A-TC02
OnyxCam
USER MANUAL

www.a-dena.com

Adena Limited 2022

This manual provides information relevant to the installation of the A-TC02 OnyxCam, as well as its functions and control methods in details. Please read this manual carefully before installing and using the camera.

Precautions

To avoid damage to the camera, please only use this product in the specified conditions and observe the following precautions:

1) Do not expose the camera and its components/accessories to rain or moisture.

2) Due to the risk of electric shock, do not open the camera's casing. Installation and maintenance of the device should only be carried out by qualified technicians.

3) Do not use the product beyond the temperature, humidity or power supply specifications stated in this user manual.

4) Please use a soft, dry cloth to clean the camera. If the camera is very dirty, clean it with a diluted neutral detergent; Using any type of solvents may damage the surface of the camera, thus you should not use them.

Electrical Safety

Installation and use of this product must strictly comply with the local electrical safety standards.

Transportation

Avoid any stress, vibration, or moisture during transportation, storage, installation and operation of the camera.

Installation

1) Do not rotate the camera head violently. Doing otherwise may cause mechanical failure.

2) This camera is designed to be placed on a stable, horizontal surface. Do not install the camera at

3) This product should be placed on a stable desktop or other horizontal surface. Do not install the product at an angle, otherwise your camera's image will be inclined;

4) Ensure there are no obstacles within the camera holder's rotation range.

5) Do not power on before completing the camera's installation.

Do Not Dismantle Camera

ADENA Limited is not responsible for any unauthorized modification or changes in the camera's behavior produced by dismantling of the product. Unauthorized dismantling of the product will nullify your camera's warranty.

Magnetic Interference

Electromagnetic fields at specific frequencies may affect the video image produced by the camera. This is a Class A product; it may cause radio interference in domestic environment. If used in such environment, please take this into account and apply appropriate measures.

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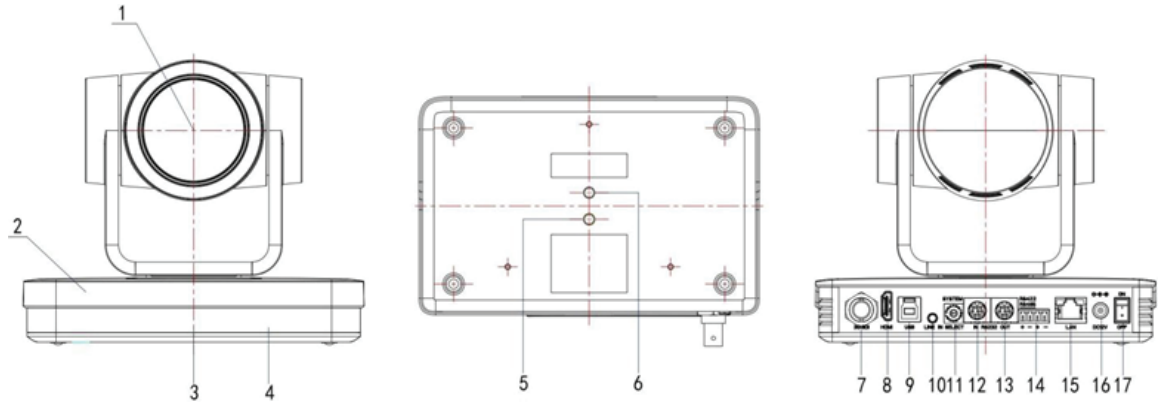
1. Quick Installation Guide

1.1 Interface

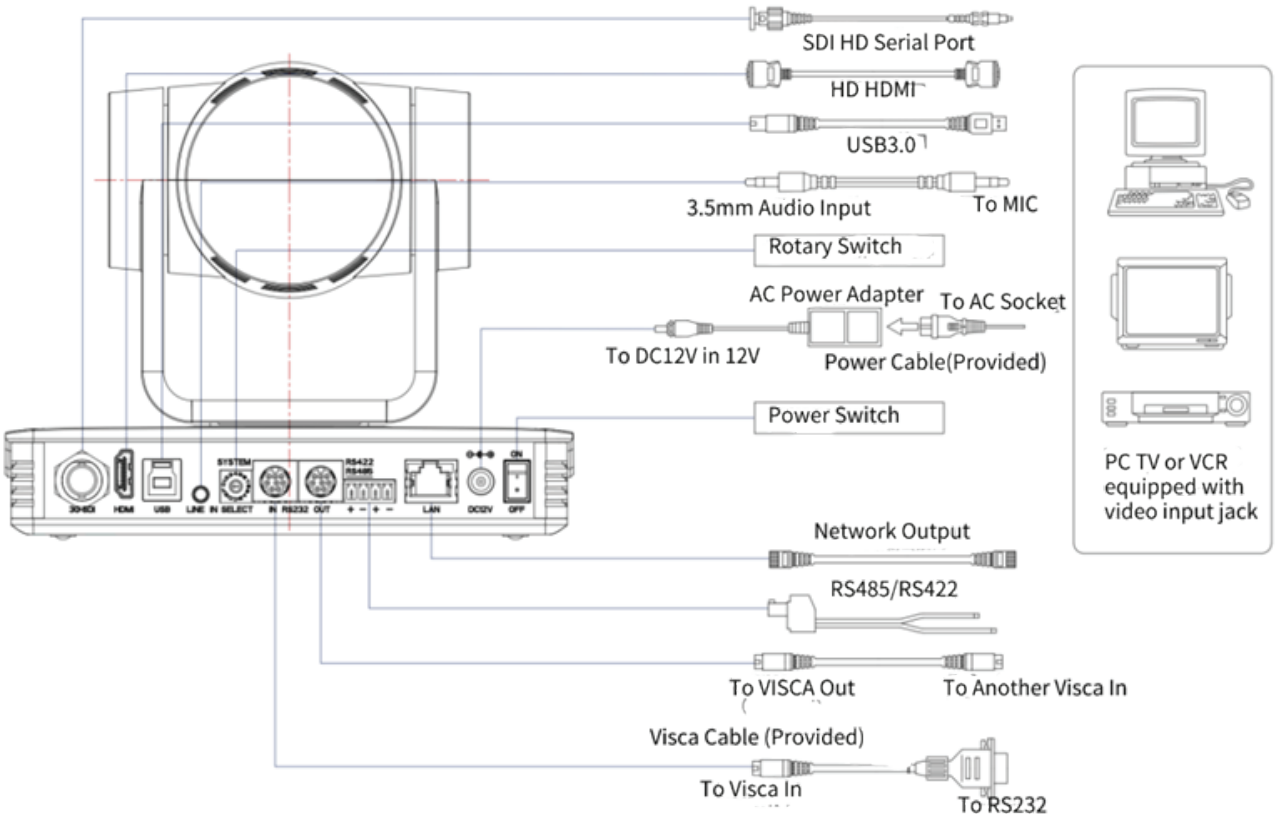


Interface Introduction

1. Camera Lens	10. Audio Input Interface (LINE-IN)
2. Camera Base	11. Rotary Dial Switch
3. Remote Control Receiving Indicator	12. RS232 Input Interface (Input)
4. Infrared Receiver	13. RS232 Output Interface (Output)
5. Tripod Screw Hole	14. RS422 Compatible with RS485 Interface
6. Screw Hole for Tripod	15. LAN Port
7. 3G-SDI Output Interface	16. Power Input Socket (DC12V)
8. HDMI	17. Power Switch Button
9. USB3.0	

When using the camera, please put the plastic pad on the bottom-center of the device

1.2 Quick Installation Guide



1) After powering on and running a self-check, the camera will automatically return to the preset 0 if it is configured.

2) The default address for the IR remote control is №1.

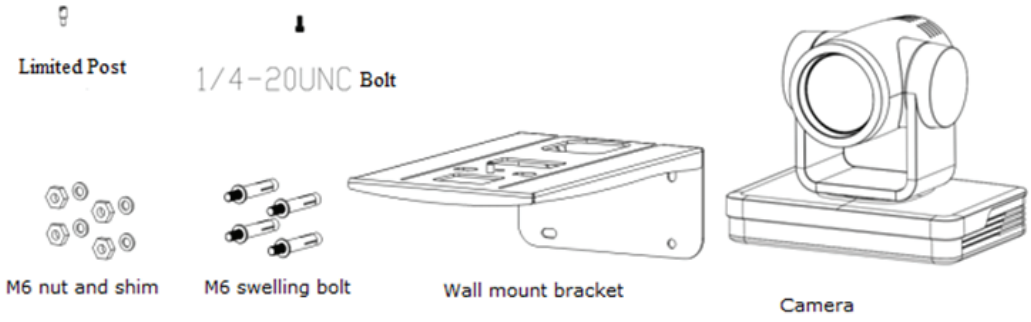
If the camera is returned to factory default settings, the remote control's default address will also reset to №1.

