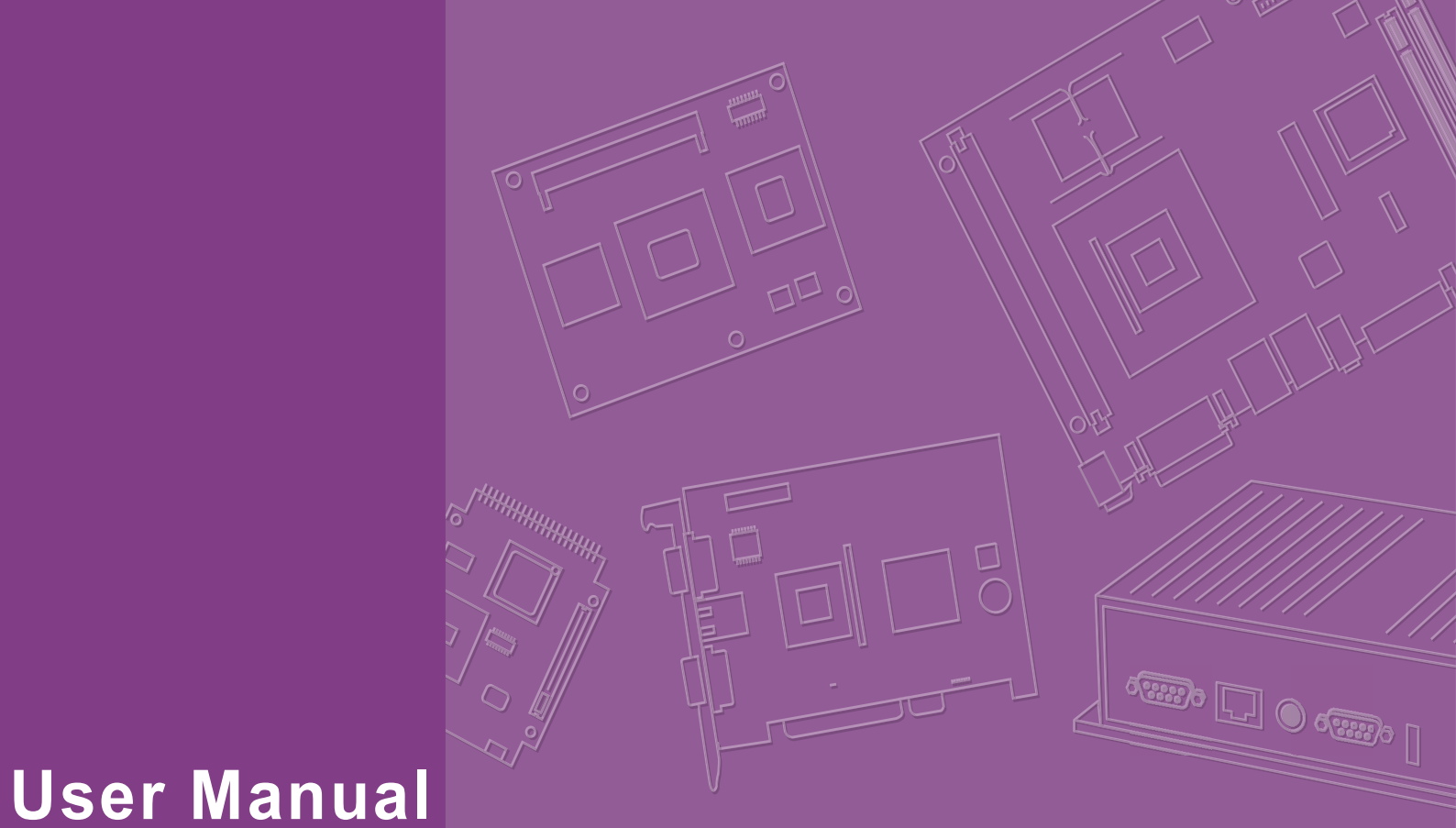




User Manual

AFE-R750/ASR-A701

ADVANTECH

Enabling an Intelligent Planet

Attention!

This product contains a hard copy of the Chinese user manual for China CCC certification purposes. A PDF of the English user manual is included on the accompanying CD. Please disregard the hard copy Chinese user manual if the product is not sold and/or installed in China.

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Product Warranty (2 Years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

FCC Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Warnings, Cautions, and Notes

Warning! *Warnings indicate conditions that could cause personal injury if not observed!*



Caution! *Cautions are included to help prevent hardware damage and data loss. For example,*



“Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.”

