

RQX-59x Series

Revision History

Revision	Release Date	Description of Change(s)
1.0	2024-05-06	Initial release
1.1	2026-03-12	Specifications updated

Preface

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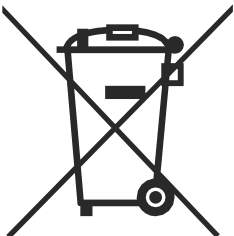
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Battery Labels (for products with battery)



Li-ion



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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

ADLINK's ROScube-X RQX-59x Series, a ROS 2-enabled robotic controller powered by NVIDIA® Jetson AGX Orin™, features an integrated NVIDIA Volta™ GPU, dual deep learning accelerators, along with a wide variety of interfaces including GMSL2 camera connectors for advanced robotic system integration. The RQX-59x Series support the full complement of resources developed with NVIDIA JetPack SDK and ADLINK's Neuron SDK, and is specifically suited for robotic applications demanding high-performance AI computing capabilities with minimal power consumption.

1.2 Features

- ▶ High-performance AI embedded computer for intelligent robotic development
- ▶ Excellent performance per watt with power consumption as low as 40 W
- ▶ Ruggedized, secure connectivity with locking USB ports
- ▶ Comprehensive I/O for connecting a wide range of devices
- ▶ Time synchronization with GMSL2 camera

1.3 Packing List

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK. Upon unpacking, make sure that the following items are included in the package.

- ▶ **RQX-59x Series Fanless Embedded Computer**
- ▶ **Accessories**
 - ▷ Power cable (lockable Molex connector to Phoenix terminal block connector)
 - ▷ Wall-mount brackets
 - ▷ Screw pack
 - ▷ Power on/off extension cable

1.4 Optional Accessories

- ▶ **AC/DC Adapter**
 - ▷ 160W (P/N: 31-62120-0020)
 - ▷ 220W (P/N: 31-62149-0000)
- ▶ **Wi-Fi Module:** Wi-Fi 6 (11a/b/g/n/ac/ax 2Tx2R) + BT (V5.2), LITEON_ENL-R8852BE (RTL8852BE) (P/N: 29-E8852-A000)
- ▶ **LTE Module:** THALES(GEMALTO), MV31-W_L30960-N6910-B100 (P/N: 29-D3096-K030)

2 Specifications

2.1 RQX-59G(-E), RQX-59F(-E), RQX-590(-E)

Model Name	RQX-59G/59G-E	RQX-590/590-E
System Core		
NVIDIA Module	NVIDIA® Jetson AGX Orin™	
CPU	8-core Arm® Cortex®-A78AE v8.2 64-bit CPU 2MB L2 + 4MB L3 Maximum Operating Frequency: 2.2GHz	
GPU	NVIDIA Ampere architecture with 1792 NVIDIA CUDA® cores and 56 tensor cores. 200 TOPS (INT8) Maximum Operating Frequency: 930 MHz	
Memory	32GB 256-bit LPDDR5. 204.8GB/s	
eMMC	64GB eMMC 5.1	
Front Panel I/O Interfaces		
Display	1x HDMI 2.0a	
Ethernet	2x GbE (IEEE 802.1AS, IEEE 1588 v2)	
USB 3.0	4x USB Type A 2x USB Type A with lockable connector	
Serial Port	COM1: RS-232/485; COM2: RS-232	
USB OTG	1x USB 2.0 OTG Micro-A/B port for updating OS	
microSD card slot	1x microSD card	
Side Panel I/O Interfaces		
DB-50 Connector	UART, SPI, CAN, I²C, PWM, 20-bit GPIO	
Internal I/O Connectors		
M.2 Expansion	1x Key M 2280/3042 for Storage (NVMe SSD) 1x Key E 1630/2230 for Wi-Fi 1x Key B 3042/3052 socket for 5G LTE module	
USIM	1x USIM socket	
RTC Battery	CR2450W Li 3.0V 550mAh	

Table 2-1: RQX-59G/59G-E, RQX-59F/59F-E, RQX-590/590-E Specifications

Model Name	RQX-59G/59C	RQX-590/590-E
LED Indicators		
User Defined	6x user defined LEDs Green: U1,U2,U3, U6 Amber: U5 Yellow: U4	
Camera Interfaces		
FAKRA connectors	2x mini FAKRA quad-port connectors. (for GMSL2 camera, driver supports Automotive HDR camera C1/C2, LI-AR0233-GMSL2 (non-ISP), oToCAM264ISP, GMSL2 cameras ZED-X/ZED-X n	N/A
Expansion Box (“E” models only)		
Dimensions	132(W) x 210(D) x 80(H) mm	
PCIe slot	1x PCIe Gen4 x16 slot, 1x PCIe Gen3 x4	
Power Requirements		
DC Power Input	9-36V (±5% tolerance, reverse polarity protection)	
AC/DC Power Adapter	160W/220W, 90-264V AC to 24 V DC power cable: lockable Molex connector to Phoenix terminal block connector	
Power Switch	1x power button (supports auto power-on) 1x power on/off extension cable for robotics	
Recovery and Reset	1x recovery button 1x hardware reset button	
Mechanical		
Dimensions	190(W) x 210(D) x 80(H) mm “-E” models: 322(W) x 210(D) x 80(H) mm	
Weight	Without expansion box: 3.4 kg With expansion box: 4.5 kg	
Mounting	Wall mount kit	

Table 2-1: RQX-59G/59G-E, RQX-59F/59F-E, RQX-590/590-E Specifications

Model Name	RQX-59G/59C	RQX-590/590-E
Environmental		
Operating Temperature	-20 °C to 65 °C with 0.6 m/s airflow at 30 W (without Wi-Fi module and 5G module)	
Operating Humidity	Approx. 95% @40°C (non-condensing)	
Storage Temperature	-40°C to 85°C	
Vibration	IEC 60068-2-64: Operating 1Grms, 5-500 Hz, 3 axes	
Shock	MIL-STD-202G Method 213B, Table 213-I condition A Operating: 30G, half sine 11ms duration. (w/o expansion)	
EMI	CE & FCC class A (EN61000-6-4/-6-2)	
EMS	• IEC 61000-4-2 (ESD, contact: ±4kV, air: ±8kV w/ expansion) • IEC 61000-4-3 (RS, 10V/m from 80-1000MHz, 3V/m from 1400-2000MHz, 1V/m from 2000-2700MHz, 1kHz sine wave, 80% AM) • IEC 61000-4-4 (EFT, ±2kV at 5KHz on power port, ±1kV at 5KHz on signal port) • IEC 61000-4-5 (Surge, ±2kV line to earth CM on power port, ±1kV line to earth CM on signal port) • IEC 61000-4-6 (CS, 10Vrms with 1kHz sine wave, 80% AM from 0.15MHz-80MHz) • IEC 61000-4-8 (power-frequency magnetic fields) • IEC 61000-4-11 (voltage DIPs & voltage interruptions)	
Safety	EN 62368-1 (LVD)	
Software		
SDK	NVIDIA Jetson SDK, Jetpack 5.1.2	
Environment	Ubuntu 20.04 L4T	
Operating System		
Environment	Ubuntu 20.04 L4T	
Middleware	ROS, ROS 2	

Table 2-1: RQX-59G/59G-E, RQX-59F/59F-E, RQX-590/590-E Specifications

2.2 RQX-59x Series Functional Block Diagram

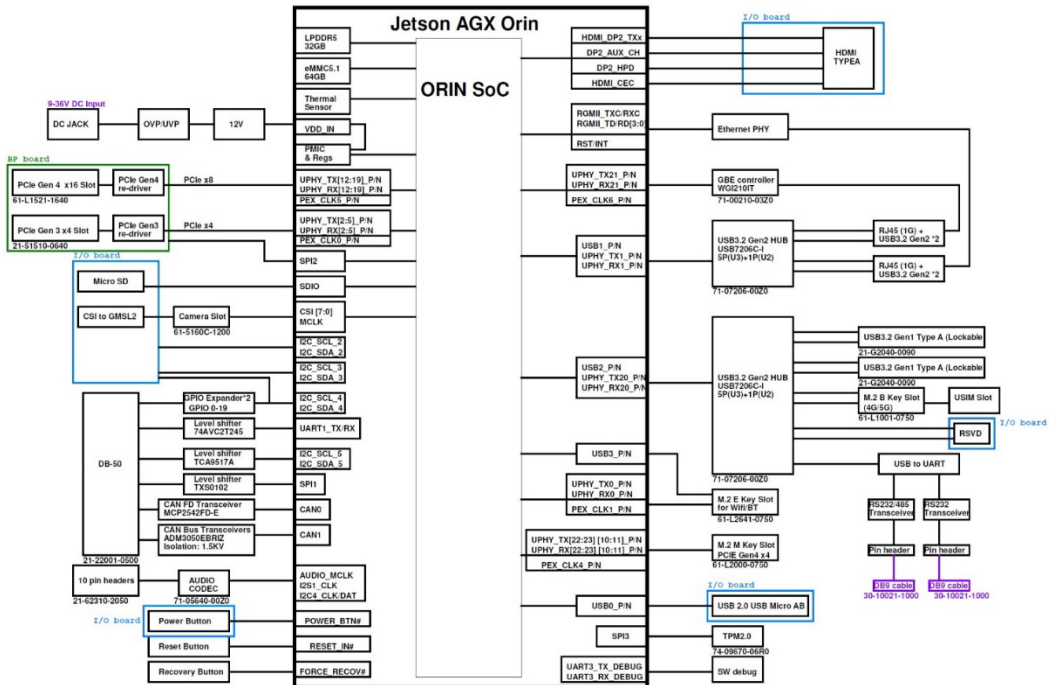


Figure 2-1: RQX-59x Series Functional Block Diagram

2.3 Display Options

With computing and graphic performance enhancement, the RQX-59x Series controller can support three independent displays with the following configuration.

