NEON-2000-JNO Series

AI Smart Camera

User's Manual



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LEADING EDGE COMPUTING

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Revision History

Revision	Release Date	Description of Change(s)
1.0	2023-01-31	Initial release

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Preface

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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.


NOTE:

Additional information, aids, and tips that help users perform tasks.


CAUTION:

Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.
ATTENTION: Informations destinées à prévenir les blessures corporelles mineures, les dommages aux composants, la perte de données et/ou la corruption de programme lors de l'exécution d'une tâche.


WARNING:

Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.
AVERTISSEMENT: Informations destinées à prévenir les blessures corporelles graves, les dommages aux composants, la perte de données et/ou la corruption de programme lors de l'exécution d'une tâche spécifique.

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1 Introduction

1.1 Overview

The NEON-2000-JNO series is an open camera platform equipped with an NVIDIA® Jetson™ Nano module supporting a series of image sensors providing industrial DI/O capabilities. It is designed for deep learning inference or other vision applications that requires a GPU at the edge. The system has Ubuntu Linux, Jetpack, camera driver and utilities pre-installed to save integration effort and avoid compatibility issues.

The following table describes the current NEON-2000-JNO models with their respective sensor specifications.

Camera Model	Image Sensor	Sensor Vendor	Sensor Module	Sensor Output	Image Capturing
NEON-201A-JNO	1/2.6”, 2M, Global Shutter, 1920x1200, 60fps, Color	onsemi	AR0234	mipi	V4L2/ Gstreamer
NEON-202A-JNO	1/1.8”, 8M, Rolling Shutter, 3840x2160, 60fps, Color	Sony	IMX334	mipi	V4L2/ Gstreamer

Table 1-1: NEON-2000-JNO Model and Sensor Specifications

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1.2 Features

- Provides rich sample code and AI development, quick to start
- CPU: Quad-Core Arm® Cortex®-A57 MPCore processor
- GPU: NVIDIA Maxwell architecture with 128 NVIDIA CUDA® cores and 16GB eMMC
- USB3 sensor interface compatible with the most machine vision software
- Type-C connector supports DC power, DisplayPort and USB signal, reducing cabling
- Preinstalled Ubuntu and software suite on microSD card, plug and play
- Highly integrated and compact system that is easy to deploy

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1.3 General Specifications

- Lens mount: C-mount
- Total weight: <700g (without lens)
- Operating temperature (tested with YOLOv4)
  - NEON-20XA-JNO series, 0°C to 55°C with 0.6 m/s airflow at 15W mode
- Power consumption: <40W
- Computing module: NVIDIA Jetson Nano
  - CPU: Quad-Core Arm® Cortex®-A57 MPCore processor
  - GPU: NVIDIA Maxwell architecture with 128 NVIDIA CUDA® cores
  - Built-in memory and storage: 4 GB 64-bit LPDDR4, 1600MHz 25.6 GB/s, 16GB eMMC and 32G microSD card
- Camera I/O and connectors
  - 1x Type-C for power input, DisplayPort and USB signals
  - 1x DC Jack for 12-24V DC input
  - 1x GbE Ethernet port
  - 1x 15-pin D-sub for DI/O and COM which includes:
    - 4x GPI/O, including 1x Camera Trigger In and 1x Trigger Out
    - 1x COM
  - 1x 32G microSD card with preinstalled OS and required software
  - 1x wafer connector and 1x Micro-USB for system flashing and debugging

NOTE:

1. When powering from the DC Jack, the Type-C connector can provide 3W of power to an external device such as a Type-C hub. Devices requiring more than 3W cannot be used.
2. DC power can be from the Type-C connector or DC jack.
3. Use only recommended ADLINK power adapters.
4. The camera boots from the preinstalled microSD card that cannot be removed. To change the microSD card, constant ADLINK.

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Model	NEON-201A-JNO	NEON-202A-JNO
Image Sensor		
Resolution (HxV)	1920x1200	3840x2160
Resolution	2M	8M
Frame Rate (fps)	60	30
Color/Mono	Color	Color
Shutter	Global	Rolling
Sensor Size	1/2.6"	1/1.8"
Pixel Size (µm)	3 x 3	2.0 x 2.0
Sensor Vendor	onsemi	Sony
Sensor Model	AR0234	IMX334
Image Capturing Software	V4L2 & Gstreamer	
Image Sensor Trigger Mode	External HW trigger, SW trigger, free run	SW trigger, free run
Lens Mount	C Mount	
System		
Computing Platform	NVIDIA Jetson Nano	
CPU	6-core NVIDIA Carmel ARM®v8.2 64-bit CPU 6 MB L2 + 4 MB L3	
Supported OS	Ubuntu 18.04	
GPU	NVIDIA Maxwell architecture with 128 NVIDIA CUDA® cores	
Storage	16G eMMC (built-in Nano module) and pre-installed 32G microSD card	
Memory	8 GB 128-bit LPDDR4/16G eMMC (built-in Nano module)	