Note! *Notes provide additional and/or optional information.*



Packing List

Before you begin installing your card, please make sure that the following materials have been shipped:

- 1 x AFE-R750 unit
- 1 x Mounting kit
- 1 x China RoHS
- 1 x Simplified Chinese Startup Manual
- 1 x Terminal block*

*Wiring must be installed by a qualified professional.

Ordering Information

Part Number	Description
AFE-R750-X0A1U	NVIDIA AGX Orin inference barebone system
AFE-R750-M0A1U	NVIDIA Orin NX inference barebone system
AFE-R750-X1A1U	NVIDIA AGX Orin inference system with 64GB memory
AFE-R750-X2A1U	NVIDIA AGX Orin inference system with 32GB memory
AFE-R750-M1A1U	NVIDIA Jetson Orin NX inference system with 16GB memory + 128GB NVME
ASR-A701-X0A1U	Carrier Board for NVIDIA AGX Orin
ASR-A701-M0A1U	Carrier Board for NVIDIA Orin NX

Optional Accessories

Optional Items for the Default SKU

Part Number	Description
968DD00269	NVIDIA AGX Orin 64GB Module for Carrier Board/Barebone System
968DD00255	NVIDIA AGX Orin 32GB Module for Carrier Board/Barebone System
968DD00538	NVIDIA Orin NX 16GB Module for Carrier Board/Barebone System
96PSA-A230W24P4-3*	AC to DC adapter, DC 24V 230W, -20 ~ 60°C
1702002600	Power cord UL 3P 10A 125V 183 cm (US)
1702002605	Power cord EU 3P 2.5A 250V 183 cm (EU)
1702031801	Power cord BSI 3P 2.5A 250V 183 cm (UK)
1700000237	Power cable, 3-pin 183cm, PSE type
AFE-RM04-4PA1	MAX96712, 4ports GMSL for Orin NX
AFE-RM04-8PA1	MAX96712, 8ports GMSL for AGX Orin

*The equipment power supply cord shall be connected to a socket-outlet with earthing connection.

For power supply connection use wires suitable for at least 75 degree C.

It is suitable for 24~12AWG, torque value 4.4lb-in user copper conductors only.

Must be installed by skilled person.

The terminal block uses two sets of interfaces to make it split to meet the maximum current limit, and a single pin will be limited below 6A.

Optional Items for the Expansion Kit

Part Number	Description
AMK-A0057	Fan kit for AFE-R750

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated the equipment.
 - The equipment has been exposed to moisture.
 - The equipment is malfunctioning, or does not operate according to the user manual.
 - The equipment has been dropped and damaged.
 - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -40°C (-40°F) or above 85°C (185°F) as this may damage the components. The equipment should be kept in a controlled environment.
16. Any unverified component may cause unexpected damage. To ensure correct installation, always use the components (e.g., screws) provided in the accessory box.
17. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
18. Always disconnect the power cord from the chassis before manually handling the hardware. Do not implement connections or configuration changes while the device is powered on. Sudden power surges may damage sensitive electronic components.
19. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position should not exceed 70 dB (A).
20. DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.
21. This product is intended to be supplied by a UL-Listed power Adapter, or DC power source rated: 20-28 Vdc, 12.03-8.64A min, Tma= 50°C min. (for AGX

Orin); 55°C min. (for Orin NX), Altitude: 2000 m maximum. If you need further assistance, please contact Advantech for further information

