”. Please refer to your video input device to choose the decoding type with the best performance.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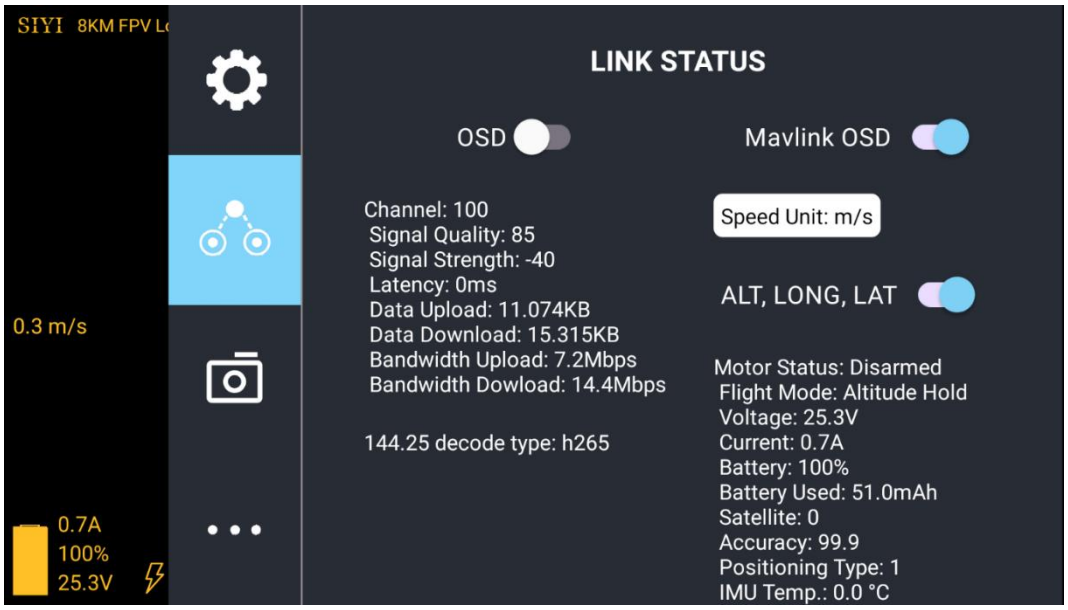
## 5.2 Link Status

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.

## 5.3 Gimbal Camera

Configure the basic functions for SIYI gimbal cameras and cameras.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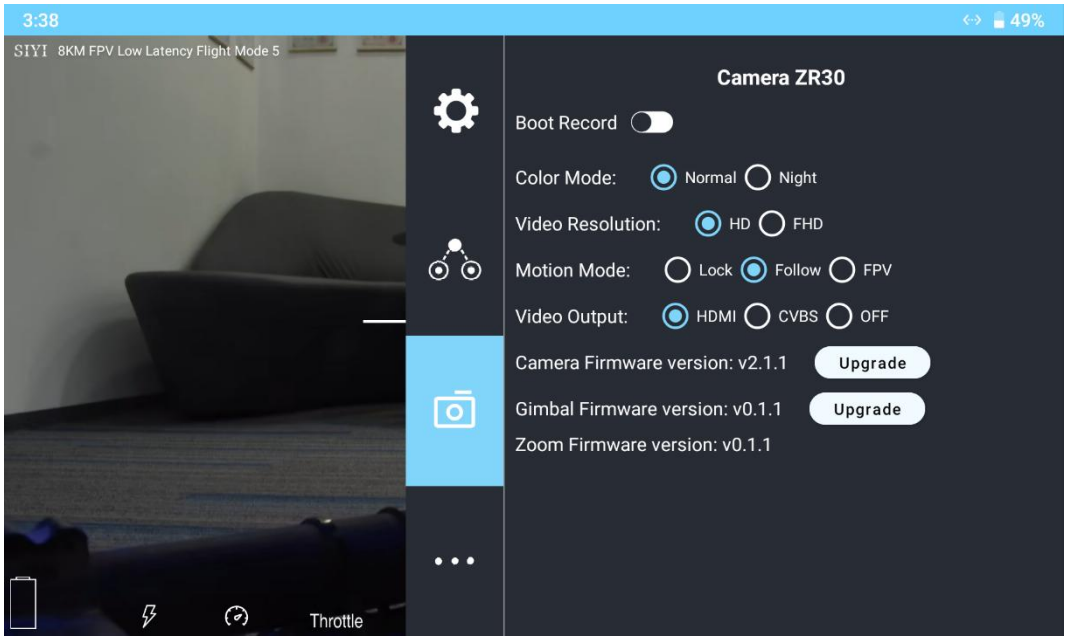


