[i-Nova3 Series]

[User Manual]

NOVITEC
Vision Intelligence

CONTENTS

1. About this manual

This manual introduces how to prepare i-Nova3 cameras and start development for acquiring images.
See other API manual and example projects for programming information.
For more information, visit Novitec Support Community.
(https://cafe.naver.com/novitecsupport)

2. Important Information

2.1. Important Safety Instructions

- We cannot and do not take any responsibility for the damage caused to you or to any other equipment connected to the camera.
- Handle the camera with care. Avoid strong impact, and do not store non-recommended environment.
- Do not use non-recommended accessories as they may cause hazards.

2.2. Operating Considerations

2.2.1. Important Safety Notes

- Check product specifications and supply power that matches the camera specification.
- The product should be placed away from heat sources such as radiators, heat registers, stoves or other products that produce heat (including amplifiers).
- Take care that flammable substances, water, or metal does not enter inside of the camera.
- Do not modify the camera or use the camera with external covers removed.
- Stop using the camera at the approach of electrical storm or thunder.
- Protect the camera from rain or snow if using it outdoors.
- Board-Level Cautions
  - Handle with care and avoid damage of electrical components by electrostatic discharge (ESD).
    - Please use grounding to respond ESD.
    - Avoid all plastic, vinyl, and Styrofoam around printed circuit boards.
    - Do not touch components on the printed circuit board with your hands or with conductive devices.

2.2.2. Handling And Cleaning

- Do not attempt to disassemble camera.
- When installing or removing a lens or filter, take care that water or dust does not enter inside of the camera.
- Use the air blower or lens brush to remove dust in lens or optical filter.
- Do not disassemble front flange.
- Clean the case with soft dry cloth.
- Do not use the cleaner like Benzene, thinner, alcohol, water, or spray.

2.2.3. Installing

- Avoid installing or storing the camera in the following environments.
- Environments exposed to direct sunlight, rain, or snow.
- Environments where combustible or corrosive gas exists.
- Excessively warm or cold environment (Operating ambient temperature: 0 ~ 45℃)
- Humid or dusty environment.
- Place subjected to excessive vibration or shock.
- Environment exposed to strong electric or magnetic field.
- Do not aim the camera lens at the sun or other very strong light sources.
- Please be sure to contact us if you want to use in bad conditions environments.

2.2.4. Performance and Lifetime

Please configure environment for camera operating specifications. When the camera is used under high ambient temperature, the internal parts may deteriorate, resulting in shorter life span. Additional cooling should be considered if applicable.

2.2.5. Connector

- When manufacturing I/O connector, please pay attention to the installation so that the wires fit well.
- Make sure the power is off before connecting or removing the connector.
- Do not pull the wire to avoid breaking the connector.

2.2.6. Adjusting the C-mount

i-Nova3 series is built with CS-mount. You can also use C-mount lenses by attaching an extension ring.

<Image> 1. i-Nova3 mount (CS) and extension ring (CS to C)

3. I-Nova3 Series Introduction

i-Nova3 Series is 4K high resolution ITS camera that supports ONVIF, GigE Vision and GenICam.
Refer to chapter 9 Appendix for camera specifications.

<Image> 2. i-Nova3 Camera

<Image> 3. i-Nova3 Zoom Camera

4. Getting Started

4.1. System Requirements

- OS: Microsoft Windows 10(32bit / 64bit), Linux (32bit / 64bit / ARM64)
  (However, Novitec Camera Viewer for Windows is only supported 64bit OS.)
- H.265 hardware encoding supported graphics card
- 100Mbps or 1Gbps supported Ethernet card
  (Recommend Intel Ethernet Card for stable connection.)
- Web Browsers: Modern browsers such as Chrome, Firefox, and others.
  (Internet Explorer is also supported but, user cannot acquire H.264 and H.265 streams.
  Refer 6-3 to get more information.)

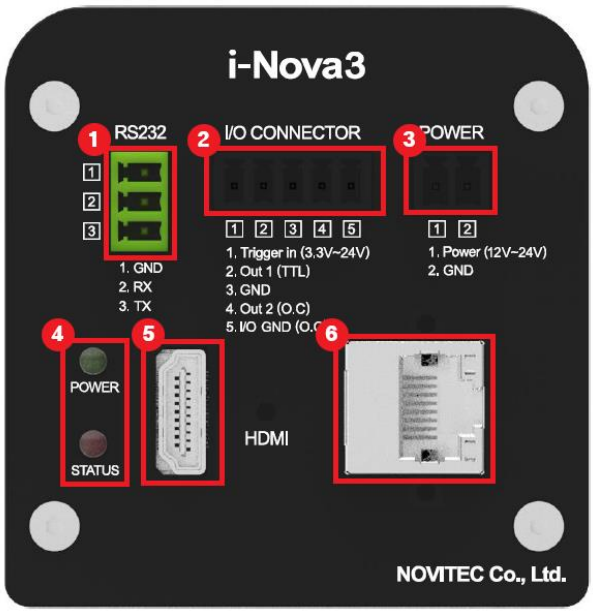
4.2. Novitec SDK

Novitec SDK supports C++ and C#. (However, Linux only supports C++.)
Novitec SDK can be downloaded from our website.
(https://www.novitec.co.kr/its/sub/support03.php?category=SDK)

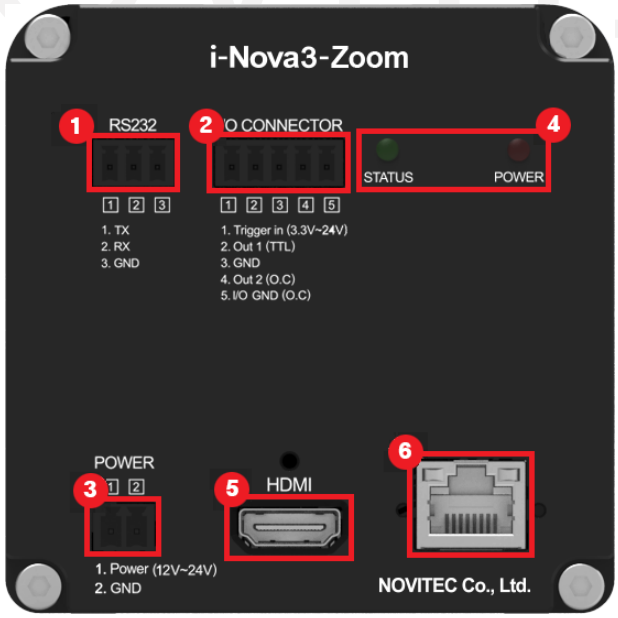
5. Camera Installation and Preferences

5.1. Camera Ports

There is power, I/O, Ethernet, HDMI and RS232 ports on the back side as below.



<Image> 4. i-Nova3 Back Side Ports



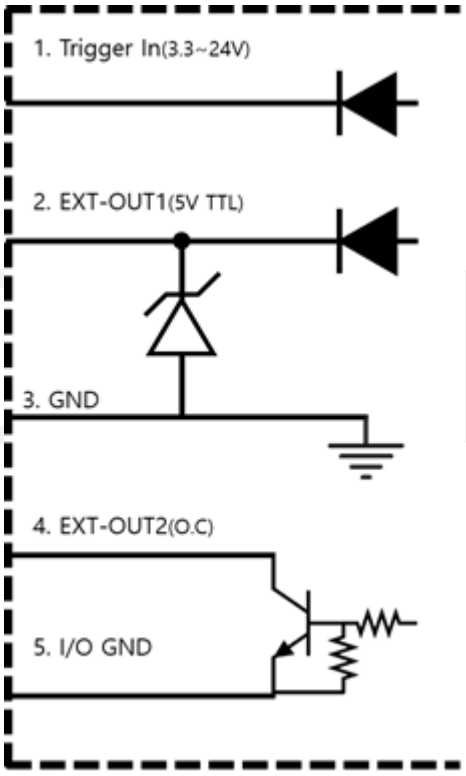
<Image> 5. i-Nova3 Zoom Back Side Ports

① RS232

② I/O: Port for using external trigger or strobe.

Pin	Signal	Description
1	Trigger In (3.3V ~ 24V)	Input Trigger (3.3V ~ 24V)
2	Out 1(TTL)	Output
3	GND	GND
4	Out 2(O.C)	Output
5	I/O GND (O.C)	I/O GND (O.C)

<Sheet> 1. I/O Connector Pin Map



<Image> 6. i-Nova3 Series GPIO Circuit

2 and 3 of the I/O ports are TTL. Use this port when using normal lighting. But, when using open collector lighting, use 4 and 5 of the I/O ports.
In this case, to clearly represent the HIGH and LOW signals, a pull-up resistor must be connected inside the lighting device to which it is connected. To minimize time of rising and time of falling, resistor optimization is required. In this regard, please refer to the example of resistor values below.

High(V)	Low(V)	Rising(tr) (us)	Falling(tf) (us)	Pull-up Resistor (kΩ)
5	0.65	18	0.5	2.2
12	0.88	18	0.72	3.6
24	1	20	1	4.7

<Sheet> 2. Pull-up Resistor Table

Also, if open collector circuit with pull-up resistor connected in port of 4 is used, the opposite signal of the applied signal is output according to the characteristics of the circuit.
When applying a HIGH signal in output, circuit is connected, and output is connected to GND and output LOW signal. On the contrary, when apply a LOW signal, circuit is disconnected, and output is connected to 12V and output HIGH signal.

③ Power: Port for supplying camera power, 12V ~ 24V input available

Pin	Signal	Description
1	Power (12V ~ 24V)	Camera power, Input 12V ~ 24V
2	GND	Power ground

<Sheet> 3. Power Connector Pin Map

④ Status LED: Power LED is light up when power is connected.

⑤ HDMI: HDMI connector

⑥ Ethernet: Network port. Green LED lights up when network is connected, orange LED lights up when sending and receiving data.

5.2. Connection

1. Connect 12 ~ 24V to the 2-pin power female connector. And then, connect it to ③power connector.
2. Connect network cable to ⑥Ethernet port and Ethernet port on PC.
   (When using DHCP, connect network cable to router, switch, hub, and others with DHCP server available.)

5.3. SDK Installation

Run the provided Novitec Camera SDK Installer to install the SDK.

5.4. Network Settings

When the camera is connected at the first time, camera IP settings option is set to DHCP and LLA (Link Local Address) by default. When the camera is failed to connect a DHCP server, the IP address is set by using LLA.

5.4.1. Network Settings with DHCP

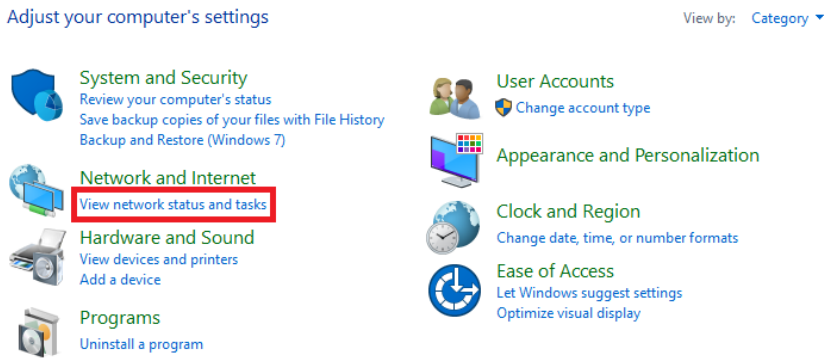
When the camera is connected for the first time, camera IP settings option is set to DHCP. When using camera first time, the camera does not require any special settings when the camera is connected to a network with a DHCP server.

5.4.2. Network Settings with Persistent IP

When the camera is connected to the PC directly, IP settings of the camera and PC's network adapter are required.

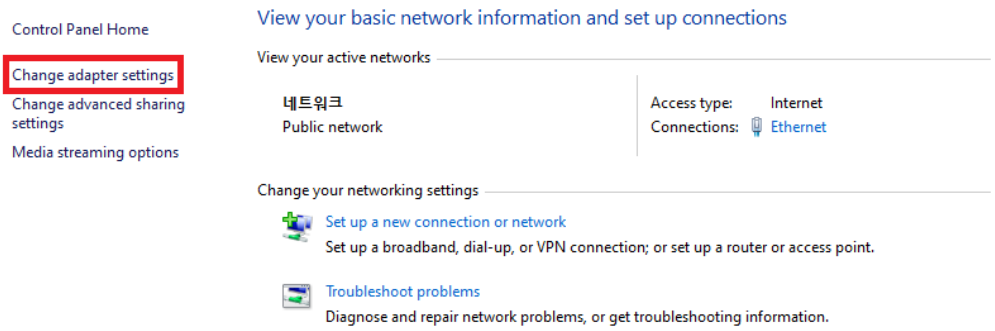
5.4.2.1. PC Network Adapter IP Settings

① Open control panel and click "View network status and tasks" below "Network and Internet".



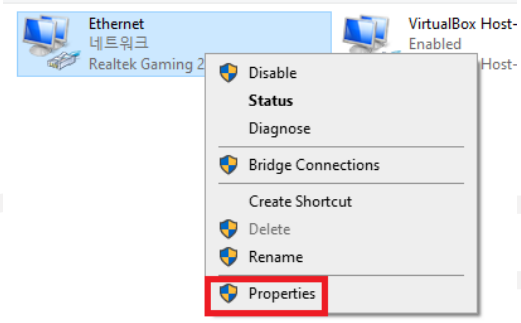
<Image> 7. Control Panel

② On the next screen, click "Change adapter settings" on the left.



