PTZ AI Tracking Camera

RGBlink®

User Manual

Content

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Thank you for choosing our product!

This User Manual is designed to show you how to use this camera quickly and make use of all the features. Please read all directions and instructions carefully before using this product.

Declarations

FCC/Warranty

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the user will be responsible for correcting any interference.

Guarantee and Compensation

RGBlink provides a guarantee relating to perfect manufacturing as part of the legally stipulated terms of guarantee. On receipt, the purchaser must immediately inspect all delivered goods for damage incurred during transport, as well as for material and manufacturing faults. RGBlink must be informed immediately in writing of any complains.

The period of guarantee begins on the date of transfer of risks, in the case of special systems and software on the date of commissioning, at latest 30 days after the transfer of risks. In the event of justified notice of compliant, RGBlink can repair the fault or provide a replacement at its own discretion within an appropriate period. If this measure proves to be impossible or unsuccessful, the purchaser can demand a reduction in the purchase price or cancellation of the contract. All other claims, in particular those relating to compensation for direct or indirect damage, and also damage attributed to the operation of software as well as to other service provided by RGBlink, being a component of the system or independent service, will be deemed invalid provided the damage is not proven to be attributed to the absence of properties guaranteed in writing or due to the intent or gross negligence or part of RGBlink.

If the purchaser or a third party carries out modifications or repairs on goods delivered by RGBlink, or if the goods are handled incorrectly, in particular if the systems are commissioned operated incorrectly or if, after the transfer of risks, the goods are subject to influences not agreed upon in the contract, all guarantee claims of the purchaser will be rendered invalid. Not included in the guarantee coverage are system failures which are attributed to programs or special electronic circuitry provided by the purchaser, e.g. interfaces. Normal wear as well as normal maintenance are not subject to the guarantee provided by RGBlink either.

The environmental conditions as well as the servicing and maintenance regulations specified in this manual must be complied with by the customer.

Operators Safety Summary

The general safety information in this summary is for operating personnel.

Do Not Remove Covers or Panels

There are no user-serviceable parts within the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

Power Source

This product is intended to operate from a power source that will not apply more than 230 volts rms between the supply conductors or between both supply conductor and ground. A protective ground connection by way of grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug

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the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse having identical type, voltage rating, and current rating characteristics. Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere.

Installation Safety Summary

Safety Precautions

For all camera installation procedures, please observe the following important safety and handling rules to avoid damage to yourself and the equipment.

To protect users from electric shock, ensure that the chassis connects to earth via the ground wire provided in the AC power Cord.

The AC Socket-outlet should be installed near the equipment and be easily accessible.

Unpacking and Inspection

Before opening shipping box, inspect it for damage. If you find any damage, notify the shipping carrier immediately for all claims adjustments. As you open the box, compare its contents against the packing slip. If you find any shortages, contact your sales representative.

Once you have removed all the components from their packaging and checked that all the listed components are present, visually inspect the system to ensure there was no damage during shipping. If there is damage, notify the shipping carrier immediately for all claims adjustments.

Site Preparation

The environment in which you install your camera should be clean, properly lit, free from static, and have adequate power, ventilation, and space for all components.

Electric Safety

Installation and operation must accord with electric safety standard

Polarity of power supply

The power supply of the product is DC12V, the max electrical current is 2A .Polarity of the power supply as the following drawing.
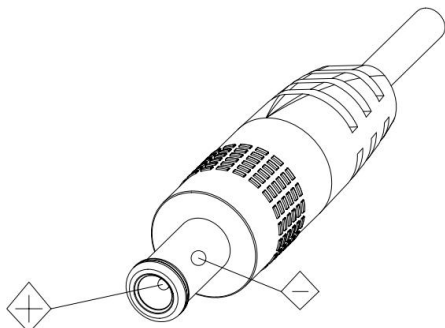
Careful of installation

Never move the camera by seizing the camera head. Don't rotate camera head by hand; otherwise, mechanical trouble will occur.

This series item must be put on the smooth desk or platform, and it can not be installed slant ways;

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If the camera is installed on TV or computer, the base can be fixed by four double-sided adhesive trays.

Don't apply in corrosive liquid, as or solid environment to avoid the cover which is made up of organic material.

To make sure no obstacle in rotation range.

Never power on before installation is completed.

Don't disassemble discretionarily.

There are no parts that users can repair by themselves on this product. We are not responsible for any unauthorized modification or dismantling.

Avoid Magnetic Interference

Magnetic field under specific frequency may affect this product image; this is Class A product. Application in domestic environment may cause radio interference. Therefore, user should take corresponding measures.

Caution

If the power cord need to be extended, must only extend the cord connect to outlet 220V/110V. Do not extend the DC 12V power cord, otherwise malfunction could be caused.

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Chapter 1 Your Product

1.1 In the Box

Power Adapter × 1
RS232 serial port line × 1
Remote control × 1

1.2 Product Overview

PTZ AI Tracking Camera is a dedicated smart camera solution leading in international education information industry.

It features built-in high speed processor and advanced image processing and analytical algorithm, which allows it to track and detect teachers, students and blackboard-writing accurately and quickly. It fully satisfies all scenario demand by recorded broadcasting of teaching and remote interactive teaching.

PTZ AI Tracking Camera adopt advanced ISP processing technique and algorithm, producing vivid images which feature balanced brightness, distinct layering, high definition and color reducibility.

PTZ series products are characterized by improved function, high performance, reliable operation, simple use and easy maintenance

Product Advantage&Features

Advantage

Full-scene solution: Different product combinations satisfy different scenario demands;

Networked control interface: Control information of all products will be transmitted via network, and it is suitable for product layout for all scenarios;

Recognition algorithm unrelated to location: Status detection and recognition of teachers and students adopt unique smart partitioning algorithm to ensure that the result of detection and recognition is unrelated to location;

Free installation: It supports both front installation and upside down installation;

It supports 5G WiFi transmission mode

All-in-one design: The built-in panoramic lens allow perfect combination of panoramic lens and tracking camera;

Sophisticated tracking algorithm: It applies sophisticated human detection, locking and tracking image processing and analytical algorithm (smart image recognition library, scene adaptive algorithm) and achieves stable, fast and accurate target tracking;

High immunity from interference: More diversified and flexible recognition shield settings ensure that once tracking target is locked, it will not be affected by other moving object or projector;

Stable tracking: Movement sensitivity is adjustable. When tracking slight movement of target or hand movement, it will not cause wrong operation of the camera;

Self-adaptive image: The tracking camera zooms depending on distance to target so that the visual image maintains proper size and scale;

High environmental suitability: Tracking result will not be affected by classroom size, shape or seat arrangement;

Super wide dynamic exposure

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Features

Full HD image: With **1/2.8 inch** high quality image sensor, its maximum resolution ratio reaches1920x1080;
Multiple optical zoom lens: 12X and 20X optical zoom lens are available. The lens features 72.5° distortionless wide viewing angle;
Advanced focusing technique: The advanced automatic focusing algorithm allows automatic focusing be done quickly, accurately and steadily;
Low noise high signal to noise ratio: Low noise CMOS ensures super high signal to noise ratio of video taken by the camera. With advanced 2D and 3D noise reduction technology, noise is reduced and image resolution is guaranteed.
Audio input port: It supports 16000, 32000, 44100, 48000 sampling frequency and AAC, MP3 and G.711A audio coding;
Super quiet holder: High precision stepping motor and precision motor driven controller ensure the holder operate at low and stable speed without noise;
Multiple video compression standards: It supports H.265/H.264 video compression;
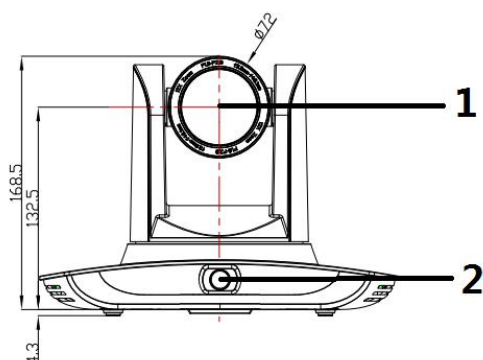**Multiple networking protocol**: It supports ONVIF, GB/T28181, RTSP, RTMP protocol and RTMP push mode;
Sleep mode: It supports low-power consumption sleep/wake up mode. Power consumption in sleep mode is lower than 400mW;
Multiple control protocol: It supports VISCA, PELCO-D, PELCO-P protocol, automatic recognition protocol

1.2.1 Interface

Front view

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Rear view

SDI model: HDMI/USB 3.0 Model：

3 4 5 6 7 8 9
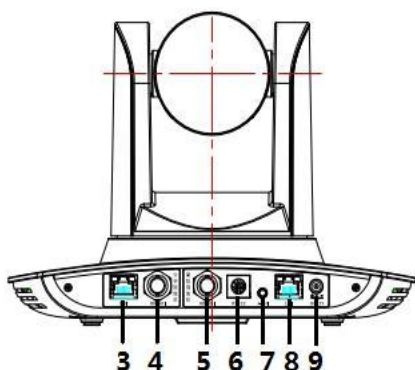
1. Close-up lens
2. Panorama lens
3. LAN network port for panorama lens
4. SDI output 1 (panorama lens output)
5. SDI output 2 (close-up lens output)
6. RS-232 control port
7. Audio input port
8. LAN network port for close-up lens
9. Power supply port (DC12V)

3 4 5 6 7 8 9 10 11
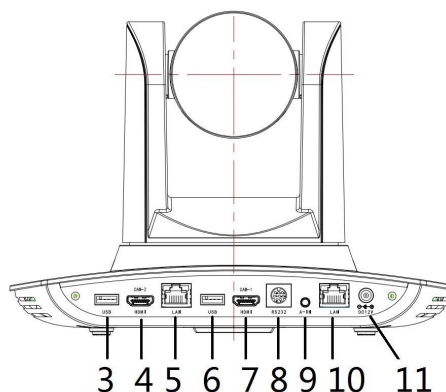
1. Close-up lens
2. Panorama lens
3. USB3.0 output 1 (panorama lens output)
4. HDMI output 1 (panorama lens output)
5. LAN network port for panorama lens
6. USB3.0 output 2 (close-up lens output)
7. HDMI output 2 (close-up lens output)
8. RS-232 control port
9. Audio input port
10. LAN network port for close-up lens
11. Power supply port (DC12V)

Pin definition:
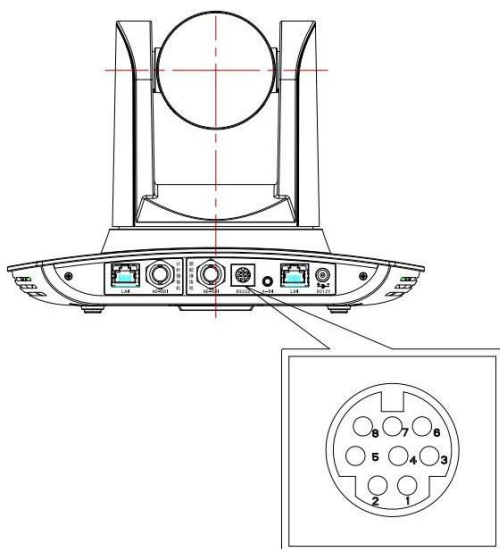
No.	Port	Definition
1	DTR	Data Terminal Ready
2	DSR	Data Set Ready
3	TXD	Transmit Data
4	GND	Signal ground
5	RXD	Receive Data
6	GND	Signal ground
7	IR OUT	IR Commander Signal IR
8	NC	No Connection

1.2.2 Dimension

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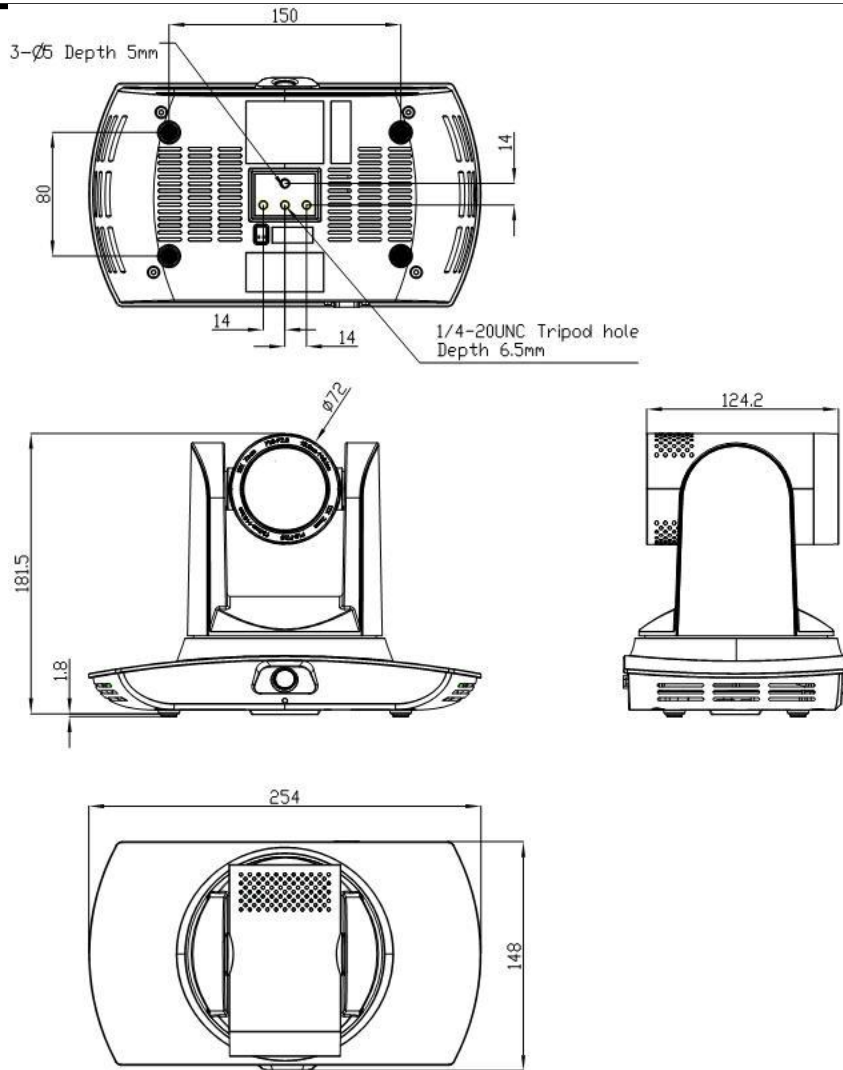
PTZ AI Tracking Camera dimension

