# AVA-1000

## User's Manual

Fanless Scalable Railway Edge AI Platform




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Revision Date: June 19, 2025
Part Number: 50M-M41060-2000

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Leading **EDGE COMPUTING**

## Revision History

| Revision | Description | Date |
|---|---|---|
| 1.0 | Initial release | 2025-06-19 |


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# Preface

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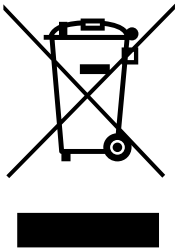
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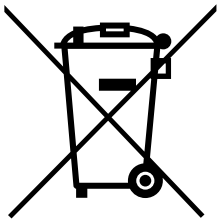
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**Battery Labels** (for products with battery)












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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.

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NOTE:

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

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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'exécu-* tion d'une tâche.

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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 bles- sures 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

This user manual provides an overview on the AVA-1000. This user guide focuses on describing the special features of the AVA-1000 series variants (AVA-1000/x7433RE/8G/64G & AVA-1000/iMX8MP/8G/64G) and provides information on assembly, installation, operation, and maintenance on AVA-1000 to make the best use of the product. It is recommended to read the instructions in this user manual before using the product.

AVA-1000 is a compact fanless system targeting for Train-to-Ground, (T2G) communication, serving as an onboard gateway in the railway application. The CPU option includes Intel Amston Lake Atom series based on x86 architecture and NXP i.MX8M Plus based on ARM structure.

AVA-1000 is a fan-less communication gateway supporting on board GNSS, up to two 5G modem M.2-3042/3052 B-key slots and one M.2-2230 E-key slot for Wi-Fi and Bluetooth modules. Each modem slot supports 2 nano SIM cards. AVA-1000 is equipped by default with QMA antenna connectors for connectivity according to the configuration. The installation of the modems and modules can be completed by opening the lid after loosening the thumb screws on the panel.

For storage, the OS can be integrated into the eMMC on the SMARC module in AVA-1000. In addition, AVA-1000 provides an M.2-2230 M-key slot as another storage option.

## 1.2 Features

- EN 50155:2021 certified
- Fan-less and compact design
- Computing Processor:
  - Intel Atom x7433RE Quad-Core 1.5 GHz, 9W TDP, LPDDR5 8GB soldered
  - NXP i.MX8M Plus with Quad core ARM Cortex-A53, LPDDR4L 8GB soldered
  - Other CPU and DDR options upon request
- Front panel interfaces
  - 1x M12 K-coded male power connector with ignition
  - 3x 2.5G M12 X-coded female Ethernet ports
  - 1x 2x6 terminal block connector supporting RS-232/422/485, 4x DI/4x DO, and other optional interfaces.
  - Contact ADLINK for additional interfaces if needed
- Side panel interfaces for maintenance
  - 1x Reset button
  - 1x HDMI 1.4
  - 1x USB 3.1 Gen1 5G Type A
- Special ports for ARM based AVA-1000
  - 1x Micro SD for quickly flash image to eMMC
  - 1x Console port for system debug
  - 1x Micro-B support OTG mode and NXP serial download mode
  - 1x Dip switch for boot mode selection
- Open lid for internal modules installation and removal
  - 2x M.2-3042/4052 B Key slots for 5G/LTE modem installation
  - 1x M.2-2230 E Key slot for Wi-Fi/BT or other expansion
  - 1x M.2-2242 M Key slot for NVME storage
  - 1x onboard u-blox Neo-M9N GNSS module
- Rear side antenna
  - 11pcs QMA connectors for x86 based and 7pcs for ARM based


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## 1.3 Packing List

Please check that your package contains the items listed below. If you discover any damaged or missing items, please contact your ADLINK representative for assistance.

- AVA-1000 hardware configured as ordered
- AVA-1000 mating power cable with terminal block (PN: 30-22184-0000-A0)
- AVA-1000 wall mount kit
- Terminal block for DI/DO and COM (PN: 20-C2041-2060)
- AVA-1000 Wi-Fi AX210 Thermal Part (PN: 58-10643-200E)
- AVA-1000 FN990 Bottom PAD Thermal Part (PN: 58-10643-300E)
- Technical service card

For modem and modules not supported in the list, please notify ADLINK representatives for thermal solution.




DO NOT install or apply power to equipment that is damaged or if there is missing/incomplete equipment. Retain the shipping carton and packing materials for inspection. Please contact your ADLINK dealer/vendor immediately for assistance. Obtain authorization from your dealer before returning any product to ADLINK.

## 1.4 Optional Accessories

The AVA-1000 is shipped without add-on modules. The approved modules is listed as below:

- AVA-1000 24VDC IN AC-DC PSU (PN: 91-95376-000E)
- 5G modem FN990A40-HP (PN: 29-D0990-E000)
- Intel AX210 Wi-Fi module (PN: 29-E0210-2010)
- ADLINK NVME series. Please contact ADLINK representative for selection


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# 2 Specifications

## 2.1 Product Specifications

| Products | AVA-1000/x7433RE/8G/64G | AVA-1000/iMX8MP/8G/64G |
|---|---|---|
| **System** | Intel Atom x7433RE Quad-Core 1.5 GHz, 9W TDP | NXP i.MX8M Plus with Quad core ARM Cortex-A53 |
| | LPDDR5 8 Gbyte soldered by default | LPDDR4L-4266 8GB soldered by default |
| | AMI® Aptio V | - |
| | 3x 2.5GbE via M12 X-coded | 3x 2.5GbE via M12 X-coded |
| | 4x DI/4 DO in 1x 2x6 terminal block | 4x DI/4 DO in 1x 2x6 terminal block |
| | 1x RS-232/422/485 in 1x 2x6 terminal block | 1x RS-232/422/485 in 1x 2x6 terminal block |
| | 1x HDMI 1.4<br>1920*1080 @ 60Hz | 1x HDMI 1.4<br>1920*1080 @ 60Hz |
| | 1x USB 3.1 Gen1 5G Type A | 1x USB 3.1 Gen1 5G Type A |
| | I2C, CAN reserved upon request | I2C, CAN reserved upon request |
| | - | 1x Console port for system debug<br>1x Micro-B support OTG mode and NXP serial download mode<br>1x Dip switch for boot mode selection<br>Covered with lids for security purpose |
| **Storage** | 64GB eMMC by default | 64GB eMMC by default |
| | - | 1x Micro SD slot for image loading<br>Covered with lids for security purpose |
| | 1 M.2-2242 M Key with PCIe Gen3 for PCIE/NVME only | 1 M.2-2242 M Key with PCIe Gen2 for PCIE/NVME only |
| **Connectivity** | 2x M.2-3042/4052 B Key (USB 3.0+USB 2.0) for 5G/LTE | 1x M.2-3042/4052 B Key (USB 3.0+USB 2.0) for 5G/LTE |
| | 1x M.2-2230 E Key (PCIe Gen3/ USB 2) for WiFi and BT | 1x M.2-2230 E Key (PCIe Gen2/ USB 2) for Wi-Fi and BT |
| | GNSS receiver supporting GPS, Galileo, GLONASS, BeiDou (NEO-M9N-0-12) | GNSS receiver supporting GPS, Galileo, GLONASS, BeiDou (NEO-M9N-0-12) |
| | 8x antenna QMA connectors for 5G/LTE | 4x antenna QMA connectors for 5G/LTE |
| | 2x antenna QMA connectors for Wi-Fi | 2x antenna QMA connectors for Wifi |
| | 1x antenna QMA connectors for GNSS | 1x antenna QMA connectors for GNSS |
| | 4x Nano Sim Card on RF board<br>2 Sim per one 5G modem | 2x Nano Sim Card on RF board for ARM version<br>2 Sim per one 5G modem |


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| | | |
|---|---|---|
| **Miscellaneous** | 1x Power/Reset LED (Green)<br>1x Watchdog LED (Yellow)<br>3x Ethernet Link LEDs (Green)<br>12x User define LEDs (Green) | 1x Power/Reset LED (Green)<br>1x Watchdog LED (Yellow)<br>3x Ethernet Link LEDs (Green)<br>12x User define LEDs (Green) |
| | 1x Reset button | 1x Reset button |
| | TPM 2.0 | TPM 2.0 |
| **Power interface** | M12 A-coded support 24V to 110V DC nominal (EN50155),<br>10ms hold-up time (acc. EN50155, class S2, C1)<br>Ignition support | M12 A-coded support 24V to 110V DC nominal (EN50155),<br>10ms hold-up time (acc. EN50155, class S2, C1)<br>Ignition support |
| **Mechanical** | Aluminum heatsink | Aluminum heatsink |
| | Passive cooling<br>Fan-less design<br>Suggested air flow 0.6m/s | Passive cooling<br>Fan-less design<br>Suggested air flow 0.6m/s |
| | Stainless steel M6 20mm stud | Stainless steel M6 20mm stud |
| | Wall mount | Wall mount |
| | EN60529 IP40 | EN60529 IP40 |
| | L: 220mm; W:130mm; H: 72.3mm | L: 220mm; W:130mm; H: 72.3mm |
| | 2.070 kg with 2x modems, 1x Wi-Fi, 1x NVME modules | 2 kg with 1x modem, 1x Wi-Fi, 1x NVME modules |
| **MTBF** | 220,051 hrs. by Telcordia Issue 4, 40 degree C, GB, GC | 250,350 hrs. by Telcordia Issue 4, 40 degree C, GB, GC |
| **Conformal Coating** | Coating PCBA | Coating PCBA |
| **Battery** | MuRata CR2032X Battery by default | MuRata CR2032X Battery by default |
| **Software** | AMI® Aptio V UEFI BIOS | - |
| | Ubuntu Linux 22.04 | Yocto Linux |
| | 1 to 255 sec. system reset | 1 to 255 sec. system reset |
| **Operating Temperature** | Depending on SMARC module selection<br>-40 °C to +70 °C, +85°C for 10 min (-40 °F to 158 °F, 185 °F for 10 min) according to EN50155, class OT4, ST1 | Depending on SMARC module selection<br>-40 °C to +70 °C, +85°C for 10 min (-40 °F to 158 °F, 185 °F for 10 min) according to EN50155, class OT4, ST1 |
| **Storage Temperature** | -40°C to +85°C | -40°C to +85°C |
| **Humidity** | +25°C to +55 °C, 95 % (acc. EN50155) | +25°C to +55 °C, 95 % (acc. EN50155) |
| **EMC** | EN 50155:2021 Clause 13.4.9<br>EN 50121-3-2 | EN 50155:2021 Clause 13.4.9<br>EN 50121-3-2 |
| **Safety** | EN 50155:2021 | EN 50155:2021 |
| | EN45545-2:2013+A1:2015 (HL 1-3) EL9 for PCB (R24 / R25)<br>Exclude add on modules | EN45545-2:2013+A1:2015 (HL 1-3) EL9 for PCB (R24 / R25)<br>Exclude add on modules |


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## 2.2 Power Specifications

### 2.2.1 AVA-1000 Power Consumption

**Ubuntu 22.04.4 LTS X86:**

| | **AVA-1000 A2 version** |
|---|---|
| CPU | Intel(R) Atom(TM) x7433REx4 |
| Memory | 8GB |
| OS | Ubuntu 22.04.4 LTS |
| **Idle mode** | |
| 24V(A) Adapter | 0.68 |
| Power consumption(W) | 16.32 |
| **MAX mode** | |
| 24V(A) Adpter | 1.45 |
| Power consumption(W) | 34.8 |

**AVA-1000-iMX8MP_yocto_2v1 ARM:**

| | **AVA-1000 A2 version** |
|---|---|
| CPU | ARM Cortex-A53<br>P-duke |
| Memory | 8GB |
| OS | |
| **Idle mode** | |
| 24V(A) Adapter | 0.58 |
| Power consumption(W) | 13.92 |
| **MAX mode** | |
| 24V(A) Adapter | 1.32 |
| Power consumption(W) | 31.68 |


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## 2.3 Functional Block Diagram

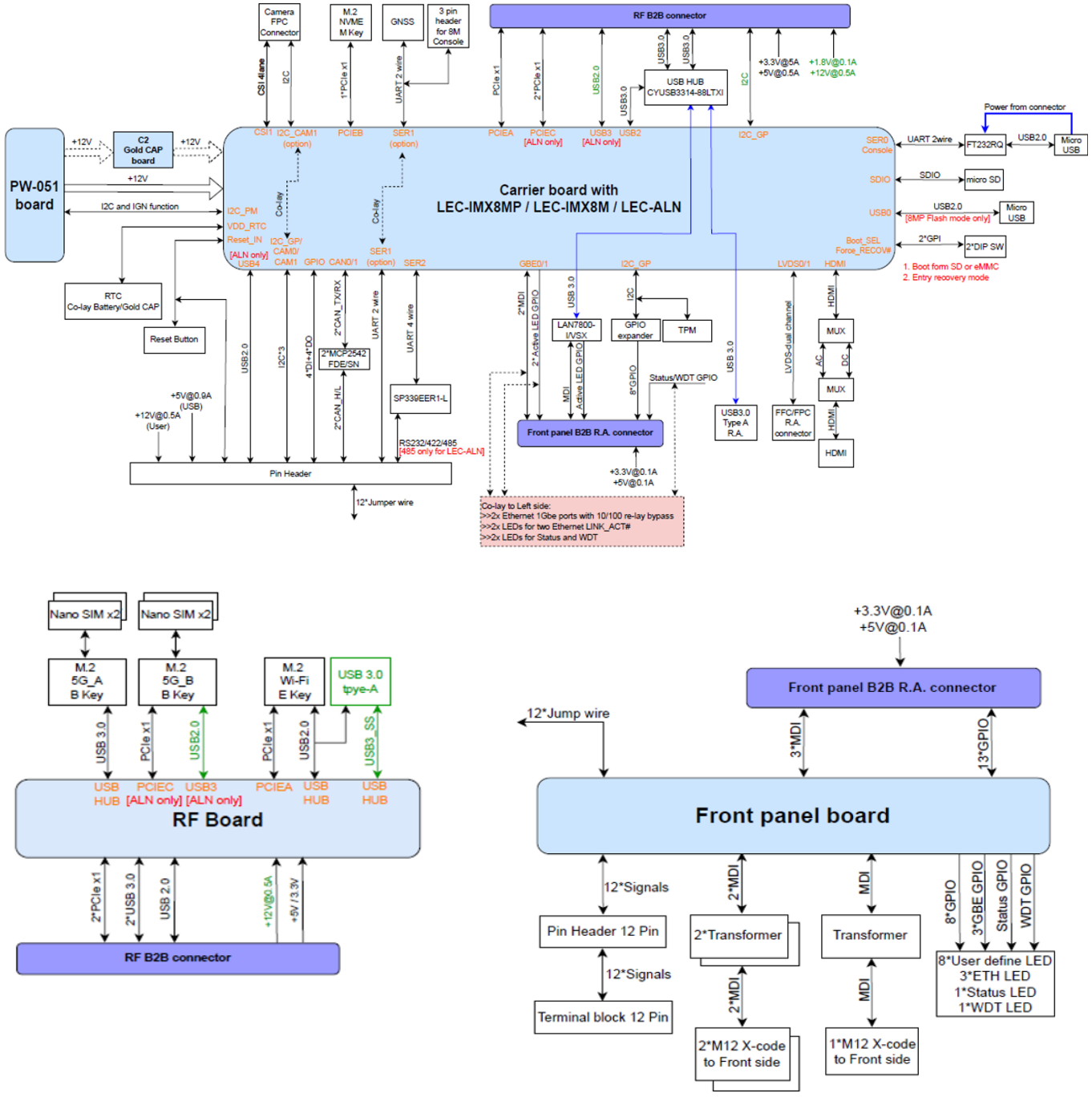



**Figure 1: Functional block diagram**



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# 3 Mechanical Layout

## 3.1 Mechanical Dimensions

NOTE:

All dimensions are in millimeters, unless noted.

