

User Manual

ICAM-540 Series

Integrated Industrial AI Camera

ADVANTECH

Enabling an Intelligent Planet

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If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

FM

This equipment has passed the FM certification. According to the National Fire Protection Association, work sites are classified into different classes, divisions and groups, based on hazard considerations. This equipment is compliant with the specifications of Class I, Division 2, Groups A, B, C and D indoor hazards.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*



Caution! *Cautions are included to help prevent hardware damage and data losses. For example,*



“Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.”

Note! *Notes provide optional additional information.*



Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all such feedback in writing to support@advantech.com.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
- Disconnect the power before making any configuration changes. A sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated the equipment.
 - The equipment has been exposed to moisture.
 - The equipment is malfunctioning, or does not operate according to the user manual.
 - The equipment has been dropped and damaged.
 - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below $-20\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$) or above $60\text{ }^{\circ}\text{C}$ ($140\text{ }^{\circ}\text{F}$) as this may damage the components. The equipment should be kept in a controlled environment.
16. **CAUTION:** Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Wichtige Sicherheitshinweise

1. Bitte lesen sie Sich diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie Keine Flüssig-oder Aerosolreiniger. Am besten dient ein angefeuchtetes Tuch zur Reinigung.
4. Die NetzanschlUBsteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Verletzungen hervorrufen.
7. Die Belüftungsöffnungen dienen zur Luftzirkulation die das Gerät vor überhitzung schützt. Sorgen Sie dafür, daB diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim. AnschluB an das Stromnetz die AnschluBwerte.
9. Verlegen Sie die NetzanschlUBleitung so, daB niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen die sich am Geräten befinden sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen Sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von autorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
 15. Netzkabel oder Netzstecker sind beschädigt.
 16. Flüssigkeit ist in das Gerät eingedrungen.
 17. Das Gerät war Feuchtigkeit ausgesetzt.
18. Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
19. Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
20. Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
21. **VORSICHT:** Explosionsgefahr bei unsachgemaben Austausch der Batterie.Ersatz nur durch denselben oder einem vom Hersteller empfohlene-männlichen Typ. Entsorgung gebrauchter Batterien navh Angaben des Herstellers.
22. **ACHTUNG:** Es besteht die Explosionsgefahr, falls die Batterie auf nicht fachmännische Weise gewechselt wird. Verfangen Sie die Batterie nur gleicher oder entsprechender Type, wie vom Hersteller empfohlen. Entsorgen Sie Batterien nach Anweisung des Herstellers.
23. Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weiger.

Haftungsausschluss: Die Bedienungsanleitungen wurden entsprechend der IEC-704-1 erstellt. Advantech lehnt jegliche Verantwortung für die Richtigkeit der in diesem Zusammenhang getätigten Aussagen ab.

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Chapter 1

Product Overview

1.1 Introduction

Advantech ICAM-540 series is a highly integrated Industrial AI Camera equipped with SONY industrial grade image sensor, multiple core ARM processors and NVIDIA AI system on module and support C-mount lens. Featuring CAMNavi SDK, Google Chromium web browser utility and NVIDIA Deepstream SDK, ICAM-540 series accelerates the development and deployment of cloud-to-edge vision AI applications. The CAMNavi SDK uses Python language by default and is better adapted to image acquisition and AI algorithm integration. Meanwhile the HTML 5 web based utility can be used to setup the cameras and network configuration to lower the installation effort. The preloaded, optimized Jetpack board support package seamlessly connects to AI cloud services. Advantech ICAM-540 series is an all-in-one, compact and rugged industrial AI camera and is ideal for a variety of Edge AI vision applications.

1.2 Product Features

- 8MP 45 FPS, SONY industrial grade sensor
- C-mount lens supported
- NVIDIA Jetson AI system on module
- HW ISP no GPU/CPU workload

1.3 Product Features

- **Sensor:** SONY IMX334, 8MP@45fps, 1/1.8", pixel size (2.0 x 2.0 μ m) Rolling Shutter, Color

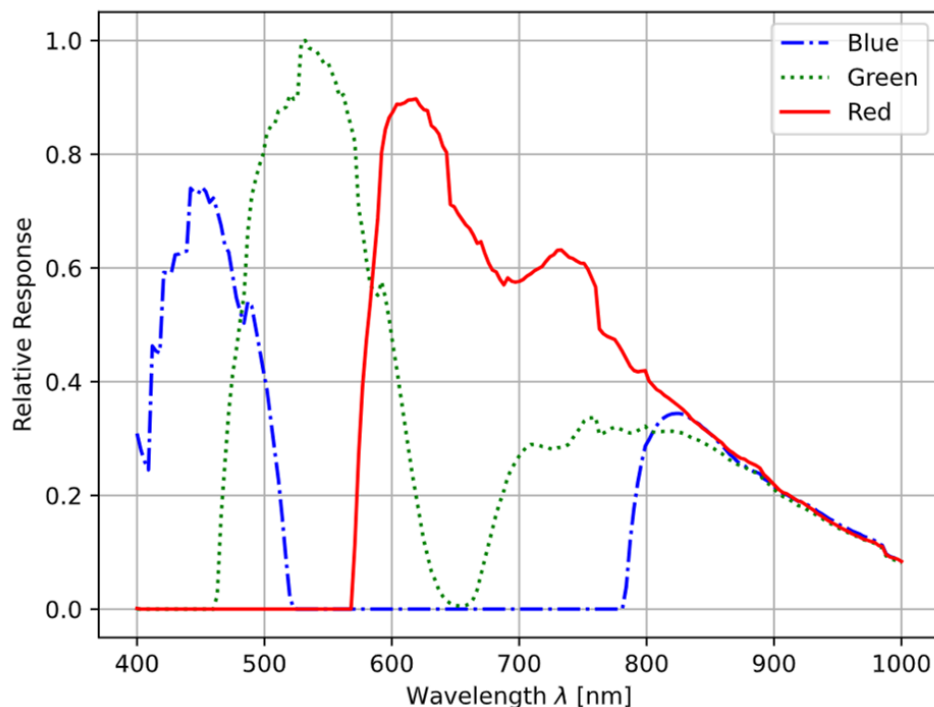


Figure 1.1 Spectrum response (nm)

- **Processor system**
 - NVIDIA Orin NX
 - CPU: 6-core Cortex A78AE ARM? v8.2 (64-bit) | 2x clusters (4x 256KB L2 +2MB L3) + 4MB LLC | L3 Cache: 4 MB | Max. 2 GHz
 - GPU: 1024 cores | 32 Tensor
- **Memory, Storage**
 - NVIDIA Orin NX 128-bit LPDDR5 / 256GB NVMe
- **Optical (Need to prepare oneself)**
 - C-mount lens supported. The following are common lens specifications.

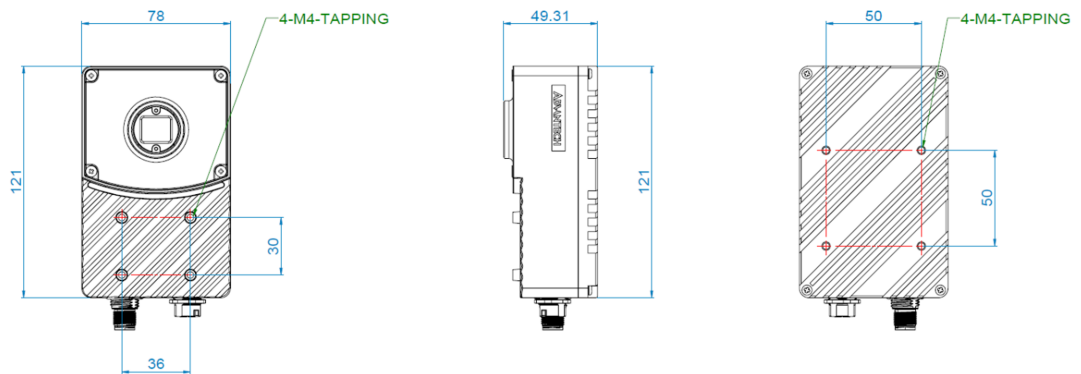
Focal length(mm)	View Angle	Min. W.D (Working Distance)	F.O.V @100mm (Field of View)	F.O.V @1000mm (Field of View)
6	65	100mm	121x68 mm	1276x712 mm
12	35	100mm	56x32 mm	634x354 mm
16	27	100mm	40x23 mm	474x264 mm
25	17.5	100mm	23x13 mm	300x168 mm

