

BOXER-8220AI

Compact Fanless Embedded AI@Edge Box PC
with NVIDIA[®] Jetson Nano[™]
User's Manual 3rd Ed

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Packing List

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

Item	Quantity
● BOXER-8220AI	1
● Wall mount bracket	2
● Power Connector	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 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 AC 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.

Table of Contents

Chapter 1 - Product Specifications	1
1.1 Specifications	2
1.2 Product Notice	4
Chapter 2 – Hardware Information	5
2.1 Dimensions	6
2.2 Jumpers and connectors.....	7
2.3 List of Jumpers	8
2.3.1 Setting Jumpers	8
2.3.2 AT/ATX Mode Select (CN14 Pins 7-8).....	9
2.4 List of Connectors.....	10
2.4.1 DC Power In Connector (CN1).....	11
2.4.2 LAN RJ45 Port (CN2—CN6)	11
2.4.3 USB 2.0 Connector for Flash Image (CN7)	12
2.4.4 Jetson Nano CPU Module Connector (CN11).....	13
2.4.5 RTC Battery Connector (CN13).....	14
2.4.6 Front Panel Connector (CN14).....	14
2.4.7 HDMI Connector (CN16).....	15
2.4.8 USB 3.0 Connector (CN17/18).....	16
2.4.9 COM Port Connector (CN19/20).....	17
2.5 Wall Mount Assembly	18
Chapter 3 – OS Flash guide	19
3.1 Force USB Recovery Mode.....	20
3.2 Software & BSP	22

Chapter 1

Product Specifications

1.1 Specifications

System

CPU	Quad Core ARM® Cortex® -A57 MPCore Processor
System Memory	4GB LPDDR4
AI Solution	NVidia® Jetson Nano™
Display Interface	HDMI 2.0
Storage Device	Micro-SD (16GB UHS-1 recommended minimum)
Ethernet	10/100/1000Base-TX x 5
I/O	USB 3.0 x 4 LAN x 5 RS-232 x 2 HDMI x 1 Micro-USB for Flash OS x 1 DC Power Input x 1 Power Button x 1 Recovery Button x 1
Expansion	—
Indicator	Power LED x 1
OS Support	ACLinux 4.9 or above (Compatible with Ubuntu 18.04)

Power Supply

Power Requirement 10~24V DC with 2-pin terminal block

Mechanical

Mounting Wallmount

Dimensions (W x D x H) 6.06" x 3.98" x 1.18" (154 mm x 101 mm x 30 mm)

Gross Weight 4.40 lbs. (2 kg)

Net Weight 2.20 lbs. (1 kg)

Environmental

Operating Temperature -4°F ~ 140°F (-20°C ~ 60°C, according to IEC60068-2 with 0.5 m/s Air Flow)

Storage Temperature -49°F ~ 176°F (-45°C ~ 80°C)

Storage Humidity 95% @ 40°C, non-condensing

Anti-Vibration 3 Grms/ 5 ~ 500Hz/ operation – eMMC

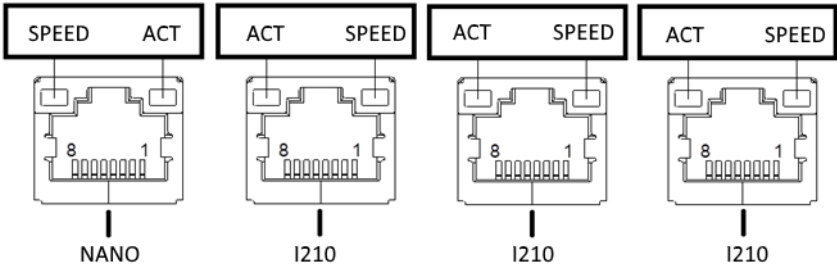
Certification CE/FCC class A

1.2 Product Notice

Micro-USB: Micro-USB port is ideally for flashing image only.

USB ports: USB ports are not support USB DVD ROM because of file system.