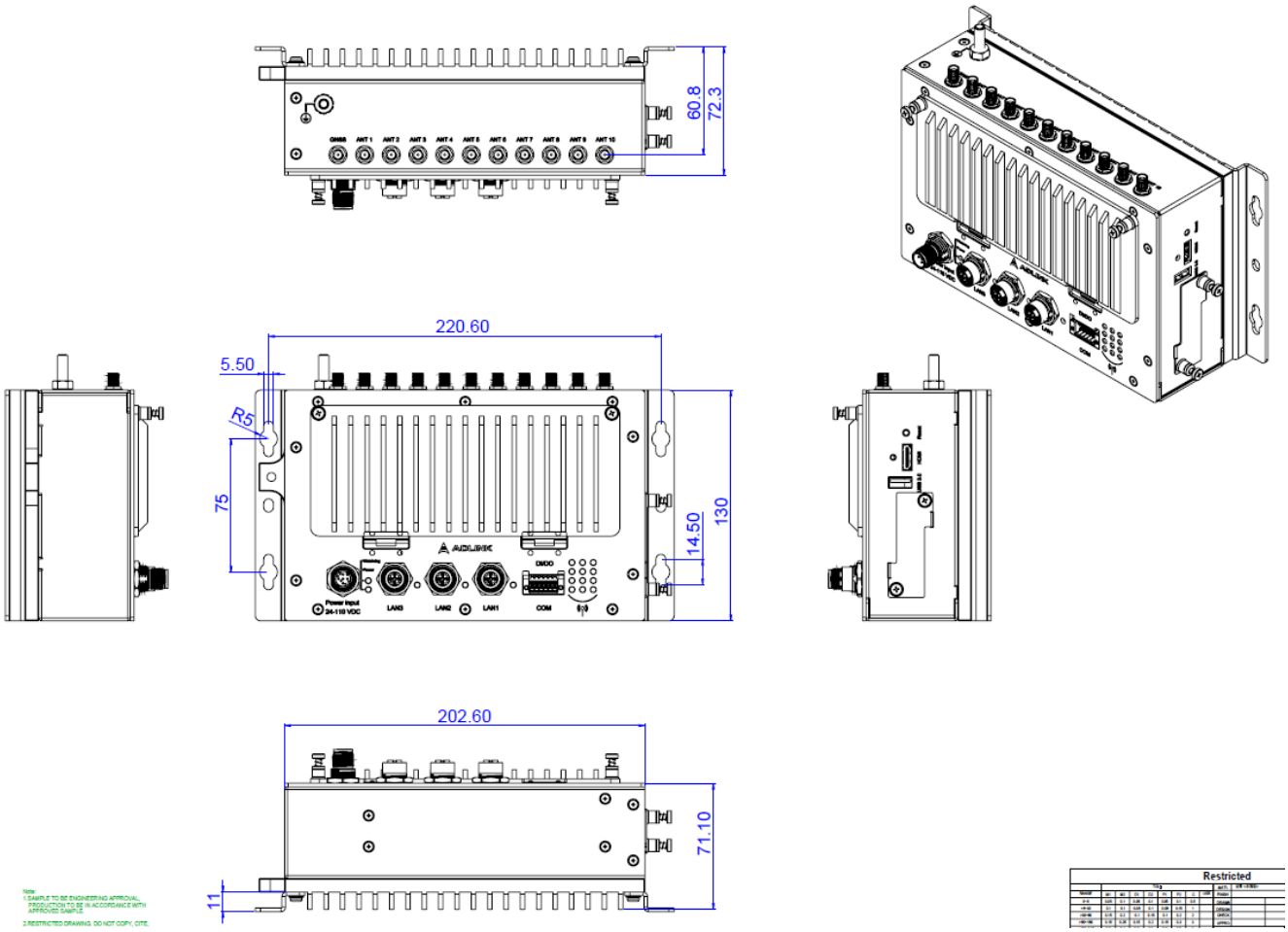



**Figure 2: Mechanical dimensions**

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## 3.2 I/O Panel Connector Locations

### 3.2.1 Front View




**Figure 3: Front I/O panel connector locations**


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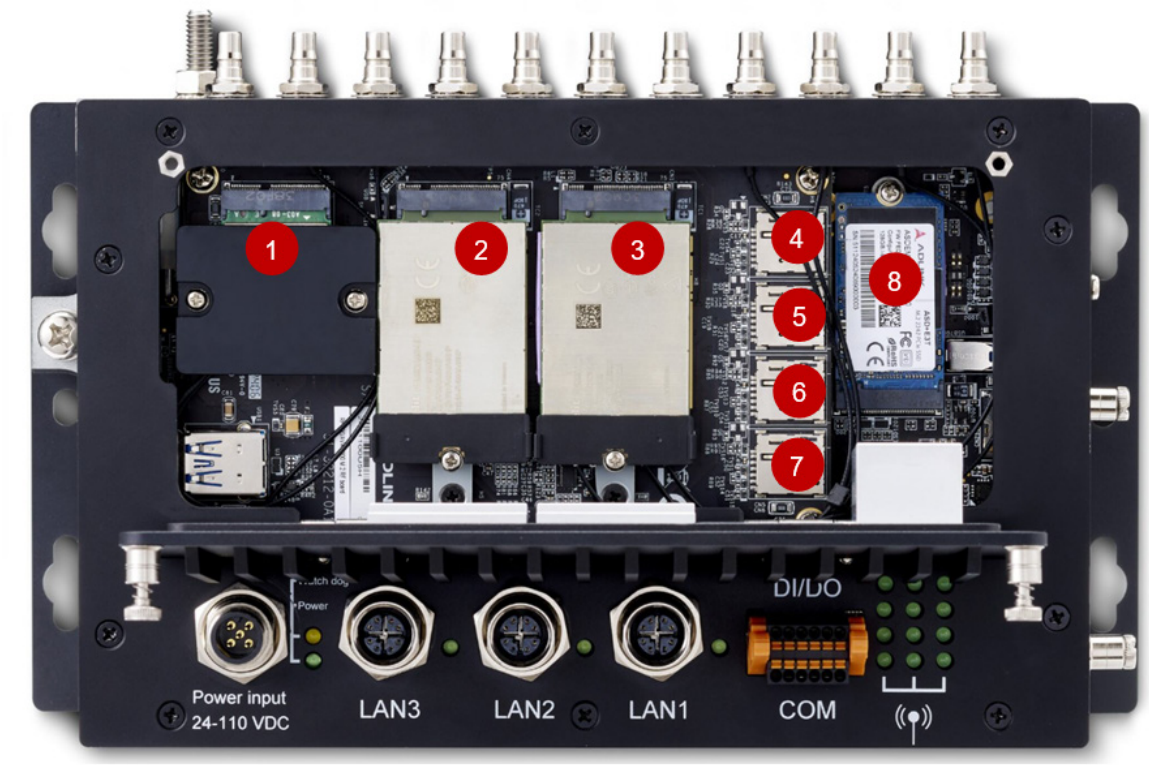



**Figure 4: Front I/O panel connector locations with open lid**

**Table 1: Front I/O panel connector descriptions (with open lid)**

| No. | Function | Approved module | Remark |
|---|---|---|---|
| 1 | M.2-2030 E key for Wi-Fi /BT | Intel AX-210, Wi-Fi/BT M.2 Card | Need a compatible thermal kit for assembly. Assemble procedure is in the following chapter. |
| 2 | M.2-3042/3052 B key for 5G/LTE modem | Telit FN990A28<br>Telit FN990A40 | Need a compatible thermal kit for assembly. Assemble procedure is in the following chapter. |
| 3 | M.2-3042/3052 B key for 5G/LTE modem | Telit FN990A28<br>Telit FN990A40 | Need a compatible thermal kit for assembly. Assemble procedure is following chapter.<br>Available on AVA-1000, based on x86 platform and ARM platform |
| 4 | 1st Nano SIM slot for modem No. 1 | | |
| 5 | 2nd Nano SIM slot for modem No. 1 | | |
| 6 | 1st Nano SIM slot for modem No. 2 | | |
| 7 | 2nd Nano SIM slot for modem No. 2 | | |
| 8 | M.2-2242 M key for NVME | | Need a compatible thermal pad for heat dissipation |


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### 3.2.2 Side View




The IO interface is only for maintenance purposes.

**Figure 5:Front I/O panel connector locations**


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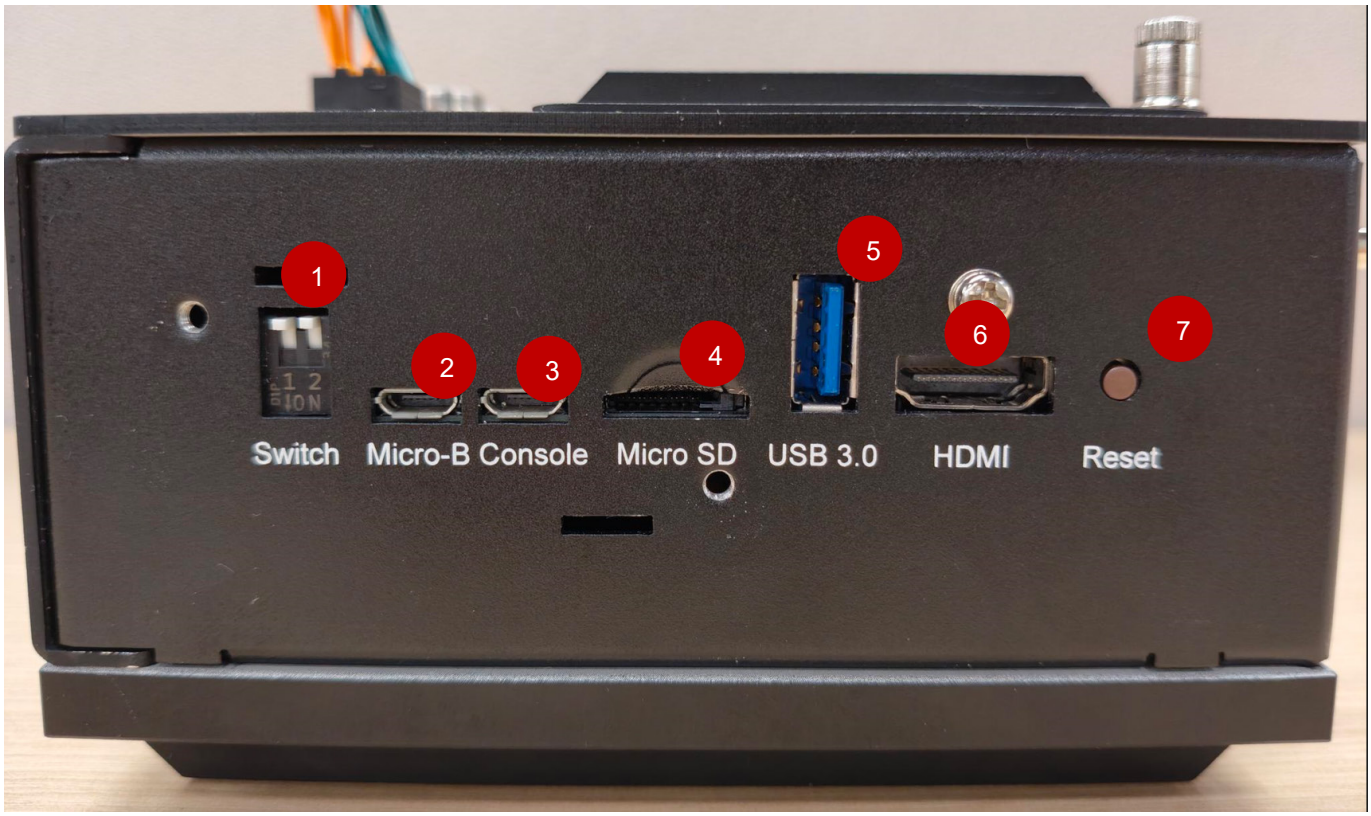



**Figure 6: Side view without cover**

**Table 2: Side I/O panel connector descriptions (without cover)**

| No. | Function | Function |
|---|---|---|
| 1 | Dip switch for boot mode selection | To selection boot mode |
| 2 | Micro-B | Support OTG mode and NXP serial download mode |
| 3 | Console | For system debug |
| 4 | Micro SD | For flash image to EMMC |
| 5 | USB3.0 GEN2 TypeA | Maintenance |
| 6 | HDMI | Maintenance |
| 7 | Reset | Reset system |


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# 4 Getting Started

Follow the instructions describing the installation of SIM cards, Wi-Fi, cellular and M.2 NVMe modules; ground cable; and DC power supply.

NOTE:

MXM and CAN bus modules must be installed at the factory. Please contact your local ADLINK representative for more information.

## 4.1 Removing the Movable Cover

To install the optional modules, first remove the movable cover as illustrated below:

1. Place the box PC on a suitable surface with the top side facing up. Remove the 2 thumb screws from the top-right side as indicated below.
2. Lift the rear cover off of the box PC chassis.

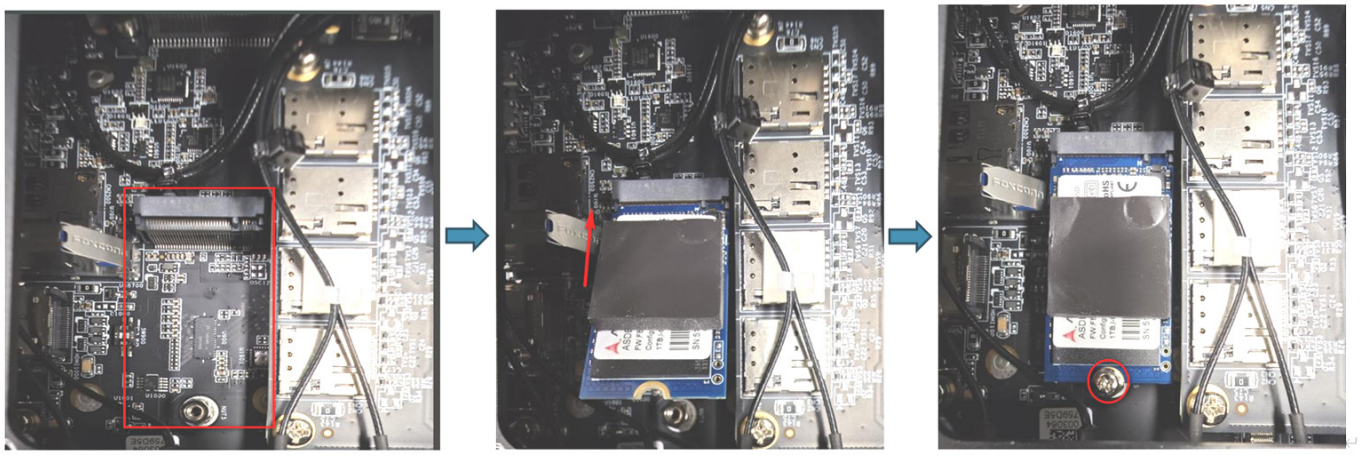




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## 4.2 Installing the M.2 M-Key 2242 NVMe Storage Module

To install the M.2 M-Key 2242 NVMe module, insert the module into the slot and attach the thermal pad, securing it with M2.5 screws, as shown below.