- **Synchronization**
 - Hardware Trigger / software Trigger / free-run
- **HW ISP**
 - Color debayering, sharpness, white balance, CCM correction, dark noise correction (Default enable), Sharpness and brightness
- **I/O**
 - 1x USB 3.0, Type-C connector (Only works for Keyboard & mouse. Connect to USB storage will increase power consumption and heat the system)
 - 1 x USB 3.0 Type A connector
 - 1x Micro USB for OTG (Only works in engineering mode)
 - 2 x Digital Input
 - 2 x Digital Output
 - 1 x Hardware trigger in
- **LAN**
 - 1x 10/100/1000 Base-T
- **Display**
 - 1x HDMI 2.0
- **Power Requirements**
 - 19~24VDC Max 18W, typical 15W

***The power related design of ICAM-540 is up to the power mode 1 (15W, 4 core CPU). The power mode (mode 0, 2, 3) may cause Jetson Platform throttling. For more information, please refer to NVIDIA Website

■ **Dimension**

- 78 mm (W) x 121 mm(H) x 49.31 mm (D)



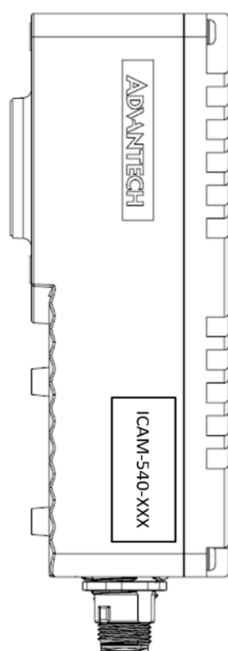
■ **Software package**

- OS: Linux Ubuntu 20.04, Jetpack 5.1.1
- SDK/Utility: CAMNavi SDK, Web based camera utility, IP configure tool, NVIDIA DeepStream SDK & example

■ **Type Key of ICAM-540**

ICAM - **5** **Y** **Z** - **R O L**

Category	AI SOC	Version	Reserved
5= Intelligent Camera	0= Entry Level 2= Mainstream 4=High Performance	0= Initial	R=Resolution <ul style="list-style-type: none"> • 1=2^1=2MP • 2=2^2=4MP • 3=2^3=8MP O=Optics <ul style="list-style-type: none"> • 0=12mm • 2=16mm • C=C mount L=Lighting <ul style="list-style-type: none"> • N=None • W=White LED



1.4 Environment Specifications

- **Operating temperature:** 0 ~ 45 °C
- **Vibration during operation:** 5 Grms
- **EMC:** CE, FCC

Chapter 2

Hardware Installation

2.1 Introduction

The electrical installation of the ICAM-540 must be carried out by a qualified electrician. Disconnect all electrical components from the power supply when installing the ICAM-540.

The following sections show the external connectors and pins assignment for applications.

2.2 External Connector

2.2.1 External I/O Connector

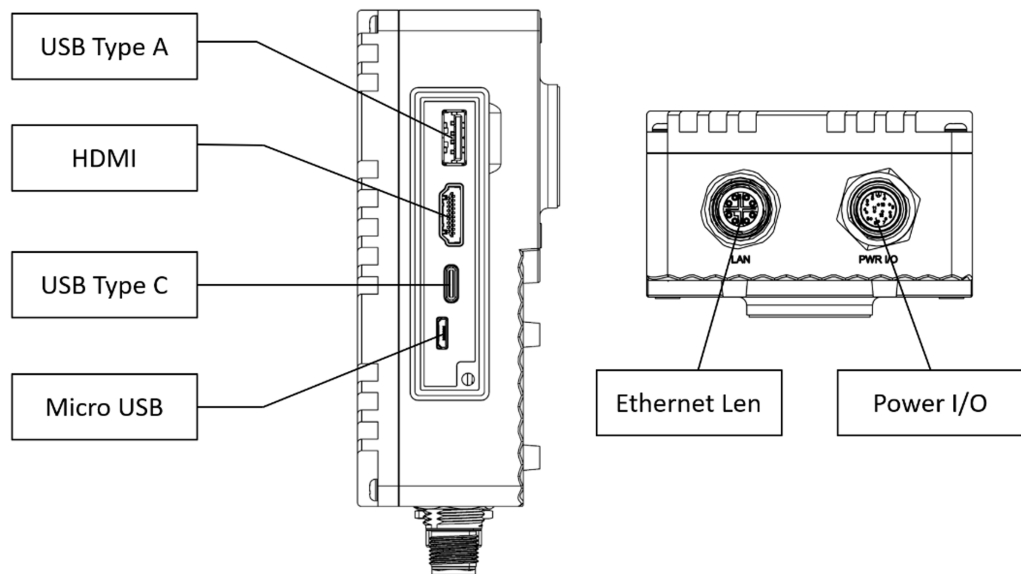
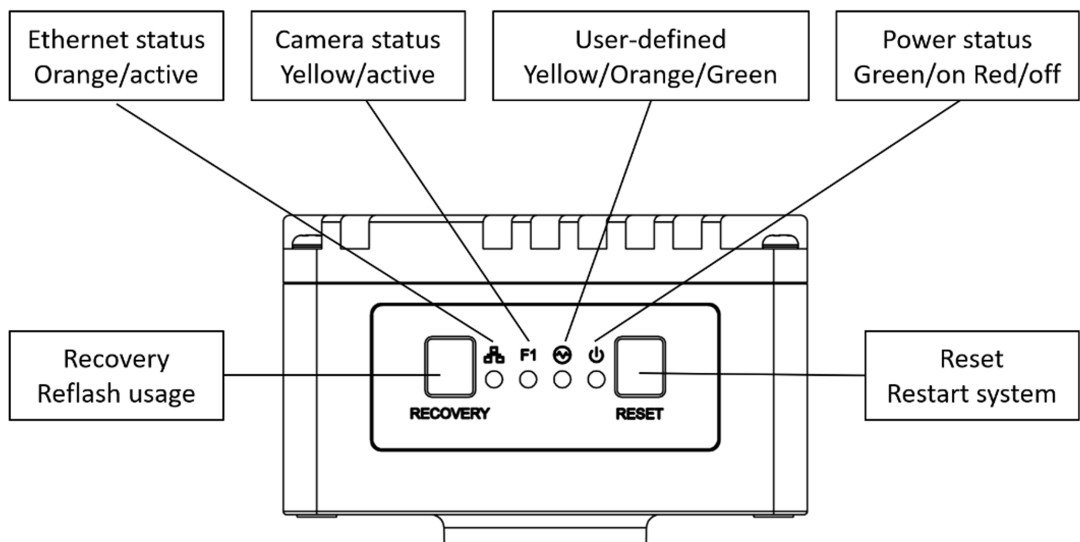


Figure 2.1 External I/O Connector



2.2.2 Power I/O

Power, Digital I/O, and RS232 Connector

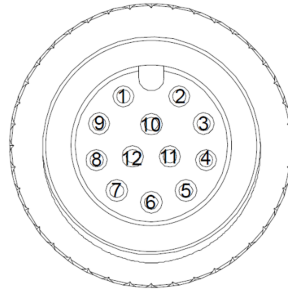


Table 2.1: Power I/O

Pin	Description
1	Digital Input 1
2	Reserve
3	Reserve
4	Reset System BTN
5	Digital Input 0
6	Common In
7	System power in Vin(+) 24V
8	System power in GND Vin(-)
9	DI/DO GND
10	Hardware Trigger Input
11	Digital Output 0
12	Digital Output 1

Signal Connections:

ICAM-540 series supports versatile digital I/O. Please read the following instructions to wire the DI/O.