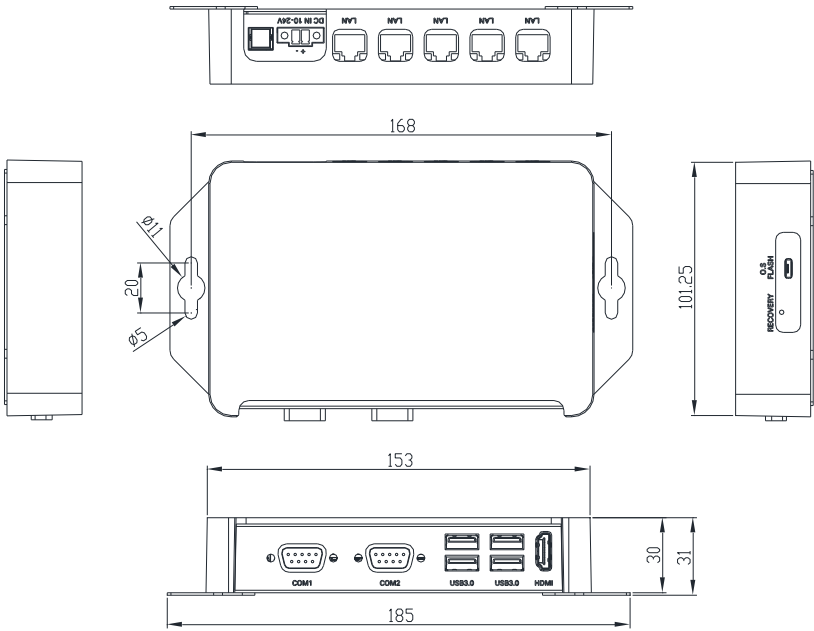
LAN Indicator Behavior



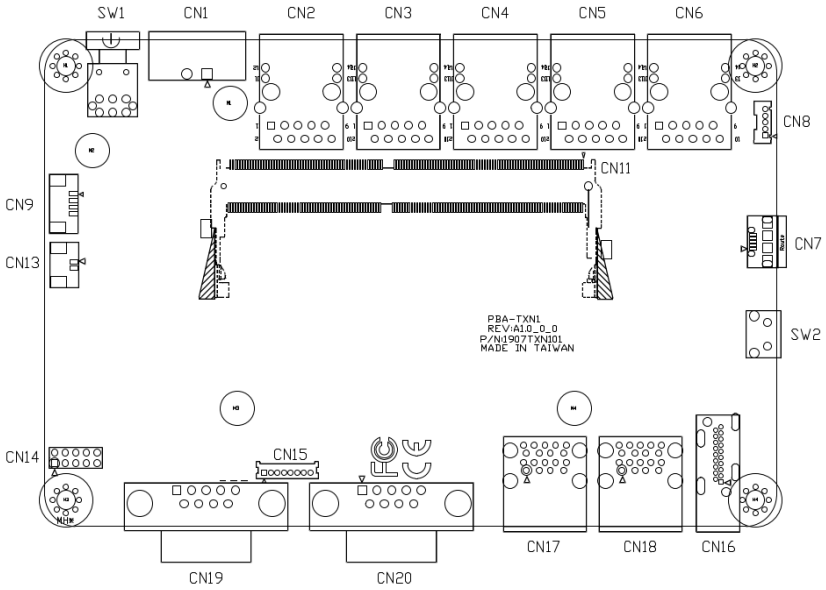
Chapter 2

Hardware Information

2.1 Dimensions



2.2 Jumpers and connectors



2.3 List of Jumpers

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

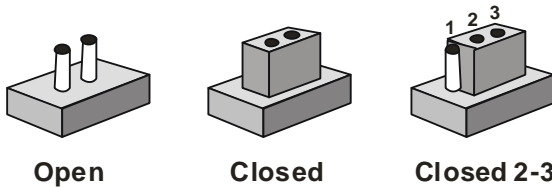
The table below shows the function of each of the board's jumpers

Label	Function
CN14 (Pin 7-8)	AT/ATX mode select

2.3.1 Setting Jumpers

You can configure your system 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 questions about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

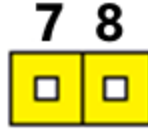
Generally, you simply need a standard cable to make most connections.

2.3.2 AT/ATX Mode Select (CN14 Pins 7-8)

The AT/ATX Mode Select functions by connecting pins 7 and 8 of CN14. To prevent damage to the system, do not connect pins 7 and 8 to any other pin.



