

BOXER-8150AI

Compact Fanless Embedded AI@Edge Box PC

User's Manual 2nd Ed

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Packing List

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

Item	Quantity
● BOXER-8150AI	1
● Power Adapter (Option)	1
● Power Cord (Option)	1
● Phoenix Power Connector	1
● Wallmount bracket	2

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 on 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.

China RoHS Requirements (CN)

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 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

- CPU HMP Dual Denver 2/2 MB L2 + Quad ARM® A57/2 MB L2
- Chipset N/A
- System Memory 8 GB 128-bit LPDDR4, 59.7 GB/s
- Display Interface HDMI 2.0 x 2
- Storage Device Onboard 32GB eMMC (via Jetson TX2)
- Ethernet 10/100/1000 Base-TX x 1
- I/O
 - USB Type A x 8 for USB 3.0
 - RJ-45 x 1 for GbE LAN Ethernet
 - DB-9 x 1 for RS-232
 - Antenna opening x 2
 - MicroSD x 1
 - OTG x 1
- Expansion
 - SATA x 1 (option)
 - DB-9 RS-232 x 1 (option)
 - 2 channel CANBUS x 1 (option)
- Indicator Power LED
- OS Support AAEON ACLinux 4.9, Compliance with Ubuntu 18.04

Mechanical

- **Mounting** Wallmount
- **Dimensions (W x H x D)** 153mm(W) x 45mm(H) x 101mm(D)
- **Gross Weight** 4.40 lbs. (2 kg)
- **Net Weight** 2.20 lbs. (1 kg)

Environmental

- **Operating Temperature** -4°F ~ 122°F (-20°C ~ 50°C, with 0.5 m/s airflow)
- **Storage Temperature** -13°F ~ 176 °F (-25°C ~ 80°C)
- **Storage Humidity** 95% @ 40°C, non-condensing
- **Anti-Vibration** Random, 3 Grm, 5~500Hz
- **Certification** CE/FCC class A

Power Supply

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

1.2 Product Notice

OTG: OTG port is ideally for flashing image only.

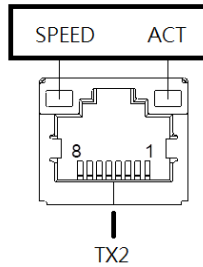
COM1: Support 1.8 meter length cable when baud rate is 115200bps and 15 meter cable when baud rate is 9600bps.

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

Storage Devices: Operating System must be installed on the eMMC drive. SATA Port can only be used for optional storage expansion drives.

LAN LED Status: LED Status for 10/100 BASE-T is not supported.

