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Chapter 1 System Introduction

ST-6300 remote microwave image transmission system adopts 1.0-12.7GHz wireless microwave to transmit video signal. Due to its high frequency and FM mode, the system has strong anti-interference and realizes clear image transmission with a distance of 50-100 kilometers.

ST-6300 series wireless video transmission equipment works with wireless digital instruction receiving/transmitting system to compose a full set of image transmission and control network, which has the following applications:

1. Bank monitoring network
2. POSB monitoring and modernized management
3. Monitoring of the public security for the important city areas by 110 Alarm Commanding Center
4. On-site monitoring by communicating and commanding vehicles
5. Armed police and fire control operation
6. Traffic monitoring and E-police
7. Toll gate monitoring system
8. On-site monitoring at oil fields and mines
9. Significant warehouses and wharfs
10. Forest fire prevention

ST-6300 system has three main bands—L, S and KU (system using S band is currently suspended)



Band:

L (model: ST-6300L) 1.0-2.0GHz

S (model: ST-6300S) 2.0-2.7GHz

Ku (model: ST-6300KU) 10.95-12.7GHz

The working frequency and power are usually determined by the user according to the actual application

Chapter 2 ST-6300 Remote Image Transmission System Configuration

ST-6300L Accessories:

1) ST-6300L transmitter	1 set
2) Receiver	1 set
3) LNA	1 pcs
4) Antenna (YAGI, helical or grid)	2 pcs
5) RF interface	attached
6) Coaxial feeder line SYWV50-7 or SYWV50-5	attached

ST-6300Ku Accessories:

1) ST-6300KU transmitter	1 set
2) Receiver	1 set
3) KU LNB	1 pcs
4) 0.45m or 0.65m paraboloid antenna	2 pcs
5) RF interface, commutator	attached
6) Coaxial feeder line SYWV50-7 or SYWV50-5	attached

Usually, it is suggested to use 75-5 coaxial cable to connect video output terminal of CCD camera with transmitter and connect receiving antenna with the receiver. The length can be confirmed by the user according to the actual application. BNC connectors are provided at



either end of the video cable.

Chapter 3 System Diagram and Installation Instructions

3.1 System Connection Diagram

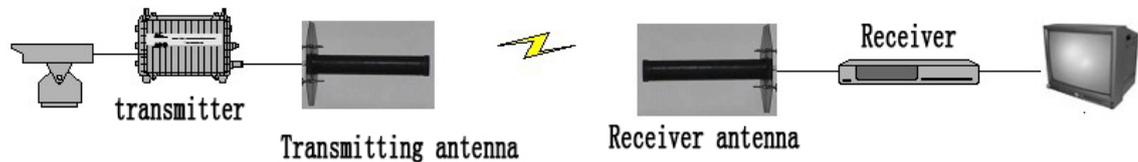


Figure 1. System connection diagram

As the above figure shows, the video output signal of CCD camera is sent via 75-7 coaxial video cable to the video input terminal (BNC connector) of ST-6300 transmitter, where the video signal is converted to corresponding band FM signal and amplified to the proper power level, and then using a microwave cable (for L band and S band transmitter, it adopts SYV50-7 coaxial cable equipped with L16 (or N) connector, for KU band transmitter, adopts WRG-3 semi-rigid cable equipped with F connector) to transmit the signal via antenna (for L band transmitter, it adopts rotary or grid antenna; for S band transmitter, adopts grid or panel antenna; for KU band transmitter, adopting 0.45 or 0.6 meter paraboloid antenna, regardless of positive or negative feeder line. The antenna is usually installed at the highest point, for example, on the rooftop).

The signal that the receiving antenna gets is firstly amplified to some power via LNA and changed to receivable band, and then using a 75-7 coaxial cable (with F-7 terminal at both ends) to send the signal to the receiver where video signal is demodulated and sent to the monitor or other video processing equipment via video cable (lotus connector).

