Wireless Video Transmission Equipment

（model：XK-F321E）

Shenzhen Xingkai Technology Co., Ltd
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Disclaimer

Welcome to use our products！

Ensure that the product is used in accordance with local laws and regulations. The company will not bear any legal liability for any result or loss caused by illegal use, installation and modification of the product。Please use this product carefully according to the process and precautions in this manual. If the product is damaged due to disassembly, impact, unconventional operation and other factors, our company will not provide the service of return and free maintenance.

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Caution

In order to ensure the correct use of the product and the best use effect, please read this manual carefully before operating the product, and follow the relevant operation procedures and precautions to avoid damage to the equipment or poor use effect due to misoperation or improper use. Operators should have a certain basic knowledge of communication electronics. When installing and using this product, please pay attention to the following precautions.

. FCC Warning Statement

Changes or modifications not expressly approved by the party responsible for co mpliance could void the user’s authority to operate the equipment. This equipment h as been tested and found to comply with the limits for a Class B digital device, pursua nt to Part 15 of the FCC Rules. These limits are designed to provide reasonable protec tion against harmful interference in a residential installation. This equipment generat es uses and can radiate radio frequency energy and, if not installed and used in accor dance with the instructions, may cause harmful interference to radio communication s. However, there is no guarantee that interference will not occur in a particular instal lation. If this equipment does cause harmful interference to radio or television recept ion, which can be determined by turning the equipment off and on, the user is encou raged 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 receiver.
- Connect the equipment into an outlet on a circuit different from that to whic h the receiver is connected.

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

Installation：

1. Before the XK-F321E equipment is powered on, the antenna or attenuator and other loads must be installed to the RF output interface, otherwise the internal power amplifier module of the equipment will be damaged.
2. When replacing the antenna, the power must be cut off first, otherwise the power amplifier module inside the equipment will be damaged.
3. Try to match the antenna with the equipment (including impedance, frequency and power), otherwise the power amplifier module inside the equipment may be damaged.
4. Please use DC power supply of dc8v ~ dc30v to supply power to the equipment, otherwise circuit damage or abnormal operation of equipment may be caused.
5. Make sure that the antenna installation of the air end equipment is exposed in the air as far as possible to avoid obstacles blocking, otherwise the communication distance will be affected.
6. The antenna should be installed far away from large metal devices.
7. Equipment installation should keep a certain distance from other electronic equipment to reduce electromagnetic interference between equipment.

Attention to use：

1. Ensure that all interfaces of the equipment are connected correctly and firmly, and the connecting wires are intact.
2. If there is high-power co channel interference in the surrounding environment, it will cause the ground unit can not receive the image normally. The problem can be solved by changing the working frequency of the equipment or turning off the co channel interference source.
3. When the button is bound for matching, long press for 3 seconds at the air end, and then press for 3 seconds for matching at the ground end.
4. The modification of configuration parameters must be successful only after the two ends are successfully paired.
5. The video rate of the camera is not greater than that of the downlink to ensure the stability of video transmission.

1. Product overview

XK-F321E figure data integrated network port transmission equipment has the characteristics of low power consumption and long communication distance. It supports simultaneous transmission of network data encoded by HD camera, flight control data, PTZ control data and remote control data.

XK-F321E has encryption function, users can set channel encryption key independently. XK-F321E supports transparent transmission protocol, which can transmit flight control data and other data information at the same time. The ground terminal can interact with ground station through serial port or network port (UDP / TCP). Support serial port and SBUs transparent transmission function, so that the UAV link is extended.

2. Product features and functions

2.1 Product features

- High sensitivity.
- Robust NLOS performance.
- LDPC coding.
- Video/Telemetry/RC Combo Link.
- RF switch on the air unit.
- Low delay.
- ARQ retransmission.
- Adaptive frequency hopping.

2.2 Product functions

- The working frequency can be adjusted manually and automatically.
- The mapping mode is adjustable.
- The LDPC coding rate is adjustable.
- TDD working mode.
- Point-to-point or point-to-multipoint.
- Ethernet, serial port, SBUS/PPM.
- AES128、AES256 encryption.
- Real time image transmission through network port.

3. Performance index

	Parameters	
	Air	Ground
Input voltage	DC8V~DC30V， DC12V	
Consumption	8W	6W
Modulation	OFDM	
FEC	1/2、2/3、3/4、5/6	
Constellation	BPSK、QPSK、16QAM	
Duplex	TDD	
Frequency	2412MHz~2477MHz	
Power	≤27dBm	
Band width	10MHz	2.5MHz
Transmission delay	3ms~8ms	
Encryption	AES128, AES256	
Interface	UART（TTL/RS232）/SBUS	
Uplink throughput	115.2kbps	
Downlink throughput	2 Mbps~15 Mbps	
Working temperature	-20℃~60℃	
Storage temperature	-40℃~75℃	
antenna	Glue stick antenna（20cm） 2dBi	Glue stick antenna（20cm） 2dBi
Dimension	102*55*25.5mm	
Weight	≤155g	