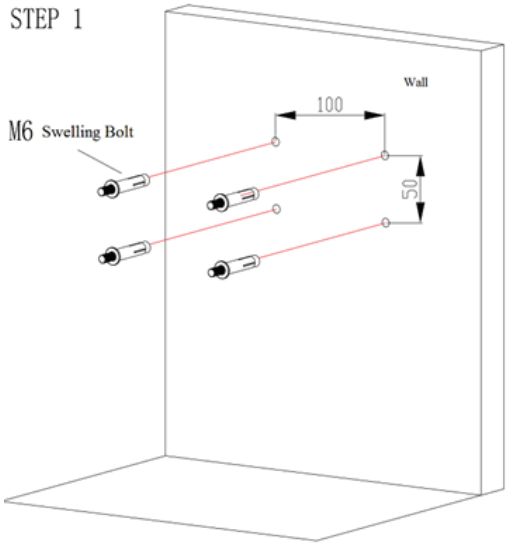
1.3 Mounting Brackets

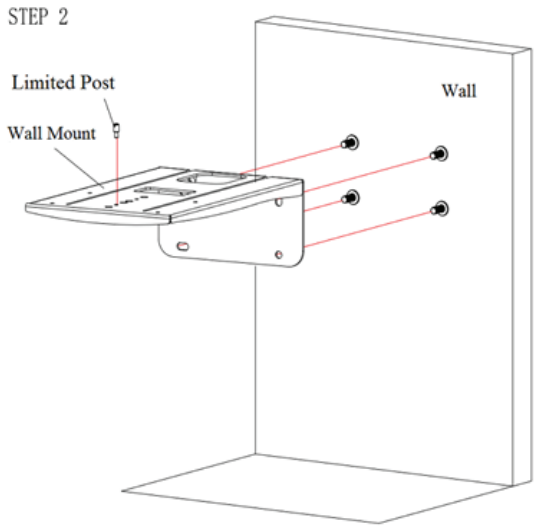
Caution

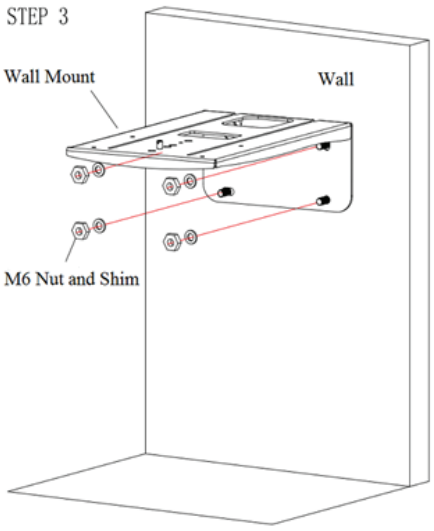
Ceiling or wall mounting brackets can only be mounted on template and concrete walls. For safety reasons, plasterboard walls are not recommended.