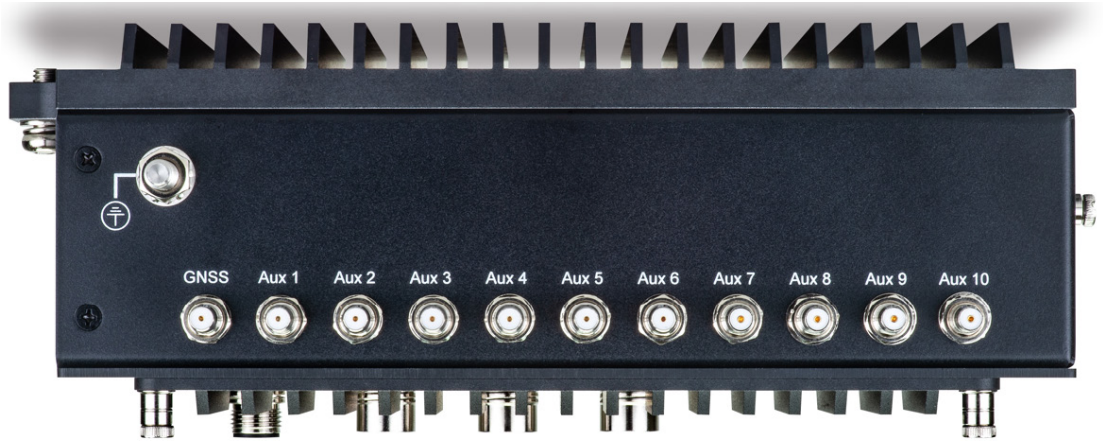


NOTE:

M.2 modules require an additional thermal solution when operated above 60°C. Please contact your local ADLINK representative for more information.

Secure the NVME module: Insert the NVME module into the corresponding slot and fasten it with screws.

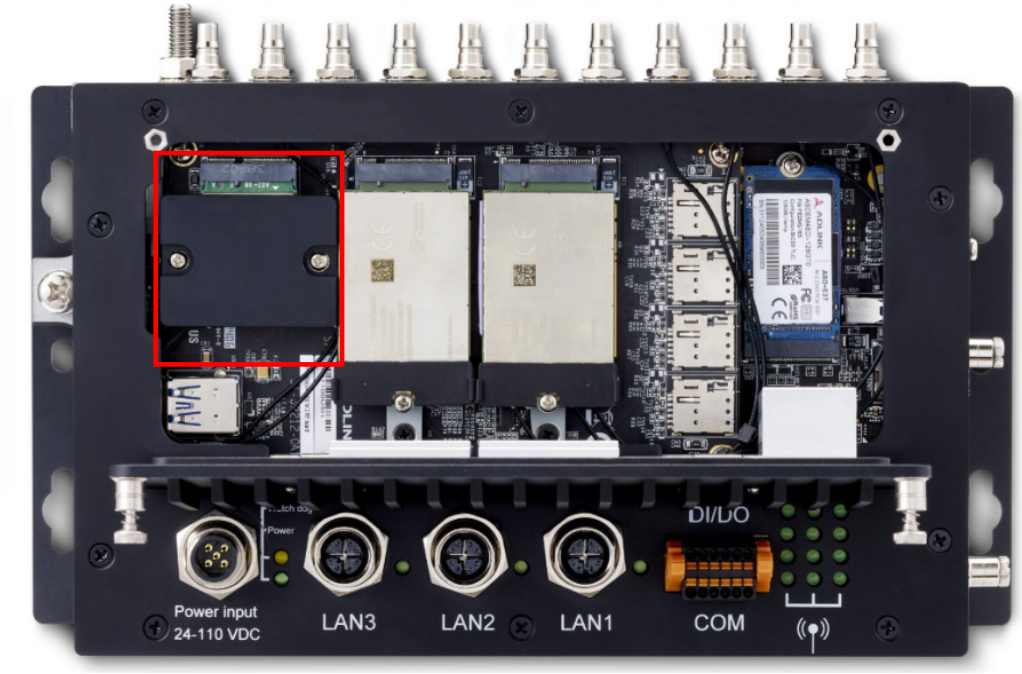
## 4.3 Installing M.2 2230 E-Key Wi-Fi/BT Modules



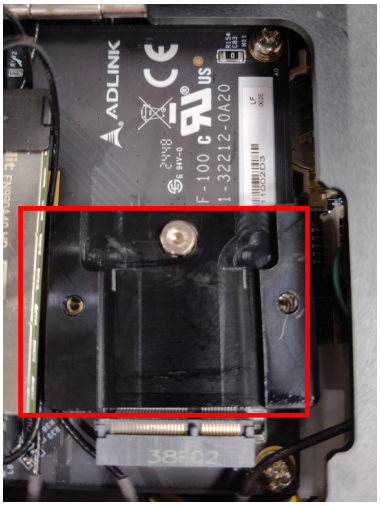

The GNSS QMA antenna is preassembled during the production stage.

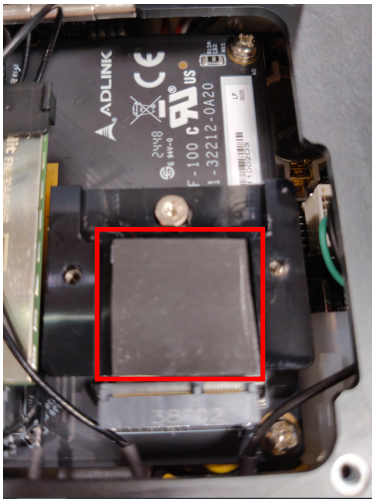
The Aux1 and Aux 2 are assigned for Wi-Fi modules. The Wi-Fi module should be placed at the location marked as below.

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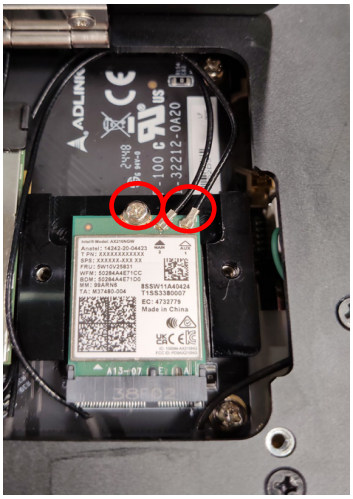

1. To install the Wi-Fi/BT module, Find the heat spreader and placed on the location for Wifi M.2. Place the thermal pad at the location marked as below.




2. Attach the AUX1 and AUX2 QMA to I-PEX4 connector to the Wi-Fi module and fasten the screw. Organize the cable prevent it from being overlap on the thermal solution. Cover the heat spreader and fasten two screws.

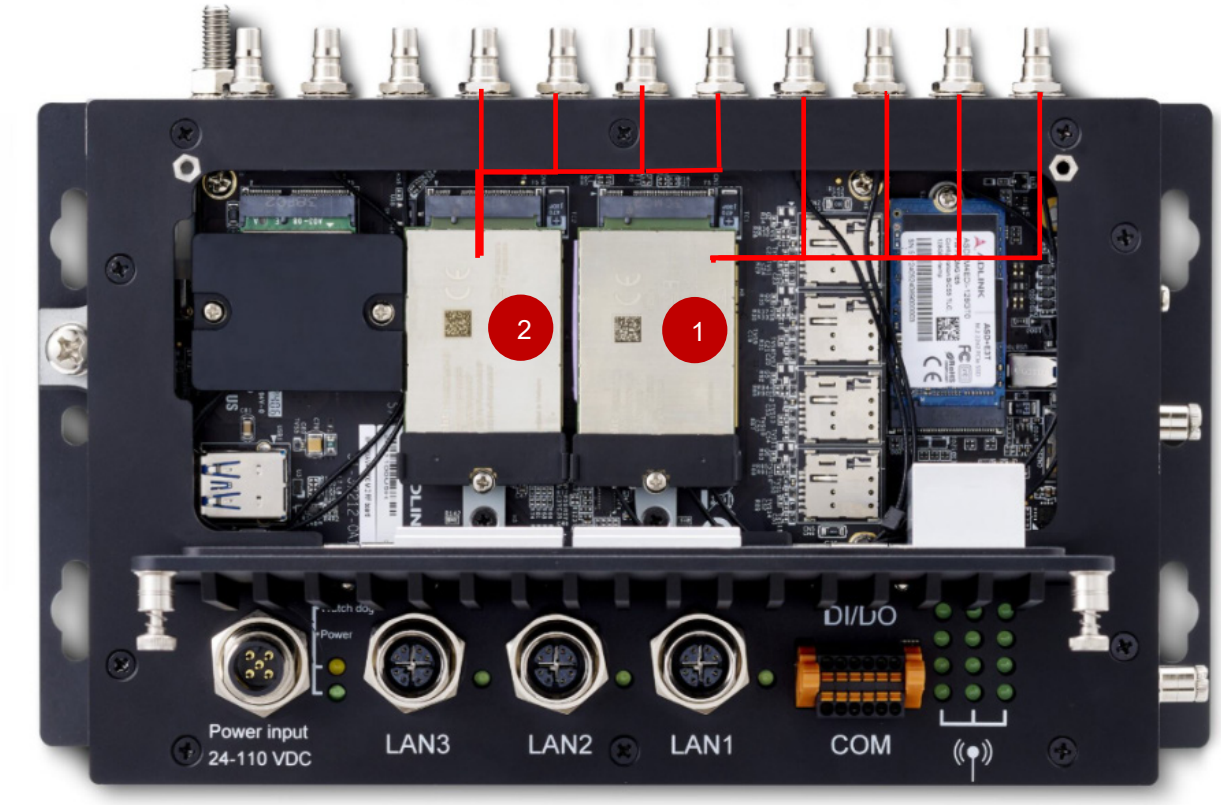
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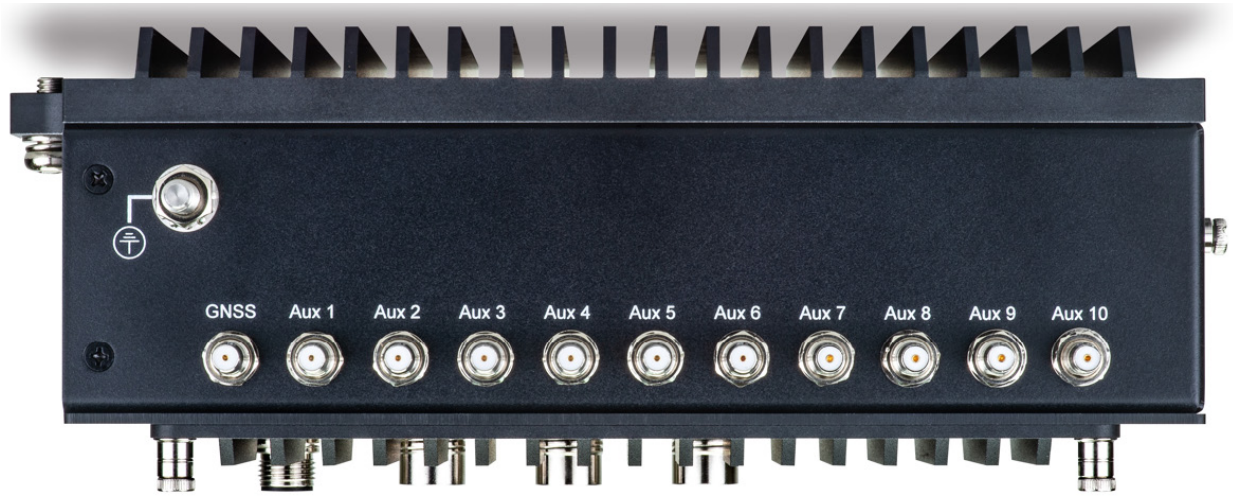
## 4.4 Installing M.2 B-Key 3042/52 5G Modules

There are two M.2 B Key 3042/3052 5G module slots. Slot 1 is supported for both x86 and ARM version. Slot 2 is supported only for AVA-1000 based on x86 architecture.  Slot 1 a is connected to AUX7, AUX8, AUX9, AUX10. Slot 2 is connected to AUX3, AUX4, AUX5, AUX6.



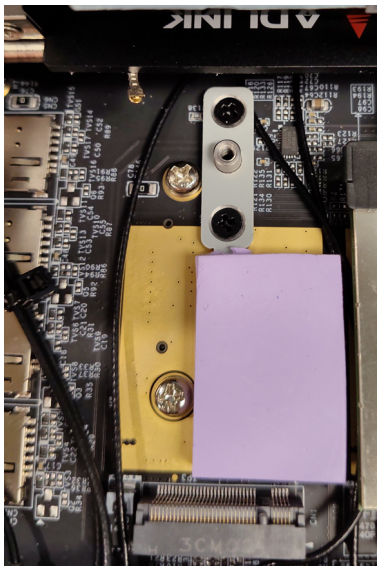


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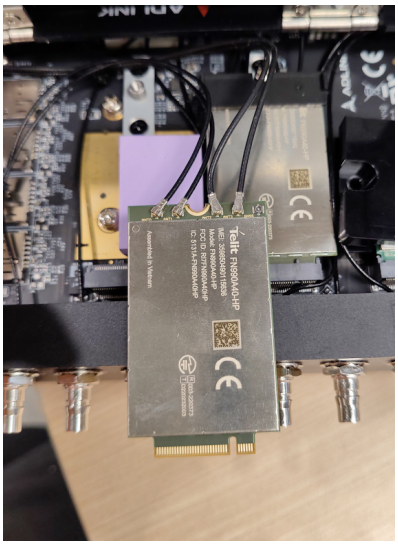



The 5G modem assembly is the same for both slot 1 and slot 2.

1. Step 1: Find the thermal pad for 5G modem FN990 and place it at the PCB with gold plate.



2. Step 2: Attach the QMA to IPEX1 cables at the location assigned on the modem according to the silkscreen on the PCBA of the modem.

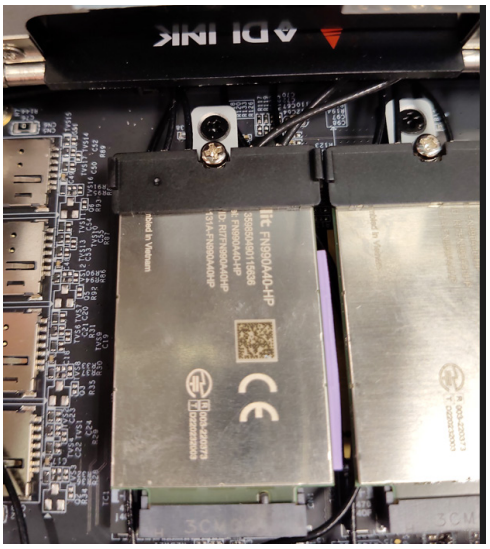


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3. Attach the IPEX bracket onto the modem. The bracket is to prevent the IPEX connector from falling off. Sliding from the end of the modem is recommended. Pay attention to the cable from interfere the bracket.