4. Product interface description

4.1 Equipment size

Figure 4.1 picture and size of XK-F321E product

4.2 Equipment interface description

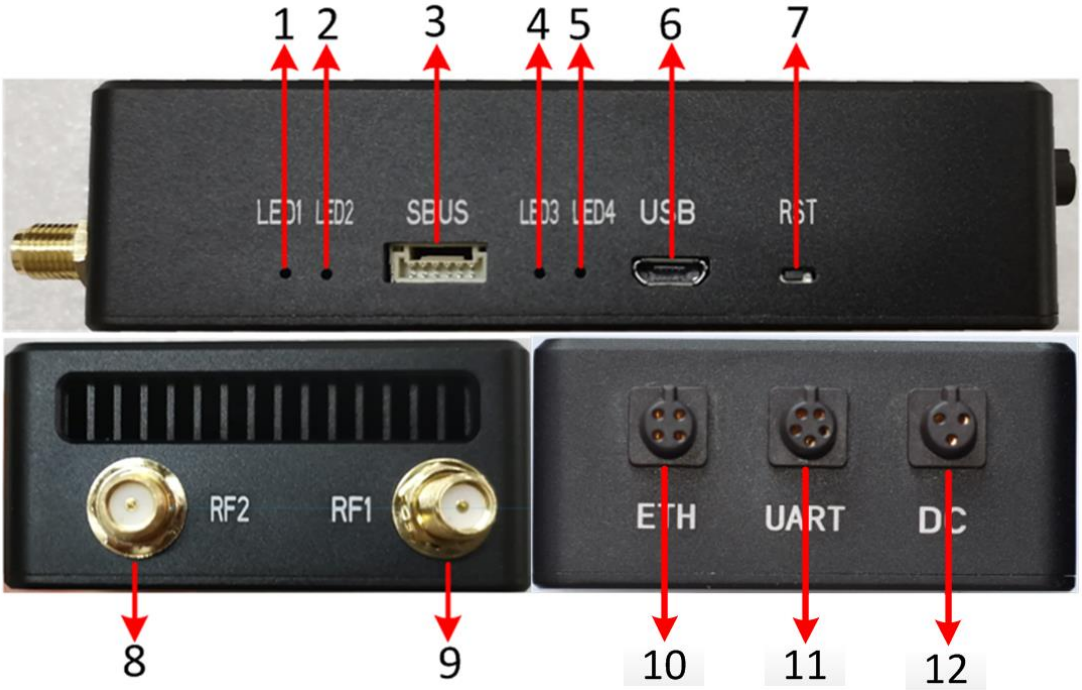

Figure 4.2 XK-F321E product interface

Ground unit and air unit equipment interface is consistent!

1、 LED 1

When this LED is on, it means the air-to-ground link is connected; when this LED is off,

it means the air-to-ground link is disconnected. (Not available for air unit)

2、LED 2

When this LED is on, it means the ground -to-air link is connected; when this LED is off, it means the ground-to-air link is disconnected. (Not available for air unit)

3、SBUS Port

Connect this port to the SBUS port of a flight controller for remote control communication with the ground unit. Pin V + can provide 5V power supply.

4、LED3

When this LED is flickering, it means the data link of the Ethernet network is connected; when this LED is off, it means the data link of the Ethernet network is disconnected.

5、LED4

When this LED is on, it means the physical link of the ethernet port is connected; when this LED is off, it means the physical link of the ethernet port is disconnected.

6、Micro USB Port

Connect this port to the USB port of a PC or Laptop, and use the PC program to upgrade firmware on the air unit.

7、Bind Button

Press this button to perform the binding operation.

8、RF2 Port

Connect the 1st air unit antenna to this port.

9、RF1 Port

Connect the 1st air unit antenna to this port.

10、Network port

Connect this ethernet output port to the ethernet input port of a camera using the supplied RJ45 cable.

11、Serial Port (UART)

Connect this port to the telemetry port of a remote controller, or the serial port of a ground control station to setup a telemetry link between the drone and the remote controller or the ground control station. UART singal: LVCMOS-3.3V or RS232.

12、Power Input Port

Connect DC8~30V power source to this port. The power source can be from a battery, or can be from a power adaptor when the ground unit is upgraded on the ground.