Table 1-2: NEON-2000-JNO General Specifications

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Model	NEON-201A-JNO	NEON-202A-JNO
Connectors and Functions		
Ethernet	Supports 10/100/1000 Mb	
USB Type C	Video output (DisplayPort), 1920x1080 @ 30fps	
	1x USB3 and 1x USB2	
	Power supply for the camera (when connected to Type-C charger or adaptor)	
	Power supply (5 W) for external Type-C Hub (when connected to Type-C hub)	
D-sub	4x DI and 4x DO	
	1x UART (TXD, RXD, GND)	
Micro USB	USB OTG (for system flash)	
Wafer Connector	For system flash	
Mechanical & Power		
Dimensions	123.3 x 77.5 x 66.81 mm	
Weight	700g	
Power Input	DC Jack (12-24V DC) or Type-C (15V DC)	
Power Consumption	<40W (camera only)	
Environmental & Certification		
Operating Temperature	0°C to 55°C	
Storage Temperature	-20°C to 70°C	
Humidity	40% to 75% (non-condensing)	
Vibration	Operating, 5 to 500 Hz, 5 Grms, 3 axes	
Shock	Operating, 11ms duration, 30G, half sine, 3 axes	
ESD	Contact +/- 4kV, Air +/- 8kV	
EMC	CE and FCC Class A (EN61000-4/-2)	
Safety	UL and cB	

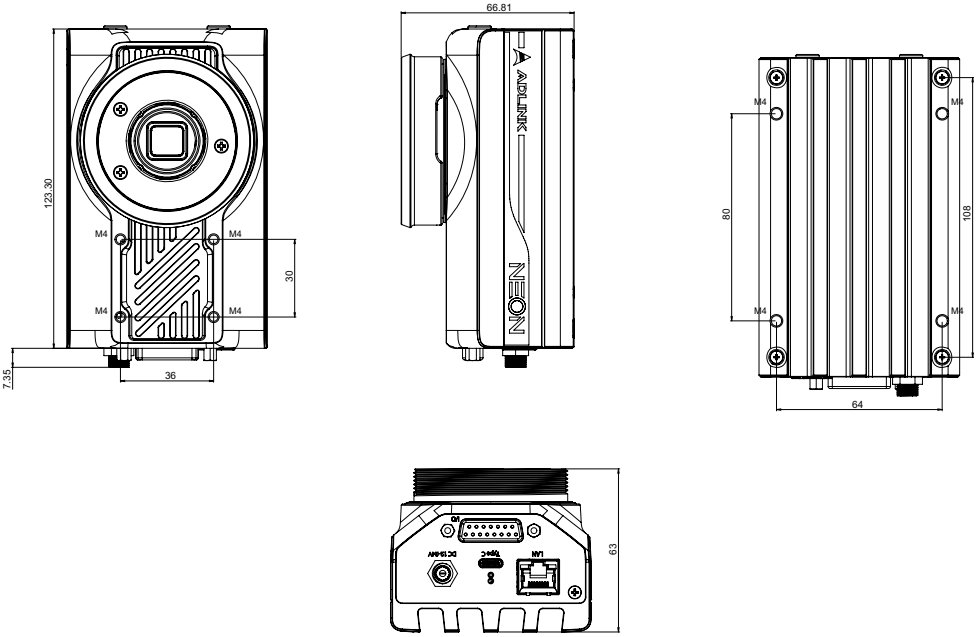
Table 1-2: NEON-2000-JNO General Specifications

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1.4 Mechanical Dimensions

This section provides dimensions and related mechanical information for the NEON-2000-JNO.

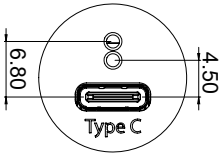
1.4.1 Camera Dimensions



Dimensions: mm

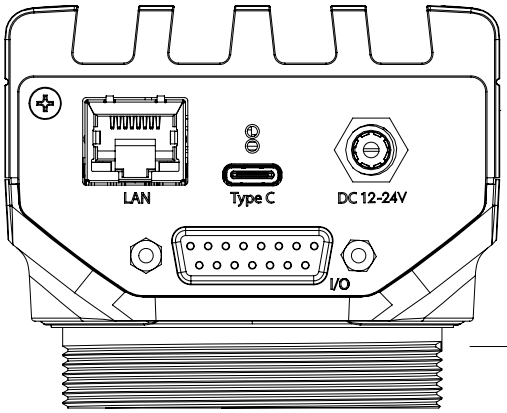
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1.4.2 USB Type-C Screw Lock Location and Dimensions



Dimensions: mm

1.4.3 LED Light Mounting Thread



Metric thread
M60x1.5mm

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1.5 Accessories

Use ADLINK recommended accessories for optimum system performance. The table below includes ADLINK verified accessories.