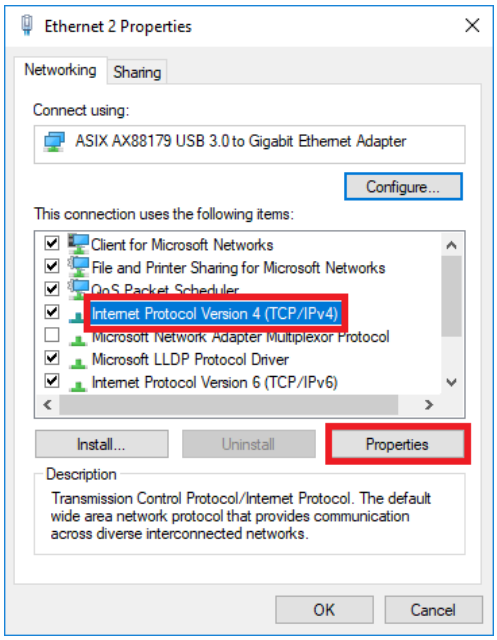
<Image> 8. Control Panel – Network Settings

③ Select and right-click network which camera connected in network list and click "Properties".



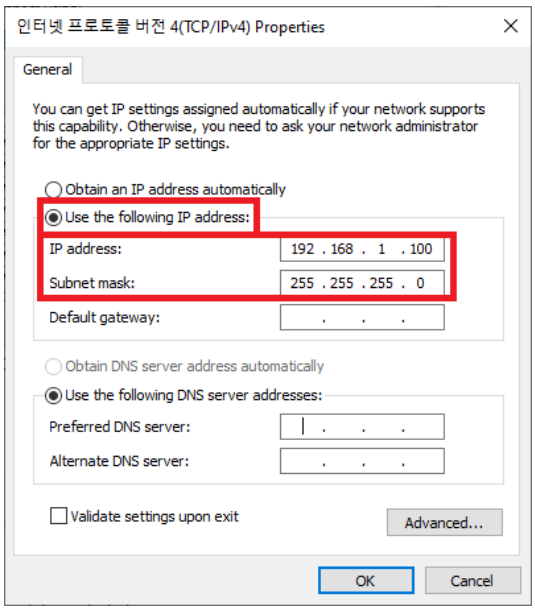
<Image> 9. Network Connection

④ Ethernet properties appears, select "Internet Protocol Version 4(TCP/IPv4)" and click "Properties."



<Image> 10. Ethernet Properties

⑤ In Internet Protocol Version 4(TCP/IPv4) properties screen, click "Use the following IP Address" and then, set up IP address and subnet mask.

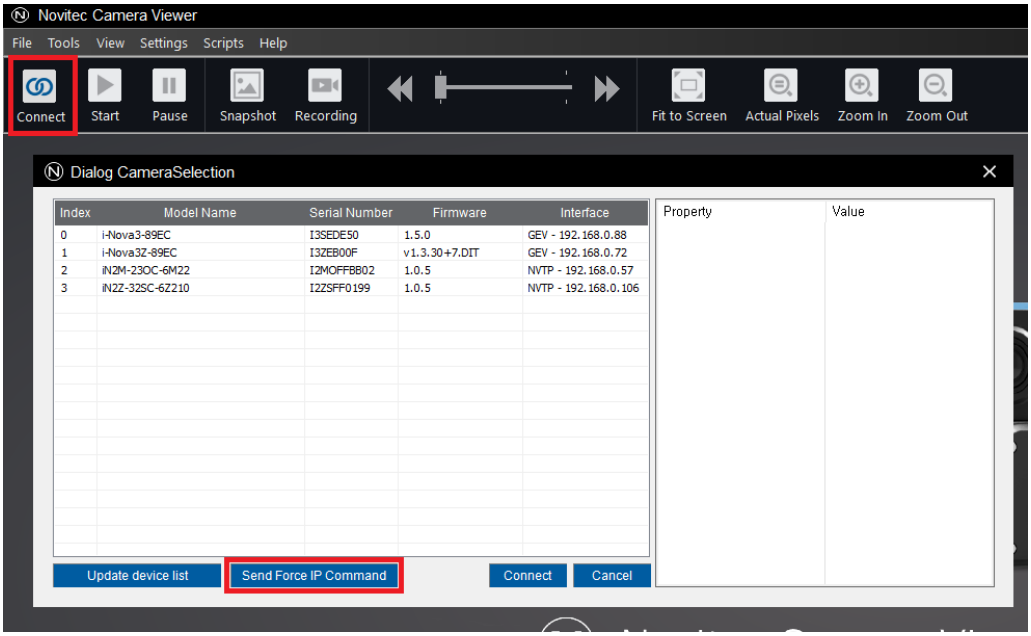


<Image> 11. IPv4 Properties

5.4.2.2. Camera IP Settings

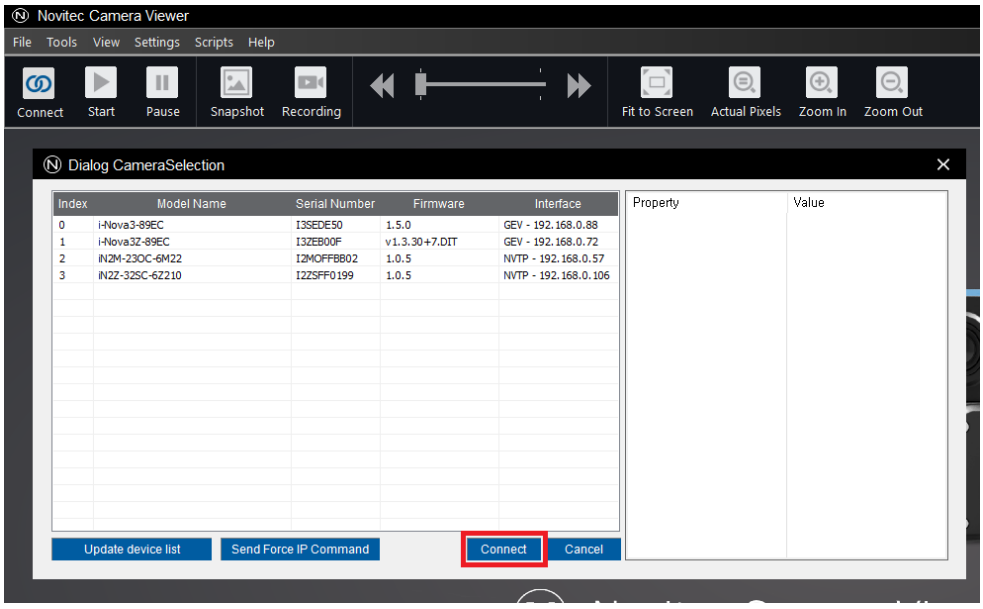
① Run the Novitec Camera Viewer included SDK.

② After running the viewer, when clicking "Connect" button on the top menu, a list of connected cameras is displayed. If IP band set on camera and IP band on network adapter are different, it is displayed in red as below. Click "Send Force IP Command" button to set a temporary IP in camera for communicating camera.



<Image> 12. Novitec Camera Viewer - Connect

③ If a camera in updated list is selected, temporarily assigned IP address is displayed. Select the camera and click "Connect" button to connect.
(If the changed IP is not shown immediately, click "Update device list" button to update camera list manually.)



<Image> 13. Novitec Camera Viewer -Connect (2)

④ After temporary IP address is assigned, the camera can be used immediately, but when the power is reset, IP settings are reset to default. Set up persistent IP to keep IP settings after camera is reset.
Persistent IP settings can be found in "TransportLayerControl" category.
Find "TransportLayerControl" category in settings window on the right, and change the following items:

GEV Current IP Configuration Persistent IP	True
GEV Persistent IP Address	IP address you want to use.
GEV Persistent Subnet Mask	Subnet mask you want to use.
GEV Persistent Default Gateway	Gateway you want to use.

<Sheet> 4. Persistent IP Settings

※The set IP must match the IP band in PC network adapter.
예) PC Network Adapter - IP: 192.168.0.100, Subnet: 255.255.255.0
Camera - IP: 192.168.0.128. Subnet: 255.255.255.0

⑤ After power reset, it is changed to the set persistent IP.

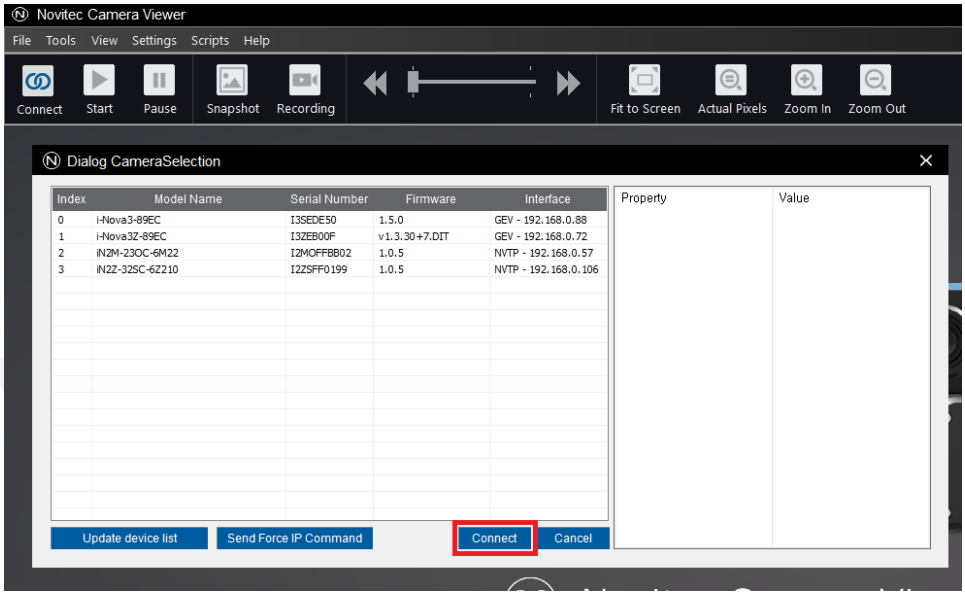
5.5. Account Setup for First Using

When connecting to camera for the first time, the user must set up ID and password. If you don't set ID and password, video streaming is limited.

5.5.1. How to find camera IP

5.5.1.1. Search camera with Novitec Camera Viewer

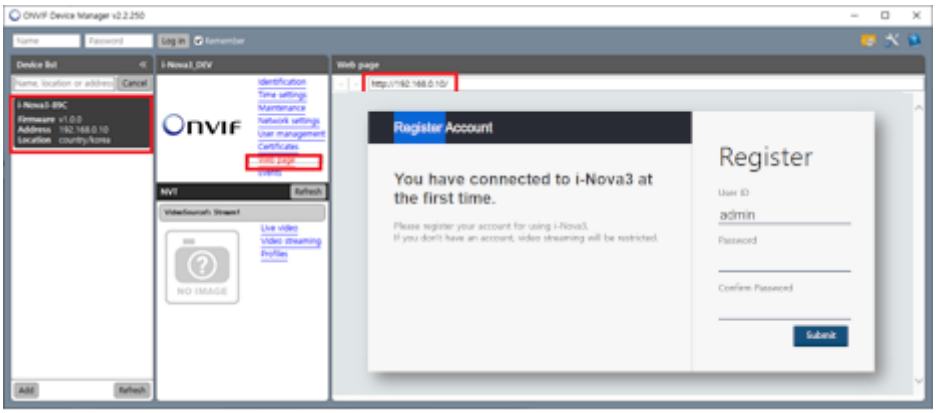
Launch Novitec Camera Viewer and click "Connect" button. Now, you can find connected camera and IP in camera selection list.



<Image> 14. Novitec Camera Viewer – Camera Search

5.5.1.2. Search camera with ONVIF

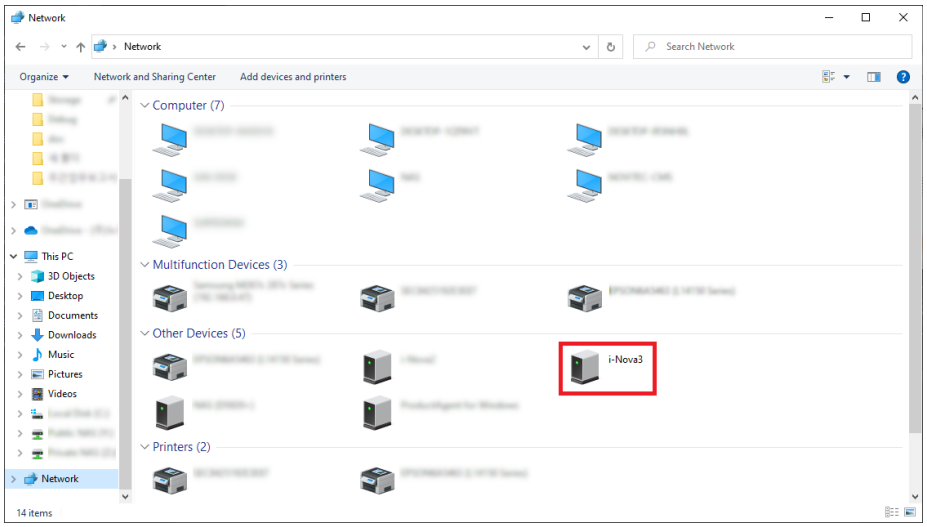
Launch ONVIF application such as 'ONVIF Device Manager'. Then, connect to camera and click "Web Page" button to open the web page.



<Image> 15. ONVIF Device Manager – Web Page

5.5.1.3. Search camera with UPnP

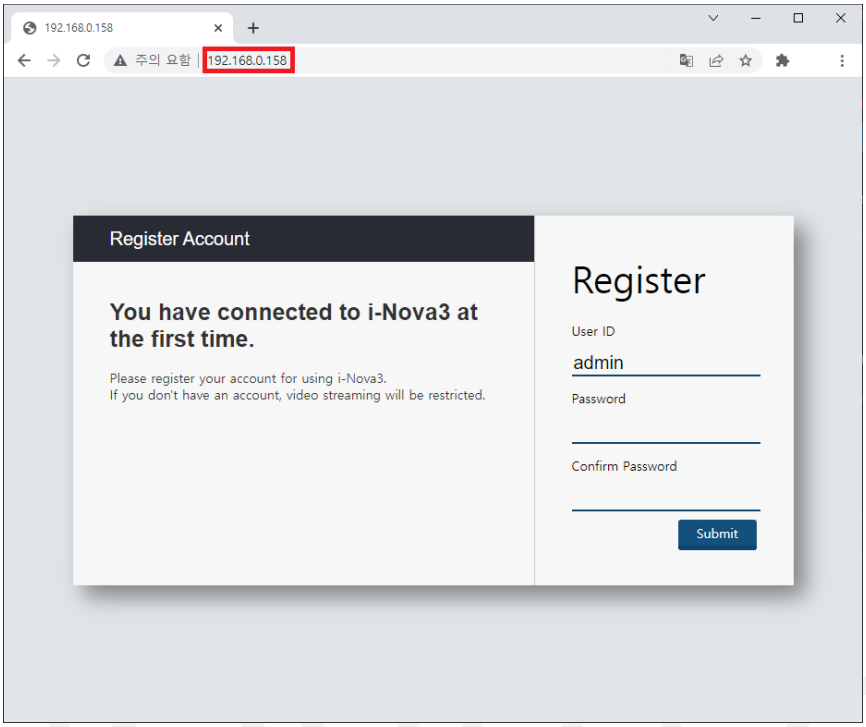
When clicking "Network" tab in Windows Explorer, network device list is displayed. Click "i-Nova3" in "Other Devices" to access the camera web page.



