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Chapter 1 Brief introduction

ST-601 mini integrated microwave video transmission system adopts 10-15GHz wireless microwave to transmit video signals. For selecting higher frequency and adopting FM modulation, the system possesses stronger counter interference and its picture is very clear.

ST-601 is in a small size, convenient to carry and its frequency is easy to modulate so that it could avoid the interfered frequency. There are some other specialties: big bandwidth, big modulation range, small power output and small harm to human body.

This system is mainly used in the following situations:

1. Post office surveillance and modern commanding management system
2. Toll-station monitoring system
3. Surveillance of important warehouses and ports
4. Community surveillance
5. Bank network surveillance
6. Surveillance in buildings

ST-601 mini integrated transmitter's working frequency covers two frequency band, L waveband and S waveband:

Ku waveband (type:ST-601ku) 10-15GHz

In order to be suitable to various situations, the frequency of ST-601 transmitter could be modulated according to actual conditions.

And thanks to its low power output, it is suitable to be used in office, on street and on fair market where there are many people.

Chapter 2 Outlook and inspection of ST-601

1. Outlook of ST-601

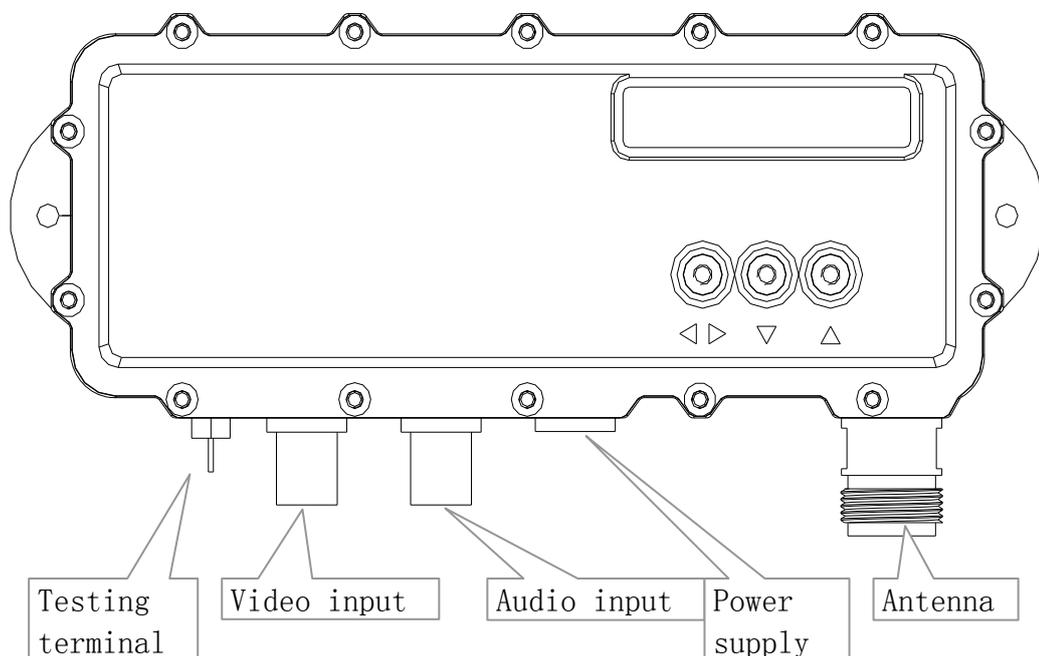


Figure 1: ST-601 plan form

We can see the connectors from the above figure. The video signals from video camera such kinds of photographing equipment are sent to the video input connector through BNC plug. And the audio signals from sound equipment are sent to the audio input connectors through BNC plug.

The antenna connector is connected to the transmitting antenna, and sometimes a cable between them is need. The length and thickness should be agreed by our technical expert. And we could also prepare the cable according requirement of our clients.

The transmitter requires 12VDC power supply. We could also add a transformer depending on client's requirement. Our client could just prepare 220VAC power source.

