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# **IR Intelligent Speed Dome Installation Manual**

**Version 1.1.3**

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# Table of Contents

<b>1</b>	<b>INSTALLATION PREPARATION.....</b>	<b>1</b>
1.1	Basic Requirements .....	1
1.2	Installation Check .....	1
1.3	Cable Preparation.....	1
1.3.1	Cable Lowest Specification Requirement .....	1
1.3.2	Select Needed Power Supply Cable According to Transmission Distance .....	2
<b>2</b>	<b>SPEED DOME INSTALLATION.....</b>	<b>3</b>
2.1	Check Accessories.....	3
2.2	Open Device.....	3
2.3	DIP Switch Setup.....	3
2.3.1	DIP Switch Location and Function .....	3
2.3.2	DIP Switch Setup .....	4
2.3.3	Address Setup .....	5
2.3.4	Baud Rate and Parity Setup.....	5
2.4	Terminal Matching Resistance Setup.....	6
2.5	Reset Button Location and SD Card Installation .....	7
2.6	Speed Dome Installation .....	9
2.6.1	Install Quick Mount Connector.....	9
2.6.2	Speed Dome Cable .....	9
<b>3</b>	<b>SPEED DOME INSTALLATION.....</b>	<b>12</b>

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<b>3.1</b>	<b>Mounting Component and Dimension .....</b>	<b>12</b>
<b>3.2</b>	<b>Wall-mounted Bracket Installation Steps .....</b>	<b>13</b>
3.2.1	Installation Environments.....	13
3.2.2	Installation Steps.....	13
<b>4</b>	<b>APPENDIX I THUNDER PROOF AND SURGE PROTECTION (OUTDOORS).....</b>	<b>16</b>
4.1	Lightning Protection (Indoors).....	16
<b>5</b>	<b>APPENDIX II ABOUT RS485 BUS .....</b>	<b>18</b>
5.1	RS485 Bus Main Feature .....	18
5.2	RS485 Bus Transmission Distance .....	18
5.3	The Problem in Practical Use .....	18
5.4	RS485 Bus FAQ .....	19
<b>6</b>	<b>APPENDIX III THE RELATIONSHIP BETWEEN AC 24V CABLE DIAMETER AND TRANSMISSION DISTANCE .....</b>	<b>20</b>
<b>7</b>	<b>APPENDIX IV THE RELATIONSHIP BETWEEN DC 12V CABLE DIAMETER AND TRANSMISSION DISTANCE .....</b>	<b>21</b>
<b>8</b>	<b>APPENDIX V WIRE GAUGE REFERENCE SHEET .....</b>	<b>23</b>

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## Welcome

Thank you for purchasing our speed dome!

**Please read the following safeguards and warnings carefully before you install or use the product!**

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# Important Safeguards and Warnings

## Safety Measures

### 1. Qualified Engineer Needed

- The installation engineer or maintenance engineer shall have corresponding CCTV system installation certificate or maintenance qualification certificate.
- The installation engineer or maintenance engineer shall have qualification certificate for work at height.
- The installation engineer or maintenance engineer shall have the basic knowledge and operation technique for low-voltage cable layout and low-voltage electronic cable connection.
- Please read the installation manual carefully and keep it well for future reference,
- We are not liable for any problems caused by unauthorized modifications or attempted repair.

### 2. Lifting Appliance Requirement

- Please select the proper speed dome installation mode and use the lifting appliances at the safety environment.
- The lifting appliances shall have the enough capacity to reach the installation height.
- The lifting appliances shall have safe performance.

**The precaution measures include two types: Warning and Note.**

- **Warning:** It is to alert you there is an optional risk of death or series injury!
- **Note:** It is to alert you there is an optional risk of damage or property loss!

## Warning

1. All installation and operation here should conform to your local electrical safety codes.
2. The power shall conform to the requirement in the SELV (Safety Extra Low Voltage) and the rated voltage conformed to Limited Power Source according to the IEC60950-1. (Power supply requirement is subject to the device label). We assume no liability or responsibility for all the fires or electrical shock caused by improper handling or installation.
3. Be sure to use all the accessories (such as power adapter) recommended by manufacturer.
4. Do not connect several speed domes to one power adapter. It may result in overheat or fire if it exceeds the rated load.
5. Before you connect the cable, install or uninstall, or begin the daily maintenance work, please turn off the power and unplug the power cable.
6. Please make sure the produce is secure firmly on the wall or the ceiling.

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7. Please turn off the power and unplug the power cable, If there is any smoke, disgusting smell, or noise. Please contact your local retailer or customer service center for help.
  8. All the examination and repair work should be done by the qualified service engineers. We are not liable for any problems caused by unauthorized modifications or attempted repair.
  9. Before installation, check whether there are anti-corrosion notices. If there are no anti-corrosion notices, do not install the speed dome in environment where the speed dome is prone to corrosion, for example by the sea or on the ship.

## **Note**

### **1. Safety Transportation**

- Heavy stress, violent vibration or water splash are not allowed during transportation, storage and installation.
- This series product must use split type package during the transportation.
- We are not liable for any damage or problem resulting from the integrated package during the transportation.

### **2. When device is malfunction**

Shut down the device and disconnect the power cable immediately if there is smoke, abnormal smell or abnormal function. Please contact your local retailer ASAP.

### **3. Do not try to dismantle or modify the device**

- There is risk of personal injury or device damage resulting from opening the shell.
- Please contact your local retailer if there is internal setup or maintenance requirement.
- We are not liable for any problems caused by unauthorized modifications or attempted repair.

### **4. Do not allow other object falling into the device**

- Please make sure there is no metal or inflammable, explosive substance in the speed dome.
- The above mentioned objects in the device may result in fire, short-circuit or damage.
- Please shut down the device and disconnect the power cable if there is water or liquid falling into the camera. Please contact your local retailer ASAP.
- Please pay attention to the camera. Avoid the sea water or rain to erode the camera.

### **5. Handle carefully**

Do not allow this series product fall down to the ground.  
Avoid heavy vibration.

### **6. Installation Environment Requirement**

- This series speed dome should be installed in a cool, dry place away from direct sunlight, inflammable, explosive substances and etc.
- This series product shall be away from the strong electromagnetism radiant, please keep it away from wireless power, TV transmitter, transformer and etc.

- 
- This device needs to be installed in restricted access areas, and anyone who operates the device needs to be aware of the safety requirements of the device.

## **7. Daily Maintenance**

- Please use the soft cloth to clean dust on the shell, or you can use soft cloth with cleaning liquid to clean the shell and then use soft cloth to make it dry.
- Do not use gasoline, dope thinner or other chemical material to clean the shell. It may result in shell transfiguration or paint flake.
- Do not allow the plastic or rubber material to touch the shell for a long time. It may result in paint flake.

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# 1 INSTALLATION PREPARATION

## 1.1 Basic Requirements

- All installation and operation here should conform to your local electrical safety codes, fire prevention laws and some related regulations.
- Make sure if the application scene of the speed dome conforms to the installation requirements. Please contact your dealer if you have any questions.
- Please use the product according to the operating environment.
- Please keep the original packing material well after opening the package; you can use original packing material to pack the speed dome and send it back for maintenance in case problems occur.