**About Gimbal Camera**

Auto Record: Turn on / off automatically video recording by TF card on gimbal camera start.

Record Resolution: Switch camera record resolution between HD (720p), Full HD (1080p), 2K, and 4K (under 4K recording resolution, A8 mini camera does not zoom).

Video (Stream) Resolution: Switch camera real-time streaming resolution between HD (720p) and Full HD (1080p).

Gimbal Working Mode: Switch gimbal motion mode between 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 enhanced stable images.


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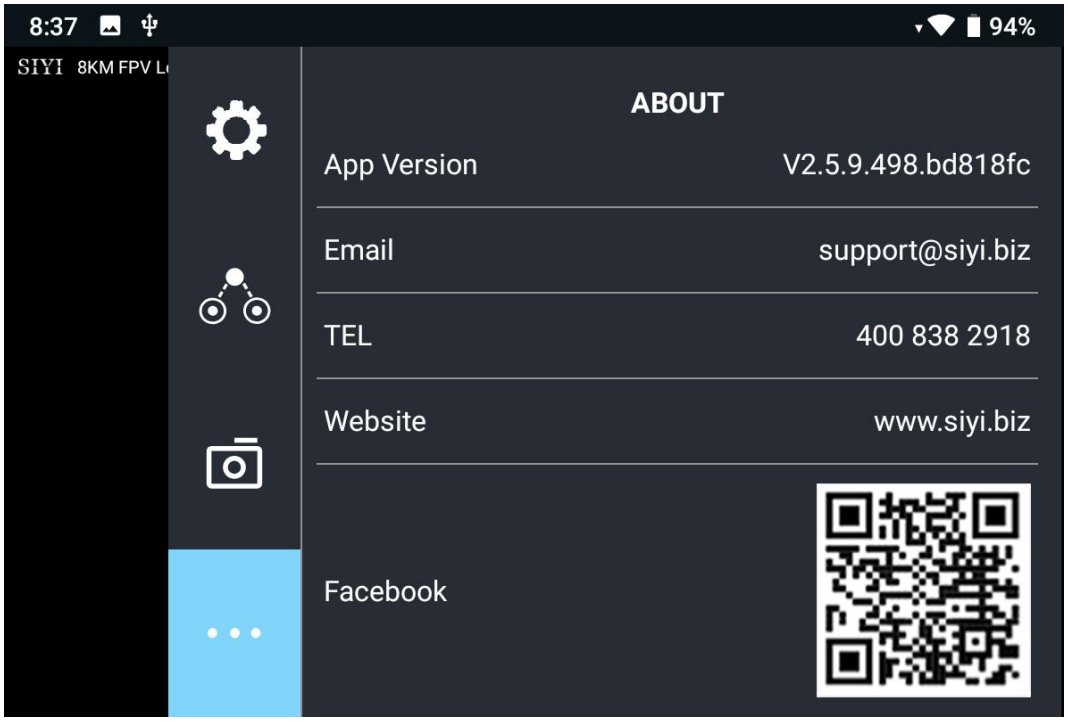
Camera Firmware Version: Display the current camera firmware version.

Gimbal Firmware Version: Display the current gimbal firmware version.

Zoom Firmware Version: Display the current zoom firmware version.

