TAiSYNC

Hawk User Manual

www.taisync.com

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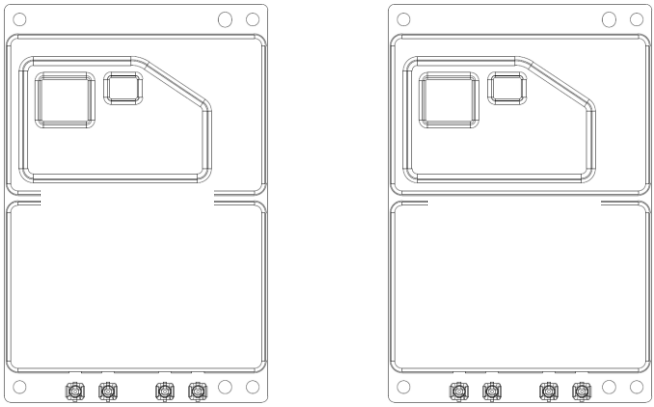
1. Package Contents

Air Unit & Ground Unit



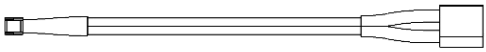
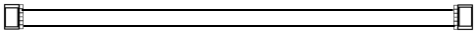
Air unit antenna × 4

(2.4G & 5G antenna for air unit)

Ground unit antenna × 2

(2.4G & 5G antenna for ground unit)

Air Unit Cables

Power cable x1	
This is used to connect the output of a battery to the power input of the air unit.	
RJ45 Ethernet cable x1	
This is used to connect the ETH output of camera to the ETH input of the air unit.	
Serial cable x1	
This is used to connect the telemetry port of flight controller to the telemetry serial port of the air unit.	
Serial-USB cable（UART） x1	
This is used to connect the configuration serial port of air unit to the USB port of PC running serial tool.	

Ground Unit Cables

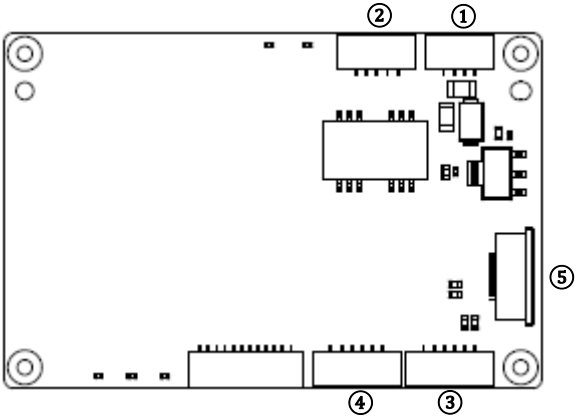
Power cable x1	
This is used to connect the output of a battery to the power input of the air unit.	
RJ45 Ethernet cable x1	
This is used to connect the ETH output of ground unit to the ETH input of a pc or laptop.	
Serial-USB cable（UART） x1	
This is used to connect the telemetry port of ground unit to the USB port of ground station.	
Serial-USB cable（UART） x1	
This is used to connect the configuration serial port of ground unit to the USB port of PC running serial tool.	

2. Product Description

2.1.Parameters

Parameter	Value
Frequency	2.4GHz/5GHz
Band width	10MHz (uplink), 10MHz (downlink)
Power	26dBm@2.4GHz, 23dBm@5.8GHz
Modulation	OFDM
Constellation	BPSK, QPSK
FEC	LDPC (1/2, 2/3, 3/4, 5/6)
Duplex	TDD
Downlink throughput	2.08Mbps ~ 6.57Mbps
Uplink throughput	400kbps
Encryption	AES256
Telemetry baud rate	9600/57600/115200bps
Configuration baud rate	115200bps
Interface	Ethernet, Serial
Weight	23.3g
Rated voltage	DC 10V~22.5V
Working temperature	-10°C ~50°C

2.2.Air Unit Interfaces

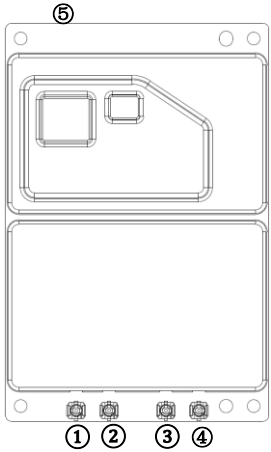


No.	Interface	Description
1	Power input	Connect 12V power source to this port. The power supply recommended 3s battery.
2	RJ45 Ethernet port	Connect the Ethernet output of camera to the Ethernet input of the air unit.
3	Configuration serial port	Connect the configuration serial port of air unit to the USB port of PC running serial tool.
4	Telemetry serial port	Connect this port to the telemetry port of a flight controller for telemetry communication with the ground unit.
5	FPC connector	Connect this port between baseboard and transmission board.

Pin (from left to right) definition of FPC connector:

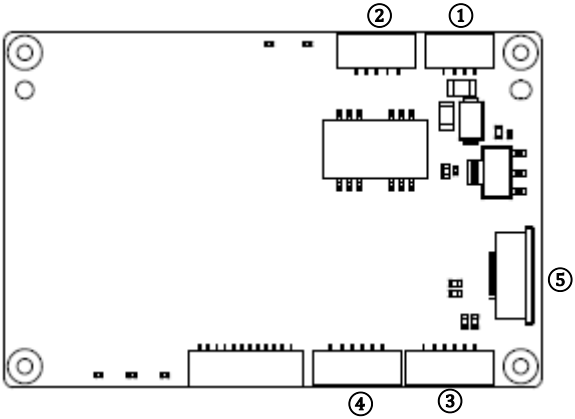
Name	Pin	Type	Description
PWR	1,2	PI	Power input(12V±5%，2A)
GND	7,8	-	Ground
UART1_TX	5	DO/NP	UART1 transmit
UART1_RX	6	DI/PU	UART1 receive
UART2_TX	3	DO/NP	UART2 transmit
UART2_RX	4	DI/PU	UART2 receive
FEA_TDP	9	AIO/PU	Ethernet in/out differential positive signal of interface 1

FEA_TDN	10	AIO/PU	Ethernet in/out differential negative signal of interface 1
FEA_RDP	11	AIO/PU	Ethernet in/out differential positive signal of interface 2



No.	Interface	Description
1	RF port 1	Connect the 1st air unit antenna to this port, for vertical direction.
2	RF port 2	Connect the 2nd air unit antenna to this port, for horizontal direction.
3	RF port 3	Connect the 3rd air unit antenna to this port, for vertical direction.
4	RF port 4	Connect the 4th air unit antenna to this port, for horizontal direction.
5	FPC connector	Connect this port between baseboard and transmission board.