Accessory	Part Number	Description
USB Type-C cable	30-01284-0030-A0	USB Type-C (M) to USB Type-C (M), length 1.8M, with screw lock
USB Type-C Hub & Adapter	92-99090-1010	AC 100-240V, USB – C PD2.0, DC 15V/2.3A
DI/O cable	30-01332-0010-A0	DB15P (M) to DB37P (M), length 3M, connected to DIN-37D-01
DIN-37D-01 DI/O extension board	91-14025-1020	DI/O extension board with one 37-pin D-sub connector and DIN-rail mount
8mm lens	92-15731-0010	Focal length 8mm, F1.4, 2/3”, 3MP
AC/DC adaptor	31-62156-1010-A0	AC 100-240V DC, 12V/5A, DC jack

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2 Connectors and I/O

This chapter includes the locations and descriptions of the connectors and I/O found on the NEON-2000-JNO.

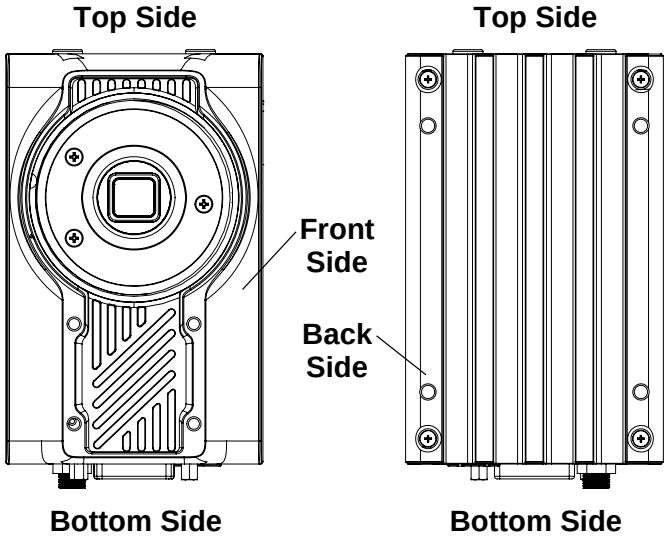


Figure 2-1: NEON-2000-JNO Orientation

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2.1 Bottom Side I/O and Connector Description

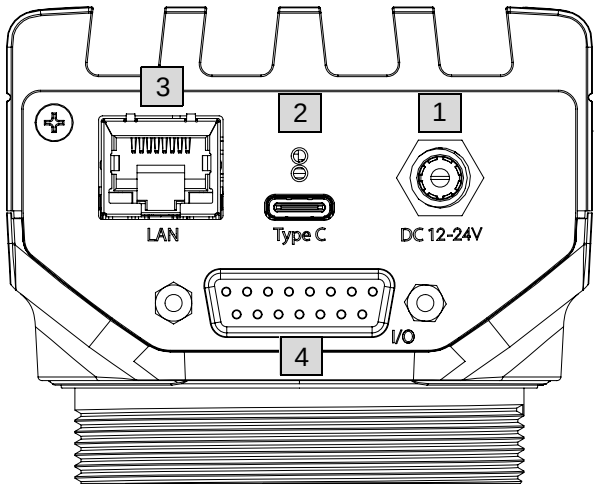


Figure 2-2: Bottom Side I/O and Connectors

Item	Description
1	• DC Jack for DC input with included ADLINK AC/DC adaptor (P/N 31-62156-1010-A0) • Power input: 12-24V DC at >30 W
2	• USB Type-C connector w/ screw lock • Supports DisplayPort (up to 1080P @ 30 fps) • The NEON-2000-JNO can be powered via this port or the DC jack
3	1 GbE LAN at 10/100/1000 Mbit/s
4	15-pin D-sub I/O connector for the digital I/O and UART. Use to connect external I/O devices such as sensors, COM and LED/strobe controllers.

Table 2-1: Bottom Side I/O and Connectors

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2.1.1 D-sub I/O Connector

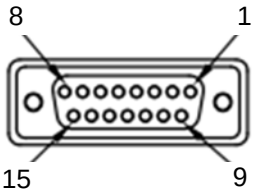


Figure 2-3: D-sub I/O Connector

Pin	Function	Pin	Function
1	UART - TX	2	DI/O GND
3	Digital output 0/Strobe output 0 (see note 2)	4	Digital output 1
5	Digital output 2	6	Digital output 3
7	UART GND	8	Reserved
9	UART – RX	10	DI/O GND
11	Digital input 0/Trigger input 0 (see note 1)	12	Digital Input 1
13	Digital Input 2	14	Digital Input 3
15	Reserved		

Table 2-2: D-sub I/O Connector Pin Definitions

NOTE:

1. Pin 11 (Digital input 0/Trigger input 0) is programmable. When configured for trigger input, it is used for hardware triggering of the image sensor. Connect an external sensor signal to pin 11 and set the camera to hardware trigger mode to enable realtime or hardware triggered image capture.