2. The dimension of ST-601 transmitter:

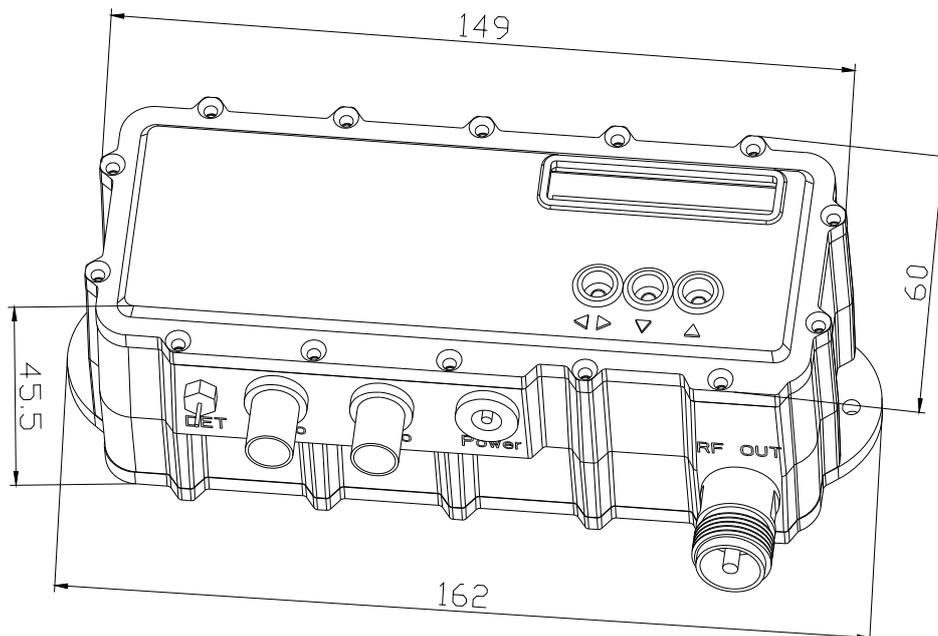


figure 2、out look and dimension of ST-601 microwave transmitter (mm)

ST-601 microwave transmitter is of a small cubage and very convenient to be installed in a small space. The length of the transmitter

is 149mm, width is 60mm and height is 45.5mm. There are specially designed hanging holes.

Customers could select the frequency of ST-601 microwave transmitter by themselves with more practicability. 12VDC voltage is needed and customers should pay attention to positive pole and negative pole. If there is a 220VAC transformer, connect to the 220VAC power source directly. When the power is on, the screen will appear with 145-158 and then the default frequency (the frequency is 1.3 G, then the nixie tube will show 1300 MHz), if it is the frequency that you need, you may not modulate it. If it is not the frequency you need, you can change it in the frequency range. Please see the following picture:

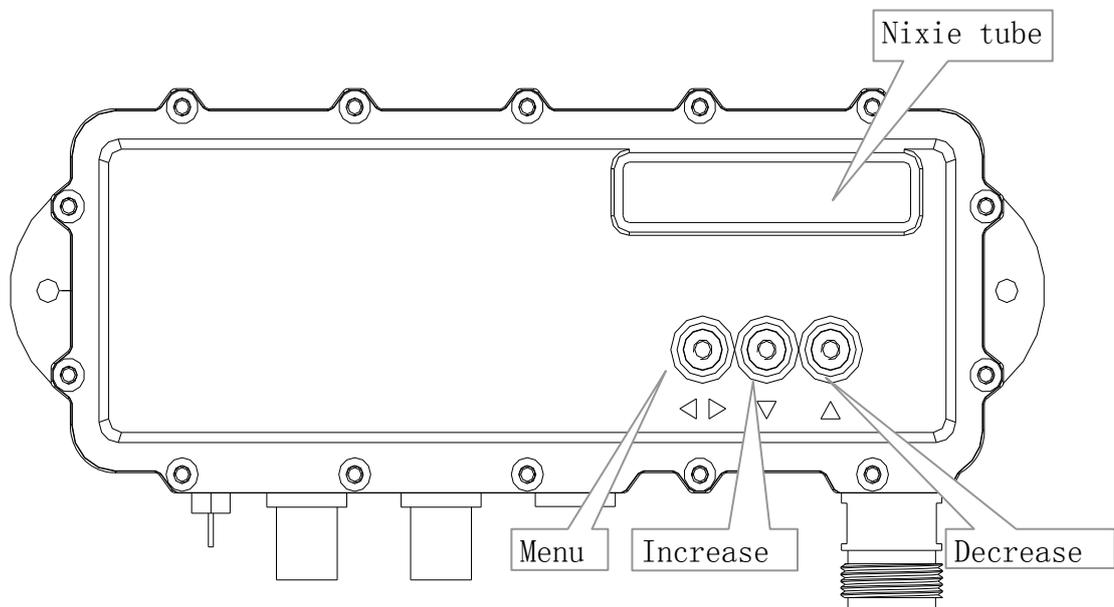


Figure 3: ST-601 front view

The procedure is as follows:

1. See the above picture and come to know the three keys: menu key, increase key and decrease key.
2. Press the “menu” key, F 1300 will appear, if you need a bigger frequency, please press “increase” key, if you need a smaller frequency, please press “decrease” key until the nixie tube show the required frequency. If the nixie tube is flashing in your modulating process, it means the frequency is out of our frequency range. The receiver may receive video signals under this kind of condition, but its picture quality could not be very good. We suggest you use the frequency in the frequency range.
3. Press “menu” key after selecting the frequency, there will be audio sub carrier frequency choices. We provide you the following 6.5M, 7.0M, 7.5M, 8.0M and 8.5M. You could select one by using the “increase” and “decrease” key.
4. Press the “menu” key twice (there will be clobber at the first, which is for test and the client may not care it), when the nixie tube shows the frequency you want, and then your configuration is settled. Remember to return back to previous menu, or else it will return back to the default frequency.

Chapter 3 Receiving System



Outlook of Ku waveband grid antenna

Note: The long edge of feed source should be parallel with the narrow edge of the grid.

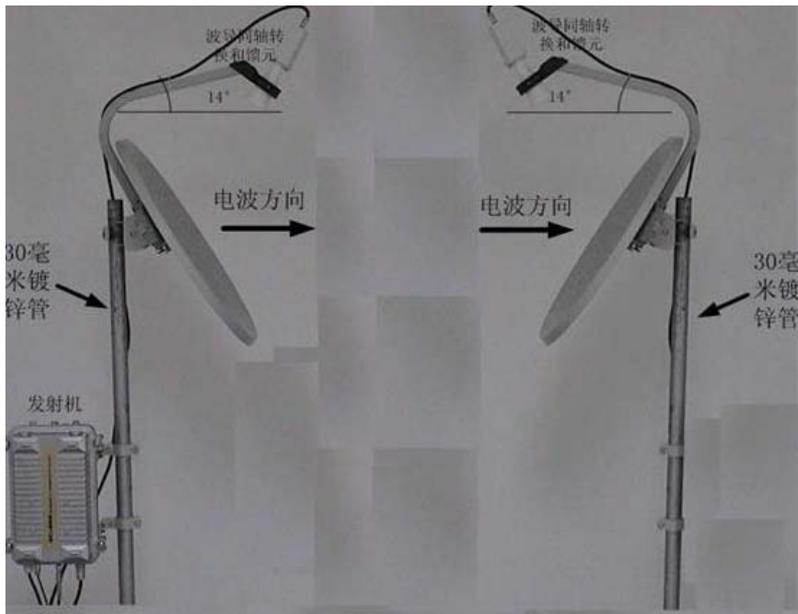
Fix the antenna like the above picture. 50Ω-7 coaxial cable is used to connect ST-601 transmitter and antenna. Customers could choose the antenna according to their actual situations. They could also customize antenna.

For the receiving system, we take ST-601 receiver for example

The installation of antenna and ST-601

The installation of antenna (same with above)

There is a filter between Ku waveband receiving antenna and ST-601 receiver, please see the following picture:



See the above picture, F connector on the right (the smaller one) is connected to the ST-601 receiver by sywv75-5 or 75-7 coaxial cable. The left L16 plug or L16 jack (the bigger one) is directly connected to the receiving antenna (see figure 8)

Figure 8、 the connection diagram of ST-601 waveband antenna and receiver

Installation of antenna with ST-601 receiver

There is a LNB (LNA+ down transducer) between the S waveband receiving antenna and ST-601 receiver, 50-7 coaxial cable is used to connect antenna and LNB and SYWV 75-7 coaxial cable is used to connect LNB with ST-601.

Please see the transmitting and receiving system in the following

The video signals from CCD camera is sent to the video input of ST-601 through 75 – 7 coaxial cable (The interface end connected with CCD camera is BNC connector, the other end connected with ST-601 transmitter is also BNC connector. The transmitter modulates the video signals by FM modulation to the correspondent frequency and amplifies them to certain power. The video signals are send through a microwave cable (for L waveband and S waveband, SYV50 – 7 coaxial cable is selected and L16 (or N type) connector, for KU waveband, it is WRG – 3 semi rigid, SMA connector) to the transmitting antenna. (for L waveband transmitter, helical antenna and grid antenna could be adopted; For S waveband transmitter, grid antenna or patch antenna could be adopted; for Ku waveband, 0.5 meter paraboloid antenna is used. The antenna is usually fixed on a commanding point, for example it could be installed on the top of the building.