<Image> 16. Windows Explorer – Network Tab (Search with UPnP)

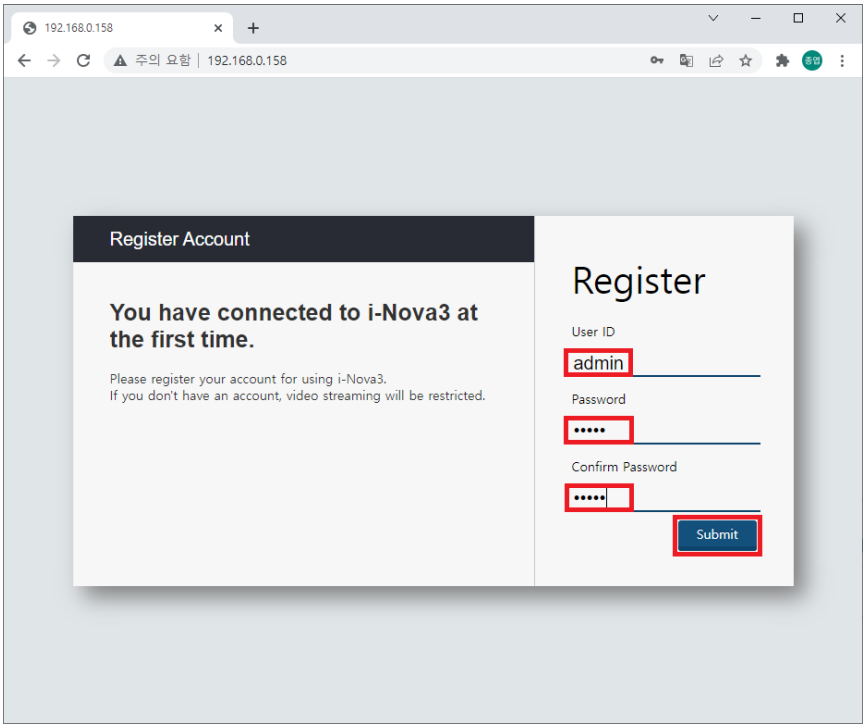
5.5.2. ID and Password Settings

① Open camera webpage.



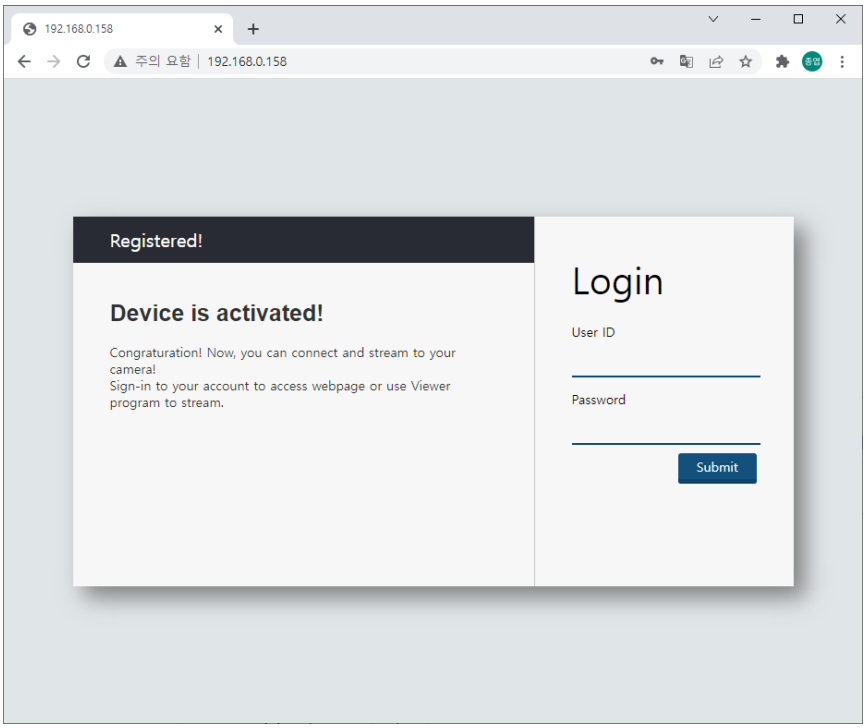
<Image> 17. Camera Web – 'Register Account' Page

② Enter ID and password to set and click 'Submit' button below.



<Image> 18. Camera Web – 'Register Account' Page (2)

③ When "Device is activated!" message is displayed, camera can be used.

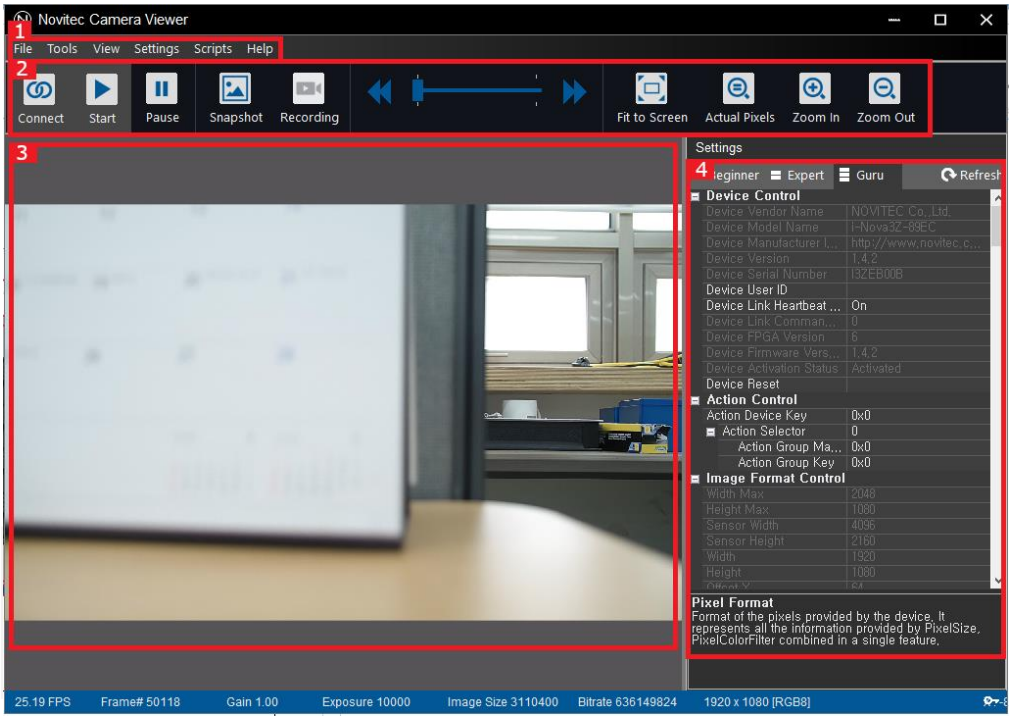


<Image> 19. Camera Web – Activation Page

6. Operation

6.1. Novitec Camera Viewer

Novitec Camera Viewer is a demo application software for controlling camera settings and acquiring images.



<Image> 20. Novitec Camera Viewer Main Screen

6.1.1. Screen Layout

① Menu

Name	Description
File	Connect camera, Snapshots, Close the application
Tools	Overlay Text, Histogram, Update Firmware, Viewer Settings
View	Zoom-In/Out, Fit to Screen, Actual Pixels, Console
Settings	Camera Settings, Exposure Tile Settings
Scripts	Load Script, Activate Script
Help	Program Info

<Sheet> 5. Menu List Sheet

② Toolbar

A toolbar is appended with frequently used camera control features. It includes screenshots, screen settings and, control features like camera connect, start, pause and others.

③ Screen

After camera acquisition is started, video is streamed on the screen.

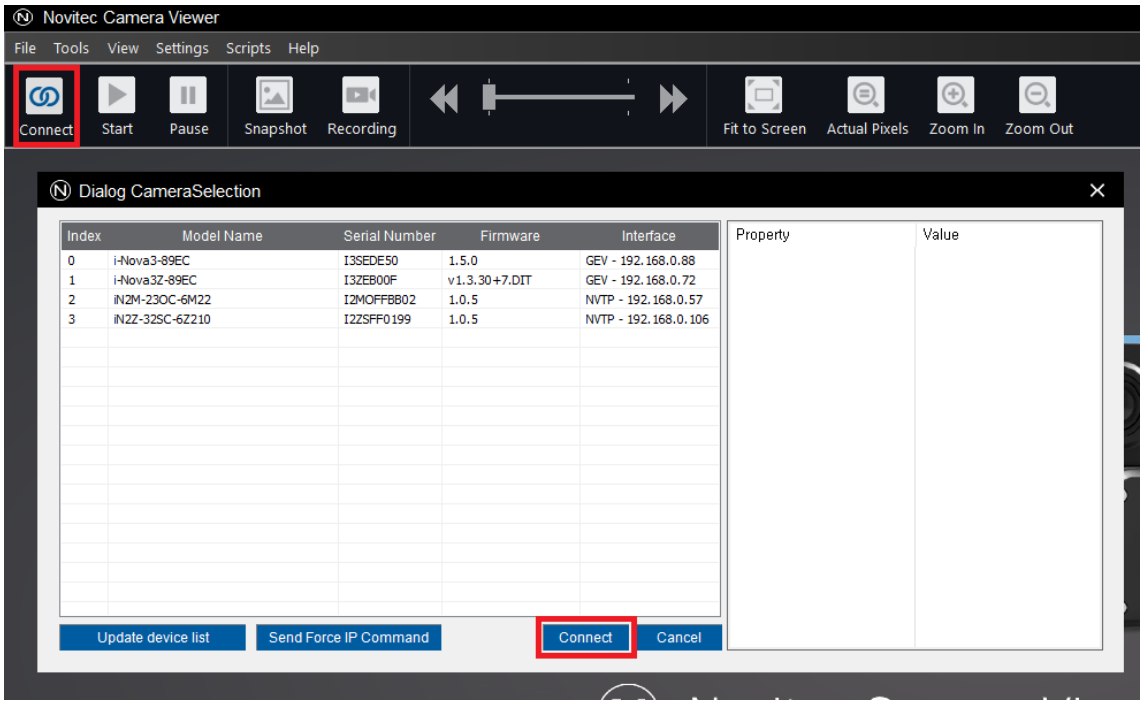
④ Settings
Settings about camera can be changed.

⑤ Status Bar
FPS, image information, bitrate, exposure, and others are displayed.

6.1.2. Camera Connection

① Launch 'Novitec Camera Viewer'.

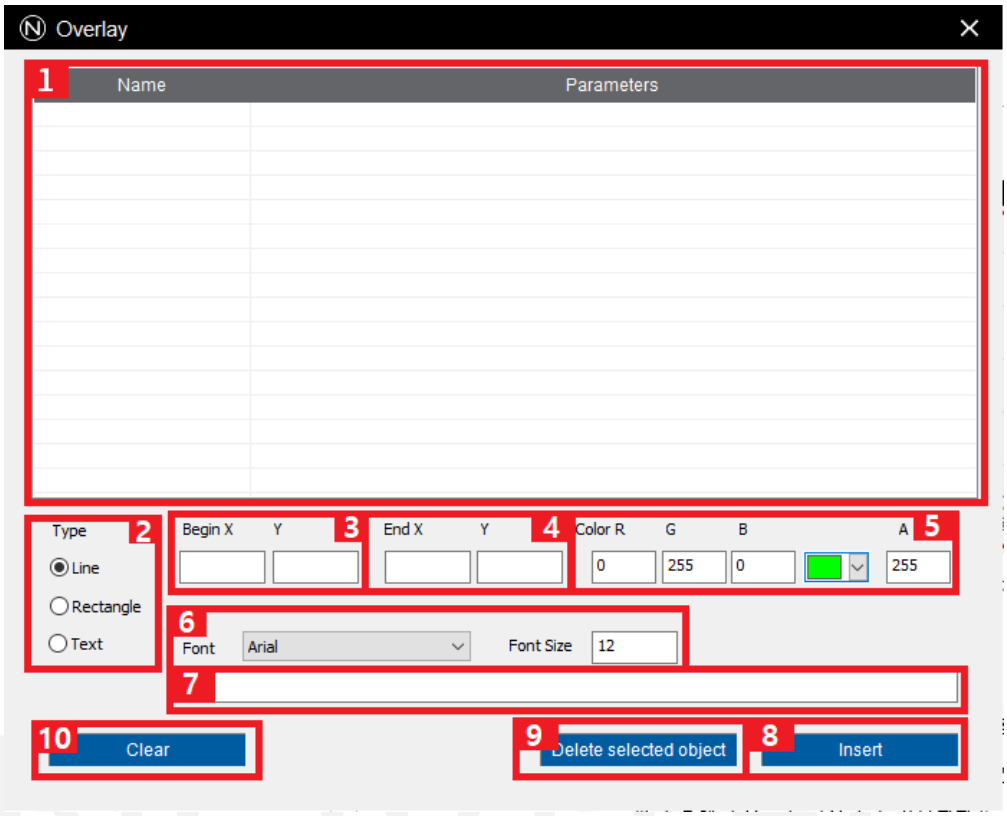
② A list of connected cameras is displayed when clicking "Connect" button on the top menu. And click camera to connect and click "Connect".



