

BOXER-8658AI

AI@Edge Fanless PoE Embedded AI System
with NVIDIA[®] Jetson Orin[™] NX

User's Manual 1st Ed

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Packing List

Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● BOXER-8658AI	1
● Wallmount Bracket	2
● Screw Package	1
● Power Connector	1
● Power Adapter (Optional)	1
● Power Cord (Optional)	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

About this Document

This User’s Manual contains all the essential information, such as detailed descriptions and explanations on the product’s hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the product page at AAEON.com for the latest version of this document.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. All cables and adapters supplied by AAEON are certified and in accordance with the material safety laws and regulations of the country of sale. Do not use any cables or adapters not supplied by AAEON to prevent system malfunction or fires.
3. Make sure the power source matches the power rating of the device.
4. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
5. Always completely disconnect the power before working on the system's hardware.
6. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
7. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
8. Always disconnect this device from any power supply before cleaning.
9. While cleaning, use a damp cloth instead of liquid or spray detergents.
10. Make sure the device is installed near a power outlet and is easily accessible.
11. Keep this device away from humidity.
12. Place the device on a solid surface during installation to prevent falls
13. Do not cover the openings on the device to ensure optimal heat dissipation.
14. Watch out for high temperatures when the system is running.
15. Do not touch the heat sink or heat spreader when the system is running
16. Never pour any liquid into the openings. This could cause fire or electric shock.

17. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.
18. If any of the following situations arises, please the contact our service personnel:
 - i. Damaged power cord or plug
 - ii. Liquid intrusion to the device
 - iii. Exposure to moisture
 - iv. Device is not working as expected or in a manner as described in this manual
 - v. The device is dropped or damaged
 - vi. Any obvious signs of damage displayed on the device
19. **DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WITH TEMPERATURES BEYOND THE DEVICE'S PERMITTED STORAGE TEMPERATURES (SEE CHAPTER 1) TO PREVENT DAMAGE.**

FCC Statement

Warning!



This device complies with Part 15 FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

Caution:

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.

Attention:

Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.

产品中有毒有害物质或元素名称及含量

AAEON System

QO4-381 Rev.A0

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯 醚(PBDE)
印刷电路板 及其电子组件	×	○	○	○	○	○
外部信号 连接器及线材	×	○	○	○	○	○
外壳	○	○	○	○	○	○
中央处理器 与内存	×	○	○	○	○	○
硬盘	×	○	○	○	○	○
液晶模块	×	×	○	○	○	○
光驱	×	○	○	○	○	○
触控模块	×	○	○	○	○	○
电源	×	○	○	○	○	○
电池	×	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。 ○：表示该有毒有害物质在该部件所有均质材料中的含量均在 GB/T 26572标准规定的限量要求以下。 ×：表示该有害物质的某一均质材料超出了GB/T 26572的限量要求，然而该部件仍符合欧盟指令2011/65/EU 的规范。 备注： 一、此产品所标示之环保使用期限，系指在一般正常使用状况下。 二、上述部件物质中央处理器、内存、硬盘、光驱、电源为选购品。 三、上述部件物质液晶模块、触控模块仅一体机产品适用。						

Hazardous and Toxic Materials List

AAEON System QO4-381 Rev.A0

Component Name	Hazardous or Toxic Materials or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBBs)	Polybrominated diphenyl ethers (PBDEs)
PCB and Components	X	O	O	O	O	O
Wires & Connectors for Ext.Connections	X	O	O	O	O	O
Chassis	O	O	O	O	O	O
CPU & RAM	X	O	O	O	O	O
HDD Drive	X	O	O	O	O	O
LCD Module	X	X	O	O	O	O
Optical Drive	X	O	O	O	O	O
Touch Control Module	X	O	O	O	O	O
PSU	X	O	O	O	O	O
Battery	X	O	O	O	O	O
This form is prepared in compliance with the provisions of SJ/T 11364. O: The level of toxic or hazardous materials present in this component and its parts is below the limit specified by GB/T 26572. X: The level of toxic of hazardous materials present in the component exceed the limits specified by GB/T 26572, but is still in compliance with EU Directive 2011/65/EU (RoHS 2). Notes: 1. The Environment Friendly Use Period indicated by labelling on this product is applicable only to use under normal conditions. 2. Individual components including the CPU, RAM/memory, HDD, optical drive, and PSU are optional. 3. LCD Module and Touch Control Module only applies to certain products which feature these components.						

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Chapter 1

Product Specifications

1.1 Specifications

System

AI Accelerator	NVIDIA® Jetson Orin™ NX
CPU	NVIDIA® Jetson Orin™ NX 8GB: 6-core Arm® Cortex® -A78AE v8.2 64-bit CPU NVIDIA® Jetson Orin™ NX 16GB: 8-core Arm® Cortex® -A78AE v8.2 64-bit CPU
System Memory	8GB LPDDR5 16GB LPDDR5
Storage Device	2.5" SATA Drive Bay x 1 M.2 2280 M-Key x 1 (NVMe)
Display Interface	HDMI 2.0 (Type-A) x 1
Ethernet	RJ-45 x 8 for GbE PoE/PSE (802.3af/at, Max: 120W) System supports total 120W PoE when input voltage is at or over 24V. System supports total 80W PoE when input voltage is between 12~24V. System supports total 30W PoE when input voltage is below 12V.
I/O	RJ-45 x 2 for Giga LAN USB 3.2 Gen 2 (Type-A) x 4 DB-9 x 1 for CANBus FD x 1 DB-15 x 1 for RS-232/422/485 x 1 and DIO x 8 Line Out x 1 Micro USB x 1 for OS Flash Power Button x 1 Recovery Button x 1

System

I/O Cont.	Switch x 2 for ACC Ignition Delay On/Off Antenna x 7 TPM Support, GNSS Support, 9-Axis Sensor Support
Expansion	M.2 2230 E-Key x 1 (Wi-Fi/BT) M.2 3052 B-Key x 1 (LTE) M.2 2280 M-Key x 1 (NVMe) 2.5" SATA x 1 SIM Slot x 2
Indicator	Power LED x 1
OS Support	Linux (NVIDIA JetPack™ 5.0 and above)

Power Supply

Power Requirement	3-pin Terminal Block x 1 for 9V ~ 36V ACC Ignition Delay On/Off
-------------------	---

Mechanical

Mounting	Wall Mount Kit
Dimensions (W x D x H)	8.27" x 6.46" x 2.99" (210mm x 164.2mm x 76mm) w/o Bracket 9.69" x 6.46" x 3.27" (246mm x 164.2mm x 83mm) w/ Bracket
Gross Weight	8.6 lb. (3.9Kg)
Net Weight	6.7 lb. (3Kg)

Environmental

Operating Temperature	5°F ~ 140°F (-15°C ~ 60°C with 0.7 m/s airflow, with Industrial wide Temp. SSD)
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Environmental

Storage Temperature	-40°F ~ 185°F (-40°C ~ 85°C)
Storage Humidity	5 ~ 95% @ 40°C, non-condensing
Anti-Vibration	MIL-STD-810G, 514.6C Procedure 1, Category 4 Trucker/Semitrailer on US highway (Figure 514.6C-1-Category 4-Common carrier)
Anti-Shock	MIL-STD-810G, Method 516.6, Procedure I, flight vehicle equipment
Certification	CE/FCC Class A

Note: 4 PoE ports sharing one MAC address and one Giga bandwidth.

Note: AAEON recommends using industrial wide-temperature Gen 3 storage.