Chapter 4 Adjustment and test of ST-601 video transmission system

After installation of ST-601 microwave video transmission system according to the above requirement, the adjustment and test should begin.

4.1 The adjustment of transmitter and receiver parameters

Generally, ST-601 receiver and ST-601 video transmitter have been adjusted before they come out of the factory and customers do not need adjustment. However, sometimes, customers could also do it if it is necessary. The parameters they could adjust are: “receiving frequency” Video frequency polarity”, “video scope (modulation percentage / image brightness)”For the adjustment of ST-601 transmitter, we have made the explanation in detail.

a) Generally speaking, the transmitting and receiving frequency do not need adjustment, but in the application, if there is interference, we can adjust the frequency of the receiver to get better effect.

b) The adjustment of video polarization is let the video polarity of the receiver be the same with that of the transmitter. If the video polarity of the receiver and transmitter is not the same, the video picture received will be distorted as follows (see the following picture) . With regards to the adjusting way of video polarity, please see the ST-601/ST-601 manual. There are two choices standing for two contrary video polar.



Figure 16 picture effect of the contrarily connected video polarization

c) However you adjust, you should obey one principle: the working frequency of the transmitter and receiver should be the same and their video polarity should also be the same.

2. Adjustment of the antenna

In the adjusting and testing process of the microwave video transmission system, the adjustment of the antenna is most important and most complicated. That how well the adjustment is made directly decides the receiving signals are strong or weak and the video quality is good or bad. Generally, the adjustment should be done by more than 2 technical persons (one is in the transmitting terminal and the other is in the receiving terminal) . It is better that the two persons have means of communication (for example, interphone, mobile phone and so on). When it is not very long between the transmitting end and the receiving end, and two persons could see each other, they could make the antenna aim at each other rightly. The adjusting procedure is as follows:

a) Transmitting antenna should be aimed at the receiving antenna, then we use the screws to fix them on the installing pole and now, the receiver could receive weak video signals.

b) Fix still the receiving antenna, and one technical person goes to the place of the transmitting antenna, turn the antenna left and right slightly to get the best video quality, therefore the transmitting antenna's direction is fixed. Then, we should adjust the pitching angle of the antenna to get the strongest signals and finally fix the antenna. Check the screws again and make sure all have been firmly fixed.

c) After the transmitting antenna has been fixed, technical person could return to the place of the receiving antenna and adjust the receiving antenna by the same way and then fix it. By this way, the antenna adjustment of the system has been accomplished.

However, if there is a long distance between the transmitting and receiving ends (above 5km) , we can not see the antenna on the other end. Under this kind of situation, we should seek help to the local map and the compass. We mark the points of the transmitting and receiving sites on the map and measure the slanting or gradient angle relative to south or north using a protractor. When arriving at the installing spots, we use the compass to measure the general angle of the other end's antenna and fix the antenna by this angle (if we do it rightly, the error to the angle will be within $3 - 5^\circ$, very near to the actual angle) , then we can adjust the

antenna carefully following the above way until we get the best quality.

The power output of ST-601 transmitter is small for convenience and reducing harm to human body, we do not suggest it be used in to transmit a long distance.

3. Failure elimination

If the system could not receive picture, and the monitor screen is full of snowflakes. We should examine the units by the following way:

a) Check the power source of the transmitter and check if the voltage of 220VAC power source works normally.

b) Check the voltage of the DET testing (calibrating) terminal of the transmitter. Generally, the voltage between DET and out case is 4.0-6.0V; it is abnormal if the voltage is above the range.

c) Check if the connection of transmitting antenna and transmitter is reliable. Check if the transmitting antenna has taken in water. All the connecting cable must not take in water.

If the monitor screen is black, and there are no snowflakes on it, the microwave channel is normal but no video signals is sent in. check the video cable connecting the video camera and video line.