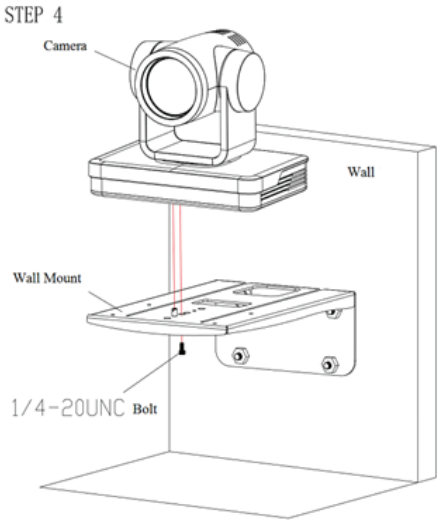
1.3.1 Wall Mount

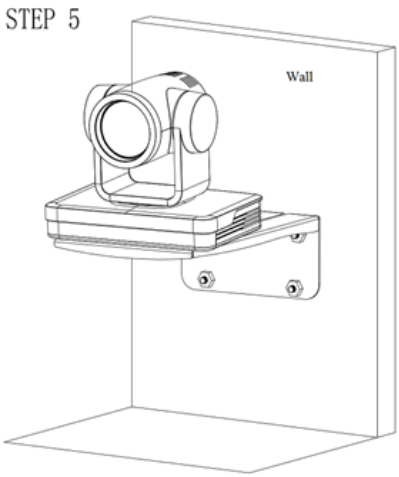




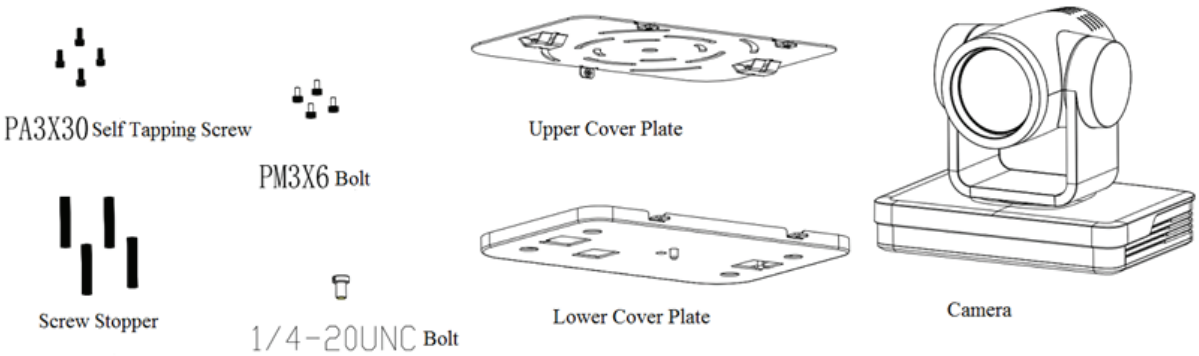




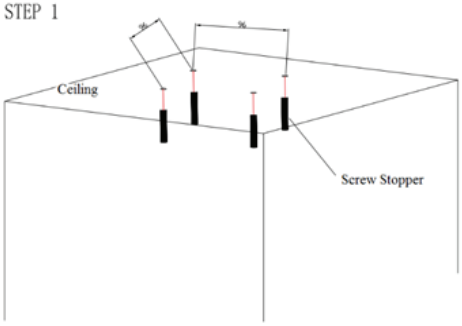




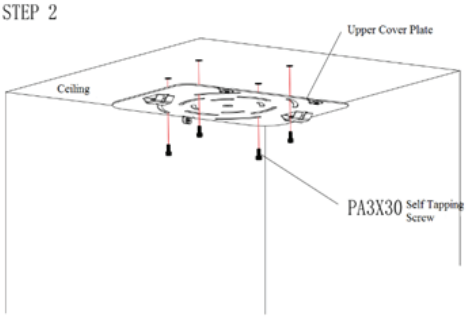
1.3.2 Ceiling Mount



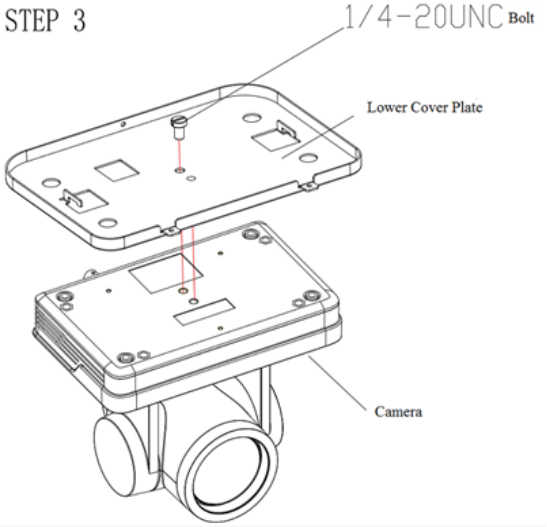
STEP 1



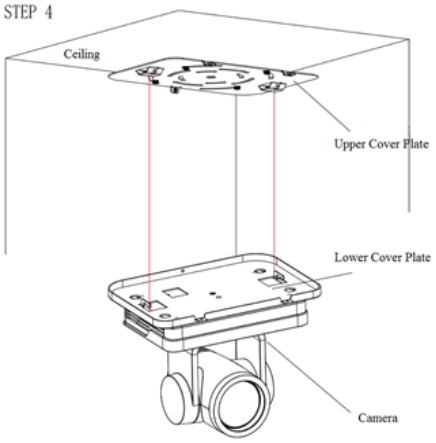
STEP 2



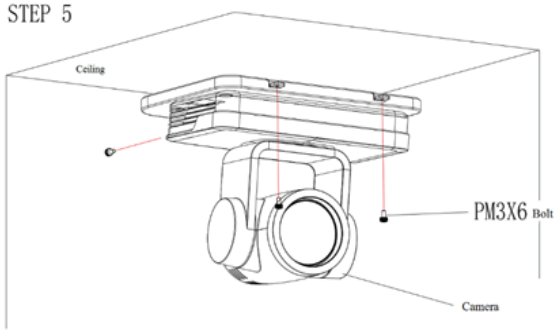
STEP 3



STEP 4

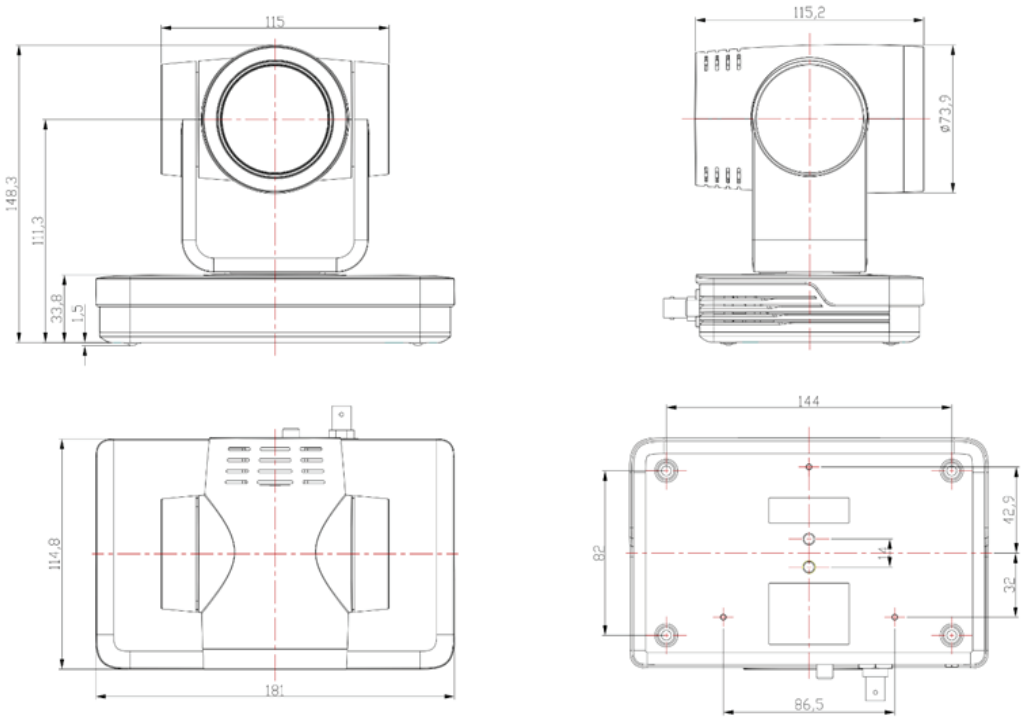


STEP 5



2. Product Overview

2.1 Dimensions



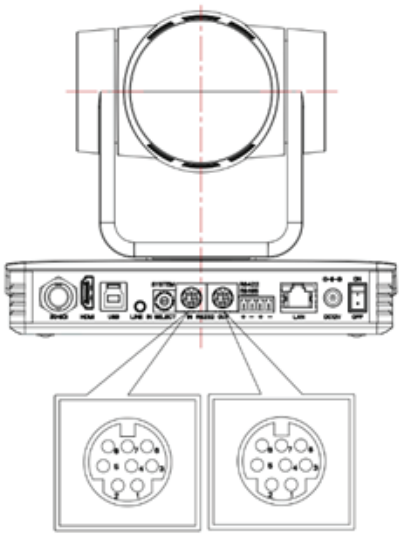
2.2 Accessories

When you unpack the product, check that all the supplied accessories are included:

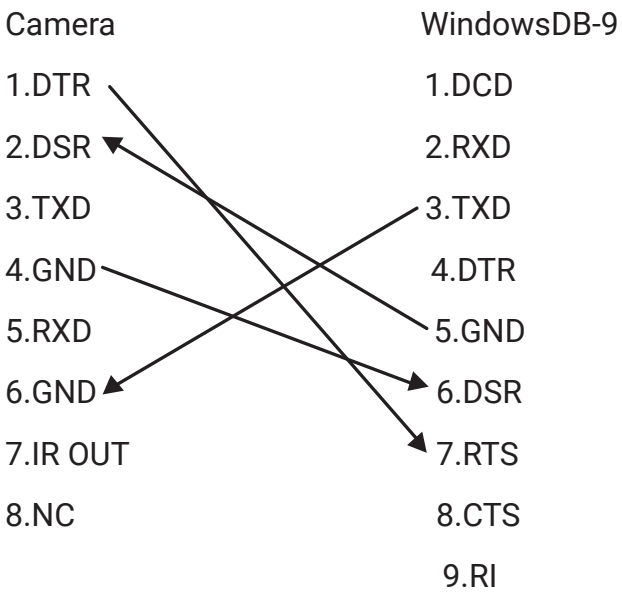
Supplied	Power adapter
	USB3.0 Cable
	RS-232 Cable
	Quick Installation Guide leaflet
	Plastic pad
	IR Remote Control

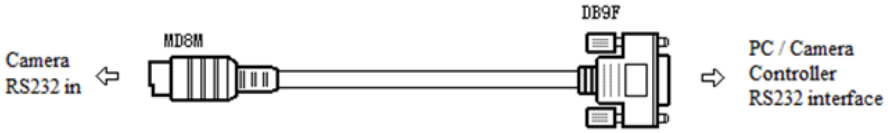
2.3 RS-232

1) RS-232 Jack

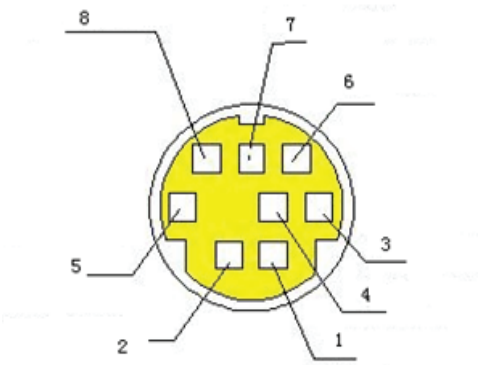


Connection method of the camera to a PC or a controller.





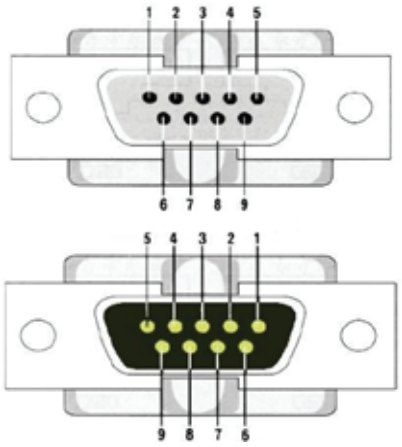
2) RS-232 Mini-DIN 8-pin Terminal Definition



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
8	NC	No Connection

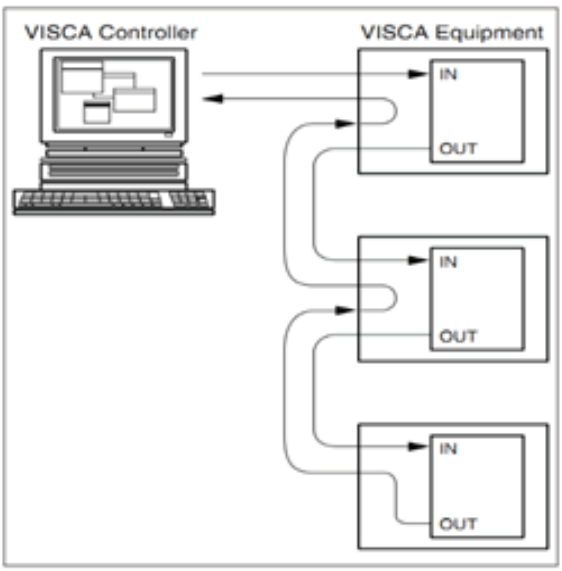
Definitions

3) RS232(DB9) Port Definition



NO.	Port	Definition
1	DCD	Data Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	System Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