Port	Resolution
HDMI 2.0a/b	4096x2160@60Hz

Table 2-2: Maximum Display Resolution

2.4 Mechanical Dimensions

All dimensions in mm

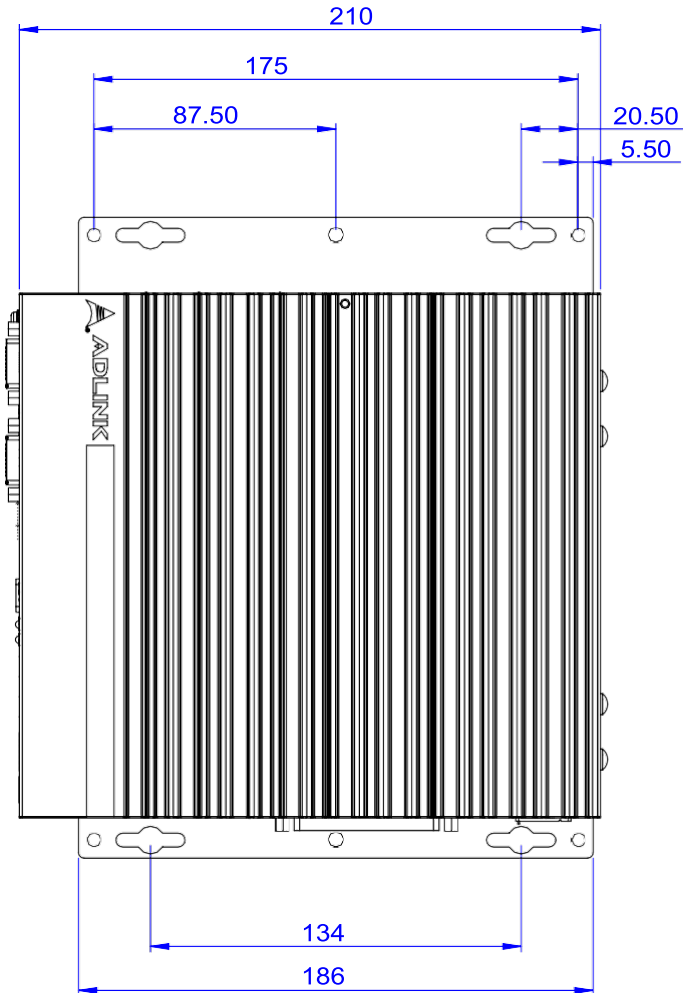


Figure 2-2: RQX-59x Series Top View

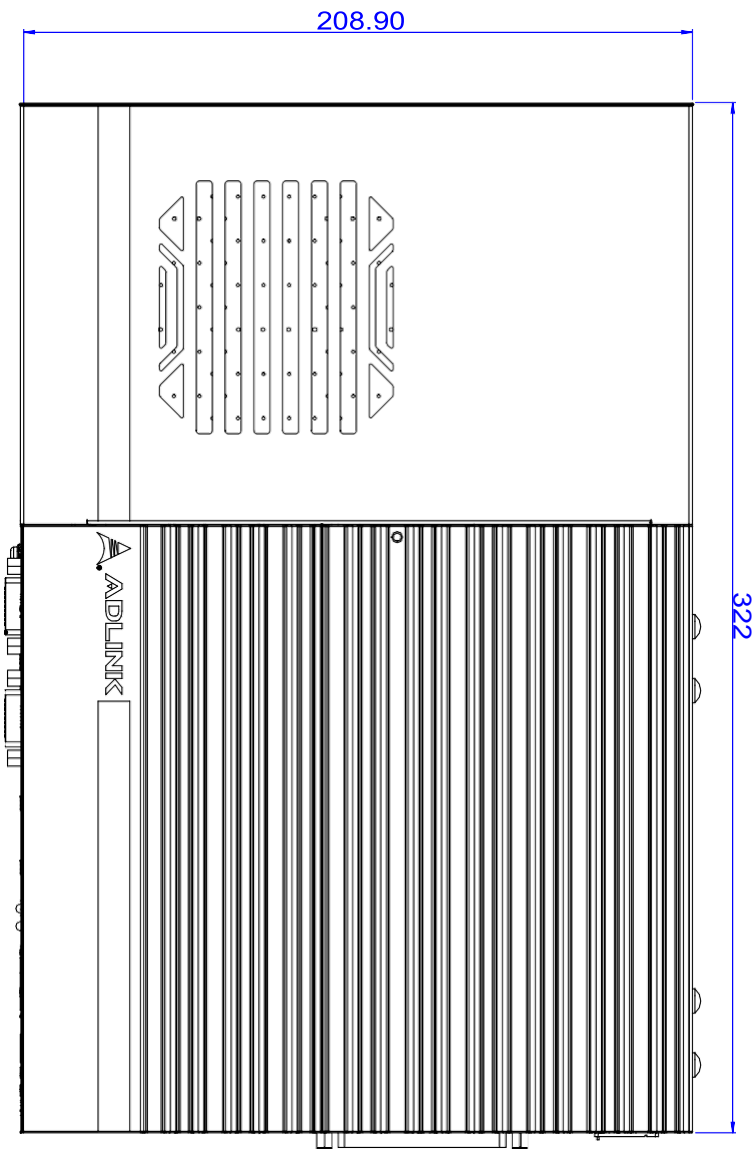


Figure 2-3: RQX-59x(-E) Series Top View

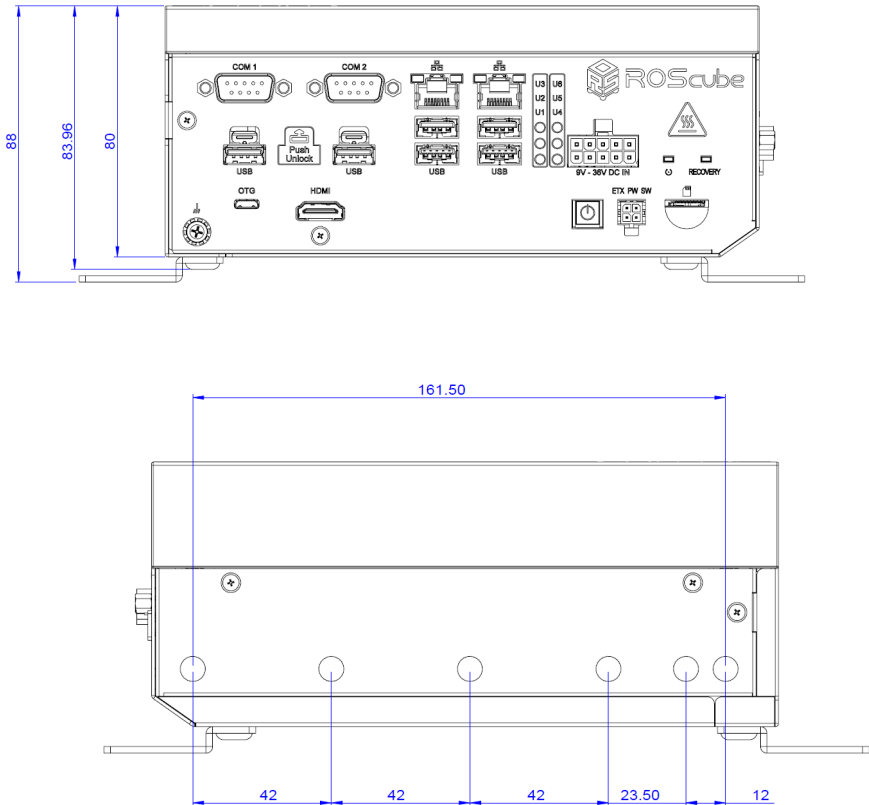


Figure 2-4: RQX-590 Front and Rear View

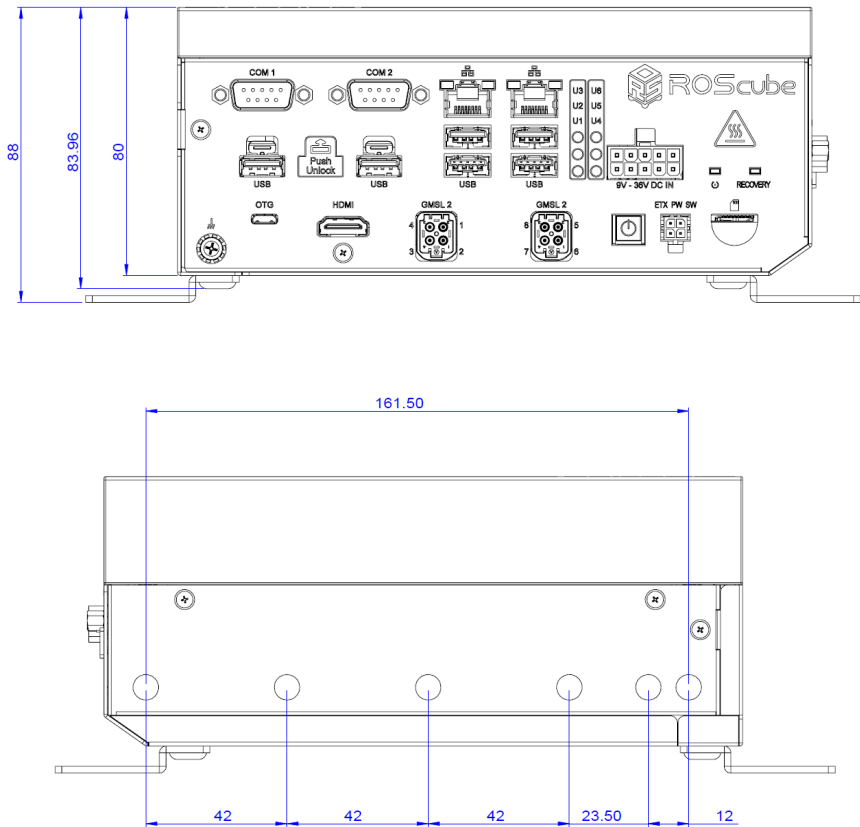


Figure 2-5: RQX-59G Front and Rear View

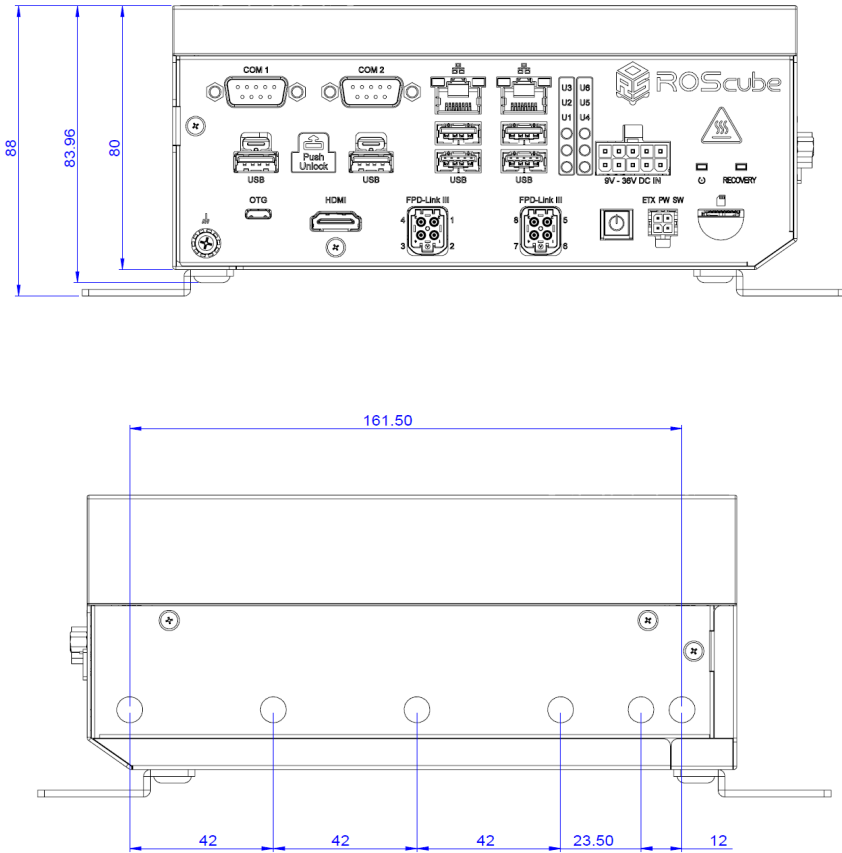


Figure 2-6: RQX-59F Front and Rear View

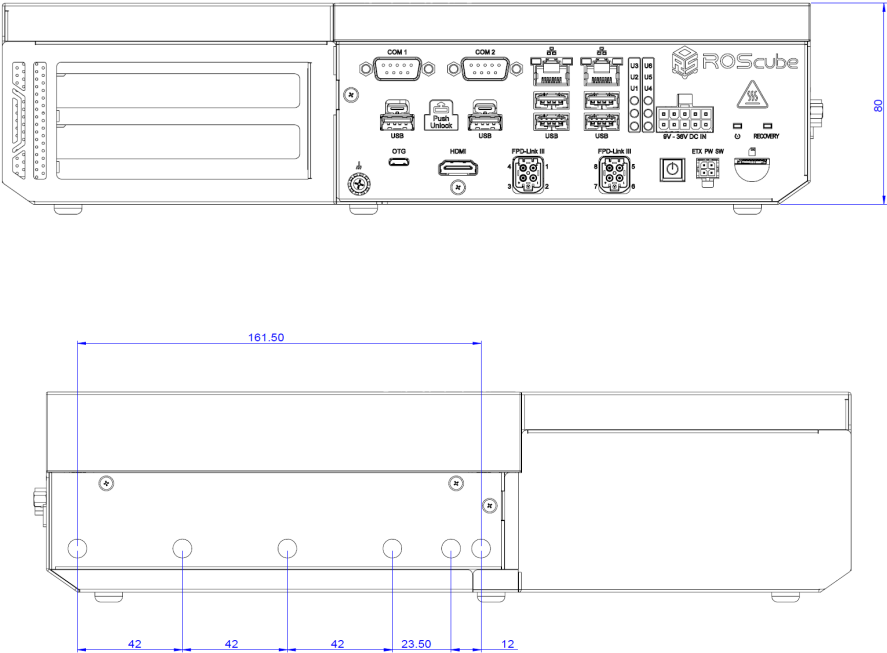


Figure 2-9: RQX-59F-E Front and Rear View

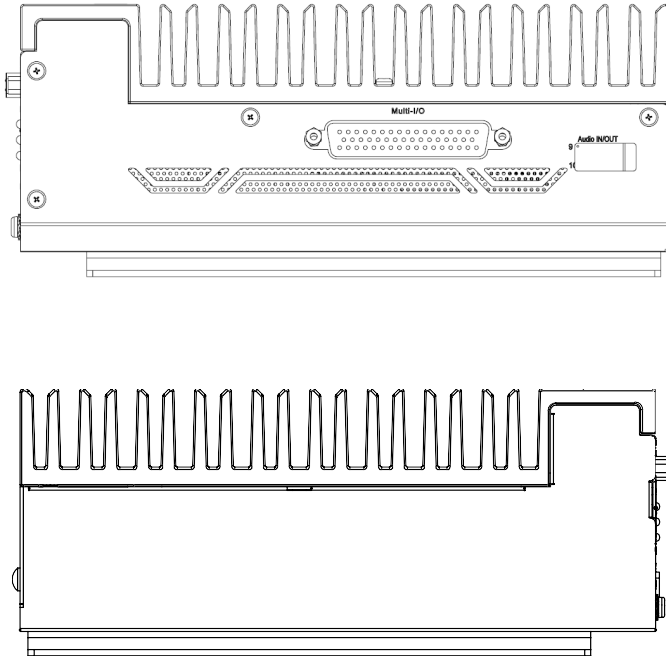


Figure 2-10: RQX-59x Series Side View

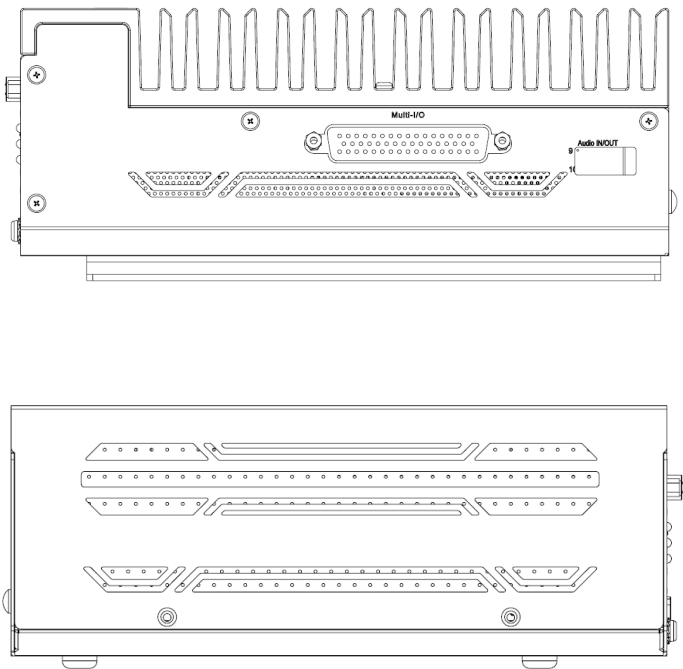


Figure 2-11: RQX-59x(-E) Series Side View

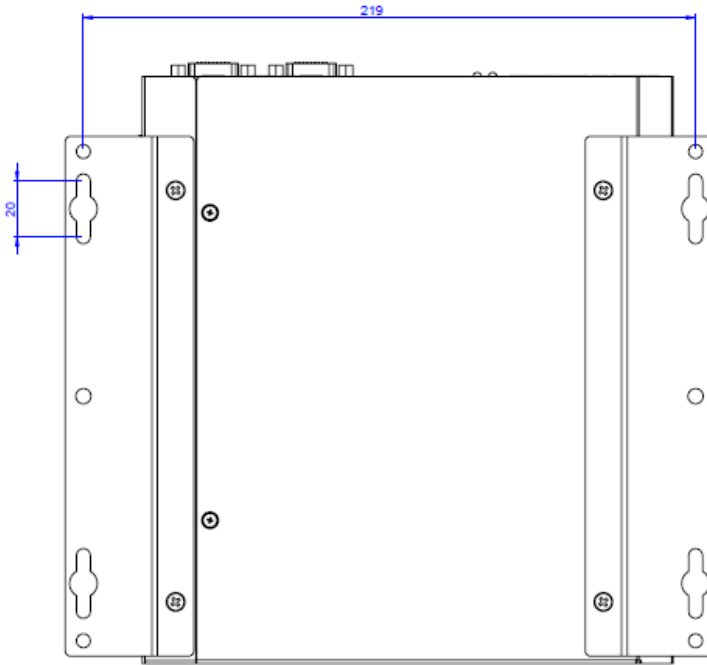


Figure 2-12: RQX-59x Series Bottom View

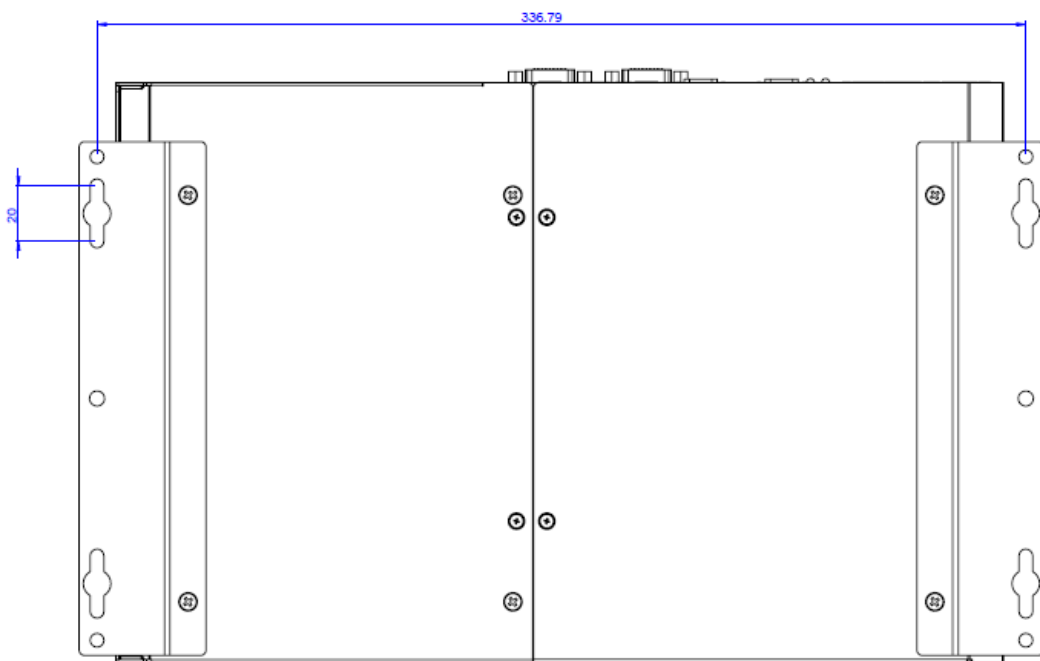


Figure 2-13: RQX-59x(-E) Series Bottom View

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3 System Layout

3.1 Front Panel

The RQX-59x Series provides the following front panel access features.

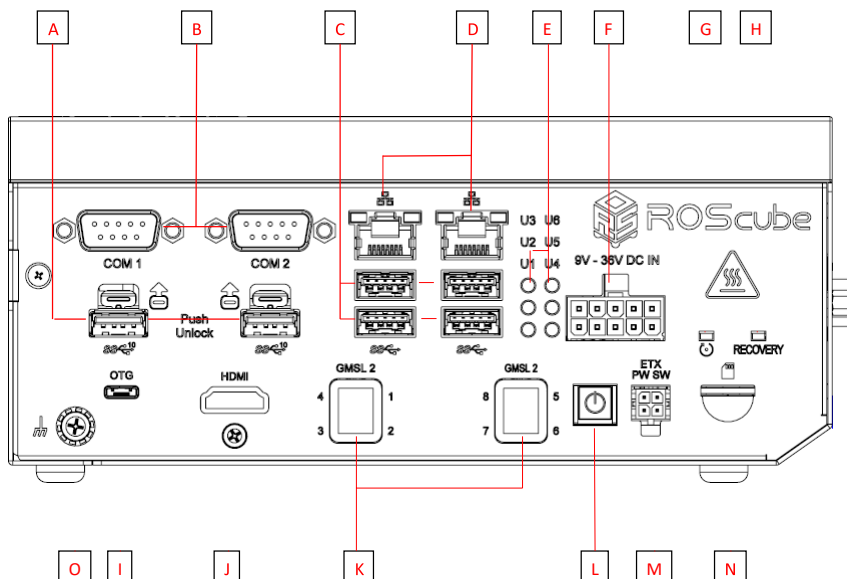


Figure 3-1: Front Panel I/O

A	Lockable USB 3.0 Type A x2	I	USB 2.0 OTG port x1
B	COM Port x2	J	HDMI port with screw x1
