



RADA



A-TC01
AI TRACKING CAMERA
USER MANUAL

www.a-dena.com

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Precautions

This manual details functions, installation, operation principles and methods of A-TC01 AI Tracking Camera. Please read this manual carefully before installation and use.

1. How to use

In order to prevent this product or products connected to it from being damaged, please use it within its prescribed scope of use.

- 1) Keep the device away from rain or moisture;
- 2) To prevent electric shock, do not open the main case; only qualified technicians are allowed to install or maintain the device;
- 3) Do not use the device beyond scope of its temperature, humidity or power supply specification;
- 4) When cleaning the camera lens, swipe it with dry soft cloth. If dirt is hard to be removed, please swipe clean gently with mild detergent. Do not use strong or corrosive detergent, for it may scratch the lens and thus affect image result.

2. Electrical safety

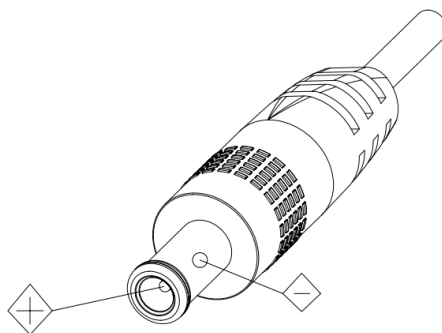
Installation and use of this product shall be in strict accordance with safety standards for electricity.

3. Careful handling

Avoid damage to product caused by heavy pressure, strong vibration or immersion during transportation, storage and installation.

4. Power supply polarity

This product applies DC 12V power supply. Power plug polarity is shown as follows:



5. Install with caution

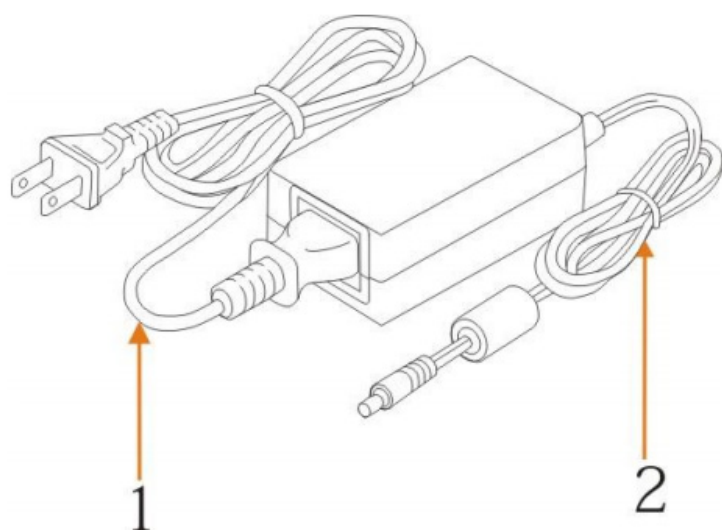
- 1) Do not rotate the camera head violently, otherwise it may cause mechanical malfunction;
- 2) This product should be placed on a stable desktop or other horizontal surfaces. Do not install the product obliquely, otherwise it may display inclined image;
- 3) When installing the camera on top of TV or personal computer, use four double faced adhesive pads at the bottom for fixing;
- 4) This product shell is made of organic materials. Do not expose it to any liquid, gas or solids which may corrode the shell.
- 5) During installation, ensure that there are no obstacles within rotation range of the holder;
- 6) Do not power on before finishing installation.

6. Do not dismantle the product without permission

This product contains no parts which can be maintained by users. Any damage arising from dismantling the product by user without permission will not be covered by warranty.

7. Magnetic field interference

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



If it is needed to extend power line of the camera, extend it from terminal 1 (220V/110V) rather than terminal 2 (DC12V), otherwise it will prevent the device from functioning!

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1. System overview

1.1. System introduction

A-TC01 AI Tracking Camera is a dual camera system that allows presenter tracking without any additional devices. Its dual system means that users can engage both cameras at the same time – wide angle shot from the lower camera, and presenter tracking shot from the upper PTZ camera.

A-TC01 AI Tracking Camera features built-in high-speed processor and advanced image processing and analytical algorithm, which allows it to track and detect teachers, presenters, students, or other targets in pan-tracking only mode, as well as board-writing accurately and quickly through either of its cameras. It fully satisfies plenty of potential scenarios of use in education, corporate, governmental, and other markets.

A-TC01 AI Tracking Camera adopts advanced ISP processing technique and algorithm, producing vivid images which feature balanced brightness, distinct layering, high definition and colour reducibility. This camera is characterized by its quality tracking, high performance, reliable operation, simple use and easy maintenance.

1.2. Product advantages

Free installation: The camera supports both front installation and upside-down installation.

All-in-one design: Capture content with the wide-angle camera and track presenter with the presenter camera simultaneously.

Sophisticated tracking algorithm: The camera 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 resistance to interference: Diversified and flexible recognition shield settings ensure that once the tracking target is locked, it will not be affected by other moving objects or projector.

Stable tracking: Movement sensitivity is adjustable. Users can define if they want tracking to reflect slight movement of target.

Self-adaptive image: A-TC01 can maintain different zoom levels for default view and tracking view, making sure that presenters are always clearly visible.

High environmental suitability: Tracking effectiveness works equally well regardless of the classroom shape or seat arrangement.

Super wide dynamic exposure: It solves the issue that a tracking object dims under strong light such as projector.

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

1.3. Product features

Full HD image: With 1/2.8 inch high quality image sensor, A-TC01 maximum resolution ratio reaches 1920x1080.

High zoom level: 20X optical zoom lens makes it possible to use the camera in medium and large size rooms. The lens features 72.5° distortion-less wide viewing angle.

Advanced focusing technique: The advanced automatic focusing algorithm allows automatic focusing to 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.

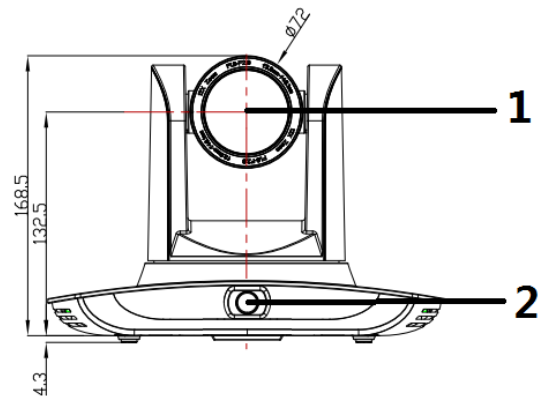
Multiple networking protocol: It supports ONVIF, GB/T28181, RTSP, RTMP protocol and RTMP push mode.

Sleep mode: It supports low-power consumption sleep/wake up mode. Power consumption in sleep mode is lower than 400mW.

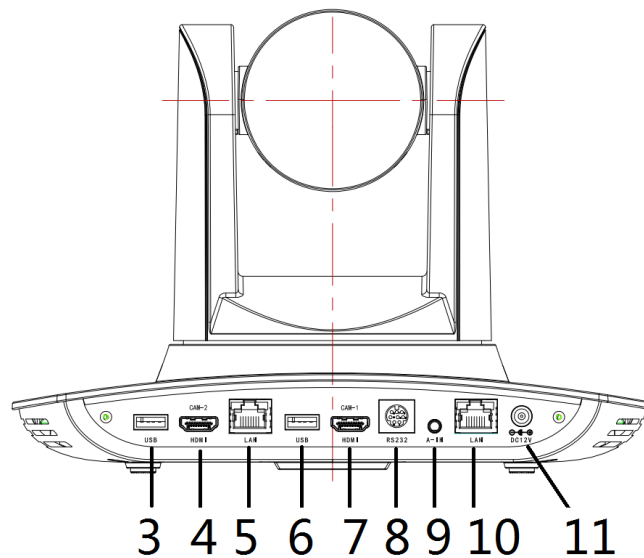
Multiple control protocol: It supports VISCA, PELCO-D, PELCO-P protocol, automatic recognition protocol and all command VISCA control protocol.

