Mini portable HD COFDM wireless video transmission equipment

<u>ST6000Mini-HD</u>

Users Manual

SUNTOR ELECTRONICS CO., LIMITED

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Part 1. Safety Precautions

Before the using, please reading the Safety Precautions clearly to make the system work safely and stably.

➢ Choosing suitable installation place, the environment between the two antennas ,it's the more open the better, and more high more better.

➢ Can't open the shell to do any operation without the permission of the supplier

- Before the transmitter and receiver is turned on, please make sure the antenna in good connection status.

- When working with the antenna, the distance between the transmitter antenna and receiver antenna should be more than 10meters, then we can turn on the equipment. To prevent the reception level is too high, causing damage to the receiver.

- Confirm the power supply system is fit with the product technology requirement.

- Forbidding any metallic object into the system shell

- **You must shut off the power before you can disassemble the antenna**

- During working, try best to make the transmitter video source far away from the antenna, and also avoid the video source and the antenna in the parallel. As possible make the av line blow the antenna space

- Before use, pls let the equipment battery charged full. If the electric quantity is lack, the system communication will be not stable, and video will be discontinuity.

- When the transmitter uses AC power, it can not use button cell at the same time.

Remark：

- ✧ system must be working in a dry , ventilated environment
- ✧ System configuration settings up already, do not change without the permission of factory.

Part 2. Equipment reference list

No.		Part Name	Part Model	Quantity	Directions
1	Transmit	Transmitter	ST6000Mini-HD	1	Transmitter(small size)

	system	TX antenna		1	The antenna is connected to transmitter. Because the antenna is small and short, it is suitable for hidden environment for short range transmission.
		SDI cable		1	To connect the HD camera and transmitter SDI interface
2	Receive system	Receiver	ST6000RHD	1	Receiver，it can be installed on the control car or the control centre.
		RX antenna		2	The antenna model is different according to the difference of the transmitter's frequency, The kind of antenna also is different according to difference of the transmitter installation environment. The receiver is installed on the command car, using omni-directional bracket antenna.
		AV cable	1.8meters	1	The length can be extended according to the transmission environment.
		AV connector	BNC	3	They are used for receiver av output interface conversion
		HDMI cable		1	Using between the receiver and the HD HDMI equipment.

Part 3. Product Introduction

Thank you for using our company's HD wireless video transmission equipment: ST6000Mini-HD.

ST6000Mini-HD mini portable HD wireless video transmission equipment is new generation of real-time broadcast-quality high-resolution image transmission system. It adopts the current leading COFDM modulation technology and relative narrow-band frequency(2/2.5//4/8MHz), it has the strong anti-jamming capability, overcomes the reflection and cover caused by transmission