22. RESTRICTED ACCESS AREA: The equipment should only be installed in a Restricted Access Area.

Consignes de Sécurité

1. Veuillez lire attentivement ces instructions de sécurité.
2. Veuillez conserver ce manuel de l'utilisateur pour référence ultérieure.
3. Veuillez débrancher cet équipement de la prise secteur avant le nettoyage. Utilisez un chiffon humide. Ne pas utiliser de détergent liquide ou pulvérisé pour le nettoyage. Utilisez une feuille ou un chiffon humide pour le nettoyage.
4. Pour les équipements enfichables, la prise de courant doit être à proximité de l'équipement et doit être facilement accessible.
5. S'il vous plaît garder cet équipement de l'humidité.
6. Posez cet équipement sur une surface fiable lors de l'installation. Une chute ou une chute pourrait causer des blessures.
7. Les ouvertures sur le boîtier sont destinées à la convection d'air, protégeant ainsi l'équipement de la surchauffe. **NE COUVREZ PAS LES OUVERTURES.**
8. Au moyen d'un cordon d'alimentation connecté à une prise de courant avec mise à la terre.
9. Placez le cordon d'alimentation de sorte que personne ne puisse marcher dessus. Ne placez rien sur le cordon d'alimentation.
10. Tous les avertissements et mises en garde sur l'équipement doivent être notés.
11. Si l'appareil n'est pas utilisé pendant une longue période, débranchez-le du secteur pour ne pas être endommagé par une surtension transitoire.
12. Ne jamais verser de liquide dans les ouvertures de ventilation; Cela pourrait provoquer un incendie ou un choc électrique.
13. N'ouvrez jamais l'équipement. Pour des raisons de sécurité, seul le personnel de maintenance qualifié doit ouvrir l'équipement.
14. Si l'une des situations suivantes se présente, faites vérifier le matériel par le personnel de service:
 - Le cordon d'alimentation ou la fiche est endommagé.
 - Un liquide a pénétré dans l'appareil.
 - L'équipement a été exposé à l'humidité.
 - L'équipement ne fonctionne pas bien ou vous ne pouvez pas le faire fonctionner conformément au manuel d'utilisation.
 - Equipment L'équipement est tombé et a été endommagé.
 - Equipment L'équipement présente des signes évidents de rupture.
15. Ne laissez pas cet équipement dans un environnement où la température de stockage peut être inférieure à -40°C (-40°F) ou supérieure à 85°C (185°F). Cela pourrait endommager l'équipement. L'équipement doit être dans un environnement contrôlé.
16. Tout composant non vérifié peut causer des dommages inattendus. Pour garantir une installation correcte, veuillez toujours utiliser les composants (ex. Vis) fournis avec la boîte d'accessoires.
17. **ATTENTION:** L'ordinateur est équipé d'un circuit d'horloge temps réel alimenté par batterie. Il y a un risque d'explosion si la batterie est remplacée de manière incorrecte. Remplacez uniquement avec le même type ou un type équivalent recommandé par le fabricant. Jetez les piles usagées conformément aux instructions du fabricant.

18. Débranchez toujours complètement le cordon d'alimentation de votre châssis lorsque vous utilisez du matériel. Ne faites pas de connexion quand l'appareil est sous tension. Les composants électroniques sensibles peuvent être endommagés par des surtensions soudaines.
19. Niveau de pression acoustique au poste de l'opérateur selon la norme CEI 704-1: 1982 n'est pas supérieur à 70 dB (A).
20. **AVERTISSEMENT:** Cet ensemble d'instructions est donné conformément à la norme CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans ce.
21. Ce produit est destiné à être alimenté par un adaptateur secteur répertorié UL ou une source d'alimentation CC, évalué: 20-28 Vdc, 12.03-8.64A, Tma = 50 degrés C, si besoin d'assistance supplémentaire, veuillez contacter Advantech pour plus d'informations
22. **ZONE D'ACCES RESTREINTE:** L'équipement ne doit être installé que dans une zone d'accès restreint.

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Chapter 1

General Information

1.1 Introduction

Advantech's ASR-A701/AFE-R750 is a high-end robotic controller series powered by NVIDIA Jetson AGX Orin, featuring compact dimensions: single board 170 x 170 mm, system 177 x 174 x 60/80 mm. The ASR-A701/AFE-R750 delivers up to 275 TOPS of AI computing performance for AMR AI control and supports the Advantech Robotic Suite, offering a fast development platform for customers building robotic applications.

1.2 Specifications

1.2.1 General

Table 1.1: General

	AFE-R750-M0A1U AFE-R750-M1A1U ASR-A701-M0A1U	AFE-R750-X0A1U AFE-R750-X1A1U AFE-R750-X2A1U ASR-A701-X0A1U
NVIDIA Jetson Series (Optional)	Orin NX 16GB(Optional)	AGX Orin 32GB/64GB
CPU	8-core NVIDIA Arm® Cortex A78AE v8.2	8-/12-core NVIDIA Arm® Cortex A78AE v8.2
GPU	1024-core NVIDIA Ampere GPU with 32 Tensor Cores Maximum Operating Frequency: 918MHz	1792-/2048-core NVIDIA Ampere GPU with 56/64 Tensor Cores, Maximum Operating Frequency: 930MHz/1.3GHz
Memory	16GB 256-bit LPDDR5	32/64GB 256-bit LPDDR5
Storage	NA	64GB eMMC 5.1
Ethernet	4 x 1GbE*	4 x 2.5GbE
Serial Port	2 x RS-232/422/485	2 x RS-232/422/485
CAN Bus	1 x isolated CANFD (supports 1Mbps or 2Mbps)	2 x isolated CANFD (supports 1Mbps or 2Mbps)
DIO	16-bit isolated DIO	16-bit Isolated DIO
USB Type A	4 x USB 3.2 Gen 2	4 x USB 3.2 Gen 2
USB Type C	1 x USB 3.2 Gen 2 (for system recovery only)	1 x USB 3.2 Gen 2 (for system recovery only)
Expansion	1 x M.2 2280/3042/3052 B-Key 1 x M.2 2230 E-Key GMSL 4 x FAKRA (optional)	1 x M.2 2280/3042/3052 B-Key 1 x M.2 2230 E-Key GMSL 8 x FAKRA (optional) IMU (optional with AFE-RM04-8PA1)