2. Port Introduction

Front view

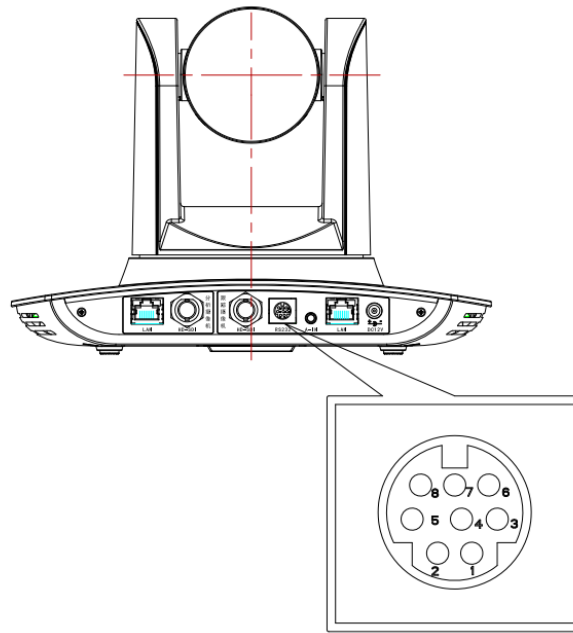


Rear view



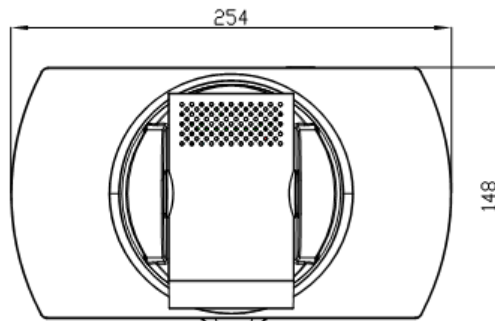
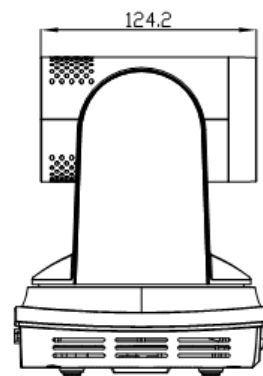
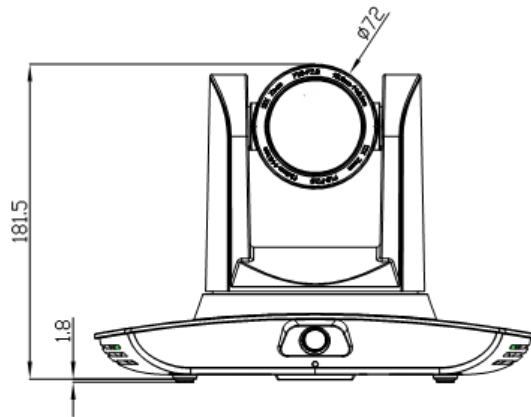
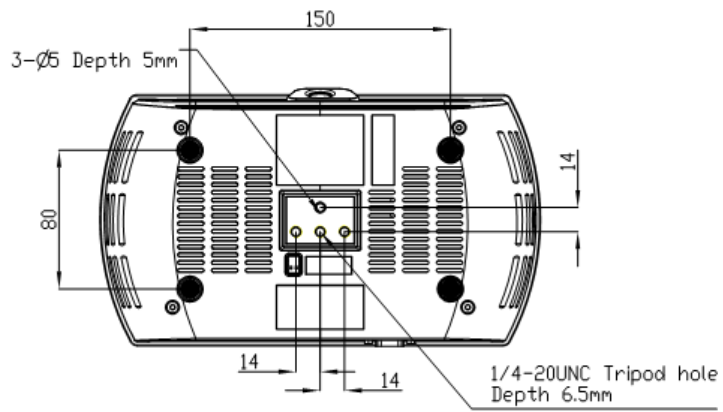
1. Close-up lens
2. Panorama lens
3. USB3.0 output 1 (panorama lens output)
4. HDMI output 1 (panorama lens output)
5. LAN network port for panorama lens
6. USB3.0 output 2 (close-up lens output)
7. HDMI output 2 (close-up lens output)
8. RS-232 control port
9. Audio input port
10. LAN network port for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

3. Dimensions



4. Configuration tools

4.1. Set IP address of the tracking camera

Open IVESmart configuration tool, click “Settings” -> “IP address” -> “Search” (refer to Figure 5.1-1 for details), the configuration interface will display all valid devices in the LAN, check only “Teacher Tracking Camera” and click Confirm. *Note: Computer with IVESmart tool should be in the same LAN with the camera to be configured.*

The screenshot shows the 'IP Setting' window with several configuration panels and a table of found devices. A red arrow points to the 'Teacher Tracking' entry in the table, and another red arrow points to the 'Confirm' button.

Device Type	Panoramic IP	Panoramic Port	Panoramic V...	Close-up IP	Close-up Port	Close-up VI...
<input type="checkbox"/> Teacher Tracking	192.168.0.201	3000	1259	192.168.0.200	3000	1259

Figure 4.1.1 Found Device List

4.2. Configure tracking parameters

1. Before configuring the camera, press “Stop” to pause tracking.
2. Press “Config” afterwards.

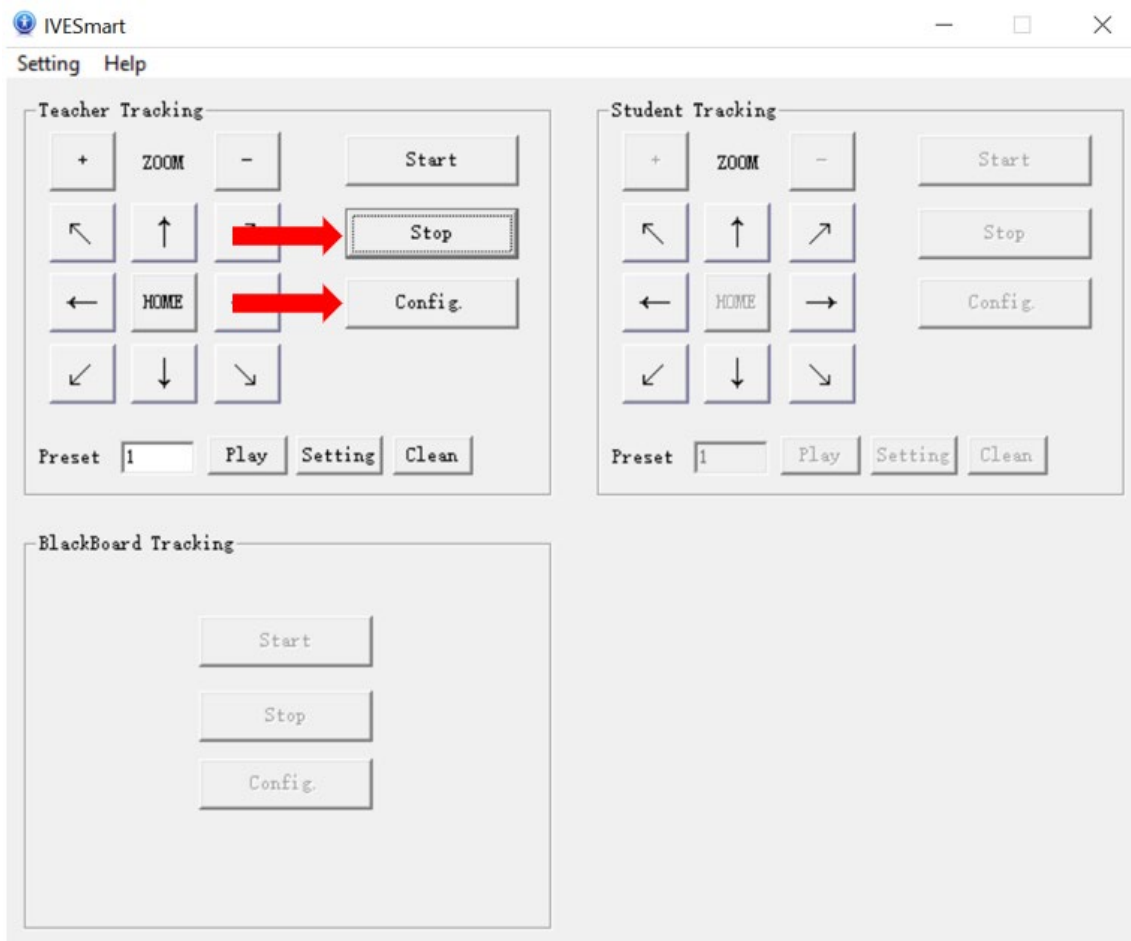


Figure 4.2.1

3. Set general view (panoramic) and presenter view (platform) preset positions. Please note that Panoramic Position preset is used when no targets are tracked. Platform Position preset is used when a target is tracked.