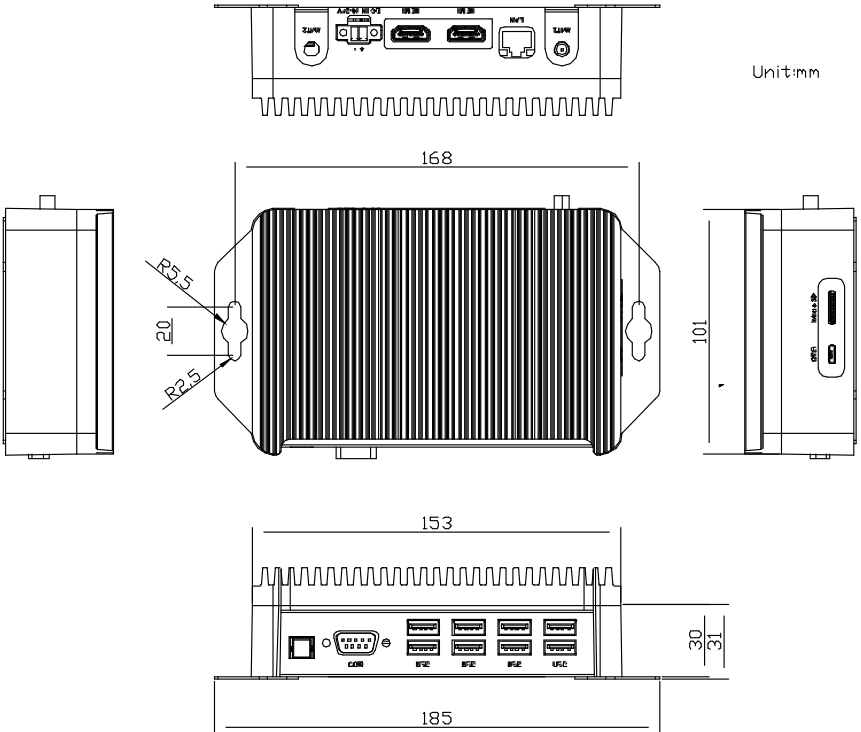
LAN LED Indicator Behavior



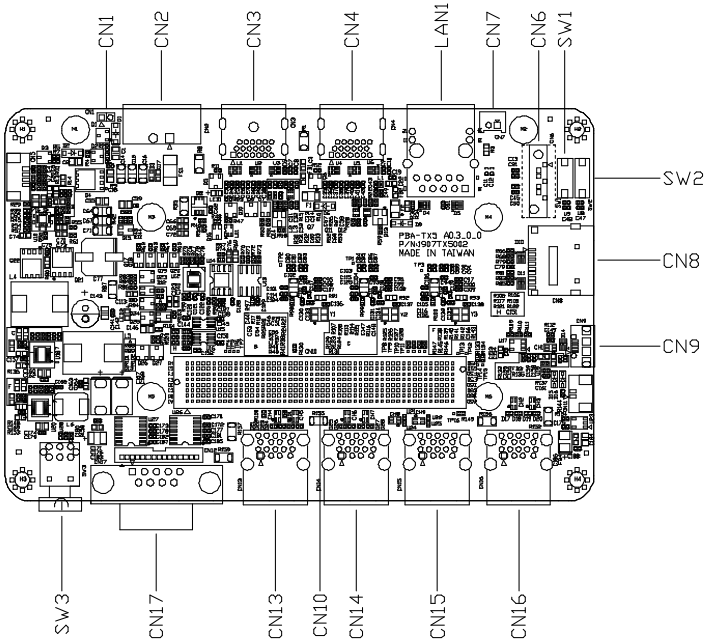
Chapter 2

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
CN1	AT mode select

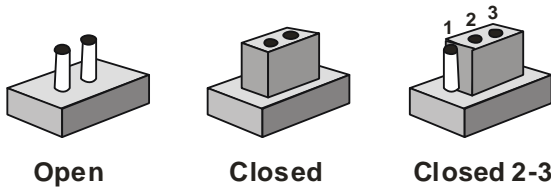
2.3.1 Setting Jumpers

You can configure the board 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 changes.

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

2.3.2 Auto Power Button (CN1)



Open - ATX (Default)



Closed - AT

CN1	Function
1-2 Open	ATX (Default)
1-2 Closed	AT

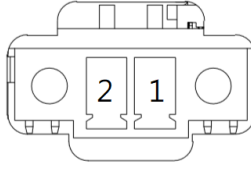
2.4 List of Connectors

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.

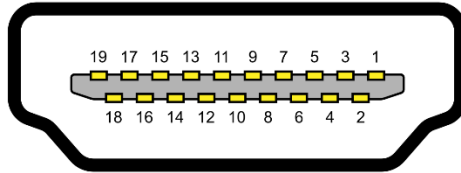
Label	Function
CN2	Power In connector
CN3	HDMI 1 connector
CN4	HDMI 2 connector
CN5	GIGA LAN 1
CN6	SATA connector
CN7	SATA Power connector
CN8	Micro SD connector
CN9	USB 2.0 OTG
CN10	TX2 CPU module connector
CN11	RTC battery connector
CN12	UART Debug/COM2/CAN BUS connector
CN13	USB 3.0 x 2
CN14	USB 3.0 x 2
CN15	USB 3.0 x 2
CN16	USB 3.0 x 2
CN17	COM 1 connector
SW1	Recovery switch
SW2	H/W Reset switch
SW3	Power switch

2.4.1 Power in connector (CN2)



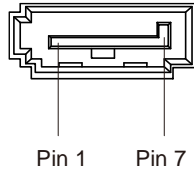
Pin	Signal	Pin	Signal
1	PWR IN	2	GND

2.4.2 HDMI connector (CN3/CN4)



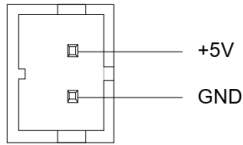
Pin	Signal	Pin	Signal
1	HDMI_DATA2_P	2	GND
3	HDMI_DATA2_N	4	HDMI_DATA1_P
5	GND	6	HDMI_DATA1_N
7	HDMI_DATA0_P	8	GND
9	HDMI_DATA0_N	10	HDMI_CLK_P
11	GND	12	HDMI_CLK_N
13	NC	14	NC
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	HDMI_PWR
19	HDMI_HDP		