Dimensions of ST-6300 transmitter:

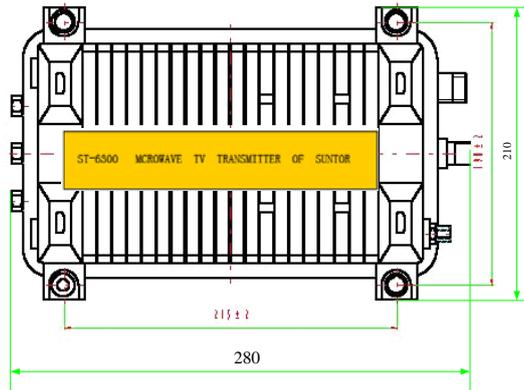


Figure 2. Appearance and dimensions of ST-6300 transmitter

Installation dimensions of receiver



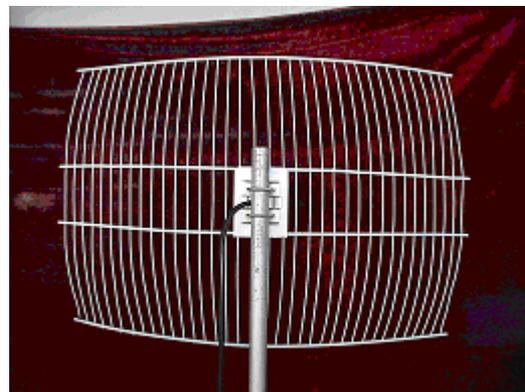
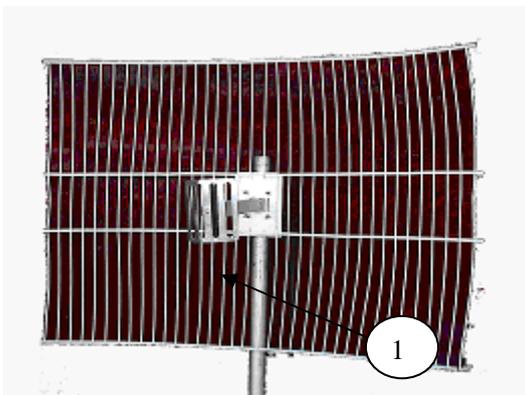
Dimensions: standard 19" 1U casing, which can be installed on the chassis.

Figure 3. Appearance and dimensions of the receiver

3.2 ST-6300L Installation Diagram and Instructions

Installation of ST-6300 transmitter and antenna

There are two kinds of L band antennas, grid antenna (as shown in below figure) and rotary antenna (as shown in system diagram). Both of them have the same connecting way with steel tube.



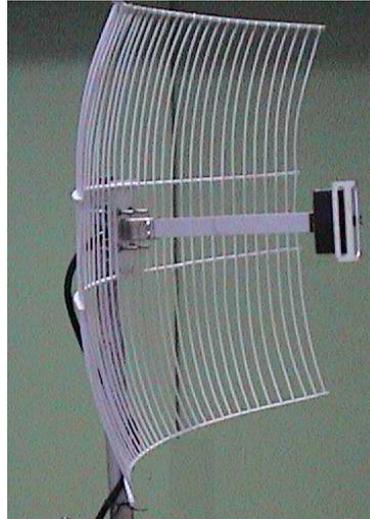


Figure 5. Appearance of L band grid antenna

Precaution: the long edge of the feed array (the direction of reflecting grating is shown as per in above figure) should parallel the short edge of the grid.



Figure 6. Appearance and installation of L band rotary antenna

Install the antenna as per above figures. Connect ST-6300L with antenna by 50Ω-7 coaxial cable.

Installation of ST-6300 receiver and antenna

The installation of antenna (the same as above)

There is an amplifier connecting L band receiving antenna with the receiver, having appearance as shown in below figure.



Figure 7. ST-6300L filter

As per above figure, the right F interface (the small one) connects with the receiver by 75-5 or 75-7 coaxial cable. The left L16 interface (the big one) directly connects with the antenna (as shown in figure 8.)