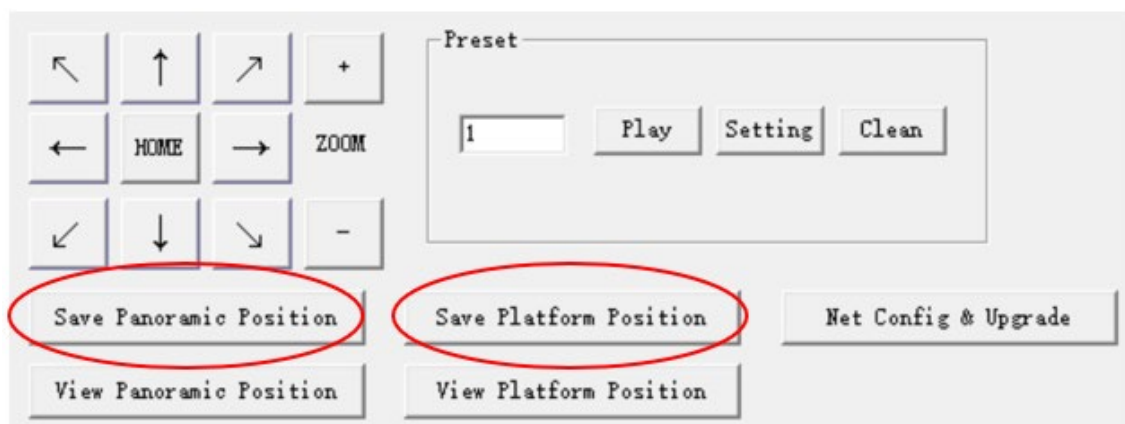


Figure 4.2.2

4. Draw zones for the presenter pickup (Platform Area), tracking (Teacher Track Area), and mask areas

Platform area: this is the area where tracking targets are first acquired. Normally, this area is set up near the blackboard, on top of a platform, podium, or other place where your tracking targets will be standing in first. We recommend drawing a rectangle that captures the upper body of your tracking target. For example, see the figure 4.2.3 below.

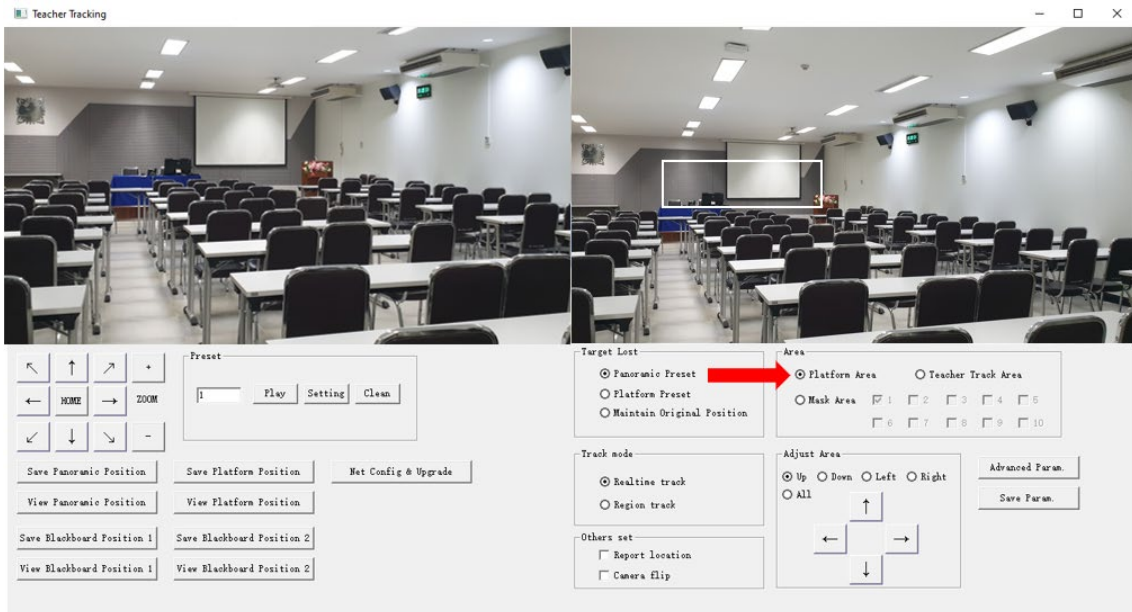


Figure 4.2.3

Tracking area: this is the area in which camera will follow your tracking targets. If the target leaves this area, camera will stop tracking and will default to the "Target Lost" mode preset. Please note that A-TC01's tracking mode is pan-only, and thus changes in the vertical position of a tracking target relative to the camera will not be adjusted for. For a setting example, see the figure 4.2.4 below:

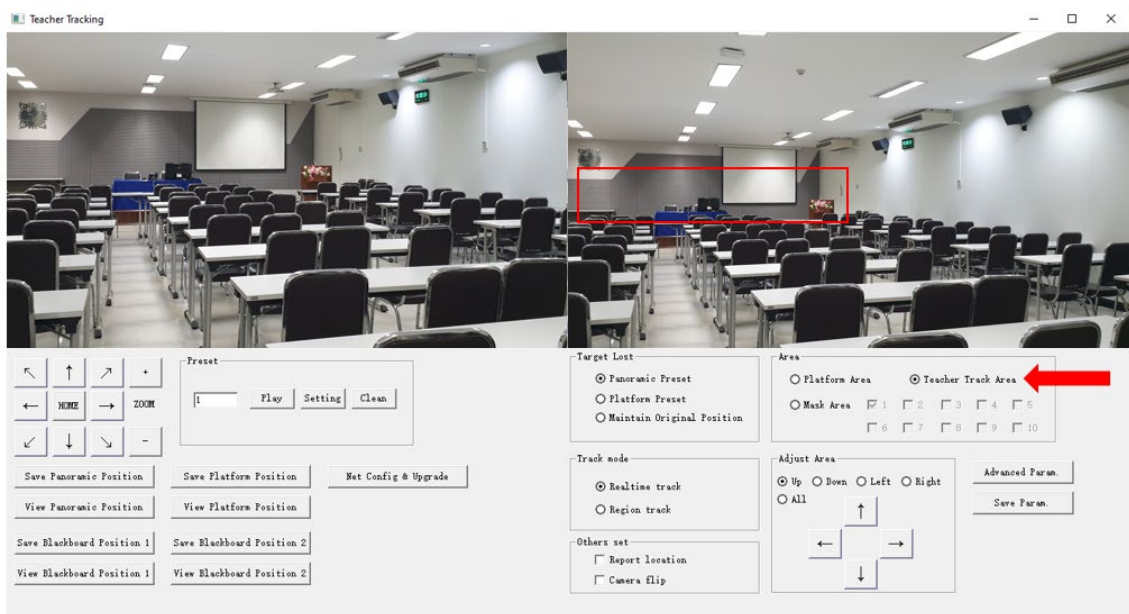


Figure 4.2.4

Mask area: this area is used to cover items and places that may impact tracking performance, e.g. places with dynamic changes such as TVs, projector displays, doors, and windows. See Figure 4.2.5 below:

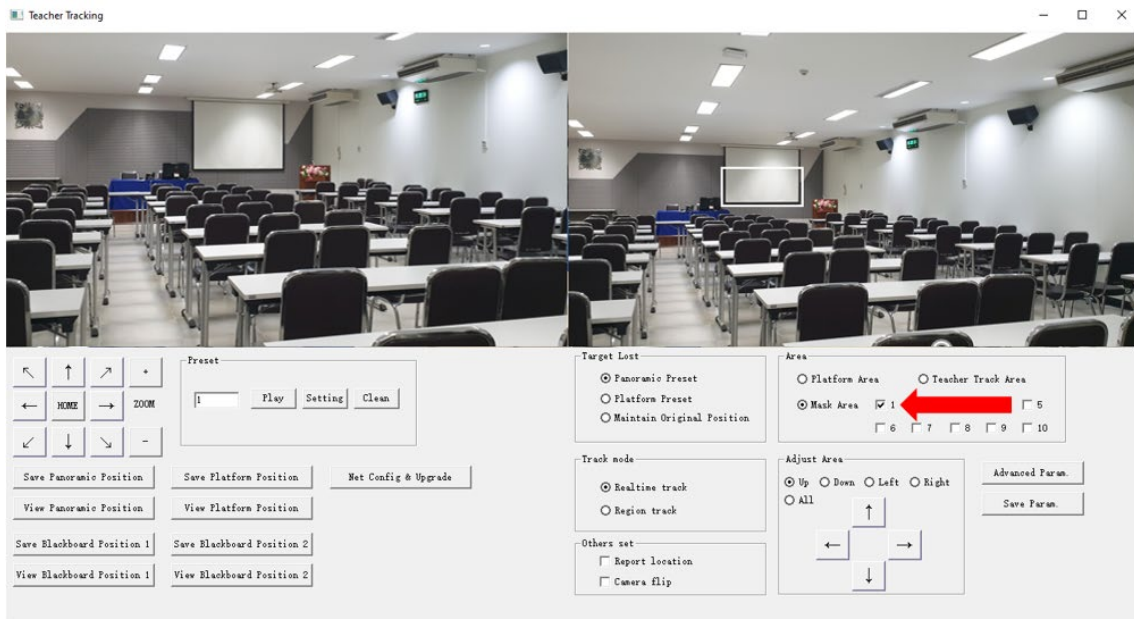


Figure 4.2.5

4.3. Other Tracking Parameters

Target lost: when the camera loses its target, it will return to the designated preset position. This preset position can be panoramic preset, platform preset or neither, in which case the camera will maintain its original position.