multipath simulation technique and conventional modulation techniques, to realize high-speed photography and real-time transmit high quality image in NLOS or complicated working environment. With small size and light weight, it is suitable for complex and special environment , such as: light-weight UAV, ultra-light UAV, rotorcraft, mini UAV, ship, robot, etc. It is used in short range NLOS and LOS environment wireless video transmission. Picture quality reach to Full HD via H.264 encode & decode, of course the picture quality downward compatibility to 1080I, 720P or 480P.   Support digital interface and analog interface, like HD-SDI & HDMI and simulation port CVBS. The advantage of the production include high resolution & contrast ratio, good color performance.
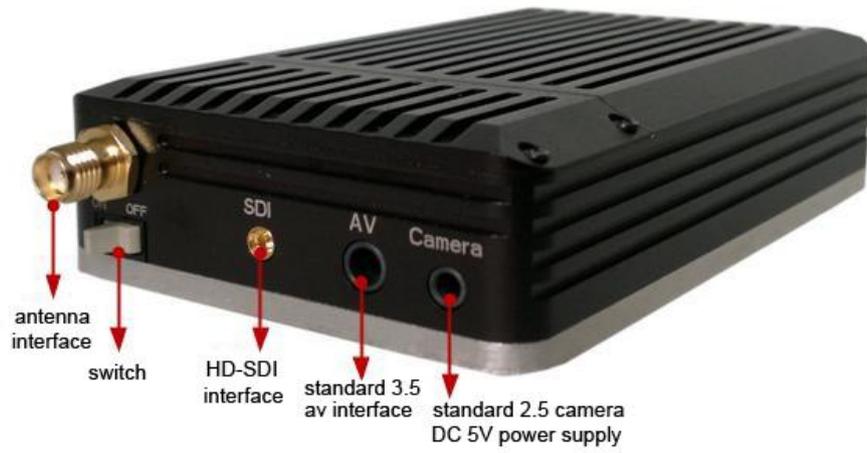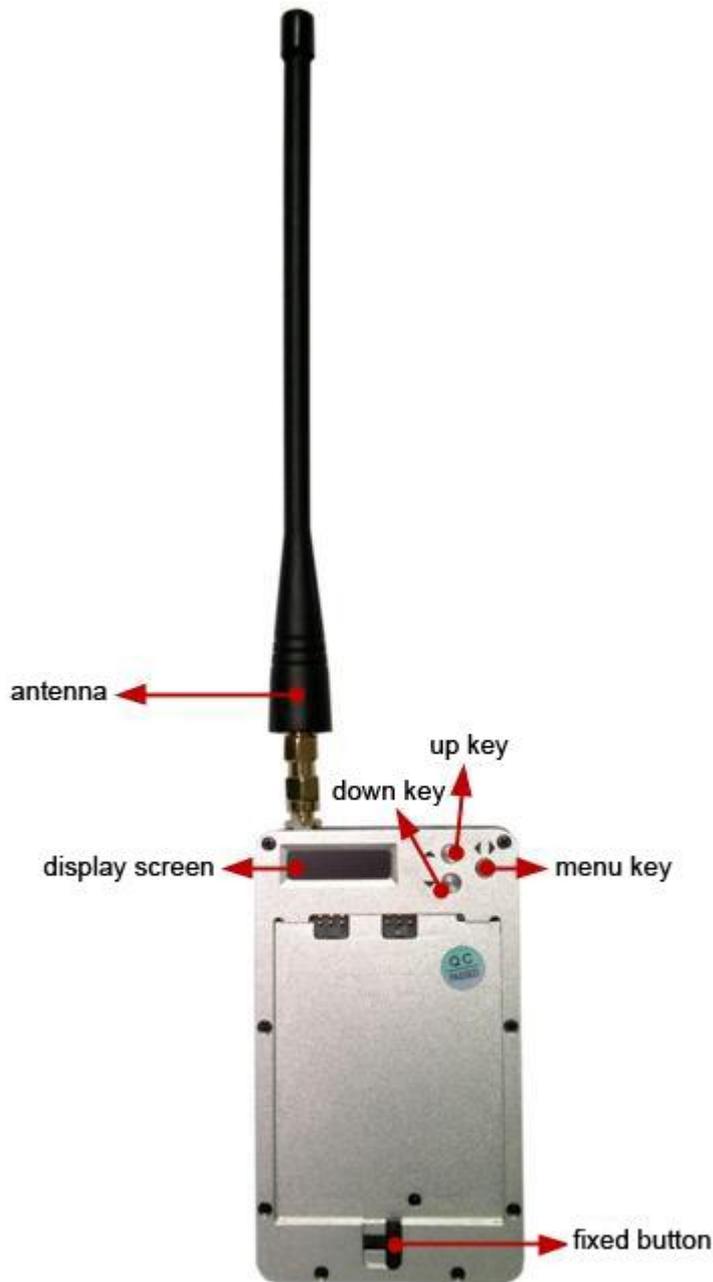
Picture:

Transmitter

Receiver

Part 4. Interface introduction

1. Transmitter Interface

The transmitter's external interface unit：

- Power switch: Press the switch , control power on-off. After the equipment operate, the LCD display will be shut automatically with 3 seconds.