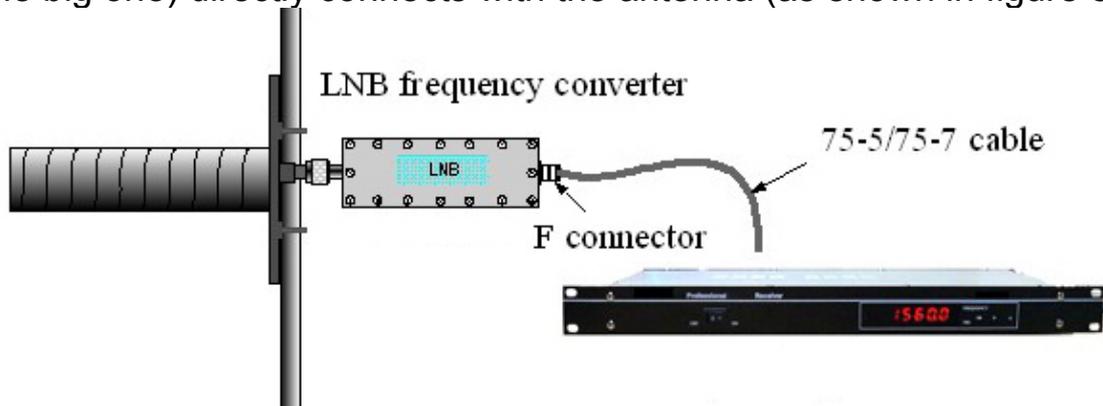


Figure 8. Connection of ST-6300L receiving antenna with the receiver

System installation diagram



Figure 9. ST-6300L system installation diagram (circular polarized antenna)

3.3 Installation diagram and instructions of ST-6300KU

Installation of ST-6300KU transmitter and antenna



As shown in below figure,



Figure 12. Installation of KU antenna

The distance between CCD camera and ST-6300 transmitter should better not exceed 100 meters, using 75-7 coaxial cable for connection. Twisted-pair cable is used for video signal transmission.

The sealed aluminum alloy housing of ST-6300 transmitter features good waterproof and electromagnetic shielding performances. It is required to keep input and output interfaces downward when installing the transmitter (as per below figure).

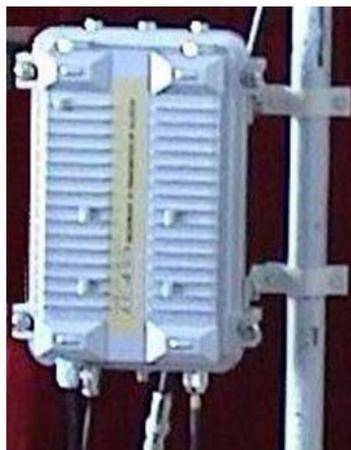
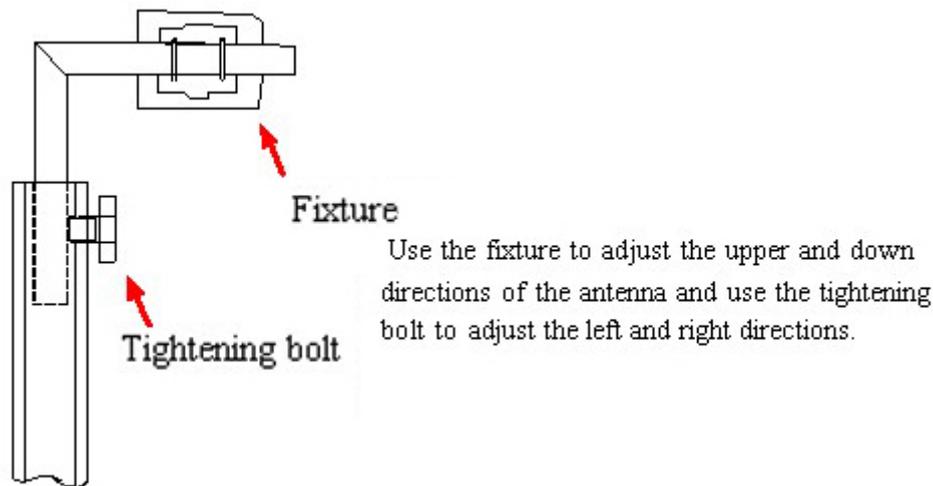