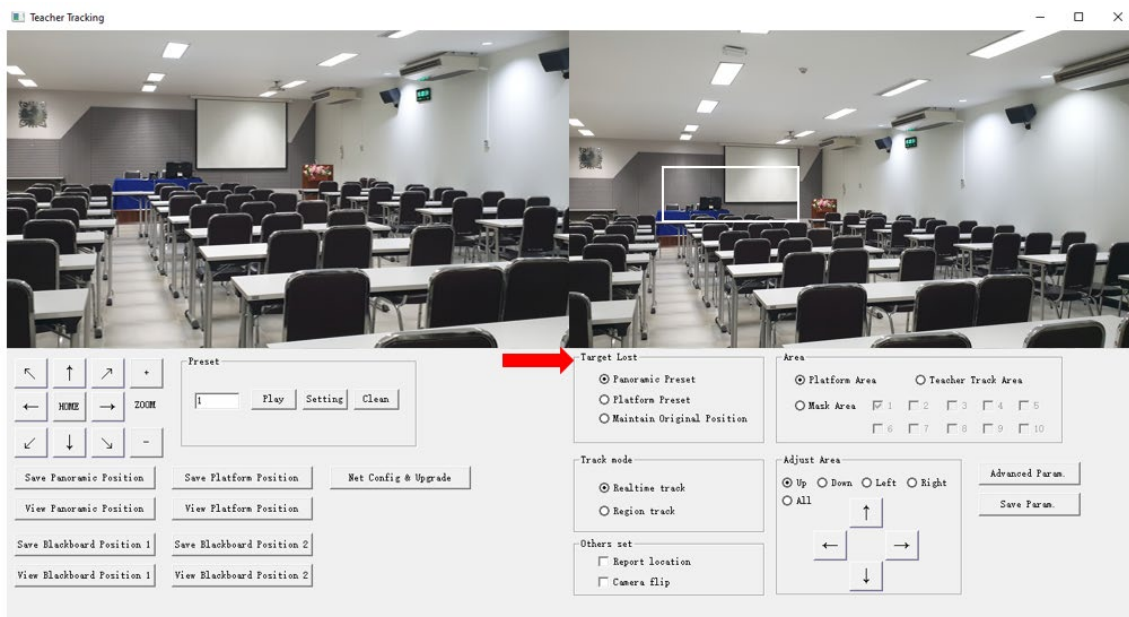


Figure 4.3.1

Track mode:

- Realtime track: camera will adjust image for the target's minor movements, e.g. hand waiving.
- Region track: camera will not adjust for minor movements, e.g. hand waiving.

Others set:

- Report location: this function is not used on A-TC01.
- Camera flip: tick to flip the image vertically.

Advanced parameters:

- Action sensitivity: this slider affects tracking movement sensitivity. Higher setting will increase sensitivity (thus making camera react to smaller movements), while lower setting will decrease it (camera will only react to big movements).
- H-speed: determines the speed of tracking camera for horizontal tracking.
- V-speed: this setting is not used on A-TC01
- Zoom range: this setting is not used on A-TC01
- Lost timeout: this determines how fast the camera will return to "Target Lost" parameter after losing its tracking target. Default is 5 seconds.
- Down platform sensitivity: determines speed of PTZ movement

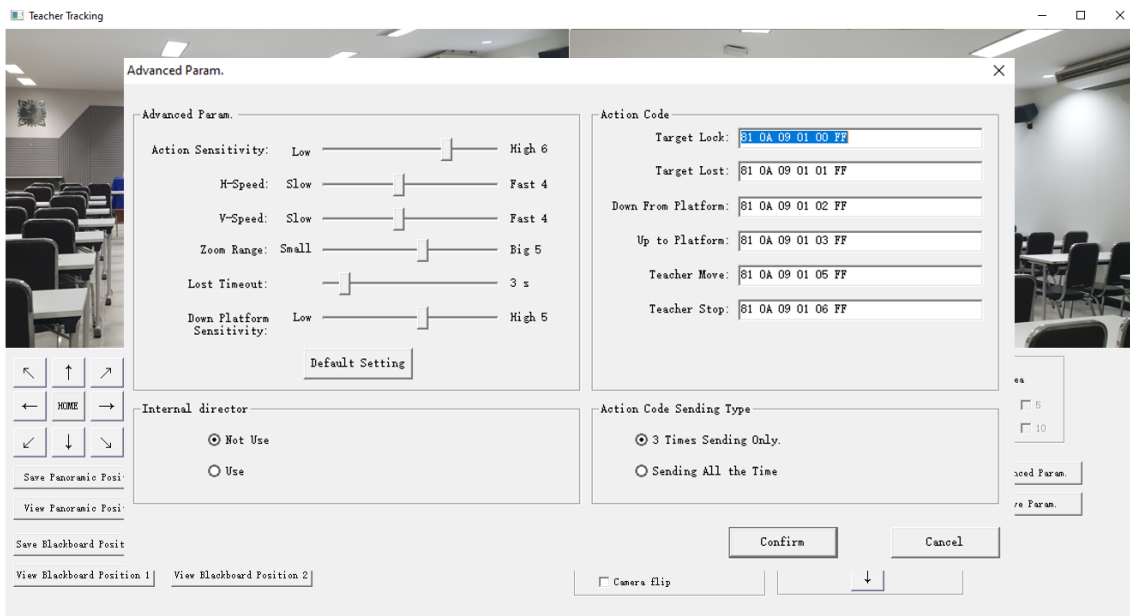


Figure 4.3.2

For action code configuration, please refer to "5.2 Action code docking".

After adjusting settings, click “Save Param.” and, when ready “start” to begin tracking.

4.4. Network update

A-TC01 can be updated via network and IVESmart tool. Click Configuration -> Network configuration & update to enter update interface, as shown below:

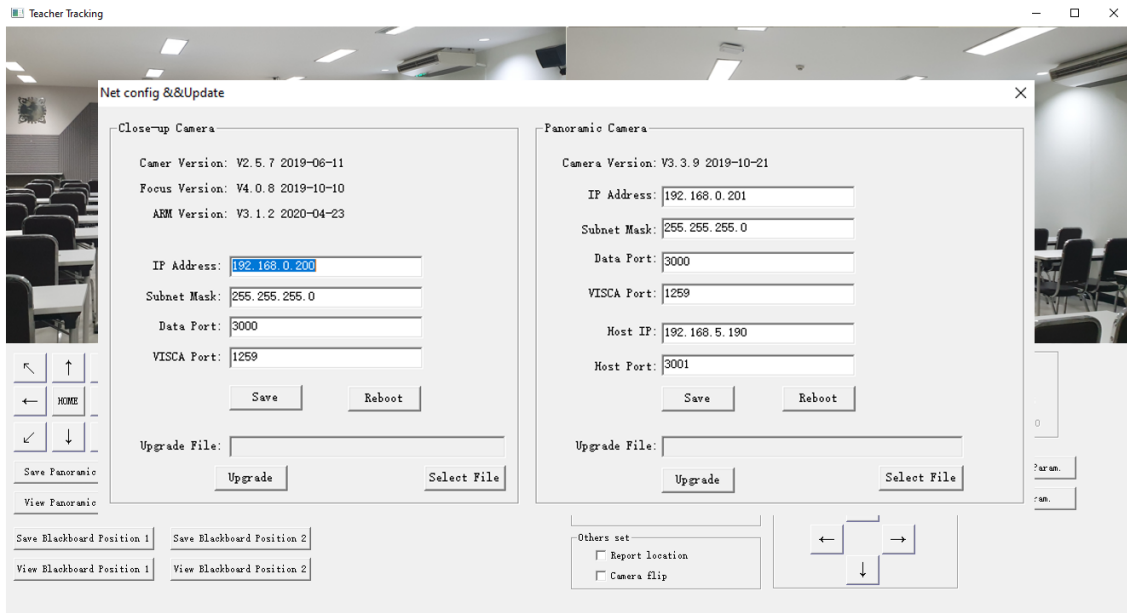
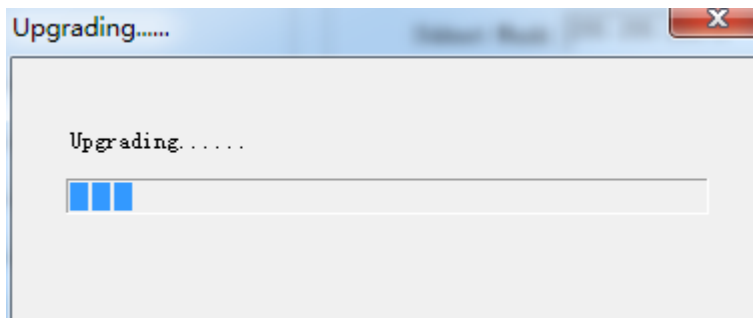


Figure 4.4.1

When upgrading, please note that there are separate update options for the wide-angle camera (Panoramic) and tracking camera (Close-up camera). When ready, click “Select File” -> “Upgrade”. The following interface will appear:



After upgrading is completed, the camera will perform self-inspection.