5. Installation

5.1 Air Unit Installation

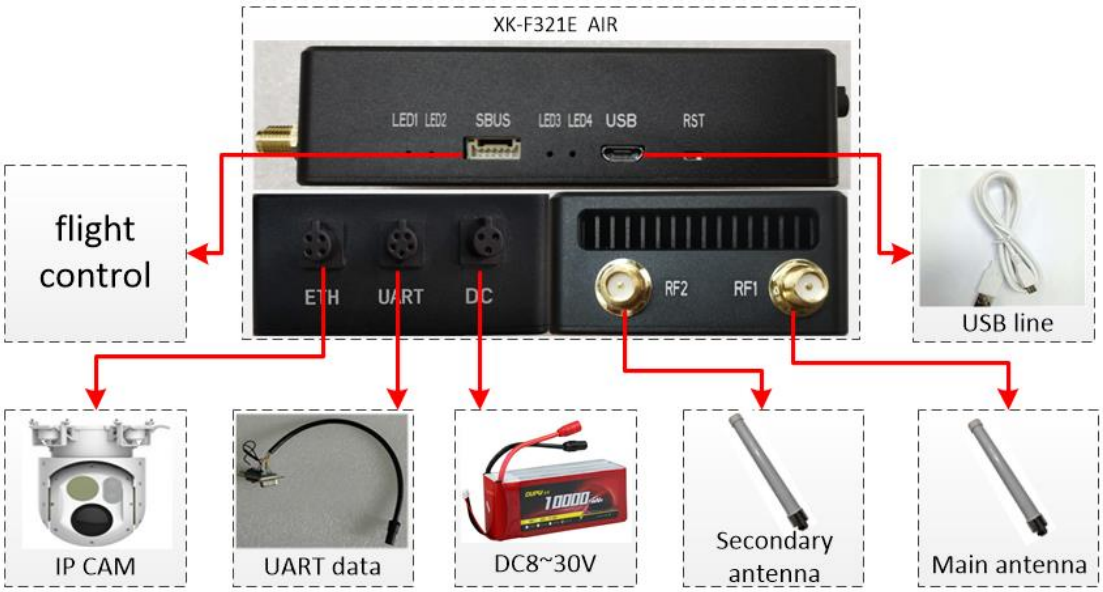

Figure 5.1 Air unit installation and connection diagram

5.2 Ground unit installation

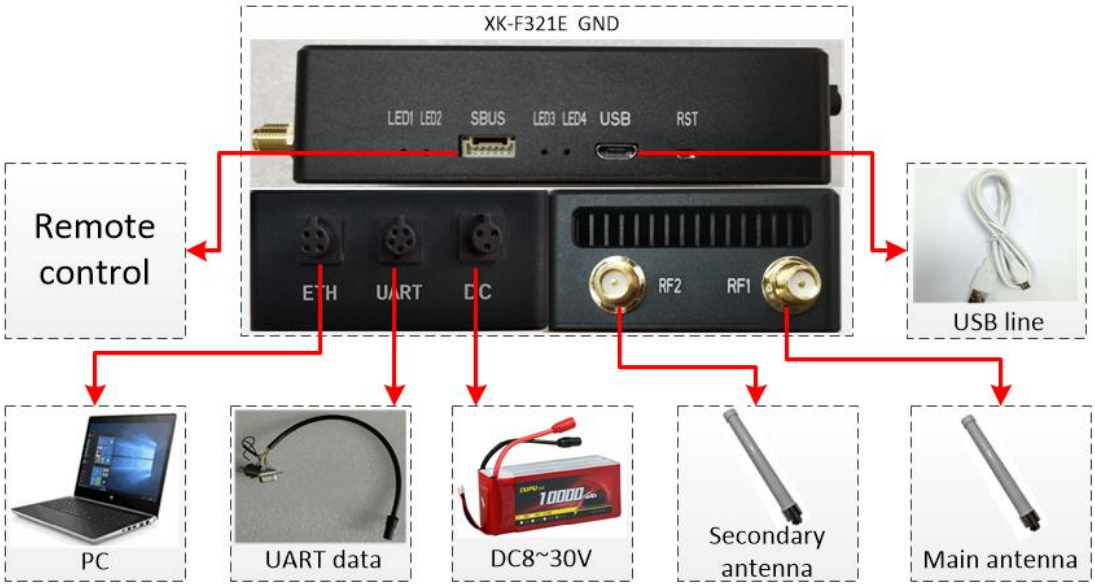

Figure 5.2 ground unit installation and connection diagram

The installation of the air unit is consistent with that of the ground unit.

The air unit and ground unit of XK-F321E bidirectional image transmission equipment are shown in Fig. 5.1 and Fig. 5.2. The specific installation steps are as follows:

① Connect the master-slave antenna of the corresponding frequency point to the RF1 and RF2 ports to ensure the connection is tight;

② The network port at the air end is connected to the pod, and the network port at the ground end is connected to the laptop / ground station;

③ SBUS interface, the air terminal is connected with UAV flight control, and the ground terminal is connected with the remote controller, which is confirmed to be correct;

④ If it is necessary to transfer the private data of the user, the USB to serial port line is used to link to the PC;

⑤ Power on at last.

Note: Two antennas must be connected to the equipment at the air unit, and the ground unit can be connected with one or two antennas.If only one antenna is connected to the ground unit, RF1 port must be connected, because RF1 has power transmission. If the RF1 port is not connected to the antenna, the equipment will be damaged.

6. Management software

6.1 Drive installation

Unzip the driver package “driverfiles ” to get the following files. First, double-click“ dpscat.exe ”Applications

名称	修改日期	类型	大小
amd64	2020/12/5 14:55	文件夹	
x86	2020/12/5 14:55	文件夹	
_DriverFiles.7z	2020/11/30 16:31	360压缩 7Z 文件	3,548 KB
dpinst.xml	2019/1/18 14:13	XML 文档	1 KB
dpinst32.exe	2019/1/18 14:13	应用程序	901 KB
dpinst64.exe	2019/1/18 14:13	应用程序	1,026 KB
dpscat.exe	2019/1/18 14:13	应用程序	37 KB
WirelessVideoTransmission.cat	2021/1/8 9:06	安全目录	5 KB
WirelessVideoTransmission.inf	2019/1/18 14:13	安装信息	10 KB

Figure 6.1.1 Compressed package file

Download the corresponding 64 bit or 32-bit driver according to the computer system

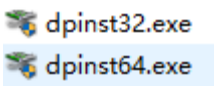

Figure 6.1.2 Installation package file

Double click to display the following interface:

Figure 6.1.3 Device Driver Installation Wizard

Click "Next" to jump to the following interface,Wait 3 seconds

Figure 6.1.4 Installation Complete

Click " Finish " to complete the installation.

6.2 software interface

When the device is not connected to the computer through USB, the interface of

management software is shown in Figure 6.2.1.

Figure 6.2.1 not connected to USB interface

When the device is normally connected to the computer through USB, the interface of the management software is shown in figure 6.2.2.

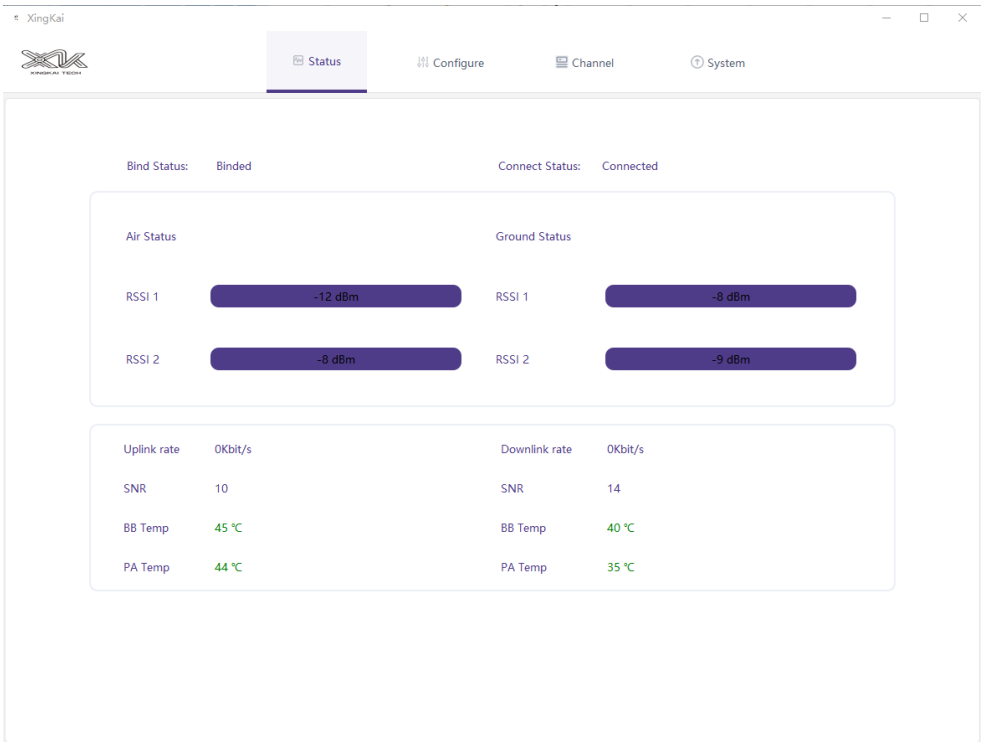

Figure 6.2.2 "status" interface

6.3 "status" interface

Information such as "device matching status", "device connection status" can be found in the current status interface.