C	USB 3.0 Type A x4	K	Mini FAKRA quad connector x2 (only on RQX-59G/-E, RQX-59F/-E)
D	Gigabit Ethernet x2	L	Power ON/OFF button
E	User define LEDs x6	M	Power on/off extension connector
F	ATX DC power input	N	microSD card slot x1
G	Reset button	O	Ground screw
H	Recovery button		

Table 3-1: Front Panel I/O Legend

The RQX-59x Series provides the following side panel access features.

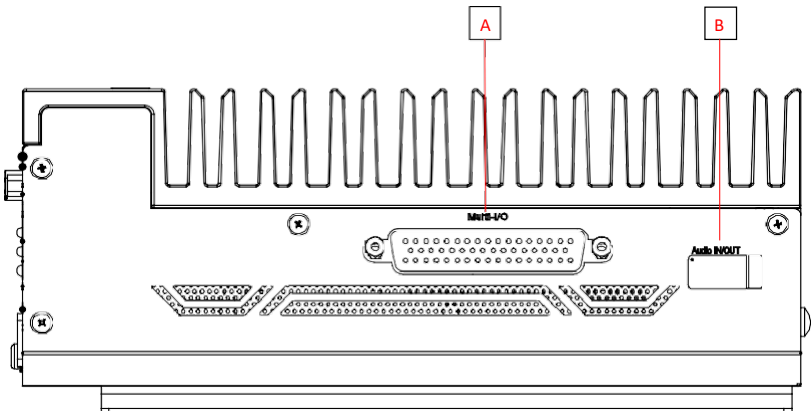


Figure 3-2: Front Panel I/O

A	Multi-I/O (DB-50)
B	Audio In/out

Table 3-2: Side Panel I/O Legend

3.1.1 Power Button

The power button is a non-latched push button with a blue LED indicator. The system is turned on when the button is pressed, and the power LED lights. If the system hangs, press and hold the button for 5 seconds to turn it off.

3.1.2 Reset Button

The reset button executes a hard system reset.

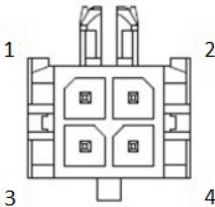
3.1.3 LED Indicators

Six user-defined LEDs are provided on the front panel.

LED	Color	LED	Color
U3	Green	U6	Green
U2	Green	U5	Amber
U1	Green	U4	Yellow

3.1.4 External Power Switch

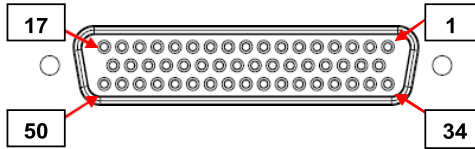
The External power switch allows user to use extended power on/off cable to control system power on and off.



Pin #	Signal	Pin #	Signal
1	GND	2	LED -