5. Description of recording and broadcasting host

5.1. Auto tracking control

The recording and broadcasting host sends commands by LAN network port or concentrator RS232 serial port and controls automatic tracking motion of the tracking camera. When tracking mode is active, camera's PTZ cannot be manually controlled; when not in tracking mode, camera can be controlled by IVESmart configuration tool or remote control.

1. Network receiving address: Address for A-TC01 to receive commands can be searched in IVESmart configuration tool. Click "Setting" -> "IP Address" (select IP address of your PC, in the same network as the camera to be configured) -> "Search", tick the box next to Teacher Tracking Camera. See the figure below for an example.

The screenshot shows the 'IP Setting' window with the following configuration details:

- Hub:** Use Hub pls. IP Address: 192.168.0.135, Data Port: 3000, Camera Port: 3001, Host Control Port: 3002.
- Teacher Tracking Camera:** Enable. Camera Type: PTZ Teach Camera.
 - Panoramic Camera:** IP Address: 192.168.0.201, Data Port: 3000, VISCA Port: 1259, User Name: admin, Password: *****.
 - Close-up Camera:** IP Address: 192.168.0.200, Data Port: 3000, VISCA Port: 1259, User Name: admin, Password: *****.
- Student Tracking Camera:** Enable. Camera Type: I Student Camera.
 - Panoramic Camera:** IP Address: 192.168.0.134, Data Port: 3000, VISCA Port: 1259, User Name: admin, Password: *****.
 - Close-up Camera:** IP Address: 192.168.5.193, Data Port: 3000, VISCA Port: 1259, User Name: admin, Password: *****.

The table at the bottom of the window is as follows:

Device Type	Panoramic IP	Panoramic Port	Panoramic V...	Close-up IP	Close-up Port	Close-up VI...
<input checked="" type="checkbox"/> Teacher Tracking	192.168.0.201	3000	1259	192.168.0.200	3000	1259

Figure 5.1.1

2. Command

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

5.2. Action code docking

Tracking status of teacher tracking camera will be fed back to the 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 codes, then it needs to configure host address by IVESmart configuration tool. Click “Configuration” -> “Network configuration & update”, as shown below:

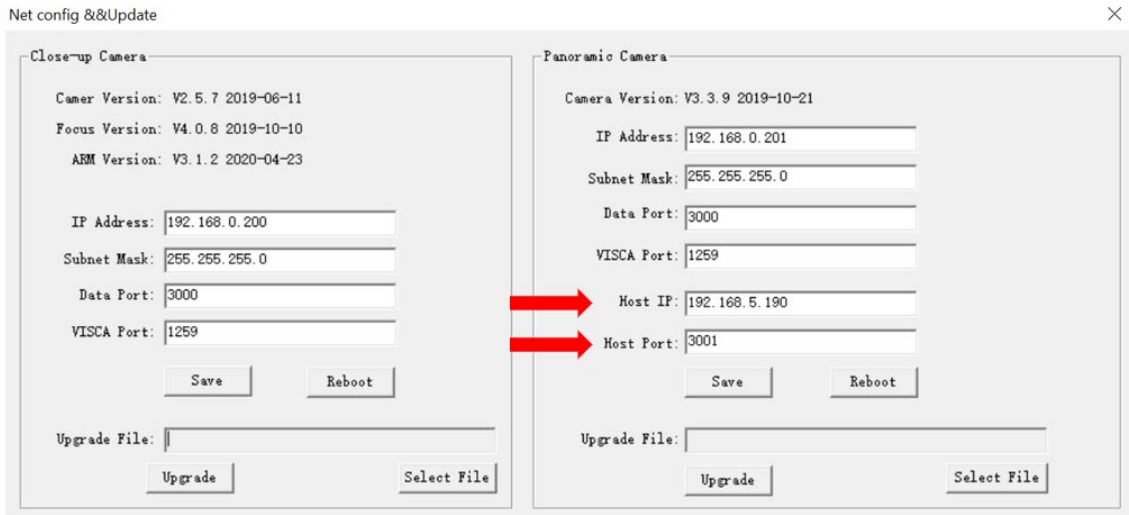


Figure 5.2.1

2. Configure action code: Edit action code as needed via IVESmart configuration tool. Click “Configuration” -> “Advanced Param.”; after modification, click “Confirm” -> “Save Param.”, as shown below:

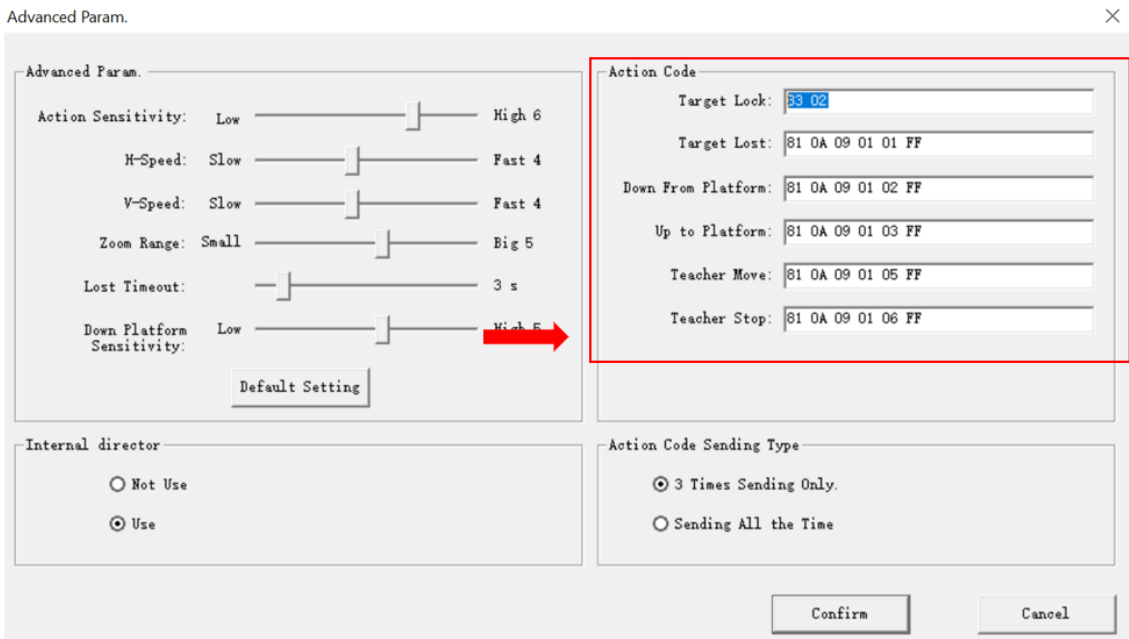


Figure 5.2.2

6. Description of the remote controller

6.1. Description of keys



1. Standby key

Long press standby key for 3s, camera enters standby mode, long press this key again for 3s, camera will perform self-inspection again and return to HOME position. When setting #0 as preset, when there is no action within 12s, the holder will return to #0 preset.

2. Select camera

Used to select the address number of a camera to be controlled.

3. Number key

Set or call #0-9 preset.

4. *key and #key

5. Focusing control key: adjust focusing

[Auto focusing]: Enter auto focusing mode

[Manual focusing]: shift camera focusing mode to manual; adjust focusing via [Focusing +] or [Focusing -]

6. Zoom key

[Zoom] +: zoom out lens; [Zoom -]: zoom in lens

7. Set and clear preset key

- **Set preset:** Set preset + number key (0-9), that is set preset of corresponding number key.
- **Cancel preset:** Cancel preset + number key (0-9), that is cancel preset of corresponding number key.

8. Holder control key

UDLR (Up, Down, Left, Right) arrows control UDLR movement of the tracking camera.

[HOME] key: returns the camera to its center position or enters the next level menu.

9. Backlight compensation control key

Backlight on/off: Turn on or off backlight.

10. Menu key

Enter/exit OSD menu or return to the previous level menu.