4. Fasten the 5G modem screws. Organize the cable to the edge of the chassis. It is to prevent the cables from overlapping on the thermal pad.

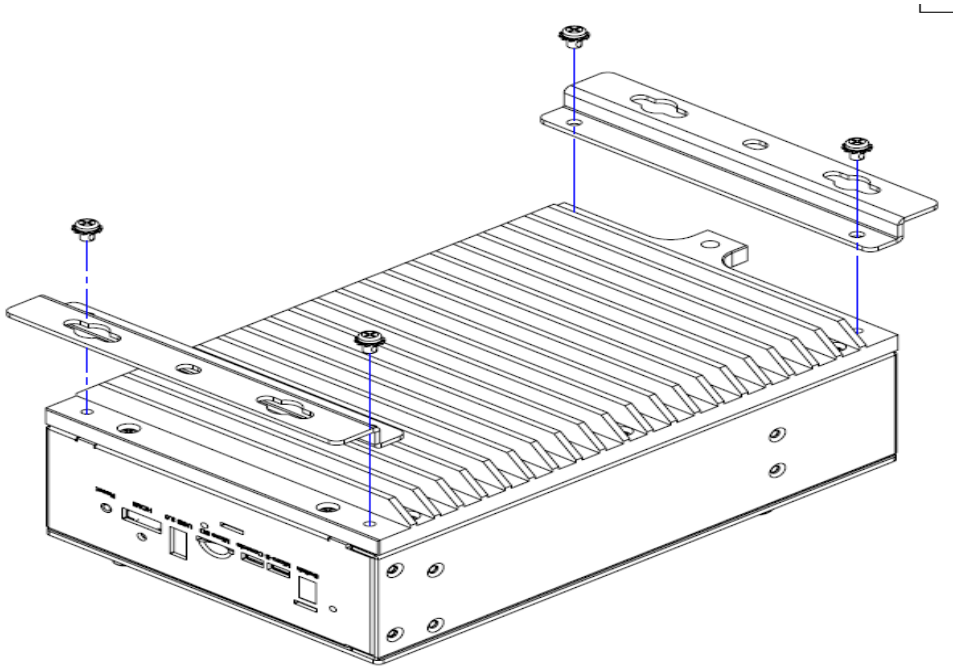


Step 5: Close the cover. The thermal pad on the cover will help dissipate the heat to the housing.

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## 4.5 Wall Mounting

The AVA-1000 can be wall or surface mounted using the wall mount brackets and screws provided. If wall mounting, make sure the wall can support the weight of the device. Secure the brackets to the chassis using the 4 screws provided.

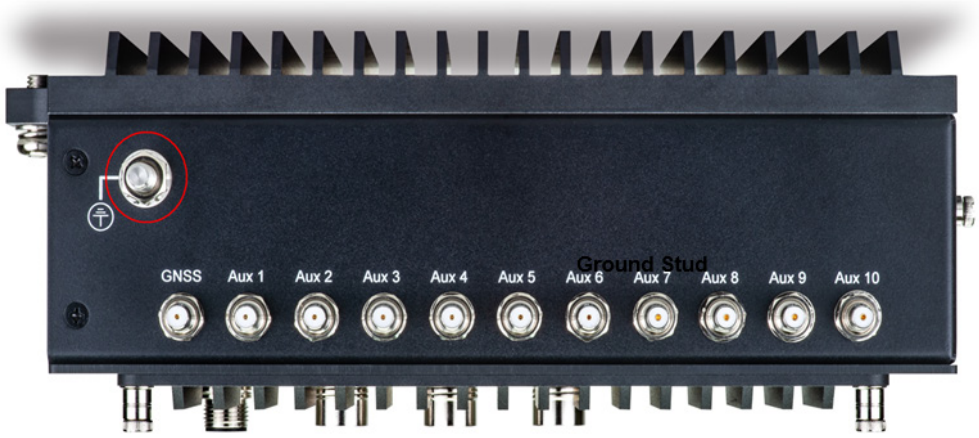


## 4.6 Connecting a Ground Cable

CAUTION:

Connect the ground cable before making any other connections. When disassembling the system, always detach the ground cable last.

- Use a ground cable with a cross section of at least 0.823mm2 (18AWG) and an M5 size ring terminal.
- Slide the ring terminal onto the ground stud and secure it with the locking M5 nut.





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## 4.7 Connecting the Power Supply

CAUTION:

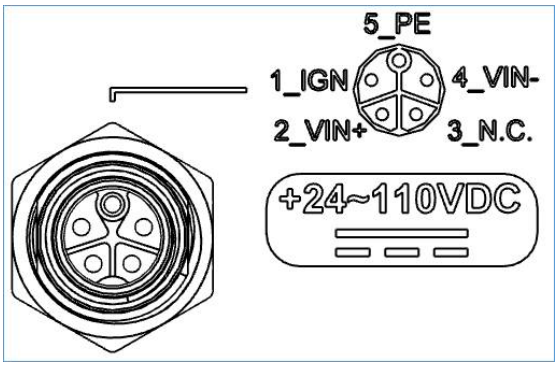
Connect the ground cable before making any other connections. When disassembling the system, always detach the ground cable last.

WARNING:

- Work on the computer system may only be carried out by personnel qualified for the specific task and who have the training and experience to identify risks and avoid potential hazards.
- Make sure that a ground cable has been connected to the system before connecting an external power supply and switching on the system.
- Make sure that the voltage supplied by the external power supply conforms to specifications of the system.

Connect the power supply to the 5-pin M12 K-coded connector on the front of the chassis. The device will power up when the power supply is turned on.




NOTE:

The user must provide the +24 to 110VDC



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## 4.8 Starting the System

Upon starting up, the system will auto-detect storage devices and boot from the operating system, if found. To change the boot device order, press <Del> or <Esc> to enter BIOS setup menu and change the Boot Option settings. If no operating system is found, the system will enter the BIOS setup menu automatically.

The AVA-1000 is delivered without an operating system installed.


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# 5 Connector Pinouts and Jumper Settings

## 5.1 External Connectors

Please refer to 3.2.1 Mechanical Layout Front View for connector locations.

### 5.1.1 M12 A-Coded Connectors

| Pin # | Signal Name |
|---|---|
| 1 | IGN |
| 2 | DC+ |
| 3 | DC+ |
| 4 | DC+ |
| 5 | DC+ |



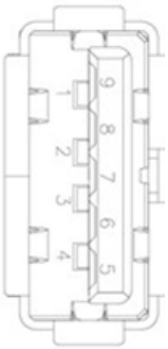
### 5.1.2 LAN Connector

| Pin # | Signal Name |
|---|---|
| 1 | MDI_T_P0 |
| 2 | MDI_T_N0 |
| 3 | MDI_T_P1 |
| 4 | MDI_T_N1 |
| 5 | MDI_T_P3 |
| 6 | MDI_T_N3 |
| 7 | MDI_T_N2 |
| 8 | MDI_T_P2 |




### 5.1.3 USB 3.0 Connector

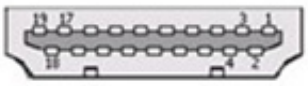
| Pin # | Signal Name |
|---|---|
| 1 | USB3.0_P5VA |
| 2 | USB2_CMAN |
| 3 | USB2_CMAP |
| 4 | GND |
| 5 | USB3A_CMRXN |
| 6 | USB3A_CMRXP |
| 7 | GND |
| 8 | USB3A_CMTXN |
| 9 | USB3A_CMTXP |




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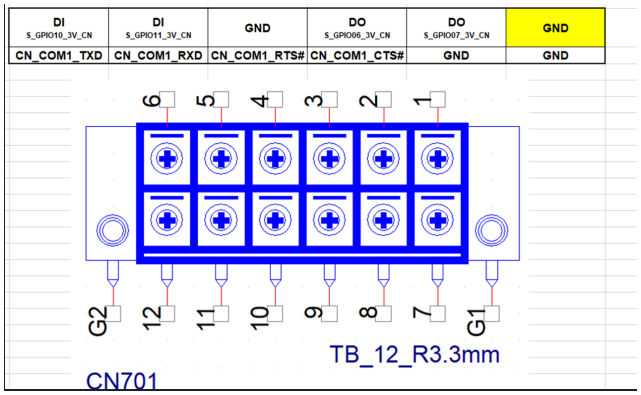
### 5.1.4 HDMI Connector

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



### 5.1.5 GPIO and COM Connectors

| SMARC module: LEC-ASL | SMARC connector pin | Carrier board | AVA-1000 GPIO connector pin | Remark |
|---|---|---|---|---|
| O2_GPIO_7 | P115 | S_GPIO07_3V_CN | 2 | DO |
| O2_GPIO_6_TACHIN (O2_GPIO_6) | P114 | S_GPIO06_3V_CN | 3 | DO |
| O2_GPIO_11 | P119 | S_GPIO11_3V_CN | 5 | DI |
| O2_GPIO_10 | P118 | S_GPIO10_3V_CN | 6 | DI |



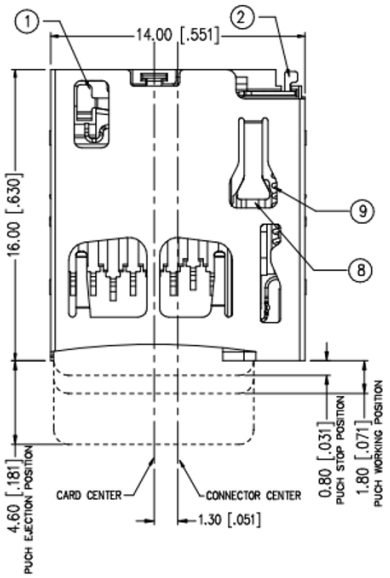




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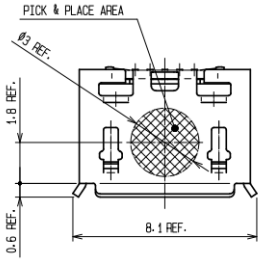
### 5.1.6 uUSB Connectors

| Pin # | Signal Name |
|---|---|
| 1 | SDIO_R_D2 |
| 2 | SDIO_R_D3 |
| 3 | SDIO_R_CMD |
| 4 | P_+SD |
| 5 | SDIO_R_CK |
| 6 | GND |
| 7 | SDIO_R_D0 |
| 8 | SDIO_R_D1 |
| 9 | GND |
| 10 | GND |
| 11 | SDIO_R_CD# |
| 12 | GND |



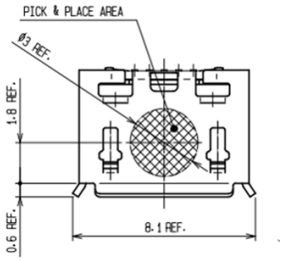

#### 5.1.6.1 uUSB Connectors (For OTG)

| Pin # | Signal Name |
|---|---|
| 1 | P_+5V_UUSB_FLASH |
| 2 | USB0_DN_CN |
| 3 | USB0_DP_CN |
| 4 | USB0_OTG_ID_CN |
| 5 | GND |



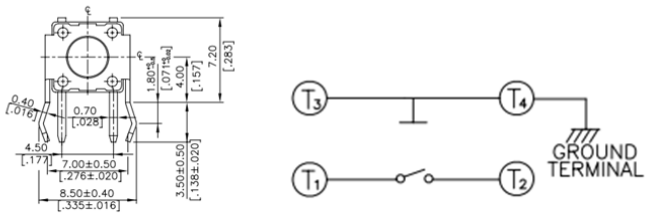

#### 5.1.6.2 uUSB Connectors (For Console)

| Pin # | Signal Name |
|---|---|
| 1 | P_+5V_MUSB |
| 2 | USB_UART_HS_DB_N_CN |
| 3 | USB_UART_HS_DB_P_CN |
| 4 | Test point |
| 5 | GND |




### 5.1.7 Reset Connectors

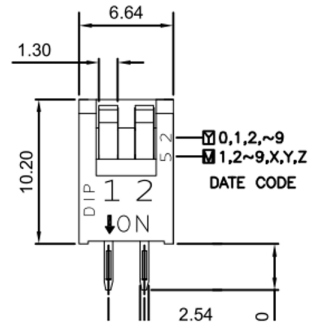
| Pin # | Signal Name |
|---|---|
| T1 | GND |
| T2 | RESET_IN#_5V |
| T3 | GND |
| T4 | GND |




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### 5.1.8 Switch Connectors

| Pin # | Signal Name |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | FORCE_RECOV# |
| 4 | BOOT_SEL_SW |

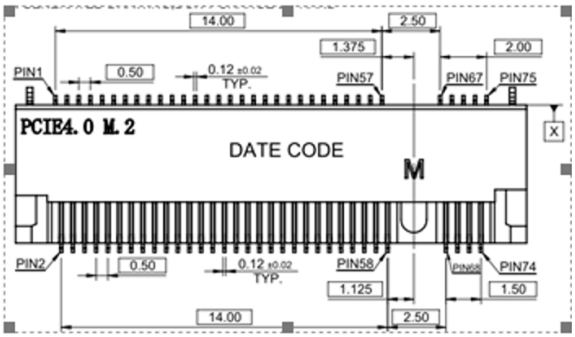



| Pin | 1 | 2 | Boot Source | Remark |
|---|---|---|---|---|
| Status | ON | OFF | From uSD card | Only 8MP(ARM) |
| | ON | ON | From SMARC model EMMC | |

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## 5.2 Internal Connectors

### 5.2.1 M.2 M-Key 2242 PCIe module Connector

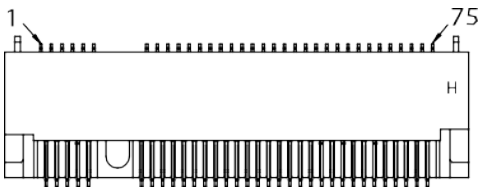



| Pin # | Signal Name | Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|---|---|
| 1 | M.2M_CONFIG_3 | 31 | NC | 69 | M.2M_CONFIG_1 |
| 2 | P_+3V3_M.2M | 32 | NC | 70 | P_+3V3_M.2M |
| 3 | GND | 33 | GND | 71 | GND |
| 4 | P_+3V3_M.2M | 34 | NC | 72 | P_+3V3_M.2M |
| 5 | NC | 35 | NC | 73 | GND |
| 6 | NC | 36 | NC | 74 | P_+3V3_M.2M |
| 7 | NC | 37 | NC | 75 | M.2M_CONFIG_2 |
| 8 | NC | 38 | PU 10K to 3.3V | | |
| 9 | GND | 39 | GND | | |
| 10 | Test point | 40 | NC | | |
| 11 | NC | 41 | PCIE_B_RX_N_R | | |
| 12 | P_+3V3_M.2M | 42 | NC | | |
| 13 | NC | 43 | PCIE_B_RX_P_R | | |
| 14 | P_+3V3_M.2M | 44 | NC | | |
| 15 | GND | 45 | GND | | |
| 16 | P_+3V3_M.2M | 46 | NC | | |
| 17 | NC | 47 | PCIE_B_TX_N_C | | |
| 18 | P_+3V3_M.2M | 48 | NC | | |
| 19 | NC | 49 | PCIE_B_TX_P_C | | |
| 20 | NC | 50 | PCIE_B_RST_N_3V_CN | | |
| 21 | M.2M_CONFIG_0 | 51 | GND | | |
| 22 | NC | 52 | M2_KEY-M_CLK_REQ_N | | |
| 23 | NC | 53 | PCIE_B_REFCLK_N_R | | |
| 24 | NC | 54 | M2_KEY-M_PEWAKE_N | | |
| 25 | NC | 55 | PCIE_B_REFCLK_P_R | | |
| 26 | NC | 56 | NC | | |
| 27 | GND | 57 | GND | | |
| 28 | NC | 58 | NC | | |
| 29 | NC | 67 | NC | | |
| 30 | NC | 68 | M.2_M_SUSCLK | | |