Open – AT Mode



Closed – ATX Mode
(Default)

CN14 pins 7-8	Function
7-8 Open	AT Power Mode
7-8 Closed	ATX Power Mode (Default)

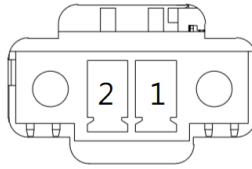
2.4 List of Connectors

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

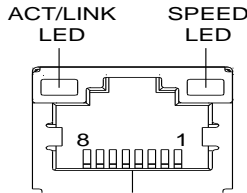
Label	Function
CN1	DC Power In connector
CN2	Jetson NANO Giga LAN Connector
CN3	I210AT Giga LAN Connector
CN4	I210AT Giga LAN Connector
CN5	I210AT Giga LAN Connector
CN6	I210AT Giga LAN Connector
CN7	USB 2.0 Connector for Flash Image
CN8	USB 2.0 Connector
CN9	FAN Connector
CN11	Jetson NANO CPU module connector
CN13	RTC Battery Connector
CN14	Front Panel Connector
CN15	Debug UART/I2C
CN16	HDMI connector
CN17	USB 3.0 Connector
CN18	USB 3.0 Connector
CN19	COM 1 connector
CN20	COM 2 connector
SW1	Power switch
SW2	Recovery switch

2.4.1 DC Power In Connector (CN1)



Pin	Signal	Pin	Signal
1	PWR IN	2	GND

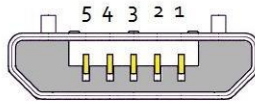
2.4.2 LAN RJ45 Port (CN2—CN6)



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

Note: CN2 is the Jetson Nano Gigabit LAN port. Ports CN3, CN4, CN5, and CN6 are I210AT Gigabit LAN Ports.

2.4.3 USB 2.0 Connector for Flash Image (CN7)



USB Micro-B

Pin	Signal	Pin	Signal
1		2	USB1-
3	USB1+	4	
5	GND		

2.4.4 Jetson Nano CPU Module Connector (CN11)

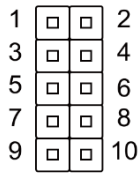
Signal Name	Pin # Top Odd	Pin # Bottom Even	Signal Name
GND	1	2	GND
CSI1 D0 N	3	4	CSI0 D0 N
CSI1 D0 P	5	6	CSI0 D0 P
GND	7	8	GND
RSVD	9	10	CSI0 CLK N
RSVD	11	12	CSI0 CLK P
GND	13	14	GND
CSI1 D1 N	15	16	CSI0 D1 N
CSI1 D1 P	17	18	CSI0 D1 P
GND	19	20	GND
CS3 D0 N	21	22	CS2 D0 N
CS3 D0 P	23	24	CS2 D0 P
GND	25	26	GND
CS3 CLK N	27	28	CS2 CLK N
CS3 CLK P	29	30	CS2 CLK P
GND	31	32	GND
CS3 D1 N	33	34	CS2 D1 N
CS3 D1 P	35	36	CS2 D1 P
GND	37	38	GND
DP0 TXD0 N	39	40	CS4 D2 N
DP0 TXD0 P	41	42	CS4 D2 P
GND	43	44	GND
DP0 TXD1 N	45	46	CS4 D0 N
DP0 TXD1 P	47	48	CS4 D0 P
GND	49	50	GND
DP0 TXD2 N	51	52	CS4 CLK N
DP0 TXD2 P	53	54	CS4 CLK P
GND	55	56	GND
DP0 TXD3 N	57	58	CS4 D1 N
DP0 TXD3 P	59	60	CS4 D1 P
GND	61	62	GND
DP1 TXD0 N	63	64	CS4 D3 N
DP1 TXD0 P	65	66	CS4 D3 P
GND	67	68	GND
DP1 TXD1 N	69	70	DS1 D0 N
DP1 TXD1 P	71	72	DS1 D0 P
GND	73	74	GND
DP1 TXD2 N	75	76	DS1 CLK N
DP1 TXD2 P	77	78	DS1 CLK P
GND	79	80	GND
DP1 TXD3 N	81	82	DS1 D1 N
DP1 TXD3 P	83	84	DS1 D1 P
GND	85	86	GND
GPIO0	87	88	DP0 HPD
SP10 MOSI	89	90	DP0 AUX N
SP10 SCK	91	92	DP0 AUX P
SP10 MISO	93	94	HDMI CEC
SP10 CS0*	95	96	DP1 HPD
SP10 CS1*	97	98	DP1 AUX N
UART0 TXD	99	100	DP1 AUX P
UART0 RXD	101	102	GND
UART0 RTS*	103	104	SP11 MOSI
UART0 CTS*	105	106	SP11 SCK
GND	107	108	SP11 MISO
USB0 D N	109	110	SP11 CS0*
USB0 D P	111	112	SP11 CS1*
GND	113	114	CAM0 PWDN
USB1 D N	115	116	CAM0 MCLK
USB1 D P	117	118	GPIO1
GND	119	120	CAM1 PWDN
USB2 D N	121	122	CAM1 MCLK
USB2 D P	123	124	GPIO2
GND	125	126	GPIO3
GPIO4	127	128	GPIO5
GND	129	130	GPIO6
PCI0 RX0 N	131	132	GND