11. Set infrared remote control address of a camera

[*] + [#] + [F1] : # 1 address [*] + [#] + [F2] : # 2 address

[*] + [#] + [F3] : #3 address [*] + [#] + [F4] : #4 address

12. Set infrared remote control address of a camera

1) [#] + [#] + [#] : Cancel all presets

2) [*] + [#] + [6] : Restore factory settings

3) [*] + [#] + [9] : Shift between front and upside down installation

4) [*] + [#] + auto: Enter aging mode

5) [*] + [#] + [3] : Set menu into Chinese

6) [*] + [#] + [4] : Set menu into English

7) [*] + [#] + manual: Restore default IP, user name, password

8) [#] + [#] + [0] : Shift video format 1080P60

9) [#] + [#] + [1] : Shift video format 1080P50

10) [#] + [#] + [2] : Shift video format 1080I60

11) [#] + [#] + [3] : Shift video format 1080I50

12) [#] + [#] + [4] : Shift video format 720P60

13) [#] + [#] + [5] : Shift video format 720P50

14) [#] + [#] + [6] : Shift video format 1080P30

15) [#] + [#] + [7] : Shift video format 1080P25

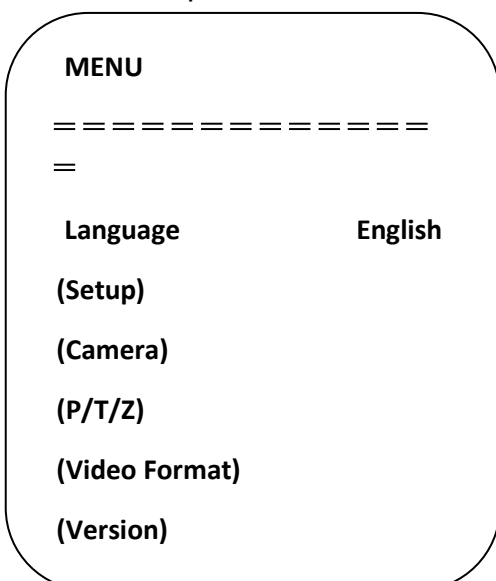
16) [#] + [#] + [8] : Shift video format 720P30

17) [#] + [#] + [9] : Shift video format 720P25

7. Set menu

7.1. Main menu

In normal image, press [MENU] key, the screen displays the menu content, use the arrow to point to the desired item.



Language settings / Language: Select menu language, Chinese/English

Camera parameters: Enter submenu of camera parameter settings

Version: Enter submenu of Version

[↑↓] Select: Press [↑↓] to select menu item

[Menu] return: Press menu key to return

Settings: Enter submenu of system parameter settings

P/T/Z: Enter submenu item of holder parameter settings

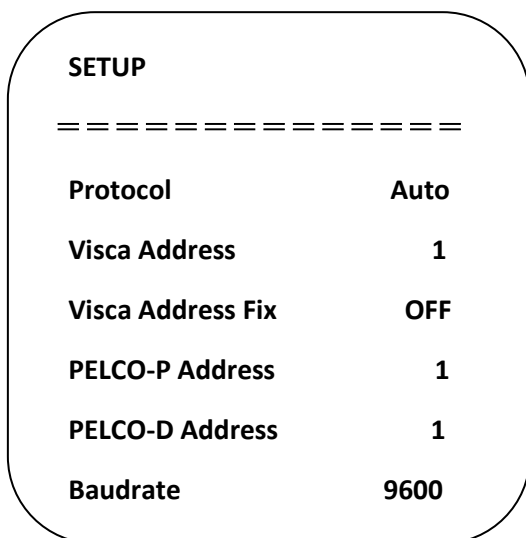
Restore default: Enter restore default, select "yes" or "no" restore default

[←→] Change value: Press [←→] to change value

[Home] OK: Press [Home] key to confirm

7.2. System parameter settings

On the main menu, move the cursor to (Settings), press [HOME] key to enter Settings page, as shown below.



The screenshot shows a terminal window titled "SETUP" with a dashed line separator. Below the separator, several parameters are listed with their current values:

Parameter	Value
Protocol	Auto
Visca Address	1
Visca Address Fix	OFF
PELCO-P Address	1
PELCO-D Address	1
Baudrate	9600

Protocol: Protocol type VISCA/PELCO-P/PELCO-D/auto

Baud rate: Set item:
2400/4800/9600/115200

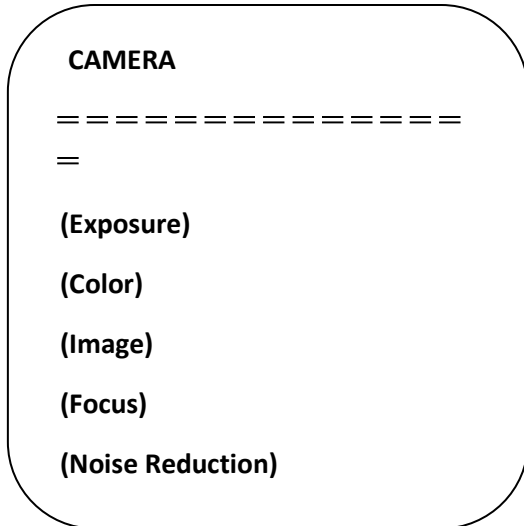
Communication address:

VISCA=1~7; PELCO-P = 1~64; PELCO-D =1~64

VISCA address fix: Set item: On/off

7.3. Camera parameter settings

On the main menu, move the cursor to (CAMERA), press [HOME] key to enter CAMERA page, as shown below.



Exposure: Enter exposure submenu item

Image: Enter image submenu item

Color: Enter color submenu item

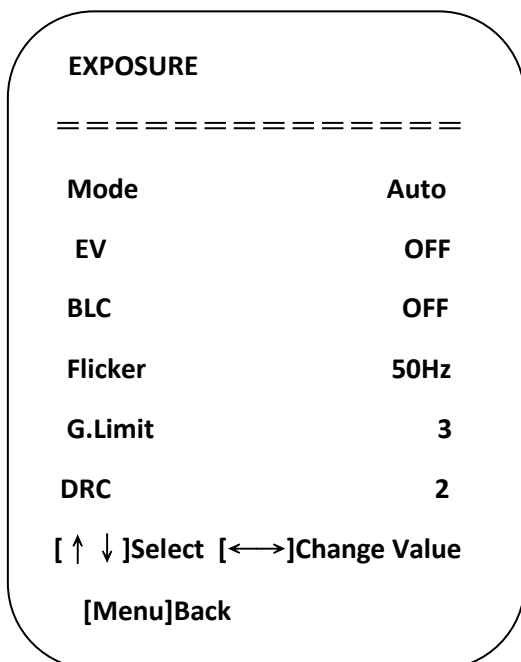
Focus: Enter focus submenu item

Noise reduction: Enter noise reduction submenu item

Style: Default, standard, clear, bright, gentle

1) Exposure

On CAMERA menu, move the cursor to (EXPOSURE), press [HOME] key to enter exposure page, as shown below.



Mode: Options: Auto, manual, shutter priority, aperture priority, brightness priority

EV: Options: On/off (only valid in auto mode)

Compensation grade: Options: -7~7 (only valid in auto mode when “EV” is on.)

BLC: Options: On/off (only valid in auto mode) **DRC:** Options: 1~8, off

Flicker: Options: Off, 50Hz, 60Hz (valid in auto, shutter priority and brightness priority modes)

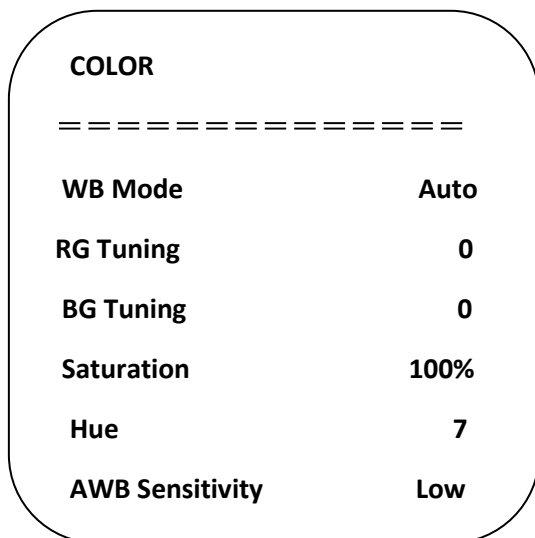
G. Limit: Options: 0~15 (valid in auto, shutter priority and brightness priority modes)

Shutter priority: Options: 1/25, 1/30, 1/50, 1/60, 1/90, 1/100, 1/120, 1/180, 1/250, 1/350, 1/500, 1/1,000, 1/2000, 1/3000, 1/4000, 1/6000, 1/10000 (valid in manual and shutter priority modes)

Aperture priority: Options: 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 (valid in manual and aperture priority modes) **Brightness:** Options: 0~23 (only valid in brightness priority mode.)

2) Color

On CAMERA menu, move the cursor to (COLOR), press [HOME] key to enter COLOR page, as shown below.



WB Mode: Options: auto, 3000K, 4000K, 5000K, 6500K, manual, one-key white balance.