2. Pin 3 (Digital output 0/Strobe output 0) is programmable. When configured for strobe output, it can be connected to an LED light/strobe controller to adjust the timing latency/delay according to the camera connected to pin 11.

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I/O Category	Maximum Throughput	Specification		
UART	-	Baud rate: 9600bps @ 8N1		
Digital Input	10 KHz	Common sharing:	1 common for sharing ground	
		Input range:	0-5 VDC	
		High level threshold:	2-5 VDC	
		Low level threshold:	0-0.8 VDC	
Digital Output	10KHz	Open-collector	Input voltage range:	3.3-30 VDC
			Maximum sink current	100 mA

Table 2-3: D-sub I/O Connector Specification

2.1.2 DC Jack

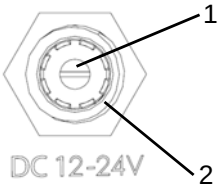


Figure 2-4: DC Jack Connector

Pin	Function	Description
1	Power	Power input
2	Ground	Reference ground

Table 2-4: DC Jack Pin Definitions

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2.2 Top Side I/O and Connector Description

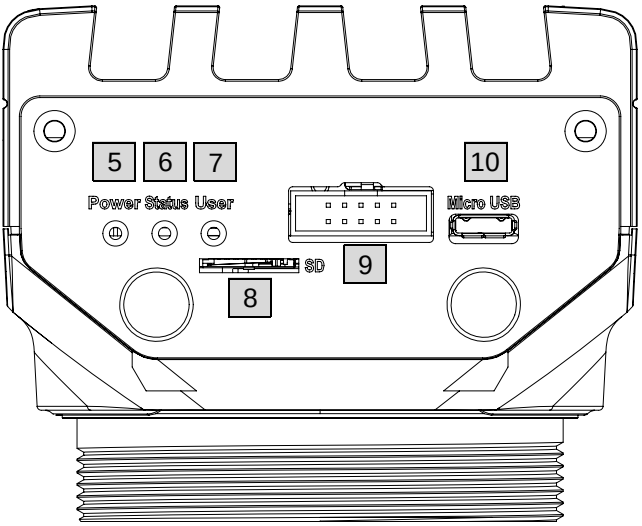


Figure 2-5: Top Side I/O and Connectors

Item	Description
5	Power status LED. Lights green when power is connected.
6	Operating system status LED. Flashes orange when the system is booting, and lights when the system has booted successfully.
7	User define green/red LED.
8	microSD card slot, with 32G microSD card pre-installed with Ubuntu and required software. The camera boots from this microSD card.
9	Wafer connector. This connector is used to update the NEON-2000-JNO.
10	Micro-USB port. This connector is used to update the NEON-2000-JNO.

Table 2-5: Top Side I/O and Connectors

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2.2.1 Wafer Connector

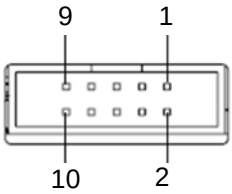


Figure 2-6: Wafer Connector

Pin	Function	Pin	Function
1	Reserved	2	Reserved
3	System Reset	4	GND
5	RECOVERY	6	GND
7	Reserved	8	GND
9	Reserved	10	GND

Table 2-6: Wafer Connector Pin Definitions

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2.3 Front Side I/O and Connector Description

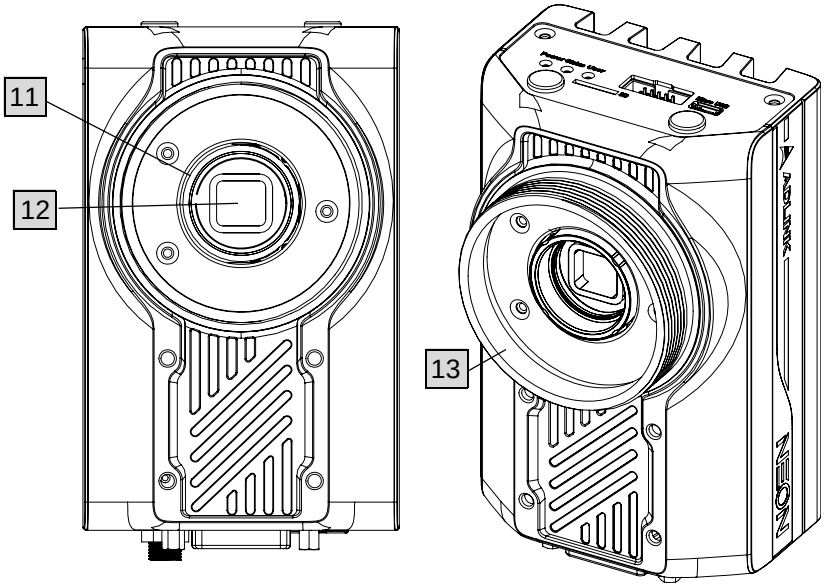


Figure 2-7: Front Side I/O and Connectors

Item	Description
11	C-type lens mount
12	Image sensor
13	Strobe/LED light mounting thread. See “LED Light Mounting Thread” on page 7.