<Image> 21. Novitec Camera Viewer – Camera Connection

③ Click "Start" button on the top menu. Images are displayed in real time.

6.1.3. Overlay



<Image> 22. Overlay Feature

Overlay feature can draw lines, rectangles, and text on the screen.
(This feature is only visible in the viewer itself, not in other applications (RTSP Viewer like VLC Player)).

① List of registered overlay objects.

② Set object type to registered.

③ Set object start coordinate to registered. (X, Y)

④ Set object end coordinate to registered. (X, Y)

⑤ Set object color to registered. (A value is transparency.)

⑥ Set object font family and font size to registered. (Text only.)

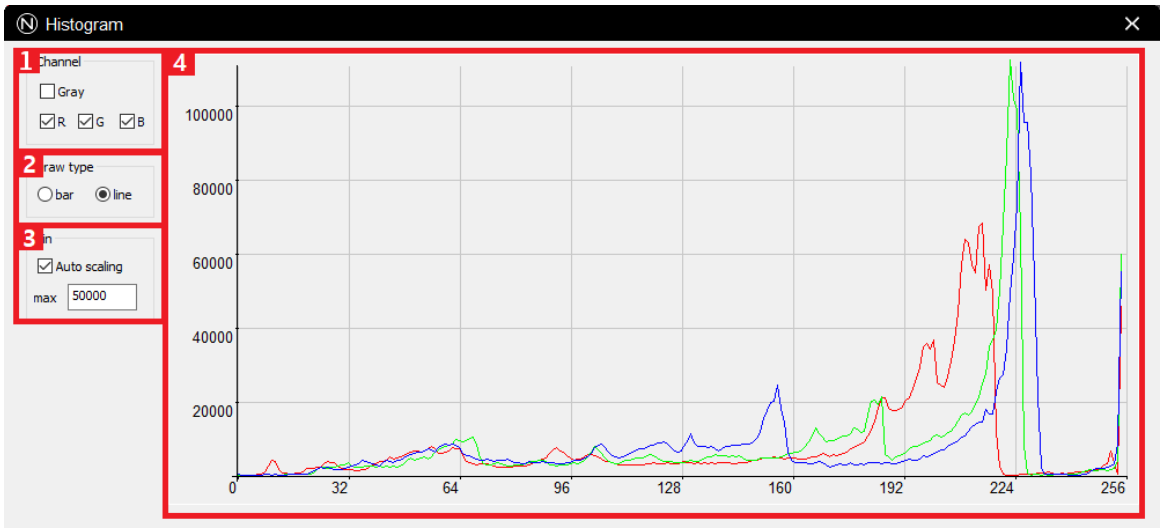
⑦ Set object text to registered. (Text only.)

⑧ Register the set object.

⑨ Remove selected objects.

⑩ Remove all registered objects.

6.1.4. Histogram



<Image> 23. Histogram Feature

This feature displays histogram.

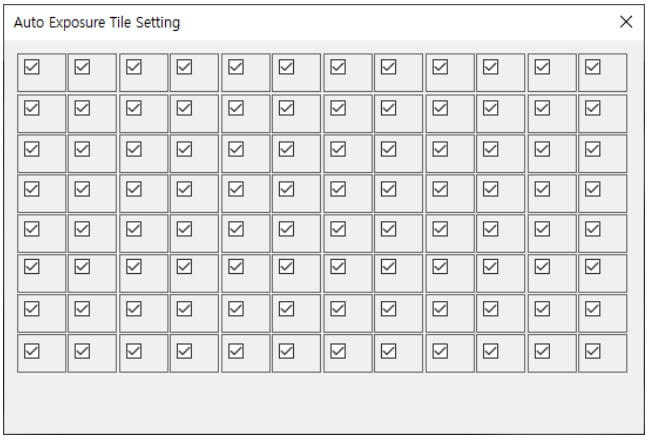
① Select channel to display.

② Select type of histogram (Bar, Line).

③ Set whether to automatically adjust the height of the histogram. (When unchecked, height can be set manually with max value.)

④ The screen where the histogram displayed.

6.1.5. Exposure Tile Settings

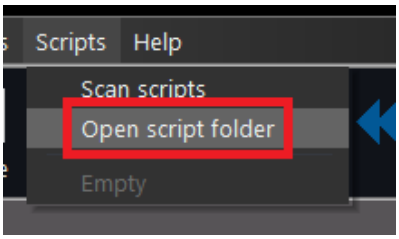


<Image> 24. Auto Exposure Tile Settings

Set up calculation range of auto exposure. Exposure is calculated for the selected range.
Refer chapter 8 to get more information.

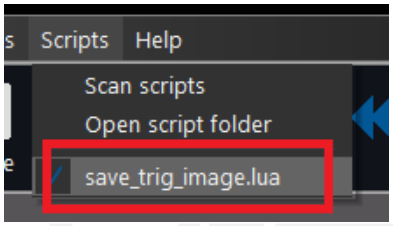
6.1.6. Scripts

Script can control camera with Lua script.
Example code of scripts is in Documents₩Novitec Camera SDK₩scripts.



<Image> 25. Open Script Folder

Click "Script" – "Open script folder" on the top menu and put it in the folder displayed, then click "Scan scripts" to load the script.



<Image> 26. Script Activation

Click loaded script to activate script.

6.2. Stream Settings

The camera has 3 streams (Stream A, B, C). Resolution and encoding mode (MJPEG, H.264, H.265) of each stream can be set individually. Max throughput of all streams is up to 267494400 pixels/s.
See below for initial stream settings of the camera.

Stream Name	Resolution	FPS
Stream A	3840x2160	30
Stream B	720x480	30
Stream C	3840x2160	1

<Sheet> 6. Default Resolution and FPS of Stream List

In this case, the throughput is as follows.

$$(3840 \times 2160 \times 30) + (720 \times 480 \times 30) + (3840 \times 2160 \times 1) = 267494400\ pixels/s$$

Encoding and image acquisition cannot be started if image resolution or FPS of specific stream is increased so that stream throughput exceeds the maximum. In this case, reduce other streams or FPS, disable stream, etc.

6.2.1. Encoding Mode

Encoding of each stream can be set MJPEG, H.264 or H.265. When changing the encoding mode, Transmission is restricted depending on the protocol being used.

Protocol	Viewer	Available Stream
GigE Vision	Novitec Camera Viewer	Stream A / MJPEG
RTSP	VLC Player and others	Stream A, B, C MJPEG, H.264, H.265 All streams available In case of MJPEG, if resolution is 2K or higher resolution, video is broken. (Refer 5.5.1 to get more information.)
ONVIF	ONVIF Device Manager, other NVR S/W and others	Stream A, B MJPEG, H.264 In case of MJPEG, if resolution is 2K or higher resolution, video is broken.

<Sheet> 7. Available Encoding by Protocol List

6.2.2. Bitstream Control

Bitrate control of each stream can be set to None, CBR or VBR.

① CBR
Constant Bitrate. This is a control method that always aims to output the same bitrate.
Related Feature: StreamACBRBitrate

② VBR

Variable Bitrate. Adjust bitrate variably. It is a method of allocating a smaller bitrate for a static video and a higher bitrate for a dynamic video.

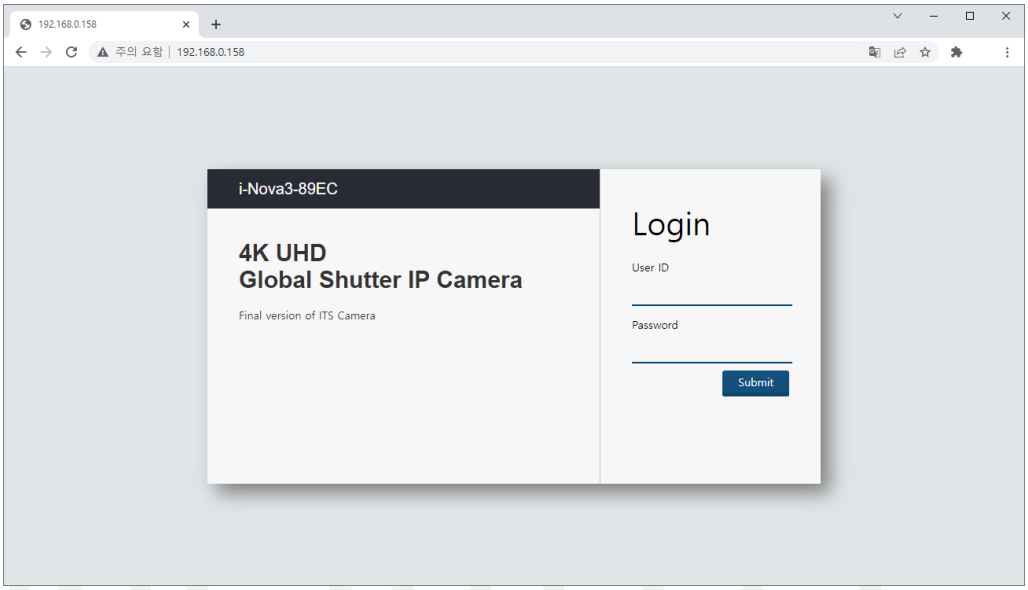
Related Feature: StreamAVBRBitrateMin, StreamAVBRBitrateMax

6.3. Web Page

On the web page of the camera, you can set initial password, display camera information, and stream videos.

Web URL: http://<Camera IP>

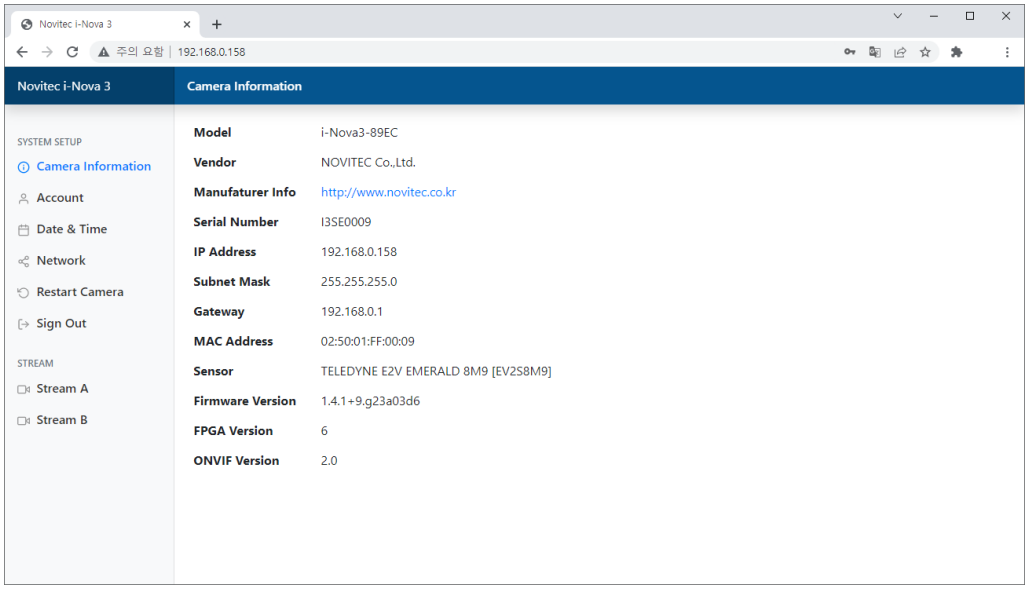
6.3.1. Login



<Image> 27. Camera Web Login Page

When accessing the camera web, sign in page appears. In this page, you can login with ID and password.

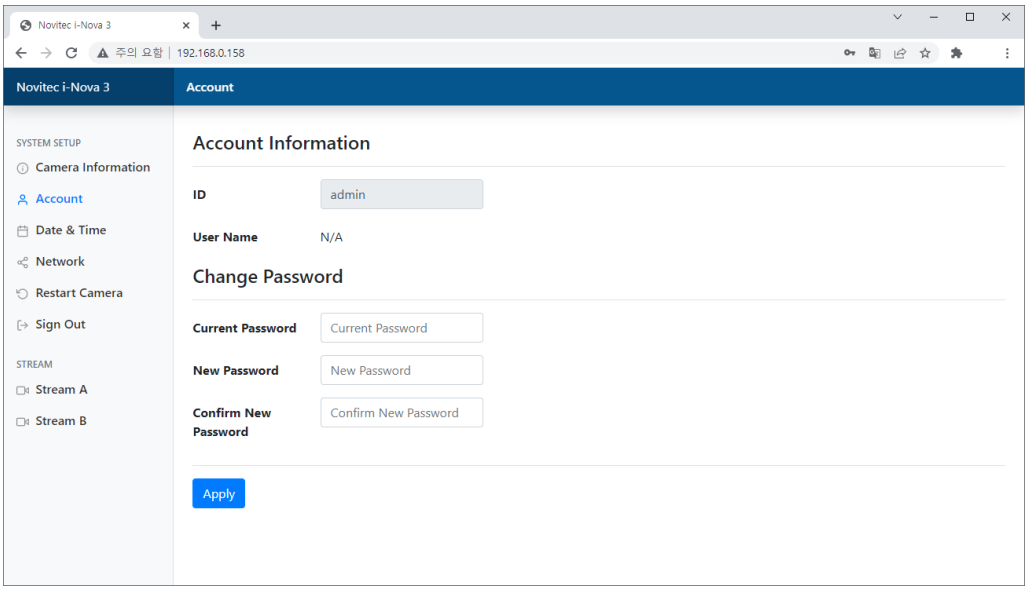
6.3.2. Camera Information



<Image> 28. Camera Web Camera Information Page

When signing in the camera, camera information is displayed.