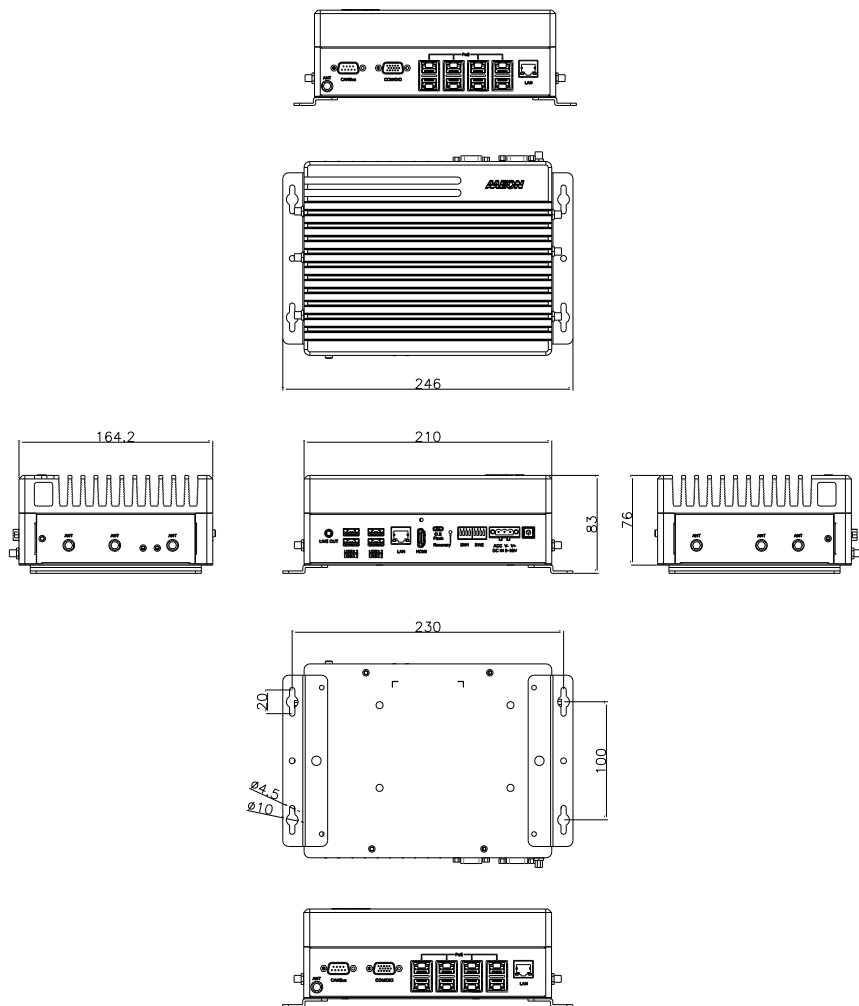
If using Gen 4 storage, a thermal solution is required for adequate heat dissipation. For any queries regarding these requirements, please contact your AAEON representative.

Chapter 2

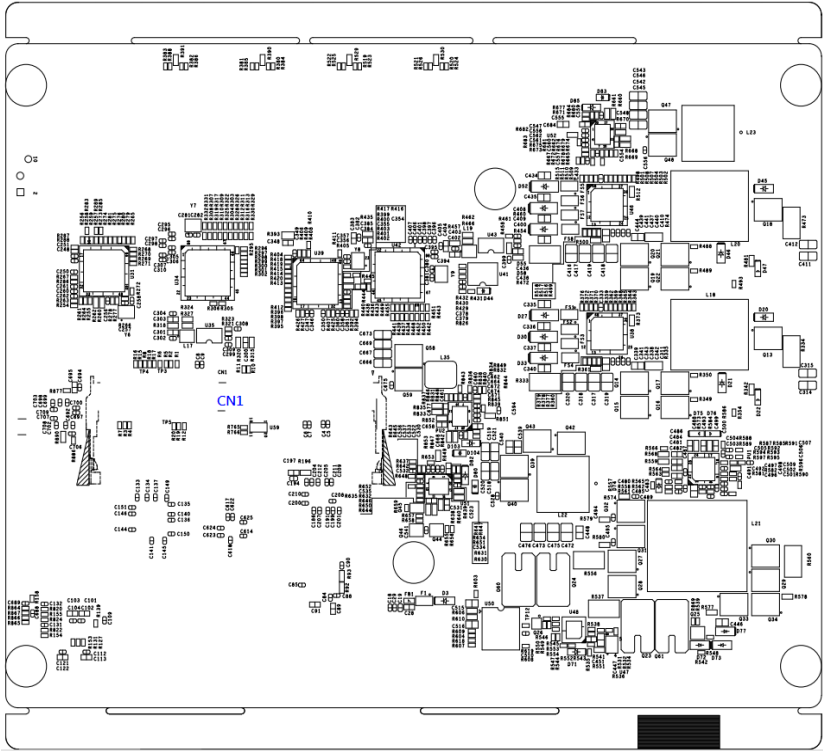
Hardware Information

2.1 Dimensions

System



Bottom



2.3 List of Jumpers

The board has a number of jumpers that allow you to configure your system to suit your application.

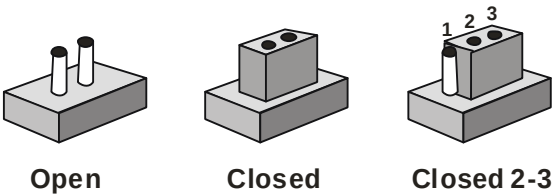
The table below shows the function of each of the board's jumpers

Label	Function
JP1	Vehicle MCU Control Setting
CN30	Front Panel

2.3.1 Jumper Settings

You configure your card to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper you connect the pins with the clip.

To "open" a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.



A pair of needle-nose pliers may be helpful when working with jumpers.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any change.

Generally, you simply need a standard cable to make most connections.

2.3.2 Vehicle MCU Control Setting (JP1)

Pin	Function
1	GND
2	ACC_ON_SET0
3	GND
4	ACC_ON_SET1
5	GND
6	ACC_ON_SET2
7	GND
8	ACC_OFF_SET0
9	GND
10	ACC_OFF_SET1
11	GND
12	ACC_OFF_SET2
13	GND
14	AT_ATX_SEL
15	PWR12V_EN
16	3789_EN

ACC ON Delay Setting Table			
Jumper Pin			
5, 6	3, 4	1, 2	Delay Time
OPEN	OPEN	OPEN	1 sec
OPEN	OPEN	SHORT	3 sec
OPEN	SHORT	OPEN	5 sec
OPEN	SHORT	SHORT	10 sec
SHORT	OPEN	OPEN	15 sec
SHORT	OPEN	SHORT	20 sec
SHORT	SHORT	OPEN	25 sec
SHORT	SHORT	SHORT	30 sec

ACC OFF Delay Setting Table			
Jumper Pin			
11, 12	9, 10	7, 8	Delay Time
OPEN	OPEN	OPEN	1 min
OPEN	OPEN	SHORT	3 min
OPEN	SHORT	OPEN	5 min
OPEN	SHORT	SHORT	10 min
SHORT	OPEN	OPEN	30 min
SHORT	OPEN	SHORT	60 min
SHORT	SHORT	OPEN	120 min
SHORT	SHORT	SHORT	0 min

POWER OFF MODE Selection Setting Table			
Jumper Pin			
11, 12	9, 10		Delay Time
OPEN	OPEN		1 min
OPEN	OPEN		3 min
OPEN	SHORT		5 min
OPEN	SHORT		10 min

AT/ATX MODE Selection Setting Table	
Jumper Pin	
13,14	MODE
ON	AT (Cut power source directly)
OFF	ATX (Normal power off)

MCU Control setting Table	
Jumper Pin	
15,16	MODE
ON	MCU control
OFF	Non MCU control

2.3.3 Front Panel (CN30)

Pin	Function
7-8	Open AT (Default)
7-8	Close ATX

2.4 List of Connectors

The board has a number of connectors that allow you to configure your system to suit your application.

The table below shows the function of each of the board's connectors

Label	Function
CN1	Jetson Orin NX Module Connector
CN2	RTC Connector
CN3	Micro USB for Flash Image
CN5	CANBus Connector
CN8	LAN Port
CN9	M.2 2230 E-Key
CN10	M.2 2280 M-Key
CN11	SIM Socket 1
CN12	M.2 3052 B-Key
CN13	LAN Port
CN15	Audio Line Out
CN17	USB 3.2 Port
CN18	SATA
CN19	PoE Port 1/2
CN20	PoE Port 3/4
CN21	PoE Port 5/6
CN22	PoE Port 7/8
CN23	DC Power in Connector
CN27	Fan Header
CN29	USB 3.2 Port
CN31	UART for Debug Port
CN32	COM Port /8-Bit DIO Connector
CN33	Audio Panel Header
CN35	USB 2.0 Connector
CN36	HDMI Port
CN37	SIM Socket 2

Label	Function
CN38	UART/I2C for GPS/9 axis Sensor Board (optional)
SW1	Switch for Vehicle MCU Setting Select
SW2	Switch for Vehicle MCU Setting Select
SW3	Switch for RS-232/RS422/RS-485 Select
SW4	Recovery Switch
SW5	Reset Switch
SW6	Power Switch
PWR1	SATA Power Connector

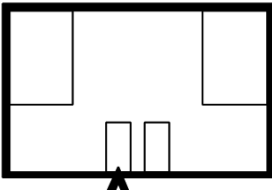
2.4.1 Jetson Orin NX Module Connector (CN1)