Table 2-7: Front Side I/O and Connectors

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3 Getting Started

3.1 Mounting

The NEON-2000-JNO can be mounted using the mounting screw holes on either the front (A) or back (B) sides.

Le NEON-2000-JNO peut être monté à l'aide des trous de vis de montage sur les côtés avant (A) ou arrière (B).

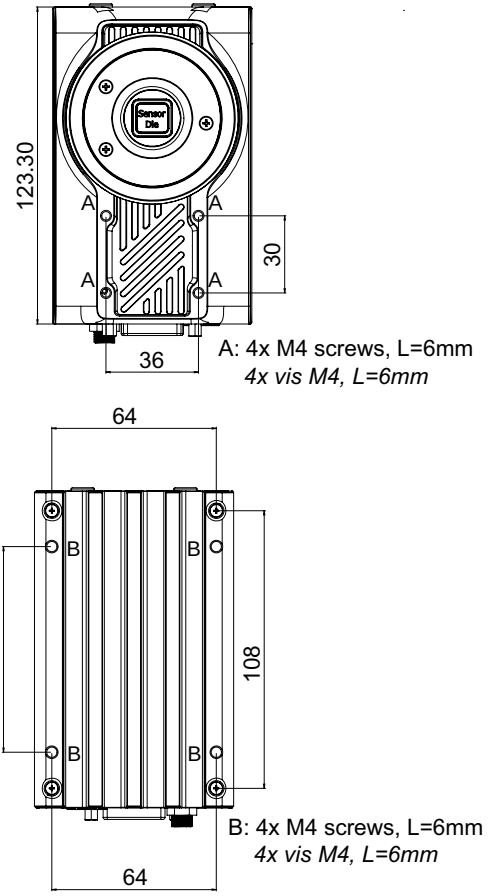


Figure 3-1: NEON-2000-JNO Mounting Holes

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3.2 Digital I/O Connection Example

External devices such as trigger sensors, LED light controllers or relays can be connected to the NEON-2000-JNO to implement different applications. This section shows an example of how to connect such devices.

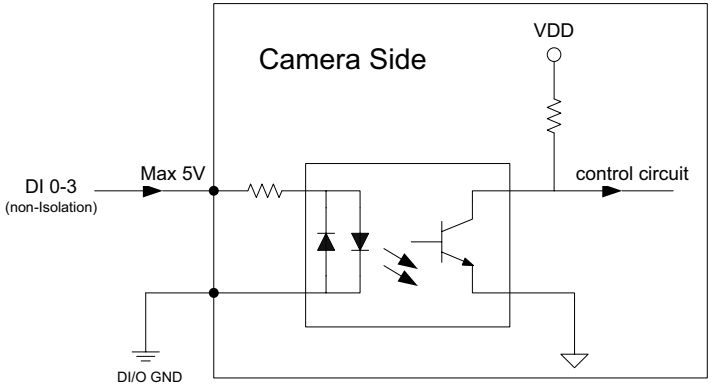


Figure 3-2: Digital Input Schematic Diagram

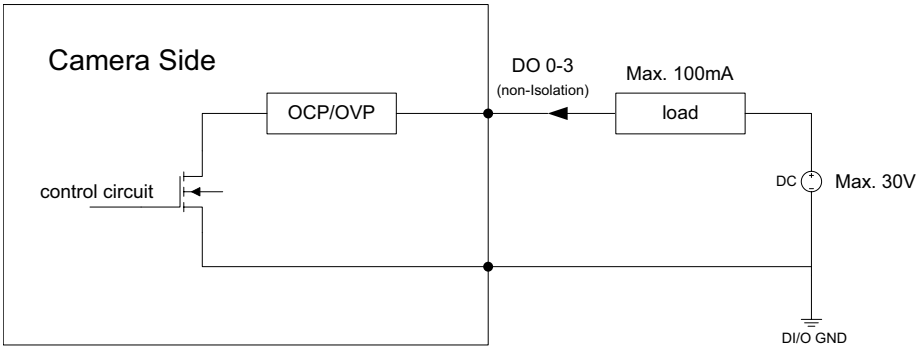


Figure 3-3: Digital Output Schematic Diagram

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3.3 Attaching a Lens

The NEON-2000-JNO is compatible with C-mount type lenses.