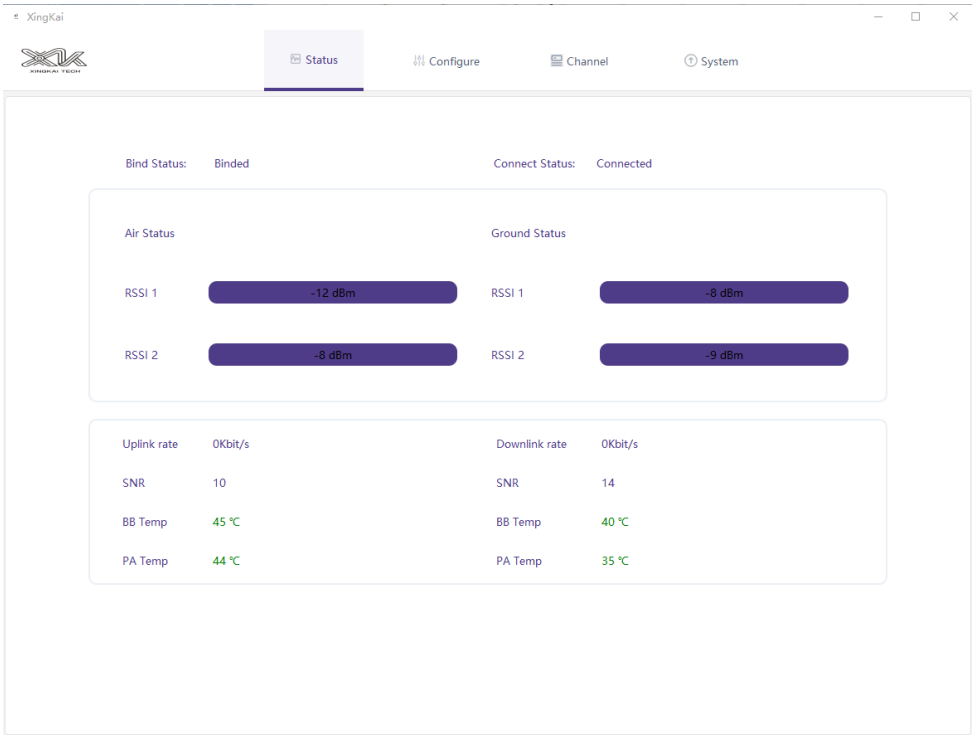

Figure 6.3 "current status" interface

Read the status information of air unit and ground unit, and read signal strength, uplink and downlink speed and baseband temperature. The larger the value of signal strength, the better the signal is. The rate of uplink and downlink will be displayed only when the image is passed.

6.4 "configure" interface

When configuring parameters, both units must be in the binding state.

Parameter configuration includes: encryption setting, downlink mode, serial port baud rate, remote control mode, data transmission interface type, etc. For example, there are two types of encryption settings: aes128 and aes256. Key input supports symbols, letters, numbers and other data. Aes128 must set 16 bit data to successfully encrypt, and aes256 must set 32-bit data to successfully encrypt (only need to set the ground unit).

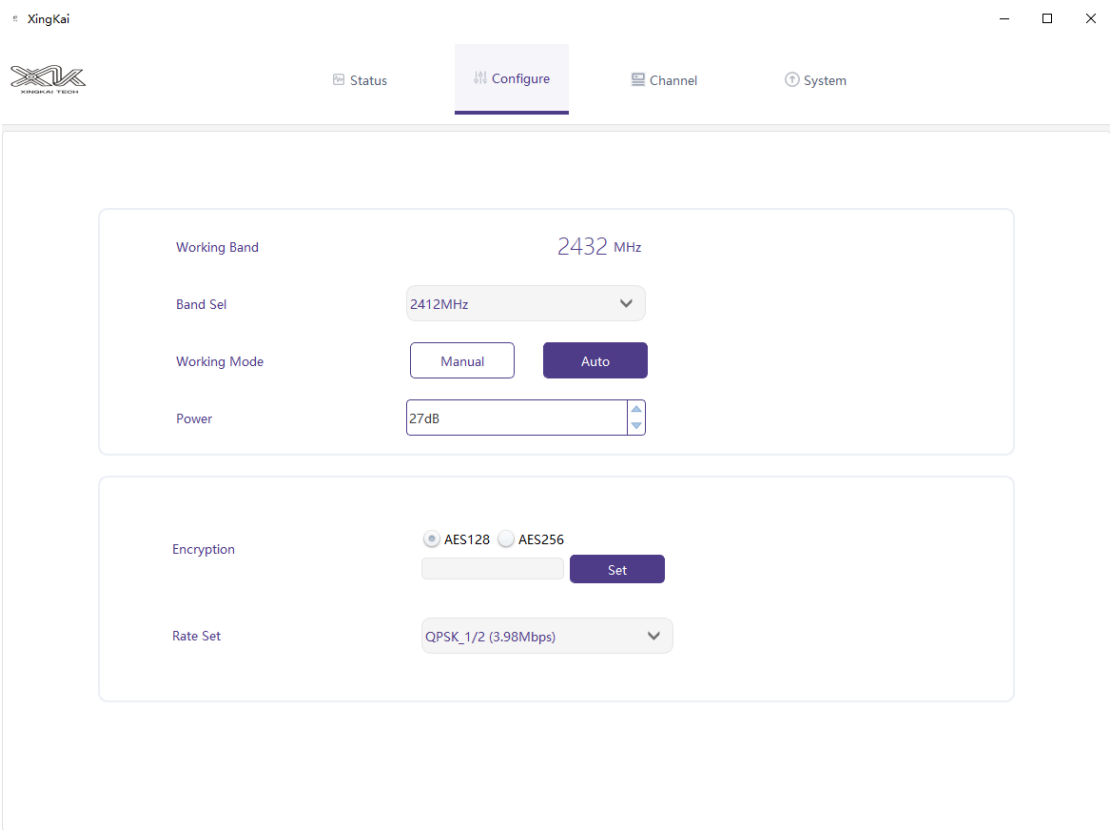

Figure 6.4.1 "Wireless Settings" interface

The frequency point selection and configuration interface is as follows:

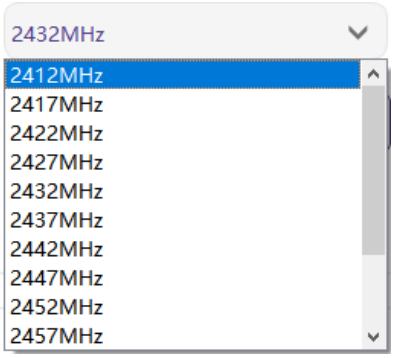

Figure 6.4.2 frequency point selection drop-down interface

The frequency points include: 2412MHz、2417MHz、2422MHz、2427MHz、2432MHz、2437MHz、2442MHz、2447MHz、2452MHz、2457MHz、2462MHz、2467MHz、2472MHz.