2.3.Ground Unit Interfaces

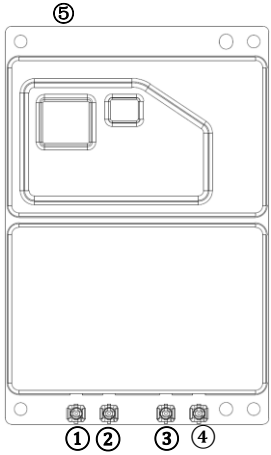


No.	Interface	Description
1	Power input	Connect 12V power source to this port. The power supply recommended 3s battery.
2	RJ45 Ethernet port	Connect the Ethernet output of ground unit to the Ethernet input of PC.
3	Configuration serial port	Connect the configuration serial port of ground unit to the USB port of PC running serial tool.
4	Telemetry serial port	Connect this port to the USB port of ground station
5	FPC connector	Connect this port between baseboard and transmission board.

Pin (from left to right) definition of FPC connector:

Name	Pin	Type	Description
PWR	1,2	PI	Power input(12V±5%，2A)
GND	7,8	-	Ground
UART1_TX	5	DO/NP	UART1 transmit
UART1_RX	6	DI/PU	UART1 receive
UART2_TX	3	DO/NP	UART2 transmit
UART2_RX	4	DI/PU	UART2 receive
FEA_TDP	9	AIO/PU	Ethernet in/out differential positive signal of interface 1

FEA_TDN	10	AIO/PU	Ethernet in/out differential negative signal of interface 1
FEA_RDP	11	AIO/PU	Ethernet in/out differential positive signal of interface 2

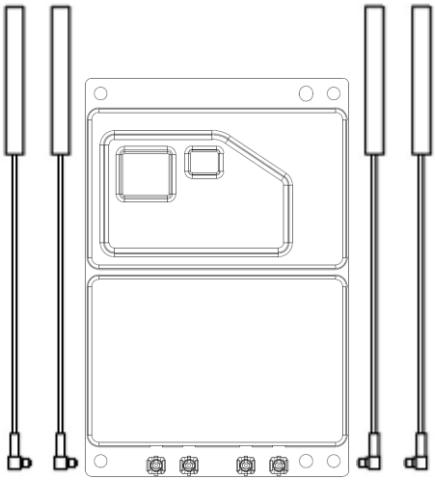


No.	Interface	Description
1	RF port 1	Connect the 1st ground unit antenna to this port, for vertical direction.
2	RF port 2	Connect the 2nd ground unit antenna to this port, for horizontal direction.
3	RF port 3	Connect the 3rd ground unit antenna to this port, for vertical direction.
4	RF port 4	Connect the 4th ground unit antenna to this port, for horizontal direction.
5	FPC connector	Connect this port between baseboard and transmission board.

3. System setup

3.1.Air Unit Installation

3.1.1. Antenna installation



Insert the air unit antennas into the RF ports with RF cables. Antenna connector clicks in when properly installed.

Note:

(1) To avoid equipment damage, install antennas before powering on the units.

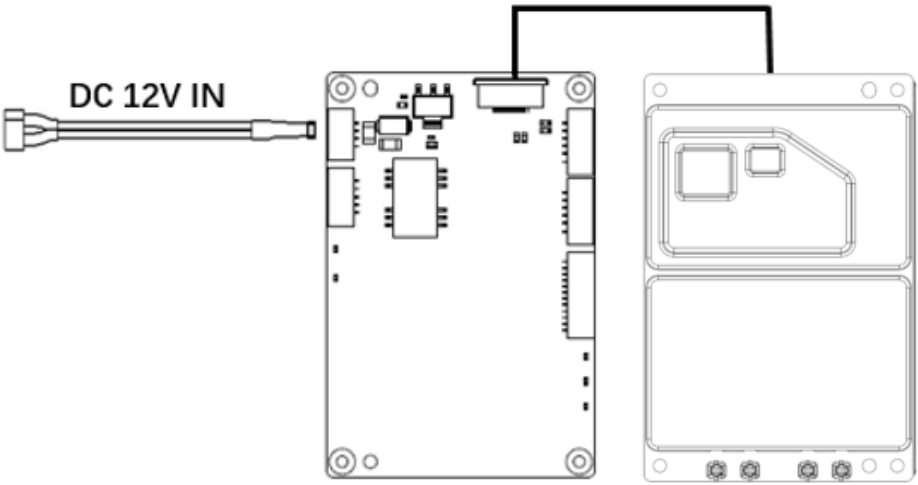
(2) When mount the air unit to drone, make sure the antennas are not both blocked by any parts of the drone.

(3) Both antennas need to be installed.

(4) Ensure the antenna connector is vertical to the board RF connector when it is pushed into the RF port.

(5) Do not pull the cable to uninstall the antenna. Hold the connector and pull it vertically out of the RF port to uninstall antennas properly.

3.1.2. Power supply



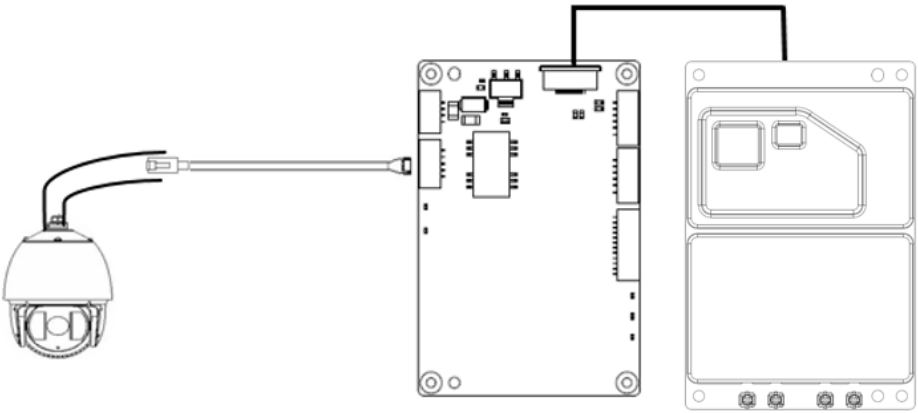
Insert the four-pin connector of supplied power cable to the power port of the air unit baseboard and connect the other end to a battery output, or the power supply port of a drone. Recommended voltage is 12V.

Note:

(1) To avoid equipment damage, install antennas before powering on the units.

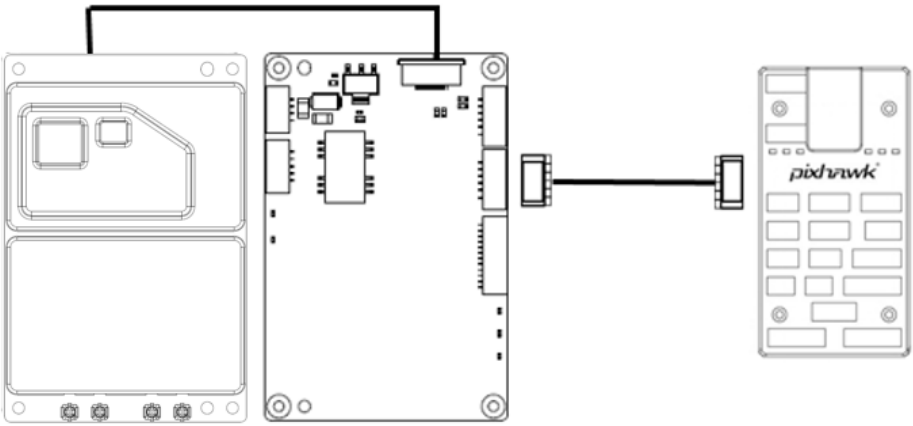
(2) Recommended rated voltage/current is DC12V/1.2A (or 3S lithium battery).