Chapter 3 Technical indicators of main equipment

1. Technical indicators of ST-601 microwave transmitter

1. Working frequency: 10-15 GHz

2. Power output: 30db
3. Output resistance: 50Ω
4. Output video: 1Vp-p value
5. Input audio: 0.1-1.0Vp-p
6. Working voltage: 12VDC
7. Working current: 0.5A
8. Modulation format: FM
9. Modulation indicator: DG≤5%, DP≤5°, PGS≥7
10. Modulation bandwidth: 30 MHz/1V
11. Video format: PAL
12. Environment temperature: -15°-+55°C
13. Output interface: N jack
14. Dimension: 149*60*45.5mm

2. Technical indicator of receiver

1. Input frequency: 950-2050MHz
2. Input resistance: 75Ω
3. Input voltage: -65-- -35dBm
4. Medium frequency bandwidth: 27MHz
5. Noise sensitivity: 6dB typical value
6. Video format: PAL/NTSC
7. De emphasis : CCIR405-1 625 行/525 行
8. Video output: 1Vp-p

9. Frequency response: +1- -2dB (10 KHz-5MHz)

10. Working Voltage: AC150V-AC270V

11. Power consumption: 1.5W

12. LNB power source: 18V/360mA

13. Dimension: 1U 19-inch standard case

14. Weight: 3.2Kg

3. Technical indicators of L-waveband LNB:

1. Input frequency: 1.0—1.6GHz

2. Noise coefficient: 0.7dB

3. Image reject: -40dB

4. Output frequency: 950-2050MHz

5. Output resistance: 75Ω

6. Output VSWR: 2.0:1

7. Gain: 50dB

8. Gain flatness: ±5dB

9. 1DB compression: +5dBm

10. Local frequency: 3650MHZ/3950MHZ 任选

11. Frequency stability: ±3MHz

12. Working temperature: -40°C- +50°C

4. Suggested cable indicators

1. Video cable: SYWV 75Ω-7 coaxial cable

2. Transmitting: RG50-3 semi rigid cable

Chapter 6 Matters needing attention in the installation of ST-601 system

1. The working frequency of ST-601 microwave transmitter is very high, it is better that there is no obstacle between the transmitting and receiving antenna. That is to say try to fix the antennas on the commanding points and realize point to point transmission. The general way is to install the antenna on top of a building. If we can not avoid the obstacles or obstruction, we could add a set of the transferring equipment. If it is not too long between the two points, the transferring equipment is not needed.
2. Due to the curvature of the earth, we have to consider the installing height during the transmission. Under good transmission conditions, the relationship between transmitting distance (L) and supposed height (H) is as follows:

$$L(\text{km}) = 3.57 \times [\sqrt{H_1(\text{m})} + \sqrt{H_2(\text{m})}]$$

3. The transmitting and receiving antenna should aim at each other.
4. The cable between transmitter and transmitting antenna usually adopts SYWV-50-7 coaxial cable (50Ω). The length of it is about 2m. If it is too long, there will be big waste.
5. Beside the transmitter's connecting terminal, there is a test terminal

marked with “DET”. When the transmitter works normally, the voltage between the terminal and its case is 4 – 6VDC. If it surpasses this range, there will be something wrong with the transmitter, you should contact with the supplier.

6 .The power source should be connected after the connection of the RF output of the transmitter with the antenna and feeder.

7. SYWV 75 – 7 or 75 – 9 cable is used to connect the receiving antenna and the receiver.

If the cable is too long (over 150m), a cable amplifier is needed in the middle of the feeder.

NOTE: There is +18V output on the receiver input terminal, therefore, short circuit of the antenna cable and feeder connected with the receiver should be avoided.

8. The prepared frequency of the receiver is the same with the transmitter. The audio sub carrier frequency of the receiver should also be the same with that of the transmitter. Generally, the audio sub carrier frequency is initialized as 7.0 or 7.5MHz.

9. If the transmitter is used in a mobile situation, better effect could be got if the receiving antenna is installed in a higher place and the transmitter is in an open area. If the transmitter has to be in a area where there are so many buildings, the best effect could be gain by fixing the receiving antenna as near the transmitter as possible.

10. The out case of ST-601 transmitter is used for heat elimination.

If the transmitter is closed and carried by humans, heat elimination should be paid attention to.

Note:

After adjustment of the system, all cable connectors and the ends of cables with equipment connectors should be sealed with garrers or electrical tape and sealer (703 sealant or 904 silica gel) to avoid taking in water. In island or coastal areas , the transmission cable is suggested to be sealed to avoid taking in the moisture.