## 1.2 Installation Check

- Make sure the installation site has enough space to hold the product and its mounting components.
- Please make sure the ceiling or wall can sustain 8X weight of the speed dome and its mounting components.
- Please make sure the wall is thick enough to install expansion bolts (Users need to purchase separately).
- It needs to guarantee the installation height shall be more than 6m if it is the intelligent tracking speed dome or laser speed dome.

## 1.3 Cable Preparation

Please select the specification of the needed video cable and video coaxial cable according to the transmission distance.

### 1.3.1 Cable Lowest Specification Requirement

- 75 ohm.
- Full cable with copper conductor.
- 95% knitted copper shield.
- Please refer to appendix II for RS485.

International Model	Max Transmission Distance (Ft/M)
RG59/U	750Ft/229M
RG6/U	1,000Ft/305M
RG11/U	1,500Ft/457M

#### Note

The above can be applied to analog speed dome and network speed dome.

International Model	Max Transmission Distance (M/Ft)
SYV-75-3	720P(25fps\30fps): 500M/1640Ft
	720P(50fps\60fps): 300M/984Ft
	1080P(25fps\30fps): 300M/984Ft

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**Note**

The above can be applied to HDCVI speed dome.

**1.3.2 Select Needed Power Supply Cable According to Transmission Distance**

Refer to appendix III for AC 24V power supply device.

Refer to appendix IV for DC 12V power supply device.

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## 2 SPEED DOME INSTALLATION

### 2.1 Check Accessories

Before the installation, please check the accessories one by one according to the packing list. Please make sure all the components listed are included.

### 2.2 Open Device

Open the package and then take out the device. Please remove the protection tape from the speed dome. See Figure 2-1



Figure 2-1

### 2.3 DIP Switch Setup

#### 2.3.1 DIP Switch Location and Function

The corresponding functions between analog speed dome and HDCVI speed dome are different, which will be separately introduced below.

##### 2.3.1.1 Analog Speed Dome

You can see there are two DIP switches on the PTZ after opening the rear cover of speed dome, which are used to set address, baud rate and parity of the speed dome, the location of DIP switch is shown in Figure 2-2.

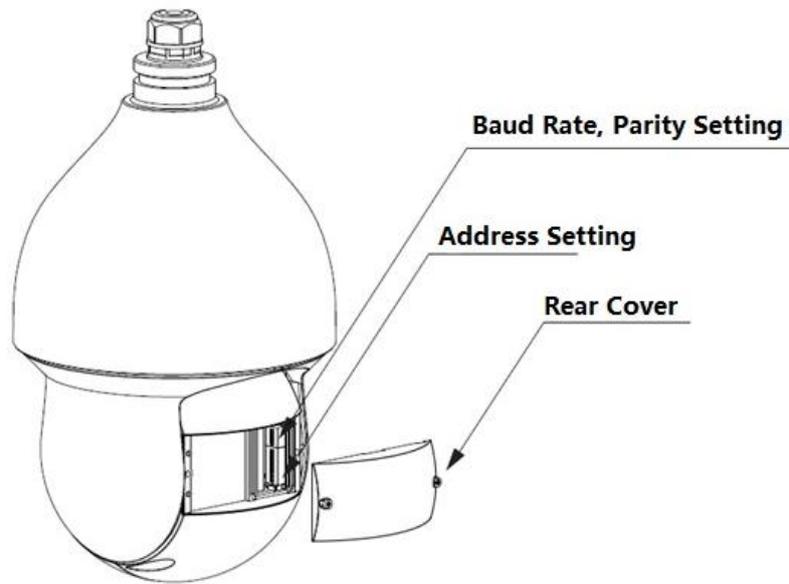


Figure 2-2

### 2.3.1.2 HDCVI Speed Dome

You can see there are two DIP switches on the PTZ after opening the rear cover of speed dome, which are used to set address and baud rate of the speed dome. Refer to Figure 2-3 for more details.

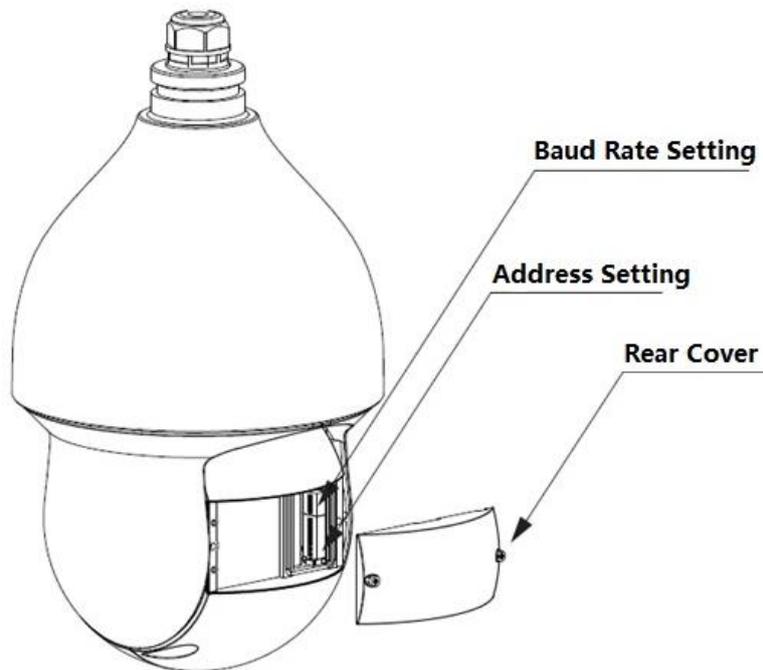


Figure 2-3

#### Note

It doesn't have to implement DIP switch and other RS485 settings when HDCVI intelligent speed dome only uses coaxial control.

### 2.3.2 DIP Switch Setup

It has to set address number, baud rate and parity before controlling the speed dome, the speed dome will respond to those control commands after these settings are completed.

**Note**

- For wall-mounted speed dome, it has to install back the transparent dome cover component after taking out EPE and set DIP switch well.
- It has to cut off the power and restart the device after related information has been reset, which is to make new settings valid.

There are two DIP switches on the PTZ which are used to confirm the parameters of speed dome address, baud rate and parity. When the switch is moved to ON as 1, then 1 is the lowest bit and 8 is the highest bit for the address DIP setting; 1 is the lowest bit and 4 is the highest bit for the baud rate and parity DIP setting.

**Note**

The intelligent speed dome can self-adapt to PELCO-D, PELCO-P and industrial standard protocol, control protocol doesn't need to be set via DIP switch.

**2.3.3 Address Setup**

The speed dome can use DIP switch to set address number, coding mode adopts binary coding. 1~8 bits are valid bit, the highest address bit is 255, the address label is shown in Figure 2-4, please refer to Table 2-1 for the address bit setup.