Table 2.2: Hardware Trigger Input

Pin No.	Input Voltage	Input Current	Duration	S/W Interrupt
10	3.3~24V _{DC}	Typical: 24mA	0-8192 us	No

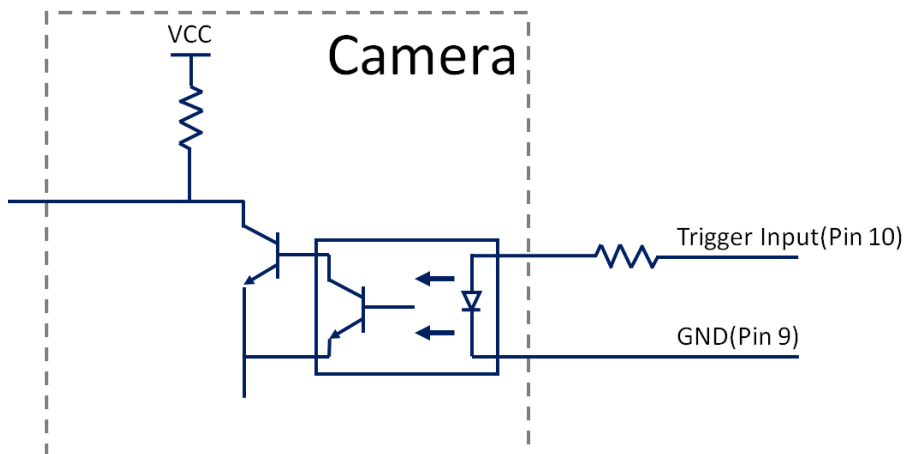


Table 2.3: Digital Input

Pin No.	Input Voltage	Input Current	Frequency	Response Time	S/W Interrupt
5, 1	3.3-5VDC	Typical: 24mA	Max. 60 Hz	Fall: 0.1us; Rise: 4.35us	Yes

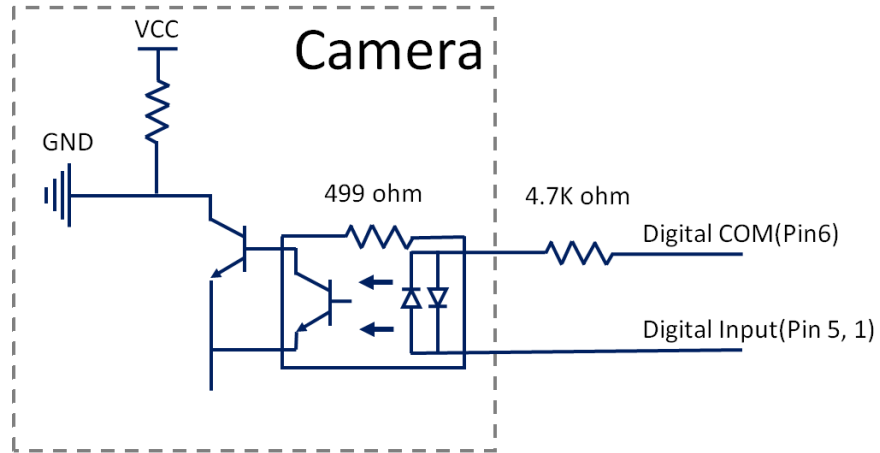
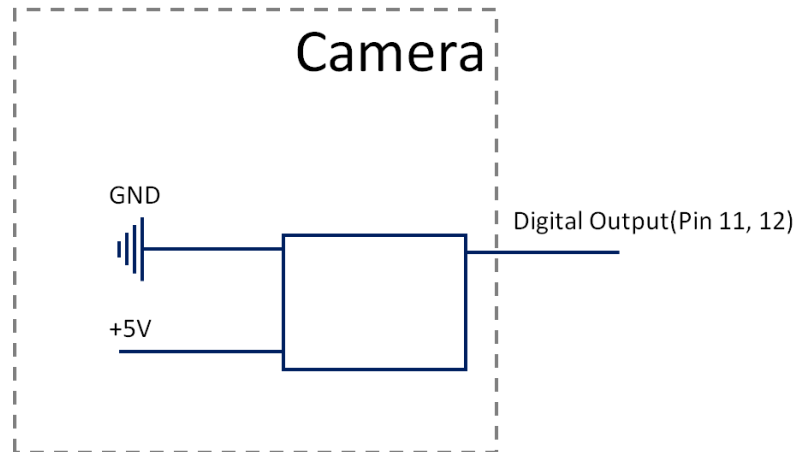


Table 2.4: Digital Output

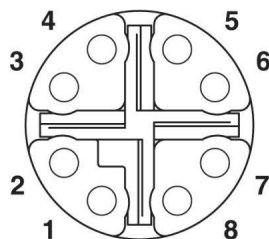
Pin No.	Output Voltage	Output Current	Frequency	Response Time	S/W Interrupt
11, 12	5-24 VDC	Typical: 0.2A	Max. 60 Hz	Fall: 1.2us; Rise: 1.92us	No



2.2.3 Ethernet/LAN

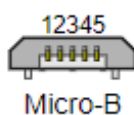
Ethernet Connector (LAN)

ICAM-540 series is equipped with one Ethernet controllers that are fully compliant with IEEE 802.3u 10/100/1000 Mbps CSMA/CD standards. The Ethernet port provides a M12 connector.



Pin	Signal
1	MDI_0_P
2	MDI_0_N
3	MDI_1_P
4	MDI_1_N
5	MDI_3_P
6	MDI_3_N
7	MDI_2_N
8	MDI_2_P

2.2.4 Micro USB



Pin	Signal
1	Vbus (4.4-5.25V)
2	D-
3	D+
4	ID
5	GND

2.2.5 USB 3

USB type C connector

ICAM-540 provides 1 USB type C interface connector which only for keyboard and mouse usage. Connect to USB storage will increase the power consumption and will heat the system. Please refer to the table below for pin assignments.

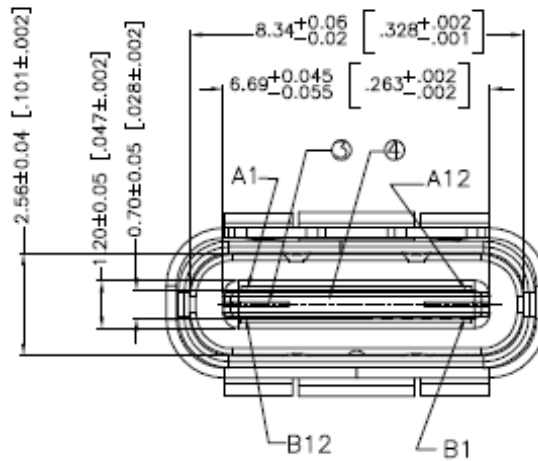


Table 2.5: USB type C connector

Pin No.	Signal	Pin No.	Signal
A1	GND	B1	GND
A2	SSTXp1	B2	SSTXp1
A3	SSTXn1	B3	SSTXn1
A4	VBUS	B4	VBUS
A5	CC1	B5	SBU2
A6	Dp1	B6	Dn2
A7	Dn1	B7	Dp2
A8	SBU1	B8	CC2
A9	VBUS	B9	VBUS
A10	SSRXn2	B10	SSTXn2
A11	SSRXp2	B11	SSTXp2
A12	GND	B12	GND

USB type A connector

Table 2.6: USB type A connector

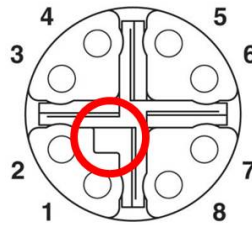
Pin	Signal
1	VBUS
2	D-
3	D+
4	GND
5	StdA_SSRX-
6	StdA_SSRX+
7	GND_DRAIN
8	StdA_SSRTX-
9	StdA_SSRTX+
H1	PTH_1
H2	PTH_2

Chapter 3

Getting Started

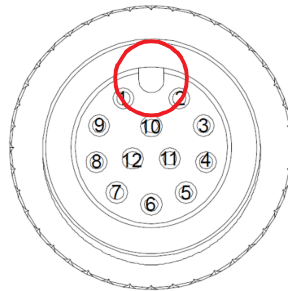
This chapter describes connection, configuration and start acquisition from ICAM-540 via host PC.

3.1 Connection an Ethernet Cable



- Align the alignment pin (Cable side) with the alignment channel (Device side)
- Inset the cable connector and tighten the threaded collar to fix the connection.

3.2 Connect a Power and D I/O Cable



- Align the alignment pin (Cable side) with the alignment channel (Device side)
- Inset the cable connector and tighten the threaded collar to fix the connection.
- Plugin the power source after the M12 connector feast on the ICAM-540 otherwise that will damage the ICAM-540.

3.3 Discover the ICAM-540

Start to configure the ICAM-540 via Ethernet after installed the ICAM-540. ICAM-540 set DHCP as default, use the IP discover utility of ICAM-540 and connected it via web browser with the IP address shows on the IP discover in windows 10 OS host PC. The default IP address of ICAM-540 is 192.168.0.100.

There are two way to access ICAM-540 in the same network domain.

1. Use LINUX command line in LINUX OS host PC.
2. Use IP discover utility in Windows 10 OS host PC

Follow the instruction to access ICAM-540 with host Linux OS PC.

ipcfg configure ICAM-540 network settings in Linux command line.