Jetson SODIMM Signal Name	Jetson Orin NX Function	Pin # Top Odd	Pin # Bottom Even	Jetson SODIMM Signal Name	Jetson Orin NX Function
GND	GND	1	2	GND	GND
CSI1_D0_N	CSI1_D0_N	3	4	CSI0_D0_N	CSI0_D0_N
CSI1_D0_P	CSI1_D0_P	5	6	CSI0_D0_P	CSI0_D0_P
GND	GND	7	8	GND	GND
CSI1_CLK_N	CSI1_CLK_N	9	10	CSI0_CLK_N	CSI0_CLK_N
CSI1_CLK_P	CSI1_CLK_P	11	12	CSI0_CLK_P	CSI0_CLK_P
GND	GND	13	14	GND	GND
CSI1_D1_N	CSI1_D1_N	15	16	CSI0_D1_N	CSI0_D1_N
CSI1_D1_P	CSI1_D1_P	17	18	CSI0_D1_P	CSI0_D1_P
GND	GND	19	20	GND	GND
CSI3_D0_N	CSI3_D0_N	21	22	CSI2_D0_N	CSI2_D0_N
CSI3_D0_P	CSI3_D0_P	23	24	CSI2_D0_P	CSI2_D0_P
GND	GND	25	26	GND	GND
CSI3_CLK_N	CSI3_CLK_N	27	28	CSI2_CLK_N	CSI2_CLK_N
CSI3_CLK_P	CSI3_CLK_P	29	30	CSI2_CLK_P	CSI2_CLK_P
GND	GND	31	32	GND	GND
CSI3_D1_N	CSI3_D1_N	33	34	CSI2_D1_N	CSI2_D1_N
CSI3_D1_P	CSI3_D1_P	35	36	CSI2_D1_P	CSI2_D1_P
GND	GND	37	38	GND	GND
DP0_TXD0_N	USBSS1_RX_N	39	40	CSI4_D2_N	PCIE2_RX0_N
DP0_TXD0_P	USBSS1_RX_P	41	42	CSI4_D2_P	PCIE2_RX0_P
GND	GND	43	44	GND	GND
DP0_TXD1_N	USBSS1_TX_N	45	46	CSI4_D0_N	PCIE2_TX0_N
DP0_TXD1_P	USBSS1_TX_P	47	48	CSI4_D0_P	PCIE2_TX0_P
GND	GND	49	50	GND	GND
DP0_TXD2_N	USBSS2_RX_N	51	52	CSI4_CLK_N	PCIE2_CLK_N
DP0_TXD2_P	USBSS2_RX_P	53	54	CSI4_CLK_P	PCIE2_CLK_P
GND	GND	55	56	GND	GND
DP0_TXD3_N	USBSS2_TX_N	57	58	CSI4_D1_N	PCIE2_RX1_N (PCIE3_RX0_N)
DP0_TXD3_P	USBSS2_TX_P	59	60	CSI4_D1_P	PCIE2_RX1_P (PCIE3_RX0_P)
GND	GND	61	62	GND	GND
DP1_TXD0_N	DP1_TXD0_N	63	64	CSI4_D3_N	PCIE2_TX1_N (PCIE3_TX0_N)
DP1_TXD0_P	DP1_TXD0_P	65	66	CSI4_D3_P	PCIE2_TX1_P (PCIE3_TX0_P)
GND	GND	67	68	GND	GND
DP1_TXD1_N	DP1_TXD1_N	69	70	DSI_D0_N	RSVD
DP1_TXD1_P	DP1_TXD1_P	71	72	DSI_D0_P	RSVD
GND	GND	73	74	GND	GND
DP1_TXD2_N	DP1_TXD2_N	75	76	DSI_CLK_N	RSVD
DP1_TXD2_P	DP1_TXD2_P	77	78	DSI_CLK_P	RSVD
GND	GND	79	80	GND	GND
DP1_TXD3_N	DP1_TXD3_N	81	82	DSI_D1_N	RSVD
DP1_TXD3_P	DP1_TXD3_P	83	84	DSI_D1_P	RSVD
GND	GND	85	86	GND	GND
GPIO00	GPIO00	87	88	DP0_HPD	RSVD
SPI0_MOSI	SPI0_MOSI	89	90	DP0_AUX_N	RSVD
SPI0_SCK	SPI0_SCK	91	92	DP0_AUX_P	RSVD
SPI0_MISO	SPI0_MISO	93	94	HDMI_CEC	HDMI_CEC
SPI0_CS0*	SPI0_CS0*	95	96	DP1_HPD	DP1_HPD
SPI0_CS1*	SPI0_CS1*	97	98	DP1_AUX_N	DP1_AUX_N
UART0_TXD	UART0_TXD	99	100	DP1_AUX_P	DP1_AUX_P
UART0_RXD	UART0_RXD	101	102	GND	GND
UART0_RTS*	UART0_RTS*	103	104	SPI1_MOSI	SPI1_MOSI
UART0_CTS*	UART0_CTS*	105	106	SPI1_SCK	SPI1_SCK
GND	GND	107	108	SPI1_MISO	SPI1_MISO
USB0_D_N	USB0_D_N	109	110	SPI1_CS0*	SPI1_CS0*
USB0_D_P	USB0_D_P	111	112	SPI1_CS1*	SPI1_CS1*

Jetson SODIMM Signal Name	Jetson Orin NX Function	Pin # Top Odd	Pin # Bottom Even	Jetson SODIMM Signal Name	Jetson Orin NX Function
GND	GND	113	114	CAM0 PWDN	CAM0 PWDN
USB1 D N	USB1 D N	115	116	CAM0 MCLK	CAM0 MCLK
USB1 D P	USB1 D P	117	118	GPIO1	GPIO1 (CLK)
GND	GND	119	120	CAM1 PWDN	CAM1 PWDN
USB2 D N	USB2 D N	121	122	CAM1 MCLK	CAM1 MCLK
USB2 D P	USB2 D P	123	124	GPIO2	GPIO2
GND	GND	125	126	GPIO3	GPIO3
GPIO04	GPIO04	127	128	GPIO5	GPIO5
GND	GND	129	130	GPIO6	GPIO6
PCIE0 RX0 N	PCIE0 RX0 N	131	132	GND	GND
PCIE0 RX0 P	PCIE0 RX0 P	133	134	PCIE0 TX0 N	PCIE0 TX0 N
GND	GND	135	136	PCIE0 TX0 P	PCIE0 TX0 P
PCIE0 RX1 N	PCIE0 RX1 N	137	138	GND	GND
PCIE0 RX1 P	PCIE0 RX1 P	139	140	PCIE0 TX1 N	PCIE0 TX1 N
GND	GND	141	142	PCIE0 TX1_P	PCIE0 TX1_P
CAN RX	CAN RX	143	144	GND	GND
CAN TX	CAN TX	145	146	GND	GND
GND	GND	147	148	PCIE0 TX2 N	PCIE0 TX2 N
PCIE0 RX2 N	PCIE0 RX2 N	149	150	PCIE0 TX2 P	PCIE0 TX2 P
PCIE0 RX2 P	PCIE0 RX2 P	151	152	GND	GND
GND	GND	153	154	PCIE0 TX3 N	PCIE0 TX3 N
PCIE0 RX3 N	PCIE0 RX3 N	155	156	PCIE0 TX3 P	PCIE0 TX3 P
PCIE0 RX3 P	PCIE0 RX3 P	157	158	GND	GND
GND	GND	159	160	PCIE0 CLK N	PCIE0 CLK N
USBSS RX N	USBSS0 RX N	161	162	PCIE0 CLK P	PCIE0 CLK P
USBSS RX P	USBSS0 RX P	163	164	GND	GND
GND	GND	165	166	USBSS TX N	USBSS0 TX N
PCIE1 RX0 N	PCIE1 RX0 N	167	168	USBSS TX P	USBSS0 TX P
PCIE1 RX0 P	PCIE1 RX0 P	169	170	GND	GND
GND	GND	171	172	PCIE1 TX0 N	PCIE1 TX0 N
PCIE1 CLK N	PCIE1 CLK N	173	174	PCIE1 TX0 P	PCIE1 TX0 P
PCIE1 CLK P	PCIE1 CLK P	175	176	GND	GND
GND	GND	177	178	MOD SLEEP*	MOD SLEEP*
PCIE WAKE*	PCIE WAKE*	179	180	PCIE0 CLKREQ*	PCIE0 CLKREQ*
PCIE0 RST*	PCIE0 RST*	181	182	PCIE1 CLKREQ*	PCIE1 CLKREQ*
PCIE1 RST*	PCIE1 RST*	183	184	GBE MDIO N	GBE MDIO N
I2C0_SCL	I2C0_SCL	185	186	GBE MDIO P	GBE MDIO P
I2C0_SDA	I2C0_SDA	187	188	GBE LED LINK	GBE LED LINK
I2C1_SCL	I2C1_SCL	189	190	GBE MDI1 N	GBE MDI1 N
I2C1_SDA	I2C1_SDA	191	192	GBE MDI1 P	GBE MDI1 P
I2S0_DOUT	I2S0_DOUT	193	194	GBE LED ACT	GBE LED ACT
I2S0_DIN	I2S0_DIN	195	196	GBE MDI2 N	GBE MDI2 N
I2S0_FS	I2S0_FS	197	198	GBE MDI2 P	GBE MDI2 P
I2S0_SCLK	I2S0_SCLK	199	200	GND	GND
GND	GND	201	202	GBE MDI3 N	GBE MDI3 N
UART1_TXD	UART1_TXD	203	204	GBE MDI3 P	GBE MDI3 P
UART1_RXD	UART1_RXD	205	206	GPIO7	GPIO7
UART1_RTS*	UART1_RTS*	207	208	GPIO8	GPIO8
UART1_CTS*	UART1_CTS*	209	210	CLK 32K OUT	CLK 32K OUT
GPIO09	GPIO09	211	212	GPIO10	GPIO10
CAM I2C_SCL	CAM I2C_SCL	213	214	FORCE RECOVERY*	FORCE RECOVERY*
CAM I2C_SDA	CAM I2C_SDA	215	216	GPIO11	GPIO11
GND	MODULE_ID	217	218	GPIO12	GPIO12
SDMMC DAT0	PCIE2_CLKREQ*	219	220	I2S1_DOUT	I2S1_DOUT
SDMMC DAT1	PCIE2_CLKREQ*	221	222	I2S1_DIN	I2S1_DIN
SDMMC DAT2	PCIE3_RST*	223	224	I2S1_FS	I2S1_FS
SDMMC DAT3	PCIE3_CLKREQ*	225	226	I2S1_SCLK	I2S1_SCLK
SDMMC_CMD	PCIE3_CLK N	227	228	GPIO13	GPIO13
SDMMC_CLK	PCIE3_CLK P	229	230	GPIO14	GPIO14
GND	GND	231	232	I2C2_SCL	I2C2_SCL
SHUTDOWN_REQ*	SHUTDOWN_REQ*	233	234	I2C2_SDA	I2C2_SDA
PMIC_BBAT	PMIC_BBAT	235	236	UART2_TXD	UART2_TXD