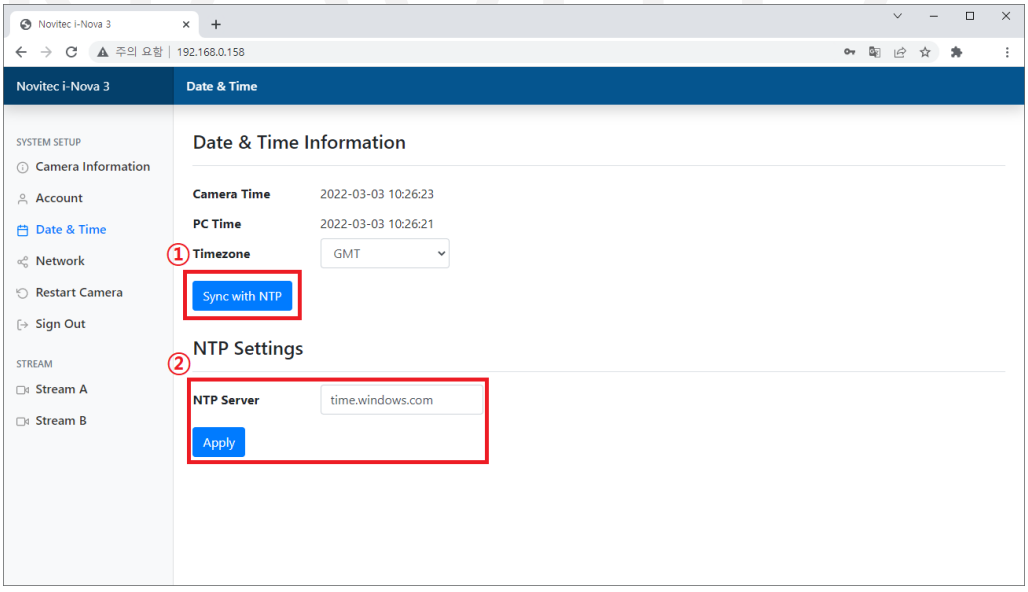
6.3.3. Account



<Image> 29. Camera Web Account Page

In this page, you can check your ID and can change the current password.

6.3.4. Date & Time



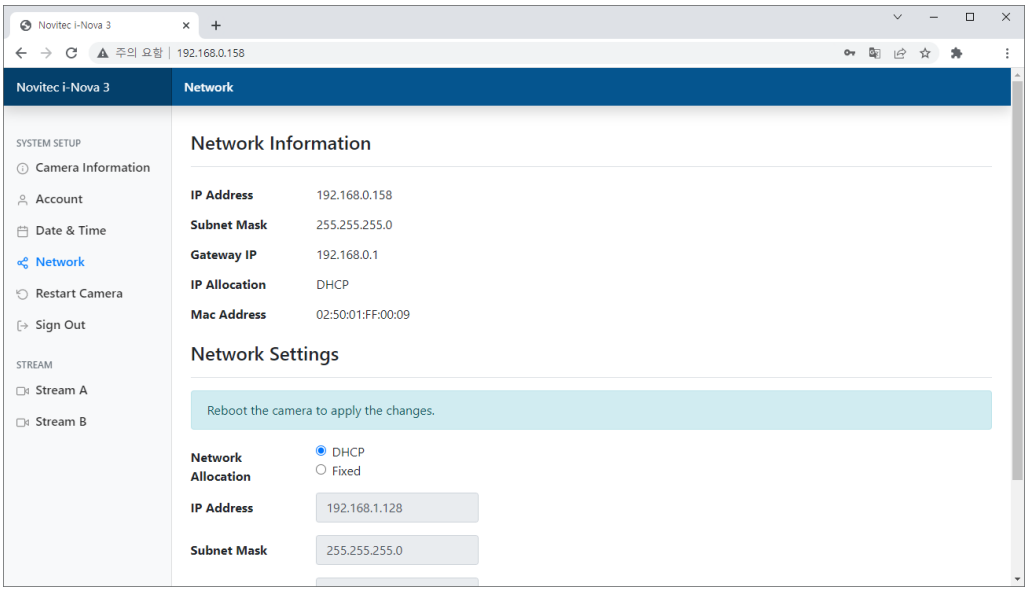
<Image> 30. Camera Web Date and Time Page

In this page, you can check time set on the camera and time of PC and can sync the time.

① When clicking “Sync with NTP”, camera time is synced with an NTP server.

② You can set up an NTP server.

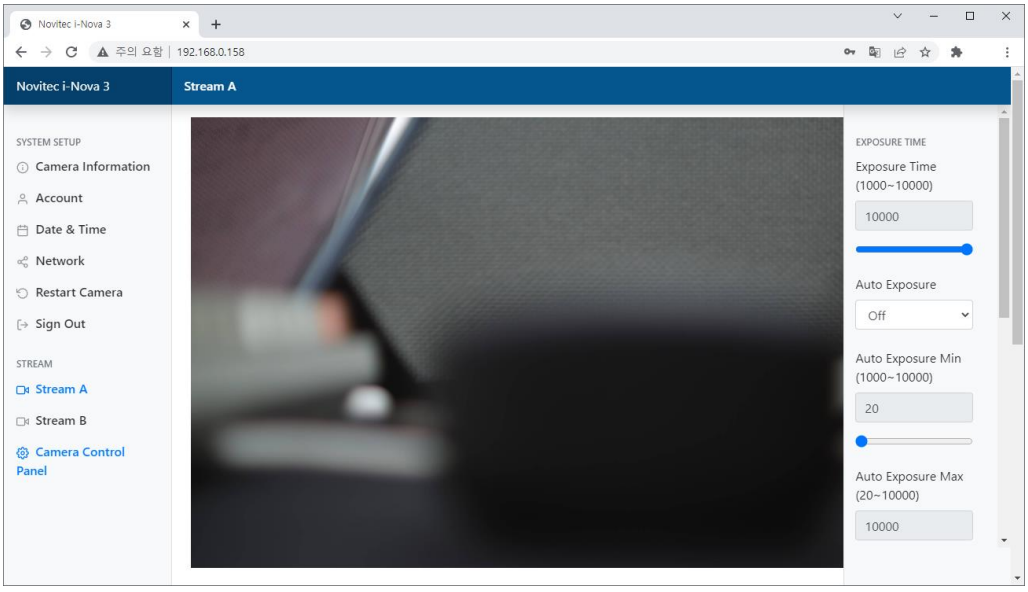
6.3.5. Network



<Image> 31. Camera Web Network Page

In this page, you can check network information of the camera, and configure network settings.

6.3.6. Stream



<Image> 32. Camera Web Stream Page

In this page, you can check camera stream on the web.

And, exposure and gain can be controlled to click “Camera Control Panel”.

(Supported Features: Exposure Time, Auto Exposure, Auto Exposure Min/Max, Gain, Auto Gain, Auto Gain Min/Max)

Encoding mode can be set in viewer and cannot be set in this page.

Only MJPEG and H.264 encoding can be streamed on the web, H.265 can’t be streamed.

For Internet Explorer, MJPEG encoding is supported only.

6.3.7. Other Menus

Restart Camera: Restart the camera.
Sign Out: Sign out in web.

6.4. RTSP Protocol

RTSP is a network protocol designed for real-time video streams. Each encoded stream images are transmitted to the client through the RTSP server operating in i-Nova3.

Stream	Stream URL
Stream A	rtsp://<Camera IP>/stream1
Stream B	rtsp://<Camera IP>/stream2
Stream C	rtsp://<Camera IP>/stream3

<Sheet> 8. RTSP URL by Stream

6.4.1. Limitation of MJPEG Image Size

In the RTSP standard, when streaming with MJPEG, width and height that can be assigned to Packet Header is limited to 2048 (https://tools.ietf.org/html/rfc2435).
To Compensate it, it can be used by arbitrarily adjusting the width and height of the RTP header received from the client.
Refer "testRTSPClient_MJPEG4K" example, you can check the following code.

```
unsigned width = (unsigned)headerStart[6] * 8;
unsigned height = (unsigned)headerStart[7] * 8;
if ((width == 0 || height == 0) && fDefaultWidth != 0 && fDefaultHeight != 0) {
  // Use the default width and height parameters instead:
  width = fDefaultWidth;
  height = fDefaultHeight;
}
if (width == 0) width = 256*8; // special case
if (height == 0) height = 256*8; // special case

if (width == 1792)            // 4K special case
    width = width + 2048;
if (height == 112)
    height = height + 2048;
```

<Image> 33. Code snippet of JPEGVideoRTPSource.cpp

When sending the image size of 2840x2160 pixels with RTSP, the resolution is reduced to 1792x112 because the size exceeds the max range in RTP Packet Header. To decode normally, add 2048 in received width and height and use. Refer "testRTSPClient_MJPEG4K" example to get more information.

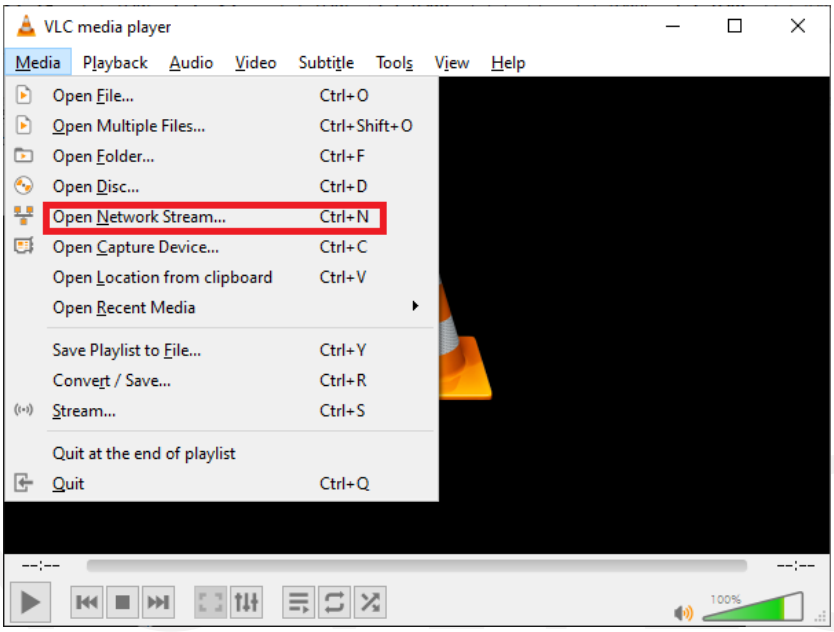
6.4.2. Acquiring in VLC Player

① Download and install VLC from the following link.
https://www.videolan.org/vlc/index.html

② Run the VLC installed.

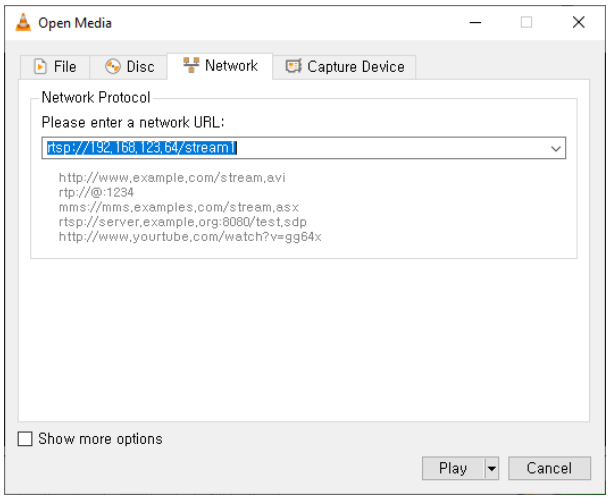
③ Check camera IP. (Refer 5.5.1 How to find camera IP.)

④ Select "Media" in VLC Player and click "Open Network Stream... ".



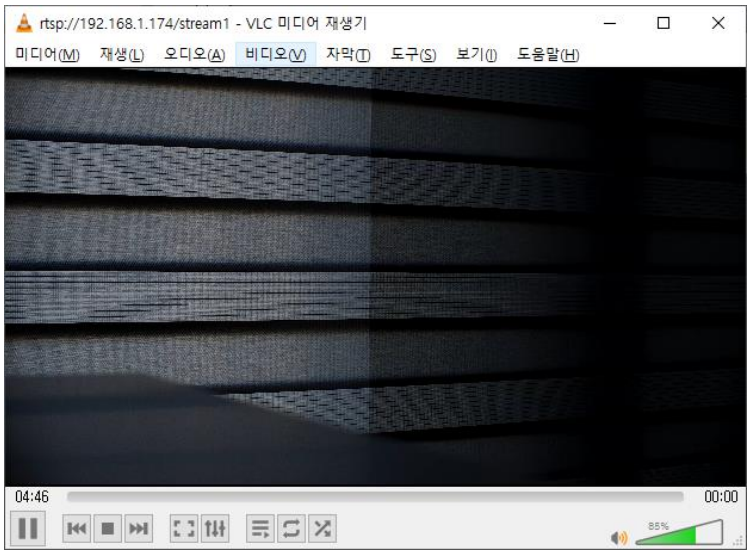
<Image> 34. VLC Media Player – Network Stream

⑤ Input the network address as below and click "Play".



<Image> 35. VLC Media Player – Open Network Stream

⑥ The stream is now played in VLC Player.



<Image> 36. VLC Media Player – Playing

6.5. Firmware Update

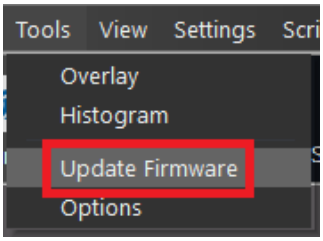
Firmware file is provided for updating when the camera feature changed, or bugs are fixed. The file extension of the provided firmware is *.nfw.

6.5.1. How to update FW in Novitec Camera Viewer

① Run the Novitec Camera Viewer.

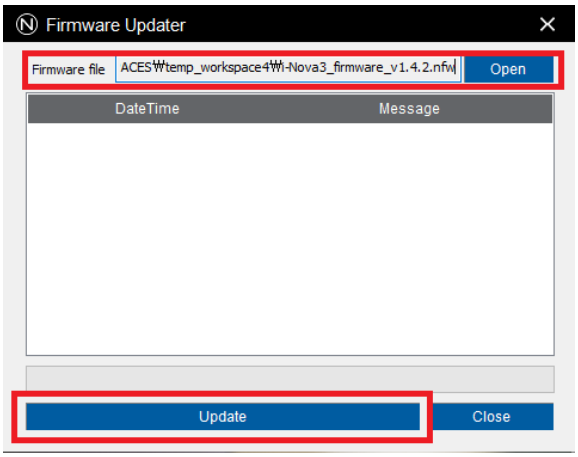
② Connect to the camera to update.