2.4.3 SATA Port (CN6)



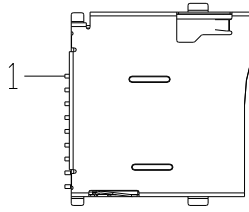
Pin	Signal	Pin	Signal
1	GND	2	SATA TX+
3	SATA TX-	4	GND
5	SATA RX-	6	SATA RX+
7	GND		

2.4.4 SATA PWR Port (CN7)



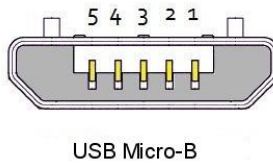
Pin	Signal	Pin	Signal
1	+5V	2	GND

2.4.5 Micro SD (CN8)



Pin	Signal	Pin	Signal
1	SDCARD D3	2	SDCARD CMD
3	GND	4	SDCARD PWR(+3.3V)
5	SDCARD CLK	6	SDCARD D0
7	SDCARD D1	8	SDCARD D2
9	SDCARD CD	10	

2.4.6 USB 2.0 OTG connector (CN9)



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

2.4.7 TX2 Module connector (CN10)

	A	B	C	D	E	F	G	H
1	VDD IN	VDD IN	VDD IN	RSVD	FORCE RECOV#	AUDIO MCLK	I250 SDIN	I250 LRCLK
2	VDD IN	VDD IN	VDD IN	RSVD	SLEEP#	GPIO19 AUD RST	I250 CLK	I250 SDOUT
3	GND	GND	GND	RSVD	SP10 CLK	SP10 CS0#	GND	GPIO20 AUD INT
4	GND	GND	GND	RSVD	SP10 MISO	SP10 MOSI	RSVD	RSVD
5	RSVD	RSVD	RSVD	RSVD	I253 SDIN	I253 LRCLK	I252 CLK	I252 LRCLK
6	I2C PM CLK	I2C PM DAT	I2C CAM CLK	I2C CAM DAT	I253 CLK	I253 SDOUT	I252 SDIN	I252 SDOUT
7	CHARGING#	CARRIER STBY#	BATLOW#	GPIO5 CAM FLASH EN	RSVD	GPIO1 CAM1_PWR#	GPIO4 CAM_STROBE	GPIO3 CAM1_RST#
8	GPIO14_AP_WAKE_MOM	VIN_PWR_SAD#	RSVD	RSVD	RSVD	CAM1_MCLK	GPIO0_CAM0_PWR#	GPIO2_CAM0_RST#
9	GPIO15_APMEM_READY	GPIO17_MMDAP_READY	RSVD	UART1_TX	UART1_RTS#	CAM0_MCLK	UART3_CTS#	UART3_RX
10	GPIO16_MDM_WAKE_AP	GPIO18_MDM_COOLDBOOT	RSVD	UART1_RX	UART1_CTS#	GND	UART3_RTS#	UART3_TX
11	RSVD	ITAG_TCK	RSVD	RSVD	RSVD	RSVD	UART0_RTS#	UART0_CTS#
12	ITAG_TMS	ITAG_TDI	RSVD	RSVD	RSVD	RSVD	UART0_RX	UART0_TX
13	ITAG_TDO	ITAG_GPO	RSVD	I251 LRCLK	SP11 CS1#	SP11 MOSI	SP11 CLK	GPIO6_AIS_PROK_INT
14	ITAG_RTCK	GND	I251 SDIN	I251 SDOUT	SP11 CS0#	SP11 MISO	GPIO9 MOTION_INT	SP12 CLK
15	UART2_CTS#	UART2_RX	I251 CLK	I2C GPO DAT	I2C GPO CLK	GND	SP12 MOSI	SP12 MISO
16	UART2_RTS#	UART2_TX	FAN_PWM	RSVD	RSVD	SP12 CS1#	SP12 CS0#	SDCARD_PWR_EN
17	USB0_EN_OC#	FAN_TACH	RSVD	RSVD	RSVD	SDCARD_C0#	GND	SDCARD_D1
18	USB1_EN_OC#	RSVD	RSVD	RSVD	RSVD	SDCARD_D3	SDCARD_CLK	SDCARD_D0
19	RSVD	GPIO11_AP_WAKE_BT	RSVD	RSVD	GND	SDCARD_D2	SDCARD_CMD	GND
20	I2C GP1 DAT	GPIO10_WFI_WAKE_AP	RSVD	GND	CS19 D1-	SDCARD_WP	GND	CS14 D1-