Command location:

/opt/advantech/sdk/bin/ipcfg

Command Parameters:

Help

Show command parameters.

ipcfg --help

```

Allowed options:
  --help                This help.
  -C [ --command ] arg  Discover commands.
  --local-device arg     Local network device.
  --local-address arg   Local network address.
  --remote-mac arg      Remote device MAC address.
  --nic-list             List local network device

Commands
GetInfo
ChangeNetwork DHCP
ChangeNetwork STATIC 192.168.0.10 255.255.255.0 192.168.0.1 --remote-mac 001122334455
ChangeDevName name --remote-mac 001122334455

```

Options

ipcfg --nic-list List local network interfaces.

ipcfg -C [cmd] Run commands (see Commands section)

ipcfg -C [cmd] --remote-mac [MAC] Configure remote device with MAC address.

ipcfg -C [cmd] --local-address [IP address] Configure specified NIC with the IP address.

ipcfg -C [cmd] --local-device [dev_name] Configure device named [dev_name].

ChangeNetwork

Set network parameters.

Config device network to DHCP

ipcfg -C ChangeNetwork DHCP

Config device network to static IP ?IP Netmask Gateway)

ipcfg -C ChangeNetwork STATIC 192.168.0.100 255.255.255.0 192.168.0.1

ChangeDevName

Change device identify name in discovery utility.

ipcfg -C ChangeDevName A-0011 --remote-mac 001122334455

User can configure and set up the ICAM-ICAM-540 via web server. The web server is accessed from a host windows 10 OS PC using Google Chrome as follower. Please connect your host PC and ICAM-540 in your local networking area.

1. Open Google Chrome on the configured PC connected to the ICAM-540.
2. Change the Network segment of Host PC and enter the IP address of the ICAM-540: 192.168.0.100:5000
3. Then ICAM-540 web server interface will be displayed in the Chrome browser.

The IP address of ICAM-540 can be modified via discover utility.

Discover utility is an ipconfig application tool to access network configuration of ICAM-540 in LAN. Please download the IP discover utility from Advantech's website (<https://www.advantech.com/search/?q=ICAM-540&st=support>) and decompress the file.

The Discover utility of ICAM-540 is for Windows 10 OS on PC and runs discover.exe. Copy the IP address shows on the discover utility and paste it into the web browser to access ICAM-540.

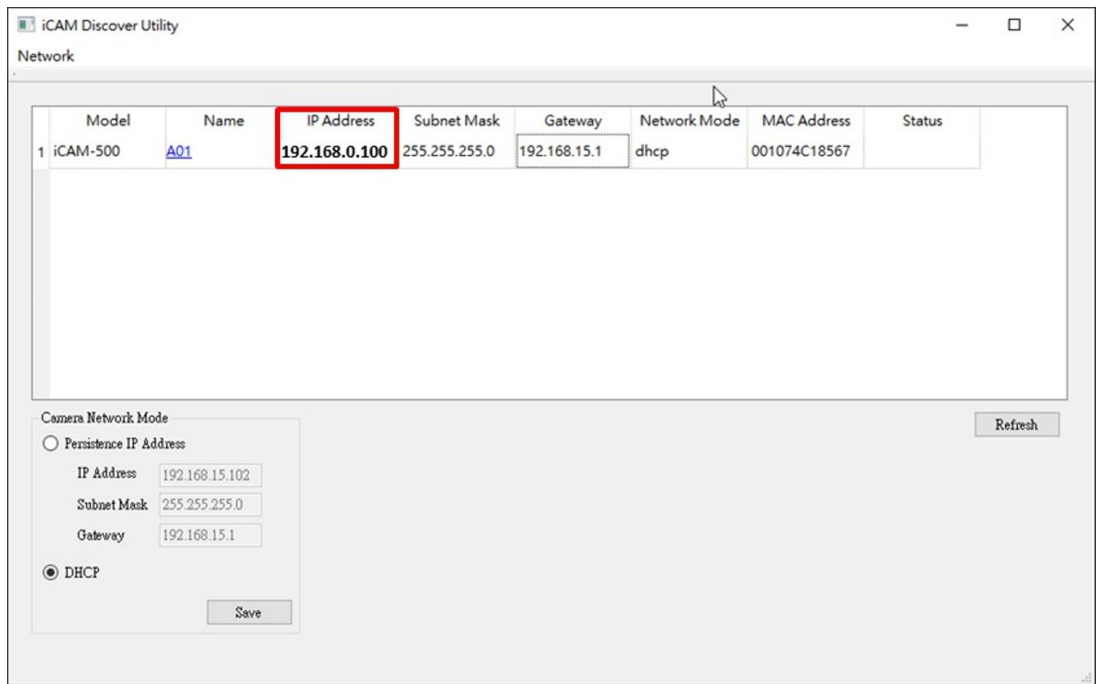


Figure 3.1 ICAM-540 discover utility

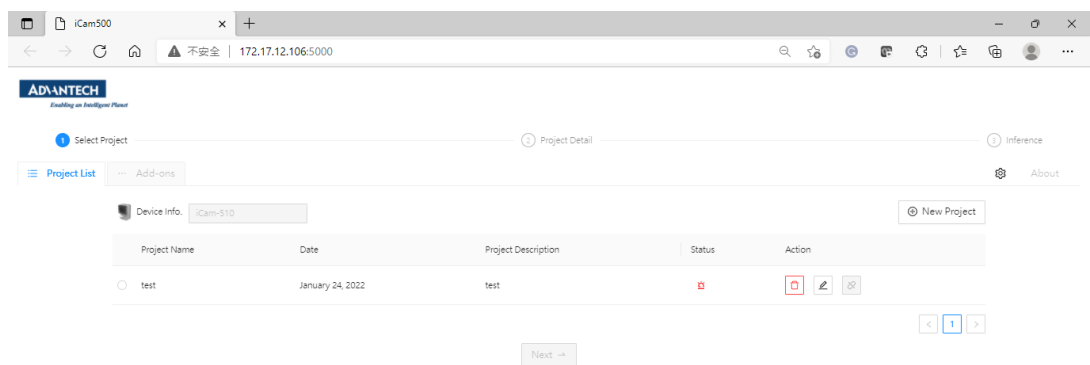


Figure 3.2 Access ICAM-540 via web browser

3.4 Start Acquisition

1. Follow the instructions of web UI to click the **New Project** button to create a new project for ICAM-540 configuration.

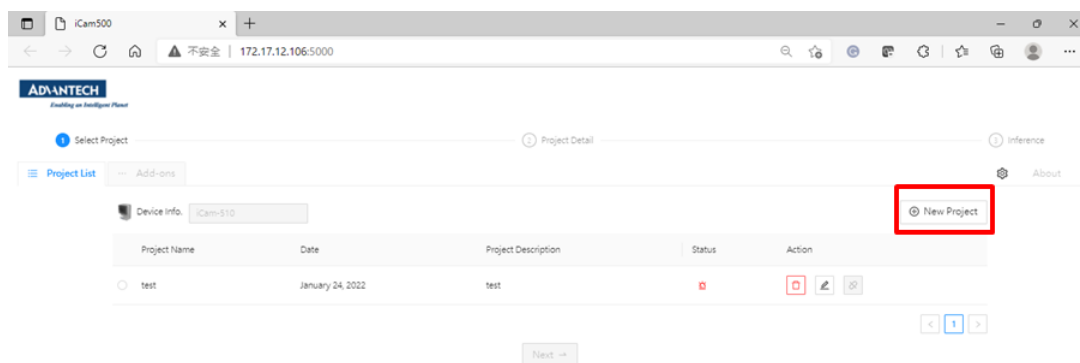


Figure 3.3 Add new project

2. Fill in the content of new project, output resolution and select the trigger mode then confirm to save the project. Select the project you just created, click the **Next** button and click the **Play** button to start the acquisition.

 A screenshot of a 'New Project' configuration dialog box. The dialog has a title bar with 'New Project' and a close button. It contains several form fields:

- Project Name***: A text input field with a character count of '0 / 15'.
- Description**: A text input field with a character count of '0 / 30'.
- Camera List***: A dropdown menu showing 'ICAM-500'.
- Resolution**: A dropdown menu showing '3840 x 2160'.
- Pixel Format**: A dropdown menu showing 'BGR'.
- Trigger Mode**: A dropdown menu showing 'Continuous'.

 At the bottom of the dialog, there are two buttons: a 'Cancel' button and a blue 'Confirm' button.

Figure 3.4 Content of a new project

- Image save function only works on continuous mode and only can save the image in ICAM-540. The image will be saved in /opt/advantech/web/temp_folder/project/{projectName}/images.