## 5.4 About SIYI FPV

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





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# 6 IMAGE TRANSMISSION

MK15 Air Unit supports maximum 1080p @ 60 fps and average 180ms low-latency HD image transmission. It connects to most IP cameras and pods on market and can connect to HDMI cameras/pods through an HDMI converter.

Please refer to the diagram in Chapter 1.5 of this manual to connect your SIYI IP Camera, Third-Party IP Camera/Pod, or HDMI Camera/Pod with MK15 Air Unit. Then follow the steps below to acquire image transmission display.

## 6.1 Using SIYI Cameras or Gimbals (Taking A8 mini gimbal as an Example)

Gimbal camera can connect to air unit directly, then you can control gimbal rotation, gimbal functions, and display video in SIYI FPV app on screen after binding it with the air unit.

### 6.1.1 Preparation

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


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- MK32 / MK15 Handheld Ground Station (MK32 / MK15 standard combo is suggested for using conveniently with A8 mini gimbal camera)
- A8 mini Gimbal Camera

**Mark**

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

- A8 mini SIYI Video Cable

**Mark**

Above tools come with gimbal camera package.

- SIYI FPV App (v2.5.8.498 or latest version)

**Mark**

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

**Steps**

1. Power air unit and bind it with ground station.
2. Use SIYI Video Cable to connect the air unit's video port with the gimbal camera's video port.
3. Update SIYI FPV app.


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4. Run SIYI FPV app, go to “Settings – Camera A8 mini”, and select “SIYI Camera 1” (when IP addresses are 192.168.144.25) or “SIYI Camera 2” (when IP addresses are 192.168.144.26), 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 is running, sliding on touchscreen can control gimbal motion. Sliding left and right are yaw rotation, up and down are 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.

### 6.1.3 Zoom

Touching “Zoom in” or “Zoom out” icon on SIYI FPV app can control camera image zooming, up to 6X digital.

### 6.1.4 Take pictures and Record Video

Touch “Photo” icon once on SIYI FPV app to take a picture. Touch “Record” icon to


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start video recording. Touch “Recording” icon to stop video recording.

**Mark**

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

## 6.2 Using Third-Party IP Cameras / Pods

Before connecting a third-party camera or pod to the air unit, please change its IP address to “192.168.144.X”.

**Mark**

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

Let’s take QGroundControl as an example.

1. In camera settings, check and copy the RTSP address of your IP camera / pod.
2. In QGC, go to “General” page and slide to “Video Settings”.


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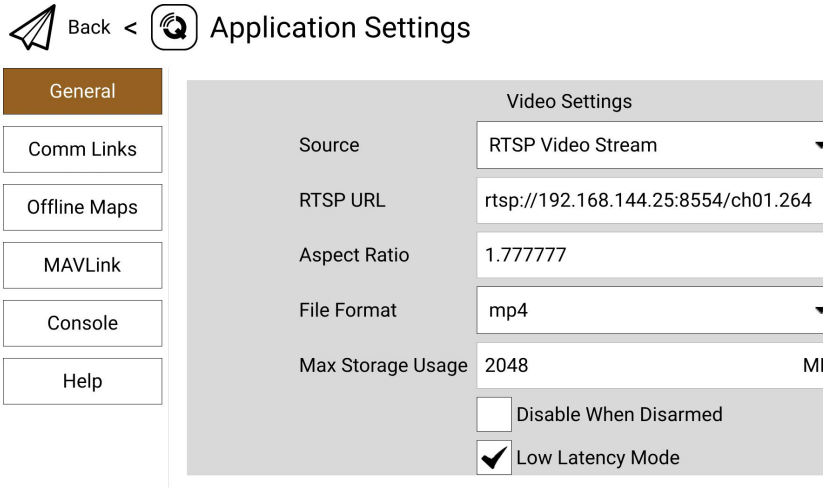


3. Configure “Source” as “RTSP Video Stream”. Then input the copied RTSP address of your IP camera/pd after “RTSP URL”.
4. Go back to QGC home page to check image display.