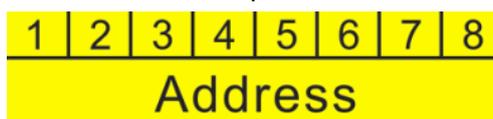


Figure 2-4

Address	1	2	3	4	5	6	7	8
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF						
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
.....	.....							
254	OFF	ON						
255	ON	ON	ON	ON	ON	ON	ON	ON

Table 2-1

**2.3.4 Baud Rate and Parity Setup**

The functions which need to be set between analog speed dome and HDCVI speed dome will be introduced separately.

**2.3.4.1 Analog Speed Dome**

It is to set parity and baud rate of the speed dome. 1 and 2 bit is the baud rate setting bit while 3 and 4 bit is the parity setting bit. Please refer to Figure 2-5 for the label, refer to Table 2-2 and Table 2-3 for settings.

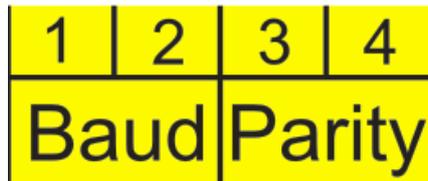


Figure 2-5

1	2	Baud Rate
OFF	OFF	9600bps
ON	OFF	4800bps
OFF	ON	2400bps
ON	ON	1200bps

Table 2-2

3	4	Parity
OFF	OFF	NONE
ON	OFF	EVEN
OFF	ON	ODD
ON	ON	NONE

Table 2-3

#### 2.3.4.2 HDCVI Speed Dome

It is to set the speed dome baud rate and HD/SD video mode. From 1 to 4 dial switch, 1 and 2 bit are used to set Baud rate, 3 and 4 bit are used to set HD/SD video mode. See Figure 2-6 for Baud rate and mode; refer to Table 2-4 and Table 2-5 for Baud rate and mode setup.

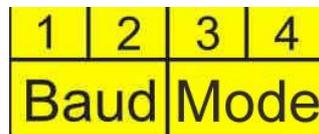


Figure 2-6

1	2	Baud Rate
OFF	OFF	9600bps
ON	OFF	4800bps
OFF	ON	2400bps
ON	ON	1200bps

Table 2-5

3	4	HD/SD video mode
OFF	OFF	HDCVI
ON	OFF	/
OFF	ON	/
ON	ON	SD

Table 2-5

## 2.4 Terminal Matching Resistance Setup

It is the connection mode of device terminal 120Ω resistance, terminal resistance 120Ω is

already equipped on the power panel, there are two connection modes, which is shown in Figure 2-7.

	1-2	2-3
120 $\Omega$	ON	OFF

Figure 2-7

Refer to Figure 2-8 for the default connection mode, at this moment, the jumper cap on the power board is connected to the location 2~3 of the socket and 120 $\Omega$  resistance hasn't been connected yet.

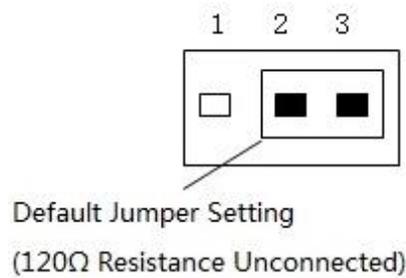


Figure 2-8

It needs to plug out the jumper cap from 2~3 location when it needs to connect to 120 $\Omega$  resistance, and then connect to the location of 1~2. In this case, 120 $\Omega$  resistance is connected to the circuit, which is shown in Figure 2-9.

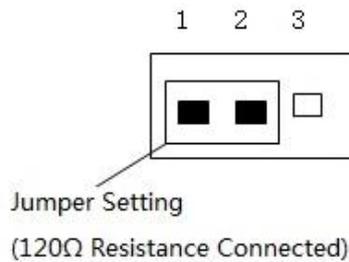


Figure 2-9

## 2.5 Reset Button Location and SD Card Installation

You can see there is a reset button on the main board of PTZ after opening the rear cover (which is shown in Figure 2-10). The reset button is used for network system reset.

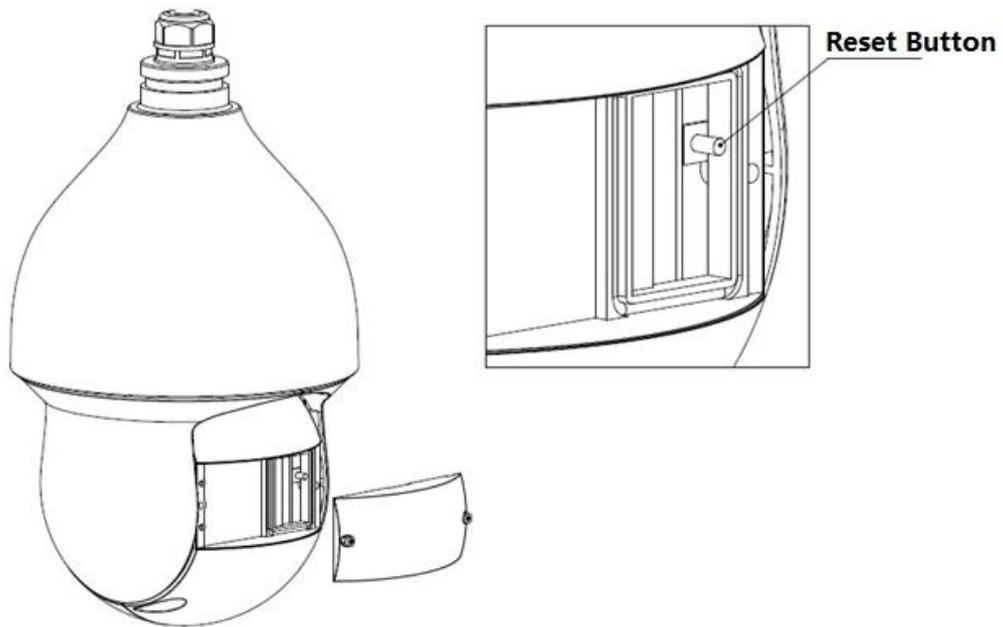


Figure 2-10

Micro SD card is installed on the module (refer to Figure 2-11), which is used for data storage. Micro SD card is used for data storage; the card slot is located on the module, please refer to Figure 2-11 for the installation mode.