New Project✕

Project Name*

Description

Camera List*

Resolution

Pixel Format

Trigger Mode

Figure 3.5 Content of new project

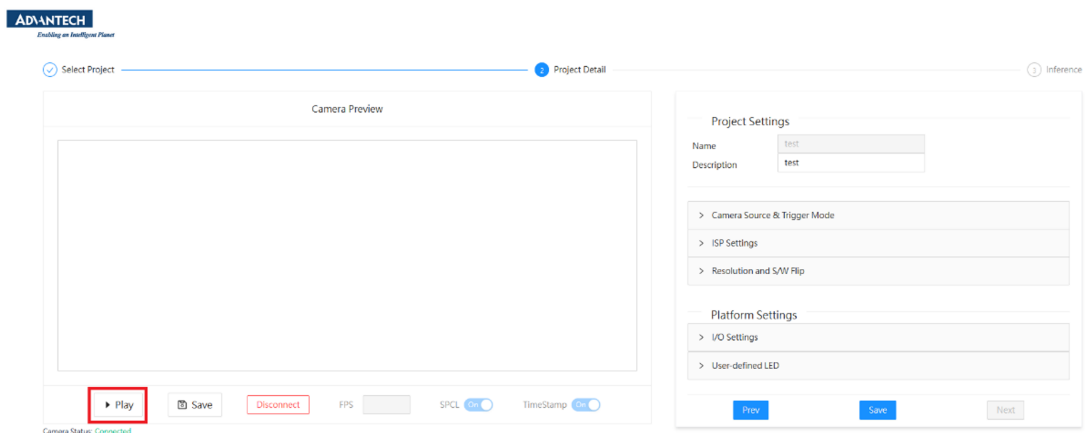


Figure 3.6 Start acquisition

3.5 Configure ICAM-540 Camera

All the camera functions are listed on the right hand side of the UI. ICAM-540 provides camera setting, generic setting, ROI setting, I/O setting and LED indicator settings. In addition to using web browser to configure the ICAM-540, a Python based example and APIs provide more flexible ways to configure and integrate the ICAM-540. For information on the APIs and examples, please reference the programming guide.

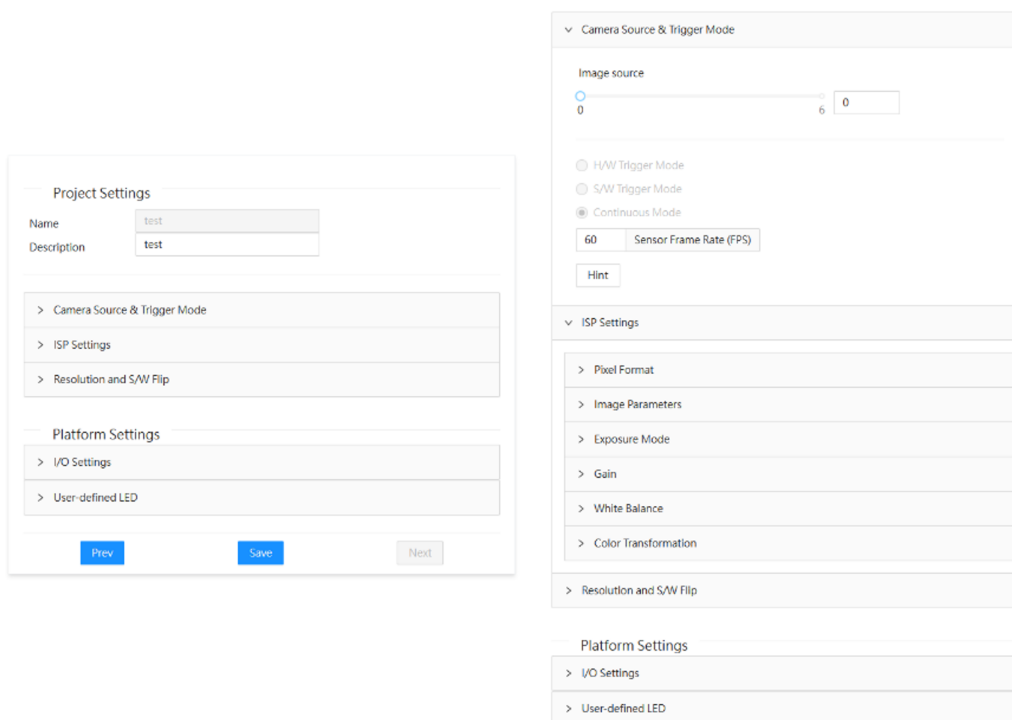


Figure 3.7 1 Camera function overview

3.5.1 Camera Acquisition Setting

This section shows camera acquisition settings that include trigger mode. The exposure time will affect Continuous Mode

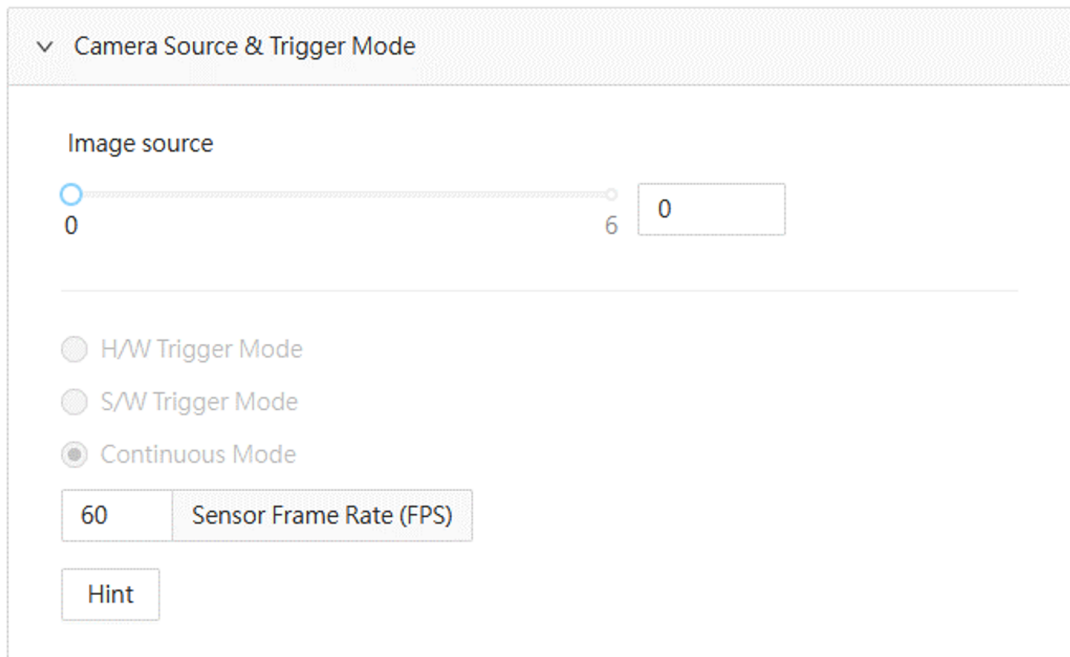


Figure 3.8 Camera Acquisition Setting

3.5.2 ISP Settings

This section shows ISP settings.

■ Brightness

The camera brightness refers to the brightness when the camera adjusts image under Auto exposure mode, or Auto Gain mode. You can set brightness as shown below. Set Brightness according to actual demand, its range is from -1 to 1.

■ Gamma

Gamma correction provides non-linear adjustment to change image brightness. The range of Gamma is from 0 to 3.

■ Mirror X

Enable Mirror X function to mirror the images in the x axis.

■ Mirror Y

Enable Mirror Y function to mirror the images in the y axis.