3.1.3. Connect camera



Connect the Ethernet video output port to the Ethernet video input port of the air unit using supplied Ethernet cable.

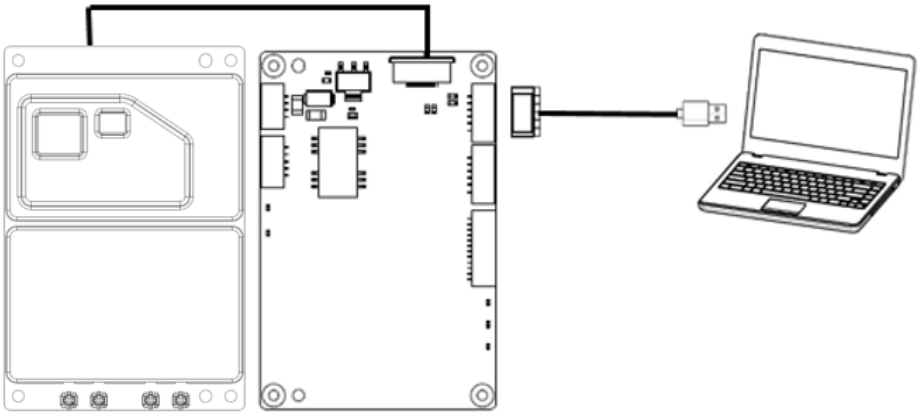
3.1.4. Connect flight controller (telemetry)



Insert the six-pin connector of supplied serial cable to the serial port of the air unit baseboard and connect the other end of the serial cable to the telemetry port of a flight controller.

Note: Ensure the baud rate of the flight controller and the baud rate of Hawk module are the same.

3.1.5. Configuration serial port connection

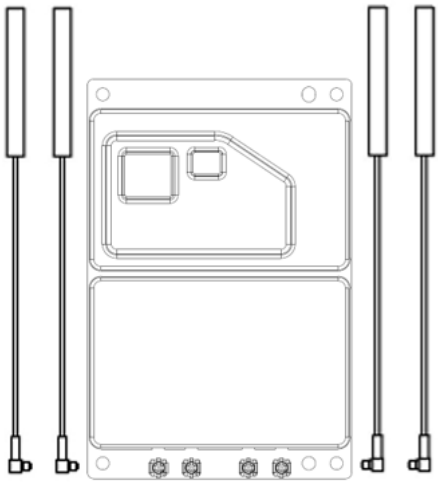


Insert the six-pin connector of serial cable to the serial port of the air unit baseboard and connect the other end of the serial cable to the PC running serial command tool.

Note: Ensure the baud rate of the flight controller and the baud rate of Hawk module are the same.

3.2.Ground unit installation

3.2.1. Antenna installation



Insert the ground unit antennas into the RF ports. Antenna connector clicks in when properly installed.

Note:

(1) To avoid equipment damage, install antennas before powering on the units.

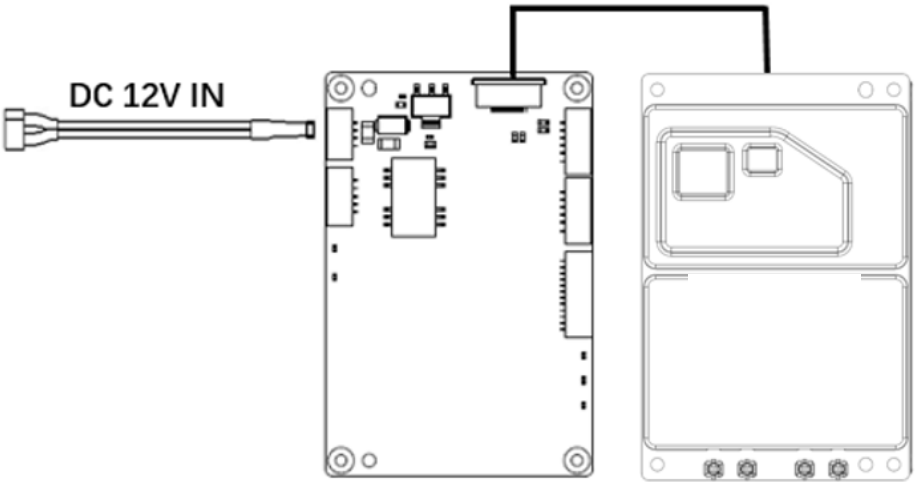
(2) When install air unit to drone, avoid the antennas being blocked by parts of the drone.

(3) Both antennas need to be installed.

(4) Ensure the antenna connector is vertical to the board RF connector when it is pushed into the RF port.

(5) When uninstall the antenna, hold the connector and pull it vertically out of the RF port. Do not pull the cable.

3.2.2. Power supply



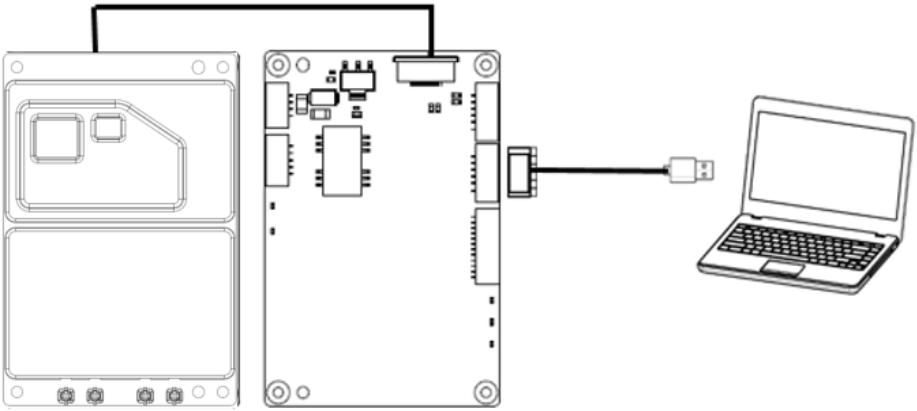
Insert the four-pin connector of supplied power cable to the power port of the ground unit and connect the other end to a battery output, or from the output of a power adaptor. Recommended voltage is 12V.

Note:

(1) Recommended rated voltage/current is DC12V/1.2A (or 3S lithium battery).

(2) To avoid equipment damage, install antennas before powering on the units.