Signal Name	Pin # Top Odd	Pin # Bottom Even	Signal Name
PCI0 RX0 P	133	134	PCI0 TX0 N
GND	135	136	PCI0 TX0 P
PCI0 RX1 N	137	138	GND
PCI0 RX1 P	139	140	PCI0 TX1 N
GND	141	142	PCI0 TX1 P
RSVD	143	144	GND
KEY	KEY	KEY	KEY
RSVD	145	146	GND
GND	147	148	PCI0 TX2 N
PCI0 RX2 N	149	150	PCI0 TX2 P
PCI0 RX2 P	151	152	GND
GND	153	154	PCI0 TX3 N
PCI0 RX3 N	155	156	PCI0 TX3 P
PCI0 RX3 P	157	158	GND
GND	159	160	PCI0 CLK N
USBSS RX N	161	162	PCI0 CLK P
USBSS RX P	163	164	GND
GND	165	166	USBSS TX N
RSVD	167	168	USBSS TX P
RSVD	169	170	GND
GND	171	172	RSVD
RSVD	173	174	RSVD
RSVD	175	176	GND
GND	177	178	MOD SLEEP*
PCIE WAKE*	179	180	PCI0 CLKREQ*
PCI0 RST*	181	182	RSVD
RSVD	183	184	GBE MDIO N
I2C0 SCL	185	186	GBE MDIO P
I2C0 SDA	187	188	GBE LED LINK
I2C1 SCL	189	190	GBE MDIO N
I2C1 SDA	191	192	GBE MDIO P
I2S0 DOUT	193	194	GBE LED ACT
I2S0 DIN	195	196	GBE MDIO N
I2S0 FS	197	198	GBE MDIO P
I2S0 SCLK	199	200	GND
GND	201	202	GBE MDIO N
UART1 TXD	203	204	GBE MDIO P
UART1 RXD	205	206	GPIO7
UART1 RTS*	207	208	GPIO8
UART1 CTS*	209	210	CLK 33K OUT
GPIO9	211	212	GPIO10
CAM I2C SCL	213	214	FORCE RECOVERY*
CAM I2C SDA	215	216	GPIO11
GND	217	218	GPIO12
SDMMC DAT0	219	220	I2S1 DOUT
SDMMC DAT1	221	222	I2S1 DIN
SDMMC DAT2	223	224	I2S1 FS
SDMMC DAT3	225	226	I2S1 SCLK
SDMMC CMD	227	228	GPIO13
SDMMC CLK	229	230	GPIO14
GND	231	232	I2C2 SCL
SHUTDOWN REQ*	233	234	I2C2 SDA
PMIC BBAT	235	236	UART2 TXD
POWER EN	237	238	UART2 RXD
SYS RESET*	239	240	SLEEPWAKE*
GND	241	242	GND
GND	243	244	GND
GND	245	246	GND
GND	247	248	GND
GND	249	250	GND
VDD IN	251	252	VDD IN
VDD IN	253	254	VDD IN
VDD IN	255	256	VDD IN
VDD IN	257	258	VDD IN
VDD IN	259	260	VDD IN

2.4.5 RTC Battery Connector (CN13)

Pin	Signal	Pin	Signal
1	+3V	2	GND

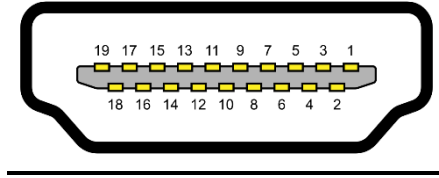
2.4.6 Front Panel Connector (CN14)



Pin	Signal	Pin	Signal
1	Button power	2	GND
3	Recovery	4	GND
5	Reset	6	GND
7	Latch set	8	Latch set
9	PWR LED	10	+5V

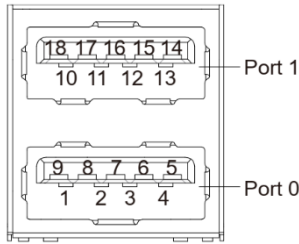
Note: Pin 7 and 8 are used for setting AT/ATX Power Mode. See [Chapter 2.3.2](#) for information. To prevent damage to your system, do not connect Pins 7 and 8 with any other pin.