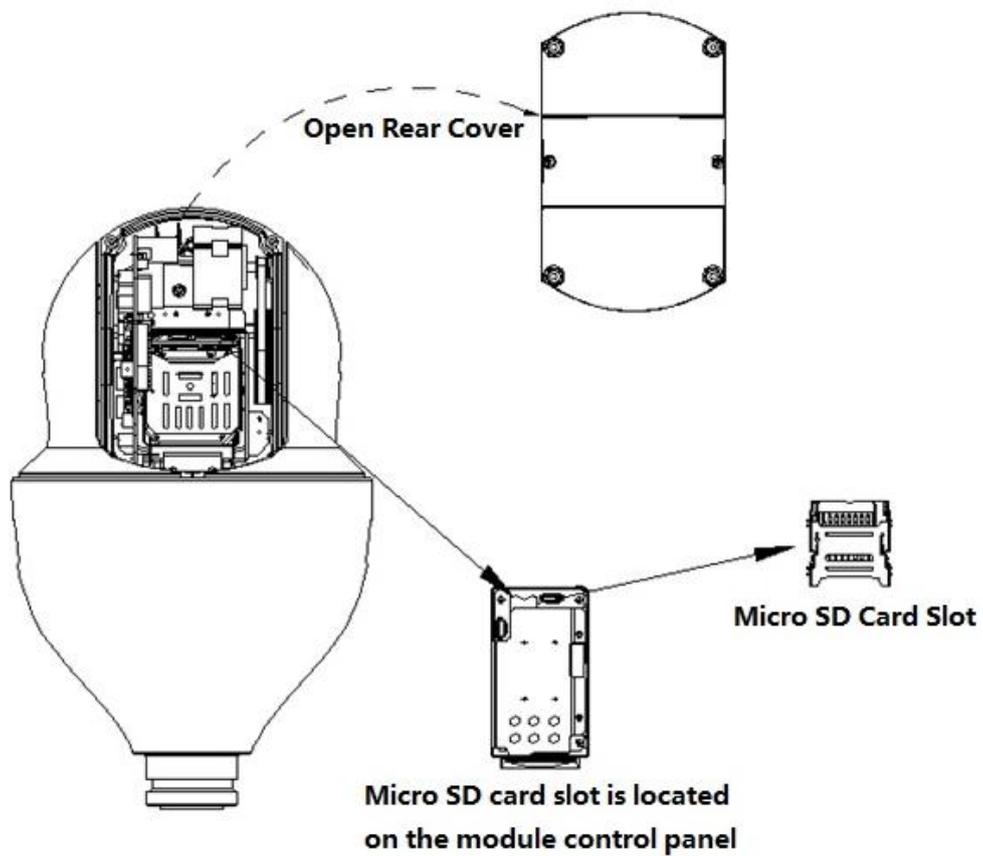


Figure 2-11

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## 2.6 Speed Dome Installation

### Note

The chapter can be applied to IR analog intelligent speed dome and IR network intelligent speed dome and so on.

There are various types of brackets which can meet different application scenarios for the speed dome, please refer to chapter 3 for the installation methods. It is to take analog speed dome wall-mounted bracket as an example to install IR speed dome.

### 2.6.1 Install Quick Mount Connector

Twine Teflon tape over the thread of quick mount connector and rotate it into the pipe thread of wall-mounted bracket, use M4 stainless screw to fix it firmly, which is shown in Figure 2-12, the thread standard is G1 1/2 pipe thread.

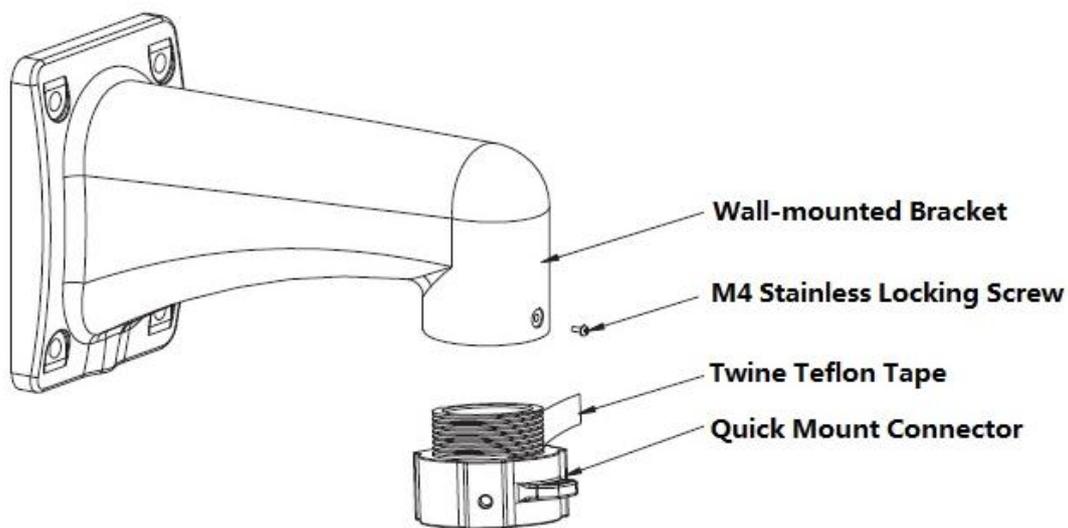


Figure 2-12

### 2.6.2 Speed Dome Cable

#### 2.6.2.1 Cable Description

The camera is equipped with a multi-functional combination cable by default, which includes power cable, video cable, audio cable, RS485 control cable, alarm cable, network cable, high-frequency cable and optical fiber cable etc. The cable detail is shown in Figure 2-13.

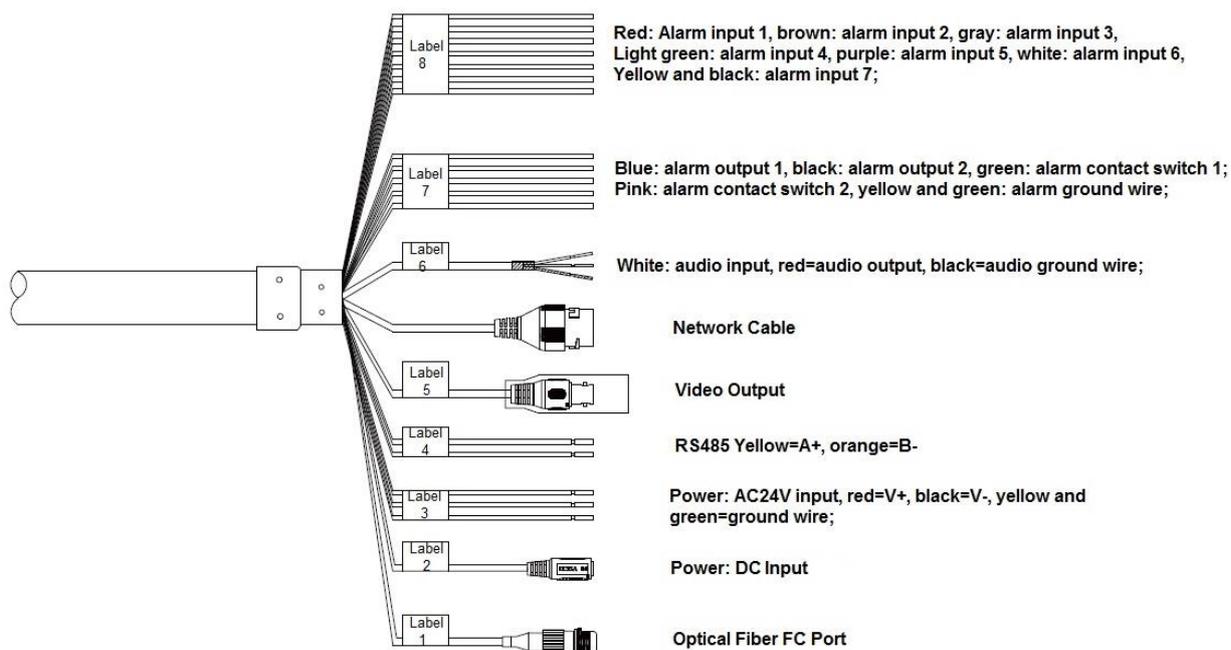


Figure 2-13

**Note**

Different models have different cable combinations; please refer to the actual cable combination for more details. The cable combination is the most comprehensive example shown in the figure above.