3.2.3. Telemetry connection



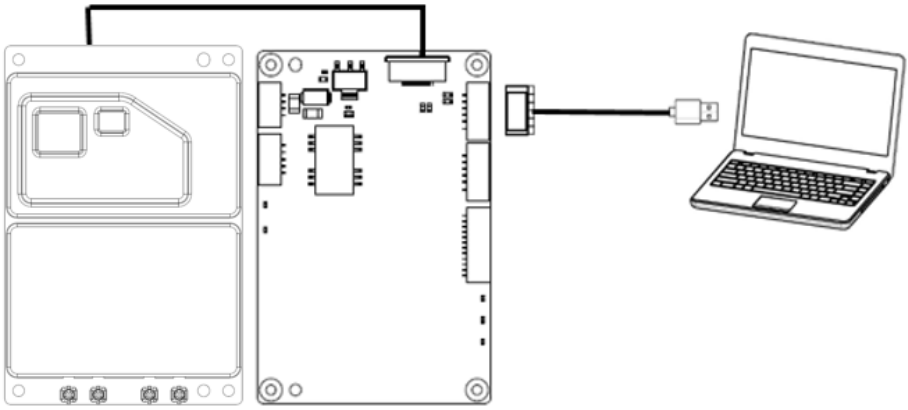
Insert the six-pin connector of serial cable to the serial port of the ground unit baseboard and connect the other end of serial cable to the USB port of the ground control station.

Note:

(1) Ensure the baud rate of ground station and the baud rate of Hawk module are the same.

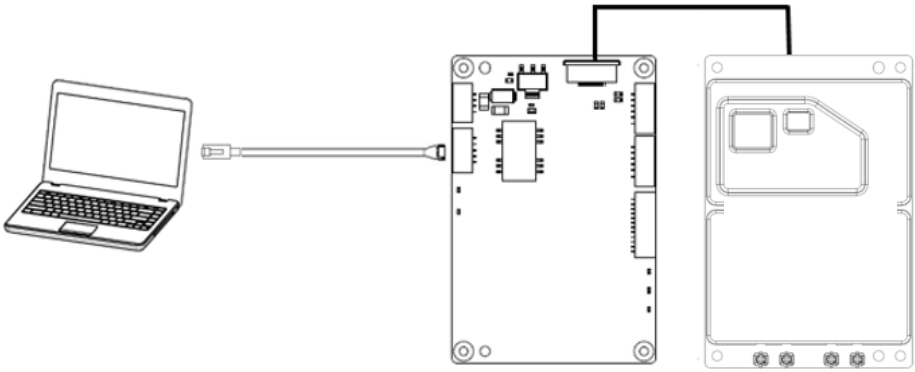
(2) Supplied cable should have correct pin-out.

3.2.4. Configuration serial port connection



Insert the six-pin connector of serial cable to the serial port of the air unit and connect the other end of the serial cable to the PC running serial command tool.

3.2.5. Setup video output



Ground unit can output video to a PC or laptop through Ethernet connection.

Note:

To view the video on PC or laptop, connect the Ethernet port of the ground unit to the Ethernet port of a PC or a laptop, and configure the IP address of the PC to be in the same sub-net with camera.

4. Hawk commands sets

Before executing commands, PC with serial command tool should be properly connected to command configuration serial port of module.

4.1.Commands used to check status

These commands can be used to check air/ground unit status.
Command format is as follows:

Air unit/Ground unit		
Function	**Command format**	**Notes**
Get bind status	GBDS	
Get SN and firmware version	GDVR	
Get device configuration	GDCF	
Get system status	GSST	

Get device status	GDS	recommend polling interval is 1 second
Get RSSI of frequency scan	GRFS	
Get unit ID	GUID	Each unit has an unique ID, get it by command of GUID.
Get peer unit ID	TUID	Available when radio link active.
Get binding list	GBID	This command is only available for air unit.
Get fast re-connection criteria	GRTH	Restore to factory setting will not change value of this parameter.
Get working band	GFBN	

4.2.Commands used under normal working mode

Under normal working mode, radio link and data communication between air unit and ground unit is properly established. Control commands can only be sent out on the ground unit side.

Commands format is as following:

Ground unit		
Function	**Commands format**	**Notes**
Band setting	SFBN {"freqBand":"2400"} SFBN {"freqBand":"5800"}	2400 for 2.4GHz, 5800 for 5.8GHz.
Frequency setting	SFRQ {"freqHop":"disable","loFreq":2417} SFRQ {"freqHop":"enable","loFreq":2417}	When freqHop is enabled, loFreq value will be invalid.
Power setting	SPWR {"maxPower":27}	Value will not be saved after power off.
Mode setting	SMCS {"mcs":"BPSK_1/2(2.08Mbps)"} SMCS {"mcs":"BPSK_2/3(2.77Mbps)"} SMCS {"mcs":"BPSK_3/4(3.01Mbps)"} SMCS {"mcs":"BPSK_5/6(3.33Mbps)"} SMCS {"mcs":"QPSK_1/2(3.98Mbps)"} SMCS {"mcs":"QPSK_2/3(5.27Mbps)"} SMCS {"mcs":"QPSK_3/4(5.92Mbps)"} SMCS {"mcs":"QPSK_5/6(6.57Mbps)"}	Value will be saved after power off.

Baud rate setting	SDBD {"baudRate":115200} SDBD {"baudRate":57600} SDBD {"baudRate":9600}	Value will be saved after power off.
Work region setting	SWRE {"workRegion":"GITEKI"} SWRE {"workRegion":"GITEKI_HIGH"} SWRE {"workRegion":"FCC"} SWRE {"workRegion":"CE"}	Default value is GITEKI after bind, value will be saved after power off.
Set fast re-connection criteria	SRTH {"rssi_threshold":90,"rssi_timeout":15}	In the example, 90 for -90dBm, 15 for 15seconds
Antenna selection of air unit	ANTS {"airAntSelect":"ant1"} ANTS {"airAntSelect":"ant2"} ANTS {"airAntSelect":"auto"}	Value will be saved after power off.
Update AES key	UAES	Air unit update the AES key first, ground unit will synchronize it from air unit.
OTA	EOTA {"otaMode":"enable"} EOTA {"otaMode":"disable"}	Default value is disable after power on, value will not be saved after power off.