3	POWER BTN	4	LED +

3.1.5 Multi-I/O DB-50 Connector

The RQX-59x Series provides comprehensive I/O for autonomous robotics via a DB-50 connector on the right side of the chassis: GPIO/UART/CAN BUS/SPI/I²C signals. PWM frequency range is from 25 kHz to 2 Hz.

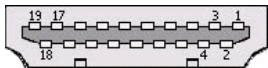


Pin	Signal	Level	Pin	Signal	Level
1	CAN1_H	5V	26	SPI_MOSI	3.3V
2	CAN1_L	5V	27	GPIO 13	3.3V
3	GPS_UART_TX_CN	3.3V	28	GPIO 14	3.3V
4	GPS_UART_RX_CN	3.3V	29	GPIO 15	3.3V
5	GPIO 0	3.3V	30	GPIO 16	3.3V
6	GPIO 1	3.3V	31	GPIO 17	3.3V
7	GPIO 2	3.3V	32	GPIO 18	3.3V
8	GPIO 3	3.3V	33	GPIO 19	3.3V
9	GPIO 4	3.3V	34	CAN1_ISOGND	
10	GPIO 5	3.3V	35	Encoder2_IN	3.3V
11	GPIO 6	3.3V	36	LIDAR_TX_CN	3.3V
12	GPIO 7	3.3V	37	Encoder1_IN_CN	3.3V
13	GPIO 8	3.3V	38	UART_RX	3.3V
14	GPIO 9	3.3V	39	UART_TX	3.3V
15	GPIO 10	3.3V	40	CAN0_H	3.3V
16	GPIO 11	3.3V	41	CAN0_L	3.3V
17	GPIO 12	3.3V	42	I2C_CLK	3.3V
18	CAN1_ISOGND		43	I2C_DATA	3.3V
19	NC		44	5V	max. current: 1A
20	PPS_OUT_CN	3.3V	45	5V	
21	PPS_IN	3.3V	46	3.3V	max. current: 1A
22	PWM	3.3V	47	GND	
23	SPI_CLK	3.3V	48	GND	
24	SPI_CS	3.3V	49	GND	
25	SPI_MISO	3.3V	50	GND	

Table 3-3: Multi-I/O DB-50 Connector Pin Definition

3.1.6 HDMI Connector

The RQX-59x Series provides one HDMI connector with lock screw for connection to an external monitor.