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Chapter 2   Install Your Product

2.1 System Connection

2.1.1 Installation Layout
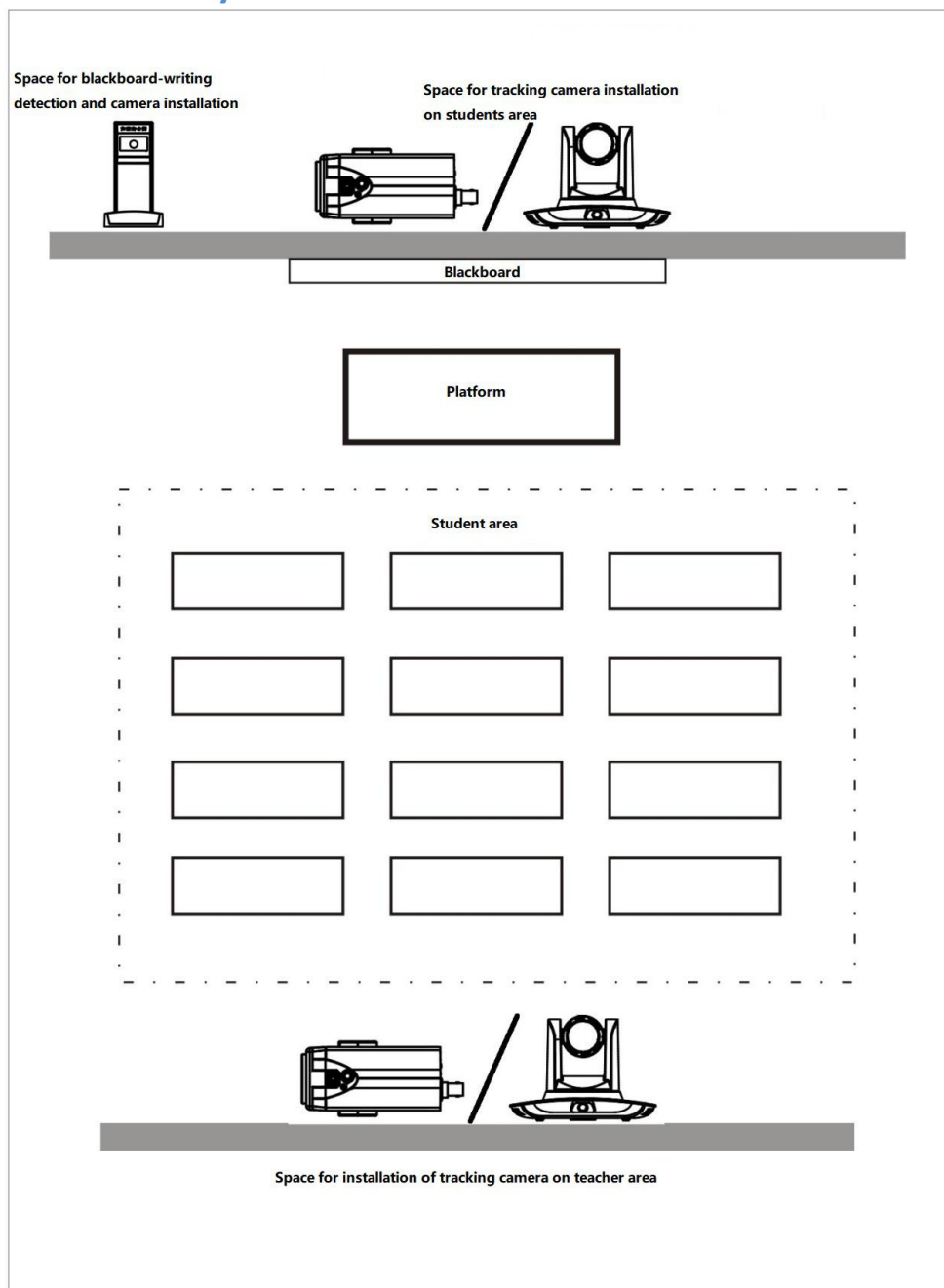
Tracking camera on teacher area is installed at place 1.8-2.5m from ground (distance from panoramic lens to ground), 5-15m from blackboard (when the distance is 5-9m, 4mm panoramic lens is recommended; when distance is 9-15m, 6mm panoramic lens is recommended). Tracking cameras should be installed near central axis of the classroom as much as possible to get the best result of tracking camera shooting.

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2.1.2　System wiring
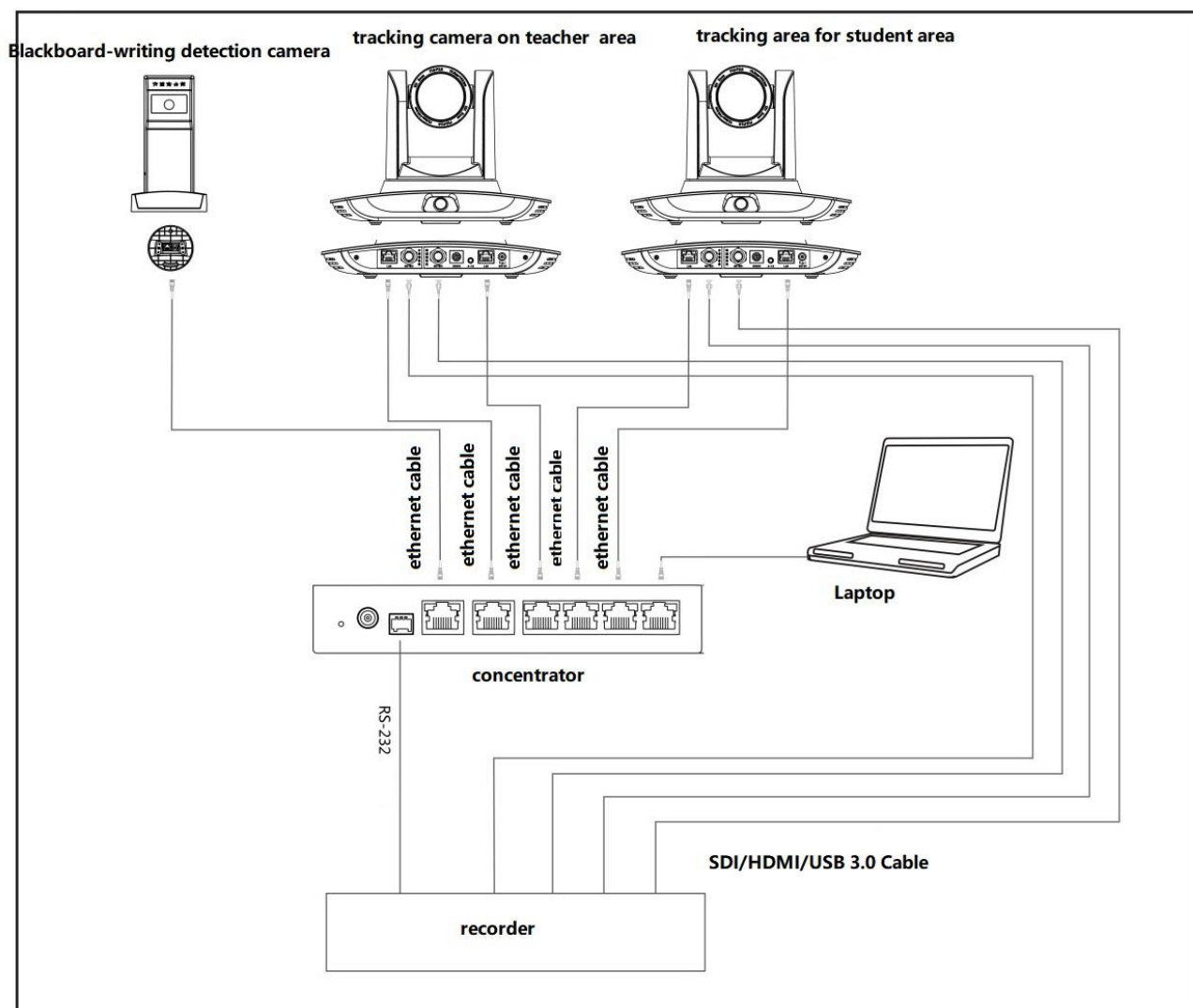
If the recording and broadcasting host supports LAN network control port, the concentrator can be replaced by LAN network switch.

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Chapter 3 Use Your Product

3.1 Configuration Tool

3.1.1 Set IP address of the tracking machine

Open IVESmart configuration tool, click Settings -> IP address -> Search successively (refer to figure below for details), the configuration interface will display all valid devices in the LAN, check type of device to be configured and click Confirm. **Note:** *Computer for operating IVESmart tool should be in the same LAN with camera configured.*

3.1.2 Configure Tracking Parameters

Setting Process

Stop Tracking→Set Panoramic preset and close up→Set space for platform, tracking and shield
→Set tracking parameter→start Tracking

Here, the following is a description of settings according to the process. The main interface of configuration tool is shown in figure below.

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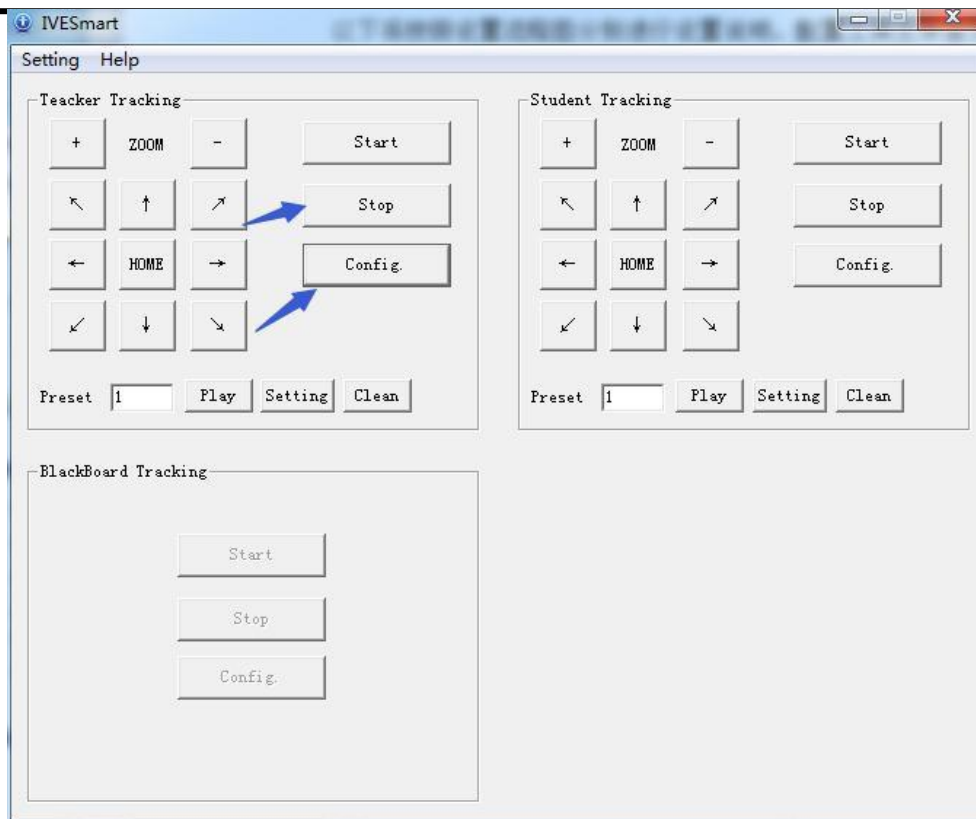
1. **Set preset position for close up**

Operation interface of setting preset position for close up is shown in Figure 5.2-2. Box indicated by arrow has a holder control button. By controlling holder position and zoom value, it will adjust camera angle and position to preset position and save. Settings of panoramic preset position and platform preset position are as follows:

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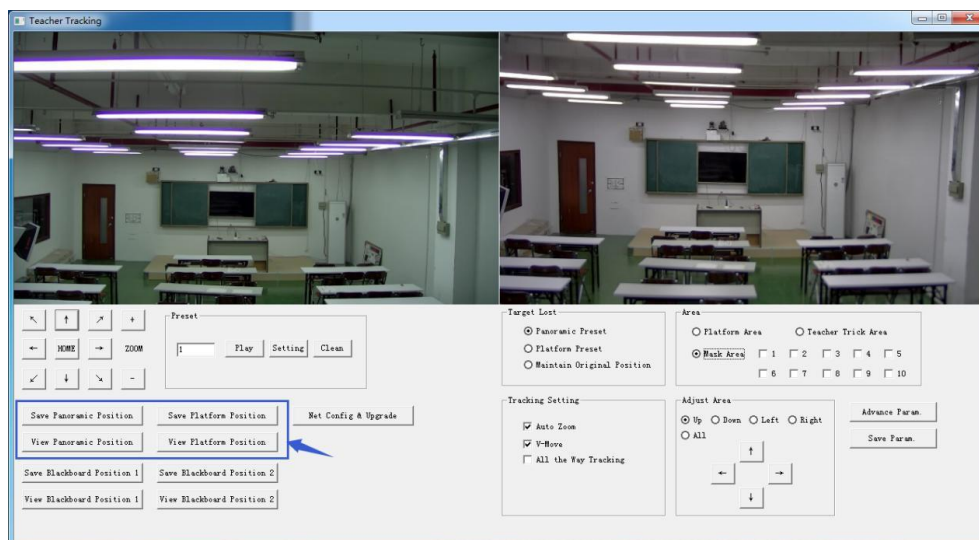
Platform preset: Control teacher tracking camera to make platform (we suggest that teachers stand in the middle of platform, if any) get desired visual result in camera image, then click and save Platform preset. During normal tracking, size of teacher's image in the picture uses Platform preset as a reference. When tracking target disappears, it can select close-up lens to go back to Platform preset.

Panoramic preset: Control teacher tracking camera to allow camera to have almost a panoramic of the classroom (or any position). When tracking target disappears, it can select close-up lens to go back to panoramic position.