4.3.Commands used under single unit configuration mode

Under single unit configuration mode, all settings can be set on air unit or ground unit separately without radio link connection between air unit and ground unit.
Commands format is as following:

Ground unit		
Function	**Commands format**	**Notes**
Antenna selection of ground unit	ANTS {"groundAntSelect":"ant1"} ANTS {"groundAntSelect":"ant2"} ANTS {"groundAntSelect":"auto"}	Value will be saved after power off.
Role switch	POSW {"pilotSwitch":"pilot"} POSW {"pilotSwitch":"observer"}	Both uplink and downlink communication are available for pilot, only downlink is available for observer. Each

		ground unit will be pilot by default after bind, however, only one pilot is allowed in the whole system.
Bind	BIND {"bind":"enable"}	It's not allowed to bind again before previous bind is completed. Bind status can be checked by command 'GBDS'.
SN setting	STSN {"SN":"123456789012"}	
Encrypt setting	SENC {"encrypt":"enable","Key":"0123456789abcdef0123456789abcdef"} SENC {"encrypt":"disable"}	Disabling encryption is not supported currently.
Set fast re-connection criteria	SRTH {"rssi_threshold":90,"rssi_timeout":15}	In the example, 90 for -90dBm, 15 for 15seconds.
Set unit ID	SUID {"unique_ID":"123"}	
Device reset	RSET	
Restore to factory setting	SDEF	
Exit OTA mode	EOTA {"otaMode":"exit"}	

Air unit		
Function	**Commands format**	**Notes**
Antenna selection of air unit	ANTS {"airAntSelect":"ant1"} ANTS {"airAntSelect":"ant2"} ANTS {"airAntSelect":"auto"}	Value will be saved after power off.
Bind	BIND {"bind":"enable"}	It's not allowed to bind again before previous bind is completed. Bind status can be checked by command 'GBDS'.
SN setting	STSN {"SN":"123456789012"}	

Encrypt setting	SENC {"encrypt":"enable","Key":"0123456789abcdef0123456789abcdef"} SENC {"encrypt":"disable"}	Disabling encryption is not supported currently.
Set fast re-connection criteria	SRTH {"rssi_threshold":90,"rssi_timeout":15}	In the example, 90 for -90dBm, 15 for 15seconds.
Restore to factory setting	SDEF	
Set unit ID	SUID {"unique_ID":"123"}	
Device reset	RSET	
Exit OTA mode	EOTA {"otaMode":"exit"}	
Delete binding unit	DBID {"unique_ID":222}	Delete the binding unit by unique ID. This command is only available for air unit.

4.4.Commands used under testing mode

Testing mode is used to test transmit power and RSSI of air unit or ground unit, radio link connection between air unit and ground unit is not needed for using this command. Commands format is as following:

Air unit/Ground unit		
Function	**Commands format**	**Notes**
Test mode setting	ETST {"testMode":"enable"} ETST {"testMode":"disable"}	After test mode enabled, set frequency band by command of SFBN.
RF continuous transmitting	ETST {"continuousTx":"enable"} ETST {"continuousTx":"disable"}	

RF continuous receiving	ETST {"continuousRx":"enable"} ETST {"continuousRx":"disable"}	
RF single tone signal	ETST {"cw":"enable"} ETST {"cw":"disable"}	
Working frequency	ETST {"IoFreq":2417}	2.4G range: 2400-2480MHz, 5.8G range: 5725-5850MHz.
RF output power	ETST {"power_db":20}	Max 26dBm for 2.4G, max 23dBm for 5.8G.
Modulation setting	ETST {"mcs":"QPSK_1/2(3.98Mbps)"}	
Air unit antenna selection	ETST {"airAntSelect":"ant1"} ETST {"airAntSelect":"ant2"} ETST {"airAntSelect":"auto"}	
Ground unit antenna selection	ETST {"groundAntSelect":"ant1"} ETST {"groundAntSelect":"ant2"} ETST {"groundAntSelect":"auto"}	

4.5.Commands used under OTA mode

Under OTA mode, uplink throughput can be up to 7Mbps using 20MHz uplink bandwidth and QPSK ½ modulation scheme. Radio link between air unit and ground unit is needed for OTA mode. This mode is used to upgrade the firmware of drone and the firmware of camera.

Commands format is as following:

Ground unit		
Function	**Commands format**	**Notes**
OTA setting	EOTA {"otaMode":"enable"} EOTA {"otaMode":"disable"}	It will revert back to working mode if radio link cannot be established in 3min after OTA mode is enabled. Default value is disabled after power on, modified value will not be stored after power off. When OTA is enabled, video transmission of air unit should

		be stopped, and no any other command operations is allowed.

5. Notes

5.1.Link performance

- Interference from 2.4GHz WiFi

WiFi operates at 2.4GHz band with bandwidths of 20MHz and 40MHz. WiFi can generate both co-channel interference and adjacent channel interference to the 2.4GHz wireless link of a drone. Even if there is not a WiFi router is present for a WiFi device (for example, WiFi of a phone) to connect with, a WiFi device periodically transmits beacon/probe signals. So, when you operate a drone in the field with 2.4GHz wireless link, it is important to turn off WiFi modem/hot spot of a phone, or a laptop. If WiFi relay of the video from the ground station is desired, it is recommended to use a 5.8GHz WiFi modem.

- Interference from Bluetooth device

Bluetooth operates on 2.4GHz in frequency hopping mode. So a Bluetooth mouse, Bluetooth joystick, or any Bluetooth device that is actively working and next to ground station will interfere the reception of downlink video. Please avoid using Bluetooth device when operate a drone with 2.4GHz wireless link.

- Interference from wireless device in co-existence

Another wireless device that operates on bands close to 2.4GHz and is placed close to the drone's 2.4GHz wireless module can interfere the drone's wireless link. For example, some drones have both LTE link and point-2-point wireless link. Particularly, the LTE operating on 2.3GHz band can be a problem. If the antenna of the LTE module is placed close to the antenna of the 2.4GHz point-2-point wireless module, the receiver of 2.4GHz module can be saturated

by the LTE signal when it is transmitting. Thus, the range/performance of the 2.4GHz module will be significantly degraded.

- Interference from HDMI

When HDMI source/cable is close to the antenna of 2.4GHz wireless modem, the HDMI source/cable will interfere the 2.4GHz wireless signal (including WiFi).

https://h30434.www3.hp.com/t5/Notebooks-Archive-Read-Only/HDMI-interfering-with-WiFi-connectivity/td-p/4535026
http://www.dslreports.com/forum/r27141612-HDMI-connect-interferes-with-wifi

It is recommended that install the antenna at least 25cm away from the HDMI source/cable. A good shield HDMI cable can be a resolution too. The following shield HDMI cable uses 360-degree shield termination, which is recommended practice.
https://interferencetechnology.com/hdmi-cables-emi/
http://www.l-com.com/content/Article.aspx?Type=P&ID=10699
http://www.l-com.com/audio-video-micro-hdmi-to-hdmi-cables
http://www.l-com.com/audio-video-hdmi-female-to-micro-hdmi-male-adapter

- Interference from USB divider/hub

Some USB splitter or hubs may generate EMI to wireless device. When using USB splitters or hubs, please check if EMI is existing.

- RF cable connector/Antenna connector check

Before flight, check if the antennas are connected to the modules. Running module without antenna connected results in very short range and potentially can damage the module. It is recommended to check the connection of all RF connectors. Loose connection can degrade the range significantly.

- Antenna placement

Place the two air antennas so that no matter what position the drone is, at lease one antenna is not blocked by the payload from the ground station.

If the drone will fly in full throttle, it will lean forward. Install the air antenna so that it is close to be vertical to the ground when the drone moves forward in full throttle.