*When the customer uses ethtool, it will show support for 2.5G, but due to the bandwidth limitation of Orin NX, the actual maximum speed will be only 1G.

1.2.2 Display

- **Resolution:** 1 x HDMI 2.0 (Max. resolution 3840 x 2160 @ 24Hz)

1.2.3 Ethernet

- **Chipset:** Intel® i226
- **Speed:** 10/100/1000/2500 Mbps (AGX), 10/100/1000 Mbps (NX)
- **Interface:** 4 x RJ-45

1.2.4 I/O Ports and Expansion

- 1 x HDMI 2.0 max. 3840 x 2160 @ 60Hz
- 4 x USB 3.2 Gen 2 Type A
- 1 x 16-bit DI/DO (DB25 connector)
- 2 x RS-232/RS-422/RS-485
- 2 x CAN bus (isolated CANFD)
- 1 x OTG Type C USB (Recovery Only)
- 1 x M.2 2230 E-Key
- 1 x M.2 2280 B-Key

1.2.5 CPU

- **AFE-R750-M0A1U:** N/A (Barebone)
- **AFE-R750-M1A1U:** 8-core NVIDIA Arm® Cortex A78AE v8.2
- **ASR-A701-M0A1U:** 8-core NVIDIA Arm® Cortex A78AE v8.2
- **AFE-R750-X0A1U:** N/A (Barebone)
- **AFE-R750-X1A1U:** 8-/12-core NVIDIA Arm® Cortex A78AE v8.2
- **AFE-R750-X2A1U:** 8-/12-core NVIDIA Arm® Cortex A78AE v8.2
- **ASR-A701-X0A1U:** 8-/12-core NVIDIA Arm® Cortex A78AE v8.2

1.2.6 GPU

- **AFE-R750-M0A1U:** N/A (Barebone)
- **AFE-R750-M1A1U:** 1024-core NVIDIA Ampere GPU with 32 Tensor Cores
- **ASR-A701-M0A1U:** 1024-core NVIDIA Ampere GPU with 32 Tensor Cores
- **AFE-R750-X0A1U:** N/A (Barebone)
- **AFE-R750-X1A1U:** 1792-/2048-core NVIDIA Ampere GPU with 56/64 Tensor Cores
- **AFE-R750-X2A1U:** 1792-/2048-core NVIDIA Ampere GPU with 56/64 Tensor Cores
- **ASR-A701-X0A1U:** 1792-/2048-core NVIDIA Ampere GPU with 56/64 Tensor Cores