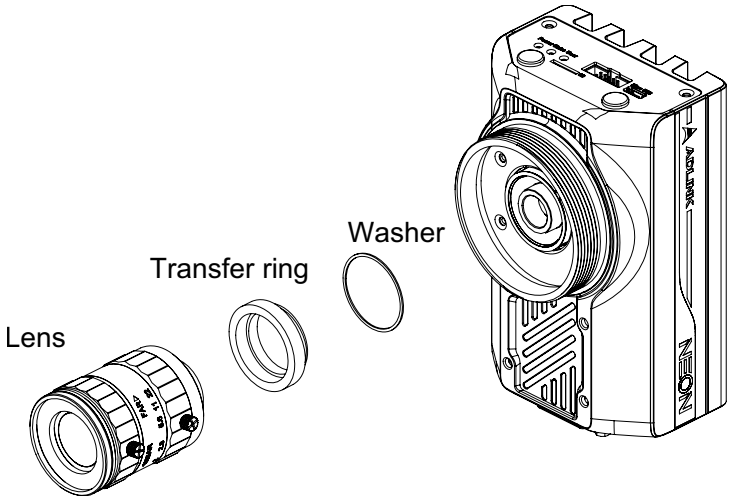


Figure 3-4: Lens Attachment Assembly

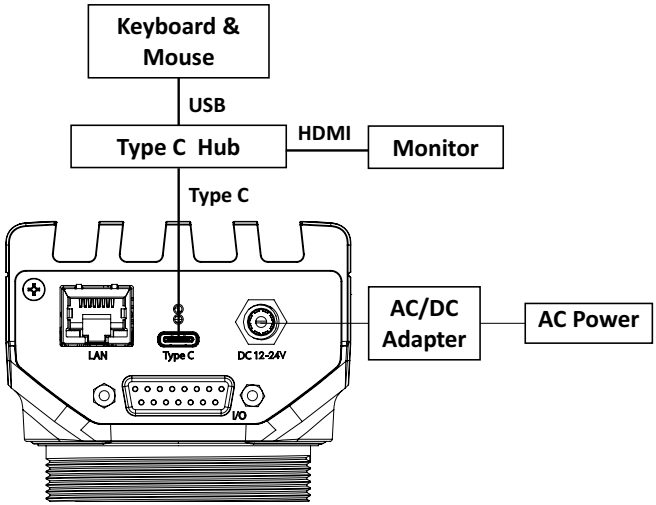
NOTE:

The transfer ring is installed before shipping.
Neon-201A: 0.9mm washer
Neon-202A: 1.55mm washer

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3.4 Power and Peripheral Connections

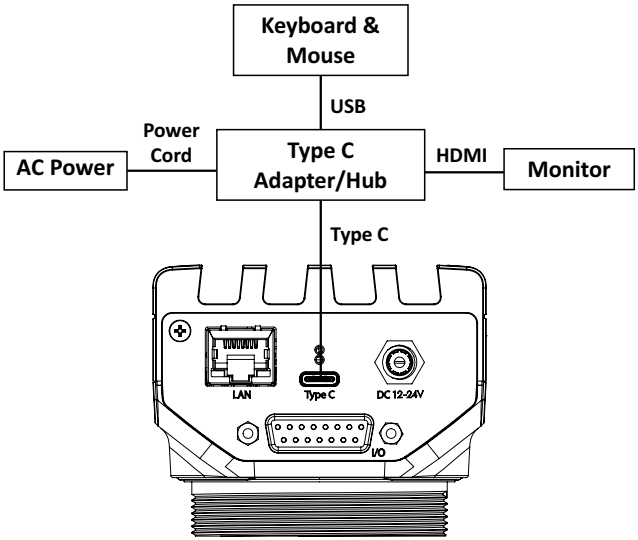
The NEON-2000-JNO DC power source can be either from a USB Type-C adaptor or DC jack. The USB Type-C connector also supports a DisplayPort video signal and USB3, which can be used to connect a keyboard and mouse. The following figures show examples of possible power and peripheral connection configurations.



NOTE: This configuration requires an ADLINK AC/DC power adapter (P/N 31-62156-1010-A0). Ensure that the power adapter cord of the device connects to a socket outlet with a ground/earth connection.

Figure 3-5: Separate Power and Peripheral Connections

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NOTE:

This configuration requires an ADLINK USB Type-C hub/adapter (P/N 92-99090-1010).