Figure 13. Appearance of ST-6300 transmitter

The fixture of antenna is just applicable to 25~30 mm diameter iron tube, therefore, we suggest 25-30 mm diameter galvanized tube as mounting bracket, triangle iron framework as mounting base, which is fixed onto the wall or ceiling with expansion bolt. Since the antenna



can only be moved horizontally after being installed on the galvanized tube, therefore, if the transmitting end and receiving end have grate difference in the lay of the land, then it is better to has a inclined steel tube soldered on the vertical part of the galvanized tube, so as to make the antennas align each other, as shown in below diagram:



Instructions for ST-6300KU installation

The installation of ST-6300KU transmitting antenna is the same as receiving antenna, and the only difference is that the transmitting antenna should install the transmitting head and the receiving antenna should install the receiving head (LNB).

ST-6300KU antenna adopts 0.45 or 0.60 meters paraboloid antenna, in order to keep a good adjustment, the antenna should be installed on the top of galvanize tube. As ST-6300KU is very sensitive to the direction (band width: 2.5°), it requires high precision, it should calibrate the pitching and position at a time. The adjustment should be made class by class.

The distance between ST-6300KU transmitter and transmitting antenna should be 100 meters and they should be connected by SYWV75-7 coaxial cable, easy and flexible to install, the microwave receiver and the receiving antenna may have a 150 meters of distance and be connected by SYWV75-7 coaxial cable, the terminal of cable is F-7.