4) VISCA Networking Method

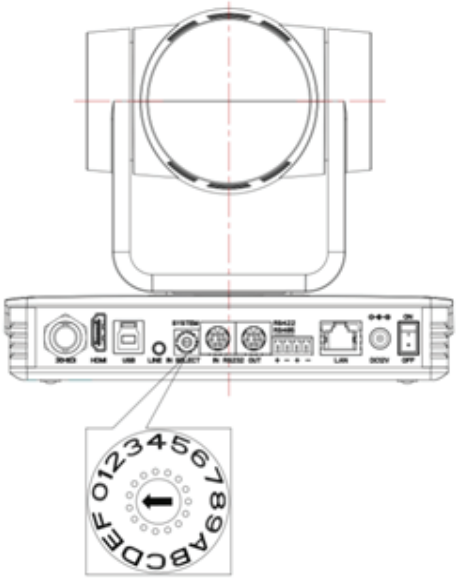


Networking Method

Device 1	Device2
1.DTR	1.DTR
2.DSR	2.DSR
3.TXD	3.TXD
4.GND	4.GND
5.RXD	5.RXD
6.GND	6.GND
7.IR OUT	7.OPEN
8. NC	8.OPEN

The product has RS232 input and output interfaces and can be cascaded in the manner described above.

2.4 Rotary Dial



Dial	Video Format	Dial	Video Format
0	1080P60	8	720P59.94
1	1080P50	9	-----
2	1080P30	A	-----
3	1080P30	B	-----
4	720P60	C	-----
5	720P50	D	-----
6	1080P59.94	E	-----
7	1080P29.97	F	-----

⚠ Caution

Ceiling or wall mounting brackets can only be mounted on template and concrete walls. For safety reasons, plasterboard walls are not recommended.

2.5 Product Features

A-TC02 OnyxCam is a standalone AI Auto-Tracking Network Camera that works out of the box. It does not require applications to work and provides a clear, high-quality Full HD image via USB, HDMI, SDI, NDI-HX and network outputs. Advanced tracking algorithm ensures that the camera stays focused on its target even if there are other potential targets walking in front of it.

A-TC02 OnyxCam is able to stream to RTMP platforms and has an audio input for you to connect a microphone. Therefore, it can be used not only with specialized hardware encoders/mixers/switchers, but also independently.

A-TC02 OnyxCam comes with a preinstalled NDI-HX license, allowing users to fully incorporate the camera into various production scenarios. It can be used with smartphones, tablets, computers, professional AV hardware, and other devices via NDI-HX protocol.

Other features include:

- Full HD Resolution: 1/2.8” high-quality CMOS sensor. Up to 1920x1080 resolution with frame rate up to 60 fps.
- Optical Zoom Lens: 20X optical zoom lens.
- Leading Autofocus Technology: Fast, accurate and stable auto-focusing technology.
- Low Noise and High SNR: High SNR image is achieved with low noise CMOS. Advanced 2D/3D noise reduction technology further reduces the noise while ensuring high image clarity.
- Multiple video output interfaces: HDMI, 3G-SDI, USB3.0, LAN.
- Combined audio/video output: Simultaneously output audio and video signal via HDMI, SDI and LAN interfaces. LAN interface supports POE, USB 3.0 supports dual code stream, SDI supports transmission up to 100m under 1080P60 format.
- Multiple Audio/Video Compression Standards: The camera supports H.264/H.265 video compression formats; AAC, MP3 and G.711A audio compression formats, and 8000,16000,32000,44100,48000 Hz audio sampling rate.
- Dual Coding Stream on USB3.0: Supports the main stream and a sub –stream, as well as simultaneous output; supports YUY2, MJPEG, H.264, NV12, H.265 video coding formats.
- Built-in Gravity Sensor: Supports PTZ auto-flip function and easy installation.
- Multiple Network Protocols: Supports ONVIF, NDI-HX, GB/T28181, RTSP, RTMP, VISCA OVER IP, RTMPS, SRT protocols; Supports RTMP push mode, easily connects to streaming servers (e.g. Wowza, FMS); Supports RTP multicast mode; Control Interfaces: RS422 is compatible with RS485, RS232-IN, RS232-OUT. RS232 interface supports cascading.
- Multiple Control Protocols: Supports VISCA, PELCO-D, PELCO-P protocols; Supports automatic identification protocols.

- Quiet Pan/Tilt Movement: Thanks to the highly accurate stepping motor, camera pans/tilts extremely quietly and smoothly.
- AI Human Detection: Built-in high-speed processor and advanced image processing and analysis algorithms. Users can choose real-time tracking or regional tracking according to the environment.
- Multiple Applications: A-TC02 OnyxCam is an excellent choice for Lecture Capture and automatic tracking of the lecturers and presenters, for tracking of the VIPs in corporate and governmental applications, for Video Conferencing, Telemedicine, Unified Communications, Live Production and other usage scenarios. The camera can be used together with other professional AV recording/streaming/mixing/switching solutions, such as AREC Media Capture System, or independently.

2.6 Technical Specification

Camera Parameter	
Parameter/Model	20X
Focus	5.2 -- 98mm
FOV	3.2°（N） 56°（W）
Aperture Value	F1.5 -- F3.0
Digital Zoom	15X
Effective Pixels	2.07, 1/2.8-inch high-quality CMOS sensor
Video Format	**HDMI/SDI:** 1080P60, 1080P50, 1080P30, 1080P25, 720P60, 720P50, 1080P59.94, 1080P29.97, 720P59.94； **USB3.0: main stream:** YUY2/NV12: 1920×1080/1280×720/1024×576/800×600/800×448/640×360/640×480/480×270/320×180@30/25/20/15/10/5fps; **MJPG/H264:** 1920×1080/1600×896/1280×720/1024×576/960×540/800×600/800×448/720×576/720×480/640×360/640×480/480×270/352×288/320×240@30/25/20/15/10/5fps;

Video Format	Sub-stream：YUY2/NV12: 1920×1080/1280×720/1024×576/800×600/800×448/640×360/640×480/480×270/320× 180@30/25/20/15/10/5fps; MJPG/H264: 1920×1080/1600×896/1280×720/1024×576/960×540/800×600/800×448/720×576/720 ×480/640×360/640×480/480×270/352×288/320×240@30/25/20/15/10/5fps;
Minimum illumination	0.5Lux (F1.8, AGC ON)
DNR	2D & 3D
AWB	Automatic, manual, one-push white balance, specified color temperatures
Focus mode	Automatic, manual, one-push focus
Exposure mode	Auto, manual, shutter priority, aperture priority, brightness priority
Iris value	F1.8 -- F11, CLOSE
Shutter Speed	1/25 -- 1/10000
BLC	On/off
Dynamic range	Off, 1 -- 8
Image adjustment	Brightness, chroma, saturation, contrast, sharpness, black and white mode, gamma curve
SNR	≥50dB
AI Function & Performance	
Real-Time Tracking	Effective tracking range up to 15 meters
Regional Tracking	Maximum 4 Tracking Regions. The camera can set the regions within horizontal -170°～+170° and vertical -30°～+90°
Interface	
Product Interface	HDMI, RJ-45 (PoE), USB3.0 (B Type, compatible with USB2.0) 3G-SDI, RS-232 IN/OUT, RS-422 (compatible with RS-485), Rotary Switch, DC 12V Power

Video Encoding Format	Network Interface：Supports main stream and sub-stream H.265, H.264 USB3.0 Interface：main stream supports YUY2, MJPG, H264, NV12
Audio input interface	Dual channel 3.5mm linear input
Audio output interface	HDMI, SDI, LAN, USB3.0
Audio compression	AAC, MP3, G.711A
Network interface	10M/100M adaptive Ethernet port, supports POE power supply, supports audio and video outputs
Network protocol	RTSP, RTMP, ONVIF, NDI-HX, GB/T28181, VISCA OVER IP, RTMPS, SRT Supports remote upgrade, remote restart, remote reset
Control Interface	RS-232-IN, RS-232-OUT, RS-422 compatible with RS-485
Serial communication protocol	VISCA/Pelco-D/Pelco-P; supports baud rates 115200/38400/9600/4800/2400
USB communication protocol	UVC (video communication protocol), UAC (audio communication protocol)
Power interface	HEC3800 Power socket (DC12V)
Power adapter	Input AC100V-AC240V; output DC12V/2.0A
Input voltage	12V±10%
Input currency	<1A
Consumption	<12W