Working mode is divided into: manual and automatic

Manual mode: the module administrator can manually configure the working frequency points, and several frequency points can be selected.

Automatic mode: the channel is selected automatically after the device is turned on.

The downlink mode configuration interface is as follows:

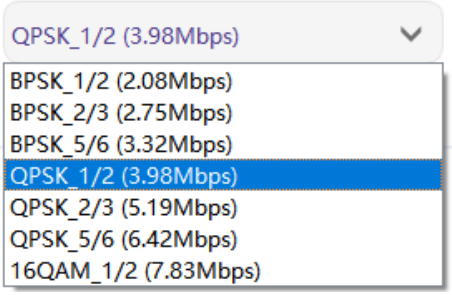

Figure 6.4.3 drop down interface in downlink mode

This rate value setting must be greater than the rate of the network encoder. It is suggested that 90% of the downlink mode rate should be consistent with the encoder rate, so that the distance can be the farthest when the image is stable. Setting too much will affect the distance transmission, the smaller the bit rate, the farther the transmission distance, but the bandwidth is small, the encoding rate of transmission is small, and the image quality will be poor.

6.5 "Channel" interface

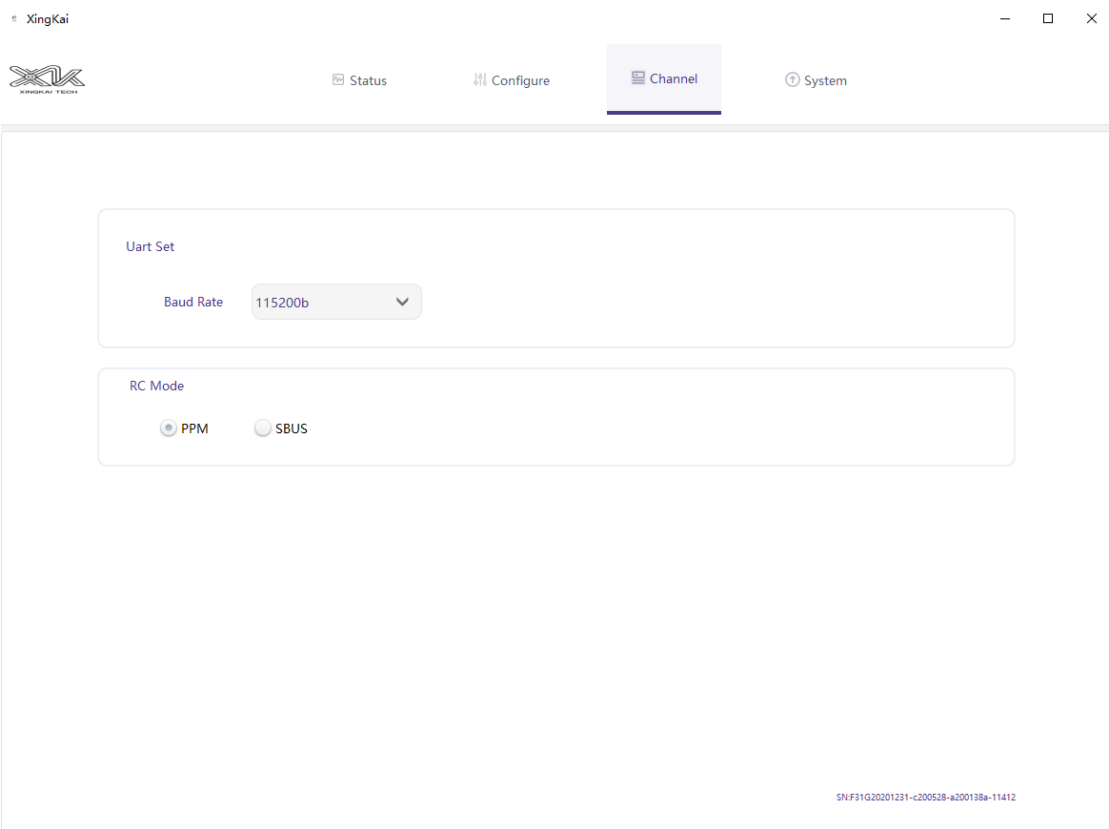

Figure 6.5.1 "frequency" interface

The baud rate configuration interface is as follows:

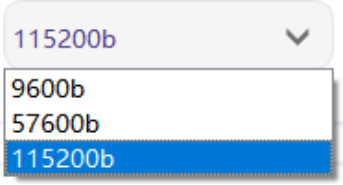

Figure 6.5.2 Serial port rate drop-down interface

This item corresponds to the baud rate of the configured data transmission channel. Support: 9600, 57600 and 115200 baud rates.

Remote control interface selection:

The remote control channel supports ppm and SBUs protocols, which can be configured and consistent according to the actual external interface configuration.