## 6.3 Using HDMI Cameras / Pods

If you use SIYI air unit HDMI input converter to connect the air unit with your HDMI camera, please refer to the steps below for acquiring image transmission.

### Steps

Let’s take QGroundControl as an example.

1. Open QGC, go to “General” page and slide to “Video Settings”.
2. Configure “Source” as “RTSP Video Stream”. Then input SIYI HDMI converter’s RTSP address after “RTSP URL”.
3. Go back to QGC home page to check image display.


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## 6.4 Dual Video Stream Connection

After connecting the FPV Hub to the air unit, dual video stream will work in many ways.

### 6.4.1 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”.

### 6.4.2 Dual Third-Party IP Cameras / 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.

### 6.4.3 SIYI HDMI Converter and 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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**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.

## 6.5 Common IP Addresses

Air Unit IP Address: 192.168.144.11

Remote Controller IP Address: 192.168.144.12

Android System IP Address: 192.168.144.20

SIYI Camera / Gimbal IP Address: 192.168.144.25

IP67 Camera A's IP Address: 192.168.144.25

IP67 Camera B's IP Address: 192.168.144.26

Air Unit HDMI Input Converter's IP Address: 192.168.144.25

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

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

Air Unit HDMI Input Converter's RTSP Address: rtsp://192.168.144.25:8554/main.264

Common Video Player: SIYI FPV, QGroundControl, EasyPlayer

Video Display URL: Please refer to the addresses given in camera settings. Cameras from different manufacturers come with different IP addresses.

Network Diagnosis Tool: Ping Tools


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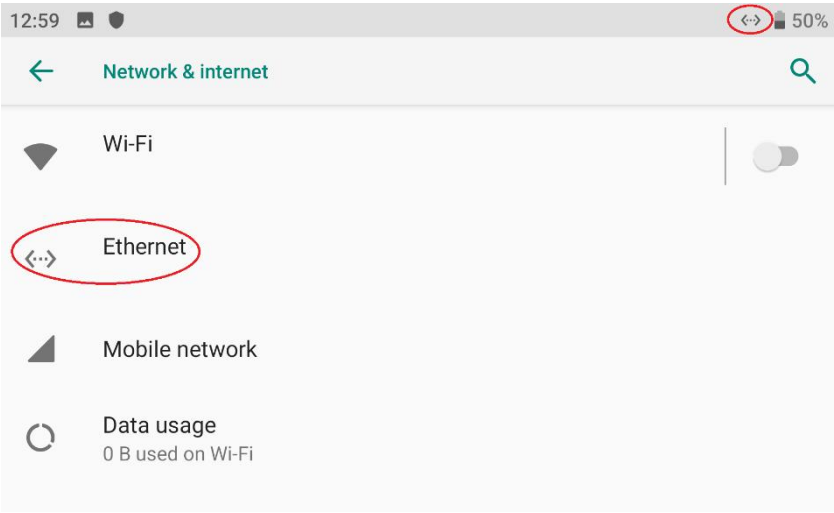
## 6.6 Solutions to No Image

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

1. Confirm if the ground unit is bound with the air unit and confirm if the camera is well connected to the air unit.
   - Ground unit and air unit status indicator is green.
2. Open “SIYI FPV” app and check if the IP address of the camera, the gimbal, or the HDMI converter is input correctly. For third-party IP cameras, please refer to their camera settings for detail IP addresses.
3. In the main menu of the ground unit Android system, check if the Ethernet icon exists. If not, please enable Ethernet function.




**Mark**

If you have done investigation by following all steps above, but the reason is still not located, please contact your dealer or SIYI immediately.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## 6.7 Output Video Stream to Other Device

There are multiple ways to output video stream from MK15 ground unit to other devices.

### 6.7.1 Through Ground Unit HDMI Port

Let's take an example of outputting video stream to an HDMI monitor.

Use a standard HDMI cable to connect MK15 ground unit's standard HDMI port to the monitor's HDMI port, then the image of the ground unit screen will display in the HDMI monitor.