Pin #	Signal	Pin #	Signal
1	TMDS Data2+	2	TMDS Data2 Shield
3	TMDS Data2–	4	TMDS Data1+
5	TMDS Data1 Shield	6	TMDS Data1–
7	TMDS Data0+	8	TMDS Data0 Shield
9	TMDS Data0–	10	TMDS Clock+
11	TMDS Clock Shield	12	TMDS Clock–
13	CEC	14	Reserved
15	SCL	16	SDA
17	DDC/CEC Ground	18	+5 V Power
19	Hot Plug Detect		

Table 3-4: HDMI Connector Pin Definition

3.1.7 USB 3.0 Ports

The RQX-59x Series provides 2x USB 3.0 Type A lockable ports and 4x USB 3.0 Type A standard ports on the front panel. All USB 3.0 ports are compatible with SuperSpeed Gen1, high-speed, full speed, and low-speed USB device.

USB 3.0 Ports	Lockable USB 3.0 Ports
• Speed: 5G/bps • Color: Blue • Voltage: 5V • Current: 1A continue • Inrush current: 1.3A max • Protection: OVP, OCP	• Speed: 5G/bps • Color: Blue • Voltage: 5V • Current: 1.8A continue • Inrush current: 2A max • Protection: OVP, OCP

3.1.8 Gigabit Ethernet Ports

There are two Gigabit Ethernet ports on the front panel supporting the following:

- ▶ IEEE 802.3az Energy Efficient Ethernet
- ▶ IEEE 802.1as-2011 Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks
- ▶ IEEE 802.31 Qav Forwarding and Queuing Enhancements for Time-Sensitive Streams
- ▶ IEEE 802.3x Pause Packets and Priority Flow Control
- ▶ Support for frames of up to 9KB

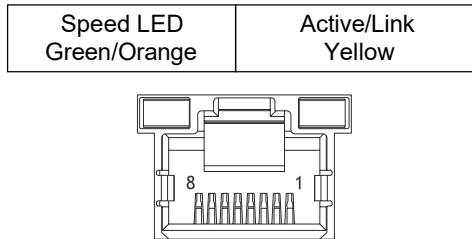


Figure 3-3: Ethernet Port and LEDs

Pin #	10BASE-T/ 100BASE-TX	1000BASE-T
1	TX+	LAN_TX0+
2	TX-	LAN_TX0-
3	RX+	LAN_TX1+
4	—	LAN_TX2+
5	—	LAN_TX2-
6	RX-	LAN_TX1-
7	—	LAN_TX3+
8	—	LAN_TX3-

Table 3-5: Ethernet Port Pin Definition

LED Color	Status	Description
Yellow	Off	Ethernet port is disconnected.
	Blinking	Ethernet port is connected and active.

Table 3-6: Active/Link LED Indicators

LED Color	Status	Description
Green/Orange	Off	10 Mbps
	Amber	100 Mbps
	Green	1000 Mbps

Table 3-7: Speed LED Indicators

3.1.9 DC Power Input

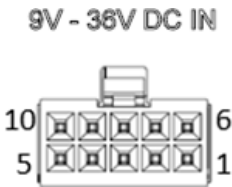


Figure 3-4: DC Power Input

Pin	Signal		
1	GND	6	VCC (9-36VDC)
2	GND	7	VCC (9-36VDC)
3	GND	8	VCC (9-36VDC)
4	GND	9	VCC (9-36VDC)
5	GND	10	VCC (9-36VDC)

Table 3-8: DC Power Input Pin Definition

Refer to Section 4.1: Attach DC Power Connector on page 33 to install the DC Power Connector to the DC Power Input.

Please use an approved power source certified by IEC or UL. The maximum ambient operating temperature (T_{ma}) is described in “Important Safety Instructions”. Altitude during operation is up to 2000 m where output meets LPS and SELV circuit requirements.

Power Source Rating

	Voltage	Current (RQX-590/59G)	Current (RQX-590-E/59G-E)
DC Power Source	9 to 36V DC	17.5A to 4.4A	24.44A to 6.11A
AC-to-DC Adapter	24V DC	6.67A	9.17A



Before providing DC power, ensure the voltage and polarity provided are compatible with the DC input. Improper input voltage and/or polarity can be responsible for system damage.

AVERTISSEMENT: Avant de fournir une alimentation CC, assurez-vous que la tension et la polarité fournies sont compatibles avec l'entrée CC. Une tension d'entrée et / ou une polarité incorrectes peuvent être responsables de dommages au système.

3.1.10 COM Port Connectors

The RQX-59x Series provides two COM ports through D-sub 9-pin connectors. COM1 support RS-232/485 (software configurable) and COM2 supports RS-232.

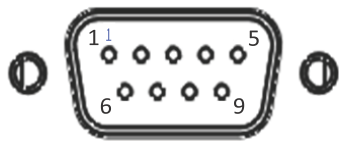


Figure 3-5: COM Port D-Sub 9-pin

Pin	Signal Name	
	RS-232	RS-485
1	DCD#	485DATA-
2	RXD	485DATA+
3	TXD	N/S
4	DTR#	N/S
5	GND	N/S
6	DSR#	N/S
7	RTS#	N/S
8	CTS#	N/S
9	RI#	N/S
Mode	Mode0=1 Mode1=0	Mode0=0 Mode1=1

Table 3-9: COM Port D-Sub 9-pin RS-232/485 Pin Definitions

To change the mode for your device, open the terminal interface in Ubuntu and use the command:

```
/sys/class/sp339_mode_ctl/  
echo rs232 or rs485
```

3.1.11 microSD Card Slot

The RQX-59x Series provides a micro SD card slot supporting storage up to 2 TB.

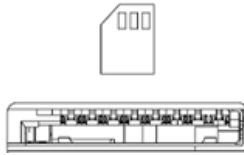


Figure 3-6: microSD Card Slot

Pin	Signal	Pin	Signal
1	DATA2	7	DATA0
2	DATA3	8	DATA1
3	CMD	9	GND
4	VDD	10	GND
5	CLK	11	DET
6	GND	12	GND

Table 3-10: microSD Card Slot Pin Definition

3.1.12 USB 2.0 OTG Port

This USB 2.0 OTG port is provided for system recovery and to update the software image.

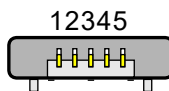


Figure 3-7: USB 2.0 OTG Micro-A/B Port

Pin	Signal
1	VBUS
2	D-
3	D+
4	ID
5	GND

Table 3-11: USB 2.0 OTG Micro-A/B Pin Definition

3.1.13 mini FAKRA Connector

The mini FAKRA connector is only available on the RQX-59G(-E)/ RQX-59F(-E) series, and provides quad ports for each connector. A total of 8 devices can be connected to RQX-59G(-E) / RQX-59F(-E). The RQX-59G/ RQX-59F(-E) provides 8 camera channels using 4 dual GMSL2 deserializers or 4 dual FPD-Link III deserializers. The detailed mappings between the camera, sensor ID, Fsync GPIO, and MIPI CSI-2 are as follows:

Camera #	Sensor ID	Fsync GPIO #	MIPI CSI-2
1	0	/sys/class/gpio/gpio440	CSI-0 / CSI-A
2	1		CSI-1 / CSI-B
3	2	/sys/class/gpio/gpio397	CSI-2 / CSI-C
4	3		CSI-3 / CSI-D
5	4	/sys/class/gpio/gpio487	CSI-4 / CSI-E
6	5		CSI-5 / CSI-F
7	6	/sys/class/gpio/gpio486	CSI-6 / CSI-G
8	7		CSI-7 / CSI-H

Table 3-12: mini FAKRA Connector Pin Definition

Quad Fakra GMSL/FPD-Link Cable: 4 position mate-AX to 4x FAKRA Z- code 50Ω cable. Cable lengths of 1, 3, 6 and 12 meters are available.

P/N	Description
30-60185-0000-A0	1 meter 1:4 FAKRA cable
30-60185-0000-A0	3 meter 1:4 FAKRA cable
30-60185-0000-A0	6 meter 1:4 FAKRA cable
30-60185-0000-A0	12 meter 1:4 FAKRA cable

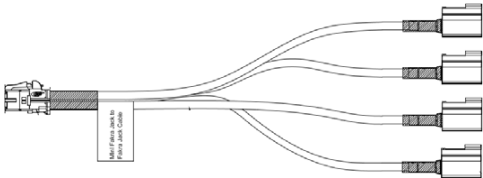


Figure 3-8: 1-to-4 mini FAKRA Connector

Fakra-Plug-to-Jack Cable: 1 position mate-AX to 1x FAKRA Z-code 50Ω cable. Cable lengths of 1, 3, 6 and 12 meters are available. All cables below are of IP69K ratings.