1.3 Mechanical Specifications

1.3.1 System Dimensions (AGX Orin)

- AFE-R750 (AGX Orin), 177 x 174 x 80 mm
- AFE-R750-X0A1U / AFE-R750-X1A1U / AFE-R750-X2A1U

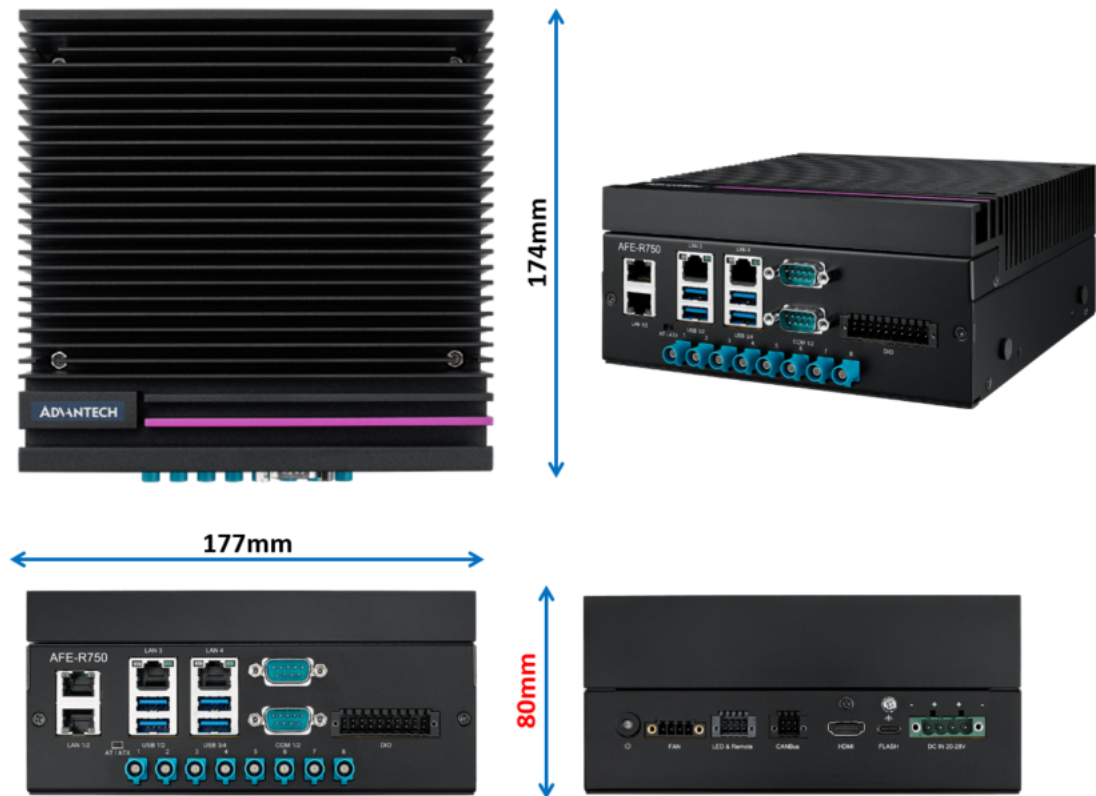


Figure 1.1 System Dimensions (AGX Orin)