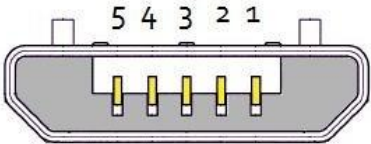
Jetson SODIMM Signal Name	Jetson Orin NX Function	Pin # Top Odd	Pin # Bottom Even	Jetson SODIMM Signal Name	Jetson Orin NX Function
POWER_EN	POWER_EN	237	238	UART2_RXD	UART2_RXD
SYS_RESET*	SYS_RESET*	239	240	SLEEP/WAKE*	SLEEP/WAKE*
GND	GND	241	242	GND	GND
GND	GND	243	244	GND	GND
GND	GND	245	246	GND	GND
GND	GND	247	248	GND	GND
GND	GND	249	250	GND	GND
VDD_IN	VDD_IN	251	252	VDD_IN	VDD_IN
VDD_IN	VDD_IN	253	254	VDD_IN	VDD_IN
VDD_IN	VDD_IN	255	256	VDD_IN	VDD_IN
VDD_IN	VDD_IN	257	258	VDD_IN	VDD_IN
VDD_IN	VDD_IN	259	260	VDD_IN	VDD_IN

2.4.2 RTC Battery Connector (CN2)



Pin	Signal
1	+3V
2	GND

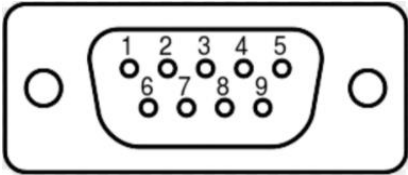
2.4.3 Micro USB for Flash Image (CN3)



USB Micro-B

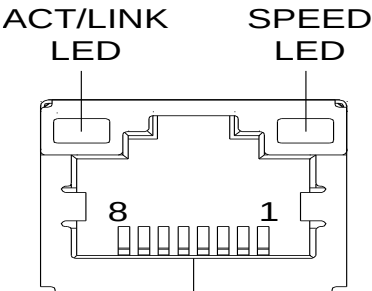
Pin	Signal
1	VBUS
2	D-
3	D+
4	
5	GND

2.4.4 CANBus Connector (CN5)



Pin	Signal
1	
2	CAN0_L
3	
4	
5	GND
6	
7	CAN0_H
8	
9	

2.4.5 LAN Port (CN8)



Pin	Signal	Pin	Signal
1	MDI0+	2	MDI0-
3	MDI1+	4	MDI1-
5	MDI2+	6	MDI2-
7	MDI3+	8	MDI3-

2.4.6 M.2 2230 E-Key (CN9)

74	3.3V	GND	75
72	3.3V	RESERVED/REFCLKn1	73
70	UIM_POWER_SRC/GPIO_1/PEWAKE1#	RESERVED/REFCLKp1	71
68	UIM_POWER_SNK/CLKREQ1#	GND	69
66	UIM_SWP/PERST1#	RESERVED/PERn1	67
64	RESERVED	RESERVED/PERp1	65
62	ALERT# (I)(0/1.8 V)	GND	63
60	I2C_CLK (O)(0/1.8 V)	RESERVED/PETn1	61
58	I2C_DATA (I/O)(0/1.8 V)	RESERVED/PETp1	59
56	W_DISABLE1# (O)(0/3.3V)	GND	57
54	W_DISABLE2# (O)(0/3.3V)	PEWAKE0# (I/O)(0/3.3V)	55
52	PERST0# (O)(0/3.3V)	CLKREQ0# (I/O)(0/3.3V)	53
50	SUSCLK(32kHz) (O)(0/3.3V)	GND	51
48	COEX_TXD (I)(0/1.8V)	REFCLKn0	49
46	COEX_RXD (I)(0/1.8V)	REFCLKp0	47
44	COEX3 (I/O)(0/1.8V)	GND	45
42	VENDOR DEFINED	PERn0	43
40	VENDOR DEFINED	PERp0	41
38	VENDOR DEFINED	GND	39
36	UART RTS (O)(0/1.8V)	PETn0	37
34	UART CTS (I)(0/1.8V)	PETp0	35
32	UART TXD (O)(0/1.8V)	GND	33
Key E		Key E	
Key E		Key E	
Key E		Key E	
Key E		Key E	
Key E		SDIO RESET#/TX_BLANKING (O)(0/1.8V)	23
22	UART RXD (I)(0/1.8V)	SDIO WAKE# (I)(0/1.8V)	21
20	UART WAKE# (I)(0/3.3V)	SDIO DATA3(I/O)(0/1.8V)	19
18	GND	SDIO DATA2(I/O)(0/1.8V)	17
16	LED_2# (I)(OD)	SDIO DATA1(I/O)(0/1.8V)	15
14	PCM_OUT/125 SD_OUT (O)(0/1.8V)	SDIO DATA0(I/O)(0/1.8V)	13
12	PCM_IN/125 SD_IN (I)(0/1.8V)	SDIO CMD(I/O)(0/1.8V)	11
10	PCM_SYNC/125 WS (I/O)(0/1.8V)	SDIO CLK/SYSCLK (O)(0/1.8V)	9
8	PCM_CLK/125 SCK (I/O)(0/1.8V)	GND	7
6	LED_1# (I)(OD)	USB_D-	5
4	3.3V	USB_D+	3
2	3.3V	GND	1