21	I2C GP1 CLK	GPIO12_BT_EN	GND	CS15 CLK-	CS19 D1+	GND	CS14 CLK-	CS14 D1+
22	GPIO EXP1 INT	GPIO13_BT_WAKE_AP	CS19 DO-	CS15 CLK+	GND	CS14 DO-	CS14 CLK+	GND
23	GPIO EXP0 INT	GPIO7 TOUCH_RST	CS19 DO+	GND	CS19 D1-	CS14 DO+	GND	CS12 D1-
24	RSVD	TOUCH_CLK	GND	CS19 CLK-	CS19 D1+	GND	CS12 CLK-	CS12 D1+
25	LCD_TE	GPIO6 TOUCH_INT	CS19 DO-	CS19 CLK+	GND	CS12 DO-	CS12 CLK+	GND
26	RSVD	LCD_VDD_EN	CS19 DO+	GND	CS11 D1-	CS12 DO+	GND	CS10 D1-
27	RSVD	LCD0_BKLT_PWM	GND	CS11 CLK-	CS11 D1+	GND	CS10 CLK-	CS10 D1+
28	GND	LCD_BKLT_EN	CS11 DO-	CS11 CLK+	GND	CS10 DO-	CS10 CLK+	GND
29	SDIO RST#	SDIO_CMD	CS11 DO+	GND	DS13 D1+	CS10 DO+	GND	DS12 D1+
30	SDIO D3	SDIO_CLK	GND	RSVD	DS13 D1-	GND	DS12 CLK+	DS12 D1-
31	SDIO D2	GND	DS13 DO+	RSVD	GND	DS12 DO+	DS12 CLK-	GND
32	SDIO D1	SDIO_D0	DS13 DO-	GND	DS11 D1+	DS12 DO-	GND	DS10 D1+
33	DP1_HPD	HDMI_CEC	GND	RSVD	DS11 D1-	GND	DS10 CLK+	DS10 D1-
34	DP1_AUX_CH-	DP0_AUX_CH-	DS11 DO+	RSVD	GND	DS10 DO+	DS10 CLK-	GND
35	DP1_AUX_CH+	DP0_AUX_CH+	DS11 DO-	GND	DP1_TX3-	DS10 DO-	GND	DP0_TX3-
36	USB0_OTG_ID	DP0_HPD	GND	DP1_TX2-	DP1_TX3+	GND	DP0_TX2-	DP0_TX3+
37	GND	USB0_VBUS_DET	DP1_TX1-	DP1_TX2+	GND	DP0_TX1-	DP0_TX2+	GND
38	USB1_D+	GND	DP1_TX1+	GND	DP1_TX0-	DP0_TX1+	GND	DP0_TX0-
39	USB1_D-	USB0_D+	GND	PEX RFU TX+	DP1_TX0+	GND	PEX RFU RX+	DP0_TX0+
40	GND	USB0_D-	PEX2_TX+	PEX RFU TX-	GND	PEX2_RX+	PEX RFU RX-	GND
41	RSVD	GND	PEX2_TX-	GND	PEX1_TX+	PEX2_RX-	GND	PEX1_RX+
42	RSVD	USB2_D+	GND	USB S51 TX+	PEX1_TX-	GND	USB S51 RX+	PEX1_RX-
43	GND	USB2_D-	USB S50 TX+	USB S51 TX-	GND	USB S50 RX+	USB S51 RX-	GND
44	PEX0_REFCLK+	GND	USB S50 TX-	GND	PEX0_TX+	USB S50 RX-	GND	PEX0_RX+
45	PEX0_REFCLK-	PEX1_REFCLK+	GND	SATA_TX+	PEX0_TX-	GND	SATA_RX+	PEX0_RX-
46	RESET_OUT#	PEX1_REFCLK-	RSVD	SATA_TX-	GND	GBE_LINK100#	SATA_RX-	GND
47	RESET_IN#	GND	PEX1_CLKREQ#	RSVD	GBE_LINK_ACT#	GBE_MD1+	GND	GBE_MD1#
48	CARRIER_PWR_ON	RSVD	PEX0_CLKREQ#	PEX WAKE#	GBE_MD10+	GBE_MD1-	GBE_MD12+	GBE_MD1#
49	CHARGER_PRSNT#	RSVD	PEX0_RST#	RSVD	GBE_MD10-	GND	GBE_MD12-	GND
50	VDD_RTC	POWER_BTN#	RSVD	RSVD	PEX1_RST#	GBE_LINK100#	GND	RSVD

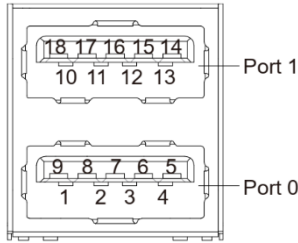
2.4.8 RTC Battery Connector (CN11)