6.6 "system" interface

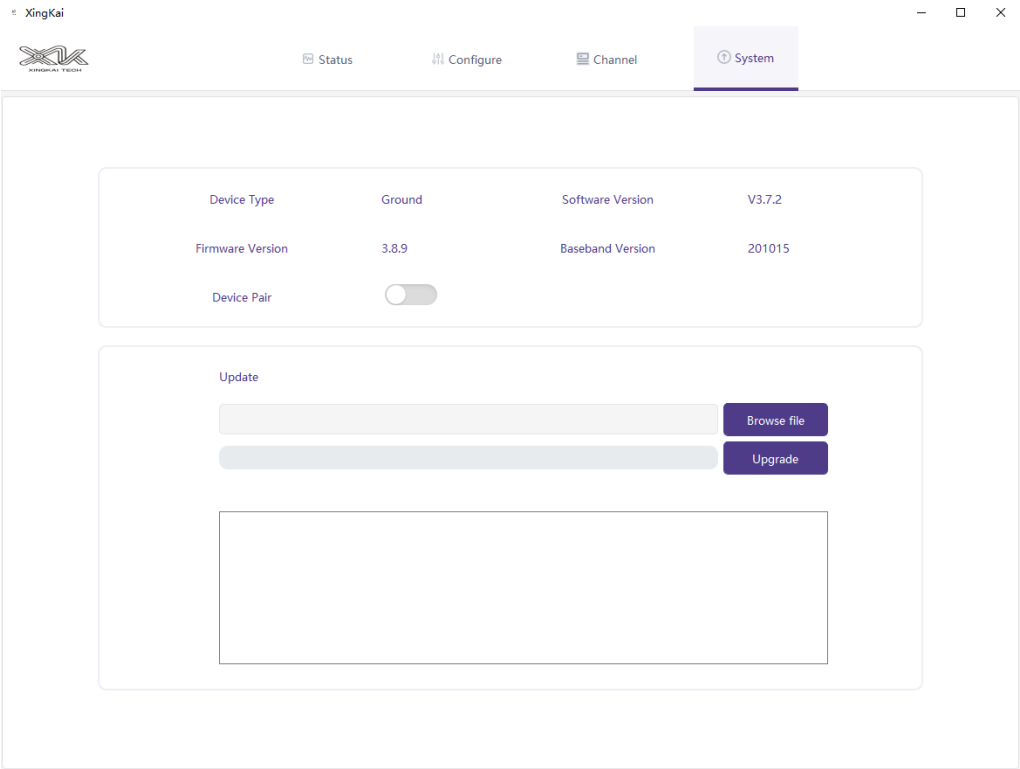

Figure 6.6 "system " interface

The information of "device type", "software version", "firmware version", "baseband version" can be obtained.

Note: the upgrade of air unit and ground unit should be operated separately. Use USB to connect PC terminal, click the software upgrade option, select the required upgrade file, and then click the upgrade button.

Notes for version upgrade:

a) During the version upgrade process, the power supply cannot be turned off, otherwise the device will not start normally.

b) When the baseband version and firmware version need to be upgraded at the same time, first upgrade the baseband version and then upgrade the firmware version.

c) The firmware files of air unit and ground unit should be the same when upgrading, and the equipment model should be corresponding, Otherwise, the pairing will not succeed.

d) After upgrading, the device needs to be paired again. You can choose physical pairing or software pairing. The pairing method is as follows:

Physical pairing steps:

First of all, press the binding button on the air unit for 3 seconds, and the prompt light will flash!

Then press the binding button on the ground unit for 3 seconds, and the prompt light will flash.

Wait 4 to 5 seconds for the pairing to succeed.

Software pairing steps:

On the software app, the air unit will start pairing first, and then the ground unit will start pairing. After 10 seconds, the device will be turned on Power off, and then power on without error prompt, the pairing is successful.