### 6.7.2 Through WiFi Hotspot

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

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


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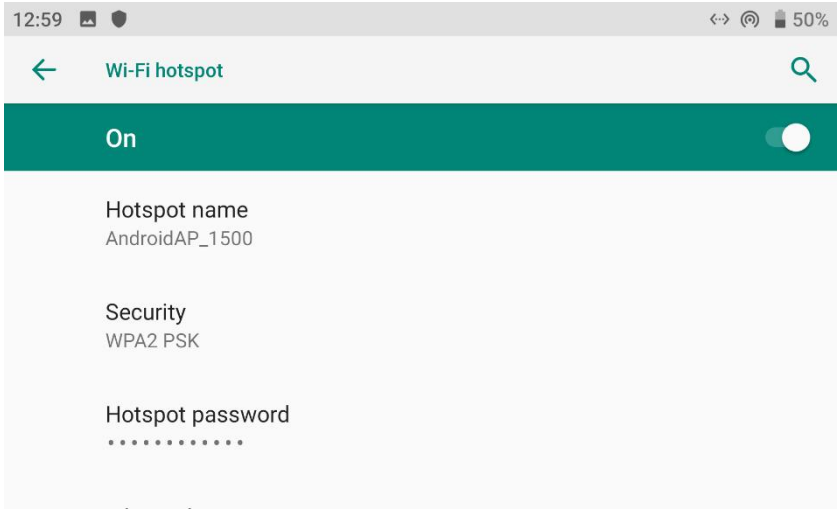
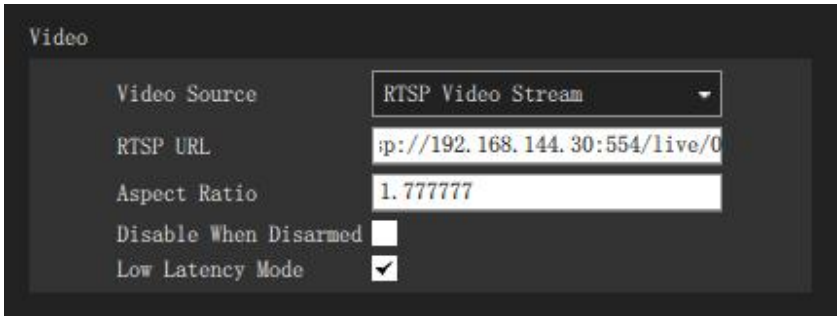



3. Enable “Wi-Fi Hotspot”, configure the hotspot name and its password.
4. Connect the laptop’s WiFi to MK15 ground unit’s Android “Hotspot”.
5. Open QGroundControl GCS on the laptop. Go to “Application Settings - Video”. Change the video source to “RTSP Video Stream”.




6. In “RTSP URL”, input the RTSP address of the camera, or the device connected with MK15 air unit, then you will see the video stream from the camera or the device on the laptop.

## Mark

If the same video stream is displayed in the device connected to the ground unit Wi-Fi hotspot and in ground unit at the same time, then one of the displayed video streams may delay or stuck due to bandwidth limit. If it happens, please disable one of the video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streams, or you can configure one video stream as “SIYI Camera 1 / 2”, another video stream as RTSP addresses.


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# 7 ANDROID OS

## 7.1 Download App

Pre-installed applications in the remote controller are:

- SIYI TX
- SIYI FPV
- Ping Tools

If you need to download the above apps, please visit the relevant product pages on SIYI Official Sites (shop.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 to the TF card slot at bottom MK15 ground unit. Copy the files from the TF card to Android system storage, then go to “Files” in Android system to find the files and install.

### 7.2.2 Through USB Disk

Save files into your USB disk and insert it to the USB port on top of the ground unit. Copy the files from the USB disk to Android system storage, then go to “Files” in


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Android system to find the files and install.

**CAUTION**

Please try to simplify the Android system as much as possible and avoid installing useless apps, in case of any unexpected issues during flight.