- External power supply interface(DC IN): the power output will be DC 7.2V when use Li-battery, it can charge the camera

- Power supply: can also use external power supply, it supports DC 7-16V

- Antenna interface: SMA RF antenna interface(connect antenna first, then open the power supply, otherwise the power amplifier will be burned)

- Camera input interface: standard 2.5 camera input, support DC 5V

- 3.5 Av input interface: turn to analog AV interface

- SDI interface: connect the external HD camera

2. Receiver (Standard 19-inch 1U)

The front panel

The back panel
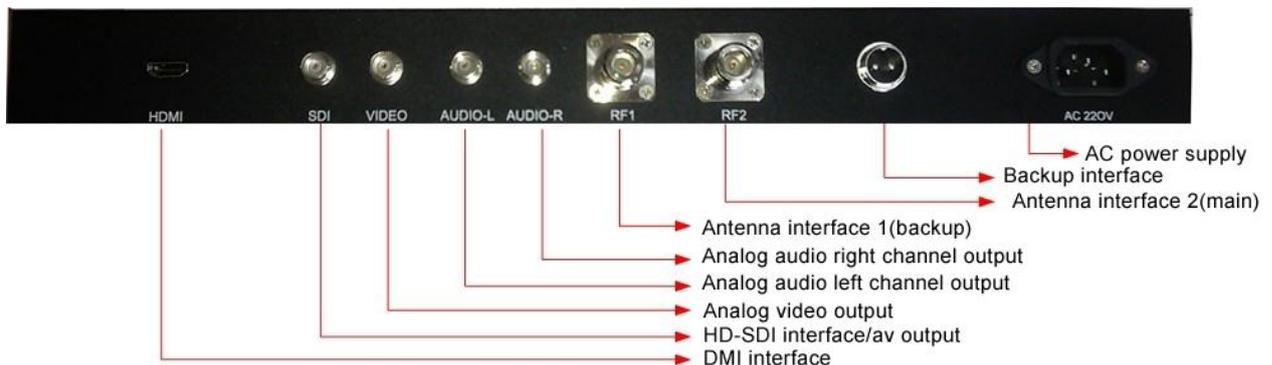
The external interfaces of the receiver are similar as the transmitter's, the interface definition also are similar.

The receiver includes the below external interfaces:

Power switch indicates: Press the switch , control power on-off, with light

LCD panel: LCD status indication, system parameters change equipment

HDMI interface: HDMI digital signal output

SDI digital interface: for HD decoding, it is HD－SDI interface. For SD decoding, it is CVBS interface

VIDEO output: analog video CVBS output

AUDIO left channel output: analog stereo left audio channel output

AUDIO right channel output: analog stereo right audio channel output

RF1antenna interface: aider antenna interface, connects to sucker antenna or feeder line,
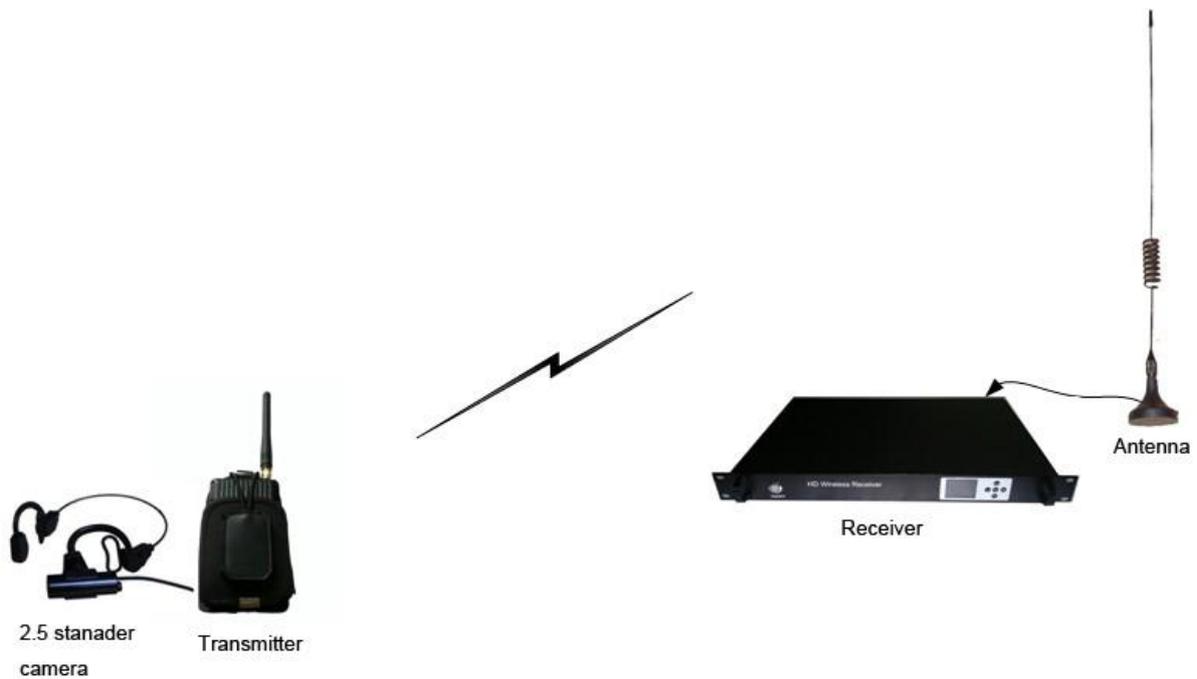
RF2 antenna interface: main antenna interface, connects to the sucker antenna or feeder line