Preset for blackboard-writing: Refer to user manual for blackboard-writing for details.

2. Set panoramic lens area

Platform area: It is the area tracked once close-up lens start up tracking. It is blackboard area on platform generally so as to ensure that when teacher is on platform his upper body is displayed within setting area, and it will not exceed lower margin of platform area when students in the first row sit down
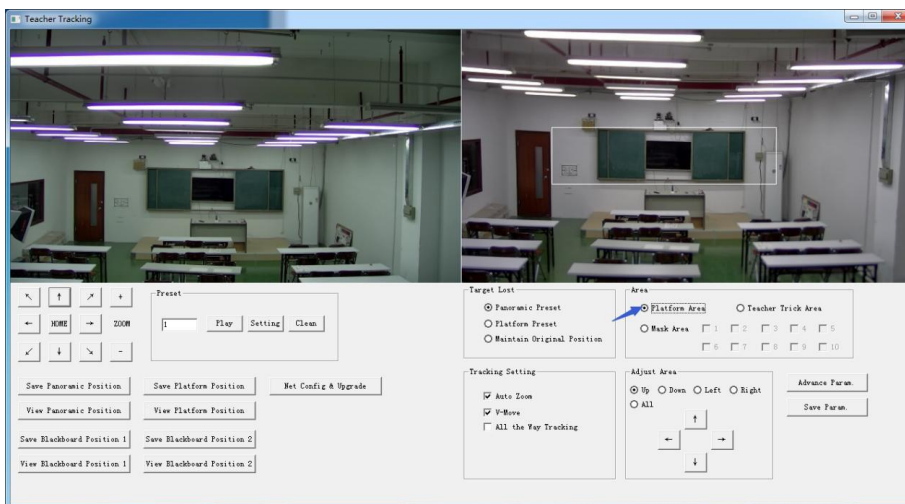
Tracking area: Tracking area means scope of tracking teacher. When the tracking target goes out of the tracking area, it will be considered tracking target losing. The tracking area can be set into polygon according to certain environment conditions, or set student area outside of tracking area.

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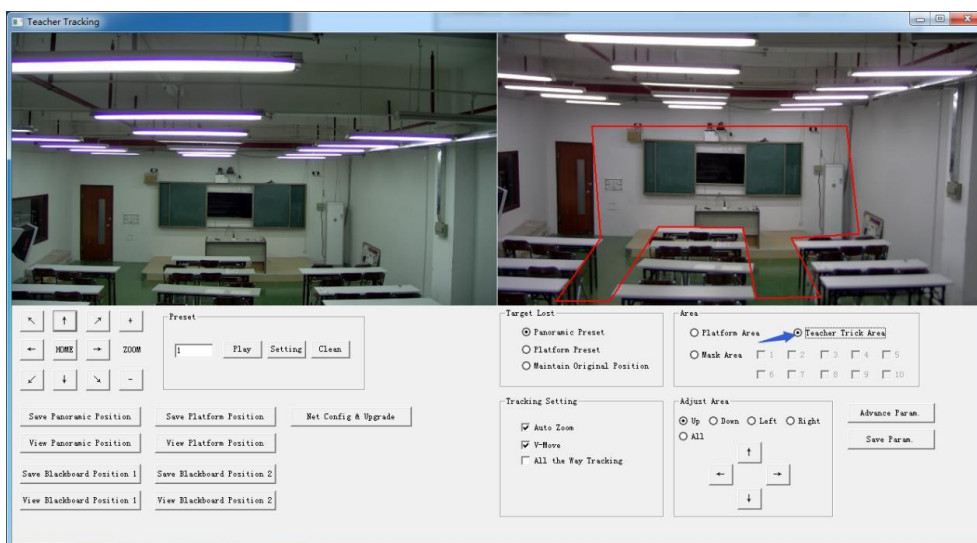
Mask area: Mask area is usually the area which may impact result of teacher tracking, such as places which may have dynamic changes such as TV, projector, doors and windows.
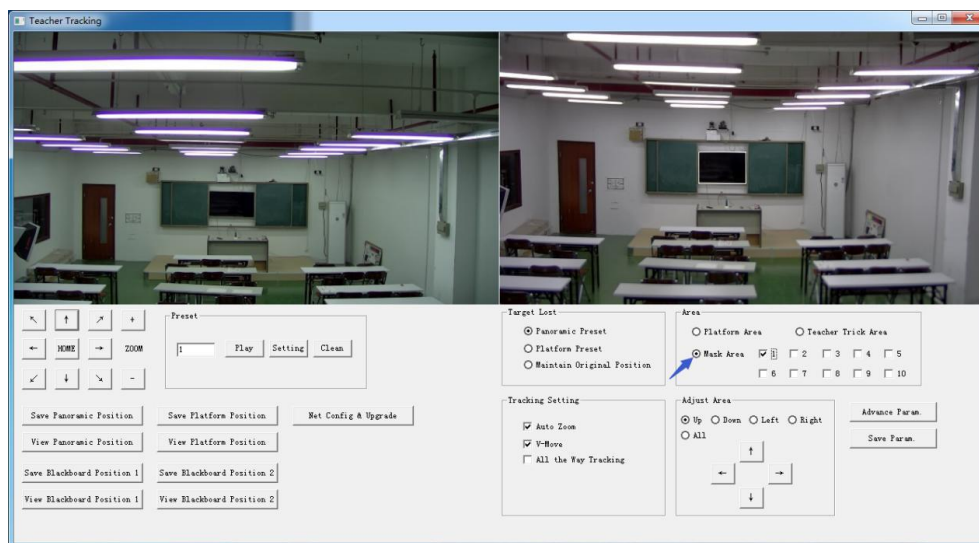
3. Set tracking parameters

Target lost: when target loses, the close-up lens will return to designated preset position. This preset position can be panoramic preset, platform preset or maintain original position.
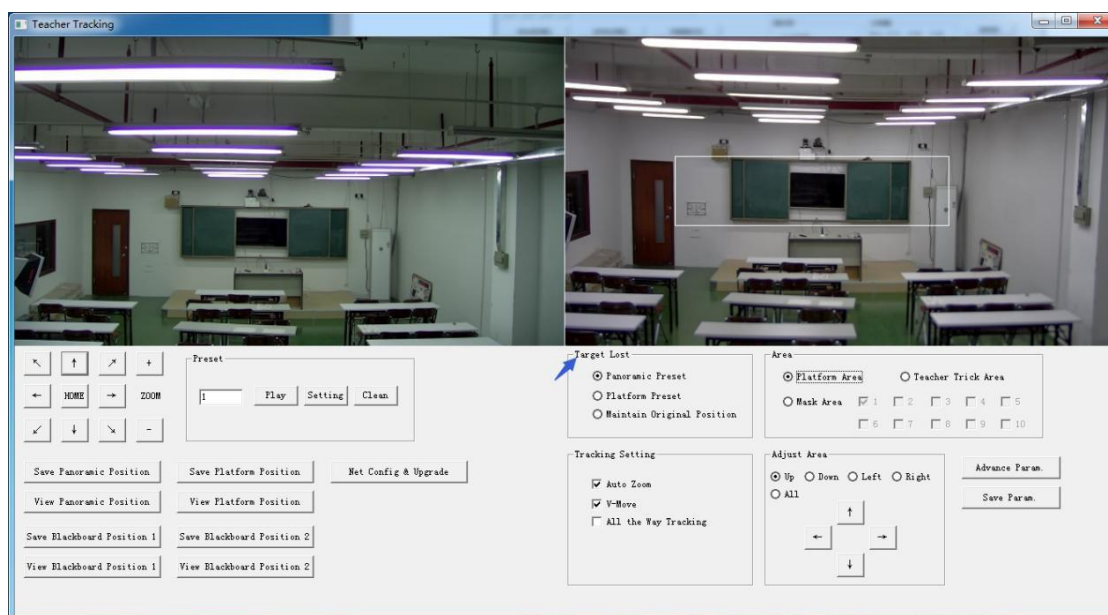
Tracking settings:

Auto zoom: In open mode (checked), during tracking, the camera will zoom automatically according to target distance; in off mode (unchecked), during teacher tracking, zoom remains the value set during platform preset.

V-move: In open mode (checked) and during teacher tracking, the camera will adjust　its angle of elevation according to height of tracking target; in off mode (unchecked) and during

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teacher tracking, angle of elevation remains the value set during platform preset. If a teacher will not step down platform in class, we suggest turning off auto zoom and v-move.
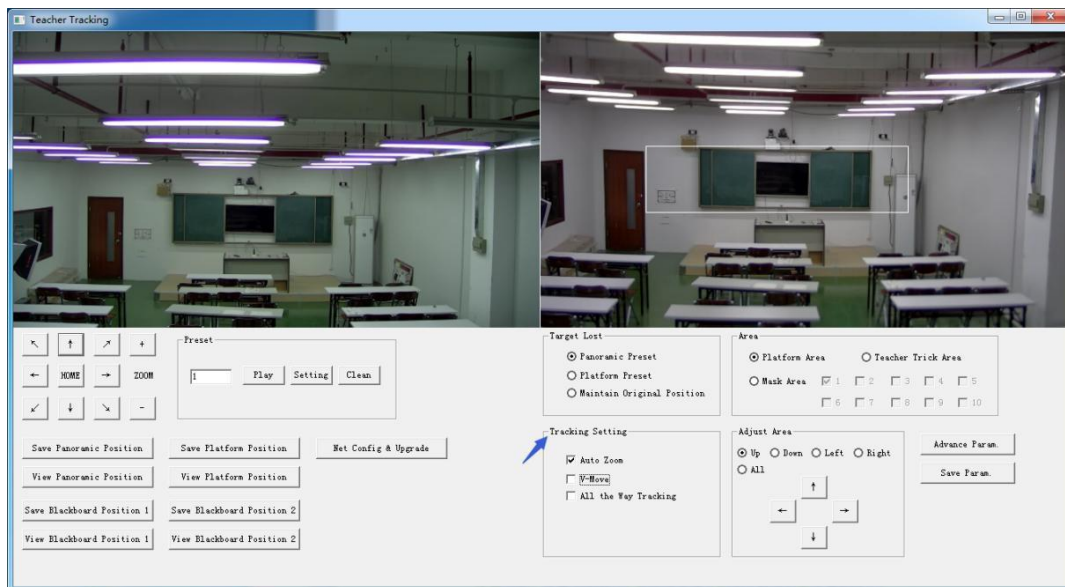
Advance parameters:

Action sensitivity: In teacher tracking mode, it is the action range required to trigger tracking camera when the tracking target changes from stationary state to motion state. The higher the action sensitivity, the smaller movement of tracking target that will trigger camera's tracking motion.

H-speed: It means speed of tracking camera for horizontal tracking.

V-speed: It means speed of tracking camera for vertical tracking.

Zoom range: The bigger the range, the higher zoom extent required for camera when tracking target steps down platform.

Lost timeout: It means time required (5s by default) for tracking camera to perform target lost action when target is lost (optional: return to panorama preset, platform preset, or remain original position).

Down platform sensitivity: It is used for determining if teacher steps down platform. The lower the sensitivity, the longer teacher's distance to blackboard it required to trigger teacher down platform action.

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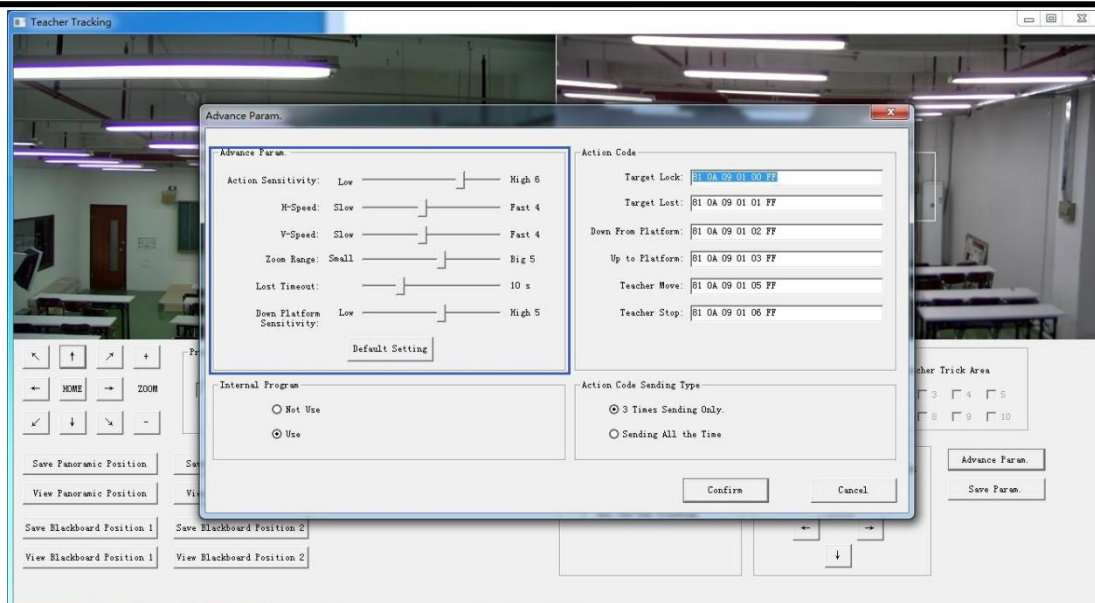
For settings of action code, refer to "7 Description of connecting recording and broadcasting host".

After setting, click Save Parameter. It allows to entering advance parameter settings column to change configuration value to obtain the best result subject to specific scenes and customer demand.