7. Network decoding settings

a) Computer IP settings

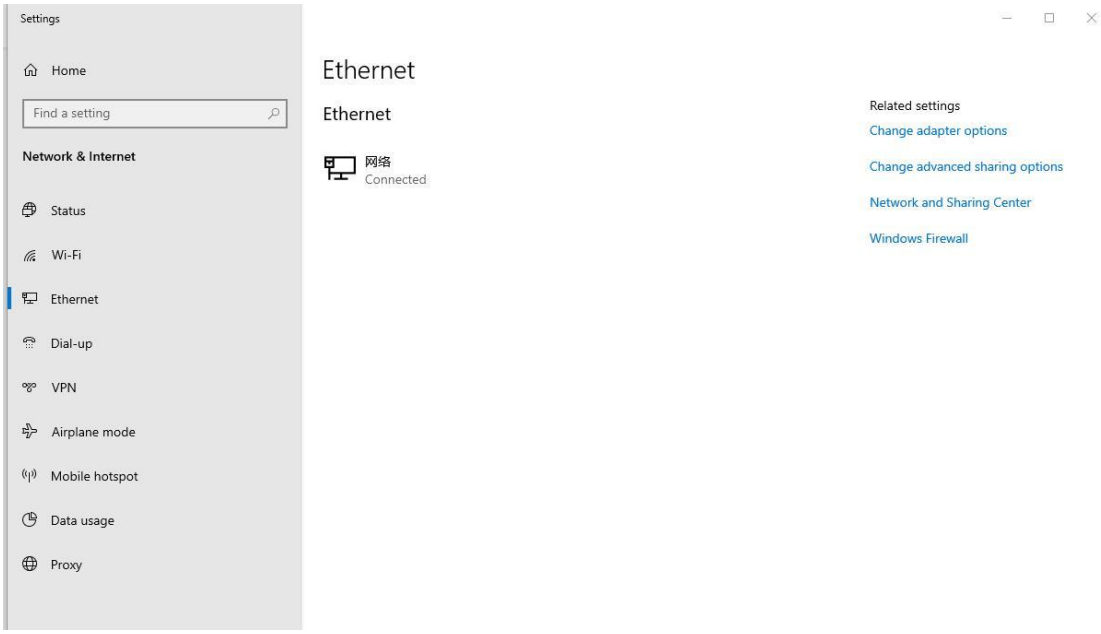

Figure 7.1 Network & internet

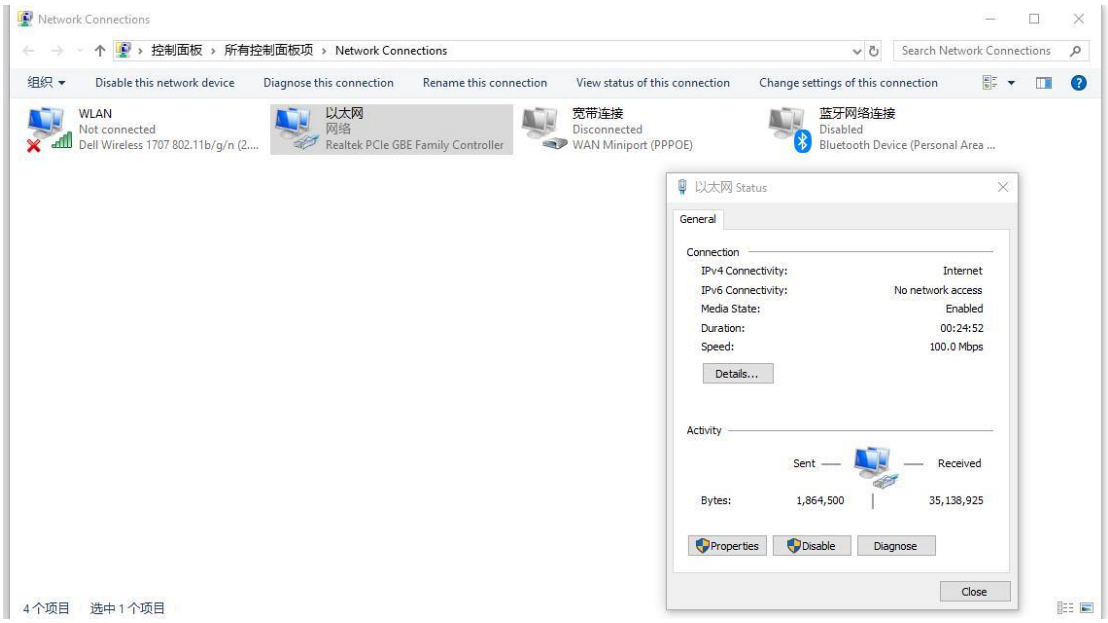

Figure 7.2 Network Connections

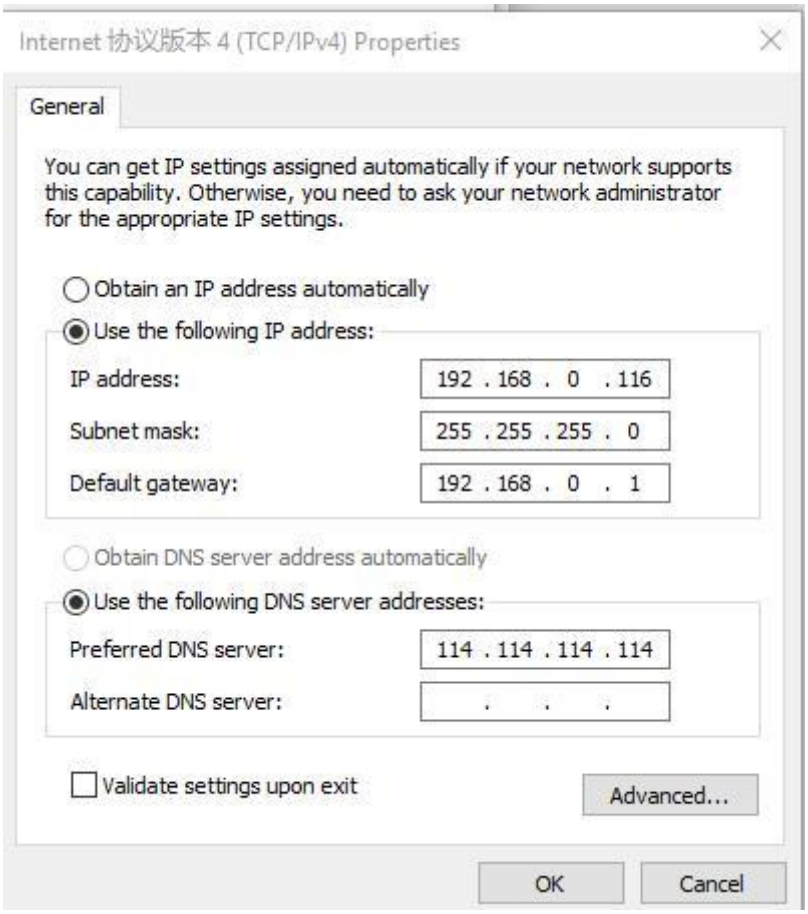

Figure 7.3 Internet Protocol Version 4 Properties

The network segment of "IP address " is consistent with webcam! No other device conflict is allowed when IP address is cut.

b) Webcam IP settings

First, log in to the webcam page and find out how to set the webcam IP address parameters (depending on different cameras) as follows:

Figure 7.4 Webcam Network Settings

The network segment of the camera should be kept in the same frequency band as the IP address of the PC.

c) Enter the IP address of the camera into the browser player to watch the decoding effect.