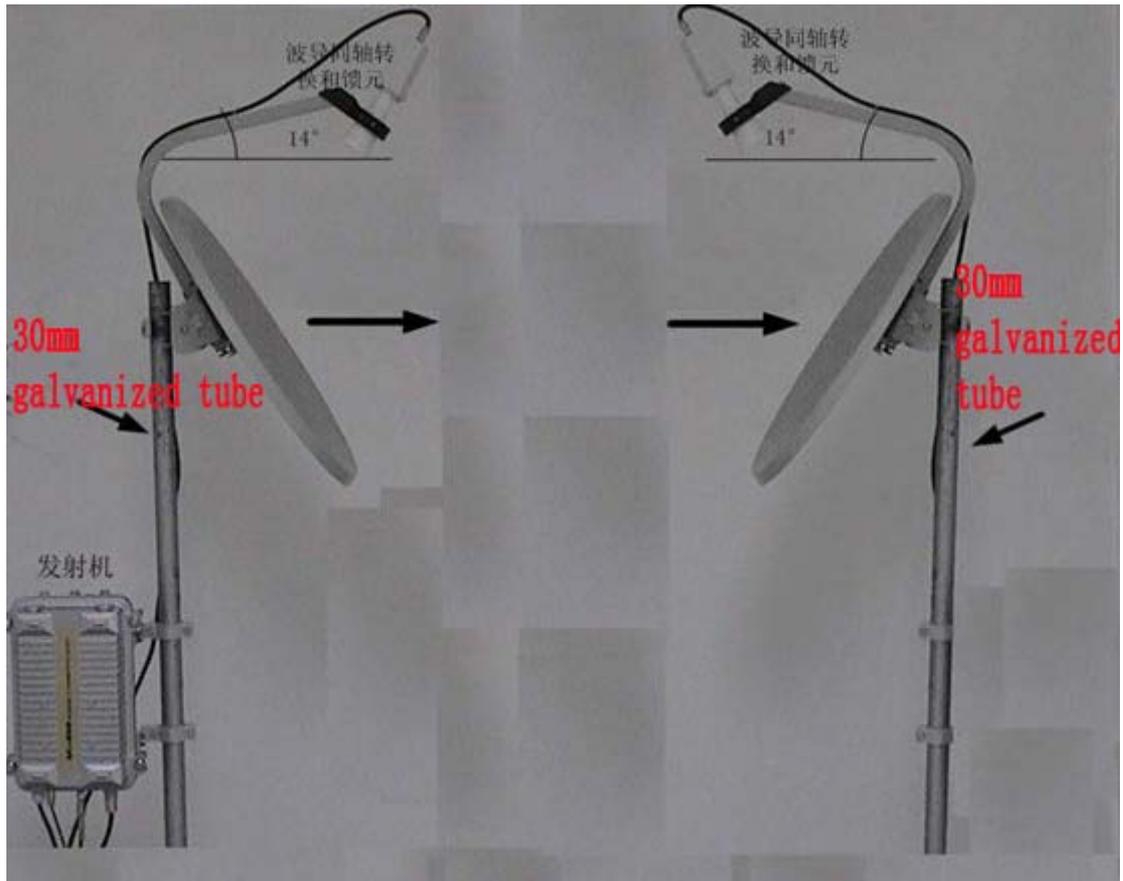


Figure 15. ST-6300KU system connection diagram

Chapter 4 Debugging of ST-6300 Image Transmission System

After installing the transmitter and antenna of ST-6300 microwave image transmission system, the user should debug the entire system.

4.1 Adjustment of receiver and transmitter parameters

Usually, ST-6300 image transmitter and receiver have been debugged before getting into the market, so it is unnecessary for the user to make adjustment. However, in some circumstances, if necessary, the user may adjust the parameters such as receiving/transmitting frequency, video polarity, video range (modulation factor/image brightness).

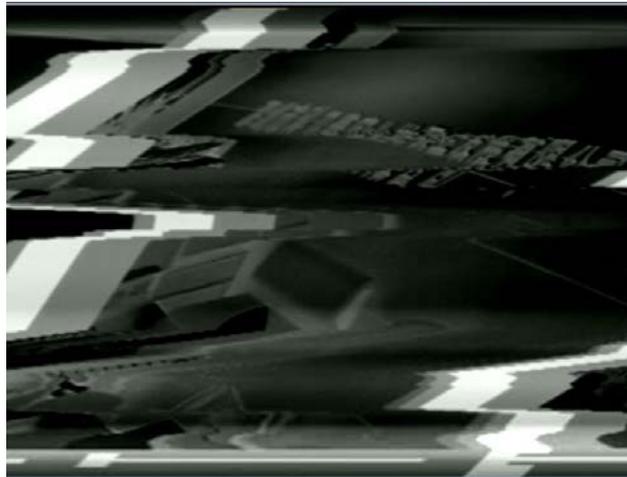
a) In principle, the receiving/transmitting frequency may not be adjusted. But if there is external interference in the actual application, it may make fine tuning to the frequency to get better effect.

For ST-6300L image transmitter, its working frequency is same as



the one the receiver displays. For ST-6300S and ST-6300KU, the frequency that the image receiver panel displays should be equal to local frequency of LNB subtracted from working frequency of the transmitter. For instance, for S band transmitter having 2.4GHz working frequency, if the local frequency of converter is 3.95GHz, then the frequency that the image receiver panel displays should be $3950\text{MHz}-2400\text{MHz}=1550\text{MHz}$.

b) The video polarity of the receiver should be consistently adjusted to the transmitter. If the polarities are conversely connected, the image might be distorted and no clear video image can be viewed **as the following figure shows**. Please refer to the instructions for polarity adjustment method, having two opposite polarity "C"&"KU" for selection.



图十六 视频极性接反后收到的图像效果

Figure 16. Image display if the polarities are conversely connected
e

c) For ST-6300, video range, modulation factor and image brightness are adjusted at the same time. If it is necessary to adjust this parameter, the user need to remove transmitter housing and there is a red adjusting knob on the video processing board, turn clockwise to increase image brightness or anticlockwise to decrease it.

d) A principle must be observed in the adjustment, the working frequency of transmitter and receiver must be corresponding and the polarity of the transmitter and receiver must be consistent.