2.4.7 HDMI Connector (CN16)



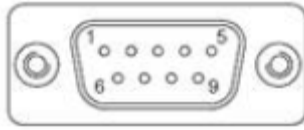
Pin	Signal	Pin	Signal
1	HDMI_DATA2_P	2	GND
3	HDMI_DATA2_N	4	HDMI_DATA1_P
5	GND	6	HDMI_DATA1_N
7	HDMI_DATA0_P	8	GND
9	HDMI_DATA0_N	10	HDMI_CLK_P
11	GND	12	HDMI_CLK_N
13	NC	14	NC
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	HDMI_PWR
19	HDMI_HDP		

2.4.8 USB 3.0 Connector (CN17/18)



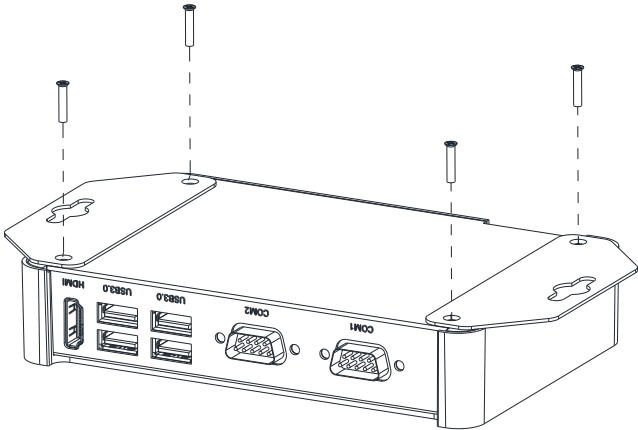
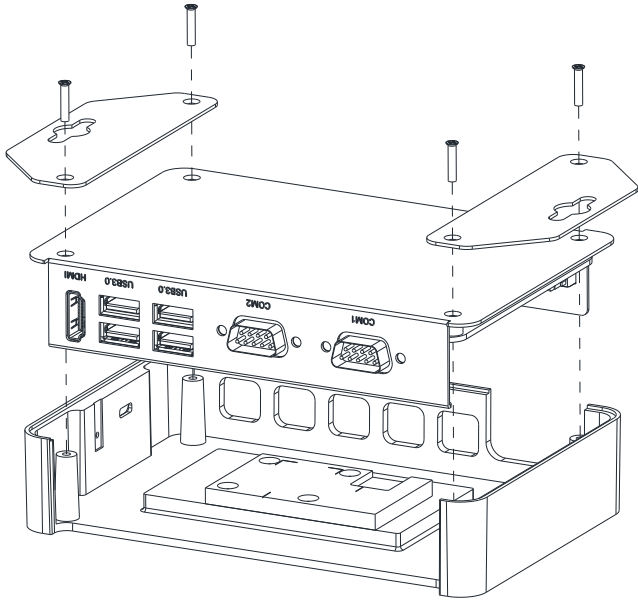
Pin	Signal	Pin	Signal
U1	VBUS_1	U10	VBUS_2
U2	(A)D-	U11	(B)D-
U3	(A)D+	U12	(B)D+
U4	GND	U13	GND
U5	(A)SSRX-	U14	(B)SSRX-
U6	(A)SSRX+	U15	(B)SSRX+
U7	GND	U16	GND
U8	(A)SSTX-	U17	(B)SSTX-
U9	(A)SSTX+	U18	(B)SSTX+