Air plugs: Backup interface

Power supply: DC 12V/ AC 220V

Part 5. System operation

1. System connection diagram

2.5 stanader camera

Transmitter

Receiver

Antenna

2. Operation directions

◆ Checking the relational attachments is integral or not;

◆ Connect transmitting equipment: the total power consumption of transmitter is about 6w, system power supply is DC7.2V/1400mA; RF interface is SMA female socket, suitable for standard SDI interface camera; connect antenna firstly, then connect camera, finally connect Li-battery. Open the switch, then transmitter will work.

◆ Connect receiving equipment: the receiver is 1U 19inch box; the power supply is AC220V/1A, also accept AC80-240V; the RX antenna can be the omni-directional fiber glass antenna or yagi antenna according to the requirements, antenna's interface is N type female socket; the receiver has the 1-channel HDMI digital output, 2-channel CVBS output interface, can connect to the HDMI/AV monitor directly, we advise to use professional cctv monitor.

- ◆ Connect 2PCS antennas firstly, then connect av cables, finally connect power supply. Open the switch, then receiver will work.

- ◆ The factory system parameters to optimize equipment setup, users do not need to re-configure the related parameters.

Part 6. Equipment technical parameters

1、Transmitter

RF modulation part

- Working frequency: 300MHz～900MHz(customized)

- Output power: 100～400mW adjustable

- Modulation: COFDM

- Channel bandwidth: 2/2.5/4/8MHz adjustable

- Error correcting mode: FEC@Viterbi (1/2, 2/3, 3/4)

- Encryption mode: manual operation AES double encryption

System part

- H.264 standard

- Code stream: 1.5Mbps～12Mbps

- System time delay: 300ms

- BER: $\leqslant 10^{-6}$

- Transmission distance: LOS: 1-8KM, air to ground: 8-20km, NLOS: >400meters

- Usage mode: portable, aerial transmission, hidden transmission and short range NLOS av transmission

Audio and video part

- Compression format: H.264

- Audio input: digital HD-SDI、analog CVBS complex standard 2.5 and 3.5 double input

- Image resolution: HD1080P（1920*1080）, compatibility 1080I、720P、480P and standard resolution

- Image frame rate: 30 frame/s

- AV input physical interface 1: digital HD-SDI

- Video input physical interface: standard 2.5 interface, standard 3.5 interface

- Audio input physical interface: standard 2.5 interface, standard 3.5 interface

Others

- Battery powered: DC 7.2V/140mA or external DC 7-16V

- Built-in LCD: display the parameters and adjust parameters function, the display will shut up within 3 seconds

- Power switch: ON/OFF

- 'Size: 100×58×18 mm (L×W×H)'

- Weight: 175g

2、Receiver

RF modulation part

- Receiving frequency: 300MHz～900MHz

- Modulation: COFDM

- Channel bandwidth: 2/2.5/4/8MHz adjustable

- Encryption mode: manual operation AES double encryption

- Receiving sensitivity: ≤-98dBm @ 4MHz, ≤-96dBm @ 8MHz

System part

- Receiving polarization: vertical polarization, dual-antenna receiving

- Receiving technique: Space diversity receiving technique

- Filter technique: built-in high performance cavity filter technique

Audio and video part

- Compression format: H.264

- AV input: digital HD-SDI、analog CVBS av

- Image resolution: HD1080P（1920*1080）, compatibility 1080I、720P、480P and standard resolution

- Image frame rate: 30 frame/s

- Video output physical interface: BNC female port, HDMI standard interface

- Audio output physical interface: BNC female port, HDMI standard interface

Others

- Come with LCD display, adjust parameter, display the receiving signal's strength and weakness

- Power supply: AV220V

- Size: 1U, 19 inch case

- Weight: 4kg

3、Antenna

- Working frequency: 330MHz-390MHz (frequency band adjustable, customized)

- Length: 39cm

- Gain: 3.5dBi

- Impedance: 50Ω

- SWR: <1.5

- Polarization mode: vertical polarization

- Weight: 85g

- Wind loading rating: when it is 8 grades wind, the equipment can guarantee indices, when 10 grades wind, it can work.