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### 5.2.2 M.2 B-Key 3042 5G Module Connector

| Pin | Signal Name | Pin | Signal Name |
|---|---|---|---|
| 1 | NC | 2 | 3.3V |
| 3 | GND | 4 | 3.3V |
| 5 | GND | 6 | FULL CARD OFF-L |
| 7 | USB2 DP | 8 | W DIS-L |
| 9 | USB2 DM | 10 | LED-L |
| 11 | GND | | |
| KEY-B | | | |
| 21 | NC | 20 | NC |
| 23 | NC | 22 | NC |
| 25 | NC | 24 | NC |
| 27 | GND | 26 | NC |
| 29 | USB3 RX N | 28 | NC |
| 31 | USB3 RX P | 30 | SIM RST1 |
| 33 | GND | 32 | SIM CLK1 |
| 35 | USB3 TX N | 34 | SIM DAT1 |
| 37 | USB3 TX P | 36 | SIM PWR1 |
| 39 | GND | 38 | NC |
| 41 | PCIE RX N | 40 | SIM DET2 |
| 43 | PCIE RX P | 42 | SIM DAT2 |
| 45 | GND | 44 | SIM CLK2 |
| 47 | PCIE TX N | 46 | SIM RST2 |
| 49 | PCIE TX P | 48 | SIM PWR2 |
| 51 | GND | 50 | PERST-L |
| 53 | PCIE CLK N | 52 | CLKREQ-L |
| 55 | PCIE CLK P | 54 | NC |
| 57 | GND | 56 | NC |
| 59 | NC | 58 | NC |
| 61 | NC | 60 | NC |
| 63 | NC | 62 | NC |
| 65 | NC | 64 | NC |
| 67 | NC | 66 | SIM DET1 |
| 69 | NC | 68 | NC |
| 71 | GND | 70 | 3.3V |
| 73 | GND | 72 | 3.3V |
| 75 | NC | 74 | 3.3V |




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### 5.2.3 M.2 E-Key 2230 Wi-Fi Module Connector

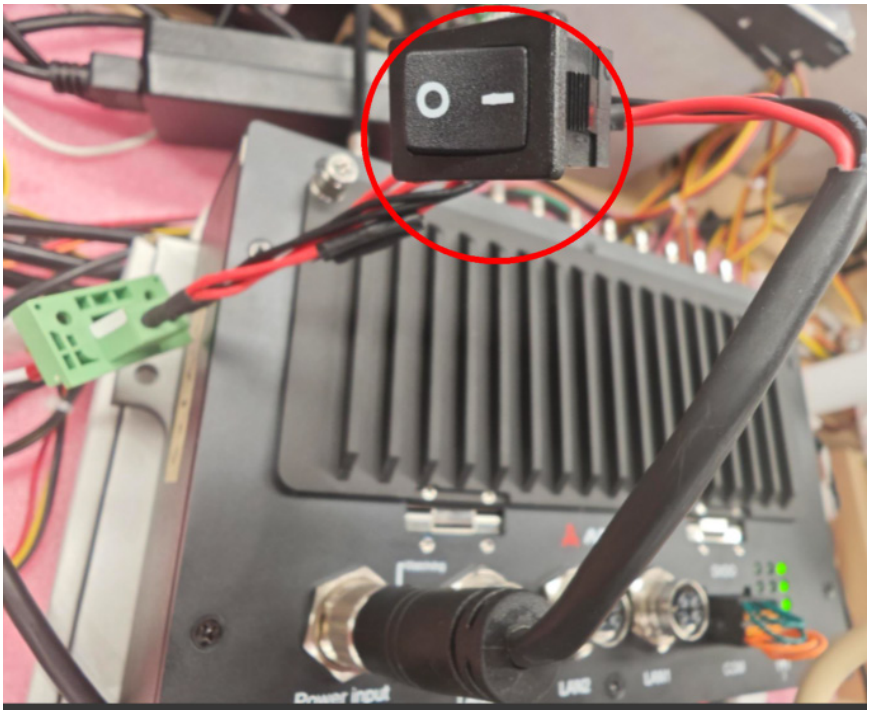
| Pin | Signal Name | Pin | Signal Name |
|---|---|---|---|
| 1 | GND | 2 | 3.3V |
| 3 | USB2_DP | 4 | 3.3V |
| 5 | USB2 DM | 6 | WIFI LED1 |
| 7 | GND | 8 | NC |
| 9 | NC | 10 | NC |
| 11 | NC | 12 | NC |
| 13 | NC | 14 | NC |
| 15 | NC | 16 | WIFI LED2 |
| 17 | NC | 18 | WIFI VIO CFG |
| 19 | NC | 20 | NC |
| 21 | NC | 22 | NC |
| 23 | N/C | 24 | N/C |
| Key E | | | |
| 33 | GND | 32 | NC |
| 35 | PCIE TX DP | 34 | NC |
| 37 | PCIE TX DN | 36 | NC |
| 39 | GND | 38 | NC |
| 41 | PCIE RX DP | 40 | NC |
| 43 | PCIE RX DN | 42 | NC |
| 45 | GND | 44 | NC |
| 47 | PCIE CLK DP | 46 | NC |
| 49 | PCIE CLK DN | 48 | NC |
| 51 | GND | 50 | NC |
| 53 | PCIE CLKREQ-L | 52 | PCIE RST-L |
| 55 | PEWAKE0-L | 54 | WIFI BT DIS-L |
| 57 | GND | 56 | WIFI DIS-L |
| 59 | NC | 58 | NC |
| 61 | NC | 60 | NC |
| 63 | GND | 62 | NC |
| 65 | NC | 64 | NC |
| 67 | NC | 66 | NC |
| 69 | GND | 68 | NC |
| 71 | NC | 70 | NC |
| 73 | NC | 72 | 3.3V |
| 75 | GND | 74 | 3.3V |

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## 5.3 Buttons and LEDs

### 5.3.1 Power Button

The power button is non-latching, the system turns on when the button is pressed, then the power LED illuminates. If the system hangs, pressing the button will completely shut it down.




| System status | Power LED (GREEN) |
|---|---|
| Power On | On |
| Power Off | Off |

### 5.3.2 Reset Button

The reset button is non-latching. The system is restarts when the button is pressed. If the system hangs, press the button to restart it.

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### 5.3.3 Status LEDs




| LED indicator | Color | Description |
|---|---|---|
| Power | Green | 1 x power on and reset LED (Green), LED on when power on.<br>LED off when power off. |
| Watchdog | Yellow | 1 x WDT LED (Yellow) , Indicates watchdog timer status.<br>When the watchdog timer starts, the LED flashes.<br>When the timer is expired, the system will auto reboot. |
| Lan | Green | 1 x 1G Ethernet (signal from USB) (Green)<br>2 x 1G Ethernet (signal from SMARC) (Green) |
| Wi-Fi | Green | 4 x Wi-Fi LED (Green) |
| Customer indicator LEDs | Green | 8 x customer indicator LEDs (2x 4 Green) |

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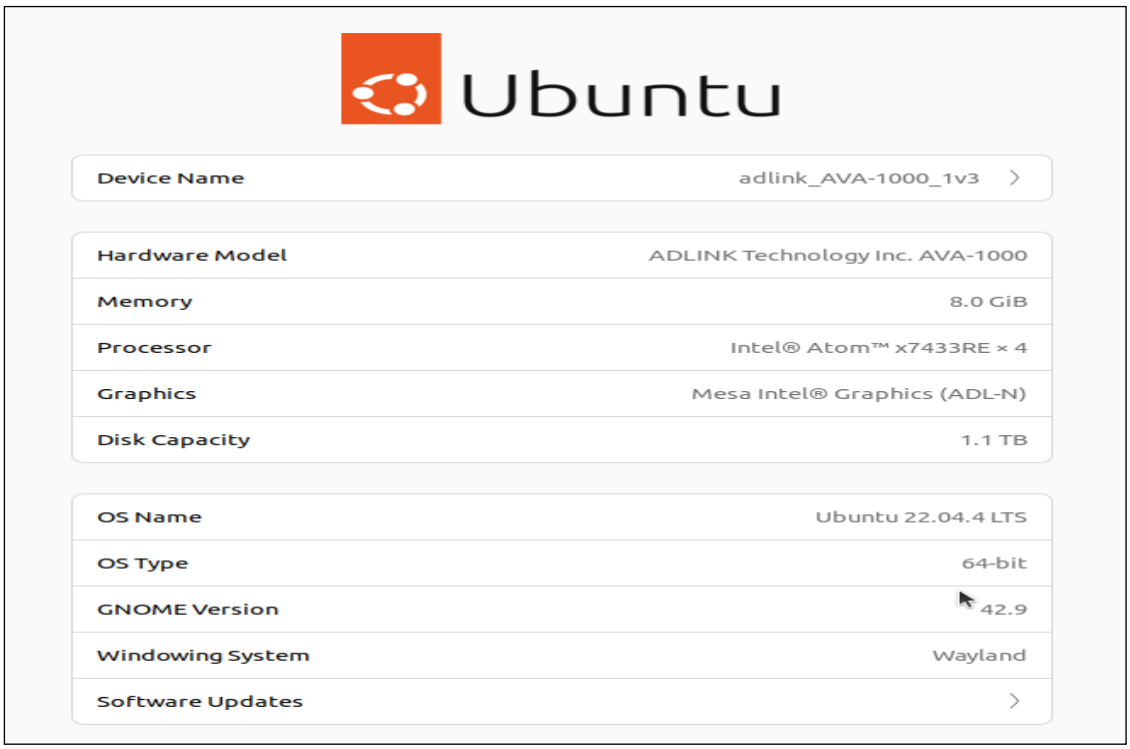
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# 6 System Interfaces

## 6.1 Installing Operating System

### 6.1.1 Install Ubuntu 22.04.4 LTS (Kernel Linux adlink-ava-1v3 6.5.0-25-generic) X86

Use Rufus tool recovery **AVA-1000_Ubuntu_22.04.4_x64_IMG_1v3.iso image**

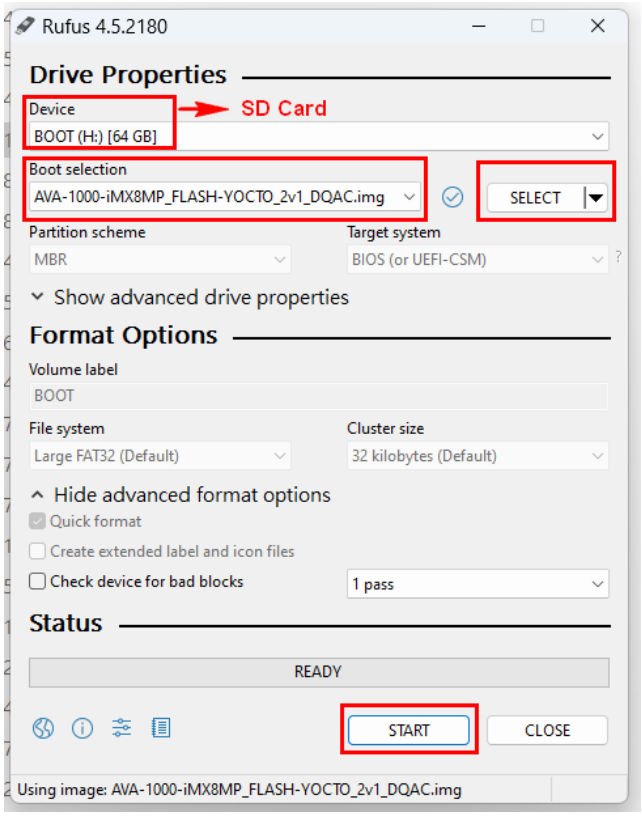




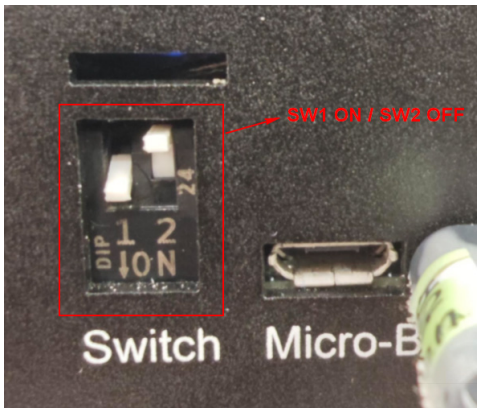
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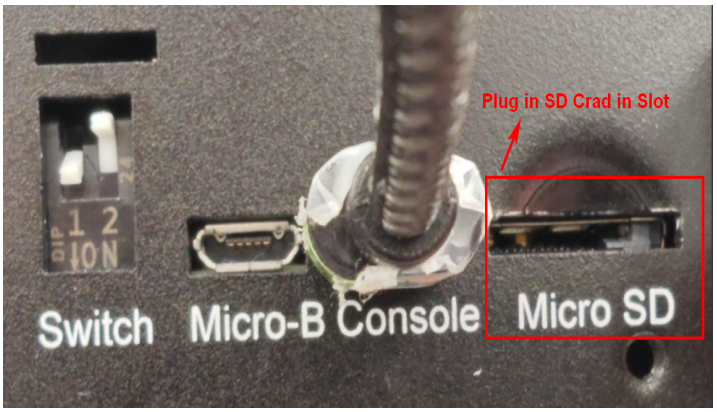
## 6.2 Install AVA-1000-iMX8MP_factory_yocto_2v1 ARM (Recovery image for SD Card to EMMC )

1. Download the **AVA-1000-iMX8MP_factory_yocto_2v1 image** and unzip it with 7-zip.
2. Please use Rufus tool to recover the **AVA-1000-iMX8MP_factory_yocto_2v1 image** to an SD Card (**SD card must be more than 16G**).