Pin	Signal	Pin	Signal
1	+3V	2	GND

2.4.9 UART Debug/ COM2/ CAN BUS connector (CN12)

Pin	Signal	Pin	Signal
1	COM 2 RXD	2	COM 2 TXD
3	COM2 RTS	4	COM 2 CTS
5	3.3V	6	UART0 RXD
7	UART0 TXD	8	UART0 RTS
9	UART0 CTS	10	GND
11	CAN0 H	12	CAN0 L
15	CAN1 H	14	CAN1 L
	GMD		

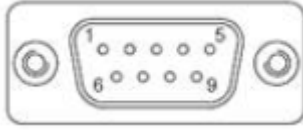
2.4.10 USB3.0 connector (CN13/CN14/CN15/CN16)



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+

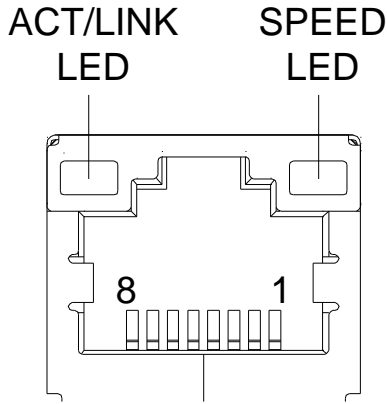
Note: CN13/CN14/CN16 by PCIe FRESCO FL1100-SX

2.4.11 COM port connector (CN17)



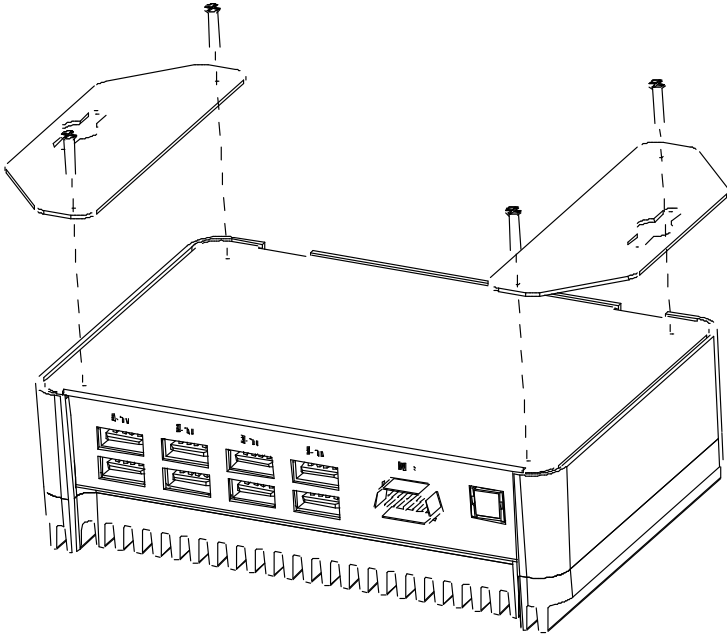
Pin	RS-232
1	
2	RXD
3	TXD
4	
5	GND
6	
7	RTS
8	CTS
9	

2.4.12 LAN (RJ-45) Port (LAN1)



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

2.5 Wall Mount Assembly



Chapter 3

OS Flash guide

3.1 Force USB Recovery Mode

To place system in Force USB Recovery Mode:

1. Power down the device and disconnect the AC adapter. The device MUST be powered OFF, not in a suspended or sleep state.
2. Connect the Micro-B plug on the USB cable to the Recovery (USB Micro-B) Port on the device and the other end to an available USB port on the host PC.
3. Connect the power adapter to the device.
4. Press and release the POWER button to power on device. Press and hold the FORCE RECOVERY button. While pressing the FORCE RECOVERY button, press and release the RESET button; wait two seconds, and then release the FORCE RECOVERY button. Refer to Chapter 2 Hardware Information for button locations.
5. When device is in recovery mode, lsusb command on host will list a line of "NVidia Corp."

3.2 Software & BSP

Please follow the steps below to install the test image.

(1) Download the image folder from the official AAEON website at:

<https://www.aaeon.com/en/p/edge-ai-solutions-boxer-8150ai#downloads>

(2) Unzip the Image file

```
unzip [Image File Name]
```

For example:

```
unzip ACLinux_4.9_ACLNX49D.NV02.BOXER-8150AI.6.2.tar
```

(3) Enter bootloader folder

```
cd bootloader
```

(4) Enter Force USB Recovery Mode. Refer to previous section **3.1 Force USB Recovery Mode** for instructions.

(5) Execute the following command to install image:

```
sudo /flashall.sh
```