### 7.2.2 Through Type-C by File Transfer

Save files into your computer and connect MK15 ground unit's Type-C port to the computer's USB port. Choose "File Transfer" in MK15 Android system when it pops up a window menu. Move the files from the computer storage to Android system storage, then go to "Files" in Android system to find the files and install.


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# 8 Firmware Upgrade

SIYI Assistant is a Windows program developed by SIYI for RC channel settings, firmware upgrade, gimbal camera settings for almost all SIYI products.

**Mark**

The manual is edited based on “SIYI Assistant v1.3.2”.

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 Assistant (Windows program)
- Remote Controller Firmware
- Air Unit Firmware

**Mark**

Above software and firmware can be downloaded from relevant product pages in SIYI official sites.


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- Fast Charging Cable (Type-C to Type-C)
- Converter (Type-C to USB)

**Mark**

Above tools come with product package.

**Firmware Upgrade Steps**

1. Install “SIYI Assistant” into your Windows device.
2. Connect your remote controller’s upgrade port to your Windows device’s USB port.
3. Run “SIYI Assistant” and switch to the “Upgrade” page to check the current firmware version of the remote controller and the air unit.


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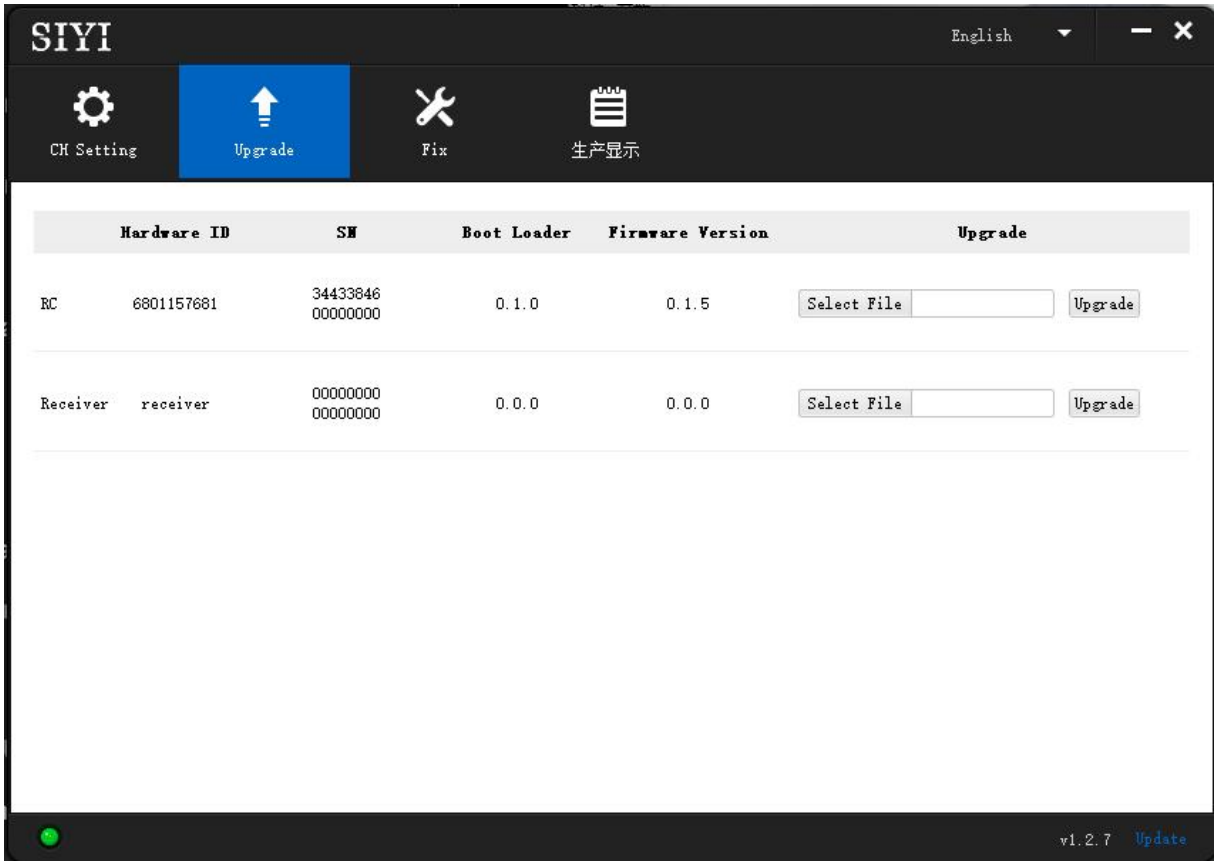