RG Tuning: Options: -10~10 (only valid in auto mode)

BG Tuning: Options: -10~10 (only valid in auto mode)

Red gain: Options: 0~255 (only valid in manual mode)

Blue gain: Options: 0~255 (only valid in manual mode)

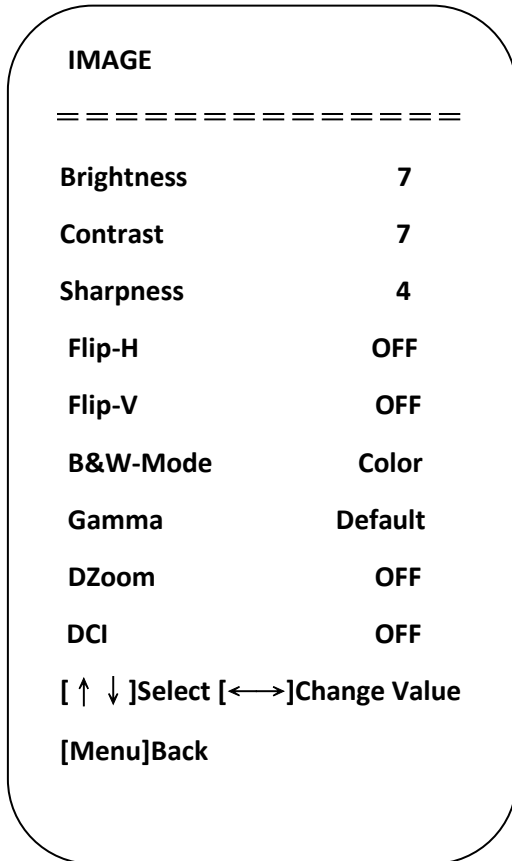
Saturation: Options: 60%, 70%, 80%, 90%, 100%, 110%, 120%, 130%, 140%, 150%, 160%, 170%, 180%, 190%, 200%

Hue: Options: 0~14

AWB Sensitivity: Options: high, medium, low (only valid in auto mode)

3) Image

On CAMERA menu, move the cursor to (IMAGE), press [HOME] to enter IMAGE page, as shown below.



Brightness: Options: 0~14

Contrast: Options: 0~14

Sharpness: Options: 0~15

Flip-H: Options: on/off

Flip-V: Options: on/off

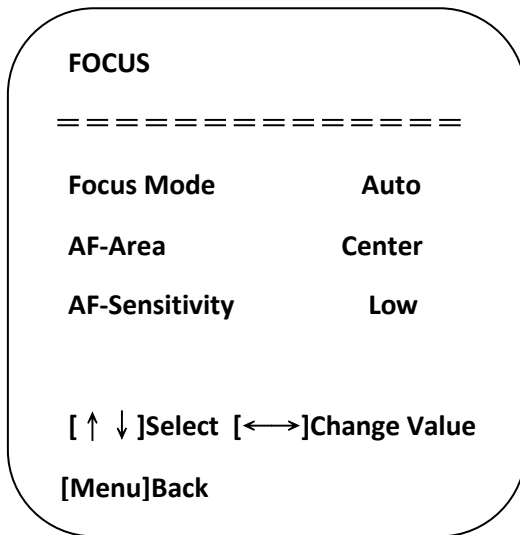
B&W-Mode: Options: color, black & white

Gamma: Options: default, 0.45, 0.50, 0.55, 0.63

Dzoom: Options: on/off **DCI:** dynamic contrast, options, off, 1~8

4) Focus

On CAMER menu, move the cursor to (FOCUS), press [HOME] key to enter FOCUS page, as shown below.



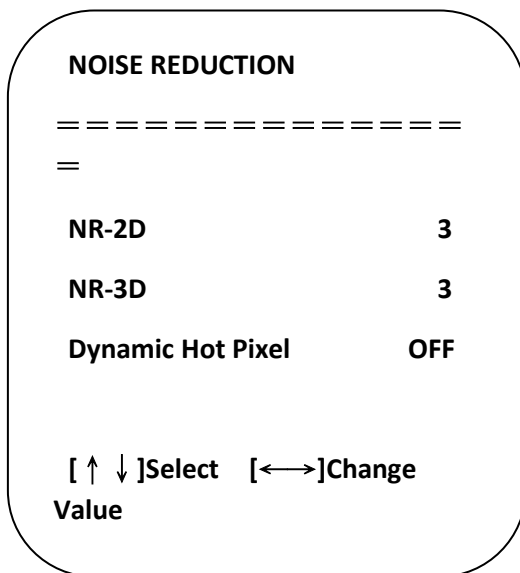
Focus mode: Options: auto/manual

AF-Area: Options: up/center/low

AF-Sensitivity: Options: high/medium/low

5) Noise reduction

On CAMERA menu, move the cursor to (Noise reduction), press [HOME] key to enter Noise reduction page, as shown below.



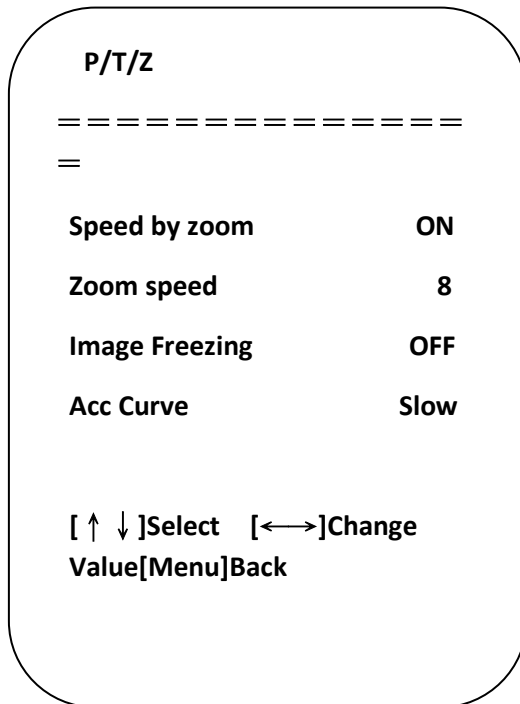
NR-2D: Options: auto, off, 1~7

NR-3D: Options: off, 1~8

Dynamic hot pixel: Options: off, 1~5

7.4. P/T/Z

On the main menu, move the cursor to (P/T/Z), press [HOME] key to enter P/T/Z page, as shown below.



Speed by zoom: It only works on remote control, on, off; when camera zooms in, remote control will make holder rotate at lower speed.

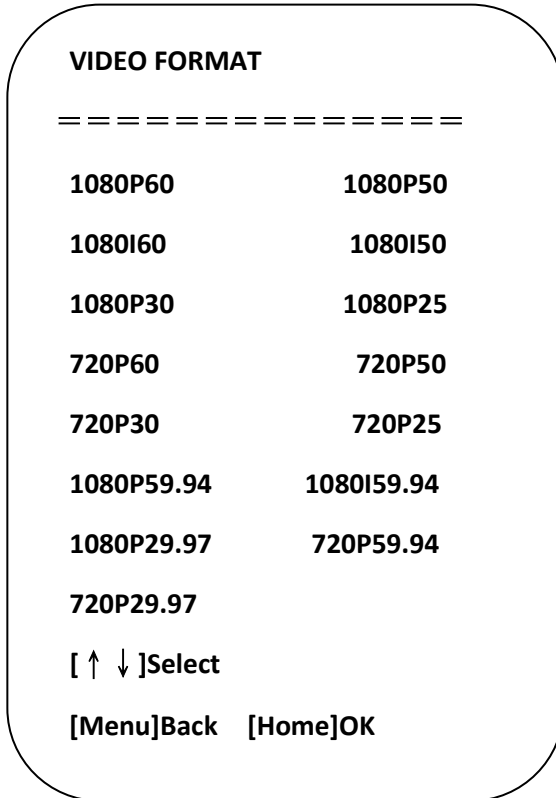
Zoom speed: Set speed for remote control camera zoom, 1~8

Image freezing: Options: On/off

Acc Curve: Options: Quick/slow

7.5. Video format

On the main menu, move the cursor to (VIDEO FORMAT), press [HOME] key to enter VIDEO FORMAT page, as shown below.



7.6. Version

On the main menu, move the cursor to (Version), press [HOME] key to enter Version page. Version information varies from product model and date of production. Version information contains version number and version upgrade time.

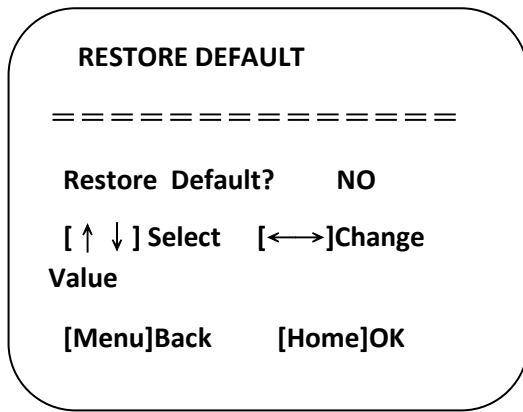
MCU version: It displays MCU version information.

Camera version: It displays camera version information.

Focus version: It displays focus version information.

7.7. Restore default

On the main menu, move the cursor to (restore), press [HOME] key to enter Restore page, as shown below.



Restore default: Options: Yes/no (color style and video format can't be restored default).