It is prohibited to pull the cable to lift the speed dome when moving the device, the wrong way of carrying device is shown in Figure 2-14.

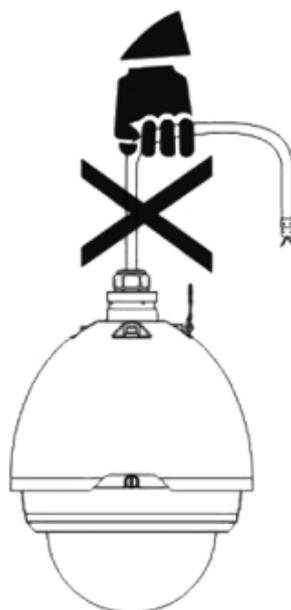


Figure 2-14

**2.6.2.2 Cable Connection**

Buckle the safety hook of speed dome on the quick mount connector; connect the integrated cable reserved by wall-mounted bracket to the corresponding power cable, video cable, audio

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cable, RS485 control cable, alarm cable, network cable, high-frequency cable and optical fiber cable etc. of the multi-functional combination cable of the speed dome (according to requirement), and then use insulated rubber tape to twine the cable connection well to make it waterproof.

**Note**

During actual installation, make sure the wire diameter of the cable which is to connect to RS485 control cable can't be too big; otherwise it will affect the control effect. Please refer to appendix 2 RS485 bus for relevant introduction.

**2.6.2.3 Alarm Cable Connection**

The alarm cable connection mode and config steps are shown as follows:

**Step 1**

Connect alarm input device to the ALARM IN and ALARM GND of the user cable.

**Step 2**

Connect alarm output device to the ALARM OUT and ALARM COM of the user cable, alarm output is the relay switch output.

**Step 3**

Open the device WEB interface, make corresponding settings to the alarm input and output device in "Setup > Event > Alarm Setup". The alarm input of WEB is corresponding to the alarm input of the user cable. It is to set the corresponding NO and NC output according to the high and low level signal generated by alarm input device when alarm triggers.

**Step 4**

Set the alarm output situation of user cable on the WEB.

**2.6.2.4 Connect Speed Dome GND Cable**

Connect the power line YELLOW & GREEN of the combination cable to the lightning protection device, and make sure the lightning protection device is well grounded.

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### 3 Speed Dome Installation

IR intelligent speed dome mainly adopts wall mount mode, here it is to take wall mount as an example to introduce the installation components and installation modes.

#### 3.1 Mounting Component and Dimension

The IR speed dome is shown in Figure 3-1, wall-mounted bracket is shown in Figure 3-2 and the dimension of adapter block is shown in Figure 3-3.

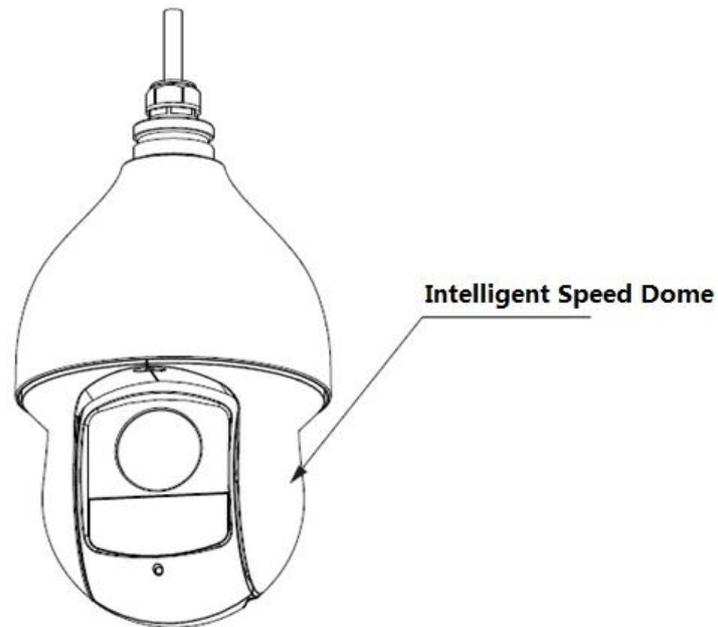


Figure 3-1

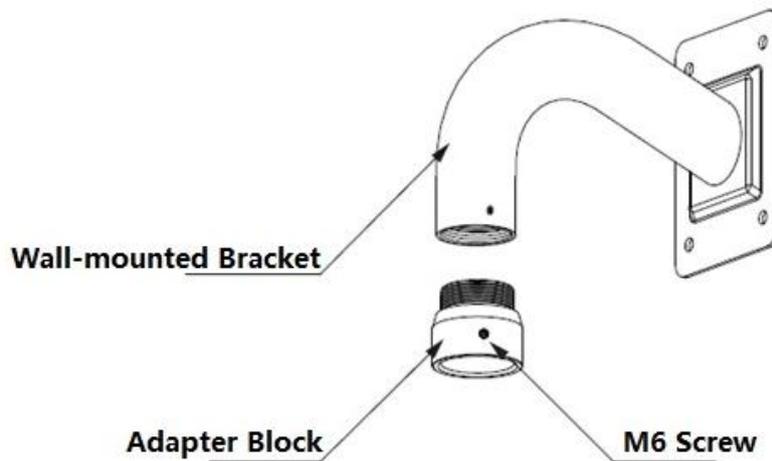


Figure 3-2

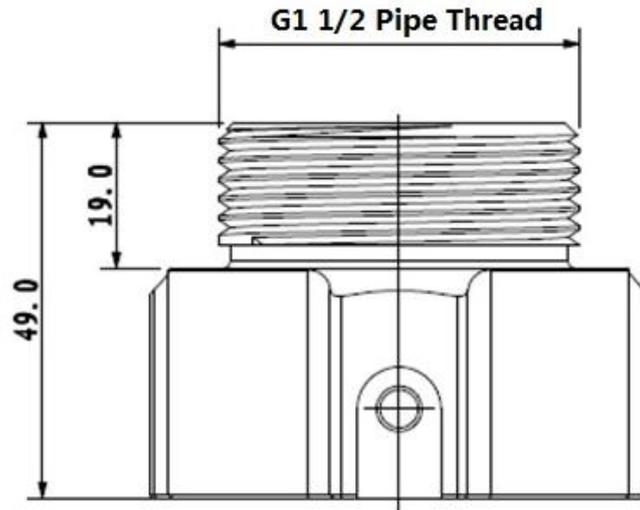


Figure 3-3

## 3.2 Wall-mounted Bracket Installation Steps

### 3.2.1 Installation Environments

The wall mount speed dome can be installed in the hard construction wall in the indoor or outdoor environments. Before the installation, please make sure:

- The wall is thick enough to install the expansion bolt.
- The ceiling can at least sustain the 8x weight of the speed dome, bracket and the accessories.