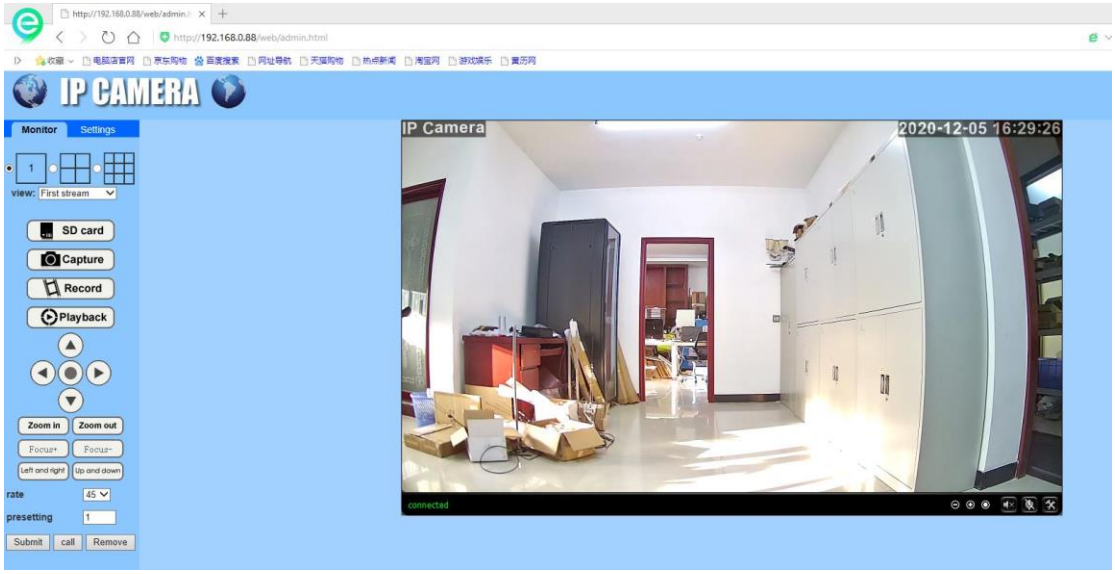

Figure 7.5 Web browser decoding

8. FAQ

Q1: How does the Xingkai module supply power?
Air unit: DC, power supply range: 8-30V, recommended to use 12V, Xingkai provides power supply cables.
Ground unit: DC, power supply range: 8-30V, recommended to use 12V, Xingkai provides power supply cables.
Q2: There are some devices nearby, such as WIFI, Bluetooth and so on. Can they be opened when flying?
Be sure to turn off WIFI, Bluetooth and other functions of other devices, because these devices are working in 2.4 GHz band, It can cause interference.
Q3: What do the four LED lights of the ground unit stand for?
LED 1 (downlink Indicator): The LED is on indicates that the air-to-ground link is connected; the LED is not on indicates that the air-to-ground link is disconnected.
LED 2(uplink Indicator): The LED is on indicates that the ground-to-air link is connected; the LED is not on indicates that the ground-to-air link is disconnected.
LED 3 (Network Data Link Indicator): The LED is flickering indicates that the data link is connected; not flickering indicates that the data link is disconnected.
LED 4 (Network Physical Link Indicator): The LED is on indicates that the data link is connected; not flickering indicates that the data link is disconnected.
Q4: What if the uplink LED indicator is not on?
Please follow the following steps:

1) Please check the power supply of the air and ground unit is normal.
2) Please check the antennas installation of the air and ground units is normal: whether the antennas is blocked; whether the antennas connection is loose; whether the RF cable and port is not tightened;
3) Check whether the TX frequency of the ground unit is consistent with the RX frequency of the air unit with Xingkai PC management software.
4) Check the TX power of the ground unit with Xingkai PC management software.
5) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q5: What if the downlink LED indicator is not on?
Please follow the following steps:
1) Please check the power supply of the air and ground unit is normal.
2) Please check the antennas installation of the air and ground units is normal: whether the antennas is blocked; whether the antennas connection is loose; whether the RF cable and port is not tightened;
3) Check whether the TX frequency of the air unit is consistent with the RX frequency of the ground unit with Xingkai PC management software.
4) Check the TX power of the air unit with Xingkai PC management software.
5) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q6: What if the ethernet physical link LED indicator is not on?

Please follow the following steps:
1) Please check whether the power supply of the air and ground unit is normal.
2) Please check whether the RJ45 cable is normal.
3) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q7: What if the ethernet data link LED indicator is not on?
Please follow the following steps:
1) Please check whether the ethernet physical link LED indicator is on.
2) Please check whether the cameras, pods and other equipment are working properly.
3) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q8: After connecting Xingkai module, telemetry can not be connected properly?
Please follow the following steps:
1) Please check whether the link state is normal, please refer to Question 4 and Question 5 if it is abnormal.
2) Please check whether the telemetry port both the air and the ground units is correct.
3) Please check whether the connecting between flight controller and air unit is correct and that between ground unit and ground station is correct.
4) Please check whether the telemetry connection of the air and ground unit is

correct. We provides standard cables. If you make it by yourself, please check the pin.
5) Check whether the baud rate is configured correctly with Xingkai PC management software.
6) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q9: After connecting Xingkai module, RC can not be connected properly?
Please follow the following steps:
1) Please check whether the link state is normal, please refer to Question 4 and Question 5 if it is abnormal.
2) Please check whether the RC port both the air and the ground units is correct.
3) Please check whether the RC connecting between flight controller and air unit is correct and that between ground unit and remote contriller is correct.
4) If using PPM mode, check the mode configuration of the remote controller. if using S.BUS mode, check the configuration of the receiver and remote controller.
5) Please check whether the RC connection of the air and ground unit is correct. We provides standard cables. If you make it by yourself, please check the pin.
6) Please check whether the RC mode is configured correctly with Xingkai PC management software.
7) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q10: After connecting Xingkai module, video can not be output properly?

Please follow the following steps:
1) Please check whether the link state is normal, please refer to Question 4 and Question 5 if it is abnormal.
2) Please confirm whether the ethernet physical link and the ethernet data link indicators are normal, if not, please refer to Question 6 and Question 7.
3)Please confirm the IP address, login username and password of the webcam.
4) Please check whether the IP address configuration of the ground station and the network camera is in the same network segment.
5)If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q11: After connecting Xingkai module, what if the video carton or mosaic?
Please follow the following steps:
1) Please confirm whether the downlink mode configuration is reasonable.
2) Please check whether the connection of RJ45 network is normal.
3) Please check If there is interference exsit, we can consider changing the working frequency.
4) If there is no interference, whether the limit distance of communication link has been reached.
5) If the above steps can not solve the problem, please contact Xingkai technical support staff.
Q12: After connecting Xingkai module, what if the transmission distance of the module is

short, which is not up to expectation?
Please follow the following steps:
1) Please verify whether the antenna and RF cable are installed correctly, check whether they are Xingkai standard materials.
2) Please ensure that the antennas installation of air unit is not blocked by the payload, and 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 RF power is reduced, not to achieve full RF power.
4) Please check whether the downlink mode configuration is reasonable or not, the high-speed downlink mode will significantly reduce the transmission distance;
5) Please check whether the working frequency is obviously interferenced or not, Figure 6.4.2 introduces how to select working frequency.
6) Please check whether there is serious obstruction between the air and the ground unit during flighting, and the complex geographical environment will affect the transmission distance.
7) If the above steps can not solve the problem, please contact Xingkai technical support staff.

If you have any questions about this document, please contact Xingkai by sending a message to support@xingkaitech.com. You can also visit http://en.xingkaitech.com .

FCC Warning Statement

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

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

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