3.2 Network Update

When updating the version, it needs to update device via IVESmart configuration tools. Click Configuration -> Network configuration & update to enter update interface, as shown below:
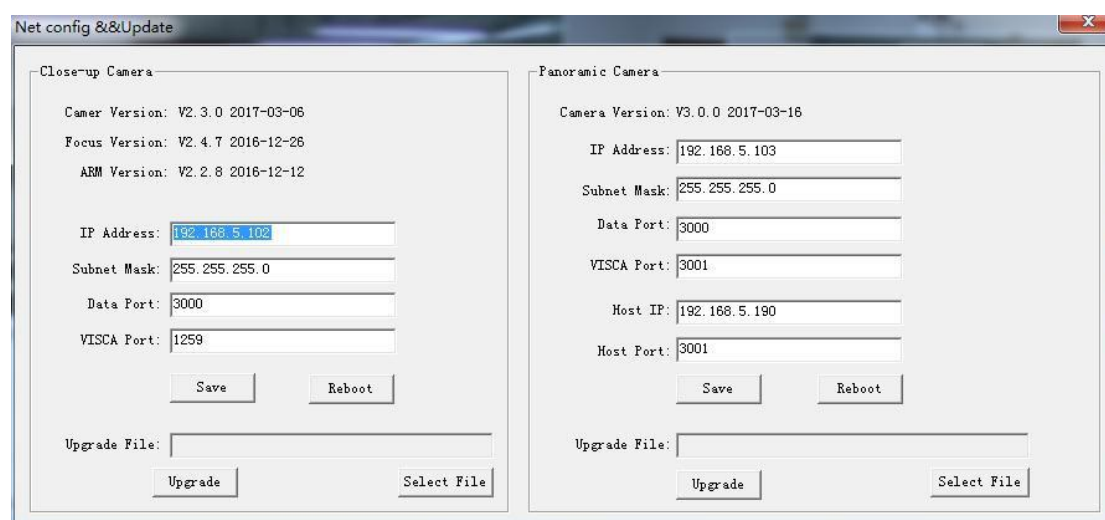
When upgrading, note whether camera to be upgraded is close-up camera or panorama camera,

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then click Select file -> upgrade, the following interface appears:
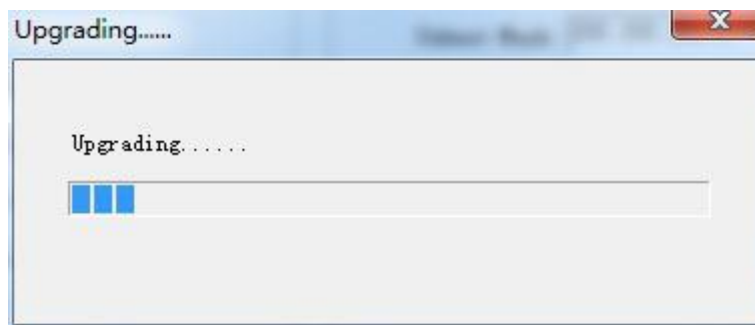
After upgrading is completed, the camera will perform self-inspection.

Note: After grading, you can restore factory settings by combination key [*] [#] [6] on remote control or by remote control menu.

3.3 Recording and Broadcasting Host

3.3.1 Auto Tracking Control

The recording and broadcasting host sends command by LAN network port or concentrator RS232 serial port and controls automatic tracking motion of teacher tracking camera. In auto tracking mode, it does not allow control camera holder rotation or zoom by IVESmart configuration tool or remote control; in stop auto tracking mode, it allows control camera holder rotation or zoom by IVESmart configuration tool or remote control.

    1. Network receiving address

Address for teacher tracking camera to receive command can be searched in IVESmart configuration tool, click Setting -> IP address -> search successively, as follows:

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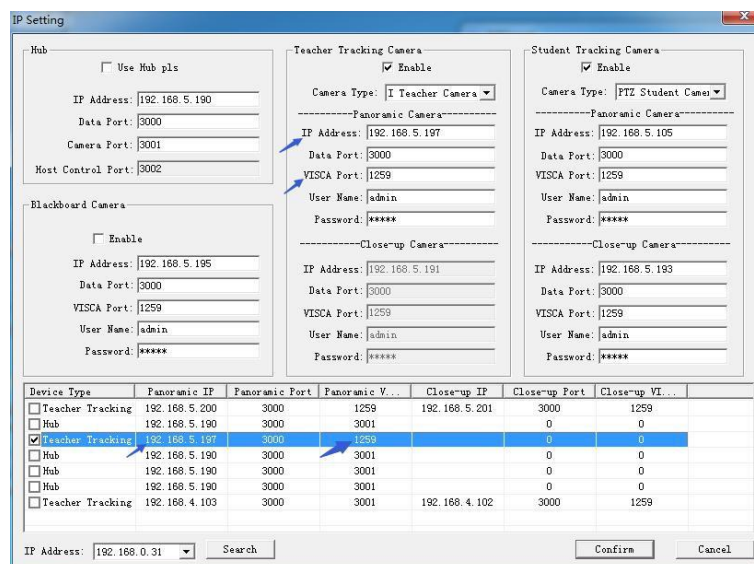
2. Command

Type	Command
Start teacher tracking	0x810x0A 0x08 0x01 0x020xFF
Stop teacher tracking	0x81 0x0A 0x08 0x01 0x03 0xFF

3.3.2 Action code docking

Tracking status of teacher tracking camera will be feed back to recording and broadcasting host via network (UDP transmission mode) or concentrator (RS232 serial port) in the form of action code.

1. **Configure recording and broadcasting host address**

If recording and broadcasting host uses LAN to receive action code, then it needs to configure host address by IVESmart configuration tool. Click **Configuration -> Network configuration & update**, as shown below:

2. **Configure action code**

Edit action code as needed via IVESmart configuration tool. Click Configuration -> advance parameters successively;
After modification, click Confirm -> save parameters, as shown below:

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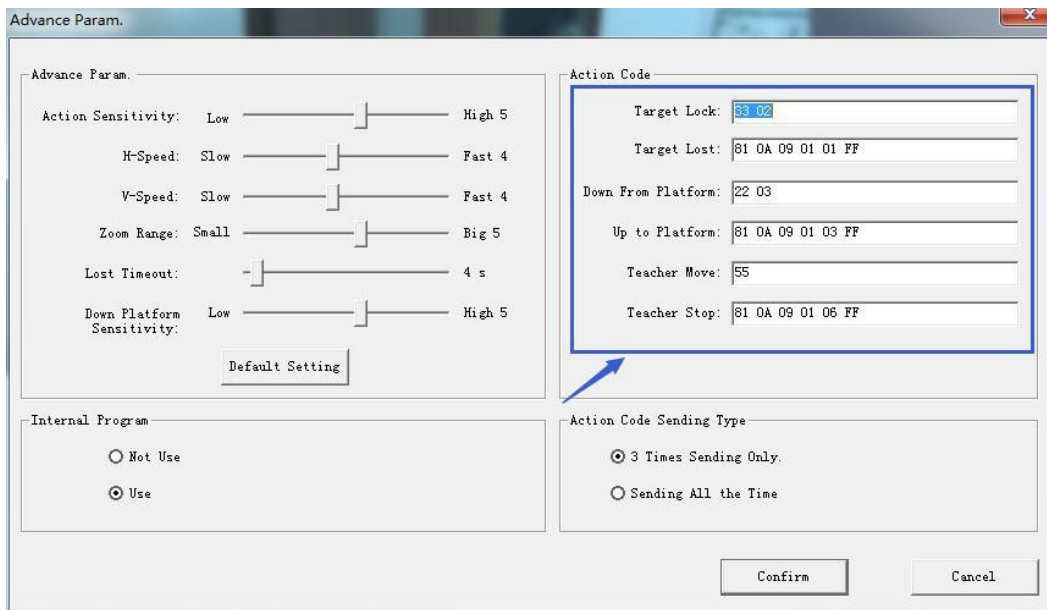
3.4 Remote Controller

3.4.1 Keys Instruction
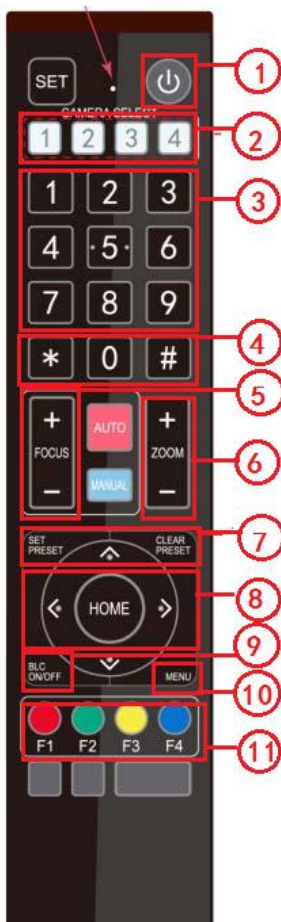
1. Standby Key

After 3S long press, the camera will step into standby mode. Long press 3S again, the camera will

self-test again and back to HOME position. (Note: If power-on mode is turned on and Preset 0 is

set, and there is no operation within 12s, it will automatically point to the specified preset position.

2. Camera Address Selection

Select the camera address which wants to be controlled

3. Number Key

Set or run 0-9 presets

4. *,# Key

Key combination use

5. Focus Control Key

Auto Focus: Enter into auto focus mode.

Manual Focus: The camera focus mode is manual

Switch the camera focus mode to manual focus by pressing [focus +] or [focus -] to adjust

6. Zoom Control Key

Zoom＋:Lens near

Zoom－:Lens far

7. Set or Clear Preset key

Set Preset: Set preset key + 0-9 number key:

Clear Preset key: Clear preset key + 0-9 number key

8. Pan/Tilt Control Key

Press Key :Up
Press Key :Down
Press Key :Left
Press Key: Right
"HOME" Key: Return to the middle position or enter into the next level menu

9. BLC Control Key

Back Light ON / OFF: Turn on or off the back light

10. Menu Setting

Open or close the OSD menu
Enter / exit the OSD menu or return to the previous menu

11. Camera IR Remote Control Address Setting

【*】+【＃】+【F1】:Camera Address No.1
【*】+【＃】+【F2】:Camera Address No. 2
【*】+【＃】+【F3】:Camera Address No. 3
【*】+【＃】+【F4】:Camera Address No. 4

12. Key Combination Functions

1）【#】+【#】+【#】：Clear all presets

2）【*】+【#】+【6】：Restore factory defaults

3）【*】+【#】+【9】：Flip switch

4）【*】+【#】+Auto： Enter into the aging mode

5）【*】+【#】+【3】：Menu set to Chinese

6）【*】+【#】+【4】：Menu set to English

7）【*】+【#】+Manual: Restore the default user name, password and IP address

8）【#】+【#】+【0】：Switch the video format to 1080P60

9）【#】+【#】+【1】：Switch the video format to 1080P50

10）【#】+【#】+【2】：Switch the video format to 1080I60

11）【#】+【#】+【3】：Switch the video format to 1080I50

12）【#】+【#】+【4】：Switch the video format to720P60

13）【#】+【#】+【5】：Switch the video format to 720P50

14）【#】+【#】+【6】：Switch the video format to 1080P30

15）【#】+【#】+【7】：Switch the video format to 1080P25

16）【#】+【#】+【8】：Switch the video format to 720P30

17）【#】+【#】+【9】：Switch the video format to 720P25

> **Note：** 7） 【*】+【#】+Manual: Restore the default user name, password and IP address
>
> **Administrator：** default user name and password is **admin**
>
> **User：** default user name and password is user1 or user2
>
> **Default IP address：** 192. 168. 5. 163

3.4.2 Applications

Finishing initialization, it can receive and execute the IR commands. Press the remote controller button, the indicator light is flashing; release the button, the indicator light stops flashing. Users can control the pan/tilt/zoom, setting and running preset positions via the IR remote controller.

Key Instruction:

1. In this instruction, "press the key" means a click rather than a long-press, and a special note will be given if a long-press for more than one second is required.

2. When a key-combination is required, do it in sequence. For example," 【 *】+【#】+【F1】"means press"【*】"first and then press"【#】" and last press"【F1】".

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1）Camera Selection

Select the camera address to control.

2）Pan/Tilt Control

Up：press【▲】　　　　Down：press【▼】
left：press【◄】　　　　Right：press【►】
Back to middle position：press【HOME】
Press and hold the up/down/left/right key, the pan/tilt will keep running, from slow to fast, until it runs to the endpoint; the pan/tilt running stops as soon as the key is released.

3) Zoom Control
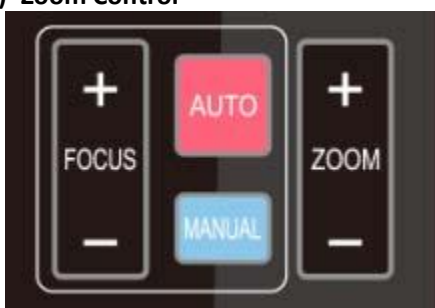
ZOOM IN: press "ZOOM 【▲】" key
ZOOM OUT: press "ZOOM 【▼】" key
Press and hold the key, the camera will keep zooming in or
zooming out and stops as soon as the key is released.

4) Focus Control

Focus (near):Press "【focus+】" key (Valid only in manual focus
mode)
Focus (far): Press "【focus-】"key (Valid only in manual focus
mode)
Auto Focus: Support
Manual Focus: Support
Press and hold the key, the action of focus will keep continue and stops as soon as the key is released.

5) BLC Setting

BLC ON / OFF: support

6) Presets Setting, Running, Clearing

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1. Preset setting: to set a preset position, the users should press the "【SET PRESET】" key first and then press the number key 0-9 to set a relative preset,

Note: 10 preset positions in total are available by remote

controller.

2. Preset Running: Press a number key 0-9 directly to run a relative preset.

Note: Action in vain if a relative preset position is not existed.

3. Preset clearing : to clear a preset position, the user can press the " 【CLEAR PRESET】 " key first and then press the number key 0-9 to clear the relative preset;

Note : press the" 【# 】" key three times continually to cancel all the presets.