### 3.2.2 Installation Steps

#### Step 1

Dig a hole of 50mm diameter for cable exit in the wall where it needs to install the speed dome.

#### Step 2

As it is shown in Figure 3-4, twist the adapter block to the internal thread of the wall-mounted bracket until it reaches the end and then fix the set screw firmly. Pull the intelligent speed dome composite cable through the adapter block and pull it out from the other end of the wall-mounted bracket. Line up the hook at the top of the external enclosure to the internal hole of the adapter block and then push it to the end, and then secure the three screws of the adapter block firmly. Please note this step is very important. Please make sure the screws are firm, otherwise, it may result in falling risk of the intelligent speed dome.

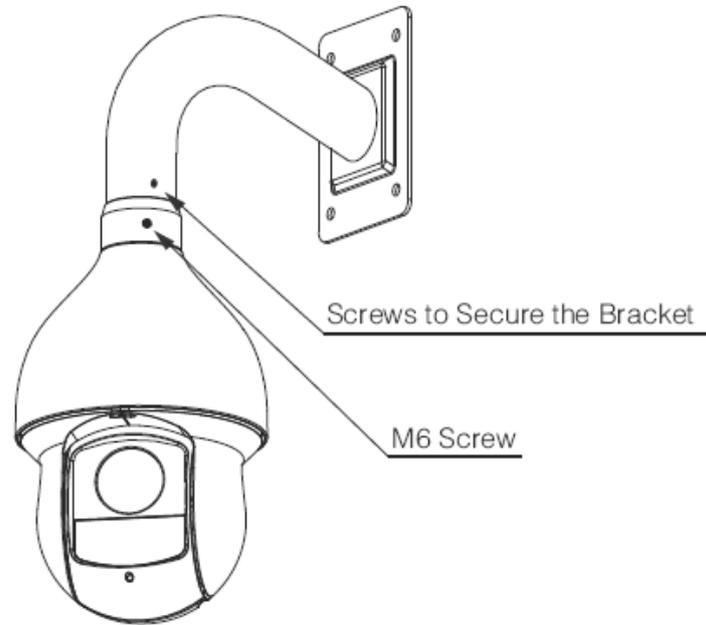


Figure 3-4

**Step 3**

Take the mounting holes of the wall-mounted bracket bottom surface as a template (Align bracket cable outlet hole with round hole on the wall), draw the punching position on the wall and dig holes, and then embed the expansion bolts into the holes you just dug in advance. Connect the composite cable correspondingly and put the cable into the holes, and then use 4 hex nuts and flat gasket to fix the wall-mounted bracket on the wall where expansion bolts have been embedded in advance, which is shown in Figure 3-5.

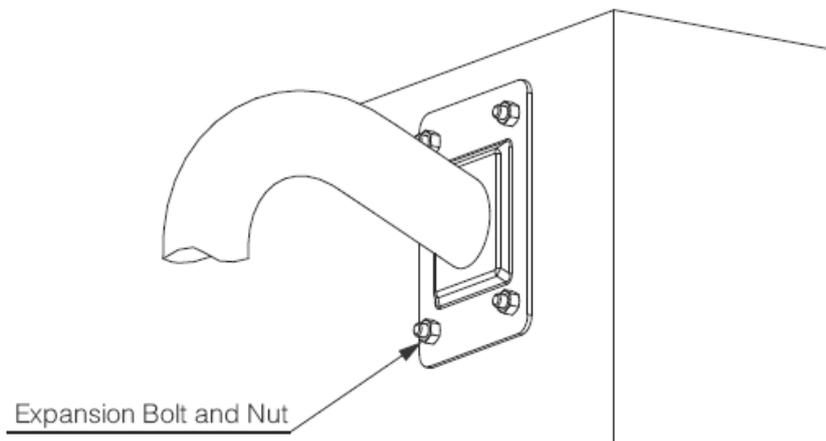


Figure 3-5

**Step 4**

So far, the speed dome installation has been completed, which is shown in Figure 3-6.

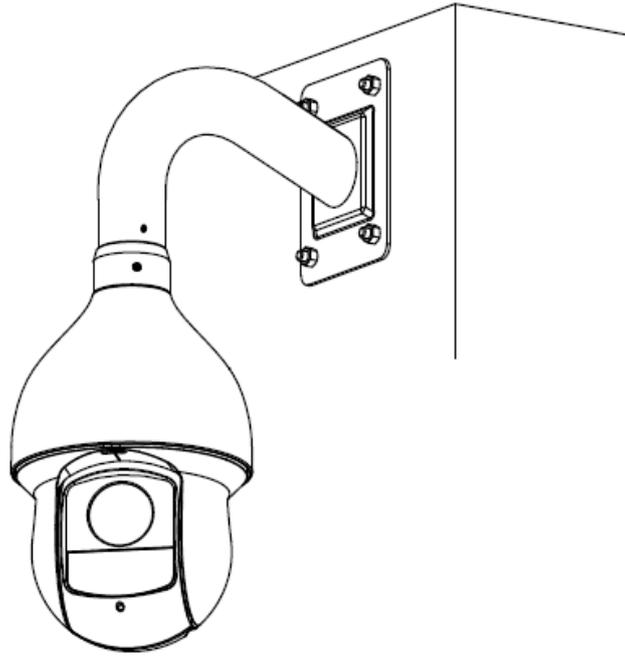


Figure 3-6

## 4 APPENDIX I THUNDER PROOF AND SURGE

### PROTECTION (Outdoors)

This series speed dome adopts TVS lightning protection technology. It can effectively prevent damages from various pulse signals below 6000V, such as sudden lightning and surge. While maintaining your local electrical safety code, you still need to take necessary precaution measures when installing the speed dome in the outdoor environment.

- The distance between the signal transmission cable and high-voltage device (or high-voltage cable) shall be at least 50 meters.
- Outdoor cable layout shall go under the penthouse if possible.
- For vast land, please use sealing steel tube under the land to implement cable layout and connects one point to the earth. Open floor cable layout is forbidden.
- In area of strong thunderstorm hit or near high sensitive voltage (such as near high-voltage transformer substation), you need to install additional high-power thunder protection device or lightning rod.
- The thunder protection and earth of the outdoor device and cable shall be considered in the building whole thunder protection and conform to your local national or industry standard.
- System shall adopt equal-potential wiring. The earth device shall meet anti-jamming and at the same time conforms to your local electrical safety code. The earth device shall not short circuit to N (neutral) line of high voltage power grid or mixed with other wires. When connect the system to the earth alone, the earth resistance shall not be more than  $4\Omega$  and earth cable cross-sectional area shall be no less than  $25\text{ mm}^2$ . See Figure 4-1