Figure 3-6: Combined Power and Peripheral Connections

3.5 Log In

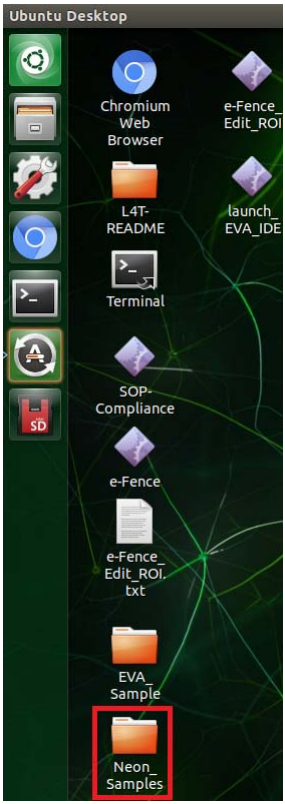
Log in to the NEON-2000-JNO with the following credentials:

- Default account: adlink
- Default password: adlink

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3.6 Image Capture and Inference

ADLINK provides sample files for testing the NEON-2000-JNO image capturing functions. The files are located in the **Samples** folder on the Desktop.



To get the latest sample code, go to https://github.com/AIoT-IST/Samples

3.7 Neon-20XA Trigger Control

3.7.1 Trigger API Function

You can adjust image features or control a lens by using the v4l2-ctl command as follows:

```
v4l2-ctl --set-ctrl=<ctrl>=<val>
```

To list the all the options, enter:

```
v4l2-ctl --all
```

The following table list all the Trigger API Function options and their descriptions.

<ctrl>	<ctrl> description	<val> type	<val> description
trigger_mode	enable/disable the trigger mode	Menu 0: OFF 1: PULSED 2: AUTOMATIC SOFTWARE 3: AUTOMATIC EXTERNAL	min=0 max=3 default=0
trigger_gain	set the gain at trigger mode	int	min=10000 max=1280000 step=1000 default=10000
trigger_wb_mode	choose the white balance mode at trigger mode	Menu 0: Manual Gain 1: Manual Color Temperature 2: Sunny 3: Shadow 4: Indoor 5: Lamp	min=0 max=5 default=1

Figure 3-7: Neon-20XA Trigger API Function Options

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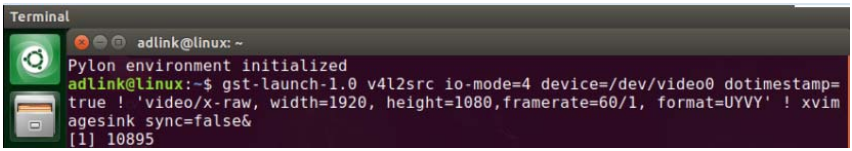
<ctrl>	<ctrl> description	<val> type	<val> description
trigger_wb_rgain	set the r gain of white balance at trigger mode	int	min=1 max=4095 step=1 default=1024
trigger_wb_bgain	set the b gain of white balance at trigger mode	int	min=1 max=4095 step=1 default=1024
trigger_wb_colortemp	set the color temperature at trigger mode	int	min=2000 max=12000 step=1 default=5500
trigger_start_stop	start trigger/stop trigger	button	
external_trigger_polarity	choose to trigger externally at falling edge or rising edge	Menu 0: Falling 1: Rising	min=0 max=1 default=1

Figure 3-7: Neon-20XA Trigger API Function Options

3.7.2 Trigger API Example

Step 1: Open a terminal and enter the following command to start streaming.

```
gst-launch-1.0 v4l2src io-mode=4 device=/dev/
     video0 do-timestamp=true ! 'video/x-raw,
     width=1920, height=1080,framerate=60/1,
     format=UYVY' ! xvimagesink sync=false&
```



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Step 2: To test the functionality of the **software trigger** of the pulsed trigger mode, enter:

```
v4l2-ctl --set-ctrl=trigger_mode=1
v4l2-ctl --set-ctrl=low_latency_mode=1
v4l2-ctl --set-ctrl=trigger_start_stop=1
```

Step 3: To test the functionality of the **hardware trigger** of the pulsed trigger mode, enter:

```
v4l2-ctl --set-ctrl=trigger_mode=1
v4l2-ctl --set-ctrl=low_latency_mode=1
```

Step 4: To test the functionality of the **software trigger** of the automatic trigger mode, enter:

```
v4l2-ctl --set-ctrl=trigger_mode=2
v4l2-ctl --set-ctrl=trigger_start_stop=1
v4l2-ctl --set-ctrl=trigger_start_stop=1
```

In automatic trigger mode, the first **trigger_start_stop** command will trigger continuously while the second **trigger_start_stop** command will stop the trigger.

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Important Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

- Read these safety instructions carefully
- Keep the User's Manual for future reference
- Read the Specifications section of this manual for detailed information on the recommended operating environment
- Operating temperature: 35ºC with USB Type C Adaptor/Hub or 40ºC with the adapter supply.
- When installing/mounting or uninstalling/removing device; or when removal of a chassis cover is required for user servicing:
  - Turn off power and unplug any power cords/cables
  - Reinstall all chassis covers before restoring power
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources
  - Keep device away from high heat or humidity
  - Keep device properly ventilated (do not block or cover-ventilation openings)
  - Always use recommended voltage and power source settings
  - Always install and operate device near an easily accessible electrical outlet
  - Secure the power cord (do not place any object on/over the power cord)
  - Only install/attach and operate device on stable surfaces and/or recommended mountings
- If the device will not be used for long periods of time, turn off and unplug from its power source
- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools

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- A Lithium-type battery may be provided for uninterrupted backup or emergency power.