7) Camera Remote Controller Address Setting

【*】+【＃】+【F1】:Camera Address No.1
【*】+【＃】+【F2】:Camera Address No. 2
【*】+【＃】+【F3】:Camera Address No. 3
【*】+【＃】+【F4】:Camera Address No. 4

3.5 Menu Setting

3.5.1 Main Menu

In normal working mode, press 【MENU】key to display the menu, using scroll arrow to point at or highlight the selected items.

```
 MENU
 ＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝
 Language                English
（Setup）
（Camera）
（P/T/Z）
（Video Format）
（Version）
（Restore Default）


 [↑↓]Select      [← →]Change Value
 [Menu]Back              [Home]OK
```
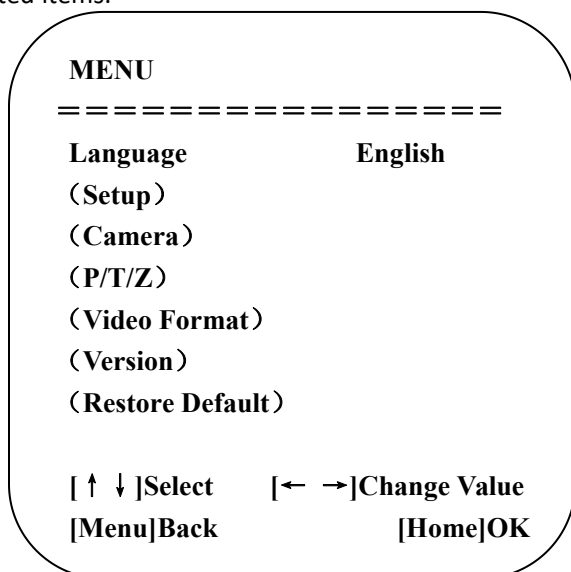
Language： Language setting, Chinese / English   **Setup：** System setting

Camera Option： Camera Setting   **P/T/Z：** Pan tilt setting

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Version：camera version setting

Restore Default: Reset setting

[↑↓]] Select: for selecting menu	**[← →]Change Value:** for modify parameters
[Menu]Back: Press [MENU] to return	**[Home] OK:** Press [Home] to confirm

3.5.2 System Setting

Move the pointer to the (Setup) in the Main Menu, click the 【HOME】key and enter into the (System Setting) as shown below

```
 SETUP
 ＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝
 Protocol              Auto
 Visca Address         1
 Visca Address Fix     OFF
 PELCO-P Address       1
 PELCO-D Address       1
 Baudrate              9600


 [↑ ↓]Select    [← →]Change Value
 [Menu]Back
```

Protocol：VISCA/Pelco-P/Pelco-D/Auto	**Visca ADDR:** VISCA=1~7 Pelco-P=1~255 Pelco-D = 1~255
Baud rate: 2400/4800/9600/115200	**Visca Address Fix:** On/Off

3.5.3 Camera Setting

Move the pointer to the (CAMERA) in the Main Menu, click the 【HOME】key and enter the (CAMERA) as follow.

```
 CAMERA
 ＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝
 （Exposure）
 （Color）
 （Image）
 （Focus）
 （Noise Reduction）
 Style                 Default
 [↑ ↓]Select    [← →]Change Value
 [Menu]Back        [Home]OK
```

Exposure: Enter into Exposure setting	**Image:**Enter into image setting	**Color:** Enter into color setting
Focus: Enter into focus setting	**Noise Reduction:**Enter into noise reduction	

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1）EXPOSURE

Move the pointer to the (EXPOSURE) in the Main Menu, click the【HOME】and enter the (EXPOSURE SET) as follow.

```
┌─────────────────────────────┐
│   EXPOSURE                  │
│  ══════════════════         │
│    Mode            Auto     │
│    EV              OFF      │
│    BLC             OFF      │
│    Flicker         50Hz     │
│    G.Limit         3        │
│    DRC             2        │
│                             │
│    [ ↑ ↓ ]Select   [← →]Change Value │
│    [Menu]Back               │
└─────────────────────────────┘
```

Mode : Auto, Manual, Shutter priority, Iris priority and Brightness priority.

EV : On/Off (only available in auto mode)

Compensation Level: -7~7 (only available in auto mode when EV is ON)

BLC: ON/OFF for options (only available in auto mode)

Anti-Flicker: OFF/50Hz/60Hz for options (only available in Auto/Iris priority/Brightness priority modes)

Gain Limit: 0~15(only available in Auto/ Iris priority /Brightness priority mode)

WDR: Off,1~8

Shutter Priority:1/25,1/30,1/50,1/60,1/90,1/100,1/120,1/180,1/250,1/350,1/500,1/1000,1/2000,1/3000,1/4000, 1/6000,1/10000(only available in Manual and Shutter priority mode)

IRIS Priority:OFF,F11.0,F9.6,F8.0,F6.8,F5.6,F4.8,F4.0,F3.4,F2.8,F2.4,F2.0,F1.8(only available in Manual and Iris priority mode)

Brightness: 0~23 (only available in Brightness priority mode)

2) COLOR SETTING

Move the pointer to the (COLOR) in the Main Menu, click the【HOME】and enter the (COLOR SET) as follow.

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```
┌─────────────────────────────────┐
│  COLOR                          │
│  ════════════════               │
│  WB Mode              Auto      │
│  RG Tuning            0         │
│  BG Tuning            0         │
│  Saturation           100%      │
│  Hue                  7         │
│  AWB Sensitivity      High      │
│                                 │
│  [↑↓]Select   [←→]Change Value  │
│  [Menu]Back                     │
└─────────────────────────────────┘
```

WB Mode: Auto, 3000K、3500K、4000K、4500K、5000K、5500K、6000K、6500K、7000K , Manual, One Push

Red Gain: 0~255(only available in Manual mode)   **Blue Gain:** 0~255(only available in Manual mode)

Saturation: 60%,70%,80%,90%,100%,110%,120%,130%   **Hue:** 0~14

AWB Sensitivity: high/middle/low

Color Temp: high/middle/low

Color Style: Default, style1~4.

3) IMAGE

Move the pointer to the (IMAGE) in the Menu, click the【HOME】and enter the (IMAGE) as follow.

```
┌─────────────────────────────────┐
│  IMAGE                          │
│  ════════════════               │
│  Brightness           7         │
│  Contrast             7         │
│  Sharpness            4         │
│  Flip-H               OFF       │
│  Flip-V               OFF       │
│  B&W-Mode             Color     │
│  Gamma                Default   │
│  DZoom                OFF       │
│  DCI                  Close     │
│  [↑↓]Select   [←→]Change Value  │
│  [Menu]Back                     │
└─────────────────────────────────┘
```

Brightness: 0~14   **Contrast:** 0~14   **Sharpness:** 0~15

Flip-H: On/Off   **Flip-V:** On/Off   **B&W Mode:** color, black/white

Gamma: default, 0.47, 0.50, 0.52, 0.55

DZoom: digital zoom options: On/Off

DCI: Dynamic Contrast: Off,1～8

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4) FOCUS

Move the pointer to the (FOCUS) in the Menu, click the【HOME】and enter the (FOCUS) as follow.

```
 FOCUS
 =================
 Focus Mode              Auto
 AF-Zone                 Center
 AF-Sensitivity          Low


 [↑ ↓ ]Select      [← →]Change Value
 [Menu]Back
```

Focus Mode: Auto, manual   **AF-Zone:** Up, middle, down   **AF-Sensitivity:** High, middle, low

5) NOISE REDUCTION

Move the pointer to the (NOISE REDUCTION) in the Menu, click the【 HOME 】 and enter the (NOISE REDUCTION) as follow.

```
 NOISE REDUCTION
 =================
 NR-2D                   3
 NR-3D                   5
 Dynamic Hot Pixel       OFF


 [↑ ↓ ]Select      [← →]Change Value
 [Menu]Back
```

2D Noise Reduction: Auto, close, 1~7   **3D Noise Reduction:** Close, 1~8   **Dynamic Hot Pixel:** Close, 1~5

3.5.4 P/T/Z

Move the pointer to the (P/T/Z) in the Main Menu, click the【HOME】and enter the (P/T/Z) as follow.

```
 P/T/Z
 ================
 =
 Speed by zoom           ON
 Zoom speed              8
 Image Freezing          OFF
 Acc Curve               Slow


 [↑ ↓ ]Select   [← →]Change Value
```

Depth of Field: Only effective for remote controller, On/ Off;

When zoom in, the PT control speed by remoter will become slow),

Zoom Speed: Set the zoom speed for remote controller,1~8

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Image Freezing: On/Off

Accelerating Curve: Fast/slow

3.5.5 Video Format

Move the pointer to the (Video Format) in the Menu, click the 【HOME】and enter the (Video Format) as follow.

```
VIDEO FORMAT
================
1080P60            1080P50
1080I60            1080I50
1080P30            1080P25
720P60             720P50
720P30             720P25
1080P59.94         1080I59.94
1080P29.97         720P59.94
720P29.97
[↑↓]Select
[Menu]Back         [Home]OK
```

Note: 1. 1080P60 Downward Compatibility;

　　　 2. Exit menu after modifying parameter to save it after powered off

3.5.6 Version

Move the pointer to the (VERSION) in the Main Menu, click the 【HOME】and enter the (VERSION) as follow.

```
VERSION
================
MCU Version      2.0.0.15   2015-12-18
Camera Version   2.0.0.13   2015-12-18

AF Version       2.0.0.6    2015-12-11
Lens             12X(20X)

[Menu]Back
```

MCU Version: Display MCU version information
Camera Version: Display camera version information
AF Version: Display the focus version information
Lens: Display the lens zoom

3.5.7 Restore Default

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Move the pointer to the (RESTORE DEFAULT) in the Main Menu, click the 【HOME】 and enter the (RESTORE DEFAULT) as follow.