- Battery level of ground station

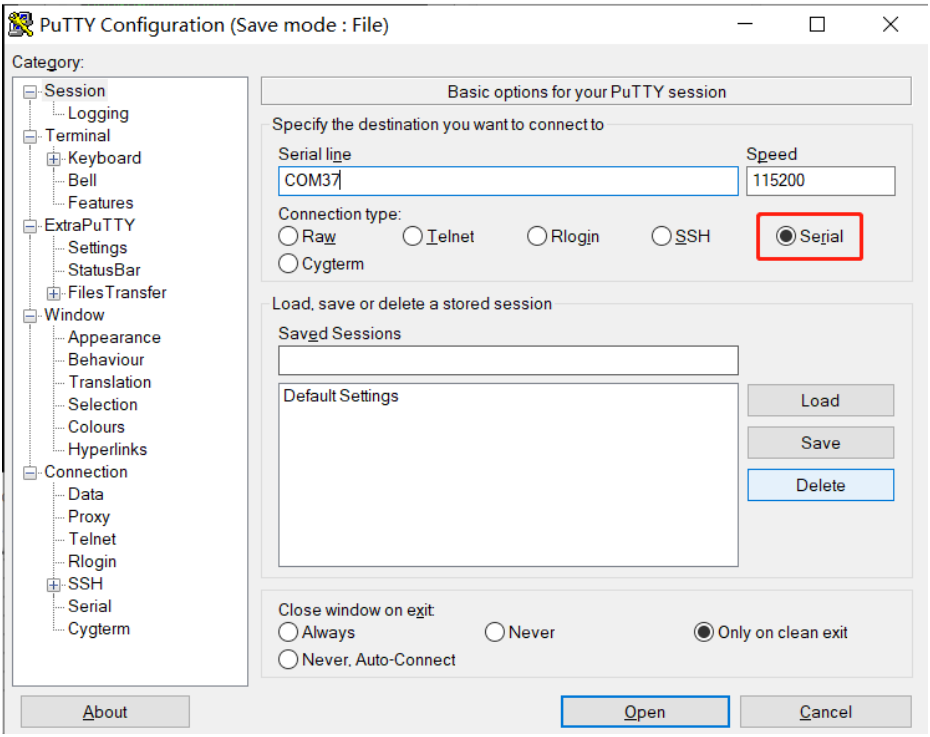
The reception performance will degrade if the battery of ground station runs low, even though it might still power the ground unit up.

5.2.Firmware update

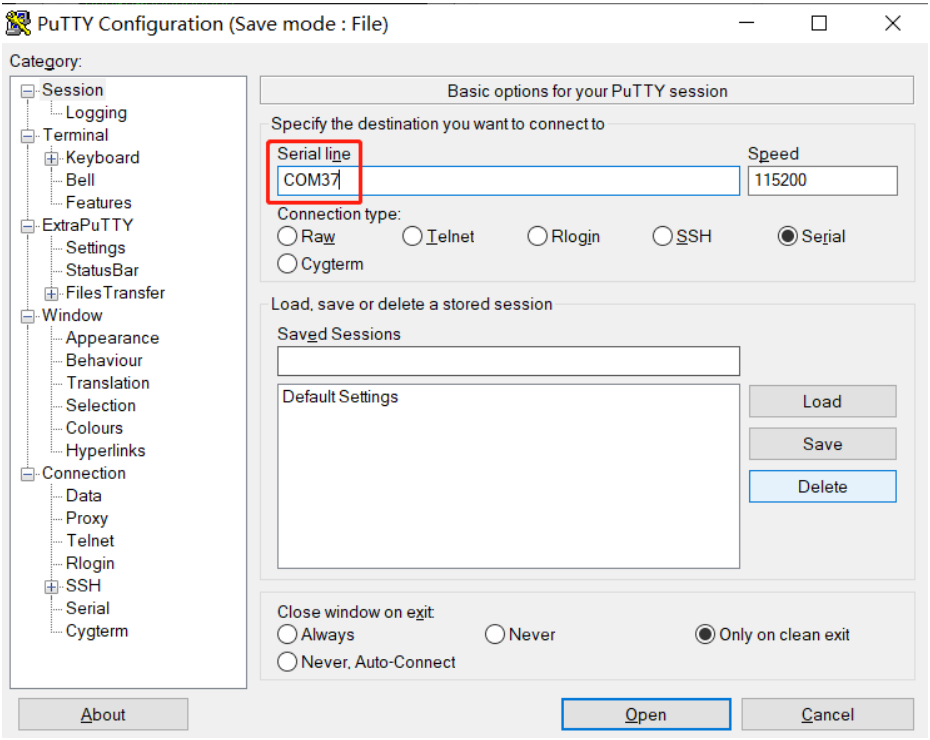
Firmware upgrade can be done following below steps via configuration serial port by tools like Putty.

Open ExtraPuTTY and configure it as following.

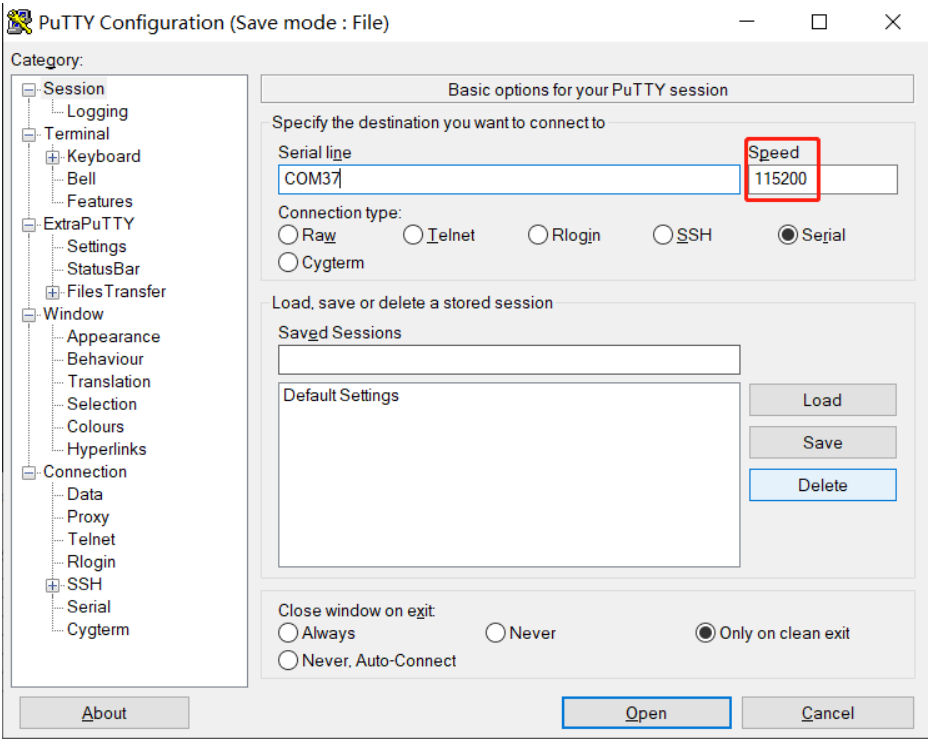
Step 1 in the following figure is to select the interface as the serial port.