2.4.7 M.2 2280 M-Key (CN10)

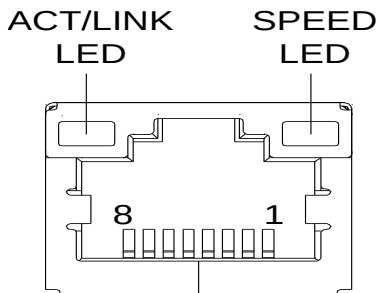
Pin Number	Pin Name	Description	Voltage
1	CONFIG 3	Defines module type	
2	3.3 V	Supply pin	3.3 V
3	GND	Ground	
4	3.3 V	Supply pin	3.3 V
5	PERn3	PCIe Lane 3 Rx	
6	N/A		
7	PERp3	PCIe Lane 3 Rx	
8	N/A		
9	GND	Ground	
10	N/A		
11	PETn3	PCIe Lane 3 Tx	
12	3.3 V	Supply pin	3.3 V
13	PETp3	PCIe Lane 3 Tx	
14	3.3 V	Supply pin	3.3 V
15	GND	Ground	
16	3.3V	Supply pin	3.3 V
17	PERn2	PCIe Lane 2 Rx	
18	3.3 V	Supply pin	3.3 V
19	PERp2	PCIe Lane 2 Rx	
20	N/A		
21	CONFIG 0	Defines module type	
22	N/A		
23	PETn2	PCIe Lane 2 Tx	
24	N/A		
25	PETp2	PCIe Lane 2 Tx	
26	N/A		
27	GND	Ground	
28	N/A		
29	PERn1	PCIe Lane 1 Rx	
30	N/A		
31	PERp1	PCIe Lane 1 Rx	
32	N/A		
33	GND	Ground	
34	N/A		
35	PETn1	PCIe Lane 1 Tx	
36	N/A		
37	PETp1	PCIe Lane 1 Tx	
38	DEVSLP	Device Sleep, input. If driven high the host is informing the SSD to enter a low power state.	
39	GND	Ground	
40	N/A		
41	PERn0	Host receiver differential signal pair. If in PCIe mode PCIe Lane 0 Rx	
42	N/A		
43	PERp0	Host receiver differential signal pair. If in PCIe mode PCIe Lane 0 Rx	

44	N/A		
45	GND	Ground	
46	N/A		
47	PETn0	Host transmitter differential signal pair. If in PCIe mode PCIe Lane 0 Tx	
48	N/A		
49	PETp0	Host transmitter differential signal pair. If in PCIe mode PCIe Lane 0 Tx	
50	PERST#	PCIe reset	
51	GND	Ground	
52	CLKREQ#	Reference clock request signal	
53	REFCLKN	PCIe Reference Clock signals (100 MHz)	
54	PEWAKE#	PCIe WAKE# Open Drain with pull up on platform. Active Low.	
55	REFCLKP	PCIe Reference Clock signals (100 MHz)	
56	MFG1	Manufacturing pin. Use determined by vendor.	
57	GND	Ground	
58	MFG2	Manufacturing pin. Use determined by vendor.	
59-66	removed	Mechanical notch M	
67	N/A		
68	SUSCLK	32.768 kHz clock supply input provided by the Platform chipset	
69	CONFIG 1	Defines module type	
70	3.3 V	Supply pin	3.3 V
71	GND	Ground	
72	3.3 V	Supply pin	3.3 V
73	GND	Ground	
74	3.3 V	Supply pin	3.3 V
75	CONFIG 2	Defines module type	

2.4.8 M.2 3052 B-Key (CN12)

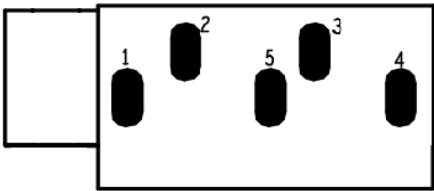
74	3.3 V/VBAT	CONFIG_2	75
72	3.3 V/VBAT	GND	73
70	3.3 V/VBAT	GND	71
68	SUSCLK(32kHz) (O)(0/3.3V)	CONFIG_1	69
66	SIM DETECT (O)	RESET# (O)(0/1.8V)	67
64	COEX_RXD (I)(0/1.8V)	ANTCTL3 (I)(0/1.8V)	65
62	COEX_TXD (O)(0/1.8V)	ANTCTL2 (I)(0/1.8V)	63
60	COEX3 (I/O)(0/1.8V)	ANTCTL1 (I)(0/1.8V)	61
58	NC	ANTCTL0 (I)(0/1.8V)	59
56	NC	GND	57
54	PEWAKE# (I/O)(0/3.3V)	REFCLKp	55
52	CLKREQ# (I/O)(0/3.3V)	REFCLKn	53
50	PERST# (O)(0/3.3V)	GND	51
48	GPIO_4 (I/O)(0/1.8V)	PETp0	49
46	GPIO_3 (I/O)(0/1.8V)	PETn0	47
44	GPIO_2 (I/O)/ALERT# (I)(0/1.8V)	GND	45
42	GPIO_1 (I/O)/SMB_DATA (I/O)(0/1.8V)	PERp0	43
40	GPIO_0 (I/O)/SMB_CLK (I/O)(0/1.8V)	PERn0	41
38	DEVS LP (O)	GND	39
36	UIM-PWR (I)	PETpI/USB31-Tx+/SSIC-TxP	37
34	UIM-DATA (I/O)	PETnI/USB31-Tx-/SSIC-TxN	35
32	UIM-CLK (I)	GND	33
30	UIM-RESET (I)	PERpI/USB31-Rx+/SSIC-RxP	31
28	GPIO_8 (I/O) (0/1.8V)	PERnI/USB31-Rx-/SSIC-RxN	29
26	GPIO_10 (I/O) (0/1.8V)	GND	27
24	GPIO_7 (I/O) (0/1.8V)	DPR (O) (0/1.8V)	25
22	GPIO_6 (I/O)(0/1.8V)	GPIO_11 (I/O) (0/1.8V)	23
20	GPIO_5 (I/O)(0/1.8V)	CONFIG_0	21
Key B		Key B	
Key B		Key B	
Key B		Key B	
Key B		Key B	
Key B		GND	11
10	GPIO_9/DAS/DSS (I/O)/LED_1# (I)(0/3.3V)	USB_D-	9
8	W_DISABLE# (O)(0/3.3V)	USB_D+	7
6	FULL_CARD_POWER_OFF# (O)(0/1.8V or 3.3V)	GND	5
4	3.3 V	GND	3
2	3.3 V	CONFIG_3	1

2.4.9 LAN Port (CN13)



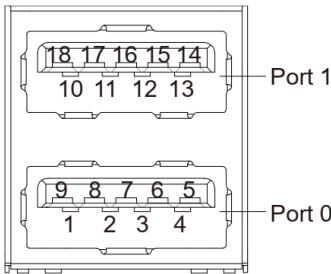
Pin	Signal	Pin	Signal
1	MDI0+	2	MDI0-
3	MDI1+	4	MDI1-
5	MDI2+	6	MDI2-
7	MDI3+	8	MDI3-

2.4.10 Audio Line Out (CN15)



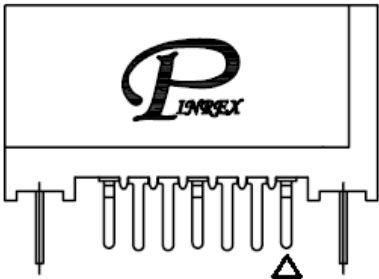
Pin	Signal
1	GND
2	Line_R
3	Line_L
4	
5	

2.4.11 USB 3.2 Port (CN17)



Pin	Signal	Pin	Signal
U1	VBUS	U10	VBUS
U2	(A)D-	U11	(B)D-
U3	(A)D+	U12	(B)D+
U4	GND	U13	GND
U5	(A)SSRX-	U14	(B)SSRX-
U6	(A)SSRX+	U15	(B)SSRX+
U7	GND	U16	GND
U8	(A)SSTX-	U17	(B)SSTX-
U9	(A)SSTX+	U18	(B)SSTX+

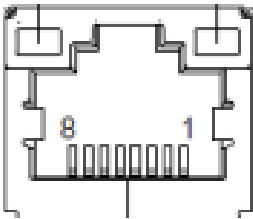
2.4.12 SATA Connector (CN18)



Pin	Signal
1	GND
2	TX+

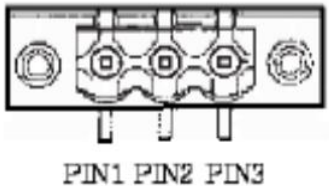
Pin	Signal
3	TX-
4	GND
5	RX-
6	RX+
7	GND