```
┌─────────────────────────────────┐
│                                 │
│   RESTORE DEFAULT               │
│   ═══════════════════           │
│   Restore   Default?        NO  │
│                                 │
│                                 │
│   [↑↓]Select      [← →]Change Value │
│   [Menu]Back      [Home]OK      │
│                                 │
└─────────────────────────────────┘
```

Restore default: options: yes/no; after restoring default, the video format won't be restored.

Note: If the address of former remoter is not 1 but another one from 2,3,4,the corresponding camera address will restore to 1 when all parameters or system parameters are restored. User should change the remoter address to be 1 (press No.1 according to the camera so to get normal operation)

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Chapter 4 Ordering Codes

4.1 Product

981-0011-05-0	**RGB12X-SAI-WH**	**with 12X zoom and 3G SDI output**
981-0011-06-0	**RGB20X-SAI-WH**	**with 20X zoom and 3G SDI output**
981-0011-07-0	**RGB12X-HAI-WH**	**with 12X zoom and HDMI/USB3.0 output**
981-0011-08-0	**RGB20X-HAI-WH**	**with 20X zoom and HDMI/USB3.0 output**
291-0001-12-0	**Bracket Mount**	

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Chapter 5 Support

5.1 Contact us

www.rgblink.com

NETHERLANDS

CHINA

INDIA

BEIJING
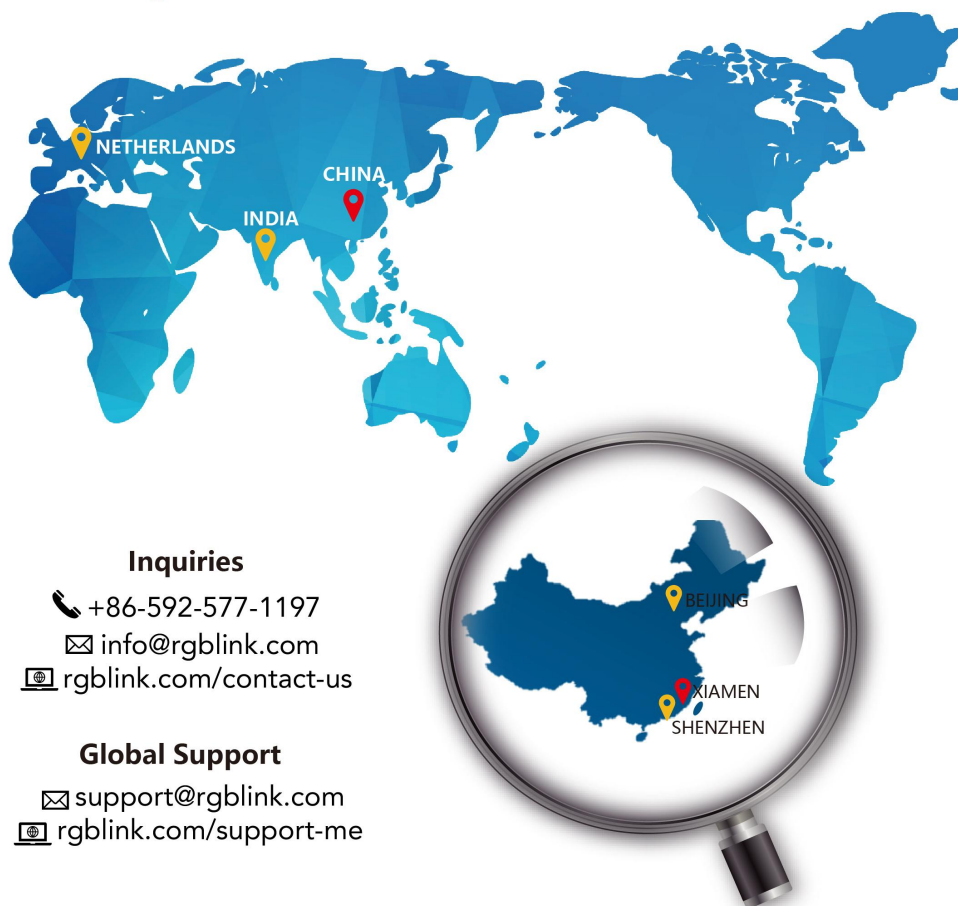
XIAMEN
SHENZHEN

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6th Floor Weiye Building Torch Park Hi Tech Zone Huli	11th Floor Baiwang Building 5318 Shahe West Road Baimang, Nanshan	Building 8, 25 Qixiao Road Shahe Town Changping	Flight Forum Eindhoven 5657 DW	78/626, Motilal Nagar, No1, Rd No1, Goregaon West, Mumbai
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5.2 Camera Maintenance and Troubleshooting

5.2.1 Camera Maintenance

1) If camera is not used for long time,please turn off power adapter switch and AC plug.

2) Use soft cloth or tissue to clean the camera cover.

3) Use soft cloth to clean the lens; Use neuter cleanser if bad smeared. No use strong or corrosive cleanser or corrosive cleanser avoiding scuffing.

5.2.2 Troubleshooting

1) No video output

——a, Check whether the camera power supply is connected,the voltage is normal,the power indicator is lit.

b, Whether the machine could do self-inspection after restarted.

c, Check whether the bottom of the DIP switch is the normal operating mode (see Table 2.2 and Table 2.3)

d, Check whether the video output cable or video display is normal

2) No image sometimes

——a, Check whether the video output cable or video display is normal

3) Image dithering when zoom-in or zoom-out

——a, Check whether the camera installation position is solid

b,Whether there is shaking machine or objects around the camera

4) Remote controller can not work
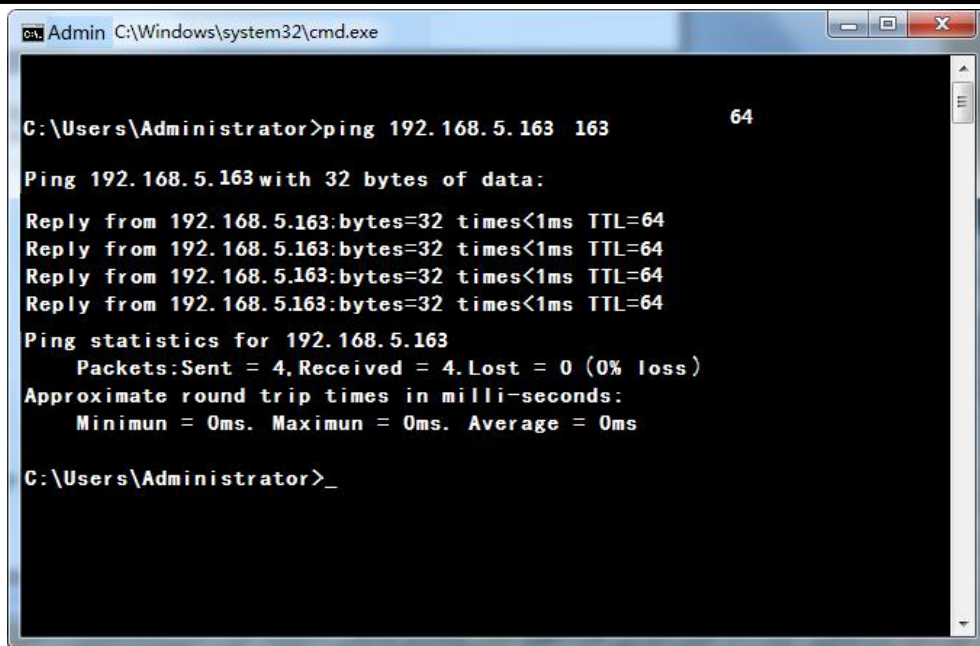
——a, Remote control address is set to 1 (if the machine is set back to the factory defaults,remote control addresses need to be back to 1 too)

b, Check whether the battery is installed on the remote controller or low .

c, Check the camera working mode is the normal operating mode

d, Check the menu whether is closed,camera control through remote controller is only available after exiting the menu.If video output from LAN,menu will not be displayed,menu will automatically exists 30s later,then it can be controlled by remote controller.

5) Serial port can not work.

——a, Check whether the camera serial device protocol,baud rate,address is consistent

b, Check whether the control cable is connected properly

c, Check whether the camera working mode is the normal operating mode

6) Web pages can not log in

——a, Check whether the camera is showing normally.

b, Check whether the network cable is connected properly(Ethernet port yellow light flashes to indicate normal network cable connection)

c, Check whether your computer is added the segment and the segment is consistent with the IP address of the camera

d, Click "Start" and select "Run" and then type "cmd" in the computer;Click "OK" then turn on a DOS command window to enter ping 192.168.5.163. Press the Enter key to appear message as follows: Description network connection is normal

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Chapter 6 Appendix

6.1 Specification

Parameter/model	12X zoom	20X zoom
Tracking camera, lens parameters		
Image sensor	1/2.8inch high quality CMOS sensor	
Effective pixels	2.07MP, 16: 9	
Video signal	1080P60/50/30/25/59.94/29.97, 1080I60/50/59.94, 720P60/50/30/25 /59.94/29.97	
Lens optics zoom	12X optical zoom f＝3.9~46.1mm	20X optical zoom f＝4.7~94mm
Visual angle	6.3° (narrow angle) ~72.5° (wide angle)	2.9° (narrow angle) ~55.4° (wide angle)
Aperture coefficient	F1.8~F2.4	F1.6 ~ F3.5
Digit zoom	X10	
Minimum illumination	0.5Lux(F1.8, AGC ON)	
Digit noise reduction	2D & 3D digit noise reduction	
White balance	Manual/auto/one-key white balance /3000K/ 4000K/5000K/6500K	
Focus	Auto/manual	
Aperture	Auto/manual	
Electronic shutter	Auto/manual	
Backlight compensation	On/off	
Wide dynamic	Off/dynamic grade adjustment	
Video regulation	Brightness, hue, saturation, contrast ratio, sharpness, Gamma	
Signal to noise ratio	>55dB	
Panoramic lens		
Image sensor	1/2.8inch high quality CMOS sensor	
Effective pixels	2,100,000	
Lens	Manual focus	
Output port	SDI Model: SDI, LAN, HDMI/USB3.0 Model: HDMI, USB3.0, LAN	
Field angle (D/H/V)	112°/82°/57.6°	
Input/output port and support protocol		
Ports	SDI Model: SDI, LAN, 2-channel 3.5mm linear audio input, RS232 (input) HDMI/USB 3.0 Model: HDMI (support video and audio output), USB3.0, LAN, 2-channel 3.5mm linear audio input, RS232 (input)	
Network port	100M internet access (10/100BASE-TX) 5GWiFi(optional), support network VISCA control protocol	
Network protocol	RTSP, RTMP, ONVIF, GB/T28181	

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Compression image code stream	Dual stream output
Video compression format	H.265, H.264
Control signal port	RS-232/485
Control protocol	VISCA/Pelco-D/Pelco-P; Baud rate: 115,200/9,600/4,800/2,400bps
Audio input port	Dual track 3.5mm linear input
Audio compression format	AAC, MP3, PCM
Power port	HEC3800 power socket (DC12V)
Pan/tilt parameters	
Horizontal rotation	-170°~+170°
Vertical rotation	-30°~+90°
Horizontal control speed	0.1 ~100°/s
Vertical control speed	0.1~45°/s
Preset speed	Horizontal: 100°/s, vertical:45°/s
Preset quantity	User can set 255 presets at most (10 pcs of mobile control)
Other parameters	
Power adapter	Input AC110V-AC220V output DC12V/2.5A
Input voltage	DC12V±10%
Input current	1.5A (maximum)
Power consumption	18W (maximum)
Storage temperature	-10℃~+60℃
Storage humidity	20%~95%
Operating temperature	-10℃~+50℃
Operating humidity	20%~80%
Dimension (WxHxD)	254mm X 144mm X 174mm
Weight (approx.)	1.50kg
Operating environment	Indoor
Remote maintenance (network port)	Remote upgrade, restart and reset
Standard accessories	12V/2.5A power, RS232 control line, remote control, operation manual, warranty card
Optional accessories	Installation support

6.2 VISCA Protocol List

6.2.1 Camera Return Command

Ack/Completion Message		
	Command packet	**Note**
ACK	z0 41 FF	Returned when the command is accepted.
Completion	z0 51 FF	Returned when the command has been executed.

z = camera address + 8

Error Messages		
	Command packet	**Note**

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Syntax Error		z0 60 02 FF	Returned when the command format is different or when a command with illegal command parameters is accepted
Command Not Executable		z0 61 41 FF	Returned when a command cannot be executed due to current conditions. For example, when commands controlling the focus manually are received during auto focus.

6.2.2 Camera Control Command

Command	Function	Command packet	Note
AddressSet	Broadcast	88 30 0p FF	p：Address setting
IF_Clear	Broadcast	88 01 00 01 FF	I/F Clear
CommandCancel		8x 21 FF	
CAM_Power	On	8x 01 04 00 02 FF	Power ON/OFF
	Off	8x 01 04 00 03 FF	
CAM_Zoom	Stop	8x 01 04 07 00 FF	
	Tele(Standard)	8x 01 04 07 02 FF	
	Wide(Standard)	8x 01 04 07 03 FF	
	Tele(Variable)	8x 01 04 07 2p FF	p = 0(low) - F(high)
	Wide(Variable)	8x 01 04 07 3p FF	
	Direct	8x 01 04 47 0p 0q 0r 0s FF	pqrs: Zoom Position
CAM _Focus	Stop	8x 01 04 08 00 FF	
	Far(Standard)	8x 01 04 08 02 FF	
	Near(Standard)	8x 01 04 08 03 FF	
	Far(Variable)	8x 01 04 08 2p FF	p = 0(low) - F(high)
	Near (Variable)	8x 01 04 08 3p FF	
	Direct	8x 01 04 48 0p 0q 0r 0s FF	pqrs: Focus Position
	Auto Focus	8x 01 04 38 02 FF	
	Manual Focus	8x 01 04 38 03 FF	
CAM _Zoom Focus	Direct	8x 01 04 47 0p 0q 0r 0s 0t 0u 0v 0w FF	pqrs: Zoom Position tuvw: Focus Position
CAM_WB	Auto	8x 01 04 35 00 FF	
	3000K	8x 01 04 35 01 FF	
	4000k	8x 01 04 35 02 FF	
	One Push mode	8x 01 04 35 03 FF	
	5000k	8x 01 04 35 04 FF	
	Manual	8x 01 04 35 05 FF	
	6500k	8x 01 04 35 06 FF	
CAM _RGain	Reset	8x 01 04 03 00 FF	Manual Control of R Gain
	Up	8x 01 04 03 02 FF	
	Down	8x 01 04 03 03 FF	
	Direct	8x 01 04 43 00 00 0p 0q FF	pq: R Gain
CAM_ Bgain	Reset	8x 01 04 04 00 FF	Manual Control of B Gain
	Up	8x 01 04 04 02 FF	
	Down	8x 01 04 04 03 FF	
	Direct	8x 01 04 44 00 00 0p 0q FF	pq: B Gain
CAM_AE	Full Auto	8x 01 04 39 00 FF	Automatic Exposure mode

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Command	Function	Command packet	Note
	Manual	8x 01 04 39 03 FF	Manual Control mode
	Shutter priority	8x 01 04 39 0A FF	Shutter Priority Automatic Exposure mode
	Iris priority	8x 01 04 39 0B FF	Iris Priority Automatic Exposure mode
	Bright	8x 01 04 39 0D FF	Bright mode
CAM_Shutter	Reset	8x 01 04 0A 00 FF	Shutter Setting
	Up	8x 01 04 0A 02 FF	
	Down	8x 01 04 0A 03 FF	
	Direct	8x 01 04 4A 00 00 0p 0q FF	pq: Shutter Position
CAM_Iris	Reset	8x 01 04 0B 00 FF	Iris Setting
	Up	8x 01 04 0B 02 FF	
	Down	8x 01 04 0B 03 FF	
	Direct	8x 01 04 4B 00 00 0p 0q FF	pq: Iris Position
CAM_Gain Limit	Gain Limit	8x 01 04 2C 0p FF	p: Gain Positon
CAM_Bright	Reset	8x 01 04 0D 00 FF	Bright Setting
	Up	8x 01 04 0D 02 FF	
	Down	8x 01 04 0D 03 FF	
	Direct	8x 01 04 4D 00 00 0p 0q FF	pq: Bright Positon
CAM_ExpComp	On	8x 01 04 3E 02 FF	Exposure Compensation ON/OFF
	Off	8x 01 04 3E 03 FF	
	Reset	8x 01 04 0E 00 FF	Exposure Compensation Amount Setting
	Up	8x 01 04 0E 02 FF	
	Down	8x 01 04 0E 03 FF	
	Direct	8x 01 04 4E 00 00 0p 0q FF	pq: ExpComp Position
CAM_Back Light	On	8x 01 04 33 02 FF	Back Light Compensation
	Off	8x 01 04 33 03 FF	
CAM_WDRStrength	Reset	8x 01 04 21 00 FF	WDR Level Setting
	Up	8x 01 04 21 02 FF	
	Down	8x 01 04 21 03 FF	
	Direct	8x 01 04 51 00 00 00 0p FF	p: WDR Level Positon
CAM_NR（2D）		8x 01 04 53 0p FF	P=0-7 0:OFF
CAM_NR（3D）		8x 01 04 54 0p FF	P=0-8 0:OFF
CAM_Gamma		8x 01 04 5B 0p FF	p = 0 – 4 0：Default 1：0.45 2：0.50 3：0.55 4：0.63
CAM_Flicker	OFF	8x 01 04 23 00 FF	OFF
	50HZ	8x 01 04 23 01 FF	50HZ
	60HZ	8x 01 04 23 02 FF	60HZ
CAM_Aperture	Reset	8x 01 04 02 00 FF	Aperture Control
	Up	8x 01 04 02 02 FF	
	Down	8x 01 04 02 03 FF	
	Direct	8x 01 04 42 00 00 0p 0q FF	pq: Aperture Gain
CAM_Memory	Reset	8x 01 04 3F 00 pq FF	pq: Memory Number(=0 to 254) Corresponds to 0 to 9 on the Remote Commander
	Set	8x 01 04 3F 01 pq FF	
	Recall	8x 01 04 3F 02 pq FF	

Command	Function	Command packet	Note
CAM_LR_Reverse	On	8x 01 04 61 02 FF	Image Flip Horizontal ON/OFF
	Off	8x 01 04 61 03 FF	
CAM_PictureFlip	On	8x 01 04 66 02 FF	Image Flip Vertical ON/OFF
	Off	8x 01 04 66 03 FF	
CAM_ColorSaturation	Direct	8x 01 04 49 00 00 00 0p FF	P=0-E 0:60% 1:70% 2:80% 3:90% 4:100% 5:110% 6:120% 7:130% 8:140% 9:150% 10:160% 11:160% 12:180% 13:190% 14:200%
CAM_IDWrite		8x 01 04 22 0p 0q 0r 0s FF	pqrs: Camera ID (=0000 to FFFF)
SYS_Menu	ON	8x 01 04 06 06 02 FF	Turn on the menu screen
	OFF	8x 01 04 06 06 03 FF	Turn off the menu screen
IR_Receive	ON	8x 01 06 08 02 FF	IR(remote commander)receive On/Off
	OFF	8x 01 06 08 03 FF	
IR_ReceiveReturn	On	8x 01 7D 01 03 00 00 FF	IR(remote commander)receive message via the VISCA communication ON/OFF
	Off	8x 01 7D 01 13 00 00 FF	
CAM_SettingReset	Reset	8x 01 04 A0 10 FF	Reset Factory Setting
CAM_Brightness	Direct	8x 01 04 A1 00 00 0p 0q FF	pq: Brightness Position
CAM_Contrast	Direct	8x 01 04 A2 00 00 0p 0q FF	pq: Contrast Position
CAM_Flip	OFF	8x 01 04 A4 00 FF	Single Command For Video Flip
	Flip-H	8x 01 04 A4 01 FF	
	Flip-V	8x 01 04 A4 02 FF	
	Flip-HV	8x 01 04 A4 03 FF	
CAM_VideoSystem	Set camera video system	8x 01 06 35 00 0p FF	P: 0~E Video format 0:1080P60 8:720P30 1:1080P50 9:720P25 2:1080i60 A：1080P59.94 3:1080i50 B：1080i59.94 4:720P60 C：720P59.94 5:720P50 D：1080P29.97 6:1080P30 E：720P29.97 7:1080P25
Pan_tiltDrive	Up	8x 01 06 01 VV WW 03 01 FF	VV: Pan speed 0x01 (low speed) to 0x18 (high speed) WW: Tilt speed 0x01 (low speed) to 0x14 (high speed) YYYY: Pan Position ZZZZ: Tilt Position