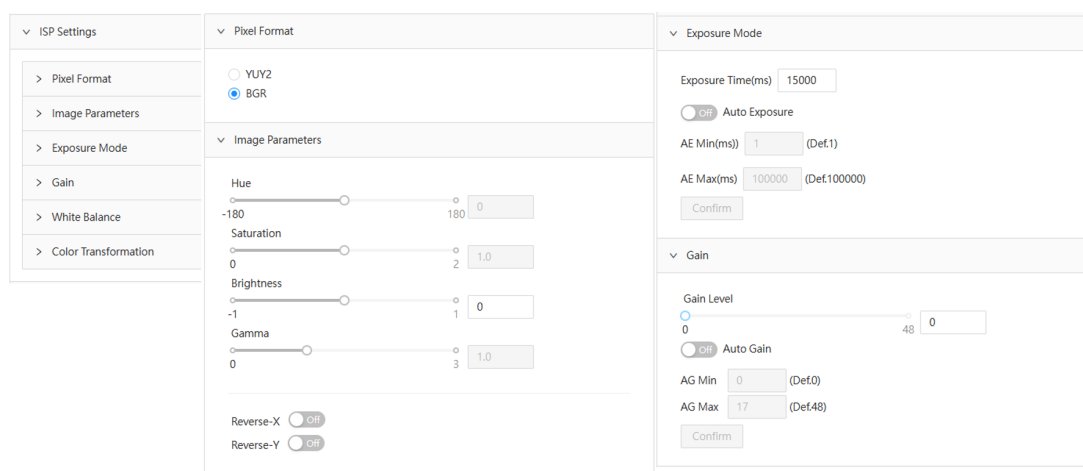


Figure 3.9 ISP Setting

Color HUE

To shifts the color of image color via the color HUE controls. HUE only works on YUV and RGB formats. The range of saturation is from 0 to 255.

Color Saturation

Changes the colorfulness of image color via the color saturation controls. Saturation only works on YUV and RGB format. The range of saturation is from 0 to 255.

Auto Exposure

Automatically adjusts the exposure time within specified limits until a default brightness value has been reached.

Auto Gain

Automatically adjusts the gain within specified limits until a target brightness value has been reached. The range of gain: 0-24.

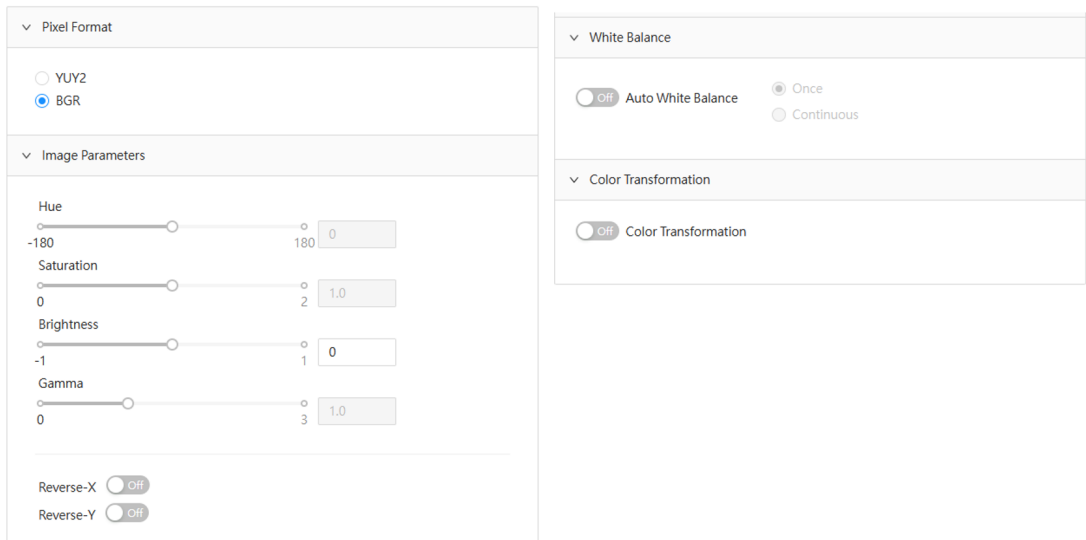


Figure 3.10 ISP Setting of Color Version

3.5.3 ROI Setting & Output

This section shows how to set the image resolution of the camera. There are 10 types of resolution for setting. And user defined resolution.

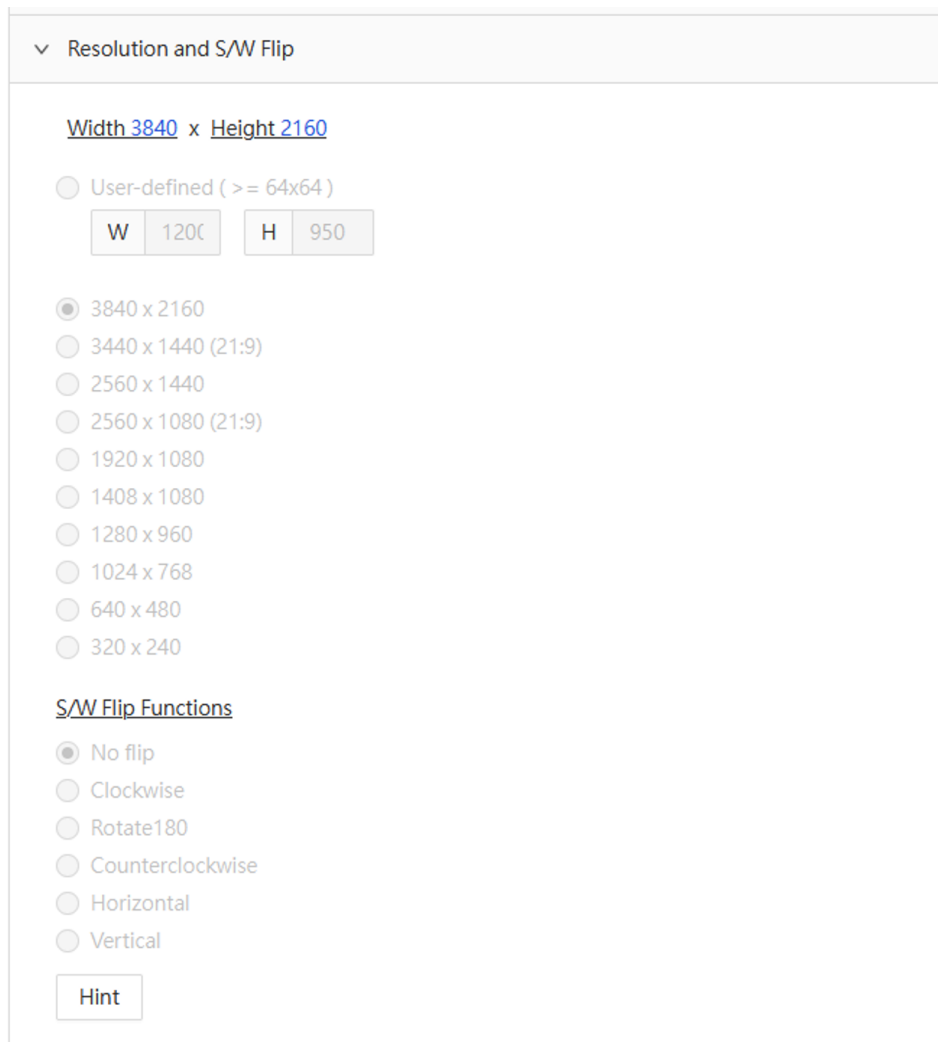


Figure 3.11 ROI Setting & Output

3.5.4 Platform Settings

This section shows the setting of LED indicators, digital inputs, and digital output.

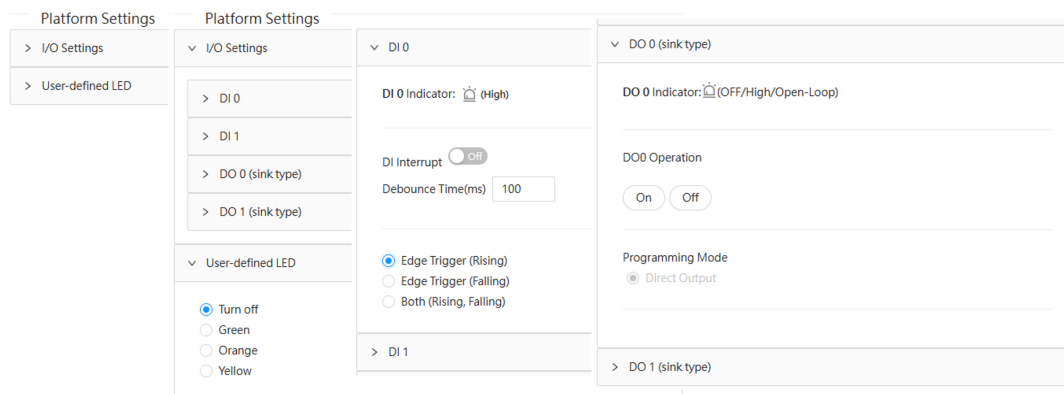


Figure 3.12 Platform Settings

3.5.5 Hardware Trigger Mode

In hardware trigger mode, the digital output pin of ICAM-540 must be connected to the trigger input (pin 16) of the cameras, and the camera will begin the process of exposing and reading out a frame, below are the operation procedures:

1. Wire trigger input (pin 16)
2. Configure the camera in hardware trigger mode.
3. The camera will acquire the images, and then send out the image data.
4. The camera will return to the standby mode, and wait for the next valid trigger signal.