P/N	Description
30-60218-0000-A0	1 meter FAKRA Plug to FAKRA Jack cable
30-60218-1000-A0	3 meter FAKRA Plug to FAKRA Jack cable
30-60218-2000-A0	6 meter FAKRA Plug to FAKRA Jack cable
30-60218-3000-A0	9 meter FAKRA Plug to FAKRA Jack cable
30-60218-4000-A0	12 meter FAKRA Plug to FAKRA Jack cable

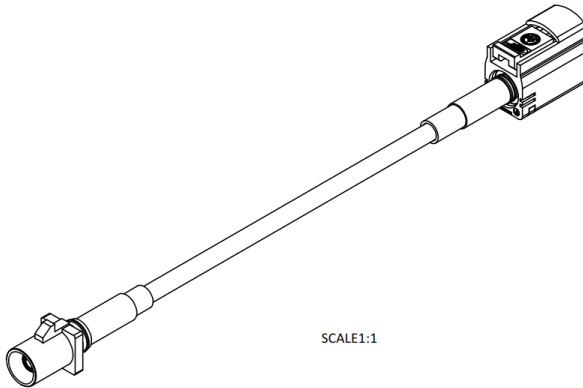


Figure 3-9: 1-to-1 mini FAKRA Connector

3.1.14 Audio port

RQX-59G(-E)/ RQX-59F(-E)/ RQX-590(-E) series provides audio signals for microphone, headphone and speaker. Users must beware not to plug in the wrong pin direction, otherwise it will cause the audio IC chip to break down. This audio port does not support hot plug. The detailed pin definition of audio in/out port is as follows:



WARNING:

Do not plug in or unplug the audio when the system is powered, otherwise damages could be done to the system.

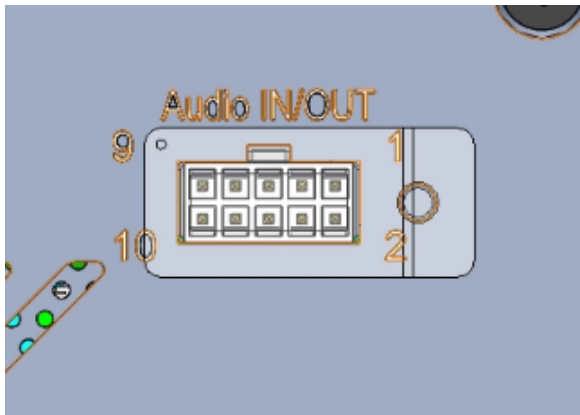


Figure 3-10: Audio Port Pin

Pin	Signal	Pin	Signal
1	MIC_CN_L	2	SPKR_L_P_CN
3	MIC_CN_R	4	SPKR_L_N_CN
5	HP_CN_L	6	SPKR_R_P_CN
7	HP_CN_R	8	SPKR_R_N_CN
9	MIC_IN_DET	10	GND

Table 3-13: audio port Pin Definition

3.2 Internal I/O Connectors

3.2.1 Board Layout

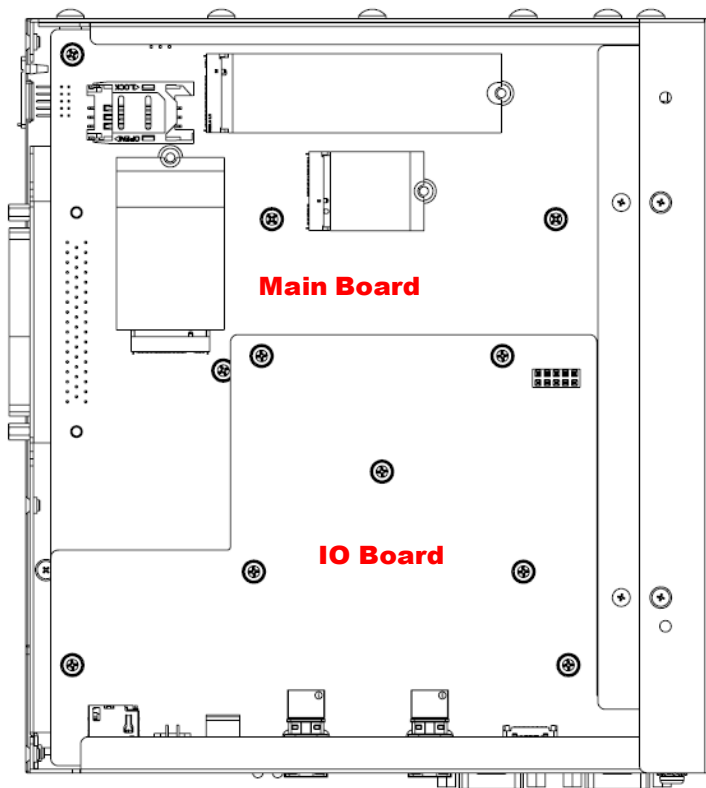


Figure 3-11: RQX-59x Board Layout

3.2.2 Mainboard Connectors

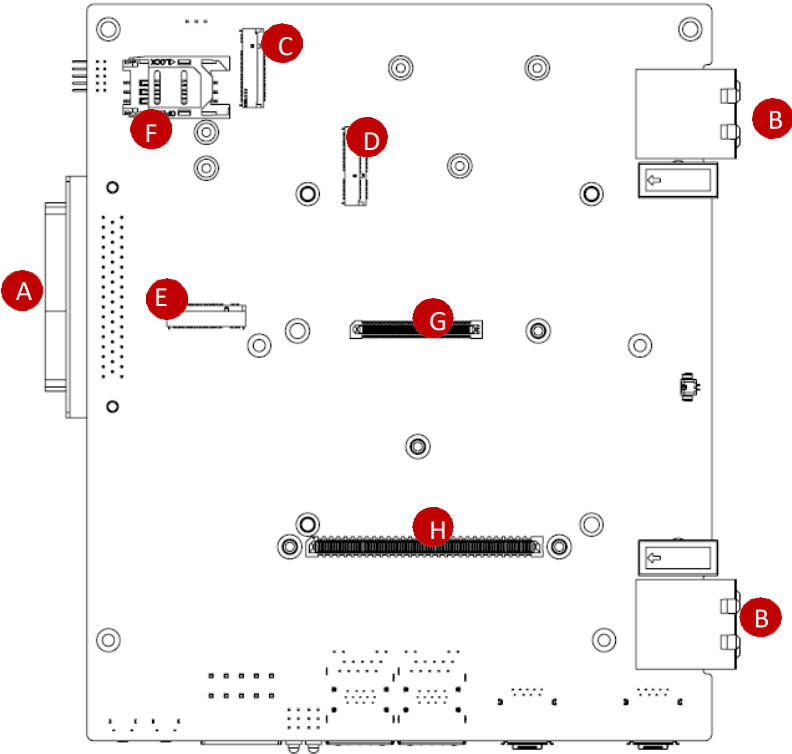


Figure 3-12: RQX-59x Mainboard Connectors

A	DB50 connector	E	M.2 B Key slot
B	Carrier Board B2B connector	F	SIM card slot
C	M.2 M Key slot	G	MIPI B2B connector
D	M.2 E Key slot	H	IO Board B2B connector

Table 3-13: RQX-59x Mainboard Connector Legend

3.2.3 IO Board Connectors

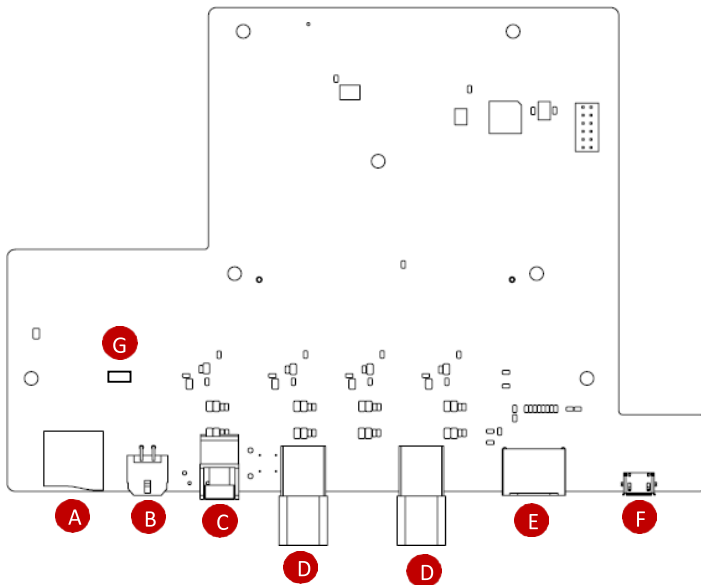


Figure 3-13: Function Module Connectors

A	microSD card slot
B	Extend power header
C	Power On/Off button
D	Mini FAKRA connector
E	HDMI Connector
F	USB 2.0 OTG Micro-A/B (for recovery)
G	Local/Extension Power On/Off Jumper

Table 3-14: Function Module Connector Legend

3.2.4 M.2 B key Slot

The M.2 B Key slot supports 3042 and 3052 sizes for 5G module (USB and USIM signals). (Connector label: CN1601).

3.2.5 SIM Card Slot

The SIM card socket connects to the Mini PCIe slot (CN) on the mainboard. (Connector label: CN1602)

3.2.6 M.2 M Key Slot

The M.2 M Key slot supports 3042 and 2280 sizes for PCIe x2 NVMe storage. (Connector label: CN2101).

3.2.7 M.2 E Key Slot

The M.2 E Key slot supports 1630 and 2230 sizes for Wi-Fi module (PCIe and USB2.0 signals).(Connector label: CN2001).

3.2.8 SW Debug Port

An internal pin header is provided for software debug (CN2301).