	Down	8x 01 06 01 VV WW 03 02 FF	
	Left	8x 01 06 01 VV WW 01 03 FF	
	Right	8x 01 06 01 VV WW 02 03 FF	
	Upleft	8x 01 06 01 VV WW 01 01 FF	
	Upright	8x 01 06 01 VV WW 02 01 FF	

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Command	Function	Command packet	Note
	DownLeft	8x 01 06 01 VV WW 01 02 FF	
	DownRight	8x 01 06 01 VV WW 02 02 FF	
	Stop	8x 01 06 01 VV WW 03 03 FF	
	AbsolutePosition	8x 01 06 02 VV WW 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	
	RelativePosition	8x 01 06 03 VV WW 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	
	Home	8x 01 06 04 FF	
	Reset	8x 01 06 05 FF	
Pan-tiltLimitSet	Set	8x 01 06 07 00 0W 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	W:1 UpRight 0:DownLeft YYYY: Pan Limit Position(TBD)
	Clear	8x 01 06 07 01 0W 07 0F 0F 0F 07 0F 0F 0F FF	ZZZZ: Tilt Limit Position(TBD)

6.2.3 Inquiry Command

Command	Function	Command packet	Note
CAM_PowerInq	8x 09 04 00 FF	y0 50 02 FF	On
		y0 50 03 FF	Off(Standby)
CAM_ZoomPosInq	8x 09 04 47 FF	y0 50 0p 0q 0r 0s FF	pqrs: Zoom Position
CAM_FocusAFModeInq	8x 09 04 38 FF	y0 50 02 FF	Auto Focus
		y0 50 03 FF	Manual Focus
CAM_FocusPosInq	8x 09 04 48 FF	y0 50 0p 0q 0r 0s FF	pqrs: Focus Position
CAM_WBModeInq	8x 09 04 35 FF	y0 50 00 FF	Auto
		y0 50 01 FF	3000K
		y0 50 02 FF	4000K
		y0 50 03 FF	One Push Mode
		y0 50 04 FF	5000K
		y0 50 05 FF	Manual
		y0 50 00 FF	6500K
CAM_RGainInq	8x 09 04 43 FF	y0 50 00 00 0p 0q FF	pq: R Gain
CAM_BGainInq	8x 09 04 44 FF	y0 50 00 00 0p 0q FF	pq: B Gain
CAM_AEModeInq	8x 09 04 39 FF	y0 50 00 FF	Full Auto
		y0 50 03 FF	Manual
		y0 50 0A FF	Shutter priority
		y0 50 0B FF	Iris priority
		y0 50 0D FF	Bright
CAM_ShutterPosInq	8x 09 04 4A FF	y0 50 00 00 0p 0q FF	pq: Shutter Position
CAM_IrisPosInq	8x 09 04 4B FF	y0 50 00 00 0p 0q FF	pq: Iris Position
CAM_Gain LimitInq	8x 09 04 2C FF	y0 50 0p FF	p: Gain Positon
CAM_ BrightPosiInq	8x 09 04 4D FF	y0 50 00 00 0p 0q FF	pq: Bright Position
CAM_ExpCompModeInq	8x 09 04 3E FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ExpCompPosInq	8x 09 04 4E FF	y0 50 00 00 0p 0q FF	pq: ExpComp Position
CAM_BacklightModeInq	8x 09 04 33 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_WDRStrengthInq	8x 09 04 51 FF	y0 50 00 00 00 0p FF	p: WDR Strength
CAM_NRLevel(2D) Inq	8x 09 04 53 FF	y0 50 0p FF	P: 2DNRLevel
CAM_NRLevel(3D) Inq	8x 09 04 54 FF	y0 50 0p FF	P:3D NRLevel

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CAM_FlickerModeInq	8x 09 04 55 FF	y0 50 0p FF	p: Flicker Settings(0: OFF, 1: 50Hz, 2:60Hz)
CAM_ApertureInq	8x 09 04 42 FF	y0 50 00 00 0p 0q FF	pq: Aperture Gain
CAM_PictureEffectModeInq	8x 09 04 63 FF	y0 50 00 FF	Off
		y0 50 04 FF	B&W
CAM_MemoryInq	8x 09 04 3F FF	y0 50 0p FF	p: Memory number last operated.
SYS_MenuModeInq	8x 09 06 06 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_LR_ReverseInq	8x 09 04 61 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_PictureFlipInq	8x 09 04 66 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ColorSaturationInq	8x 09 04 49 FF	y0 50 00 00 00 0p FF	p: Color Gain setting 0h (60%) to Eh (130%)
CAM_IDInq	8x 09 04 22 FF	y0 50 0p FF	p: Gamma ID
IR_ReceiveInq	8x 09 06 08 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
IR_ReceiveReturn		y0 07 7D 01 04 00 FF	Power ON/OFF
		y0 07 7D 01 04 07 FF	Zoom tele/wide
		y0 07 7D 01 04 38 FF	AF ON/OFF
		y0 07 7D 01 04 33 FF	Camera _Backlight
		y0 07 7D 01 04 3F FF	Camera _Memery
		y0 07 7D 01 06 01 FF	Pan_titleDriver
CAM_BrightnessInq	8x 09 04 A1 FF	y0 50 00 00 0p 0q FF	pq: Brightness Position
CAM_ContrastInq	8x 09 04 A2 FF	y0 50 00 00 0p 0q FF	pq: Contrast Position
CAM_FlipInq	8x 09 04 A4 FF	y0 50 00 FF	Off
		y0 50 01 FF	Flip-H
		y0 50 02 FF	Flip-V
		y0 50 03 FF	Flip-HV
CAM_GammaInq	8x 09 04 5B FF	y0 50 0p FF	p: Gamma setting
CAM_VersionInq	8x 09 00 02 FF	y0 50 ab cd mn pq rs tu vw FF	ab cd : vender ID (0220) mn pq : model ID ST (0510)、U2(0512)、U3 (0513)、HD（？？） rs tu : ARM Version vw : reserve
VideoSystemInq	8x 09 06 23 FF	y0 50 0p FF	P: 0~E Video format 0:1080P60 8:720P30 1:1080P50 9:720P25 2:1080i60 A：1080P59.94 3:1080i50 B：1080i59.94 4:720P60 C：720P59.94 5:720P50 D：

			1080P29.97	
			6:1080P30 E: 720P29.97	
			7:1080P25	
Pan-tiltMaxSpeedInq	8x 09 06 11 FF	y0 50 ww zz FF	ww: Pan Max Speed zz: Tilt Max Speed
Pan-tiltPosInq	8x 09 06 12 FF	y0 50 0w 0w 0w 0w 0z 0z 0z 0z FF	wwww: Pan Position zzzz: Tilt Position

Note:[X] in the above table indicates the camera address to be operated,【y】=【x + 8】.

6.3 Pelco-D Protocol Command List

Function	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Up	0xFF	Address	0x00	0x08	Pan Speed	Tilt Speed	SUM
Down	0xFF	Address	0x00	0x10	Pan Speed	Tilt Speed	SUM
Left	0xFF	Address	0x00	0x04	Pan Speed	Tilt Speed	SUM
Right	0xFF	Address	0x00	0x02	Pan Speed	Tilt Speed	SUM
Upleft	0xFF	Address	0x00	0x0C	Pan Speed	Tilt Speed	SUM
Upright	0xFF	Address	0x00	0x0A	Pan Speed	Tilt Speed	SUM
DownLeft	0xFF	Address	0x00	0x14	Pan Speed	Tilt Speed	SUM
DownRight	0xFF	Address	0x00	0x12	Pan Speed	Tilt Speed	SUM
Zoom In	0xFF	Address	0x00	0x20	0x00	0x00	SUM
Zoom Out	0xFF	Address	0x00	0x40	0x00	0x00	SUM
Focus Far	0xFF	Address	0x00	0x80	0x00	0x00	SUM
Focus Near	0xFF	Address	0x01	0x00	0x00	0x00	SUM
Stop	0xFF	Address	0x00	0x00	0x00	0x00	SUM
Set Preset	0xFF	Address	0x00	0x03	0x00	Preset ID	SUM
Clear Preset	0xFF	Address	0x00	0x05	0x00	Preset ID	SUM
Call Preset	0xFF	Address	0x00	0x07	0x00	Preset ID	SUM
Query Pan Position	0xFF	Address	0x00	0x51	0x00	0x00	SUM
Query Pan Position Response	0xFF	Address	0x00	0x59	Value High Byte	Value Low Byte	SUM
Query Tilt Position	0xFF	Address	0x00	0x53	0x00	0x00	SUM
Query Tilt Position Response	0xFF	Address	0x00	0x5B	Value High Byte	Value Low Byte	SUM
Query Zoom Position	0xFF	Address	0x00	0x55	0x00	0x00	SUM
Query Zoom Position Response	0xFF	Address	0x00	0x5D	Value High Byte	Value Low Byte	SUM

6.4 Pelco-P Protocol Command List

Function	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Up	0xA0	Address	0x00	0x08	Pan Speed	Tilt Speed	0xAF	XOR
Down	0xA0	Address	0x00	0x10	Pan Speed	Tilt Speed	0xAF	XOR
Left	0xA0	Address	0x00	0x04	Pan Speed	Tilt Speed	0xAF	XOR

Right	0xA0	Address	0x00	0x02	Pan Speed	Tilt Speed	0xAF	XOR
Upleft	0xA0	Address	0x00	0x0C	Pan Speed	Tilt Speed	0xAF	XOR
Upright	0xA0	Address	0x00	0x0A	Pan Speed	Tilt Speed	0xAF	XOR
DownLeft	0xA0	Address	0x00	0x14	Pan Speed	Tilt Speed	0xAF	XOR
DownRight	0xA0	Address	0x00	0x12	Pan Speed	Tilt Speed	0xAF	XOR
Zoom In	0xA0	Address	0x00	0x20	0x00	0x00	0xAF	XOR
Zoom Out	0xA0	Address	0x00	0x40	0x00	0x00	0xAF	XOR
Stop	0xA0	Address	0x00	0x00	0x00	0x00	0xAF	XOR
Focus Far	0xA0	Address	0x01	0x00	0x00	0x00	0xAF	XOR
Focus Near	0xA0	Address	0x02	0x00	0x00	0x00	0xAF	XOR
Set Preset	0xA0	Address	0x00	0x03	0x00	Preset ID	0xAF	XOR
Clear Preset	0xA0	Address	0x00	0x05	0x00	Preset ID	0xAF	XOR
Call Preset	0xA0	Address	0x00	0x07	0x00	Preset ID	0xAF	XOR
Query Pan Position	0xA0	Address	0x00	0x51	0x00	0x00	0xAF	XOR
Query Pan Position Response	0xA0	Address	0x00	0x59	Value High Byte	Value Low Byte	0xAF	XOR
Query Tilt Position	0xA0	Address	0x00	0x53	0x00	0x00	0xAF	XOR
Query Tilt Position Response	0xA0	Address	0x00	0x5B	Value High Byte	Value Low Byte	0xAF	XOR
Query Zoom Position	0xA0	Address	0x00	0x55	0x00	0x00	0xAF	XOR
Query Zoom Position Response	0xA0	Address	0x00	0x5D	Value High Byte	Value Low Byte	0xAF	XOR

6.5 Terms & Definitions

●**RCA** ： Connector used primarily in consumer AV equipment for both audio and video. The RCA connector was developed by the Radio Corporation of America.

●**BNC:** Stands for Bayonet Neill-Concelman. A cable connector used extensively in television (named for its inventors). A cylindrical bayonet connector that operates with a twist-locking motion .

●**CVBS**：CVBS or Composite video, is an analog video signal without audio. Most commonly CVBS is used for transmission of standard definition signals. In consumer applications the connector is typically RCA type, while in professional applications the connector is BNC type.

●**YPbPr:** Used to describe the colour space for progressive-scan. Otherwise known as component video.

●**VGA** ： Video Graphics Array. VGA is an analog signal typically used on earlier computers. The signal is non-interlaced in modes 1, 2, and 3 and interlaced when using in mode

●**DVI**：Digital Visual Interface. The digital video connectivity standard that was developed by DDWG (Digital Display Work Group). This connection standard offers two different connectors: one with 24 pins that handles digital video signals only, and one with 29 pins that handles both digital and analog video.

●**SDI**：Serial Digital Interface. Standard definition video is carried on this 270 Mbps data transfer rate. Video pixels are characterized with a 10-bit depth and 4:2:2 color quantization. Ancillary data is included on this interface and typically includes audio or other metadata. Up to sixteen audio channels can be transmitted. Audio is organised into

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blocks of 4 stereo pairs. Connector is BNC.

●**HD-SDI:** high-definition serial digital interface (HD-SDI), is standardized in SMPTE 292M this provides a nominal data rate of 1.485 Gbit/s.

● **3G-SDI**: standardized in SMPTE 424M, consists of a single 2.970 Gbit/s serial link that allows replacing dual link HD-SDI.

●**6G-SDI:** standardized in SMPTE ST-2081 released in 2015, 6Gbit/s bitrate and able to support 2160p@30.

●**12G-SDI:**standardized in SMPTE ST-2082 released in 2015, 12Gbit/s bitrate and able to support 2160p@60.

●**U-SDI:**Technology for transmitting large-volume 8K signals over a single cable. a signal interface called the ultra high definition signal/data interface (U-SDI) for transmitting 4K and 8K signals using a single optical cable. The interface was standardized as the SMPTE ST 2036-4.

●**HDMI**：High Definition Multimedia Interface: An interface used for the transmission of uncompressed high definition video, up to 8 channels of audio, and control signals, over a single cable.

●**HDMI 1.3:** released on June 22 2006, and increased the maximum TMDS clock to 340 MHz (10.2 Gbit/s). Support resolution 1920 × 1080 at 120 Hz or 2560 × 1440 at 60 Hz). It added support for 10 bpc, 12 bpc, and 16 bpc color depth (30, 36, and 48 bit/px), called deep color.

● **HDMI 1.4 :** released on June 5, 2009, added support for 4096 × 2160 at 24 Hz, 3840 × 2160 at 24, 25, and 30 Hz, and 1920 × 1080 at 120 Hz. Compared to HDMI 1.3, 3 more features added which are HDMI Ethernet Channel (HEC) , audio return channel (ARC),3D Over HDMI, a new Micro HDMI Connector, an expanded set of color spaces.

● **HDMI 2.0**, released on September 4, 2013 increases the maximum bandwidth to 18.0 Gbit/s. Other features of HDMI 2.0 include up to 32 audio channels, up to 1536 kHz audio sample frequency, the HE-AAC and DRA audio standards, improved 3D capability, and additional CEC functions.

● **HDMI 2.0a:** was released on April 8, 2015, and added support for High Dynamic Range (HDR) video with static metadata.

● **HDMI 2.0b:** was released March, 2016, support for HDR Video transport and extends the static metadata signaling to include Hybrid Log-Gamma (HLG).

● **HDMI 2.1** : released on November 28, 2017. It adds support for higher resolutions and higher refresh rates, Dynamic HDR including 4K 120 Hz and 8K 120 Hz.

● **DisplayPort:** A VESA standard interface primarily for video, but also for audio, USB and other data. DisplayPort (orDP) is backwards compatible with HDMI, DVI and VGA.

● **DP 1.1:** was ratified on 2 April 2007, and version 1.1a was ratified on 11 January 2008. DisplayPort 1.1 allow a maximum bandwidth of 10.8 Gbit/s (8.64 Gbit/s data rate) over a standard 4-lane main link, enough to support 1920x1080@60Hz

● **DP 1.2:** introduced on 7 January 2010, effective bandwidth to 17.28 Gbit/s support increased resolutions, higher refresh rates, and greater color depth, maximum resolution 3840 × 2160@60Hz

● **DP 1.4:** publish on 1 Mar, 2016.overall transmission bandwidth 32.4 Gbit/s ,DisplayPort 1.4 adds support for Display Stream Compression 1.2 (DSC), DSC is a "visually lossless" encoding technique with up to a 3:1 compression ratio. Using DSC with HBR3 transmission rates, DisplayPort 1.4 can support 8K UHD (7680 × 4320) at 60 Hz or 4K UHD (3840 × 2160) at 120 Hz with 30 bit/px RGB color and HDR. 4K at 60 Hz 30 bit/pix RGB/HDR can be achieved without the need for DSC.

●**Multi-mode Fiber:** Fibers that support many propagation paths or transverse modes are called multi-mode fibers, generally have a wider core diameter and are used for short-distance communication links and for applications where

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high power must be transmitted.