③ Select "Tools" on the menu, click "Update Firmware".



<Image> 37. Novitec Camera Viewer – Firmware Update Menu

④ Click "Open" and select firmware file and click "Update" to update.



<Image> 38. Novitec Camera Viewer – Firmware Update Window

⑤ After the update process is finished, reset the camera power.

7. Filters and Lenses

7.1. Filters

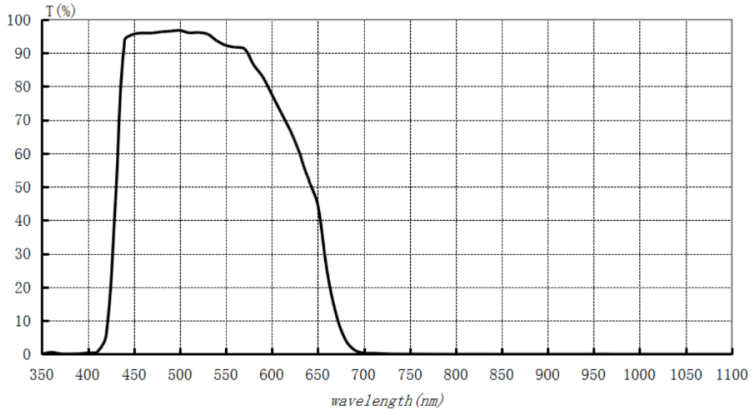
Filters out light in some wavelength bands that are input to the sensor, There are various types of filters for various effects, such as those that only accept light in a specific wavelength band.

Camera	Filter List
i-Nova3	IR Cut Filter, Bare Glass
i-Nova3 Zoom	IR Cut Filter, Fog Filter, Off

<Sheet> 9. Filters by camera List

7.1.1. IR Cut Filter

Sensor like CCD and others acquires IR regions that cannot be recognized by humans, so colors may look different. Therefore, using a filter that block IR regions for correction is recommended.



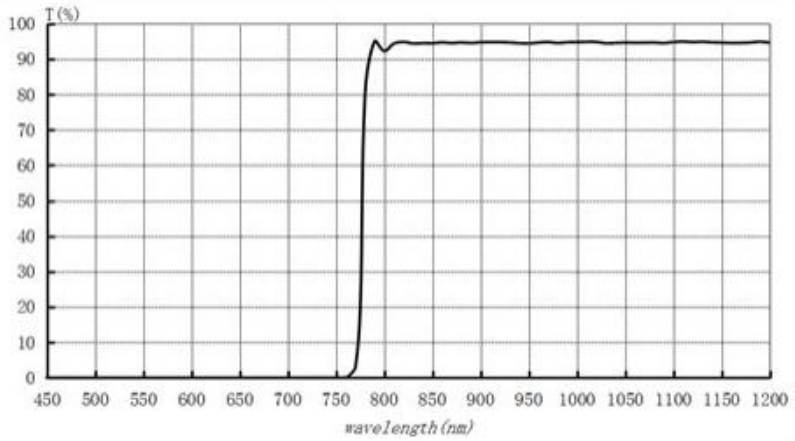
<Image> 39. IR Cut Filter Wavelength Bandwidth

7.1.2. Bare Glass

There is a focus difference between using IR Cut Filter and not using it, so a bare glass is used which compensates the focus difference even when IR Cut Filter is not used.

7.1.3. Fog Filter

Fog Filter is opposite concept to IR Cut Filter and is a filter that blocks light below 780nm band.



<Image> 40. Fog Filter Wavelength Bandwidth

7.2. Lenses (i-Nova3 Zoom)

i-Nova3 Zoom has a motor-controlled lens.

The specification of installed lens is as follows.

Lens	10 ~ 300mm(30x)
Lens Control	Motorized Zoom / Focus / Iris
Focal Range	0.5m ~ INF(Wide) / 7.0 ~ INF(Tele)
F-number	F1.5(Wide) ~ F5.5(Tele)

<Sheet> 10. i-Nova3 Zoom Lens Specification

The zoom, focus and iris of the lens can be controlled.

8. Features

8.1. Auto Exposure / Gain

Exposure Time		
Exposure Auto		
	Exposure Auto Lower Limit	
	Exposure Auto Upper Limit	
	Exposure Auto Speed	
	Exposure Auto Delay Images	
	Exposure Level	
	AE Metering Mode	
		Custom Metering Tile X
		Custom Metering Tile Y
		Custom Metering Tile Enable
	Auto Flash Mode	
		Auto Flash Max Exposure
		Auto Flash Min Exposure
		Auto Flash IO
		Auto Flash Control Switch
		Auto Flash Control Color Mode

<Sheet> 11. Exposure Feature List

Gain
Gain Auto
Gain Auto Lower Limit
Gain Auto Upper Limit

<Sheet> 12. Gain Features List

Exposure and gain are automatically adjusted based on the set brightness. Exposure and gain can be set separately for auto control.

When both exposure and gain are set to auto, the feature works based on the gain being 1.0.

When brightness increases, the exposure is increased first, and when the exposure value reached to the maximum, the gain is increased.

When the brightness reduces, the gain is reduced first, and when the gain reached to the minimum, the exposure is reduced.

When exposure and gain work in auto, the min and max ranges to be controlled can be set separately.

8.1.1. Auto Exposure Additional Features

① Exposure Auto Speed: Set the amount of change in the exposure value that increases or

decreases for each frame. (Slow, Medium, Fast)

② Exposure Auto Delay Images: Set how many frames auto exposure is used.

③ Exposure Level: Set the reference brightness value of Auto Exposure.

④ AE Metering: See 8.1.2 to get detail

⑤ Auto Flash: See 8.1.3 to get detail.

8.1.2. AE Metering

AE Metering can be set on how to calculate auto exposure.

① AE Metering Mode: Select calculus to use in auto exposure.
- Average: Calculate based on the average of the entire frame.
- Custom: Split frame into tiles of size 12x8, enable or disable specific tile and calculate based on the average of the enabled frames.

② Custom Metering Tile X: X coordinate of tile to select.

③ Custom Metering Tie Y: Y coordinate of tile to select.

④ Custom Metering Tile Enable: Select to active selected tile.

8.1.3. Auto Flash

Auto Flash function automatically turns on or off the flash lighting based on the exposure value.
(This is only applied when auto exposure is enabled.)

① Auto Flash Mode: Select whether to use Auto Flash Mode.

② Auto Flash Max Exposure: When value of auto exposure is bigger than this value, light turns on. (Day -> Night)

③ Auto Flash Min Exposure: When value of auto exposure is smaller than this value, light turns off. (Night -> Day)

④ Auto Flash IO: Set line of light to use in auto flash.

⑤ Auto Flash Control Filter Switch: Adjust filter switch in auto flash mode when enabled.
(When status is day filter is set IR Cut Filter, opposite, filter is set Bare Glass.)

⑥ Auto Flash Control Color Mode: Adjust filter switch in auto color mode when enabled.
(When status is night, stream is gray scale.)

8.3. Trigger

The trigger can acquire an image according to an externally input signal.
The related features are as follows.

Trigger Mode
Trigger Source
Trigger Activation
Trigger Software
Trigger Debounce Active
Trigger Debounce InActive
Pseudo Multishot Frame Count

<Sheet> 13. Trigger Features List

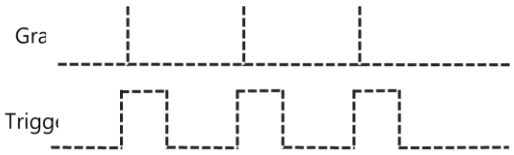
8.3.1. Trigger Mode

i-Nova3 supports Free Run, One Shot Trigger, Bracket Mode, Pseudo Trigger.

① Off
Acquire images according to the FPS set regardless of the external trigger signal.

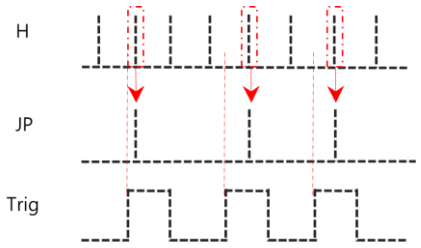
<Image> 41. Trigger Off Mode

② On (One Shot Trigger)
Acquire an image only when an external trigger signal is received.



<Image> 42. One Shot Trigger Mode

③ Pseudo Trigger Mode
When trigger signal is inputted while camera is working with specific FPS, it sends image close to the input timing.



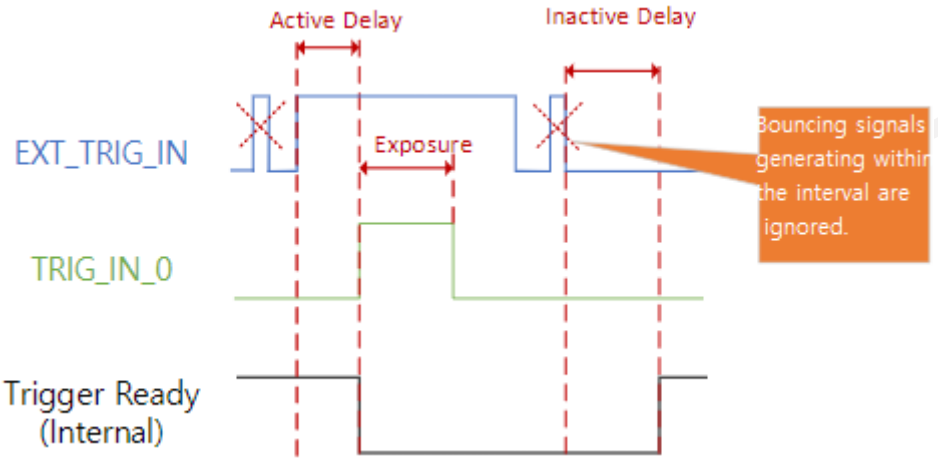
<Image> 43. Pseudo Trigger Mode

④ Bracket Mode
When an external trigger signal is occurred, a set number of images are taken. At this time, each image applies specified exposure time and gain, so that images with different brightness can be acquired sequentially.

⑤ Pseudo Multi-shot Trigger Mode
When trigger signal is inputted while camera is working with specific FPS, it sends a set number of images close to the input point.

8.3.2. Trigger Debouncing

This feature can be used to detect the noise in the trigger input and ignore it.



<Image> 44. Trigger Debouncing

① Active Delay
If the external trigger remains active for a specified amount of time, it is recognized as a trigger input. If the signal state changes within time, it is recognized as noise and ignored.

② Inactive Delay
When the external trigger remains inactive for a specified amount of time, it is recognized as trigger termination. Any signal generated before the signal is maintained and becomes Inactive is recognized as noise and ignored.

8.4. Features List

Below are the features list of i-Nova3. Most of features are compatible with GenICam SFNC. Customized features are colored sky-blue background in sheet.

8.4.1. Device Control

Feature	Type	Description	Visibility	Access
DeviceVendorName	String	Vendor Name	Beginner	RO
DeviceModelName	String	Model Name	Beginner	RO
DeviceManufacturerInfo	String	Manufacturer Info	Beginner	RO
DeviceVersion	String	Device Version	Beginner	RO
DeviceSerialNumber	String	Serial Number	Expert	RO
DeviceUserID	String	User-enterable Device ID	Beginner	RW
DeviceLinkHeartbeatMode	Enum	Heartbeat of Link Activation Status	Expert	RW
DeviceLinkCommandTimeout	Integer	Command timeout of device link.	Guru	RO
DeviceFPGAVersion	String	FPGA Version	Beginner	RO
DeviceFirmwareVersion	String	Firmware Version	Beginner	RO
DeviceActivationStatus	Enum	Device Activation Status	Beginner	RO
DeviceReset	Command	Reset device.	Guru	RW

<Sheet> 14. Device Control Feature List

8.4.2. Action Control

Feature	Type	Description	Visibility	Access
ActionDeviceKey	Integer	Device key to check the validity of action commands.	Guru	RW
ActionSelector	Integer	Select Action Signal	Guru	RW
ActionGroupMask	Integer	Mask to validate the action on reception of the action protocol message.	Guru	RW
ActionGroupKey	Integer	Key to validate the action on reception of the action protocol message.	Guru	RW

<Sheet> 15. Action Control Feature List

8.4.3. Image Format Control

Feature	Type	Description	Visibility	Access
WidthMax	Integer	Max Pixels of Width	Expert	RO

HeightMax	Integer	Max Pixels of Height	Expert	RO
SensorWidth	Integer	Sensor Width Pixels	Expert	RO
SensorHeight	Integer	Sensor Height Pixels	Expert	RO
Width	Integer	Image Width	Beginner	RO
Height	Integer	Image Height	Beginner	RO
OffsetX	Integer	ROI Offset X	Beginner	RO
OffsetY	Integer	ROI Offset Y	Beginner	RO
PixelFormat	Enum	Pixel Format (Mono8, YUV420_NV12)	Beginner	RW
ImageCompressionMode	Enum	Image Compression Mode (Off, JPEG)	Beginner	RW
SensorPixelSize	Float	Sensor Pixel Size	Expert	RO

<Sheet> 16. Image Format Control Feature List

8.4.4. Stream Control

When setting up the stream resolution, Stream C is restricted based on Stream A.

Ex: If resolution of Stream A is set 1920x1080, Max resolution of Stream C is 1920x1080.