PTZ	
Pan rotation	-170° -- +170°
Tilt rotation	-30° -- +90°
Pan speed	0.1°/s -- 100°/s
Tilt speed	0.1°/s -- 45°/s
Preset speed	Pan：100°/s,Tilt：45°/s

Preset quantity	Maximum 255 preset positions can be set (10 via the remote control)
Other Parameters	
Storage temperature	-10℃ -- +70℃
Storage humidity	20% -- 95%
Working temperature	-10℃ -- +50℃
Working humidity	20% -- 80%
Dimension	181mm×115mm×149mm
Weight	1.15kg
Environment	Designed for indoor use

Accessories	
Package contents	Power adapter, RS232 control line, USB3.0 connection line, remote control (no batteries included), quick installation guide leaflet

3. Remote Control Functions

3.1 IR Remote Control Keys and Commands

1. Standby Key

Press and hold for 3 seconds to send the camera into standby mode. Press and hold for 3 seconds again to boot up the camera. It will perform the self-test and return to the “HOME” position or to Preset 0 if it is configured)

2. Camera Address Selection

Change the remote’s IR number to control the camera with the same IR number. Please note that OnyxCam is set to “1” by default.

3. Number Keys

Press to move the camera to presets 0-9. You will need to save them first by following the procedure described under the point 7. “SET PRESET” and “CLEAR PRESET” keys.

4. Asterisk (*) and Hash (#) Keys

These keys are used in some commands described bellow

5. Focus Control Keys

AUTO: Enables autofocus on the camera

MANUAL: Changes the focus mode to manual, allowing you **to change it with the plus (+) and minus (-) buttons.**

6. Zoom Control Keys

Zoom＋: Zooms in the lens, making the image appear closer.

Zoom－: Zooms out the lens, making the image appear farther.

7. “SET PRESET” and “CLEAR PRESET” Keys:

SET PRESET: Press this button and then a 0-9 number key to save the current pan/tilt/zoom settings as that preset number position.

CLEAR PRESET: Press this button and then a 0-9 number key to clear that preset number position.

▲ Key :Moves the camera up; also used for navigation in the camera's OSD menu.

▼ Key : Moves the camera down; also used for navigation in the camera's OSD menu.

◀ Key : Moves the camera left; also used for navigation in the camera's OSD menu.

▶ Key: Moves the camera down; also used for navigation in the camera's OSD menu.

"HOME" Key: Return to the middle position or enter the next level in the camera's OSD menu.

9. BLC ON/OFF Control Key

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

10. MENU Key

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

3.2 IR Remote Control Key Combinations

1. Setting the camera's IR address number

【*】+【＃】+【F1】: Change the camera's IR address to №1
【*】+【＃】+【F2】: Change the camera's IR address to №2
【*】+【＃】+【F3】: Change the camera's IR address to №3
【*】+【＃】+【F4】: Change the camera's IR address to №4

2. Key Combination Functions

1) 【#】+【#】+【#】: Clear all presets
3) 【*】+【#】+【9】: Flip switch
5) 【*】+【#】+【3】: Menu set to Chinese
7) 【*】+【#】+ Manual: Restore the default user name, password, and IP address
9)【#】+【#】+【1】: Switch the video format to 1080P50
2) 【*】+【#】+【6】: Restore factory defaults
4) 【*】+【#】+ Auto: Enter into the aging mode
6) 【*】+【#】+【4】: Menu set to English
8) 【#】+【#】+【0】: Switch the video format to 1080P60
10)【#】+【#】+【2】: Switch the video format to 1080I60

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

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

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

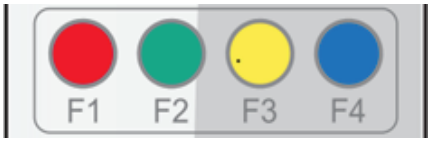
17)【#】+【#】+【9】: Switch the video format to 720P25

【12)【#】+【#】+【4】: Switch the video format to 720P60

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

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

3. AI Tracking Control Keys



【F1】：Turn off AI Tracking

【F2】：Turn on AI Tracking

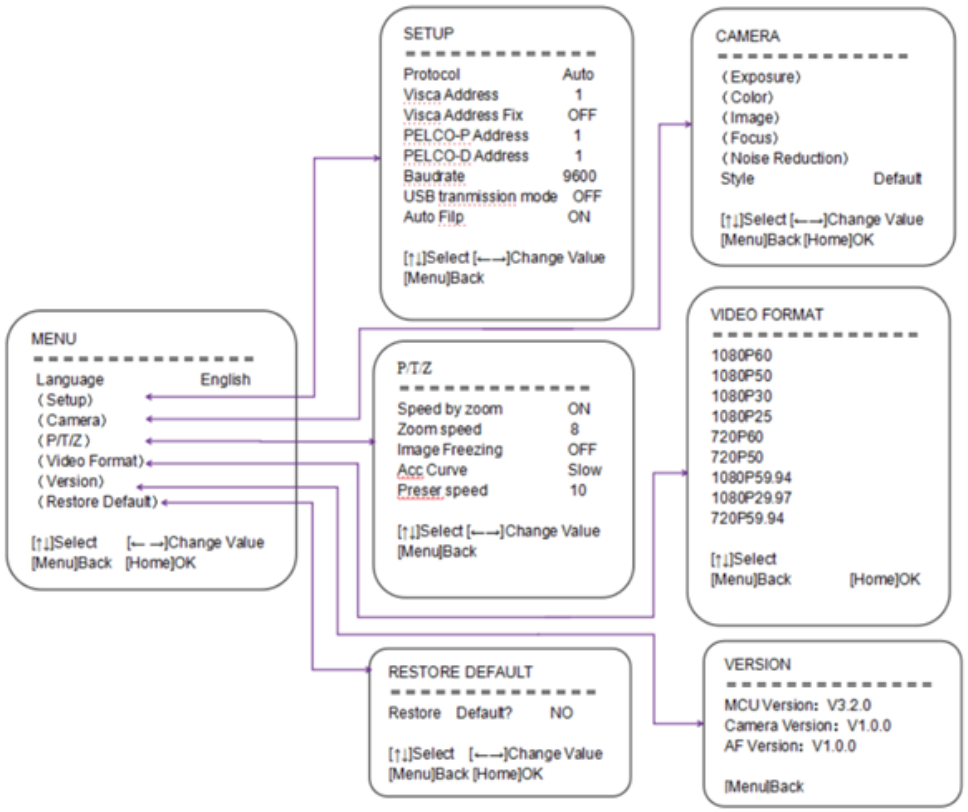
【F3】：Toggle between real time tracking mode and region tracking mode

【F4】：Change the tracking target in real tracking mode

3.3 OSD Menu

1. Setting the camera's IR address number

To enter the OSD menu, press "MENU" on the remote. Use the arrow keys to navigate this menu/change values. Press "HOME" to enter the next menu.



4. Web interface and settings

4.1 Accessing the Web Interface

To connect the A-TC02 OnyxCam to network, connect an Ethernet cable to its RJ-45 port and plug it into a switch or router. comes with a static default IP address 192.168.5.163.
Use an Ethernet cable to connect the camera to network. OnyxCams come with a static default IP address 192.168.5.163. To change the camera's IP address, connect to the camera using a computer and set the computer to be in the same network as the camera. If you know how to do this, continue to "4.2 Camera Web Interface".

If you do not know, then please first make sure that the computer is in the same network segment as the camera. Thus, computer must also have an IP address 192.168.5.xxx. If you are using Windows, open Settings -> Advanced network settings -> Change adapter options. In the menu that opens, double-click on your Ethernet adapter, click on Properties -> Internet Protocol Version 4 and click on Properties. Select "Use the following IP address" and type in an IP address that matches the camera's network segment, for example 192.168.5.160. Click on the empty field in "Subnet mask" and let it auto-fill to 255.255.255.0. Then press "OK" to save your settings. You should now be able to access the camera by typing its IP address 192.168.5.163 in a browser.

This process is demonstrated on the ADENA Limited YouTube channel in video "26. How to Change the IP Address of your AREC Device".