2.4.13 PoE Port 1 ~ 8 (CN19/CN20/CN21/CN22)



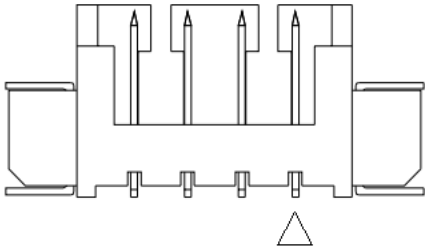
Pin	Pin Name	Signal Type	Signal Level
1	MDI0+	DIFF	
2	MDI0-	DIFF	
3	MDI1+	DIFF	
4	MDI2+	DIFF	
5	MDI2-	DIFF	
6	MDI1-	DIFF	
7	MDI3+	DIFF	
8	MDI3-	DIFF	

2.4.14 DC Power in Connector (CN23)



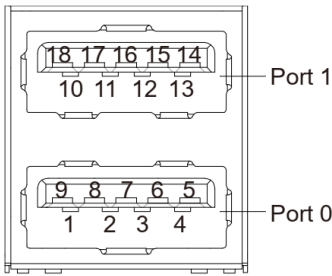
Pin	Signal
1	PWR_IN
2	GND
3	ACC_IN

2.4.15 Fan Header (CN27)



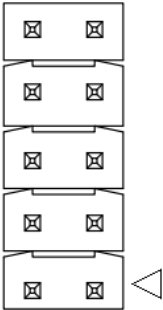
Pin	Signal
1	GND
2	VDD_12V
3	FAN_TACH
4	FAN_PWM_Q*

2.4.16 USB 3.2 Port (CN29)



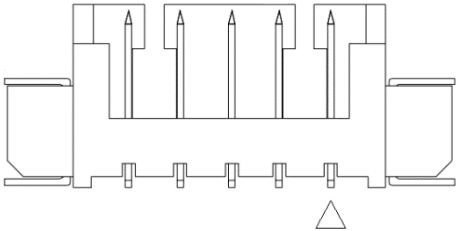
Pin	Signal	Pin	Signal
U1	VBUS	U10	VBUS
U2	(A)D-	U11	(B)D-
U3	(A)D+	U12	(B)D+
U4	GND	U13	GND
U5	(A)SSRX-	U14	(B)SSRX-
U6	(A)SSRX+	U15	(B)SSRX+
U7	GND	U16	GND
U8	(A)SSTX-	U17	(B)SSTX-
U9	(A)SSTX+	U18	(B)SSTX+

2.4.17 Front Panel (CN30)



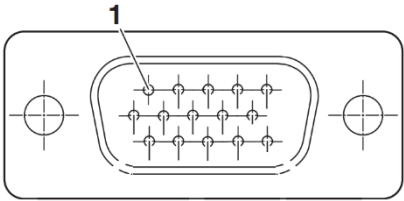
Pin	Signal	Pin	Signal
1	PWR_BTN*	2	GND
3	FORCE_RECOVERY*	4	GND
5	SYS_RST*	6	GND
7	BMCU_ACOK	8	GND
9	3V3_AO	10	VDD_5V_SYS

2.4.18 UART for Debug Port (CN31)



Pin	Signal
1	VDD_3V3_SYS
2	UART2_TXD
3	UART2_RXD
4	GND
5	GND

2.4.19 COM Port /8-Bit DIO Connector (CN32)

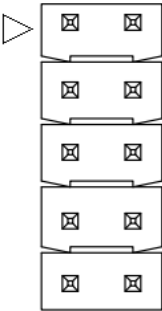


Pin	RS-232	RS-422	RS-485
1		TX-	D-
2	TXD	TX+	D+
3	RXD	RX+	
4		RX-	
5	GND		
6	DIO1		
7	DIO2		
8	DIO3		
9	DIO4		
10	GND		
11	DIO5		
12	DIO6		
13	DIO7		
14	DIO8		
15	GND		

8-Bit DIO	
Pin	GPIO Index
6	PQ.05
7	PG.06
8	PN.01
9	PH.00
10	GND
11	PZ.06
12	PZ.05

8-Bit DIO	
Pin	GPIO Index
13	PZ.04
14	PZ.03
15	GND

2.4.20 Audio Panel Header (CN33)



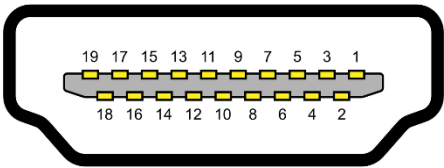
Pin	Signal	Pin	Signal
1	MIC_L	2	AGND
3	MIC_R_RECOVERY*	4	AUDIO_PRSENT_L
5	HPOR_HDA	6	MIC_HDA
7	NC	8	NC
9	HPOL_HDA	10	HP_HDA

2.4.21 USB 2.0 Connector (CN35)



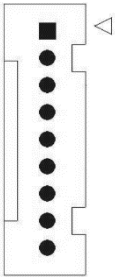
Pin	Signal
1	5V
2	D-
3	D+
4	GND
5	GND

2.4.22 HDMI Port (CN36)



Pin	Signal	Pin	Signal
1	HDMI_DATA2_P	2	GND
3	HDMI_DATA2_N	4	HDMI_DATA1_P
5	GND	6	HDMI_DATA1_N
7	HDMI_DATA0_P	8	GND
9	HDMI_DATA0_N	10	HDMI_CLK_P
11	GND	12	HDMI_CLK_N
13	CEC	14	NC
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	HDMI_PWR
19	HDMI_HDP		

2.4.23 UART/I2C for GPS/9-axis Sensor Board (CN38)

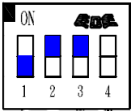
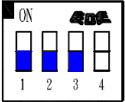
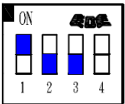
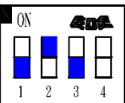
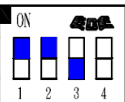
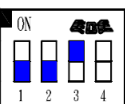
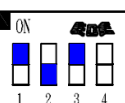


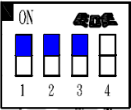
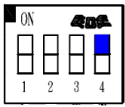
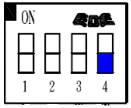
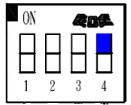
Pin	Signal
1	3.3V
2	3.3V
3	I2C0_SCL
4	I2C0_SDA
5	GPIO
6	UART_TXD
7	UART_RXD
8	GND
9	GND

2.4.24 Switch for Vehicle MCU Setting Select (SW1/SW2)



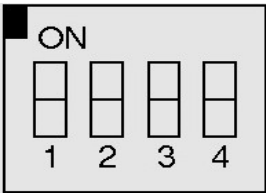
Function	SW1	SW2	Set Time
ACC ON Delay Minutes Setting			1 Sec
			3 Sec
			5 Sec
			10 Sec
			15 Sec
			20 Sec

Function	SW1	SW2	Set Time
ACC ON Delay Minutes Setting			25 Sec
			30 Sec
Function	SW1	SW2	Set Time
ACC OFF Delay Minutes Setting			1 min
			3 min
			5 min
			10 min
			30 min
			60 min

Function	SW1	SW2	Set Time
ACC OFF Delay Minutes Setting			120 min
			0 min
Function	SW1	SW2	Set Time
Power off AT/ATX MODE Selection			Cut power source directly after ACC off delay time up
			Normal Power off after ACC off delay time up
Function	SW1	SW2	Set Time
MCU Control Setting			Non MCU Control
			By MCU Control

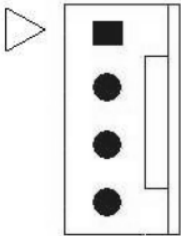
Note: Co-lay with JP1.

2.4.25 Switch for RS-232/RS422/RS-485 Select (SW3)



Mode	S-1	S-2	S-3	S-4
1T/1R RS-232	On	On		
1T/1R RS-422	On	Off		
1T/1R RS-485	Off	On		
Low power shutdown	Off	Off		
250kbps for RS-232 and RS-485/RS-422			On	
RS-232 to 3Mbps and RS-485/RS-422 to 20Mbps			Off	
Enable RS-422/RS-485 bias and termination resistors.				On
Disable RS-422/RS-485 bias and termination resistors.				Off

2.4.26 SATA Power Connector (PWR1)



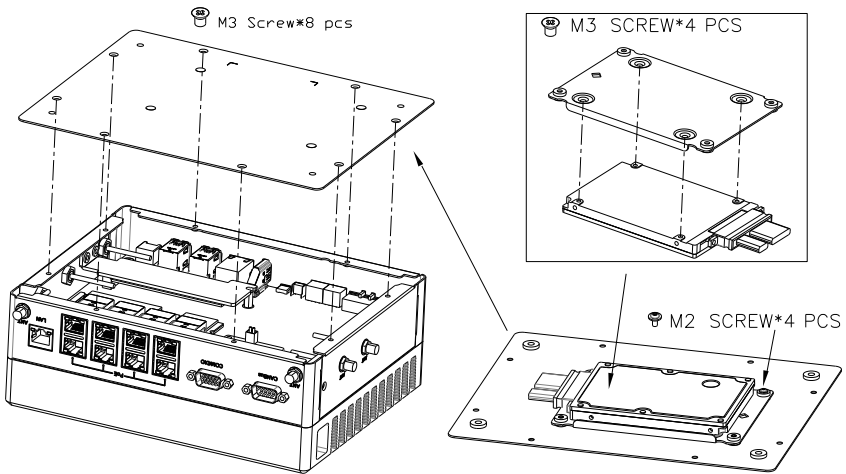
Pin	Signal
1	12V
2	GND
3	GND
4	5V

2.5 Hardware Installation

Before installing hard disk drives or expansion modules, ensure the system is powered down and disconnect the power cord from the system.