*** The shortest duration of trigger input is 16 ms.

3.5.6 Software Trigger Mode

In software trigger mode, users can use the software API to control the image acquisition, and the camera will not acquire frames unless software acquisition command is executed, below are the operation procedures:

1. Configure the camera in software trigger mode.
2. Execute the image acquisition command through software API.
3. The camera will acquire the images and receiving image data.
4. The camera will return to the standby mode, and wait for the next acquisition command.

***The shortest duration of trigger input is 28 ms (in resolution 640x480).

3.5.7 Continuous Mode

Camera performs acquisition continuously until acquisition stop is executed.

Mono

Below is the fps in different resolution and color format.

Table 3.1: fps in different resolution and color format

Resolution	BGR Color Format	YUV2 Color Format
3860x2178	12.9	9.3
1920x1080	52.6	37
1408x1080	59.8	52.6
640x480	59.8	59.8

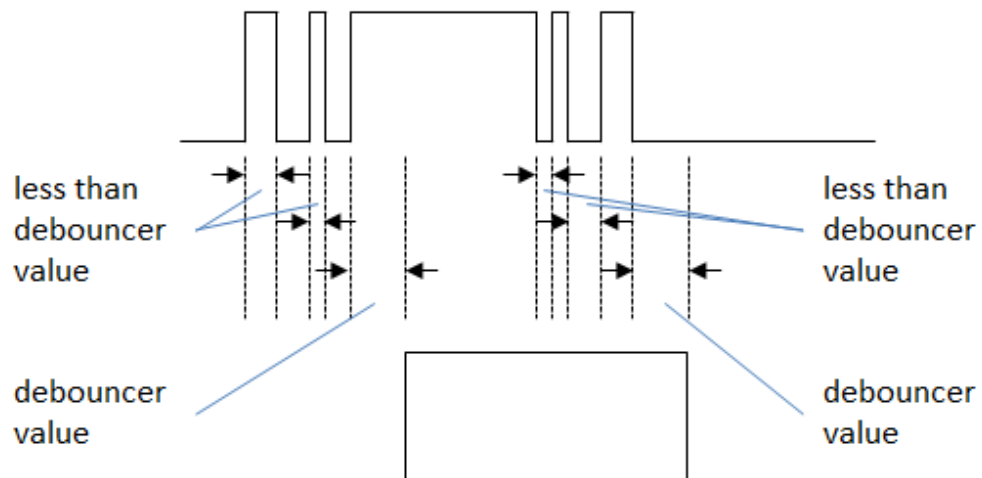
3.5.8 Set up the Digital I/O control

ICAM-540 provides 2 port digital input and 2 ports digital output for external connection.

3.5.8.1 Digital Input and trigger input

There are two digital inputs (Pin 8, 9) that support debouncer features. The debouncer feature identifies the valid and invalid input signals via setting the debouncer value (the minimum period of time for the valid signal). In this way, the circuit will only respond to the signal that the pulse width is greater than the debouncer value.

Trigger in: default setting debouncer 50 us.

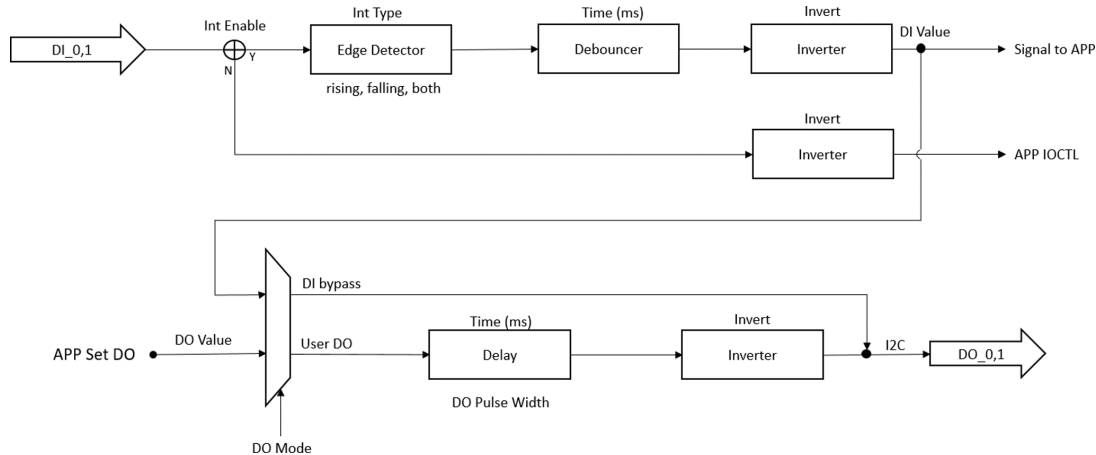


3.5.8.2 Digital output

There are two digital outputs (Pin 10,11), each digital output supports inverter and can be configured as two different modes, including direct output.

Direct output:

The digital output signal is active when a valid command occurs, and the delay time can be set as well.



3.6 ICAM-540 Camera Parameters and SDK

For information on the APIs and examples please refer to the programming guide.

Table 3.2: Camera parameters	
Function Name	Parameters
	Mono Color
Camera Acq. Settings	
Trigger Mode Settings	H/W Trigger Mode S/W Trigger Mode Continuous Mode Frame rate
ISP Settings	
Pixel Format	YUV RGBA
Image Adjustments	Color HUE (0~255) Color Saturation (0~255) CCM Gain00, Gain10 and Gain20 R channel. (-4096~4096) Gain01, Gain11 and Gain21 G channel. (-4096~4096) Gain02, Gain12 and Gain22 B channel. (-4096~4096) White balance(1~16376)
Auto Exposure Mode	Exposure time
Auto Gain Mode/Intensity	Gain Range(0~48)
Platform Settings	

I/O Setting	DI 0/1 Debounce time Edge Trigger (Rising) DO 0/1 Output High Output Low Programming Mode Direct Output
User-defined LED	Green Orange Yellow

3.7 Project Management

ICAM-540 allows users to save camera setting as a project and provides auto-run, import and export functions.

3.7.1 Auto-run

ICAM-540 allow users to set up an auto run project function while camera boots up. Select the project and enable auto-run function and ICAM-540 will auto execute the project while the camera boots up.

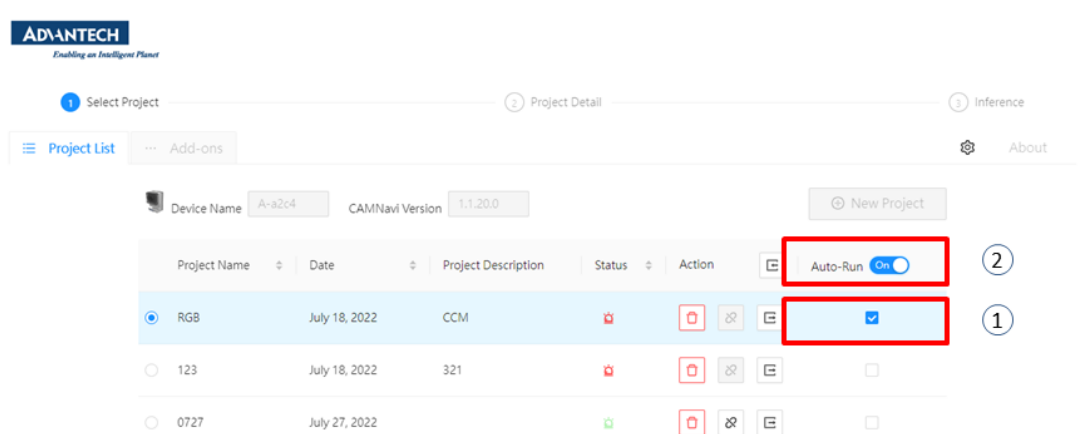


Figure 3.13 Auto run

3.7.2 Project import & export

ICAM-540 provides a project import and export function.

3.7.2.1 Project import

Click the project import icon and upload the selected project to import.