Feature	Type	Description	Visibility	Access
StreamAEnable	Boolean	Stream A Enable	Beginner	RO
StreamAResolution	Enum	Stream A Resolution	Beginner	RW
StreamAEncodeMode	Enum	Stream A Encoding Mode (MJPEG, H.264, H.265)	Beginner	RW
StreamAScale	Enum	Stream A Image Scale (1/N)	Expert	RW
StreamAOffsetX	Integer	Stream A ROI Offset X	Expert	RW
StreamAOffsetY	Integer	Stream A ROI Offset Y	Expert	RW
StreamAWidth	Integer	Stream A Width	Expert	RW
StreamAHeight	Integer	Stream A Height	Expert	RW
StreamAFrameFactorN	Integer	Stream A Frame Factor N $Frame\ Rate = 30 \times (N \div M)$	Beginner	RW
StreamAFrameFactorM	Integer	Stream A Frame Factor M	Beginner	RW
StreamAJPEGQuality	Integer	Stream A JPEG Quality	Expert	RW
StreamABitrateControl	Enum	Select Stream A bitrate control (CBR, VBR)	Expert	RW
StreamACBRBitrate	Integer	Stream A CBR Bitrate Value	Expert	RW
StreamAVBRBitrateMin	Integer	Min. value of Stream A VBR bitrate	Expert	RW

StreamAVBRBitrateMax	Integer	Max. value of Stream A VBR bitrate	Expert	RW
StreamBEnable	Boolean	Stream B Enable	Beginner	RW
StreamBResolution	Enum	Stream B Resolution	Beginner	RO
StreamBEncodeMode	Enum	Stream B Encoding Mode (MJPEG, H.264, H.265)	Beginner	RW
StreamBScale	Enum	Stream B Image Scale (1/N)	Expert	RW
StreamBOffsetX	Integer	Stream B ROI Offset X	Expert	RW
StreamBOffsetY	Integer	Stream B ROI Offset Y	Expert	RW
StreamBWidth	Integer	Stream B Width	Expert	RW
StreamBHeight	Integer	Stream B Height	Expert	RW
StreamBFrameFactorN	Integer	Stream B Frame Factor N $Frame\ Rate = 30 \times (N \div M)$	Beginner	RW
StreamBFrameFactorM	Integer	Stream B Frame Factor M	Beginner	RW
StreamBJPEGQuality	Integer	Stream B JPEG Quality	Expert	RW
StreamBBitrateControl	Enum	Select Stream B bitrate control (CBR, VBR)	Expert	RW
StreamBCBRBitrate	Integer	Stream B CBR Bitrate Value	Expert	RW
StreamBVBRBitrateMin	Integer	Min. value of Stream B VBR bitrate	Expert	RW
StreamBVBRBitrateMax	Integer	Max. value of Stream B VBR bitrate	Expert	RW
StreamCEnable	Boolean	Stream C Enable	Beginner	RW
StreamCResolution	Enum	Stream C Resolution	Beginner	RW
StreamCEncodeMode	Enum	Stream C Encoding Mode (MJPEG, H.264, H.265, HDMI)	Beginner	RW
StreamCScale	Enum	Stream C Image Scale (1/N)	Expert	RW
StreamCOffsetX	Integer	Stream C Offset X	Expert	RW
StreamCOffsetY	Integer	Stream C Offset Y	Expert	RW
StreamCWidth	Integer	Stream C Width	Expert	RW
StreamCHeight	Integer	Stream C Height	Expert	RW
StreamCFrameFactorN	Integer	Stream C Frame Factor N $Frame\ Rate = 30 \times (N \div M)$	Beginner	RW
StreamCFrameFactorM	Integer	Stream C Frame Factor M	Beginner	RW
StreamCJPEGQuality	Integer	Stream C JPEG Quality	Expert	RW
StreamCBitrateControl	Enum	Select Stream C bitrate control (CBR, VBR)	Expert	RW

StreamCCBRBitrate	Integer	Stream C CBR Bitrate Value	Expert	RW
StreamCVBRBitrateMin	Integer	Min. value of Stream C VBR bitrate	Expert	RW
StreamCVBRBitrateMax	Integer	Max. value of Stream C VBR bitrate	Expert	RW
TotalThroughput	Integer	Total throughput of current settings.($pixels/s$)	Expert	RO
MaxThroughput	Integer	Max throughput. ($pixels/s$)	Expert	RO
StreamAURL	String	Stream A RTSP URL	Expert	RO
StreamBURL	String	Stream B RTSP URL	Expert	RO
StreamCURL	String	Stream C RTSP URL	Expert	RO

<Sheet> 17. Stream Control Features List

8.4.5. Acquisition Control

Feature	Type	Description	Visibility	Access
AcquisitionMode	Enum	Data acquisition mode.	Beginner	RW
ExposureMode	Enum	Exposure mode	Beginner	RW
ExposureTime	Integer	Exposure Time	Beginner	RW
ExposureAuto	Enum	Enable/Disable auto exposure.	Beginner	RW
ExposureAutoLowerLimit	Integer	Auto exposure Min. value.	Expert	RW
ExposureAutoUpperLimit	Integer	Auto exposure Max. value.	Expert	RW
ExposureAutoSpeed	Enum	Auto exposure control speed	Expert	RW
ExposureAutoDelayImages	Integer	Auto Exposure Delay	Expert	RW
ExposureLevel	Integer	Auto exposure level	Beginner	RW
AEMeteringMode	Enum	AE metering mode (Average, Custom)	Beginner	RW
CustomMeteringTileX	Integer	Set offset X of AE metering tile(12×8)	Expert	RW
CustomMeteringTileY	Integer	Set offset Y of AE metering tile(12×8)	Expert	RW
CustomMeteringTileEnable	Integer	Enable AE metering tile	Expert	RW
AutoFlashMode	Enum	Enable/Disable auto flash mode. (Available when AE is enabled.)	Beginner	RW
AutoFlashMaxExposure	Integer	Max. Exposure of AF	Expert	RW
AutoFlashMinExposure	Integer	Min. Exposure of AF	Expert	RW
AutoFlashIO	Enum	Set I/O in auto flash mode.	Expert	RW
AutoFlashControlFilterSwitch	Boolean	Use filter switch in AF mode.	Expert	RW

AutoFlashControlColorMode	Boolean	Use color mode in AF mode.	Expert	RW
TriggerMode	Enum	Trigger mode.	Beginner	RW
TriggerSource	Enum	Trigger source.	Beginner	RW
TriggerActivation	Enum	Set trigger activation mode. (RisingEdge, FallingEdge)	Beginner	RW
TriggerSoftware	Command	Execute software trigger.	Beginner	RW
TriggerDebounceActive	Integer	Trigger debounce active time (us)	Beginner	RW
TriggerDebounceInactive	Integer	Trigger debounce inactive time (us)	Beginner	RW
PseudoMultishotFrameCount	Integer	Number of data to acquire from Pseudo Multishot trigger mode.	Beginner	RW
BracketCount	Integer	Number of bracket mode image.	Beginner	RW
Bracket0ExposureTime	Integer	Bracket0 exposure time value.	Beginner	RW
Bracket0Gain	Float	Bracket0 gain value.	Beginner	RW
Bracket1ExposureTime	Integer	Bracket1 exposure time value.	Beginner	RW
Bracket1Gain	Float	Bracket1 gain value.	Beginner	RW
Bracket2ExposureTime	Integer	Bracket2 exposure time value.	Beginner	RW
Bracket2Gain	Float	Bracket2 gain value.	Beginner	RW
Bracket3ExposureTime	Integer	Bracket3 exposure time value.	Beginner	RW
Bracket3Gain	Float	Bracket3 gain value.	Beginner	RW
AcquisitionFrameRate	Float	Set frame rate.	Beginner	RW
AcquisitionStart	Command	Start data acquisition.	Beginner	RW
AcquisitionStop	Command	Stop data acquisition.	Beginner	RW

<Sheet> 18. Acquisition Control Features List

8.4.6. Analog Control

Feature	Type	Description	Visibility	Access
Gain	Float	Gain value.	Beginner	RW
GainAuto	Enum	Enable/disable auto gain.	Beginner	RW
GainAutoLowerLimit	Float	Min. value of auto gain.	Expert	RW
GainAutoUpperLimit	Float	Max. value of auto gain.	Expert	RW
WhiteBalanceAuto	Enum	Enable/disable auto white balance.	Beginner	RW
WhiteBalanceR	Integer	White balance R value.	Expert	RW
WhiteBalanceB	Integer	White balance B value.	Expert	RW
WDREnable	Boolean	Enable/disable Wide Dynamic Range	Beginner	RW

WDRStrength	Integer	Wide Dynamic Range strength	Expert	RW
SharpeningStrength	Integer	Sharpening strength	Expert	RW
ColorSaturation	Integer	Saturation	Guru	RW

<Sheet> 19. Analog Control Features List Sheet

8.4.7. Digital I/O Control

Feature	Type	Description	Visibility	Access
LineSelector	Enum	Select I/O to set.	Expert	RW
LineSource	Enum	Set line source.	Expert	RW
LineInverter	Boolean	Use/unuse signal inversion.	Expert	RW
LineFormat	Enum	I/O format.	Expert	RO

<Sheet> 20. Digital I/O Control Features List

8.4.8. Optics Control

Feature	Type	Description	Visibility	Access
FilterSwitcher	Enum	Set filter switch. (IRCut, BareGlass)	Beginner	RW

<Sheet> 21. Optics Control Features List

8.4.8.1. I-Nova3 Zoom Only Features List

Feature	Type	Description	Visibility	Access
Zoom	Integer	Set zoom.	Beginner	RW
Focus	Enum	Set focus.	Beginner	RW
FocusOffset	Integer	Set focus offset.	Beginner	RW
Iris	Integer	Set iris.	Beginner	RW
LensReadjust	Command	Readjust zoom, focus, iris.	Beginner	RW
LensPresetSelector	Enum	Select lens preset.	Beginner	RW
LensPresetLoad	Command	Load lens preset.	Beginner	WO
LensPresetSave	Command	Save lens preset. (Cannot save in preset name of "default")	Beginner	WO
LensPresetDefault	Enum	Set preset load by default. (Load selected preset when booting the camera.)	Beginner	RW

<Sheet> 22. Optics Control – Zoom Features List

8.4.9. UART Control

- Baud rate of UART is 115200.

Feature	Type	Description	Visibility	Access
UARTDataLength	Integer	UART Data Length	Expert	RW
UARTData	String	UART Data	Expert	RW
UARTRead	Command	Read UART	Expert	RW
UARTWrite	Command	Write UART	Expert	RW
PrintFrameInfo	Boolean	Print Frame Info	Expert	RW

<Sheet> 23. UART Control Features List

8.4.10. Time Settings

Feature	Type	Description	Visibility	Access
NTPServer	String	Set NTP Server address.	Expert	RW
TimeSyncNTP	Command	Sync with NTP Server.	Expert	RW

<Sheet> 24. Time Settings Features List

8.4.11. Debug

Feature	Type	Description	Visibility	Access
SPIAddress	Integer	SPI address	Guru	RW
SPIValue	Integer	SPI value	Guru	RW
SPIRead	Command	Read SPI	Guru	RW
SPIWrite	Command	Write SPI	Guru	RW

<Sheet> 25. Debug Features List

8.4.12. Transport Layer Control

Feature	Type	Description	Visibility	Access
PayloadSize	Integer	Size of payload (Bytes)	Expert	RO
GevVersionMajor	Integer	GEV major version	Expert	RO
GevVersionMinor	Integer	GEV minor version	Expert	RO
GevDeviceModeIsBigEndian	Boolean	Endian of bootstrap register True: Big Endian False: Little Endian	Guru	RW
GevDeviceClass	Enum	Device class	Guru	RW
GevDeviceModeCharacterSet	Enum	Char Set of bootstrap register (Reversed, UTF8)	Guru	RW
GevInterfaceSelector	Integer	Network interface selector	Beginner	RW

GevMACAddress	IInteger	MAC Address	Beginner	RO
GevCurrentIPConfigurationLLA	Boolean	Enable/Disable LLA	Beginner	RO
GevCurrentIPConfigurationDHCP	Boolean	Enable/Disable DHCP	Beginner	RW
GevCurrentIPConfigurationPersistentIP	Boolean	Enable/Disable Persistent IP	Beginner	RW
GevCurrentIPAddress	Integer	Current IP address	Beginner	RO
GevCurrentSubnetMask	Integer	Current subnet mask	Beginner	RO
GevCurrentDefaultGateway	Integer	Current gateway	Beginner	RO
GevPersistentIPAddress	Integer	Set persistent IP	Beginner	RW
GevPersistentSubnetMask	Integer	Set persistent subnet mask	Beginner	RW
GevPersistentDefaultGateway	Integer	Set persistent gateway	Beginner	RW
GevLinkSpeed	Integer	Network connection speed	Expert	RO
GevFirstURL	String	First URL of XML device description	Guru	RO
GevSecondURL	String	Second URL of XML Device Description	Guru	RO
GevNumberOfInterfaces	Integer	Number of the interfaces installed in the device.	Expert	RO
GevMessageChannelCount	Integer	Message channel count supported by the device.	Expert	RO
GevStreamChannelCount	Integer	Stream channel count supported by the device.	Expert	RO
GevHeartbeatTimeout	Integer	Heartbeat Timeout(ms)	Guru	RW
GevTimestampTickFrequency	Integer	Tick frequency of timestamp clock in 1 second.	Expert	RW
GevTimestampControlLatch	Command	Latch timestamp value	Expert	RW
GevTimestampControlReset	Command	Reset timestamp in device.	Expert	RW
GevTimestampControlLatchReset	Command	Reset timestamp latch.	Expert	RW
GevDiscoveryAckDelay	Integer	Maximum value of random delay waiting to receive search command. (ms)	Expert	RW
GevGVCPExtendedStatusCodesSelector	Enum	Select GEV version to control extended status code.	Guru	RW
GevGVCPPendingAck	Boolean	Enable PENDING_ACK command generation.	Guru	RW
GevPrimaryApplicationSwitchoverKey	Integer	Key for primary application switchover requests activation.	Guru	WO
GevCCP	Enum	Control channel privilege	Guru	RW

		feature		
GevPrimaryApplicationSocket	Integer	UDP Port of Primary Application.	Guru	RO
GevPrimaryApplicationIPAddress	Integer	IPv4 Address of Primary Application	Guru	RO
GevStreamChannelSelector	Integer	Select stream channel	Expert	RW
GevSCPDirection	Enum	Direction of the steam channel	Guru	RW
GevSCPInterfaceIndex	Integer	network interface index to use.	Guru	RW
GevSCPHostPort	Integer	Port through device streams data.	Guru	RW
GevSCPSFireTestPacket	Boolean	Execute test packet in bits 16-31	Guru	RW
GevSCPSDoNotFragment	Boolean	Copied to the DF (Don't Fragment)bit in the IP header of each stream packet.	Guru	RW
GevSCPSPacketSize	Integer	Packet Size of Selected Channel(bytes)	Expert	RW
GevSCPD	Integer	Latency between packets of selected channel(tick)	Expert	RW
GevSCDA	Integer	Destination IPv4 Address of Selected Channel	Guru	RW
GevSCSP	Integer	Source port of the stream channel	Guru	RO
nvtTCPStreamServerEn	Boolean	Stream with TCP	Guru	RW