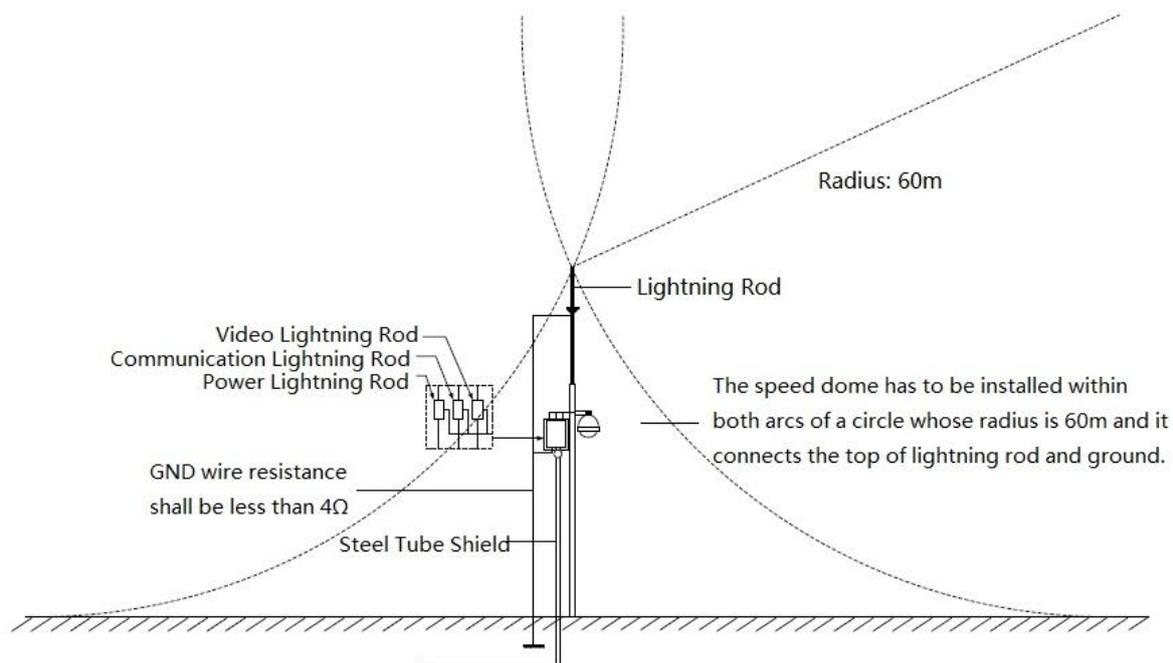


Figure 4-1

#### 4.1 Lightning Protection (Indoors)

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The yellow and green GND wire or GND screw of the speed dome should be reliably connected by several strands of copper wire with no less than 25mm<sup>2</sup> and indoor equipotential GND terminal. Please refer to Figure 4-2 for lightningproof installation mode.

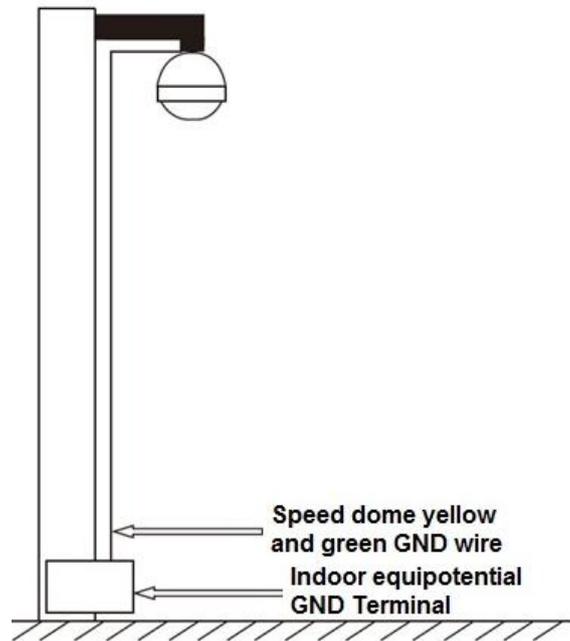


Figure 4-2

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## 5 APPENDIX II ABOUT RS485 BUS

### 5.1 RS485 Bus Main Feature

RS485 is semi duplex communication cable of impedance  $120\ \Omega$  . Its max load amount is 32 effective loads (including main control device and devices to be charged).

### 5.2 RS485 Bus Transmission Distance

When we take 0.56mm (24AWG) twisted-pair as communication cable, the max transmission distance (theoretically) are listed below (according to different baud rates).

Baud Rate	Max Distance
2400 BPS	1800M
4800 BPS	1200M
9600 BPS	800M

In the following situations, the max transmission distance shall become shorter accordingly:

- The communication cable is a little bit thin;
- The surrounding environment has strong electromagnetic interference;
- There are too much devices connected to the RS485 bus;

And vice versa, the max transmission distance shall become longer.

### 5.3 The Problem in Practical Use

In practical usage, we usually adopt star type connection. The terminal resistance shall connect to the furthest two devices (Such as device 1# and device 15# in Figure 5-1 ). But this connection way does not conform to RS485 Bus standard. When the distances between devices are too long, the signal reflection occurs and anti-jamming decreases, thus the signal reliability becomes very low. You can see speed dome is not under control or speed dome is running automatically and cannot stop.

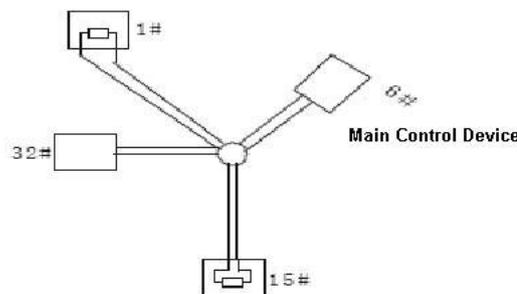


Figure 5-1

In this situation, we recommend RS485 distributor. This device can turn star type connection into the connection that conforms to RS485 bus industry standard, which can avoid the above mentioned problems and enhance communication reliability. See Figure 5-2.

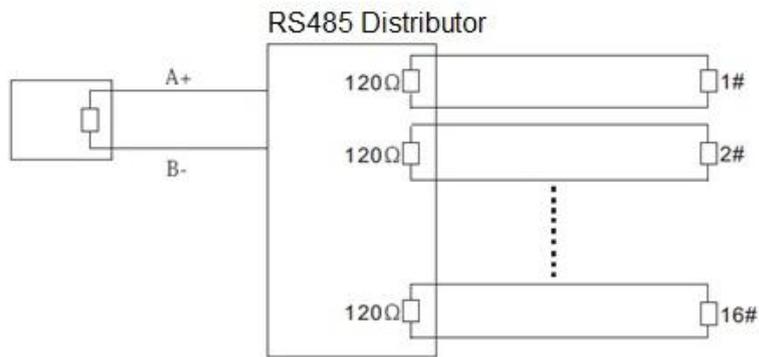


Figure 5-2

## 5.4 RS485 Bus FAQ

Phenomenon	Possible Reasons	Solution
Speed dome can run self-diagnosis but I cannot control it.	<ul style="list-style-type: none"> <li>● Host address(baud rate) and speed dome address(baud rate) are not match;</li> <li>● Positive and negative end of RS485 Bus are misconnected;</li> <li>● Connection cable is loose;</li> <li>● RS485 Bus connection are cut off;</li> </ul>	<ul style="list-style-type: none"> <li>● Modify host or speed dome setup ;</li> <li>● Switch RS485 positive end and negative end;</li> <li>● Fix connection cable firmly;</li> <li>● Replace RS485 Bus.</li> </ul>
I can control the speed dome but is not smooth	<ul style="list-style-type: none"> <li>● RS485 Bus connection are not good;</li> <li>● One RS485 bus is off;</li> <li>● The distance between host and speed dome is too far;</li> <li>● Parallel connected too much speed domes.</li> </ul>	<ul style="list-style-type: none"> <li>● Connect RS 485 Bus again;</li> <li>● Replace RS485 Bus;</li> <li>● Add terminal matching resistance;</li> <li>● Add RS485 distributor.</li> </ul>

## 6 APPENDIX III THE RELATIONSHIP BETWEEN AC 24V CABLE DIAMETER AND TRANSMISSION DISTANCE

It is the recommended max transmission distance when the cable diameter is fixed and the AC 24V power consumption is below 10%. (For the AC power supply devices, the max allowed voltage loss rate is 10%. For example, a device with rated power 20W, installed 141 feet (42m) away from the transformer, the needed minimum cable diameter is 0.8000mm).