2.5.1 SATA Drive Installation

Step 1: Open the chassis by removing the eight (8) bottom panel screws.



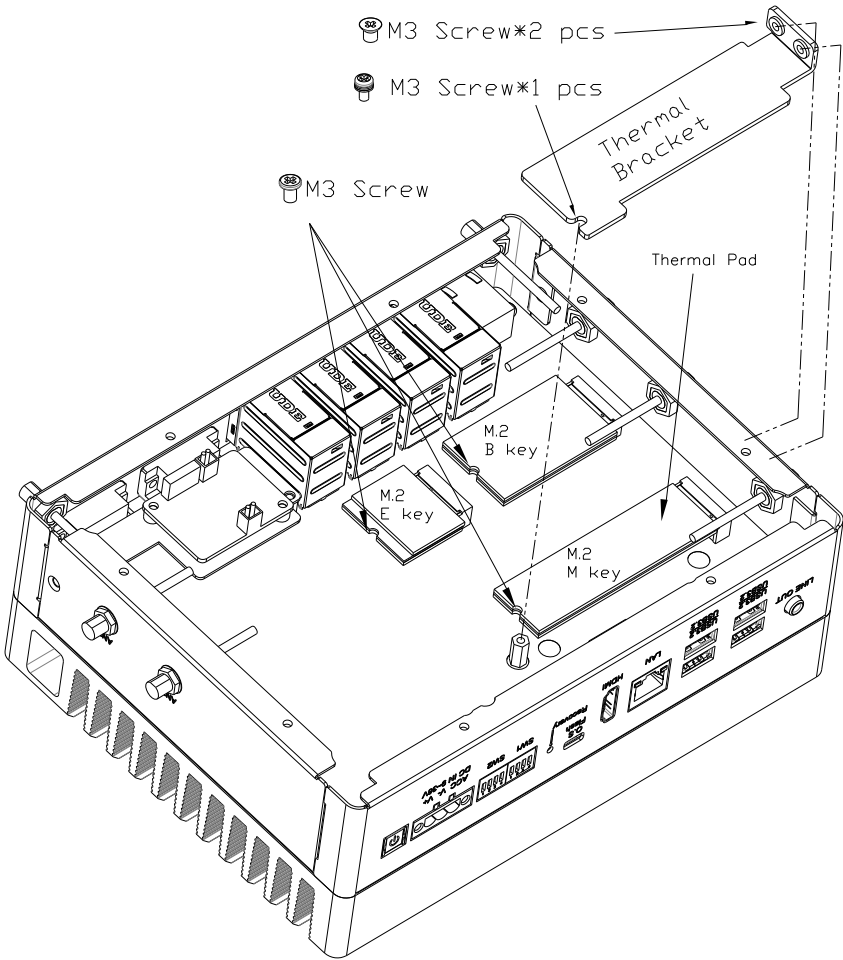
Step 2: Affix the SATA drive to the drive bay using the four (4) screws provided.

Step 3: Attach the drive bay to the bottom panel using the four (4) screws provided.

2.5.2 Expansion Module Installation

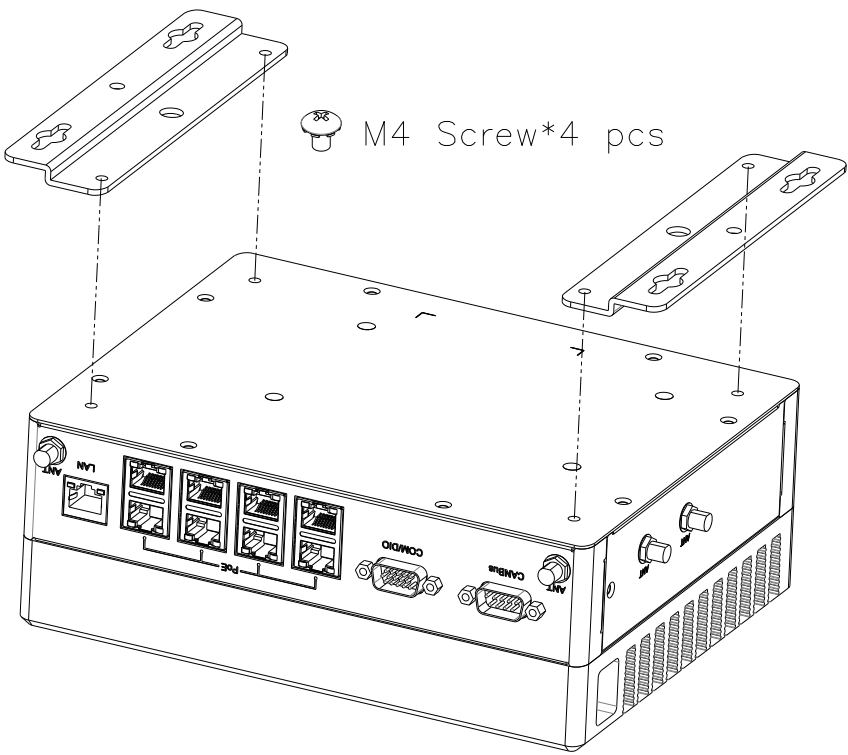
Install each expansion module by first inserting at an angle (approx. 30°), then gently press down and securing with the screws provided. Refer to the images below for guidance on M.2 Key slot location.

Note: Make sure to affix the thermal bracket using three (3) screws, as shown below. To replace the bottom panel, simply reaffix using the eight (8) screws removed during step 1 of section 2.5.1.



2.5.3 Wall Mount Installation

Secure the wall mount brackets to the chassis using the four (4) screws provided, as shown below.



Chapter 3

BSP Flash Guide

3.1 Before Installation

Before starting the process, make sure your BOXER-8658AI system is turned off and the power source is disconnected. You will need a Host PC running Ubuntu 18.04/20.04, and to make sure the NVIDIA Jetson Orin NX module is installed on the BOXER-8658AI carrier board system.

Note: Do not use a virtual machine as a host PC, as some virtual machines may have unstable USB connections which can cause the flash procedure to fail.



Download the compressed BSP image file

"BOXER_8658AI_J5.1.2_A00_1.0.2_20231110.tar.gz" into the Host Ubuntu 18.04/20.04 PC directory.

Note: No spaces, special characters, or non-English characters can be used for the name of the folder where the file is stored, or its parent folder.

Note: Ensure the language settings of Ubuntu 18.04/20.04 are set to English, and the format setting is the United States, to prevent flash failure.

3.2 Connecting to PC/Force Recovery Mode

Step 1:

On the Host computer, open the Linux terminal and enter the following command to extract the compressed BSP image files (BSP file name may vary):

```
$ sudo tar -zxvf BOXER_8658AI_J5.1.2_A00_1.0.2_20231110.tar.gz
```

Note: Do not decompress the file (Internal.tar.gz) using a Windows OS, BSP should only be decompressed in a Linux EXT3/4 file system.