3. Set **jump Switch SW1 to ON / SW2 to OFF** for SD card image recovery to EMMC, and plug in the SD card slot.

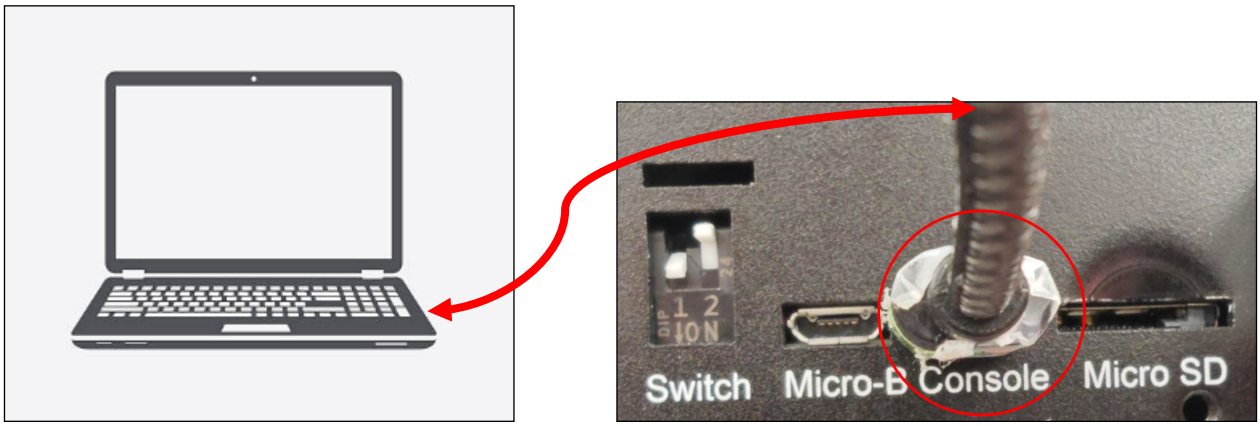


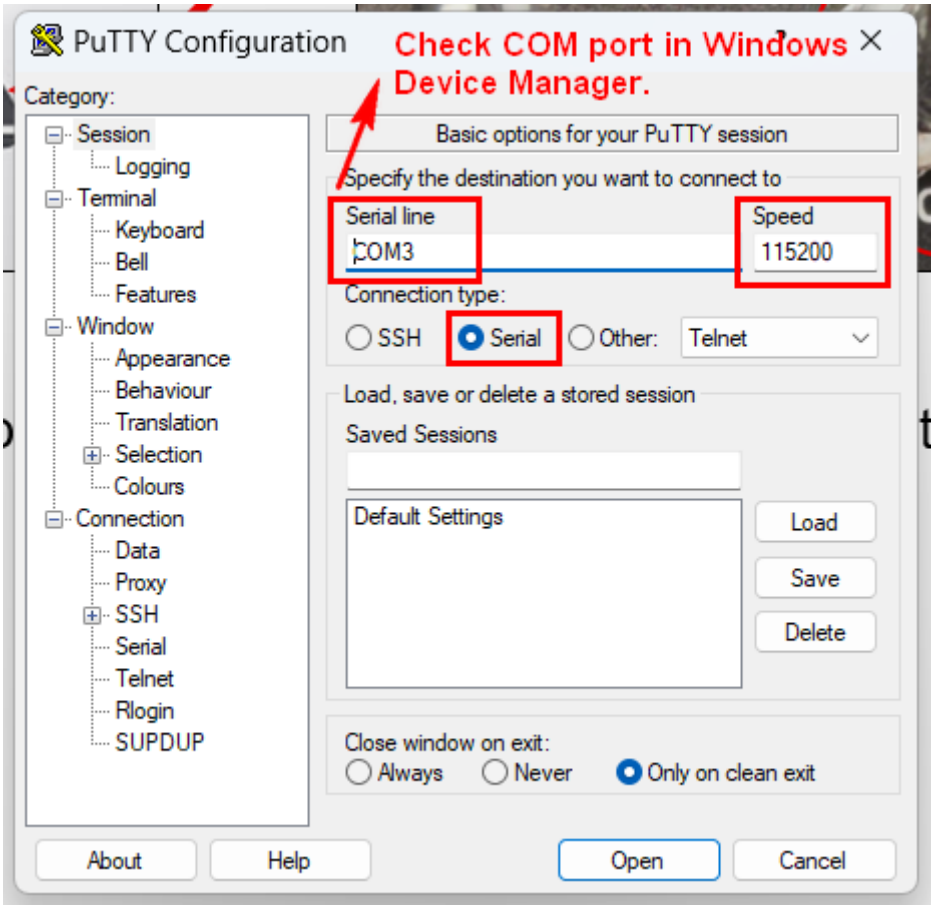


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4. Use a Micro USB to USB Type-A cable to connect the Console slot to the Host PC (Window 10).



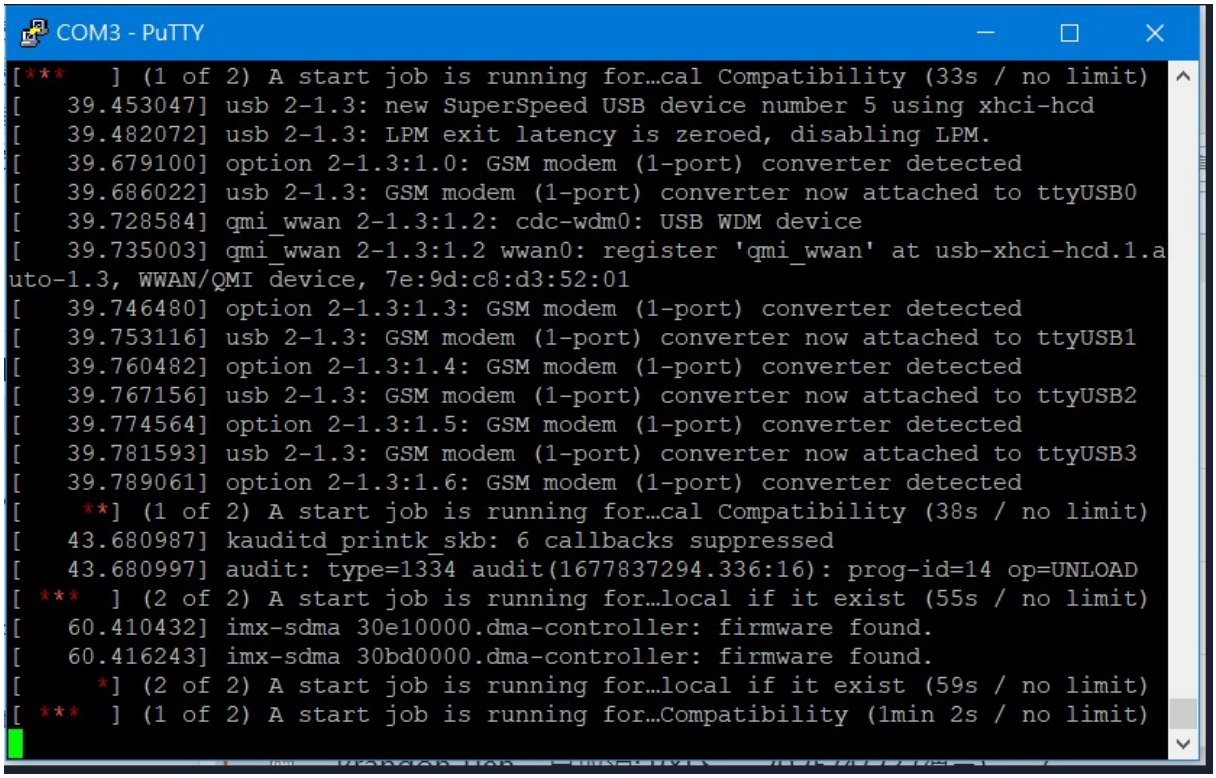

5. Check the COM port in Windows Device Manager. Open PuTTY, Select connection type:Serial, and set COM port and speed (115200).



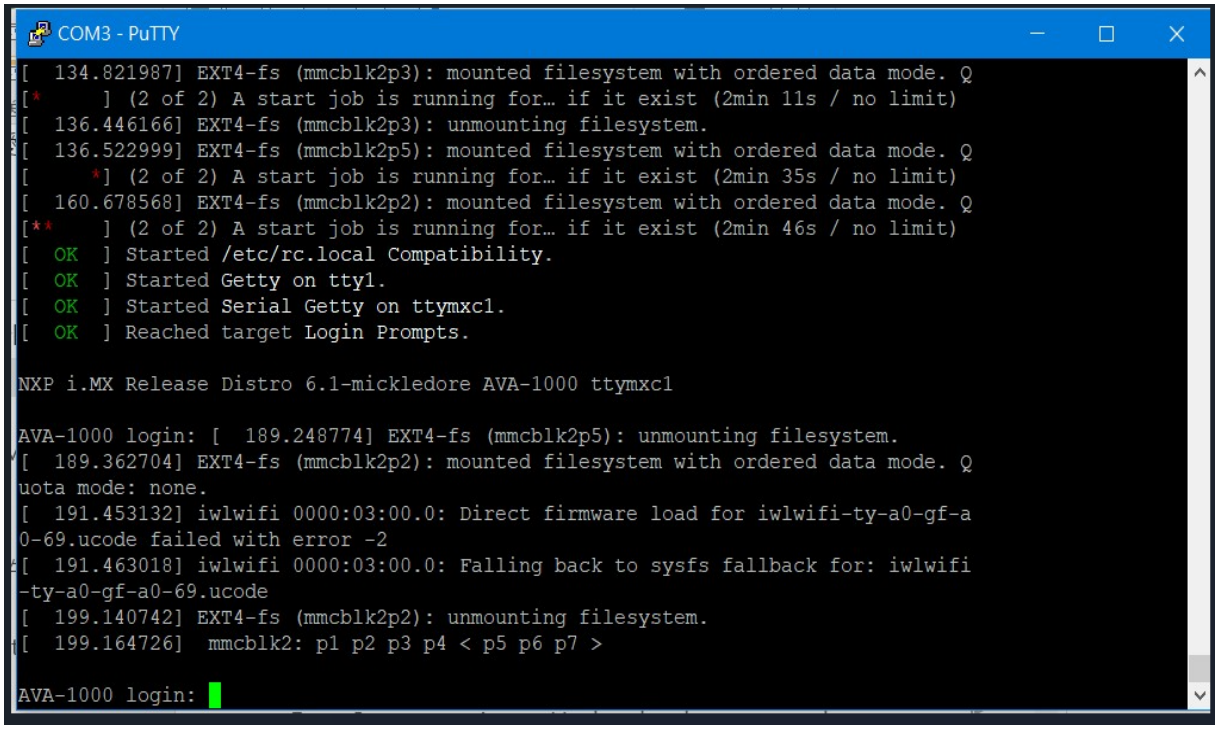


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6. Once the AVA-1000 is powered ON, PuTTY will show the SD card image being restored to eMMC.



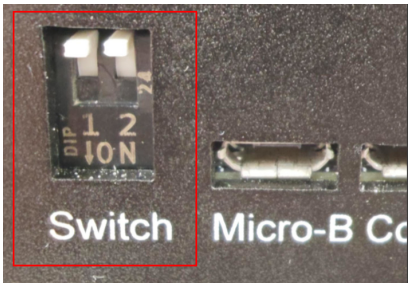

SD card image successfully restored to eMMC.





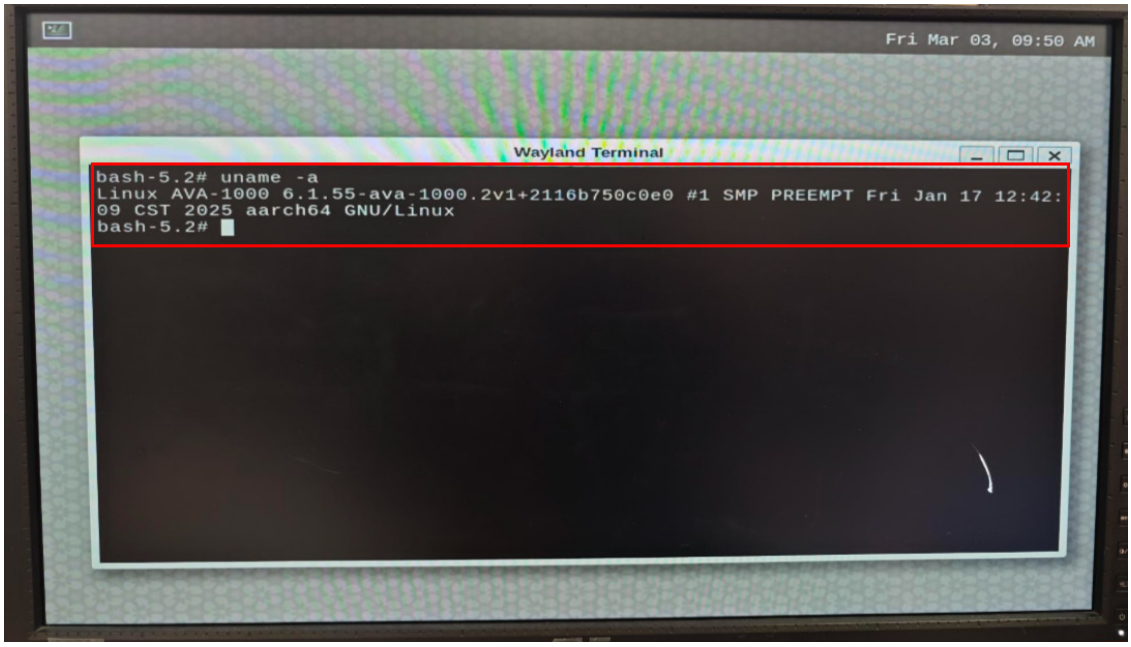
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7. Set jump **Set SW1 to OFF / SW2 to OFF**. Remove the SD card and Micro USB cable, then connect the HDMI cable and boot from eMMC.