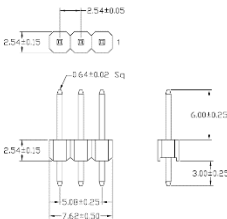


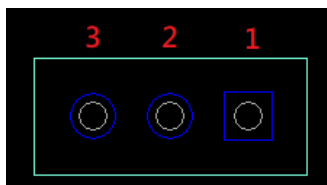
Figure 3-14: Software Debug Port

Pin	Signal
1	UART3_TX
2	UART3_RX
3	GND

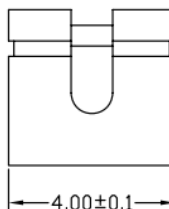
Table 3-15: USB 2.0 OTG Micro-A/B Pin Definition

3.2.9 Local/Extension Power On/Off Jumper

This jumper switch (JP1201) puts on CN1202 pin 1 and pin 2 for local power on system. Jumper switch (JP1201) puts on CN1202 pin 2 and pin 3 for extension power on system.



CN1202



JP1201

CN1202 Power button Selection	
1-2	Internal/Local
2-3	External

Table 3-16: Power Button Jumper Selection Pin Definition

3.2.10 FPGA JTAG Direction from Jetson AGX Xavier GPIO or Pin Header CN1501

Default setting is 1-4 ON

Switch Number	Pin description
1-4 ON	Jetson AGX Xavier GPIO
1-4 OFF	Pin header CN1501

Table 3-17: FPGA JTAG Pin Definition

4 Getting Started

This chapter describes the steps needed to begin using the RQX-59x Series in your application.

4.1 Attach DC Power Connector

Locate the DC power cable shown below that is included in the Accessory Box. Insert connector P2 into the ATX DC Power Input “F” shown in **Figure 3-1** on page 17.



Connect a DC power source as described in **Section 3.1.9: DC Power Input** (on page 23) to the inputs of connector P1, connecting “positive” (red) to Pin1 and “negative” (black) to Pin 2.



WARNING:

Before providing DC power, ensure the voltage and polarity provided are compatible with the DC input. Improper input voltage and/or polarity can be responsible for system damage.

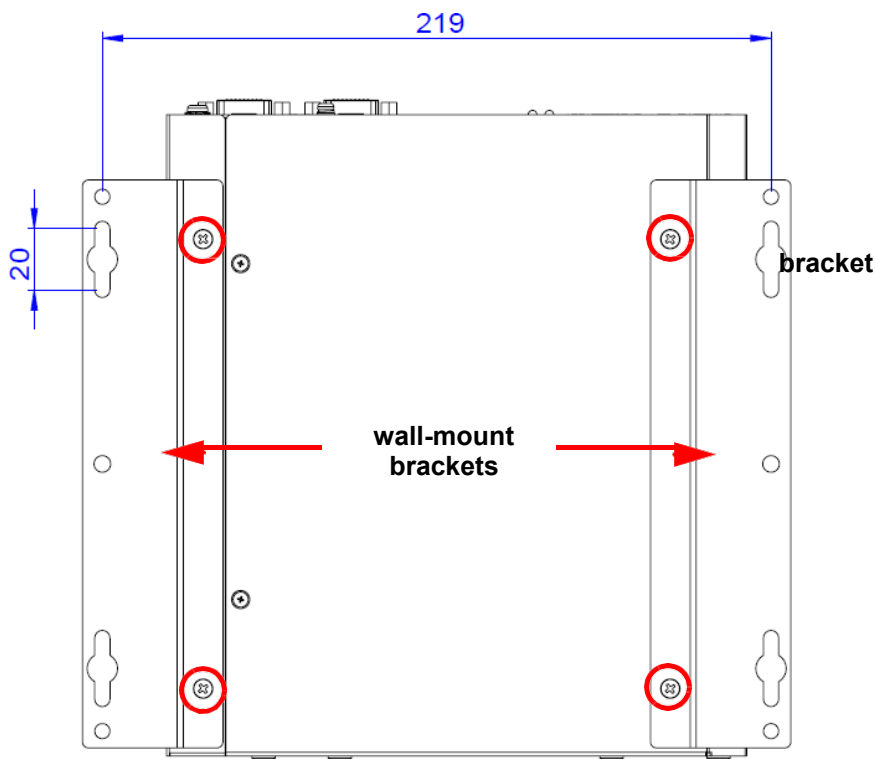
AVERTISSEMENT: Avant de connecter à une source de courant continu, veuillez vous assurer de la polarité de la tension conformément à l'entrée CC du PC. Une tension et/ou une polarité incorrectes peuvent causer des dommages irréversibles sur le système.

4.2 Mounting the RQX-59x Series

4.2.1 Install the Wall-mount Brackets

Use the 4 M4 6mm screws included in the Accessory Box to attach the 2 included wall-mount brackets to the chassis as indicated by the red circles below.

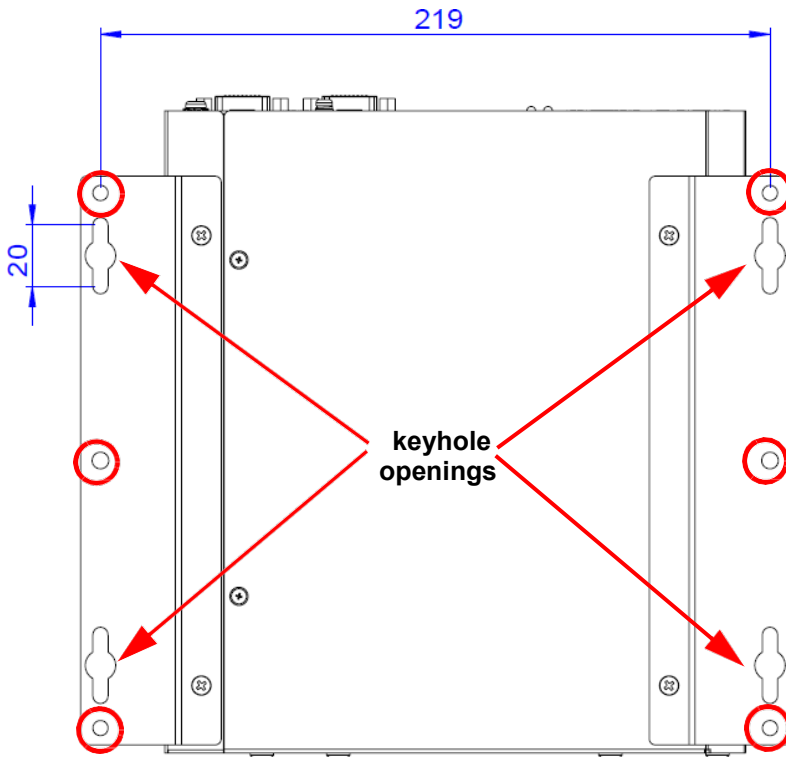
Utilisez les 4 vis M4 6 mm incluses dans la boîte d'accessoires pour fixer les 2 supports de montage mural inclus au châssis, comme indiqué par les cercles rouges ci-dessous.



4.2.2 Mounting the Device / Montage de l'Appareil

Mount the device to a wall using the 4 keyhole openings indicated or the 6 mounting holes circled in red, according to the spacing dimensions of the holes in the bracket as shown in Figure 2-2 RQX-59x Series Top View.

Montez l'appareil sur un mur à l'aide des 4 ouvertures de trou de serrure en fonction des dimensions d'espacement des trous dans le support, comme indiqué dans Figure 2-2 RQX-59x Series Top View.



4.3 Camera application in RQX-59x Series

4.3.1 Camera supporting list in RQX-59 series

ADLINK RQX-59 series has two SKUs with serial link technology for video distribution to choose from: RQX-59G for GMSL2 and RQX-59F for FPD-Link III. Below is a table of validated cameras and LiDAR for RQX-59 series.

Brands Sensors	GMSL2 camera (drivers ready)	FPD-Link III camera (drivers ready)	LiDAR
TIER IV	Automotive HDR camera C1/C2		
Stereolabs	ZED-X/ZED-X mini		
oToBrite	oToCAM264ISP oToCAM260ISP	oToCAM264ISP oToCAM222	
Leopard	LI-AR0233-GMSL2 (non-ISP)		
Ouster			OS1-3

It is suggested that users choose only one brand of camera in one RQX-59 application. If two brands of cameras are applied and mixed in one RQX-59 application, two drivers from different camera brands may cause incompatibility issues and render the cameras not working properly.

If users have decided to choose one brand of the above suggested camera list, please contact Adlink's sales team. Once we receive the request, the team will send out the drivers to users. Installation guide will also be included in the files.

Regarding FPD-Link III cameras from oToBrite, we suggest that users, when mounting the cameras, should wait for the cameras to get into a stable state (more than 30 seconds), before shutting down the whole system.

Due to NVIDIA's Jetson Orin Argus streaming known issue, it is recommended to use ISP GMSL2 or FPD-Link III cameras to avoid encountering image drop while executing full loading image scenarios.

4.4 RQX-59 series flashing BSP MFI file SOP

Adlink's RQX-59 series come with BSP in NVIDIA's Orin module eMMC. If user wishes to reflash the BSP MFI image file into eMMC in RQX-59 series, this is the SOP of flashing the image. Latest BSP MFI file can be downloaded on Adlink's official website.

https://www.adlinktech.com/Products/ROS2_Solution/ROS2_Controller/RQX-59_Series?lang=zh-Hant

Before flashing image to NVIDIA Jetson Family, user should prepare the following items:

1. **Host PC** with **Ubuntu** operating system.
2. A good quality **OTG cable (micro-usb/USB type C)** for connecting to NVIDIA Jetson Family (**Client PC**).