Part 7. Equipment Common Troubleshooting

1. Lots of interference stripes or snowflakes appears on the monitor

As usual, the reason is that video cable is too close to the antenna. You can let them apart far away from each other.

2. Black and white image appears on the monitor

Please check the receiver's video output cable connects to the monitor good, make sure the power supply is good

First open the video source, second turn on the transmitter, then turn on the receiver. Because the HD equipments need distinguish the video resolution first, then transmit the video signal. If it can not distinguish the video source's resolution, The default is no video source and it can not transmit the signal normal，and caused the black screen. Please check the HD-SDI/HDMI connection line is good also.

Replacing the HD-SDI/HDMI video source at the transmitter end to cause the black screen, for

example: when the HD-SDI/HDMI video source is working, Individual operations into a card or hard disk storage of video clip playback, then you must restart the transmitter to identify the resolution again.

Changing the transmitter level cause the problem, such as the transmitter default and use the 1080P/I video source, the user suddenly change to 720P or 480P, then you must restart the transmitter, sometimes you should also restart the receiver to refresh the list of resolutions to make sure the equipments work well.

3. Mobile transmitter get the signal closed, and has no signal or poor signal when the distance is far away

Please test the electromagnetic environment near the receiving end，to see if there is frequency interference source around the receiver or not, If there is, the equipment should change frequency.

4. After the receiver and transmitter is installed, the signal has not been able to synchronize with the short distance .

This problem is caused by the transmitter instantly synchronize command, must restart the transmitter.

5. Whether up close or from a distance, the signal has not been able to synchronize

It's a transmitter transmitting frequency offset problem, reset again transmitter.

6. After receiver video connector connects to the monitor, the monitor can not display the image.

It is the reason that the video connector is not match with video cable impedance. You should make the receiver and monitor ground connection well.

7. After the transmitter changes the video source, the receiving end has no display.

You should change the video source, then restart the receiver.

8. No transmitter power output, the transmission distance is not far.

Equipment amplifier may be damaged, usually because before the device is powered on, the antenna is not connected, so that the amplifier prolonged idling, burning amplifier, it needs change a new amplifier.

9. The receive LNA is damaged, and with short transmission distance.

When the transmission distance is short, and reduce to 120dBi, you should change another new LNA.

Part 8. Technical support of service

1. Ways of service

1) Telephone & Fax service

Once engineers get a Call or Fax from our customer on maintenance, they will be enthusiastic and patient for answering all questions.

They will explain and apologize for our customer if they can't answer the question on telephone.

Considering limited capacity , they will seek help from engineer supervisor. If the question comes from Fax, the engineer will carefully write resolution proposal and fax to our customer.

After that, they will call our customer to make sure receiving resolution proposal, meanwhile, keeping maintenance record,

2) Door service

- ♢ Maintenance workers take " After-sales service customer feedback form" & " Engineering material supplement form" any time.

- ♢ Maintenance worker had better use(How do you do ,please, sorry, good bye and so on) polite words.

- ♢ All work focuses on customer, based on principle of customer service, to make a good reputation for our company.

  Before door service, maintenance worker needs to learn about the cause of the problem, concerned the problem, bring necessary tool, software and hardware, keep everything in control, make sure resolve all problem by one-time.

- ♢ Under special occasion, maintenance worker can't provide support service on appointed time, they should explain and apologize to customer in advance.

- ♢ Maintenance worker should pay more attention to customer reflect question, do systematic and overall testing, maintenance, enthusiastic service for customer.

- ♢ User don't know on part of system or function of part device and software , maintenance worker should speak carefully to user and teach user the correct operation.

- ♢ Under lacking spare part , unclear reason of problem and so on, the problem can't be fixed immediately,

- ♢ Maintenance worker should explain current situation and apologize to customer..they will seek help from engineer supervisor at once, let the problem be resolved in the shortest time.