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## 6.3 DIO Test

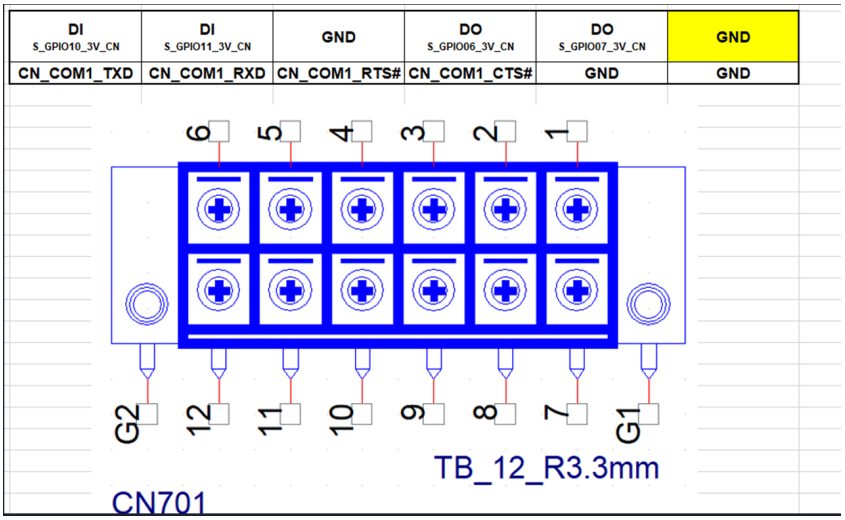
### 6.3.1 Ubuntu 22.04.4 LTS (Kernel Linux adlink-ava-1v3 6.5.0-25-generic) X86 GPIO Test

- Platform: AVA-1000
- OS: Ubuntu 22.04.4 LTS (Kernel Linux adlink-ava-1v3 6.5.0-25-generic)

**# The gpio chip have GPIOs include 12 pins, use the GPIO loopback test fixture test**




Identify the GPIO number for the DIO pin





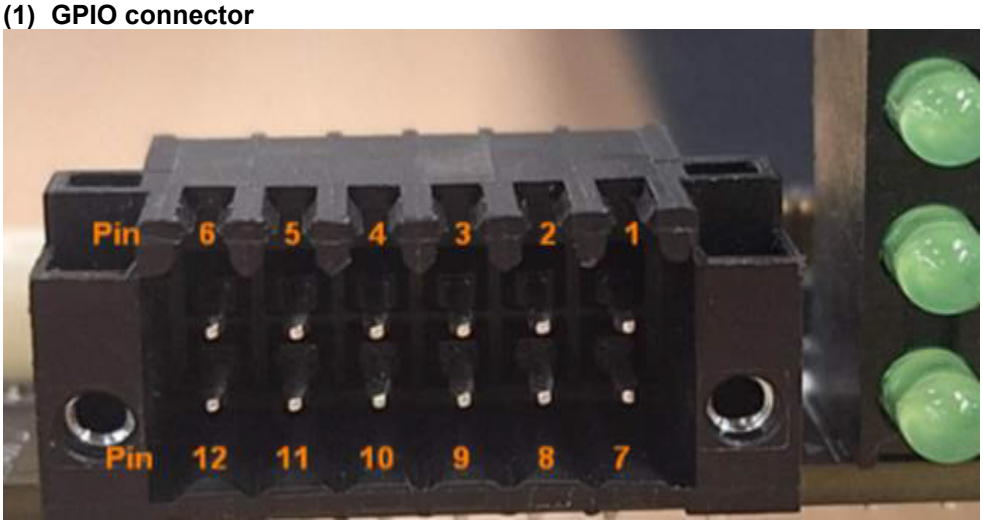
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**# Check GPIO function number in the platform schematic**

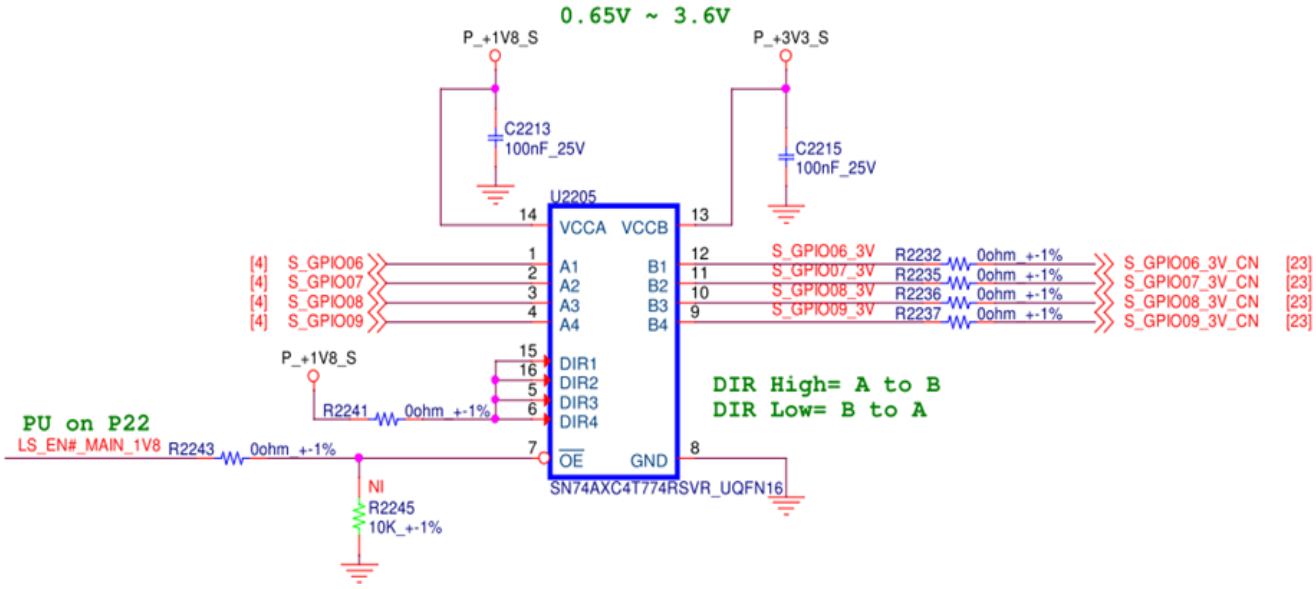
Refer the platform schematic, there are 2 * DI( O2_GPIO_11/ O2_GPIO_10) and 2 * DO( O2_GPIO_7/ O2_GPIO_6).

| SMARC module: LEC-ASL | SMARC connector pin | Carrier board | AVA-1000 GPIO connector pin | Remark |
|---|---|---|---|---|
| O2_GPIO_7 | P115 | S_GPIO07_3V_CN | 2 | DO |
| O2_GPIO_6_TACHIN (O2_GPIO_6) | P114 | S_GPIO06_3V_CN | 3 | DO |
| O2_GPIO_11 | P119 | S_GPIO11_3V_CN | 5 | DI |
| O2_GPIO_10 | P118 | S_GPIO10_3V_CN | 6 | DI |

**(1) GPIO connector**

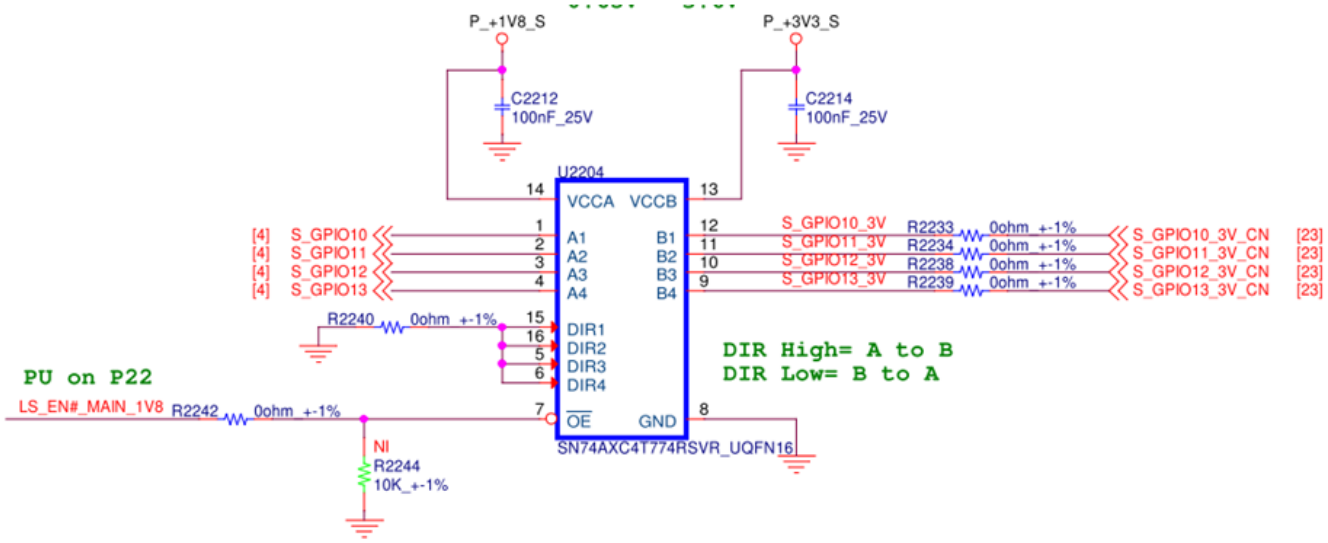



**(2) Carrier board:**
Level shift for GPIO



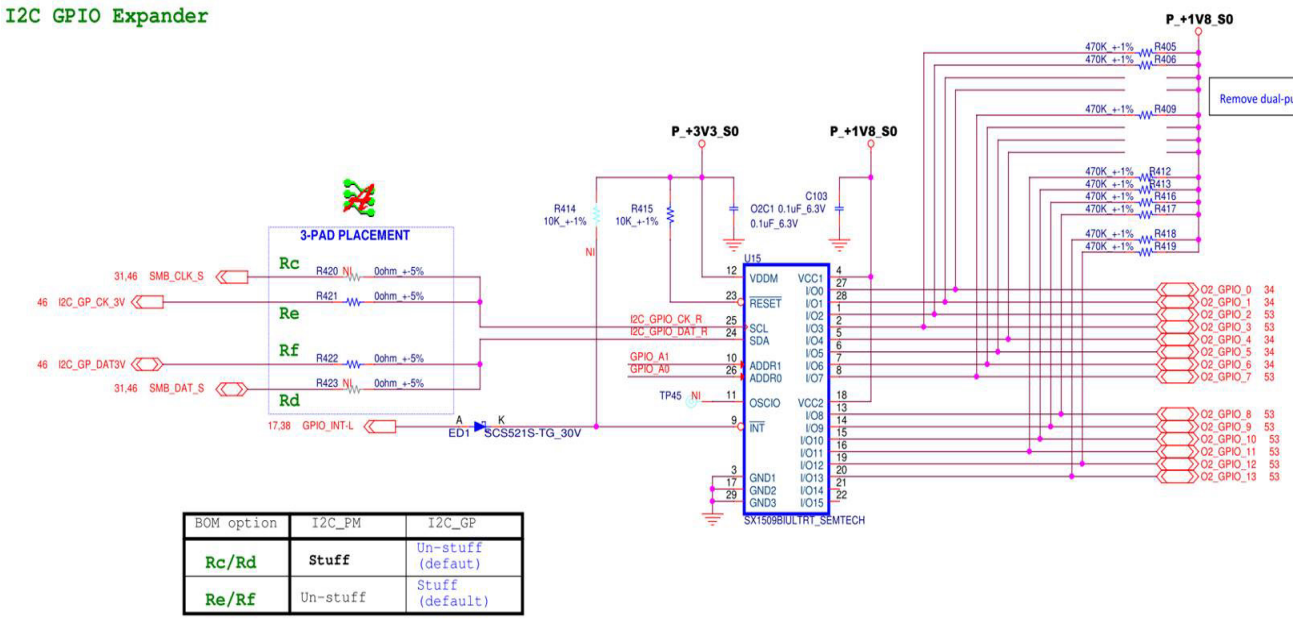


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(3) **SMARC module: LEC-ASL**

GPIO expander on the SMARC module (LEC-ASL).




| BOM option | I2C_PM | I2C_GP |
|---|---|---|
| Rc/Rd | Stuff | Un-stuff (defaut) |
| Re/Rf | Un-stuff | Stuff (default) |


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### 6.3.2 Test GPIO function

Digital Input & Output

DIO function

AVA-1000 platform has 4 DI & 4 DO from SMARC HW pin GPIOs.

**# Digital Input & Output Table**

| Digital Input | HW Pin | Digital Output | HW Pin |
|---|---|---|---|
| DI1 | GPIO6 | DO1 | GPIO10 |
| DI2 | GPIO7 | DO2 | GPIO11 |
| DI3 | GPIO8 | DO3 | GPIO12 |
| DI4 | GPIO9 | DO4 | GPIO13 |

DIO control

Using SEMA to control SMARC HW pin.

# Config DIO HW pin & set value default low

```
$ sudo semautil /i2c write_raw 2 0x3f 2 0e 3c # 0011 1100
$ sudo semautil /i2c write_raw 2 0x3f 2 0f 31 # 0011 0001
$ sudo semautil /i2c write_raw 2 0x3f 2 10 00 # 0000 0000
$ sudo semautil /i2c write_raw 2 0x3f 2 11 0e # 0000 1110

# Control DO output level
# DO1 high
$ sudo semautil /i2c write_raw 2 0x3f 2 11 7f
# DO2 high
$ sudo semautil /i2c write_raw 2 0x3f 2 11 bf
# DO3 high
$ sudo semautil /i2c write_raw 2 0x3f 2 10 01
# DO4 high
$ sudo semautil /i2c write_raw 2 0x3f 2 10 02
# DOx low
$ sudo semautil /i2c write_raw 2 0x3f 2 10 00
$ sudo semautil /i2c write_raw 2 0x3f 2 11 3f
```

Using SEMA to control SMARC HW pin.

```
# Get DI input level
$ sudo semautil /i2c read_raw 2 0x3f 10 1
```



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# read DI hex value

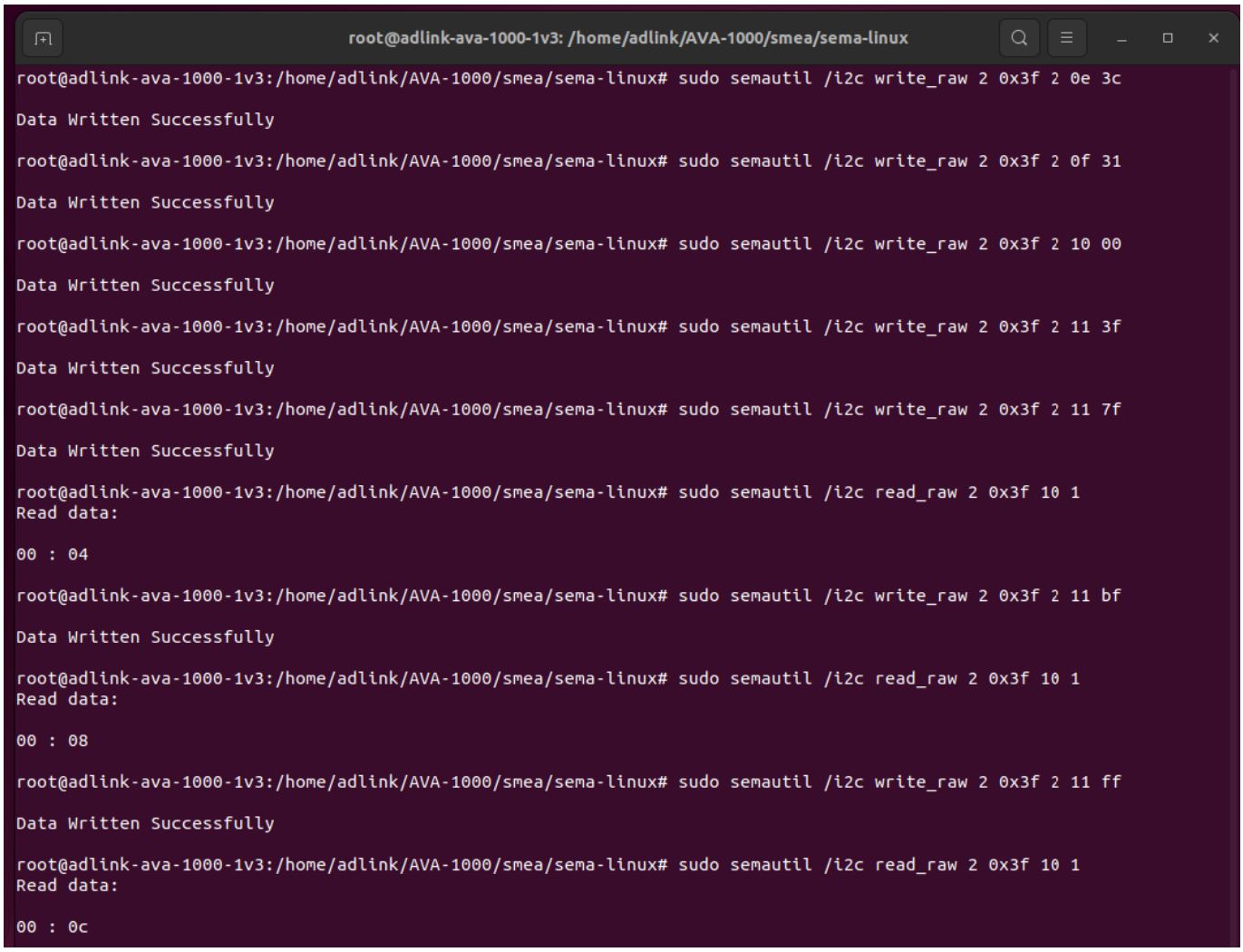
Return value 00 is a hexadecimal value. ( 0000 0000 )