Step 2:

Perform the following actions to force the system to start in USB Recovery Mode:

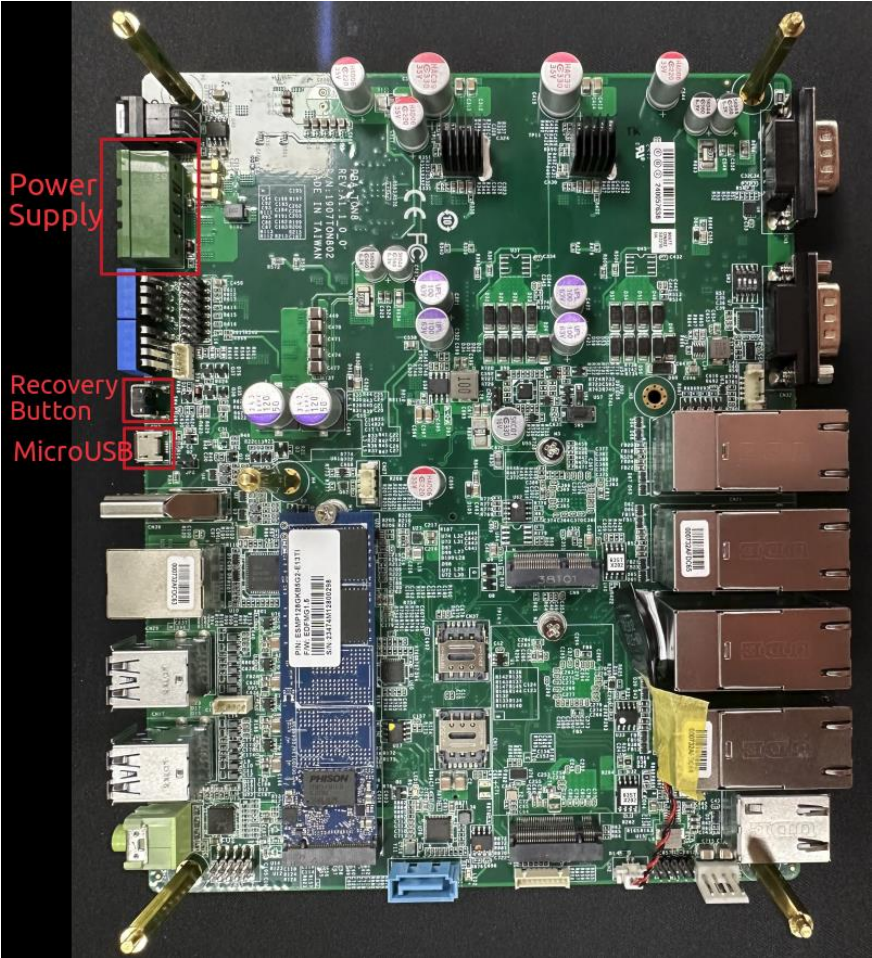
1. Connect the Micro-USB plug on the USB cable to the Recovery Port on the BOXER-8658AI, and the other end to an available USB port on the Host PC.
2. Connect the BOXER-8658AI to a power supply.
3. Press and hold the recovery key button. While holding the recovery key button, power on the system, and continue to hold the recovery key button for two seconds, then release. The BOXER-8658AI should then enter recovery mode.
4. To check if device is in recovery mode, enter the `lsusb` command in terminal on the host PC.

```
$ lsusb | grep "0955:7523"
```

If successful, the command will return **"0955:7523 Nvidia Corp"**

```
Bus 001 Device 018: ID 0955:7523 NVidia Corp.
```

Note: Recovery mode cannot be initiated if the NVIDIA Jetson Orin NX module is disassembled. Ensure the NVIDIA Jetson Orin NX module is installed and refer to the image below to perform the force recovery mode steps:



3.3 Flash Image to Board

Use the following steps to flash the OS to the BOXER-8658AI.

1) Open terminal on the Ubuntu Host PC, then access the folder you extracted in the previous section.

2) Enter the following command in terminal to flash the image:

```
$ ./flashboxer -s 62517420 nvme
```

3) Wait as the image is installed. Once complete you should see the following:

```
tar: Read checkpoint 668000
tar: Read checkpoint 678000
writing item=17, 9:0:secondary_gpt, 32008902144, 16896, gpt_secondary_9_0.bin, 16896, fixed-<reserved>-0, 99780b7732fdeff330529d8178dfa2cf89e3298c
[ 597]: ldt_flash_from_kernel: Successfully flash the external device
[ 597]: ldt_flash_from_kernel: Flashing success
[ 597]: ldt_flash_from_kernel: The device size indicated in the partition layout xml is smaller than the actual size. This utility will try to fix the GPT.
Flash is successful
Reboot device
Cleaning up...
Log is saved to /linux_for_Tegra/initrdlog/flash_1-2_0_20240410-165418.log
Flash target board Success
```

4) After Steps 2 and 3, mass-flash image is built up internally, so you can flash up to 10 targets at once by using the following command:

```
$ ./flashboxer -m nvme
```


3.4 Check BSP Version

Once the flash image is successfully installed, the BOXER-8658AI will reboot automatically, then check the BSP version to see if the system is flashing the correct version of BSP.

Open a Terminal, and type command **"cat /proc/product"**

You will see the product name with version and date

BOXER-8658AI_J5.1.2_A00_1.0.2_20231110

The version name will follow the format of:

{PJ_IF}_{JPV_IF}_A00_{IMGV_IF}_{BD_IF}

For example:

BOXER-8658AI_J5.1.2_A00_1.0.2_20231110

Note: File name may differ from this example.

{PJ_IF} is Project Information; e.g. BOXER-8658AI

{JPV_IF} is Jetpack Version; e.g. J5.1.2

{IMGV_IF} is Build Version; e.g. 1.0.2

{BD_IF} is Build Date; e.g. 20231110

Chapter 4

OS User Guide

4.1 Introduction

The BOXER-8658AI's OS, Ubuntu/Linux version, and preinstalled SDK components are as follows:

For **Jetpack 5.1.2 (L4t 35.4.1)**

1. Ubuntu/Linux version
 - a. Ubuntu version: 20.04.6
 - b. Kernel version: 5.10.120-tegra
 - c. UEFI version: 4.1-33958178
2. Built-in all Jetson SDK Components
 - a. CUDA Toolkit for L4T 11.4.19
 - b. cuDNN 8.6.0
 - c. TensorRT 8.5.2
 - d. OpenCV 4.5.4
 - e. VPI 2.3
 - f. NVIDIA Container Runtime 2.11
 - g. Multimedia API 35.4
 - h. Nsight Systems 2023.2
 - i. Nsight Graphics 2023.2
 - j. Nsight Compute 2022.2
 - k. Nsight DL Designer 2022.2
 - l. Deepstream 6.3
3. Built-in Allxon DMS
 - a. Please refer <https://www.allxon.com/solutions>

Default login user/password is:

Account: **aaeon**

Password: **aaeon**

4.2 Update Note

Running **\$ sudo apt upgrade** command in terminal will overwrite the **Aaeon kernel device tree(.dtb)/kernel image(Image)/bootloader** in the OS, which can lead to unexpected results, including the loss of I/O ports. To prevent this, AAEON disables the NVIDIA apt repository by default for updating NVIDIA apt packages.

AAEON maintains updated versions of BSP on the product page, which follow updates to the NVIDIA Jetpack software. Contact your AAEON representative or visit the product page to download the latest version of Aaeon BSP for your system:

<https://www.aaeon.com/en/>

4.3 Power Mode for BOXER-8658AI

NVIDIA Jetson Orin NX power mode can be selected and monitored by GUI, please refer to the following image:



Note: Power mode is dependent on DRAM size. For more detailed information please visit: <https://developer.nvidia.com/embedded/jetson-modules>

4.4 DIO/GPIO Setting Command for BOXER-8658AI

1. GPIO test command:

Please refer to HW DIO/GPIO section for PIN Number and GPIO ID mapping. Take "PIN 6 <-> GPIO ID:PQ.05" as an example on JetPack 5.1.2:

Export PQ.05

```
$ echo PQ.05 > /sys/class/gpio/export
```

Set GPIO direction to output mode

```
$ echo "out" > /sys/class/gpio/PQ.05/direction
```

Set the output value

high

```
$ echo 1 > /sys/class/gpio/PQ.05/value
```

low

```
$ echo 0 > /sys/class/gpio/PQ.05/value
```

Set GPIO direction to input mode

```
$ echo "in" > /sys/class/gpio/PQ.05/direction
```

Read the input value of GPIO

```
$ cat /sys/class/gpio/PQ.05/value
```

Unexport PQ.05

```
$ echo PQ.05 > /sys/class/gpio/unexport
```

2 FAN PWM control command:

Stop NV fan control daemon

```
$ sudo systemctl stop nvfancontrol
```

Set PWM value

```
$ echo [PWM_duty_cycle] >
```

```
/sys/devices/platform/pwm-fan/hwmon/hwmon<x>/pwm1
```

* Where:

[PWM_duty_cycle] is a value in the range [0, 255].

<x> is a kernel enumerated number for fan hwmon.