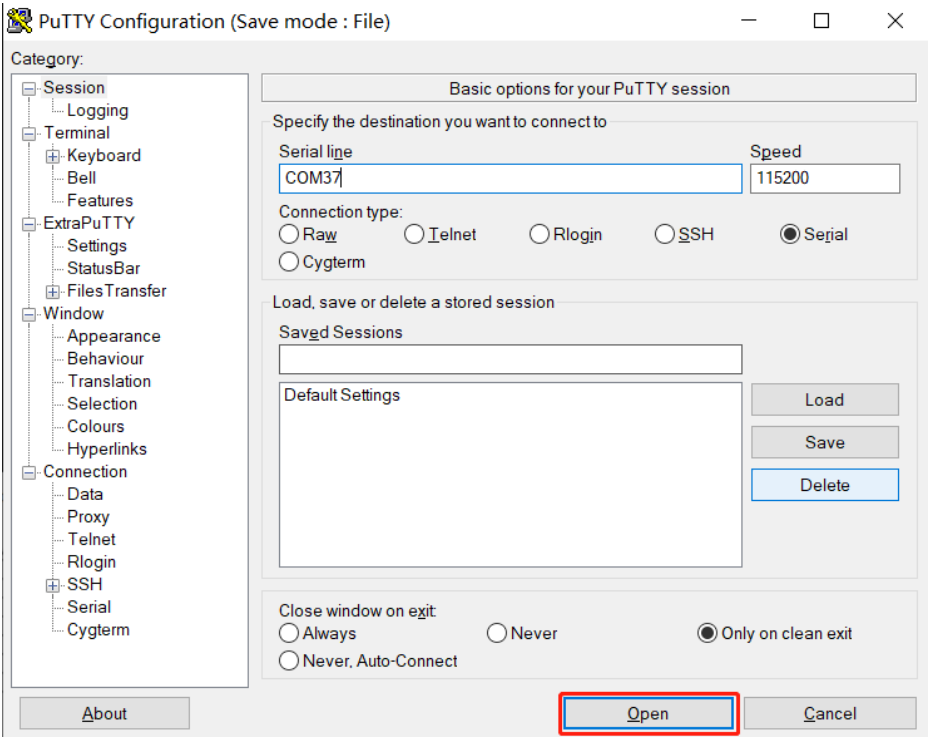
Step 2 is to enter the serial port number, in this step, fill in the serial port number according to your own setup, for example, for serial port 37, input COM37.



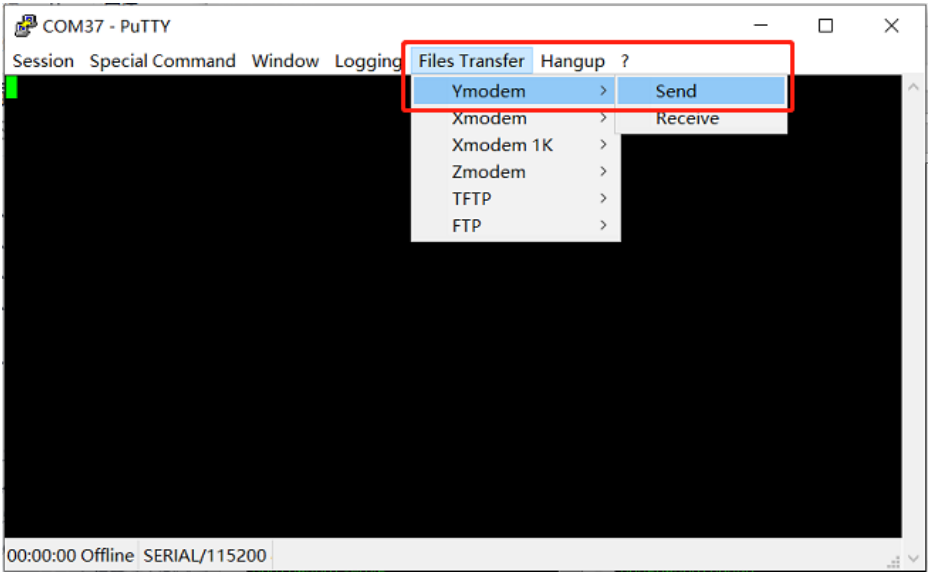
Step 3 is to set the baud rate of the serial port, fixed at 115200.



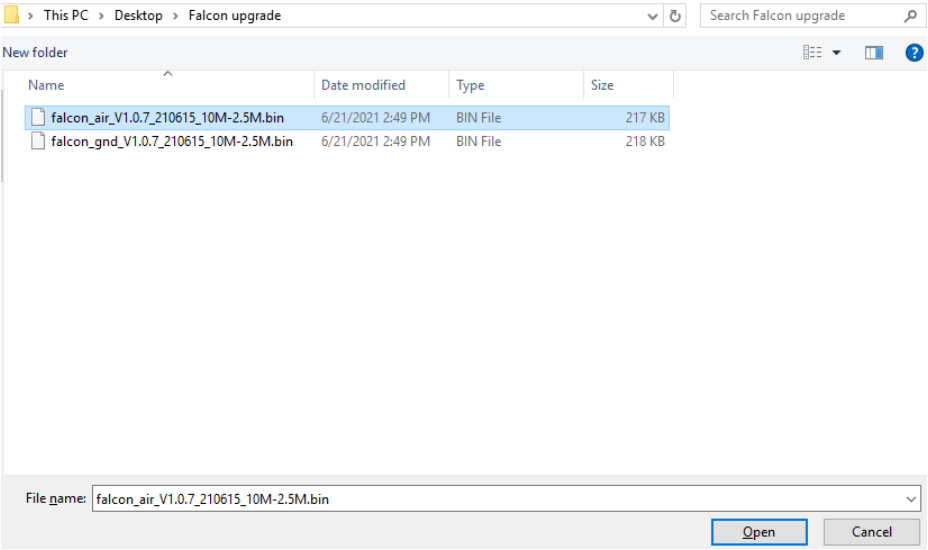
Step 4 is to click open.



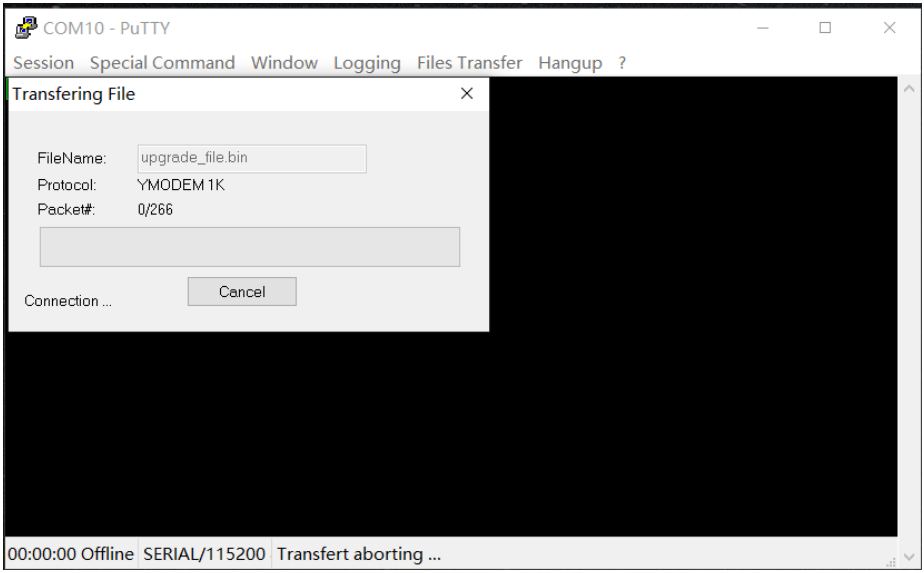
Make your selection as shown in the following picture, select Ymodem as the serial port protocol to use.