If DI1 is high, the hex value is 04 ( 0000 0100 )

If DI2 is high, the hex value is 08 ( 0000 1000 )

If DI3 is high, the hex value is 10 ( 0001 0000 )

If DI4 is high, the hex value is 20 ( 0010 0000 )




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### 6.3.3 Test LED function

LED

LEC control

Using SEMA to control LED HW pin

```
# Config LED HW pin & set LED default off
$ semautil /i2c write_raw 2 0x71 2 0e 00
$ semautil /i2c write_raw 2 0x71 2 0f 00
$ semautil /i2c write_raw 2 0x71 2 10 f0
$ semautil /i2c write_raw 2 0x71 2 11 00
```

Control LED

```
# set LED all on
$ sudo semautil /i2c write_raw 2 0x71 2 10 ff
$ sudo semautil /i2c write_raw 2 0x71 2 11 ff

# set LED column1 on
$ sudo semautil /i2c write_raw 2 0x71 2 10 ff
$ sudo semautil /i2c write_raw 2 0x71 2 11 00

# set LED column2 off
$ sudo semautil /i2c write_raw 2 0x71 2 10 f0
$ sudo semautil /i2c write_raw 2 0x71 2 11 0f

# set LED column3 on
$ sudo semautil /i2c write_raw 2 0x71 2 10 f0
$ sudo semautil /i2c write_raw 2 0x71 2 11 f0

# set LED all off
$ sudo semautil /i2c write_raw 2 0x71 2 10 f0
$ sudo semautil /i2c write_raw 2 0x71 2 11 00
```



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### 6.3.4 AVA-1000-iMX8MP_factory_yocto_2v1 ARM GPIO Test

#### 6.3.4.1 Test GPIO function

AVA-1000 ARM System, DIO Port plug-in DIO test fixture




Digital Input & Output

connect:

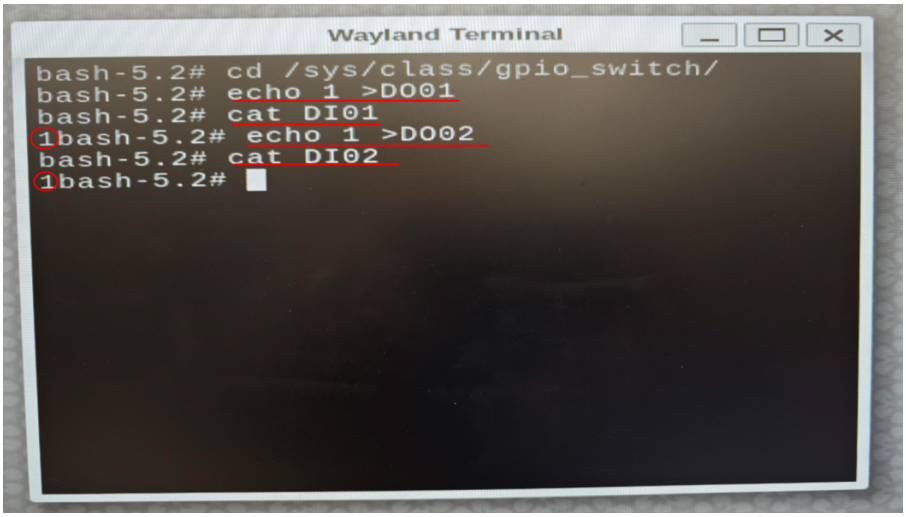
GPIO6<->GPIO10

GPIO7<->GPIO11

GPIO8<->GPIO12

GPIO9<->GPIO13

```
#cd /sys/class/gpio_switch/
#echo 1 > DO01
#echo 1 > DO02
#cat DI01
1
#cat DI02
1
```

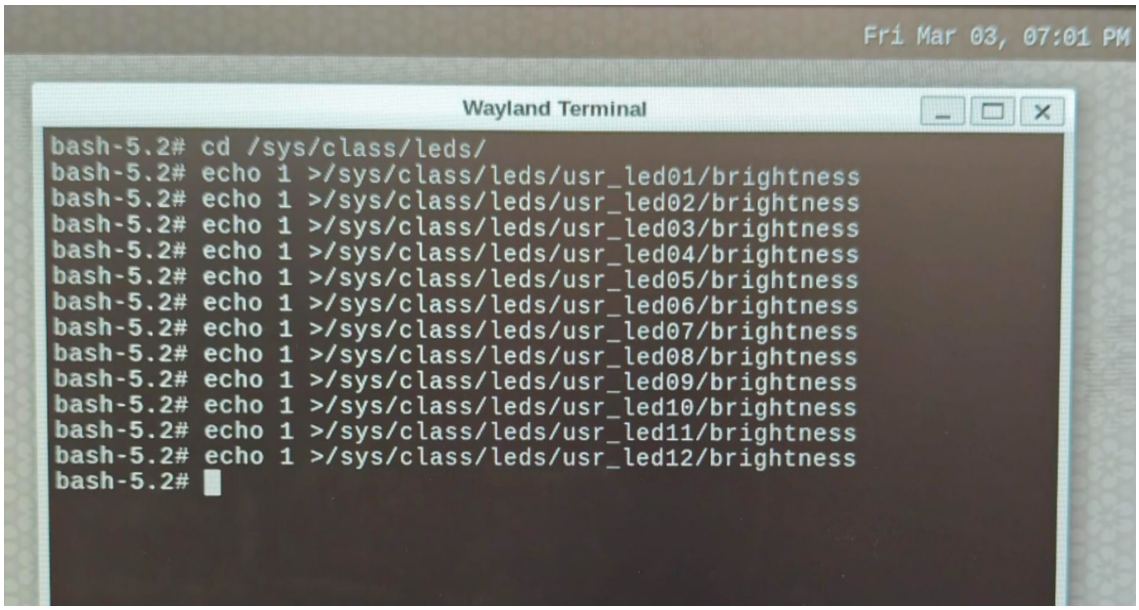



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### 6.3.5 Test LED function

**LED1~LED12 ON**

```
#cd /sys/class/ leds /
# echo 1 > /sys/class/leds/usr_led01/brightness
# echo 1 > /sys/class/leds/usr_led02/brightness
# echo 1 > /sys/class/leds/usr_led03/brightness
# echo 1 > /sys/class/leds/usr_led04/brightness
# echo 1 > /sys/class/leds/usr_led05/brightness
# echo 1 > /sys/class/leds/usr_led06/brightness
# echo 1 > /sys/class/leds/usr_led07/brightness
# echo 1 > /sys/class/leds/usr_led08/brightness
# echo 1 > /sys/class/leds/usr_led9/brightness
# echo 1 > /sys/class/leds/usr_led10/brightness
# echo 1 > /sys/class/leds/usr_led11/brightness
# echo 1 > /sys/class/leds/usr_led12/brightness
```



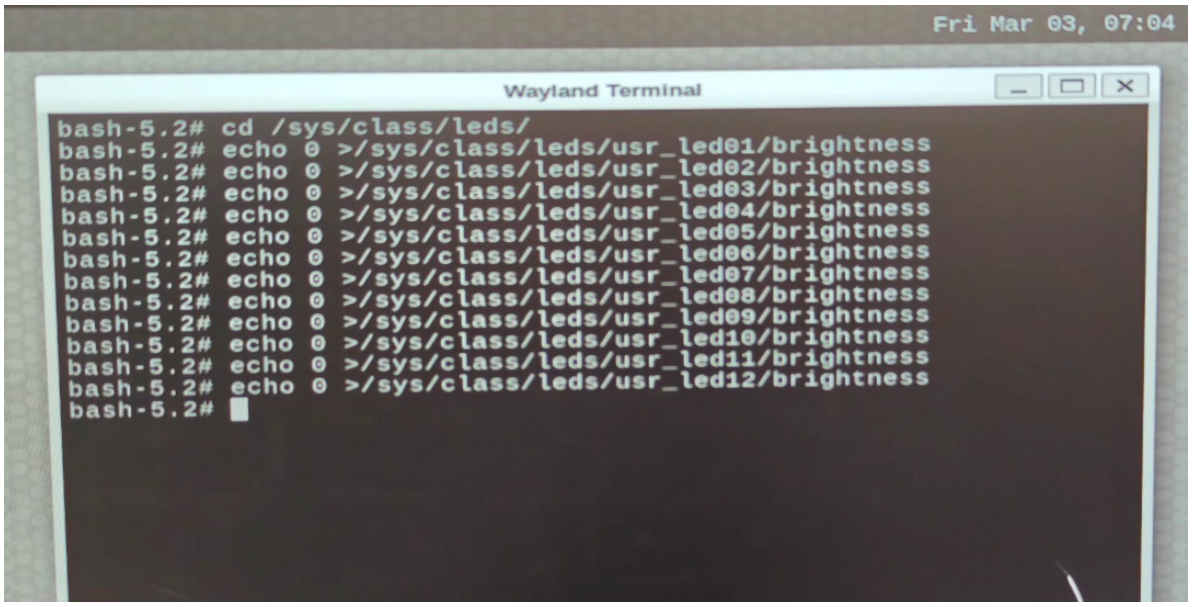





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**LED1~LED12 OFF**

```
#cd /sys/class/ leds /
# echo 0 > /sys/class/leds/usr_led01/brightness
# echo 0 > /sys/class/leds/usr_led02/brightness
# echo 0 > /sys/class/leds/usr_led03/brightness
# echo 0 > /sys/class/leds/usr_led04/brightness
# echo 0 > /sys/class/leds/usr_led05/brightness
# echo 0 > /sys/class/leds/usr_led06/brightness
# echo 0 > /sys/class/leds/usr_led07/brightness
# echo 0 > /sys/class/leds/usr_led08/brightness
# echo 0 > /sys/class/leds/usr_led9/brightness
# echo 0 > /sys/class/leds/usr_led10/brightness
# echo 0 > /sys/class/leds/usr_led11/brightness
# echo 0 > /sys/class/leds/usr_led12/brightness
```







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# 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.

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.

- 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.
- When installing/mounting or uninstalling/removing device; or when removal of a chassis cover is required for user servicing (See "Getting Started"):
  [> Turn off power and unplug any power cords/cables.
  [> Reinstall all chassis covers before restoring power.
- To avoid electrical shock and/or damage to device:
  [> Keep device away from water or liquid sources.
  [> Keep device away from high heat or humidity.
  [> Keep device properly ventilated (do not block or cover ventilation openings).
  [> Always use recommended voltage and power source settings.
  [> Always install and operate device near an easily accessible electrical outlet.
  [> Secure the power cord (do not place any object on/over the power cord) and connect it to a socket-outlet with earthing connection.
  [> Only install/attach and operate device on stable surfaces and/or recommended mountings.
- If the device will not be used for long periods of time, turn off and unplug from its power source.
- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools.
- A Lithium-type battery may be provided for uninterrupted backup or emergency power.

---

CAUTION:

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

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

---

- 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 equipment is not intended to be installed or used in a home, school, or public area accessible to the general population.
  [> The knurled thumb screws with slotted heads for each Node module should be tightened with a tool after both initial installation and subsequent use.
- It is recommended that the device be installed only in a server room or computer room where access is:
  [> Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefore, 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.
- Please use an approved power source certified by IEC or UL. If you need an adapter, optional accessories, or further assistance, please contact ADLINK for more information.

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

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

- 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*
- Lors de l'installation/montage ou de la désinstallation/retrait de l'appareil ; ou lorsque le retrait d'un boîtier est nécessaire pour l'entretien par l'utilisateur (voir Mise en route) :
  - Éteignez l'alimentation et débranchez tous les cordons/câbles d'alimentation.
  - Réinstallez tous les panneaux du boîtier avant de remettre l'alimentation sous tension.
- *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/au-dessus du cordon d'alimentation) et connectez-le à une prise de courant avec mise à la terre
- N'essayez jamais de réparer l'appareil, qui doit être réparé uniquement par du personnel technique qualifié *et utilisant des outils appropriés.*
  - *Lors de l'installation/montage ou de la désinstallation/retrait d'un périphérique, ou lorsque le retrait d'un couvercle de châssis est requis pour l'entretien par l'utilisateur :*
  - *Coupez l'alimentation et débranchez tous les cordons/câbles d'alimentation.*
- *Réinstallez tous les capots du châssis avant de rétablir l'alimentation. Installez/fixez et utilisez l'appareil uniquement sur des surfaces stables et/ou des supports recommandés.*
- *Si l'appareil n'est pas utilisé pendant une longue période, éteignez-le et débranchez-le de sa source d'alimentation.*
- *Une batterie de type lithium peut être fournie pour une alimentation de secours ou de secours ininterrompue.*

  - *L'appareil doit être réparé par des techniciens agréés lorsque :*
  - *Le cordon d'alimentation ou la fiche est endommagé.*
  - *Du liquide est entré dans l'appareil. € L'appareil a été exposé à une humidité élevée et/ou à l'humidité.*
  - *L'appareil ne fonctionne pas ou ne fonctionne pas conformément au manuel de l'utilisateur.*

- *L'appareil est tombé et/ou a été endommagé et/ou présente des signes évidents de casse.*
- *Débranchez le cordon d'alimentation avant de desserrer les vis moletées et fixez toujours les vis moletées avec un tournevis avant de démarrer le système.*
  - *L'équipement n'est pas destiné à être installé ou utilisé dans une maison, une école ou une zone publique accessible au grand public.*
  - *Les vis à molette avec têtes fendue pour chaque module Node doivent être serrées avec un outil après l'installation initiale et lors de l'utilisation suivante.*
- *Il est recommandé d'installer l'appareil uniquement dans une salle de serveurs ou une salle informatique dont l'accès est :*

  - *Réservé au personnel de service qualifié ou aux utilisateurs familiers avec les restrictions appliquées à l'emplacement, les raisons de celles-ci et les précautions requises.*
  - *Autorisé uniquement par l'utilisation d'un outil ou d'une serrure et d'une clé, ou d'autres moyens de sécurité, et contrôlé par l'autorité responsable du lieu.*

*Veuillez utiliser une source d'alimentation approuvée et certifiée par la norme IEC ou UL. Si vous avez besoin d'un adaptateur, d'accessoires en option ou d'une assistance supplémentaire, veuillez contacter ADLINK pour plus d'informations.*

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# Getting Services

**Ask an Expert:** https://www.adlinktech.com/en/Askanexpert

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Fax: +886-3-328-5723
Email: service@adlinktech.com

**Ampro ADLINK Technology, Inc.**
Address: 6450 Via Del Oro, San Jose, CA 95119-1208, USA
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Toll Free: +1-800-966-5200 (USA only)
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Email: emea@adlinktech.com

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