Note: If remote address used before is not 1, but any one from 2, 3 and 4, after restoring all parameters or system parameters, device address corresponding to the remote control will be reset to 1. At this moment, it is needed to change remote control address to 1, that is, press Camera and select [1], control will function.

8. VISCA protocol command list

When the camera is operated normally, it can be controlled via RS232C/RS485 port (VISCA IN). Parameters of RS232C serial port are as follows:

Baud rate: 2,400/4,800/9,600/115,200 bit/s; start bit: 1 bit; digit bit: 8 bits; stop bit: 1 bit; verification bit: none

After powering on, camera rotates to left bottom first, and then returns to middle. Zoom lens zooms out to the furthest and zooms in to the nearest, and finishes self-inspection. If the camera has a saved #0 preset, after initialization, camera will go to #0 preset. Afterwards, user can use a serial port command to control the camera.

Return commands

Ack/Completion Message		
	Command package	Notes
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 package	Notes
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.

Control command

Command	Function	Command package	Notes
AddressSet	Broadcast	88 30 01 FF	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	p = 0(low) - 7(high)
	Tele (Standard)	8x 01 04 07 02 FF	
	Wide (Standard)	8x 01 04 07 03 FF	
	Tele (Variable)	8x 01 04 07 2p FF	
	Wide (Variable)	8x 01 04 07 3p FF	

Command	Function	Command package	Notes
	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) - 7(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
	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

Command	Function	Command package	Notes
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	Reset	8x 01 04 0C 00 FF	Gain Setting
	Up	8x 01 04 0C 02 FF	
	Down	8x 01 04 0C 03 FF	
	Direct	8x 01 04 0C 00 00 0p 0q FF	pq: Gain Position
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 Position
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
	Off	8x 01 04 33 03 FF	Compensation
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

Command	Function	Command package	Notes
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	
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 4900 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 0608 02 FF	IR(remote commander)receive On/Off
	OFF	8x 01 0608 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

Command	Function	Command package	Notes
			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	
	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 07000W 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	W:1 UpRight 0:DownLeft YYYY: Pan Limit Position(TBD) ZZZZ: Tilt Limit Position(TBD)
	Clear	8x 01 06 07010W 07 0F 0F 0F 07 0F 0F 0F FF	

Search command

Command	Command package	Return package	Notes
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_FocusAFModelInq	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_WBModelInq	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
CAM_WBModelInq	8x 09 04 35 FF	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_AEModelInq	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_BrightPosInq	8x 09 04 4D FF	y0 50 00 00 0p 0q FF	pq: Bright Position
CAM_ExpCompModelInq	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_BacklightModelInq	8x 09 04 33 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
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
CAM_FlickerModelInq	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_PictureEffectModelInq	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_MenuModelInq	8x 09 0606 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 (200%)
CAM_IDInq	8x 09 04 22 FF	y0 50 0p FF	p: Gamma ID
IR_ReceiveInq	8x 09 0608 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
IR_ReceiveReturn		y0 077D 01 04 00 FF	Power ON/OFF
		y0 077D 01 04 07 FF	Zoom tele/wide
		y0 077D 01 04 38 FF	AF ON/OFF
		y0 077D 01 04 33 FF	Camera _Backlight
		y0 077D 01 04 3F FF	Camera _Memery
		y0 077D 01 06 01 FF	Pan_titleDriver
CAM_BrightnessInq	8x 09 04A1 FF	y0 50 00 00 0p 0q FF	pq: Brightness Position
CAM_ContrastInq	8x 09 04A2 FF	y0 50 00 00 0p 0q FF	pq: Contrast Position
CAM_FlipInq	8x 09 04A4 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 (0951) U3 (3950)

			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	www: Pan Position zz: Tilt Position

Note: [x] on table above means address of camera to be operated, [y] = [x+8].

9. 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

10. 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

11. Maintenance and troubleshooting

11.1. Maintenance

- 1) Please disconnect power from camera if it is not in long-term use. Also, disconnect AC power adapter from AC socket.
- 2) To avoid scratches, use soft cloth or cotton to wipe off dust on camera case.
- 3) Please clean camera lens with dry soft cloth. If stains persist, use mild detergent to wipe gently.

Do not use strong or corrosive detergent which may scratch the lens and affect image result.

11.2. Troubleshooting

1) No image displayed by video output

Solution:

- a. Check camera power for connection, and check if power indicator is lit.
- b. Power off, restart the device and check if it performs self-inspection normally.
- c. Check if connection line of video output and video display functions.

2) Image is unstable

Solution:

- a. Check if connection line of video output and video display functions.

3) Lens zoom image dithering

Solution:

- a. Check if camera is installed securely.
- b. Check if there is vibrating machine or object nearby the camera.

4) Remote control is out of service

Solution:

- a. Set remote control address to be 1, and check if it works (if the device restores to default, remote control address will be restored to 1).
- b. Check if remote control battery is installed or battery is low
- c. Check if camera is in normal operating mode
- d. Check if menu exits. It only works when menu exits; if webpage outputs image, it will not display menu or perform any operation. Menu exits in 30s automatically. Remote control works.

5) Serial port is out of control

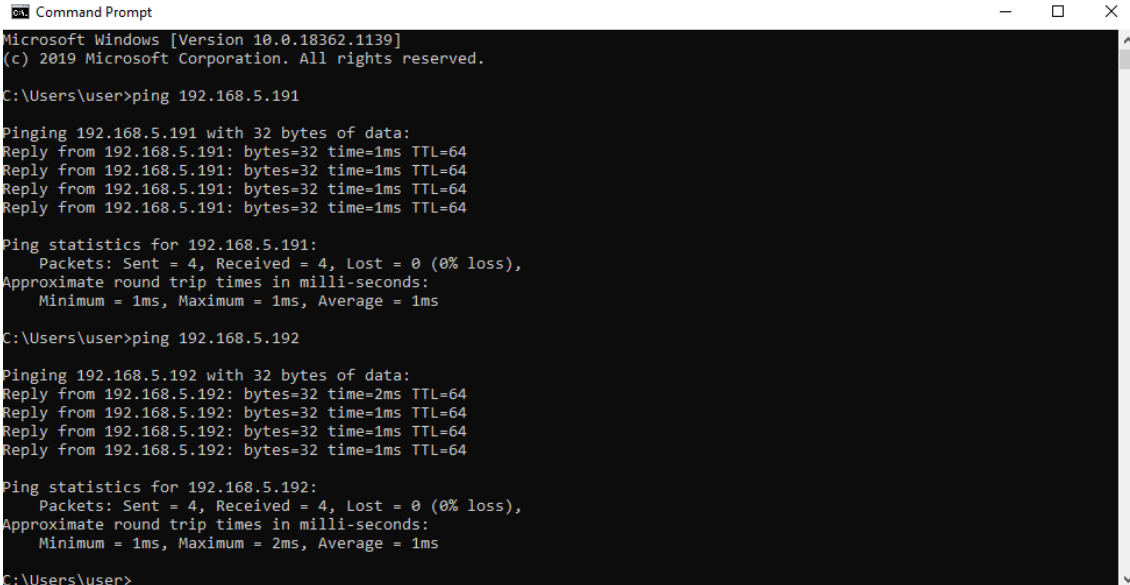
Solution:

- a. Check if it is standard control line provided by our company.
- b. Check if serial port protocol, baud rate and address are consistent with camera.
- c. Check if control line connects correctly.
- d. Check if camera is in normal operating mode.

6) Failure to log in webpage

Solution:

- a. Use display to check if camera outputs image normally.
- b. Check if network cable connects correctly (flicker of yellow indicator at internet access means network cable connection is correct).
- c. Check if computer adds network segment and if network segment is consistent with camera IP address.
- d. Click "Start" in computer, enter CMD (command prompt); DOS command window appears; input "ping 192.168.5.191" (default Tracking Camera IP) or "ping 192.168.5.192" (default Wide-angle Camera IP), press Enter, information below means network connection functions well.



```
Command Prompt
Microsoft Windows [Version 10.0.18362.1139]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\user>ping 192.168.5.191

Pinging 192.168.5.191 with 32 bytes of data:
Reply from 192.168.5.191: bytes=32 time=1ms TTL=64
Reply from 192.168.5.191: bytes=32 time=1ms TTL=64
Reply from 192.168.5.191: bytes=32 time=1ms TTL=64
Reply from 192.168.5.191: bytes=32 time=1ms TTL=64

Ping statistics for 192.168.5.191:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\user>ping 192.168.5.192

Pinging 192.168.5.192 with 32 bytes of data:
Reply from 192.168.5.192: bytes=32 time=2ms TTL=64
Reply from 192.168.5.192: bytes=32 time=1ms TTL=64
Reply from 192.168.5.192: bytes=32 time=1ms TTL=64
Reply from 192.168.5.192: bytes=32 time=1ms TTL=64

Ping statistics for 192.168.5.192:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\Users\user>
```