4. If the firmware is not the latest, then click the “Select File” button in the “RC” line to import the latest remote controller firmware. Then click “Upgrade” and wait till it is “100%” finished.

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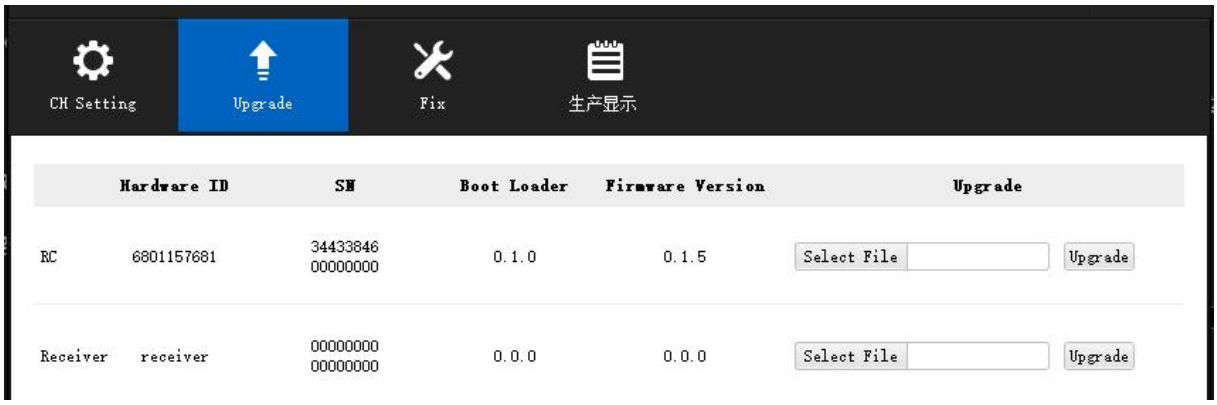
firmware version starting with number 5. If the boot loader number is 0.1.0, then please choose the RF firmware version with number 0.




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.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# 9 After-sale Service

If there were any questions or problems using SIYI Technology's product, you can always try to send an email to SIYI Official A/S Center (support@siyi.biz) or consult your sales representative or dealer for answers or solutions.

## 9.1 Repair Service

If your purchased SIYI products cannot work properly, please contact SIYI Official A/S Center for consulting.

Usually there are two situations for acquiring repair service.

- Product Defect
- Product Damage

SIYI products under the two situations can be sent back to SIYI for repairing. Defect products with valid warranty can be repaired for free. Defect products without valid warranty or damaged products should be charged of repair fees after repairing. Please refer to SIYI's Official A/S Quotation for detail.


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## 9.2 Warranty

SIYI Technology guarantees that, subject to the following conditions, Return & Refund Service, Replacement Service, and Warranty Repair Service can be requested. Please contact SIYI directly (support@siyi.biz or your sales manager) or authorized SIYI dealer for more detail.

### 9.2.1 7-Day Return & Refund

You can request Return & Refund Service:

Within seven (7) days of receiving a product if the product has no manufacturing defect, has not been activated and is still in new or like-new condition.

Within seven (7) days of receiving a product if the product has a manufacturing defect.

Return & Refund Service will not be provided where:

It is requested beyond seven (7) calendar days of receiving a product.