4.2 Web Interface Introduction

After you land on the camera's web page, use the default username and password "admin" to access it.
There are three pages on the web interface of A-TC02:

- Preview
- Monocular tracking
- Configuration

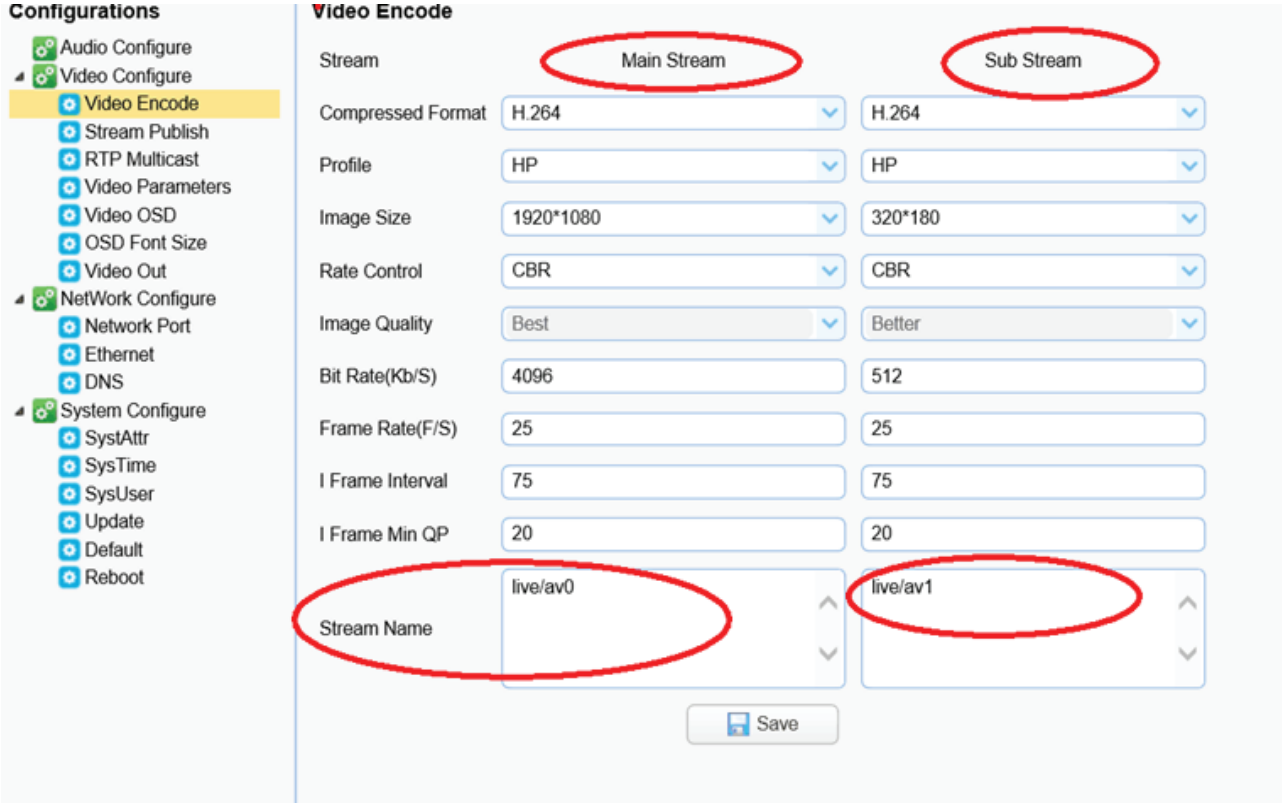
After logging in, you will see the camera's preview. You can control its PTZ from this page, change focus modes, save and go to presets, and control other options, including audio and streaming.

Tracking settings can be adjusted on the “Monocular tracking” page and is described in “4.5 Tracking Settings.”
Camera’s streaming, image, and other settings can be changed in the “Configuration” page. This page is described in headings 4.3 and 4.4.

4.3 Configuration – Streaming

1). Configuring the camera’s video encoding

OnyxCam’s streaming settings can be changed in the “Configuration” page. Click on it, then proceed to -> Video Configure-> Video Encode



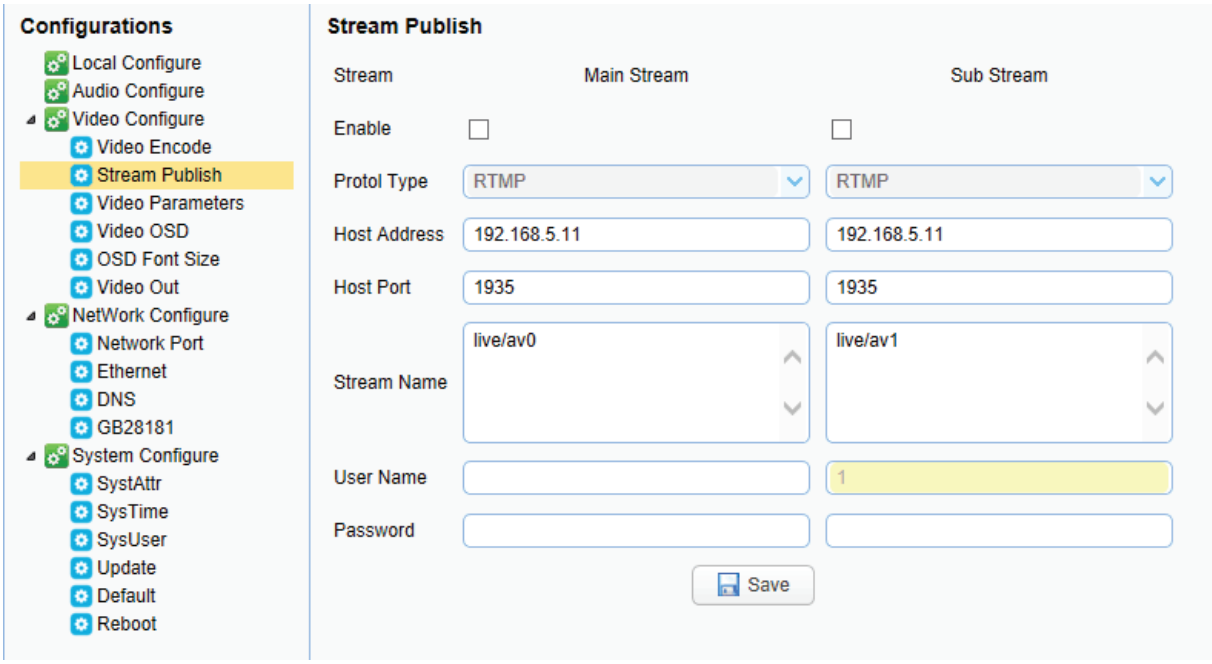
You can change the parameters to better suit the camera’s network environment
To access the camera via RTSP (or to use it via RTSP), use the following link structure:
rtsp://IP address of the camera/stream name (by default it is live/av0 for the main stream and live/av1 for the sub stream. These can be changed in the “Stream Name” fields).

Thus, if there are no changes to the camera's IP or settings, you should be able to access its RTSP stream by entering either of the links below in your network media player or hardware:

rtsp://192.168.5.163/live/av0（av0 main stream）
rtsp://192.168.5.163/live/av1（av1 sub stream）
The same link structure applies if you want to use RTMP:
rtmp://192.168.5.163/live/av0（av0 main stream）
rtmp://192.168.5.163/live/av1（av1 sub stream）

2). Publishing the camera's stream

OnyxCam can be used to stream to RTMP servers. Related settings can be changed in the "Configuration" page. Click on it, then proceed to -> Video Configure -> Stream Publish



Please note that the camera must be on the public network to stream to public network servers. For this you will also need to configure DNS, thus make sure to go to the Network Configure -> DNS page and fill out the fields accordingly. Your organization should inform you which DNS should be used, but you can use Google's public DNS 8.8.8.8 and 8.8.4.4 if there are no restrictions. You must reboot the camera for these network changes to take effect.