2.4.9 COM Port Connector (CN19/20)



Pin	RS-232	UART
1		UART RXD
2	RXD	
3	TXD	
4		
5	GND	
6		UART TXD
7	RTS	
8	CTS	
9		

2.5 Wall Mount Assembly



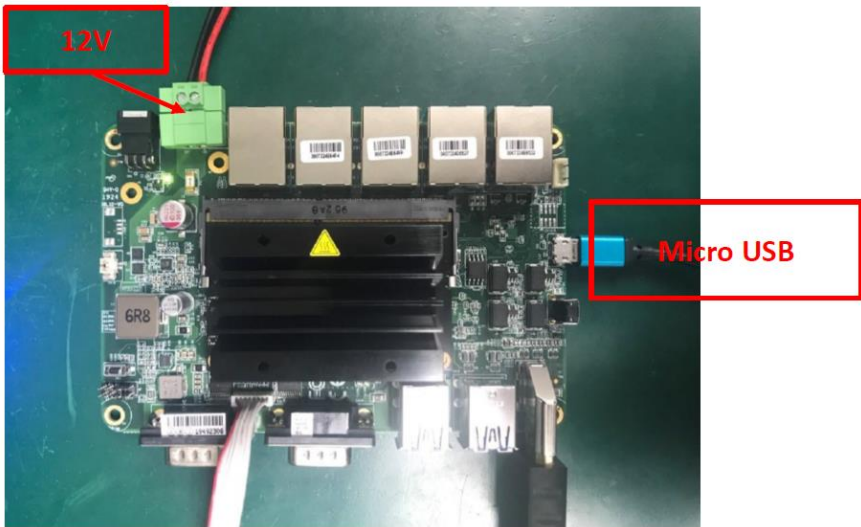
Chapter 3

OS Flash guide

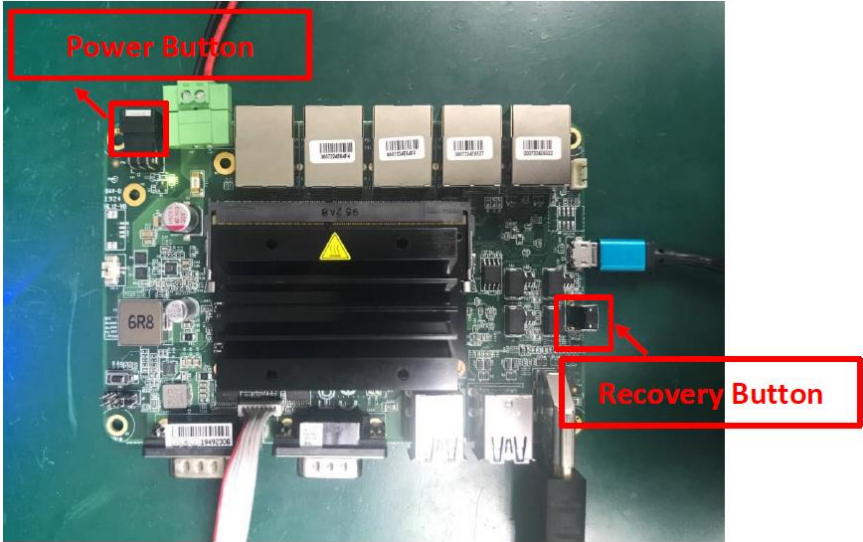
3.1 Force USB Recovery Mode

Follow these steps to place the system in Force USB Recovery Mode.

1. Power down the device. If connected, remove the AC adapter from the device. The device **MUST** be powered OFF, not in suspend or sleep mode.
2. Connect the Micro-USB plug on the USB cable to the Recovery Port on the BOXER-8220AI and the other end to an available USB port on the host PC.
3. Connect the power adapter to the device.



4. Press and hold down the FORCE RECOVERY button and then press the POWER button. Wait two seconds, then release the FORCE RECOVERY button.



5. When device is in recovery mode, lsusb command on host PC will list a line of "NVidia Corp"

3.2 Software & BSP

Please follow the steps below to install the image.

- 1) Open terminal on Linux host PC.
- 2) Download the `ACLinux_4.9_ACLNX49D.NV03.BOXER-8220AI.2.tar.gz` image.
Note: The file name may be changed without notice.
- 3) Decompress/ Extract `ACLinux_4.9_ACLNX49D.NV03.BOXER-8220AI.2.tar.gz`

```
$ tar -zxvf ACLinux_4.9_ACLNX49D.NV03.BOXER-8220AI.2.tar.gz
```

- 4) Access the bootloader folder

```
$ cd bootloader
```

- 5) Start up the BOXER-8220AI in Force USB Recovery Mode. See previous section (Chapter 3.1) for directions.
- 6) Execute the following command to install the image.

```
$ sudo ./flashall.sh
```

- 7) The ACLinux account is "aaeon" and the password is "aaeon".