A product sent to SIYI for Return & Refund Service does not include all original accessories, attachments or packaging, or any item is not in new or like-new condition, i.e., with cracks, dents, or scratches.

A legal proof of purchase, receipt or invoice is not provided or is reasonably believed to have been forged or tampered with.


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Any fault or damage of the product is caused by unauthorized use or modification of the product, including exposure to moisture, entry of foreign bodies (water, oil, sand, etc.) or improper installation or operation.

Product labels, serial numbers, waterproof marks, etc. show signs of tampering or alteration.

Damage is caused to the product by uncontrollable external factors, including fire, floods, high winds, or lightning strikes.

A product is not delivered to SIYI within seven (7) calendar days after Return & Refund Service confirmation is sent from SIYI.

Other circumstances stated in this policy.

### 9.2.2 15-Day Replacement

You can request Replacement Service:

Within fifteen (15) calendar days of receiving the product if the product has sustained a substantial damage in transit, provided always that the damage proof issued by the carrier can be provided to SIYI.

Within fifteen (15) calendar days of receiving the product if the product does not match the original description of the product in one or more significant respects.


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Within fifteen (15) calendar days of receiving the product if the product suffers performance failure.

Replacement Service will not be provided where:

Service is requested more than fifteen (15) calendars days after receiving a product.

Legal proof-of-purchase, receipts, or invoices are not provided, or are reasonably believed to have been forged or tampered with.

A product sent to SIYI for replacement does not include all original accessories, attachments, and packaging, or contains items damaged by user error.

A product is found to have no defects after all appropriate tests are conducted by SIYI.

Any fault or damage of the product is caused by unauthorized use or modification of the product, including exposure to moisture, entry of foreign bodies (water, oil, sand, etc.) or improper installation or operation.

Damage is caused by uncontrollable external factors, including fires, floods, high winds, or lightning strikes.

Received product has not been sent back to SIYI seven (7) calendar days after replacement confirmation from SIYI.

Proof of damage during transit issued by the carrier cannot be provided.


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Other circumstances stated in this policy.

### 9.2.3 1-Year Warranty Repair

You can request warranty repair service:

If a product does not function as warranted during the warranty period, you may obtain after-sales service by contacting SIYI's service center. You will need to provide a valid proof-of-purchase, receipt, or order number for the warranty service.

Charges may apply for services not covered by this Limited Warranty. Please contact SIYI for information specific to your location.

Please note that the warranty service is only available in the respective SIYI service regions where you purchased your SIYI product.

Warranty Repair service will not be provided where:

Crashes or fire damage caused by non-manufacturing factors, including but not limited to pilot errors.

Damage caused by unauthorized modification, disassembly, or shell opening not in accordance with official instructions or manuals.

Damage caused by improper installation, in correct use, or operation not in accordance with official instructions or manuals.


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Damage caused by non-authorized service provider.

Damage caused by unauthorized modification of circuits and mismatch or misuse of the battery and charger.

Damage caused by operation in bad weather (i.e., strong winds, rain, sand/dust storms, etc.)

Damage caused by operating the product in an environment with electromagnetic interference (i.e., in mining areas or close to radio transmission towers, high-voltage wires, substations, etc.)

Damage caused by operating the product in an environment suffering from interference from other wireless devices (i.e., transmitter, video-downlink, Wi-Fi signals, etc.)

Damage caused by reliability or compatibility issues when using unauthorized third-party parts.

Damage caused by operating the unit with a low-charged or defective battery.

Products or parts with an altered identification label or from which the identification label has been removed.


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# 10 FCC STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

**WARNING**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which


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can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and Air Unit. Connect the equipment into an outlet on a circuit different from that to which the Air Unit is connected.

Consult the dealer or an experienced radio/TV technician for help.

**RF Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated. with minimum distance 20cm between the radiator & your body.


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**SIYI Technology (Shenzhen) Co., Ltd**

Business Inquiry: info@siyi.biz

Phone: +86 400 838 2918



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A/S Center: support@siyi.biz


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