To set up streaming, first, fill out the fields accordingly:

Host address: this should be the server's address. Either a domain name or an IP address. Host port: server default port number

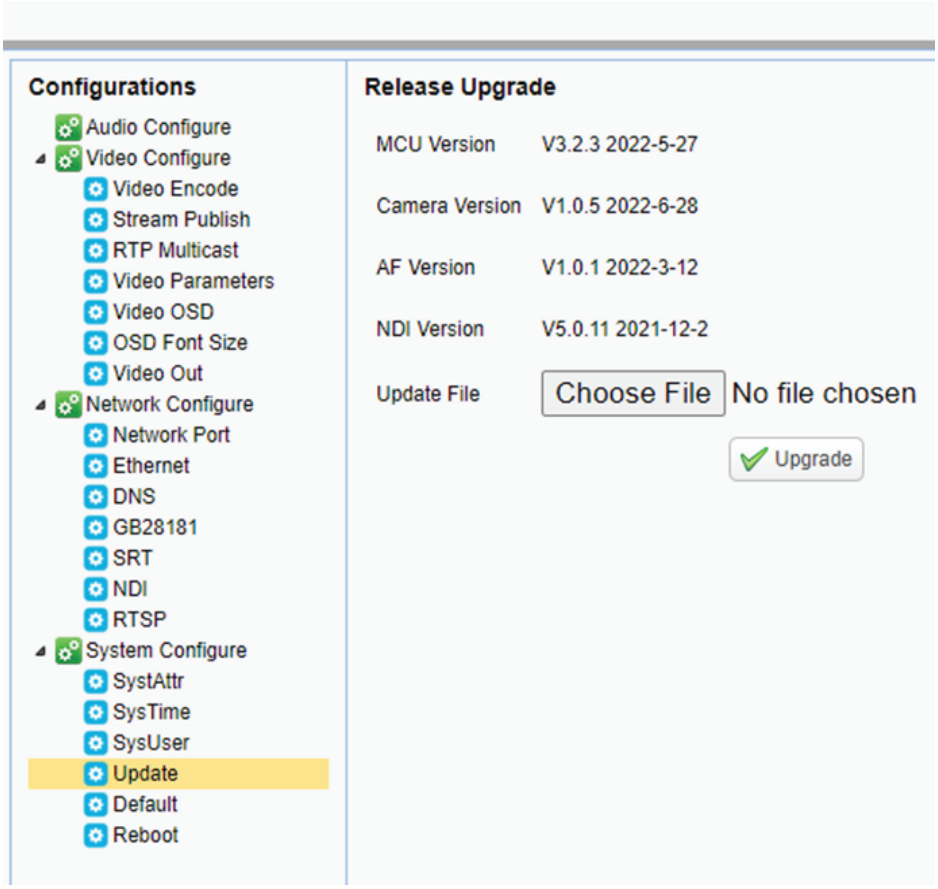
Stream name: enter the stream key in this field.
Username and password: enter the username and password set by the server in these fields if required

After you fill out the required information, tick the box under the main and/or sub stream to publish your camera's stream.

The stream can then be accessed via network media players by typing the information in the following format:
rtmp://host domain name:host port/live/xxx
rtmp://host IP address:host port/live/xxx

4.4 Configuration – Firmware Update

The camera's firmware can be updated via the "Configuration" page of the web interface. Click on it, then System Configure -> Update. You can find out if there is a new firmware update for your camera on www.a-dena.com -> Firmware & Applications page.

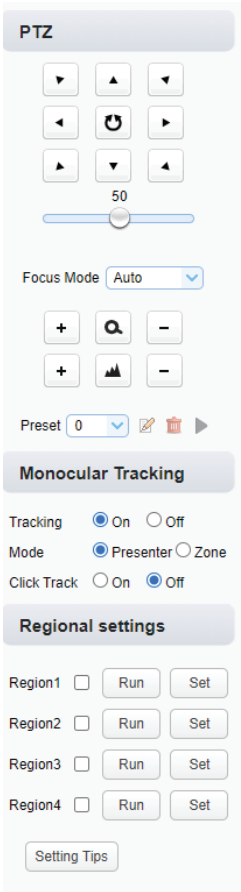


To update firmware, click “Browse”, select the .mrg file update file, then click “Upgrade”. Your camera will reboot after completing the firmware update. Login again after it finishes to check if the new version is in place.

It may be possible that for certain new features to take effect you will need to do a factory reset after updating the camera. You can double-check with your vendor or at www.a-dena.com if this is needed in your case. To do a factory reset, click on “Default” under “System Configure”, then click on “Restore factory defaults”.

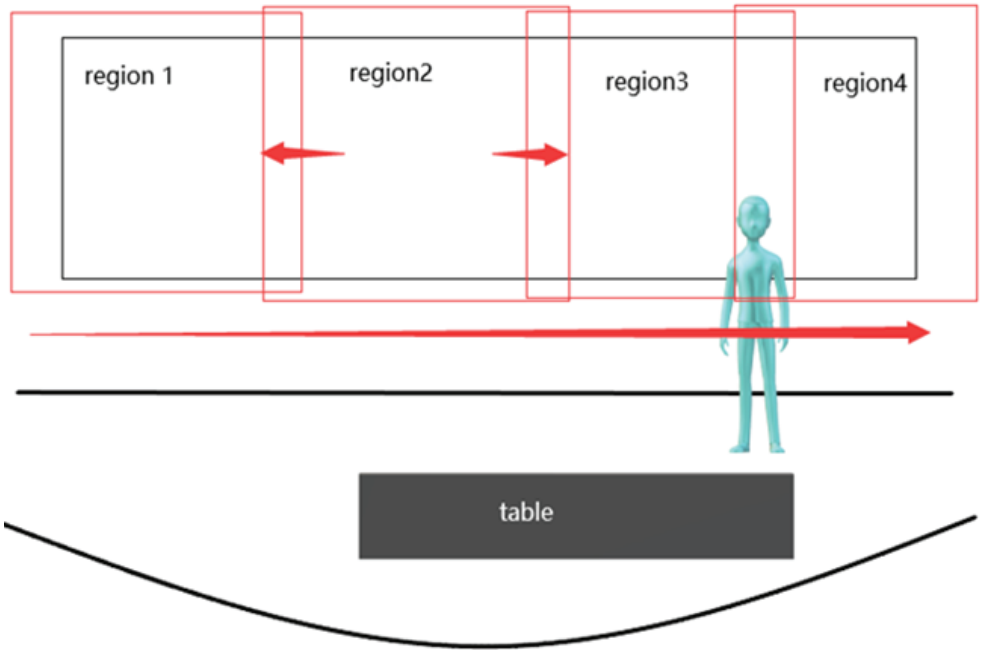
4.5 Monocular Tracking - Tracking Settings

The camera’s tracking settings are configured on the “Monocular Tracking” page.
To enable tracking, select “On” under the “Monocular Tracking”.
OnyxCam supports two different tracking modes – “Presenter” and “Zone”.



“Presenter” mode is the default tracking mode and it will make the camera track the first person it saw. The camera will automatically adjust zoom based on the person’s position relative to the camera. Please note that manual PTZ controls will not work while this tracking mode is active.
“Zone” mode allows you to configure up to 4 regions/presets that the camera will move to when a person walks into that region. Regions must overlap and be continuous – please refer to the image below for reference.
All regions are set in the same way:

1. Turn off the tracking.
2. Use the PTZ controls to move the camera in your desired position and zoom level.
3. Tick the box next to the region you are configuring, then click “Set” to save that preset position for the region.
4. Repeat for other regions. You must set up at least 2 regions for this tracking mode to work. Up to 4 regions are supported.



Another option that you can see under Modes is called "Click Track". When it is set to "On", the camera will continuously draw squares on faces of people that are in its field of view. The camera's active tracking target is marked with a yellow square, whereas other potential tracking targets are marked with green ones. You can click on any of the green squares in the preview window on this page to change the tracking target accordingly.

If the option is set to "Off", you will not be able to change the tracking target from the web interface. However, please keep in mind that it is still possible to change the tracking target via the camera's remote controller (by pressing F4).

5. Serial Port Communication Port

In normal working state, you can control the camera through RS232/RS485 (VISCA IN) cable. The parameters of RS232 are as below:
Baud rate: 2400/4800/9600/115200/second
Start Bit：1 bit；
Data Bit：8 bit；
Stop Bit：1 bit；
Verification Bit：None.
After powering on, the camera runs a self-check and then returns back to its center position.
The zoom lens is pulled to the farthest position, and then pulled back. The self-check is completed at that point.

5.1 VISCA

5.1.1 VISCA Protocol List

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

z = device address + 8

Error Messages		
	Command packet	Remark
Syntax Error	z0 60 02 FF	Returned when the command format is different or when a command with illegal command parameters is accepted.
Command Buffer Full	z0 60 03 FF	Indicates that two sockets are already being used (executing two commands) and the command could not be accepted when received.
Command Canceled	z0 6y 04 FF(y: Socket No.)	Returned when a command which is being executed in a socket specified by the cancel command is canceled. The completion message for the command is not returned.
No Socket	z0 6y 05 FF(y: Socket No.)	Returned when no command is executed in a socket specified by the cancel command, or when an invalid socket number is specified.
Command Not Executable	z0 6y 41 FF(y: Execution command Socket No. Inquiry command: 0)	Returned when a command cannot be executed due to current conditions. For example, when commands controlling the focus manually are received during auto focus.