Risk of explosion if battery is replaced with one of an incorrect type; please dispose of used batteries appropriately.

- The device must be serviced by authorized technicians when:
  - The power cord or plug is damaged
  - Liquid has entered the device interior
  - The device has been exposed to high humidity and/or moisture
  - The device is not functioning or does not function according to the User's Manual
  - The device has been dropped and/or damaged and/or shows obvious signs of breakage
- Disconnect the power supply cord before loosening the thumbscrews and always fasten the thumbscrews with a screwdriver before starting the system up
- Ensure that the power adapter cord of the device connects to a socket outlet with a ground/earth connection.
- It is recommended that the device be installed only in a server room or computer room where access is:
  - Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefor, and any precautions required
  - Only afforded by the use of a tool or lock and key, or other means of security, and controlled by the authority responsible for the location

	***BURN HAZARD*** Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching.

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Consignes de Sécurité Importante

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil, pour éviter des blessures ou des dommages.

- *Lisez attentivement ces consignes de sécurité.*
- *Conservez le manuel de l'utilisateur pour pouvoir le consulter ultérieurement.*
- *Lisez la section Spécifications de ce manuel pour des informations détaillées sur l'environnement d'exploitation recommandé.*
- *Température de fonctionnement: 35 ° C avec adaptateur / concentrateur USB Type C ou 40 ° C avec l'adaptateur.*
- *Lors de l'installation / du montage ou de la désinstallation / suppression du périphérique; ou lorsque le retrait d'un capot de châssis est requis pour l'entretien par l'utilisateur:*
  - *Coupez l'alimentation et débranchez tous les cordons / câbles d'alimentation*
  - *Réinstallez tous les couvercles de châssis avant de rétablir l'alimentation*
- *Pour éviter les chocs électriques et / ou les dommages à l'appareil:*
  - *Gardez l'appareil éloigné de l'eau ou des sources de liquide*
  - *Gardez l'appareil loin de la chaleur ou de l'humidité élevée*
  - *Gardez l'appareil correctement ventilé (ne bloquez pas et ne couvrez pas les ouvertures de ventilation)*
  - *Utilisez toujours les paramètres de tension et de source d'alimentation recommandés*
  - *Installez et utilisez toujours l'appareil à proximité d'une prise électrique facilement accessible*
  - *Fixez le cordon d'alimentation (ne placez aucun objet sur / par-dessus le cordon d'alimentation)*
  - *Installez / fixez et utilisez l'appareil uniquement sur des surfaces stables et / ou des supports recommandés*
- *Si l'appareil n'est pas utilisé pendant de longues périodes, éteignez-le et débranchez-le de sa source d'alimentation*
- *N'essayez jamais de réparer l'appareil, qui ne doit être entre-*

tenu que par du personnel technique qualifié à l'aide d'outils appropriés.

- *Une batterie de type lithium peut être fournie pour une alimentation de secours ou une alimentation de secours ininterrompue.*



Risque d'explosion si la pile est remplacée par une autre de type incorrect. Veuillez jeter les piles usagées de façon appropriée.

- *L'appareil doit être réparé par des techniciens autorisés lorsque:*
  - *Le cordon d'alimentation ou la fiche est endommagé*
  - *Du liquide a pénétré à l'intérieur de l'appareil*
  - *L'appareil a été exposé à une humidité élevée et / ou à l'humidité*
  - *L'appareil ne fonctionne pas ou ne fonctionne pas selon le manuel de l'utilisateur*
  - *L'appareil est tombé et / ou endommagé et / ou montre des signes évidents de casse*
- *Débranchez le cordon d'alimentation avant de desserrer les vis moletées et fixez toujours les vis moletées avec un tournevis avant de démarrer le système*
- *Assurez-vous que le cordon de l'adaptateur secteur de l'appareil est connecté à une prise de courant avec une connexion terre / terre.*
- *Il est recommandé d'installer l'appareil uniquement dans une salle de serveurs ou une salle informatique où l'accès est:*
  - *Réservé au personnel de service qualifié ou aux utilisateurs familiers avec les restrictions appliquées à l'emplacement, les raisons de celles-ci et les précautions nécessaires*
  - *Seulement permis par l'utilisation d'un outil ou d'une serrure et d'une clé, ou d'autres moyens de sécurité, et contrôlé par l'autorité responsable de l'emplacement*

	***RISQUE DE BRÛLURES*** *Ne touchez pas cette surface, cela pourrait entraîner des blessures.* *Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*

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Getting Service

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