<Sheet> 26. Transport Layer Control Features List

8.4.13. User Set Control

Feature	Type	Description	Visibility	Access
UserSetSelector	Enum	Select UserSet to save or load.	Beginner	RW
UserSetLoad	Command	Load settings.	Beginner	RW
UserSetSave	Command	Save current settings (Cannot save in "Default".)	Beginner	RW
UserSetDefault	Enum	Set channel to load by default. (Load selected UserSet when booting the camera.)	Beginner	RW

<Sheet> 27. User Set Control Features List

9. Appendix

9.1. i-Nova3 Specification

9.1.1. i-Nova3 Camera

Model name	iN3-89EC
Sensor model	e2v Emerald EV2S8M9C: 2/3", CMOS, Color
Interface	100/1000Mbps Ethernet (RJ45 Connector)
Resolution / Frame rate	4096x2160 pixels, 30fps (MJPEG: 1920x1080)
Shutter mode	Global Shutter
Color depth	8bit
Gain	Manual / Auto 1 ~ 10 (0 ~ 20dB)
Trigger modes	External Trigger (One shot, Multi shot), Software Trigger
Flash out modes	On / Off / Auto
Operation temperature / Humidity	0°C ~ 50°C / 20 ~ 80%
Storage temperature / Humidity	-20°C ~ 60°C / 20 ~ 90% (Before Condensation)
Power supply	+12 V DC ~ 24 V DC
Power consumption	Max. 8.5W
Connector I/O, Power	2-pin Screw terminal block
Lens mount	C/CS-Mount
I/O port	1x Input for Triggering (Low level : 0 ~ 0.8V / high level : 2V ~ 24V) 2x Strobe (TTL, open collector)
Dimension / Weight	70 x 72 x 82mm (W x H x D), 665g
Filter switcher / DC iris	IR-cut filter On/Off
Image processing	White Balance, WDR, Sharpening
Protocol	RTSP (MJPEG, H.264, H.265), GenICam, ONVIF
SDK	Viewer and example code for Novitec Camera API(C++, C#)
Certificate	KC

<Sheet> 28. I-Nova3 Specification

9.1.2. i-Nova3 Zoom Camera

Model name	iN3Z-89EC-10Z300
Sensor model	e2v Emerald EV2S8M9C: 2/3", CMOS, Color
Interface	100/1000Mbps Ethernet (RJ45 Connector)
Resolution / Frame rate	4096x2160 pixels, 30fps (MJPEG: 1920x1080)
Shutter mode	Global Shutter
Color depth	8bit
Gain	Manual / Auto 1 ~ 10 (0 ~ 20dB)
Trigger modes	External Trigger (One shot, Multi shot), Software Trigger
Flash out modes	On / Off / Auto
Operation temperature / Humidity	0°C ~ 50°C / 20 ~ 80%
Storage temperature / Humidity	-10°C ~ 60°C / 20 ~ 90% (Before Condensation)
Power supply	+12 V DC ~ 24 V DC
Power consumption	Max. 14W
Connector I/O, Power	2-pin Screw terminal block
Lens	10 ~ 300mm(30x)
Lens control	Motorized Zoom / Focus / Iris
Focal range	0.5m ~ INF(Wide) ~ 7.0 ~ INF(Tele)
F-number	F1.5(Wide) ~ F.5.5(Tele)
I/O port	1x Input for Triggering (Low level : 0 ~ 0.8V / high level : 2V ~ 24V) 2 x Strobe / GPIO (TTL, Open Collector)
HDMI	HDMI A (Locking)
Dimension / Weight	90 x 90 x 204mm (W x H x D), 1.9kg
Filter switcher	IR-cut filter On/Off
Image processing	White Balance, WDR, Sharpening
Protocol	RTSP (MJPEG, H.264, H.265), GenICam, ONVIF
SDK	Viewer and example code for Novitec Camera API (C++, C#)
Certificate	KC, CE

<Sheet> 29. i-Nova3 Zoom Specification

9.2. EV2S8M9

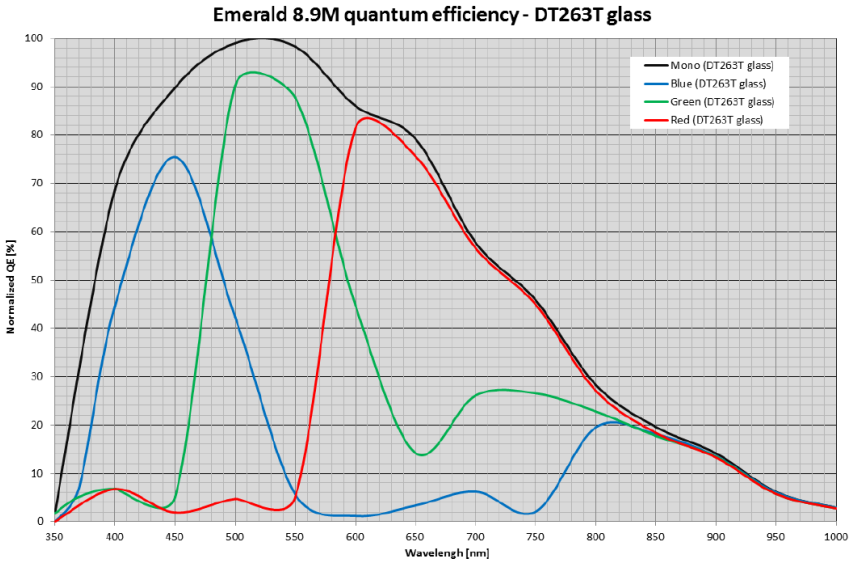
9.2.1. EV2S8M9 Sensor Information

Parameter		Unit	Typical Value
Sensor characteristics	Resolution	Useful pixels	4096 (H) x 2160 (V)
	Image size	mm inch	12.96 (diagonal) 2/3
	Pixel size (square)	µm²	2.8 x 2.8
	Aspect ratio		17/9
	Bit depth	bit	8 – 10 – 12
Pixel performances	QE(0)	%	63
	Dynamic range	dB	67.5 (Standard mode) 71.9 (Ultra-low noise mode)
	Readout Noise	e-	2.8 (Standard mode) 1.7 (Ultra-low noise mode)
	Full well capacity	e-	6700
	MTF at Nyquist, λ=550 nm	%	> 50
	Dark current(1)	e-/s	2
Pixel performances EMVA 1288	System Gain (K)	DN12bits/e-	0.61
	Saturation Capacity (µe.sat)	e-	6000
	Absolute Sensitivity (µe.min)	e-	3.3
	Temporal dark noise (σd)	e-	2.8
	DSNU(2)	e-	2.3
	PRNU(3)	%	2.6
	Dynamic range(4)	dB	66.6 (1:2138)
	Linearity : LEmin / LEmax(5)	%	-1 / +1
Electrical interface	Power supplies	V	3.3 / 1.8 / 1.2
	Power consumption : Functional(6) Standby	 W mW	 < 1.8 < 6

At 25°C unless indicated, nominal input clock (50MHz)
(0): Measured without window
(1): At 21°C junction. Doubling factor ~5°C
(2): EMVA Conditions
(3): measured @ Vsat/2, min gain. EMVA Conditions
(4): 20·Log(µe.sat/ µe.min)
(5): Over 5% - 95% saturation
(6): @max frame rate & full format

<Image> 45. EV2S8M9 Sensor Information

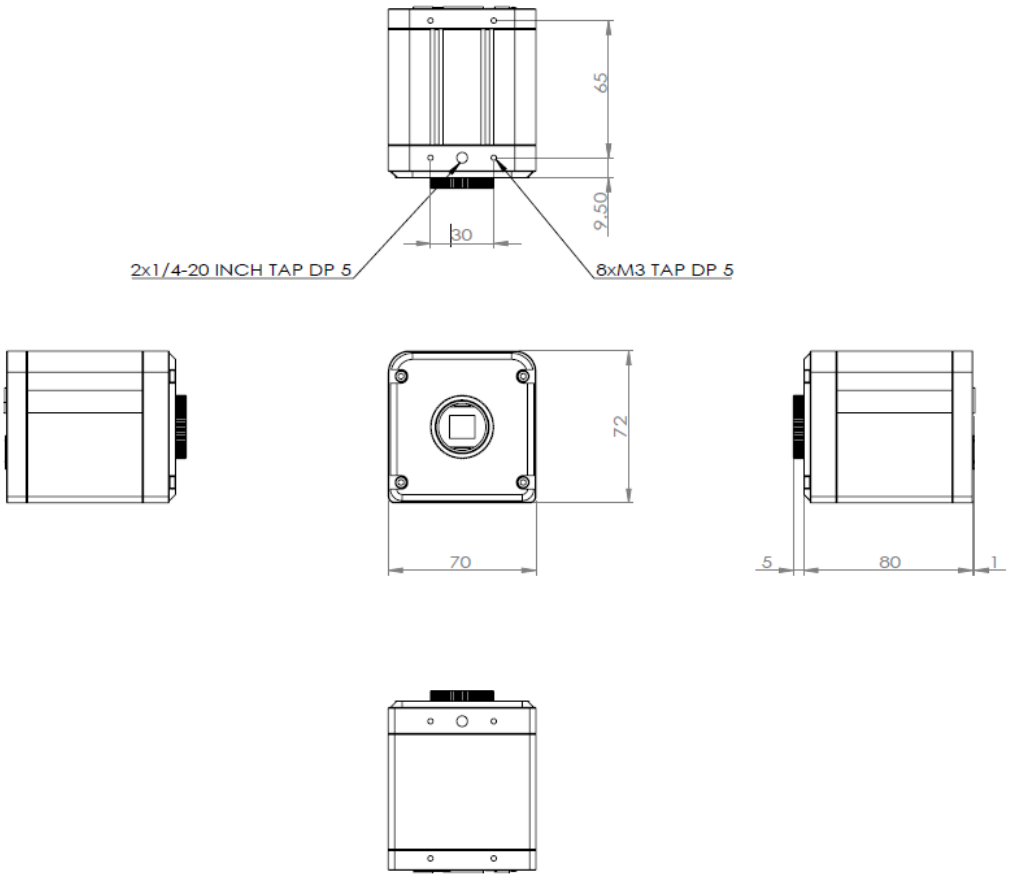
9.2.2. Quantum Efficiency



<Image> 46. Quantum Efficiency

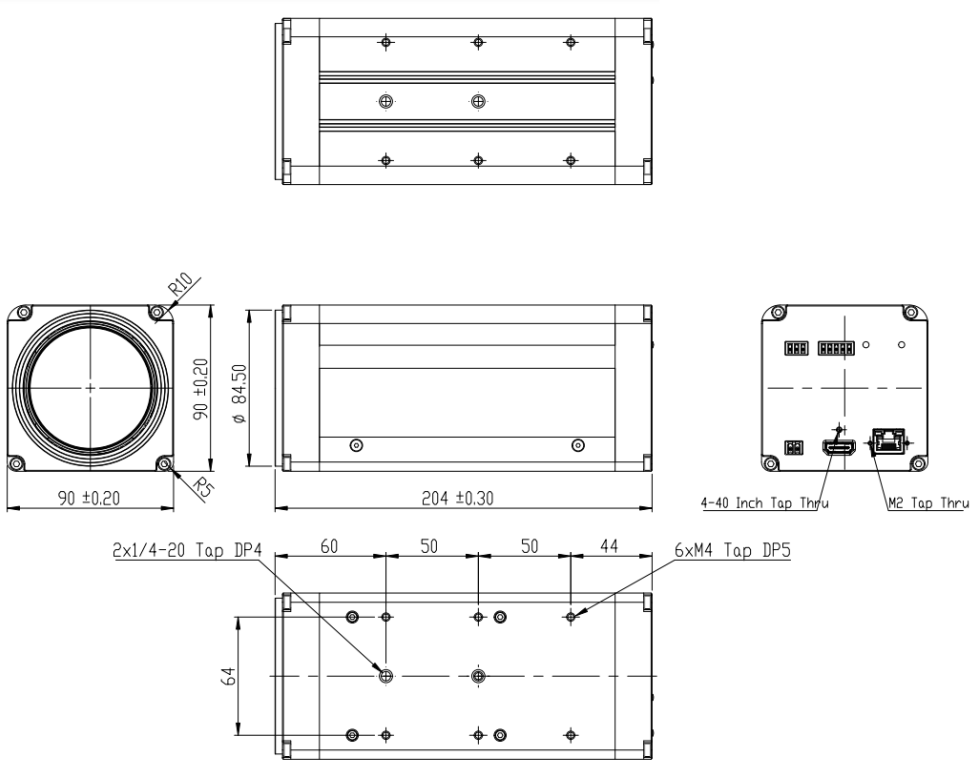
9.3. Dimensions

9.3.1. i-Nova3 Dimensions



<Image> 47. i-Nova3 Dimensions

9.3.2. i-Nova3 Zoom Dimensions



<Image> 48. i-Nova3 Zoom Dimensions

10. Image Index

11. Sheet Index

12. Revision History

Date	Version	Description	Note
2022.03.30	V1.0	Initial Release	
2022.06.27	V1.1	Change to the latest viewer image.	

<Sheet> 30. Revision History

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