5.1.2 Camera Control Commands & Operation of the Camera.

Command	Function	Command Packet	Remark
AddressSet	Broadcast	88 30 0p FF	p：Address setting
IF_Clear	Broadcast	88 01 00 01 FF	I/F Clear

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) - 7(high)
	Wide(Variable)	8x 01 04 07 3p FF	
	Direct	8x 01 04 47 0p 0q 0r 0s FF	pqrs: Zoom Position
	Stop	8x 01 04 08 00 FF	

Command	Function	Command Packet	Remark
ACM _Focus	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	
	One Push mode	8x 01 04 38 04 FF	
	One Push Triger	8x 01 04 18 01 FF	One Push Triger
CAM _Zoom Focus	Direct	8x 01 04 47 0p 0q 0r 0s 0t 0u 0v 0w FF	pqrs: Zoom Position tuvw: Focus Position
CAM_AF Sensitivity	High	8x 01 04 58 01 FF	Focus sensitivity Setting
	Normal	8x 01 04 58 02 FF	
	Low	8x 01 04 58 03 FF	
CAM_AF Zone	Top	8x 01 04 AA 00 FF	Focus Region Setting

Command	Function	Command Packet	Remark
	Center	8x 01 04 AA 01 FF	
	Bottom	8x 01 04 AA 02 FF	
	ALL	8x 01 04 AA 03 FF	
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	
	3500K	8x 01 04 35 07 FF	
	4500K	8x 01 04 35 08 FF	
	5500K	8x 01 04 35 09 FF	
	6000K	8x 01 04 35 0A FF	
	7000K	8x 01 04 35 0B FF	
	One Push Trigger	8x 01 04 10 05 FF	One Push WB Trigger (Enabled during One Push WB mode)

Command	Function	Command Packet	Remark
CAM_AWB Sensitivity	Low	8x 01 04 A9 00 FF	WB Sensitivity Setting
	Normal	8x 01 04 A9 01 FF	
	High	8x 01 04 A9 02 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
	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_ Bgain	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
CAM_AE	Iris priority	8x 01 04 39 0B FF	Iris Priority Automatic Exposure mode

Command	Function	Command Packet	Remark
	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	Reset	8x 01 04 0C 00 FF	Gain Limit Setting
	Up	8x 01 04 0C 02 FF	
	Down	8x 01 04 0C 03 FF	
	Gain Limit	8x 01 04 2C 0p FF	p: Gain Position
CAM_Bright	Reset	8x 01 04 0D 00 FF	Bright Setting
	Up	8x 01 04 0D 02 FF	

Command	Function	Command Packet	Remark
	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 8x 01 04 4E 00 00	
	Direct	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

Command	Function	Command Packet	Remark
	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_Low-Light Mode	ON	8x 01 04 2D 01 FF	Low-Light Mode Setting
	OFF	8x 01 04 2D 00 FF	
CAM_Gain		8x 01 04 4C 00 00 0p 0q FF	pq：0-20
CAM PresetSpeed		8x 01 01 0p FF	p：1-10
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	
	Up	8x 01 04 02 02 FF	
	Down	8x 01 04 02 03 FF	Aperture Control
	Direct	8x 01 04 42 00 00 0p 0q FF	pq: Aperture Gain
CAM_Picture effect	B&W-Mode	8x 01 04 63 04 FF	Picture effect Setting

Command	Function	Command Packet	Remark
	OFF	8x 01 04 63 00 FF	
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 49 00 00 00 0p FF	
CAM_IDWrite		8x 01 04 22 0p 0q 0r 0s 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%
SYS_Menu	ON	8x 01 04 06 06 02 FF	pqrs: Camera ID (=0000 to FFFF)
	OFF	8x 01 04 06 06 03 FF	Turn on the menu screen
IR_Receive	ON	8x 01 06 08 02 FF	Turn off the menu screen
	OFF	8x 01 06 08 03 FF	IR (remote commander) receive On/Off

Command	Function	Command Packet	Remark
CAM_Setting Reset	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
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	

Command	Function	Command Packet	Remark
	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 07 00 0W 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	W:1 UpRight 0:DownLeft YYYY: Pan Limit Position (TBD) ZZZZ: Tilt Limit Position (TBD)

Command	Function	Command Packet	Remark
	Clear	8x 01 06 07 01 0W 07 0F 0F 0F 07 0F 0F 0F FF	
Tracking	Tracking OFF	81 0A 01 32 00 00 03 00 FF	Tracking OFF/ON
	Tracking ON	81 0A 01 32 00 00 02 00 FF	
	Real time tracking mode	81 0A 01 32 00 00 02 00 FF	
	zone tracking mode	81 0A 01 32 00 00 02 01 FF	

5.1.3 Inquiry Command

Command	Command Packet	Return Packet	Remark
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
		y0 50 04 FF	One Push mode
CAM_FocusPosInq	8x 09 04 48 FF	y0 50 0p 0q 0r 0s FF	pqrs: Focus Position
CAM_AFSensitivityInq	8x 09 04 58 FF	y0 50 01 FF	High
		y0 50 02 FF	Normal

Command	Command Packet	Return Packet	Remark
		y0 50 03 FF	Low
CAM_AFZoneInq	8x 09 04 AA FF	y0 50 00 FF	Front
		y0 50 01 FF	Beting
		y0 50 02 FF	Meeting
		y0 50 03 FF	Education
		y0 50 04 FF	Moving
		y0 50 05 FF	Middle
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
		y0 50 06 FF	6500K
		y0 50 07 FF	3500K
		y0 50 08 FF	4500K
		y0 50 09 FF	5500K
		y0 50 0A FF	6000K
		y0 50 0B FF	7000K
CAM_AWBSensitivityInq	8x 09 04 A9 FF	y0 50 00 FF	Low
		y0 50 01 FF	Normal
		y0 50 02 FF	High
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

Command	Command Packet	Return Packet	Remark
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 Position
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
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_PictureEffectMod-eInq	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.

Command	Command Packet	Return Packet	Remark
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_ColorSatura-tionInq	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: Camera ID
IR_ReceiveInq	8x 09 06 08 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
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

Command	Command Packet	Return Packet	Remark
CAM_VersionInq	8x 09 00 02 FF	y0 50 ab cd mn pq rs tu vw FF	ab cd : vendor ID (0220) mn pq : model ID rs tu：ARM Version vw：reserve
VideoSystemInq	8x 09 06 23 FF	y0 50 0p FF	P: 0~E Video format 0:1080P60 1:1080P50 2:1080i60 3:1080i50 4:1080P30 5:1080P25 6:720P60 7:720P50 8：1080P59.94 9：1080i59.94 A：1080P29.97 B：720P59.9
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

5.2 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

5.3 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. Maintenance and Troubleshooting

6.1 Camera Maintenance

1）If you are not going to use the camera for a long time, please keep it powered off.

2）Use a soft cloth or lotion-free tissue to clean the camera body.

3）Use a soft, dry lint-free cloth to clean the lens. If the camera is very dirty, clean it with a diluted neutral detergent. Do not use any type of solvent or harsh detergent, since they may damage the surface.

6.2 Important Notice

- Do not shoot extremely bright objects for a long period of time, such as sunlight, ultra-bright light sources, etc…
- Do not operate in unstable lighting conditions, otherwise the image may flicker.
- Do not operate close to sources of powerful electromagnetic radiation, such as TV or radio transmitters.

6.3 Troubleshooting

- No image

1. Check whether the power cord is connected, that voltage is OK, and that the power LED is lit.

2. Check whether the camera does the self-check after its startup (camera will briefly pan and tilt and return to the home position, or if preset 0 is set, the camera will return to the preset 0 position).

3. Check that the cable you are using to get the camera's image (USB/HDMI/S-DI/Network) is connected correctly.

- Abnormal display of image

1. Check settings of the rotary dial on the rear of camera. Be sure to use the resolution and refresh rate that is supported by your software.

- Image is shaky or vibrating.

1. Check whether the camera is mounted solidly or sitting on a steady horizontal and level surface.

2. Check the building and any supporting furniture for vibration. Ceiling mounts are often affected by building vibration more than wall mounts.

3. Any external vibration that is affecting the camera will be more apparent when in tele zoom (zoomed in).