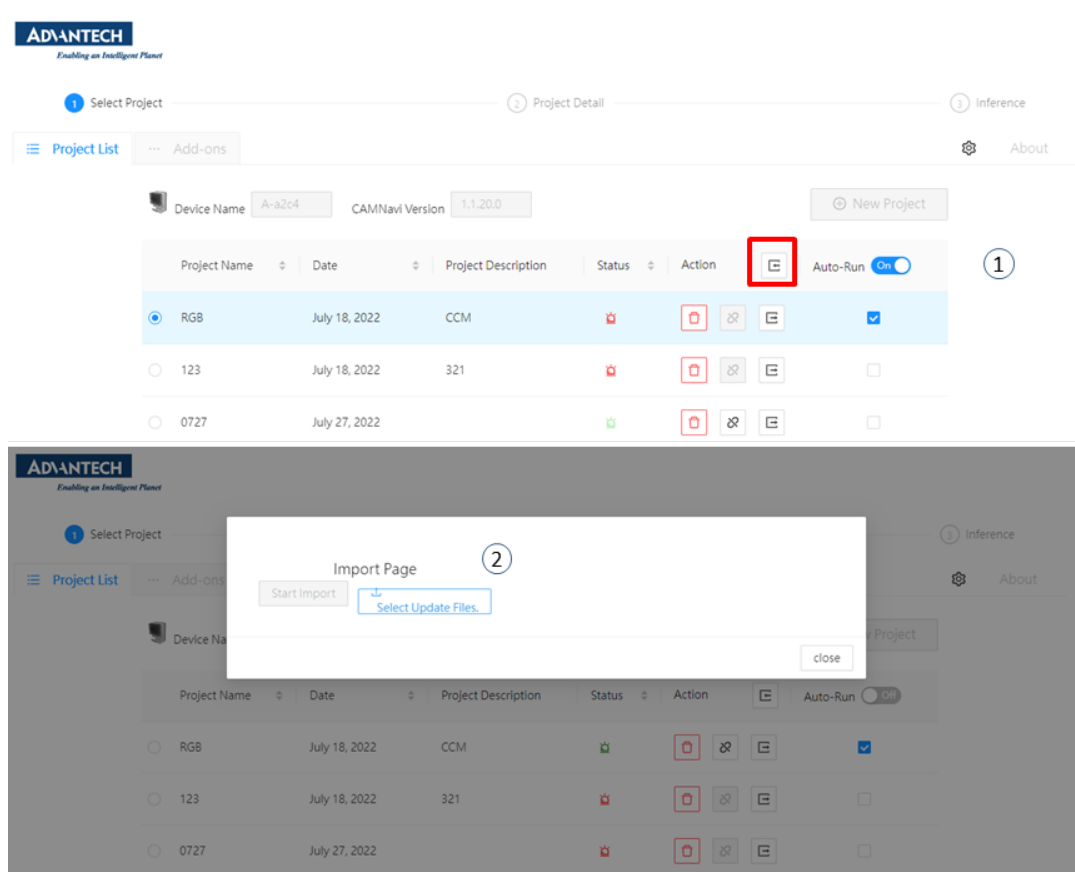


Figure 3.14 Project import

3.7.3 Project Export

Click the project export icon and export the selected project to a download folder.

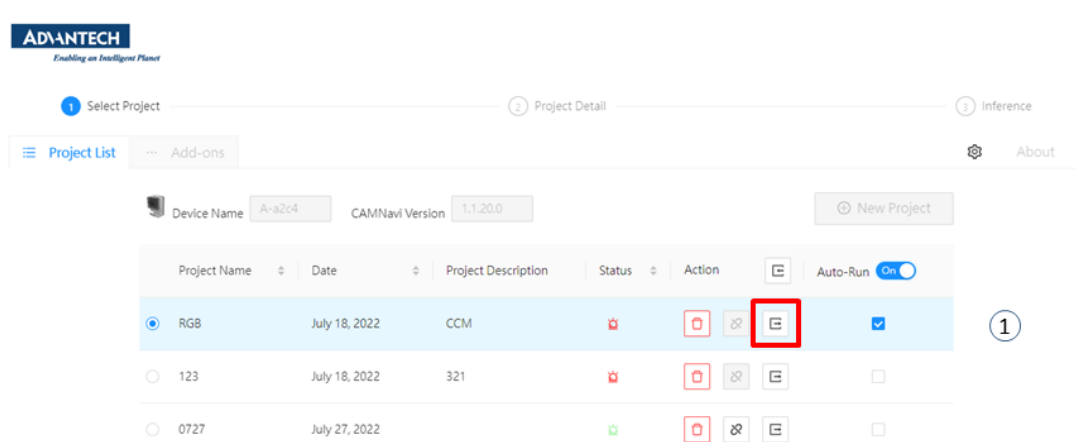


Figure 3.15 Project export

Chapter 4

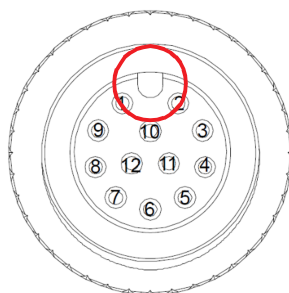
Troubleshooting

Please setup the ICAM-540 with the following instructions to operate ICAM-540 in local mode for troubleshooting. If the user has problems connecting the ICAM-540 via a host PC, or if ICAM-540 still can't boot up and make an acquisition after reset up the ICAM-540, contact Advantech FAE for technical support.

4.1 Connection for Keyboard, Mouse and Display

- Insert the USB type C adapter/cable to USB type C connector directly for keyboard & mouse connection.
- Insert the HDMI cable to connector directly for display connection.

4.2 Reconnect a Power and D I/O Cable



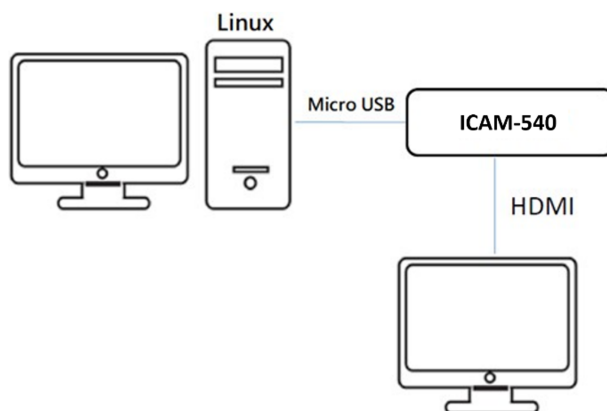
- Align the alignment pin (Cable side) with the alignment channel (Device side).
- Inset the cable connector and tighten the threaded collar to fix the connection.
- Plugin the power source after the M12 connector is fastened on the ICAM-540.

4.3 Operate the Camera Function

1. Use Google Chrome on the desktop to connect with the ICAM-540.
2. Enter the default IP address of the ICAM-540: 192.168.0.100:5000 or Local-host5000
3. ICAM-540 web server interface will be displayed in the Chrome browser.

4.4 BSP Image Flashing

1. Connect ICAM-540 device and Host PC(X 86 with Ubuntu 20.04 OS with 80GB or above storage) with micro USB cable and connect the HDMI screen to the ICAM-540 device. DO NOT connect USB type-C during flashing.



2. Copy BSP file (Ex: ICAM-540_ORIN-NX_5.1.1_GA_3.1.4.14.tbz) to Host PC
3. Enter the following command on the Host PC to un-tar the BSP image file: `sudo tar -jxvf ICAM-540_ORIN-NX_5.1.1_GA_3.1.4.13.tbz2`
4. Press and hold Recovery buttons during micro USB connection. Then turn on the power.
5. Release the Recovery button after waiting for 3 seconds.
6. Enter the "lsusb" command on the Host PC.
7. ID 0955:7423 Nvidia Corp. means device is in recovery mode.

```
Bus 001 Device 003: ID 0955:7423 NVIDIA Corp. APX
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

8. On the Host PC, enter the decompressed BSP directory and type the following command: `sudo ./tools/kernel_flash/l4t_initrd_flash.sh --external-device nvme0n1p1 -c tools/kernel_flash/flash_l4t_external.xml -p "-c bootloader/t186ref/cfg/flash_t234_qspi.xml" --showlogs --network usb0 p3509-a02+p3767-0000 internal`
9. After 20 to 30 minutes, you should see a success message as shown below on the Host PC and ICAM-540 will automatically restart.

```
icam-540@tegra-ubuntu:~$ cat /opt/version
ICAM-540_ORIN-NX_5.1.1_GA_3.1.4.14, Build Date: 2023-12-22 15:04:02
icam-540@tegra-ubuntu:~$
icam-540@tegra-ubuntu:~$
icam-540@tegra-ubuntu:~$
icam-540@tegra-ubuntu:~$
```

10. To find BSP version, enter `cat /opt/version`

www.advantech.com

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