Complete the following steps on the **Client PC** before performing the host PC steps.

Client PC

1. Connect the OTG cable to the USB port.
2. Enter Recovery Mode. RQX-59 is at Power off.
 - (1) Press and hold recovery button.
 - (2) plug in AC adapter connector on RQX-59.
 - (3) RQX-59 will get into recovery mode.



The location of Recovery button

Host PC

- The host must have the following dependencies:

```
$ sudo apt install libxml2-utils simg2img network-manager  
abootimg sshpass device-tree-compiler nfs-kernel-server
```

Step 1. Connect the host PC to the Client PC via OTG cable.

Step 2. Open a terminal, run following command and check out the mode on Host PC:

```
$ lsusb | grep NVIDIA
```

Recovery mode will show APX.

```
Bus 001 Device 031: ID 0955:7019 NVIDIA Corp. APX
```

- User needs to make sure the client PC in recovery mode before flash image.
- If client PC doesn't recognize or not in recovery mode, double-check the OTG cable connection and perform troubleshooting as needed until the client is recognized and in recovery mode.

Step 3. Download MFI image file into host PC.

```
mfi_jetson-agx-orin-rqx590-35.4.1-1v2.4.tbz2
```

Step 4. Unzip the MFI file that was downloaded previously.

```
$ sudo tar -I lbzip2 -xf mfi_jetson-agx-orin-rqx590-35.4.1-  
1v2.4.tbz2
```

or

```
$ sudo tar jxf mfi_jetson-agx-orin-rqx590-35.4.1-1v2.4.tbz2
```

Step 5. Navigate to working folder

```
$ cd mfi_jetson-agx-orin-rqx590-35.4.1-1v2.4
```

Step 6. Execute flashing command

```
$ sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only
```

4.5 Expansion box application in RQX-59 series

ADLINK's expansion box SKUs provides users with one PCIe Gen4 x16 slot, and one PCIe Gen3 x4 slot. Any expansion cards that users wish to use must comply with the specs. The allowed length of the expansion card is below 19 cm, and width is less than 10 cm.

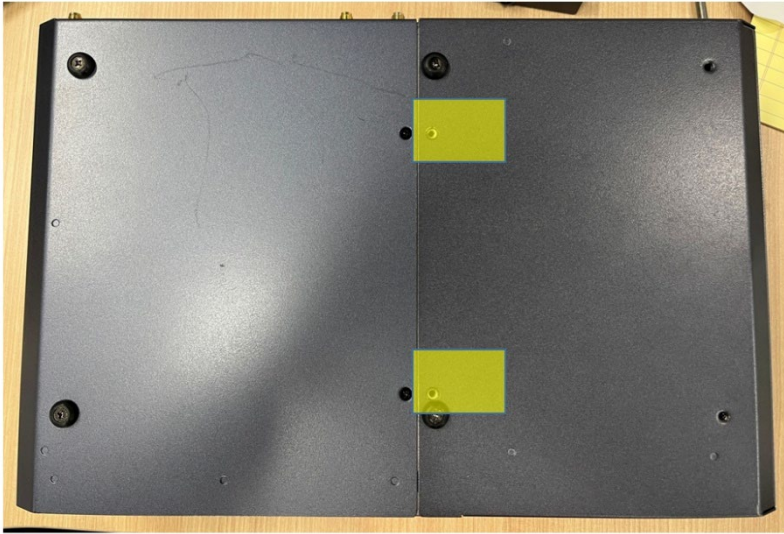
If user wishes to put a 10 GbE card as an expansion card in the expansion box, Intel® Ethernet Converged Network Adapter X550-T2 card can be used for this application. Adlink team has tested and verified the compatibility of this X550-T2 card with RQX-59 series.

After installation, user has to get into the system terminal and enter the following command line for the 10GbE card to have the best performance. This command line has to be entered every time when system is turned on, when using this 10 GbE expansion card.

```
$ sudo nvpmodel -m 0
$ sudo jetson_clocks
$ sudo ifconfig eth0 down
$ sudo ifconfig eth0 mtu=9000
$ sudo ifconfig eth0 up
```

The steps for installing the expansion card into the expansion box are as follows:

1. Remove the bottom screws



2. Remove the top screws



3. Remove the screw on the front panel and the one on the rear, highlighted in yellow color.



4. Remove the expansion box gently.



5. Remove the screws at the side of expansion box



6. Remove the top casing of the expansion box gently in the direction indicated by arrows. Please be very careful when removing. There is a FAN cable connected to the top casing.



7. After the top casing is open, user can insert the expansion cards intended for the application. In this case, we use X550-T2 10 GbE card as a demonstration. After the card is properly inserted into the PCIe Gen 3 x 4 slot, use a screw to lock the expansion card on the casing.



8. After the card is properly installed, put back the top casing in the direction indicated by the arrows. Be very careful not to let the FAN cable to be severed by the top casing when putting back.



9. Put the screws back



10. Gently assemble the expansion box back the RQX-59.



11. Put back all the screws at their original places.

Appendix A Power



NOTE:

Information in this Appendix is for power budget planning and design purposes only. Actual power consumption may differ based on final application.

A.1 Power Consumption Reference

The power consumption provided below is based on lab data in which 24V DC is applied and current is measured by the DC power supply. The power consumption (W) is calculated as the product of applied voltage (V) and the current (A).

The platform was tested with the following external I/O interfaces connected to supported devices: HDMI monitor, keyboard/mouse, USB dummy load, COM loopback, and Ethernet port.

Information is presented for reference only. Actual power consumption will vary with different attached devices and operating system.

System	Power Off (S5)	System Idle	MAXN type0	Mode 30W type all	Recommended Power Supply
RQX-59G(-E)	6.48W	40.1W	96.7W	123.5W	160W
RQX-590(-E)	2.1W	16.05W	96.7W	59.37W	160W

Table A-1: Power Consumption

This page intentionally left blank.

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.
- ▶ The device can be operated at an ambient temperature of 50°C with DC input, and 35°C with AC/DC power adapter input.
- ▶ It is recommended that the device be installed in Information Technology Rooms that are in accordance with Article 645 of the National Electrical Code and NFPA 75.
- ▶ 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.
 - ▷ The power cord must be connected to a socket or outlet with a ground connection.
- ▶ 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.

- ▶ 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.

- ▶ This equipment is not suitable for use in locations where children are likely to be present.
- ▶ 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
- ▶ The device shall 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

Hot surface! Do not touch! Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching.

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.*
- ▶ *L'appareil peut être utilisé à une température ambiante de 50°C avec entrée CC et 35°C avec entrée adaptateur secteur CA/CC.*
- ▶ *Il est recommandé d'installer l'appareil dans des salles de technologie de l'information conformes à l'article 645 du National Electrical Code et à la NFPA 75.*
- ▶ *Pour éviter les chocs électriques et/ou d'endommager l'appareil:*
 - ▷ *Tenez l'appareil à l'écart de toute source d'eau ou de liquide.*
 - ▷ *Tenez l'appareil à l'écart d'une forte chaleur ou d'une humidité élevée.*
 - ▷ *Maintenez l'appareil correctement ventilé (n'obstruer ou ne couvrez pas les ouvertures de ventilation).*
 - ▷ *Utilisez toujours les réglages de tension et de source d'alimentation recommandés.*
 - ▷ *Installez et utilisez toujours l'appareil près d'une prise de courant facilement accessible.*
 - ▷ *Fixez le cordon d'alimentation (ne placez aucun objet sur le cordon d'alimentation).*
 - ▷ *Installez/fixez et utilisez l'appareil uniquement sur des surfaces stables et/ou sur les fixations recommandées.*
 - ▷ *Le cordon d'alimentation doit être connecté à une prise ou à une prise de courant avec mise à la terre.*

- ▶ Si l'appareil ne doit pas être 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 réparé que par un personnel technique qualifié à l'aide d'outils appropriés*
- ▶ *Une batterie de type Lithium peut être fournie pour une alimentation de secours ininterrompue ou d'urgence.*



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

-
- ▶ *Cet équipement ne convient pas à une utilisation dans des lieux pouvant accueillir des enfants.*
 - ▶ *L'appareil doit être entretenu par des techniciens agréés lorsque:*
 - ▶ *Le cordon d'alimentation ou la prise est endommagé(e)*
 - ▶ *Un liquide a pénétré à l'intérieur de l'appareil.*
 - ▶ *L'appareil a été exposé à une forte humidité et/ou de la buée.*
 - ▶ *L'appareil ne fonctionne pas ou ne fonctionne pas selon le manuel de l'utilisateur.*
 - ▶ *L'appareil est tombé et/ou a été endommagé et/ou présente des signes évidents de dommage.*
 - ▶ *Débranchez le cordon d'alimentation avant de desserrer les vis à oreilles et serrez toujours les vis à oreilles avec un tournevis avant de mettre le système en marche.*
 - ▶ *L'appareil doit être installé uniquement dans une salle de serveurs ou une salle informatique où l'accès est:*
 - ▷ *Réservé au personnel de service qualifié ou aux utilisateurs familiarisés avec les restrictions appliquées à l'emplacement, aux raisons de ces restrictions et toutes les précautions requises*
 - ▷ *Uniquement autorisé par l'utilisation d'un outil, d'une serrure et d'une clé, ou d'un autre moyen de sécurité, et contrôlé par l'autorité responsable de l'emplacement.*

**RISQUE DE BRÛLURES**

Partie chaude! 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

Ask an Expert: <https://www.adlinktech.com/en/askanexpert>

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