Feet (m) \ mm	0.8000	1.000	1.250	2.000
5	488.52 (148.90)	763.31 (232.66)	1192.67 (363.53)	3053.25 (930.63)
10	244.26 (74.45)	381.66 (116.33)	596.34 (181.76)	1526.62 (465.31)
15	162.84 (49.63)	254.44 (77.55)	397.56 (121.18)	1017.75 (310.21)
20	122.13 (37.23)	190.83 (58.16)	298.17 (90.88)	763.31 (232.66)
25	97.70 (29.78)	152.66 (46.53)	238.53 (72.71)	610.65 (186.13)
30	81.42 (24.82)	127.22 (38.78)	198.78 (60.59)	508.87 (155.10)
35	69.79 (21.27)	109.04 (33.24)	170.38 (51.93)	436.18 (132.95)
40	61.06 (18.61)	95.41 (29.08)	149.08 (45.44)	381.66 (116.33)
45	54.28 (16.54)	84.81 (25.85)	132.52 (40.39)	339.25 (103.40)
50	48.85 (14.89)	76.33 (23.27)	119.27 (36.35)	305.32 (93.06)
55	44.41 (13.54)	69.39 (21.15)	108.42 (33.05)	277.57 (84.60)
60	40.71 (12.41)	63.61 (19.39)	99.39 (30.29)	254.44 (77.55)
65	37.58 (11.45)	58.72 (17.90)	91.74 (27.96)	234.87 (71.59)
70	34.89 (10.64)	54.52 (16.62)	85.19 (25.97)	218.09 (66.47)
75	32.57 (9.93)	50.89 (15.51)	79.51 (24.24)	203.55 (62.04)
80	30.53 (9.31)	47.71 (14.54)	74.54 (22.72)	190.83 (58.16)
85	28.74 (8.76)	44.90 (13.69)	70.16 (21.38)	179.60 (54.74)
90	27.14 (8.27)	42.41 (12.93)	66.26 (20.20)	169.62 (51.70)
95	25.71 (7.84)	40.17 (12.25)	62.77 (19.13)	160.70 (48.98)
100	24.43 (7.45)	38.17 (11.63)	59.63 (18.18)	152.66 (46.53)

## 7 APPENDIX IV THE RELATIONSHIP BETWEEN DC 12V CABLE DIAMETER AND TRANSMISSION DISTANCE

It is the recommended max transmission distance when the cable diameter is fixed and the DC 12V power consumption is lower than 10%. For the DC power supply devices, the max allowed voltage loss rate is 10%. The cable listed in the table below is copper wire (the resistivity of copper is  $\rho=0.0175\Omega\cdot\text{mm}^2/\text{m}$ ).

Feet (m) w	0.8000 mm	1.000	1.250	2.000
5	122.13 (37.23)	190.83 (58.16)	298.17 (90.88)	763.31 (232.66)
10	61.06 (18.61)	95.41 (29.08)	149.08 (45.44)	381.66 (116.33)
15	40.71 (12.41)	63.61 (19.39)	99.39 (30.29)	254.44 (77.55)
20	30.53 (9.31)	47.71 (14.54)	74.54 (22.72)	190.83 (58.16)
25	24.43 (7.45)	38.17 (11.63)	59.63 (18.18)	152.66 (46.53)
30	20.35 (6.20)	31.80 (9.69)	49.69 (15.15)	127.22 (38.78)
35	17.45 (5.32)	27.26 (8.31)	42.60 (12.98)	109.04 (33.24)
40	15.27 (4.65)	23.85 (7.27)	37.27 (11.36)	95.41 (29.08)
45	13.57 (4.14)	21.20 (6.46)	33.13 (10.10)	84.81 (28.85)
50	12.21 (3.72)	19.08 (5.82)	29.82 (9.09)	76.33 (23.27)
55	11.10 (3.38)	17.35 (5.29)	27.11 (8.26)	69.39 (21.15)
60	10.18 (3.10)	15.90 (4.85)	24.85 (7.57)	63.61 (19.39)
65	9.39 (2.86)	14.68 (4.47)	22.94 (6.99)	58.72 (17.90)
70	8.72 (2.66)	13.63 (4.15)	21.30 (6.49)	54.52 (16.62)
75	8.14 (2.48)	12.72 (3.88)	19.88 (6.06)	50.89 (15.51)
80	7.63 (2.33)	11.93 (3.64)	18.64 (5.68)	47.71 (14.54)
85	7.18 (2.19)	11.23 (3.42)	17.54 (5.35)	44.90 (13.69)
90	6.78 (2.07)	10.60 (3.23)	16.56 (5.05)	42.41 (12.93)
95	6.43 (1.96)	10.04 (3.06)	15.69 (4.78)	40.17 (12.25)
100	6.11 (1.86)	9.54 (2.91)	14.91 (4.54)	38.17

mm				
Feet (m)	0.8000	1.000	1.250	2.000
w				(11.63)

## 8 APPENDIX V WIRE GAUGE REFERENCE SHEET

Metric bare wire diameter (mm)	AWG	SWG	Bare wire cross section (mm <sup>2</sup> )
0.050	43	47	0.00196
0.060	42	46	0.00283
0.070	41	45	0.00385
0.080	40	44	0.00503
0.090	39	43	0.00636
0.100	38	42	0.00785
0.110	37	41	0.00950
0.130	36	39	0.01327
0.140	35	/	0.01539
0.160	34	37	0.02011
0.180	33	/	0.02545
0.200	32	35	0.03142
0.230	31	/	0.04115
0.250	30	33	0.04909
0.290	29	31	0.06605
0.330	28	30	0.08553
0.350	27	29	0.09621
0.400	26	28	0.1257
0.450	25	/	0.1602
0.560	24	24	0.2463
0.600	23	23	0.2827
0.710	22	22	0.3958
0.750	21	/	0.4417
0.800	20	21	0.5027
0.900	19	20	0.6362
1.000	18	19	0.7854
1.250	16	18	1.2266
1.500	15	/	1.7663
2.000	12	14	3.1420
2.500	/	/	4.9080
3.000	/	/	7.0683

### Note

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