- ♢ If need to add the device at scene, please fill in the relevant form and make user to sign the signature.

✧ After service done, help to customer to fill in " After-sales service customer feedback form" & " Engineering material supplement form"(if need this form) well. Maintenance worker need to submit all forms to secretary of customer service department, make sure the related information will be recorded in CIM system, better to manage customer information.

✧ Maintenance worker can't accept cash or precious gift from customer.

# Part 9. Attachment: important parameters modification

Note: In principle, we don't suggest that you change the equipment important parameters. Because the technical parameter will be set well according to customers' requirements before ship them out.

1. Transmitter parameters modification: In the condition of transmitter off, connect well the antenna(the shortest small gain antenna) and battery, start up the transmitter to enter parameter modification mode. Refer to the **Picture 1**.   After finishing the modification, you don't need to turn off the transmitter power, you can continue to modify the receiver parameters.

2. Receiver parameters modification: connect well receiving antenna, power supply and let av signal connecting to monitor. Modify the parameters at the manual LCD when the receiver is on. Refer to **Picture 2.** After finishing the receiver modification, it will search the transmitter av signals automatically.

Picture 1(transmitter)

setup menu

up key ◄ ———————— ► function key
                              down key
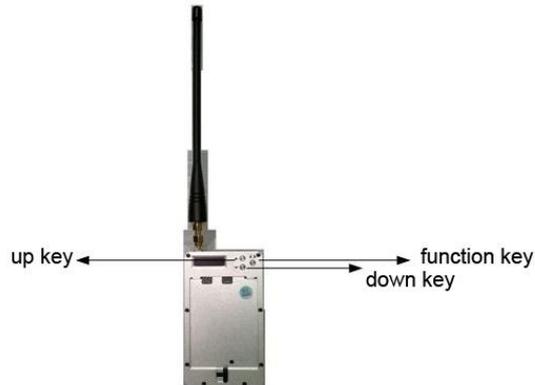
*Revisable function:1. video sources type; 2. change frequency; 3. change frequency bandwidth; 4. change transmission power; 5. manual encryption Firstly

* press any key to enter menu mode, you can choose different functions by the UP and Down key. Then press the function key to enter setup mode, you can change the data what you need.

1. Video: the default video source type is HD-SDI input, adjustable type is HD-SDI, CVBS. After entering the setup mode, press the function key and move the cursor position. It will flicker when you move the cursor at the modified position. You can change the data by Up and Down key. Long press the function key to save. After saving, the cursor will not flicker.

2. Freq: 340 means 340MHz, adjustable frequency range is 300-900MHz

3. Band: 20 means 2MHz, adjustable bandwidth is 2/2.5/4/8MHz.

4. Gain: power adjustable range is -10----0, 0 means no decay, -1 means the minimum decay, -10 means the maximum decay. After modifying, long press the function key to save.

5. AES: Manual encryption: AES manual double-encryption function, OFF means close the encryption function. ON means turn on the encryption function. Long press the function key to save. This function will work only when the transmitter and receiver is open.

Picture 2(receiver)

Receiver LCD display instructions:

State: receive signal strength 100% Scaling indicator

Freq: receive centre frequency（default 340M）

Band: frequency bandwidth（default 8.0M）

PoE: RF interface power supply（default OFF）

AES: Manual AES encryption（default OFF）

Note: when turn on the receiver, the LCD will blink to identify the wireless signal, receive the signals success, the **State** will be show green 100% scaling indicator. If can not receive the signals, the State will be show blue00% scaling indicator.

LCD parameter modification instructions:

Parameters modification: Press the middle button to enter the modification status, "L" "R" is mobile menu key, "U" "D" is parameters modification key.

Press the middle button longer to save the changed parameters. If synchronization is not normal after finishing the parameters modification, you must restart the transmitter and receiver.

Centre frequency: range to 300-900M (configurable)

Frequency bandwidth: range to 2MHz\2.5MHz\4MHz\8MHz(configurable)

PoE: RF interface power supply（ON/OFF configurable）

AES encryption: Optional AES encryption algorithm to encrypt or off

Note: the factory system parameters to optimize equipment setup, users do not need to re-configure the related parameters.

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