4.2 Antenna Adjustment

In the debugging process of microwave image transmission system, the adjustment of antenna is the most important as it directly decides



the receiving effect of signal. Usually the work must be finished by two or more technicians (one stands at the transmitting end and the other stands at the receiving end), and both of them must take communication tool (interphone or mobile phone). If the distance between the transmitting and receiving points is not so far, and the technicians can see each other, it's a little easy to calibrate the antenna. The debugging steps are described as follows:

a) Aim the receiving antenna to the transmitting antenna, and fix the antenna on the pole by screws, at this moment, the receiver should receive some image signals.

b) Fix the receiving antenna and arrange one technician to go to the transmitting antenna and slightly rotate the angle of the transmitting antenna to get the best receiving effect and then fix the angle; and then adjust the pitching angle of the antenna to realize the best signal and image effect, and then fix. After adjusting the transmitting antenna, check the fixing screws and confirm they are in good condition.

c) After adjusting the transmitting antenna, the technician shall get back to the receiving antenna and adjust the receiving antenna as the same operation. The debugging of the entire system has been finished.

However, if the distance between the transmitting and receiving points is a little far (longer than 10 kilometers), and the technicians can not see each other. In this case, you need to use local map and the compass to aim the antennas Firstly, mark the transmitting and receiving positions on the map and then measure the angles of the antenna by the protractor. The technicians may find the angle by the compass on the installing site and fix the antenna according to the measured angle (if the operation is correct, the error might be 3-5 degrees only), and then make fine tuning as per the above operation till good effect is achieved.

4.3 Troubleshooting

If the system fails to receive the image and the screen displays snow points, please check as per the following steps:

- a) Check the power supply of transmitter, 220V AC power.
- b) Check the voltage between DET testing terminals and housing, usually the value is between 4.0~6.0V. If otherwise, please



immediately contact your distributor.

c) Check the connection of transmitter and transmitting antenna, whether the receiving antenna is contacted with water. No cable is allowed to contact with water.

If it displays a black screen without snow points, it means the microwave channel is normal but no video signal is inputted, please check whether the cables and interfaces between the camera and transmitter are well connected.

Chapter 5 Technical Indexes

5.1 ST-6300KU Remote Transmitter

After installing the transmitter and antenna of ST-6300 microwave image transmission system, the user should debug the entire system.

1. Working frequency:	10.7GHz-14.0GHz
2. Transmitting power:	15dBm-30dBm
3. Output impedance:	50Ω
4. Input video:	1V peak-peak value
5. Input audio:	0.1-1.0V peak-peak
6. Working voltage:	12VDC or 220VAC/50Hz
7. Working current:	500-1000mA/12VDC
8. Modulation mode:	FM
9. Modulation index:	DG≤5%, DP≤5°, PGS≥7
10. Modulation bandwidth:	25MHz
11. Video system:	PAL
12. Ambient temperature:	-15°-+55°C
13. Output interface:	SMA
14. Dimensions	300*240*90mm

5.2 Receiver

1. Input frequency:	950-2050MH
2. Input impedance:	75Ω
3. Input level:	-65-- -35dBm



- | | |
|--------------------------------------|-----------------------------------|
| 4. Intermediate frequency bandwidth: | 27MHz |
| 5. Noise threshold: | 6dB typical value |
| 6. Video system: | PAL/NTSC |
| 7. De-emphasis: | CCIR405-1 625lines/525 lines |
| 8. Video output: | 1V peak-peak value |
| 9. Frequency response: | +1- -2dB (10
KHz-5MHz) |
| 10. Working voltage: | AC150V-AC270V |
| 11. Power consumption: | 15W |
| 12. LNB power supply | 18V/360mA |
| 13. Dimensions | 19 inches 1U standard
case |
| 14. Weight | 3.2Kg |