●**Single-mode Fiber:** Fiber that support a single mode are called single-mode fibers. Single-mode fibers are used for most communication links longer than 1,000 meters (3,300 ft).

●**SFP** ： small form-factor pluggable , is a compact, hot-pluggable network interface module used for both telecommunication and data communications applications.

●**optical fiber connector:** terminates the end of an optical fiber, and enables quicker connection and disconnection than splicing. The connectors mechanically couple and align the cores of fibers so light can pass. 4 most common types of optical fiber connectors are SC, FC, LC,ST.

●**SC:**(Subscriber Connector), also known as the square connector was also created by the Japanese company – Nippon Telegraph and Telephone. SC is a push-pull coupling type of connector and has a 2.5mm diameter. Nowadays, it is used mostly in single mode fiber optic patch cords, analog, GBIC, and CATV. SC is one of the most popular options, as its simplicity in design comes along with great durability and affordable prices.

● **LC:**(Lucent Connector) is a small factor connector (uses only a 1.25mm ferrule diameter) that has a snap coupling mechanism. Because of its small dimensions, it is the perfect fit for high-density connections, XFP, SFP, and SFP+ transceivers.

● **FC** :(Ferrule Connector) is a screw type connector with a 2.5mm ferrule. FC is a round shaped threaded fiber optic connector,mostly used on Datacom, telecom, measurement equipment, single-mode laser.

● **ST:** (Straight Tip) was invented by AT&T and uses a bayonet mount along with a long spring-loaded ferrule to support the fiber.

● **USB:** Universal Serial Bus is a standard that was developed in the mid-1990s that defines cables, connectors and communication protocols. This technology is designed to allow a connection, communication and power supply for peripheral devices and computers.

● **USB 1.1**: Full–Bandwidth USB, specification was the first release to be widely adopted by the consumer market. This specification allowed for a maximum bandwidth of 12Mbps.

●**USB 2.0**:or Hi–Speed USB, specification made many improvements over USB 1.1. The main improvement was an increase in bandwidth to a maximum of 480Mbps.

● **USB 3.2:** Super Speed USB with 3 varieties of 3.2 Gen 1(original name USB 3.0), 3.2Gen 2(original name USB 3.1), 3.2 Gen 2x2 (original name USB 3.2) with speed up to 5Gbps,10Gbps,20Gbps respectively.

USB version and connectors figure：

●**NTSC** : The colour video standard used in North America and some other parts of the world created by the National Standards the 1950s. NTSC interlaced video Committee in Television utilizes an signals.

	Type A	Type B	Mini A	Mini B	Micro-A	Micro-B	Type C
USB 2.0							
USB 3.0							
USB 3.1& 3.2							

●**PAL:** Phase television standard in colour carrier is line. It takes four full Alternate Line. A which the phase of the alternated from line to images (8 fields) for the

colour-to-horizontalimages (8 fields) for the colour-to-horizontal phase relationship to return to the reference point. This alternation helps cancel out phase errors. For this reason, the hue control   is not needed on a PAL TV set. PAL, is widely

used in needed on a PAL TV set. PAL, is widely used in Western Europe, Australia, Africa,　the　Middle East, and Micronesia. PAL uses 625-line, 50-field (25 fps) composite colour transmission system.

● **SMPTE**：Society of Motion image and Television Engineers. A global organization, based in the United States, that sets standards for baseband visual communications. This includes film as well as video and television standards.

●**VESA**: Video Electronics Standards Association. An organization facilitating computer graphics through standards.

●**HDCP**: High-bandwidth Digital Content Protection (HDCP) was developed by Intel Corporation an is in wide use for protection of video during transmission between devices.

●**HDBaseT:** A video standard for the transmission of uncompressed video (HDMI signals) and related features using Cat 5e/Cat6 cabling infrastructure.

●**ST2110:** A SMPTE developed standard, ST2110 describes how to send digital video over and IP networks. Video is transmitted uncompressed with audio and other data in a separate streams.

SMPTE2110 is intended principally for broadcast production and distribution facilities where quality and flexibility are more important.

●SDVoE: Software Defined Video over Ethernet (SDVoE) is a method for transmission, distribution and management AV signals using a TCP/IP Ethernet infrastructure for transport with low latency. SDVoE is commonly used in integration applications.

●**Dante AV:** The Dante protocol was developed for and widely adopted in audio systems for the transmission of uncompressed digital audio on IP based networks. The more recent Dante AV specification includes support for digital video.

●**NDI:** Network Device interface (NDI) is a software standard developed by NewTek to enable video-compatible products to communicate, deliver, and receive broadcast quality video in a high quality, low latency manner that is frame-accurate and suitable for switching in a live production environment over TCP (UDP) Ethernet based networks. NDI is commonly found in broadcast applications.

●**RTMP:** Real-Time Messaging Protocol (RTMP) was initially a proprietary protocol developed by Macromedia (now Adobe) for streaming audio, video and data over the Internet, between a Flash player and a server.

●**RTSP :** The Real Time Streaming Protocol (RTSP) is a network control protocol designed for use in entertainment and communications systems to control streaming media servers. The protocol is used for establishing and controlling media sessions between end points.

●**MPEG:** Moving Picture Experts Group is a working group formed from ISO and IEC developing standards that allow audio/video digital compression and Transmission.

●**H.264:** Also known as AVC (Advanced Video Coding) or MPEG-4i is a common video compression standard. H.264 was standardized by the ITU-T Video Coding Experts Group (VCEG) together with the ISO/IEC JTC1 Moving Picture Experts Group (MPEG).

●**H.265:** Also known as **HEVC** (High Efficiency Video Coding) H.265 is　the　successor　to　the　widely used H.264/AVC digital video coding standard. Developed under the auspices of ITU, resolutions up to 8192x4320 may be compressed.

●**API:** An Application Programming Interface (API) provides a predefined function which allows access capabilities and features or routines via a software or hardware, without accessing source code or understanding the details of inner working mechanism. An API call may execute a function and/or provide data feedback/report.

●**DMX512:** The communication　standard developed by USITT for entertainment and digital lighting systems.The

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wide adoption of the Digital Multiplex (DMX) protocol has seen the protocol used for a wide range of other devices including video controllers. DMX512 is delivered over cable of 2 twisted pairs with 5pin XLR cables for connection.

●**ArtNet:** An ethernet protocol based on TCP/IP protocol stack, mainly used in entertainment/events applications. Built on the DMX512 data format, ArtNet enables multiple "universes" of DMX512 to be transmitted using ethernet networks for transport.

●**MIDI:** MIDI is the abbreviation of Musical Instrument Digital Interface. As the name indicates the protocol was developed for communication between electronical musical instruments and latterly computers. MIDI instructions are triggers or commands sent over twisted pair cables, typically using 5pin DIN connectors.

●**OSC:** The principle of Open Sound Control (OSC) protocol is for networking sound synthesizers, computers, and multimedia devices for musical performance or show control. As with XML and JSON, the OSC protocol allows sharing data. OSC is transported via UDP packets between devices connected on an Ethernet.

●**Brightness：** Usually refers to the amount or intensity of video light produced on a screen without regard to colour. Sometimes called black level.

●**Contrast Ratio：** The ratio of the high light output level divided by the low light output level. In theory, the contrast ratio of the television system should be at least 100:1, if not 300:1. In reality, there are several limitations. Well-controlled viewing conditions should yield a practical contrast ratio of 30:1 to 50:1.

●**Colour Temperature:** The colour quality, expressed in degrees Kelvin (K), of a light source. The higher the colour temperature, the bluer the light. The lower the temperature, the redder the light. Benchmark colour temperature for the A/V industry include 5000°K, 6500°K, and 9000°K.

●**Saturation:** Chroma, Chroma gain. The intensity of the colour, or the extent to which a given colour in any image is free from white. The less white in a colour, the truer the colour or the greater its saturation. Saturation is the amount of pigment in a colour, and not the intensity.

●**Gamma:** The light output of a CRT is not linear with respect to the voltage input. The difference between what you should have and what is actually output is known as gamma.

●**Frame:** In interlaced video, a frame is one complete image.A video frame is made up of two   fields, or two sets of interlaced lines. In a   film, a frame is one still image of a series that makes up a motion image.

●**Genlock:** Allows synchronisation of otherwise video devices. A signal generator provides a signal pulses which connected devices can reference. Also see Black Burst and Color Burst.

●**Blackburst:** The video waveform without the video elements.It includes the vertical sync, horizontal sync, and the Chroma burst information. Blackburst is used to synchronize video equipment to align the video output.

●**Colour Burst:** In colour TV systems, a burst of subcarrier frequency located on the back part of the composite video signal. This serves as a colour synchronizing signal to establish a frequency and phase reference for the Chroma signal. Colour burst is 3.58 MHz for NTSC and 4.43 MHz for PAL.

●**Colour Bars：** A standard test pattern of several basic colours (white, yellow, cyan, green, magenta, red, blue, and black) as a reference for system alignment and testing. In NTSC video, the most commonly used colour bars are the SMPTE standard colour bars. In PAL video, the most commonly used colour bars are   eight full field bars. On computer   monitors the most commonly used colour bars are two rows of reversed colour bars

●**Seamless Switching:** A feature found on many video switchers. This feature causes the switcher to wait until the vertical interval to switch. This avoids a glitch (temporary scrambling) which often is seen when switching between

sources.

●**Scaling:** A conversion of a video or computer graphic signal from a starting resolution to a new resolution. Scaling from one resolution to another is typically done to optimize the signal for input to an image processor, transmission path or to improve its quality when presented on a particular display.

●**PIP:** Picture-In-Picture. A small image within a larger image created by scaling down one of image to make it smaller. Other forms of PIP displays include Picture-By-Picture (PBP) and Picture- With-Picture (PWP), which are commonly used with 16:9 aspect display devices. PBP and PWP image formats require a separate scaler for each video window.

●**HDR:** is a high dynamic range (HDR) technique used in imaging and photography to reproduce a greater dynamic range of luminosity than what is possible with standard digital imaging or photographic techniques. The aim is to present a similar range of luminance to that experienced through the human visual system.

●**UHD:** Standing for Ultra High Definition and comprising 4K and 8K television standards with a 16:9 ratio, UHD follows the 2K HDTV standard. A UHD 4K display has a physical resolution of 3840x2160 which is four times the area and twice both the width and height of a HDTV/FullHD (1920x1080) video signal.

●**EDID:** Extended Display Identification Data. EDID is a data structure used to communicate video display information, including native resolution and vertical interval refresh rate requirements, to a source device. The source device will then output the provided EDID data, ensuring proper video image quality.

6.6 Revision History

The table below lists the changes to the camera User Manual.

Format	Time	ECO#	Description	Principle
V1.0	2021-3-22	0000#	Release	Fanny

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