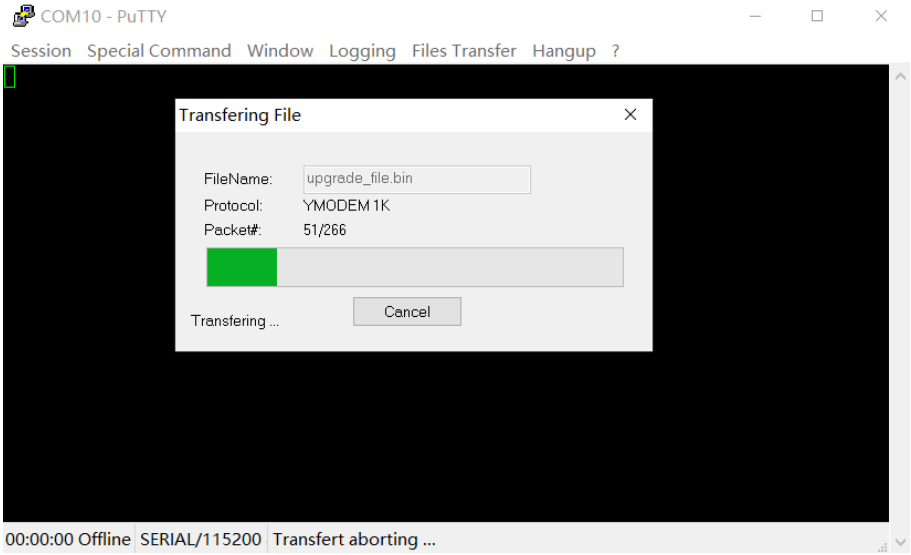
Select the file to be upgraded as follows



After selecting a file as shown in above picture, the following prompt window appears



Power cycle the device, and the upgrade starts. Wait for the upgrade to complete.



6. FAQ

Q1: What power supply should be used for the Hawk module?
Air unit: DC, power supply range: 8-15V, recommended to use 12V.
Ground unit: DC, power supply range: 8-15V, recommended to use 12V.
Q2: Can the Hawk module be powered on before antennas installation?
The antennas must be installed before a unit is powered on.
Q3: How many antennas does Hawk air unit need to be installed?
Two antennas need to be installed.
Q4: How many antennas does Hawk ground unit need to be installed?
Two antennas need to be installed.
Q5: Can two air units be installed on a drone?
No, a drone can only have one air unit.
Q6: There are some wireless devices nearby, such as WIFI, Bluetooth and so on. Can they be turned on when the drone is flying?
Make sure to turn off WIFI, Bluetooth and other functions of other devices, because these devices are working in 2.4 GHz band and can cause interference.
Q7: Telemetry connection can not be setup properly?
Please follow the following steps:
1) Please check whether the link status is normal.
2) Please check whether the serial telemetry cable connection between flight controller and air unit is correct and that between ground unit and ground station is correct.
3) Check whether the baud rates are the same.
4) If the above steps can not solve the problem, please contact Hawk technical support staff.
Q8: What if there's no video output?
Please follow the following steps:
1) Please check whether the link status is normal.

3) Please confirm the IP address, login username and password of the webcam are correct.
4) Please check whether the IP address of the ground station/computer and the IP address of the drone camera are in the same subnet.
5) If the above steps can not solve the problem, please contact Hawk technical support staff.
Q9: What if the video is choppy or has mosaic?
Please follow the following steps:
1) Please confirm whether the downlink mode configuration is larger than the video bit rate.
2) Please check whether the connection of RJ45 network is reliable.
3) Please check If there is interference exsit, if so, try to change the working frequency.
4) If there is no interference, whether the distance of communication link has reached the limit.
5) If the above steps can not solve the problem, please contact Hawk technical support staff.
Q10: What if the transmission distance of the module is shorter than expectation?
Please follow the following steps:
1) Please verify whether the antenna and RF cable are installed correctly and check whether they are supplied Hawk accessories.
2) Please ensure that the air antennas are not both blocked by the payload, there is no obvious blocking at the ground unit near the antennas, and the antennas of the air and ground units are perpendicular to the ground.
3) Please check whether the module works with full RF power output.
4) Please check whether the downlink mode configuration is proper or not, the high throughput downlink modes can significantly reduce the transmission distance.
5) Please check whether the working frequency is obviously interfered or not, Chapter 6.2 introduces how to select working frequency.
6) Please check whether there is serious obstruction between the air and the ground unit during flight, and the complex geographical environment will also affect the transmission distance.
7) If the above steps can not solve the problem, please contact Hawk technical support staff.

NCC 警語：

「取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。」

低功率警語

1. 取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。
2. 應避免影響附近雷達系統之操作。

List of applicable FCC rules
This module has been tested and found to comply with *part 15* requirements for Modular Approval.

Specific operational use condition
The module is tested for standalone mobile RF exposure use condition.
(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
(2) The transmitter module may not be co-located with any other transmitter or antenna.

Limited modular Procedures
No applicable.

Trace antenna designs
No applicable.

RF exposure considerations
1. 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.

Antennas:
The following antennas have been certified for use with this module.
Only antennas of the same type with equal or lower gain may also be used with this module.
Other types of antennas and/or higher gain antennas may require the additional authorization for operation.
Antenna Specification list below:

Antenna Type	M/N	Frequency Band (MHz)	Antenna Gain (dBi)
PCB	F-OG-CC-9044-003-00 (H)	2400~2500 5150~5850	2.4G:0.15dBi 5.8G: 2.02dBi
PCB	F-0G-CC-9044-003-0O (V)	2400~2500 5150~5850	2.4G:1.83dBi 5.8G: 2.07dBi
Dipole	N12-7498-ROA	2400~2500 5100~5900	2.4G:5.02dBi 5.8G: 4.95dBi

Label and compliance information
When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: 2A8JK-FIRES-LINK3”.
The FCC ID can be used only when all FCC compliance requirements are met.
The end product shall bear the following 15.19 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.

Information on test modes and additional testing requirements
This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) class II permissive change re-evaluation or new certification.

Part 15 Subpart B disclaimer
This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Note
In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can

not be used on the final product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.

OEM/Host manufacturer responsibilities
OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment

Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.