5.3 KU Antenna

1. Antenna gain 34dB
2. Input standing wave 1.15
3. Interface BJ120wave guide or SMA
4. Antenna caliber 0.5m offset
5. Band width 2.5°
6. Polarization Vertical/ horizontal/left rotary/right rotary (optional)

5.4 KU LNB

- | | |
|-----------------------------|-----------------------|
| 1. Input frequency | 10.7-12.75GHz |
| 2. Noise factor | 0.7dB |
| 3. Image rejection | -40dB |
| 4. Output frequency | 950-2050MHz |
| 5. Output impedance | 75Ω |
| 6. Output standing wave | 2.0:1 |
| 7. Gain | 56dB |
| 8. Gain flatness | ±5dB |
| 9. 1DB compression | +5dBm |
| 10. Local frequency | 10GHZ/9.75GHZ/11.8GHZ |
| 11. Frequency stabilization | ±3MHz |
| 12. Working temperature | -40°C- +50°C |

5.5 Indexes for optional cables (suggested)



1. Video cable: 75Ω-7 coaxial cable
2. Transmitting cable: WRG50-3 semi-rigid cable

Chapter 6 Precautions for ST-6300 Installation

1. ST-6300 microwave transmitter has a very high working frequency, consequently it should avoid barrier between the transmitting and receiving antennas, it's advised to conduct point-to-point transmission. Install the antenna on the roof. If there is a barrier, it should adopt a third tool. If the distance is not far, sometimes it's unnecessary to use a third tool.

Due to the curvature of the earth, when the transmission is made in a long distance, it must consider the curvature and the installation height (as figure 9 shown). In ideal condition, the formula of the distance and the height is described as follows:

$$L \text{ (KM)} = 3.57 * [\sqrt{H1 \text{ (M)}} + \sqrt{H2 \text{ (M)}}]$$

L means the transmission length, H1 and H2 means the heights of two antennas.

2. When installing the antenna, it is required to aim the transmitting and receiving antennas.

3. The cable between the transmitter and transmitting antenna generally adopts SYWV-50-7 50Ω coaxial cable with the length of 2 meters.

4. Besides connection terminals of transmitter, there is a testing terminal marked with "DET". When the transmitter is in normal work, the voltage between the housing and this terminal should be 4~6V. If the value exceeds this range, it means the transmitter has fault and requires repairing, in this case you need to contact your distributor for help.

5. After connecting the RF output terminal of transmitting and the antenna, power on the device.

6. The receiver and receiving antennas are connected by SYWV-75-7 or 75-9 cable

If the cable is too long (longer than 150 meters), it needs to add a circuit compensation amplifier. Please note that the input terminal of receiver has +18V output, do not make the connection with receiver in



short circuit.

7. The preset frequency of the receiver must be consistent to the transmitter, the carrier wave frequency of the audio must be same as the transmitter. Usually, the system has already been preset the audio carrier wave frequency 7.0 or 7.5MHz before leaving factory.

7. The transmitter can be placed and work out of the house, while the receiver should be installed inside.

9. It is suggested to choose high frequency system like ST-6300KU.

Special Notes:

After the microwave system is debugged, all cable connectors and interfaces should be sealed by the electrical tapes and sealant (703 glue or 904 silica gel) to avoid water permeation. For the island or coastal areas, it's advised to adopt the transmission cable to avoid water condensation inside.

Appendix Subjective Evaluation Grade (Q value) of Video Image Quality

The calculation of Q value relating to video image quality is described as follows::

$$S/N=23-Q+1.1Q^2 \quad (\text{dB})$$

The Q value adopts five-point scale with the following as standard

Image Grade	Subjective Evaluation	Visibility interference clutter	of and weighted (S/N)
5	Excellent	Invisible	44.7dB
	Good	Visible but not annoying	34.7dB
4	Middle	Visible, but bearable	30dB
3	Poor	Obviously visible and annoying	



2 1		Evident and extremely annoying	27dB
			21dB

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