1.3.2 System Dimensions (Orin NX)

- AFE-R750 (Orin NX), 177 x 174 x 60 mm
- AFE-R750-X0A1U / AFE-R750-M1A1U / AFE-R750-X1A1U / AFE-R750-X2A1U

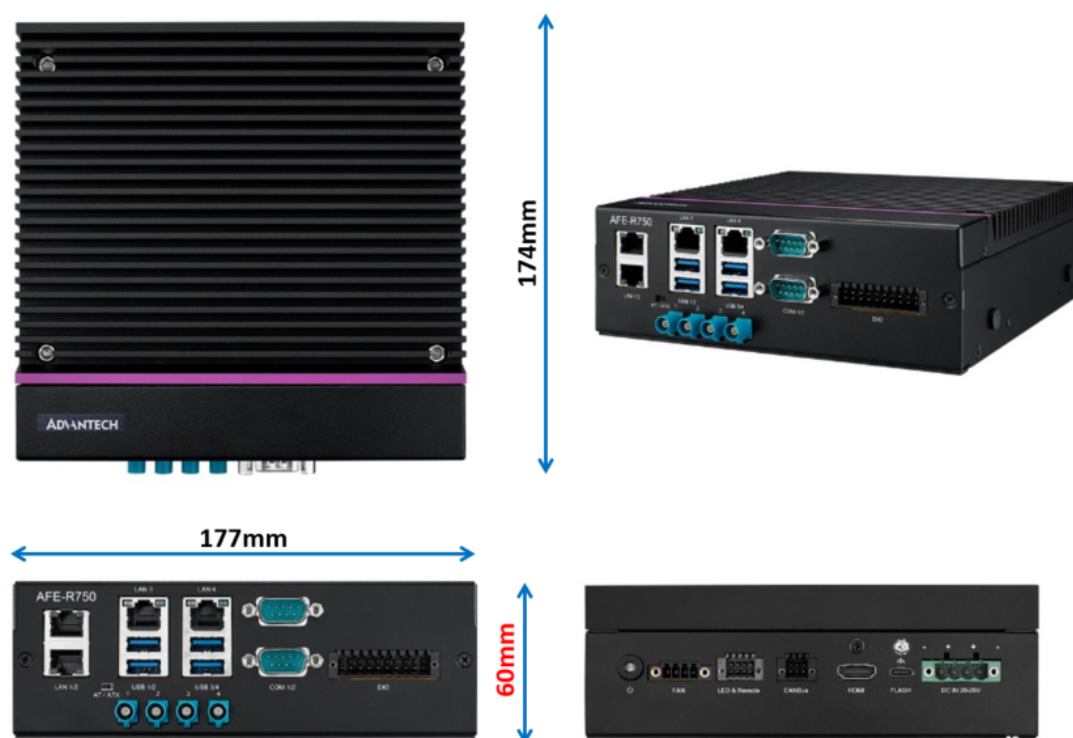


Figure 1.2 System Dimensions (Orin NX)

Note! The AFE-R750 has a different height of the top cover for different SKUs. For AFE-R750-X0A1U / AFE-R750-X1A1U / AFE-R750-X2A1U, the top cover P/N is 1960118505T001. For AFE-R750-M0A1U / AFE-R750-M1A1U, the top cover P/N is 1960118506T001.

1.3.3 Weight of the System

Table 1.2: Weight of the System		
Part Number	Module	Weight (System Only)
AFE-R750-X0A1U	AGX Orin	2.36 kg
AFE-R750-X1A1U	AGX Orin	2.66 kg
AFE-R750-X2A1U	AGX Orin	2.66 kg
AFE-R750-M0A1U	Orin NX	1.8 kg
AFE-R750-M1A1U	Orin NX	1.83 kg

1.4 Power Requirements

1.4.1 System Power

- Power supply voltage: 20~28V
- Power type: ATX/AT mode, ATX default

1.5 Environmental Specifications

1.5.1 Operating Temperature Range

- AFE-R750-X0A1U / AFE-R750-X2A1U/ASR-A701-X0A1U -10 ~ 55°C with 0.7m/s airflow
- AFE-R750-X1A1U / -10 ~ 50°C with 0.7m/s airflow*
- AFE-R750-M0A1U/AFE-R750-M1A1U/ASR-A701-M0A1U -10 ~ 55°C with 0.7m/s airflow

1.5.2 Relative Humidity

- 95% @ 40°C (104°F) (non-condensing)

1.5.3 Storage Temperature

- -40 ~ 60°C

1.5.4 Vibration Tolerance

- When the system is equipped with an M.2 SSD: 3 Grms, IEC 60068-2-64, random, 5 ~ 500 Hz, 1 hr/axis, (x, y, z) 3 axes

1.5.5 Shock Tolerance

- When the system is equipped with an M.2 SSD: 30 G, IEC 60068-2-27, half-sine, 11 ms duration

1.5.6 Safety Certification

- CB-IEC62368-1 2nd / CB-IEC62368-1 3rd / UL- UL62368-1 3rd

1.5.7 EMC Certification

- CE, FCC Class B and BSMI

Note! *This temperature is based on tests with fan kit (P/N: AMK-A0057). Without fan kit (P/N: AMK-A0057), actual operating temperature may vary with environment and test conditions.*



Chapter 2

Hardware Installation

This chapter details instructions for installing hardware and external I/O on the board for the ASR-A701.

2.1 Introduction

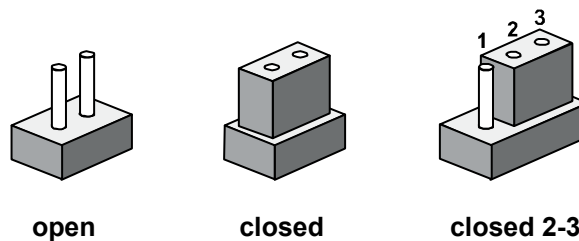
The AFE-R750 is the control system and works with the ASR-A701 control board.

The following sections demonstrate the internal jumper settings and the external connector pin assignments on the ASR-A701 board.

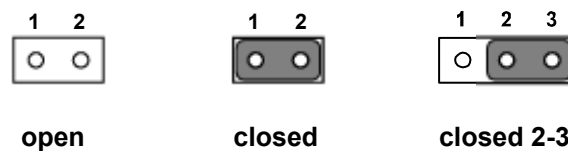
2.2 Jumpers

2.2.1 Jumper Description

The ASR-A701 can be configured to satisfy specific application requirements by setting jumpers. A jumper is a metal bridge used to close an electric circuit. 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, connect the pins with the clip. To open a jumper, remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. For these jumpers, connect either pins 1 and 2, or 2 and 3.



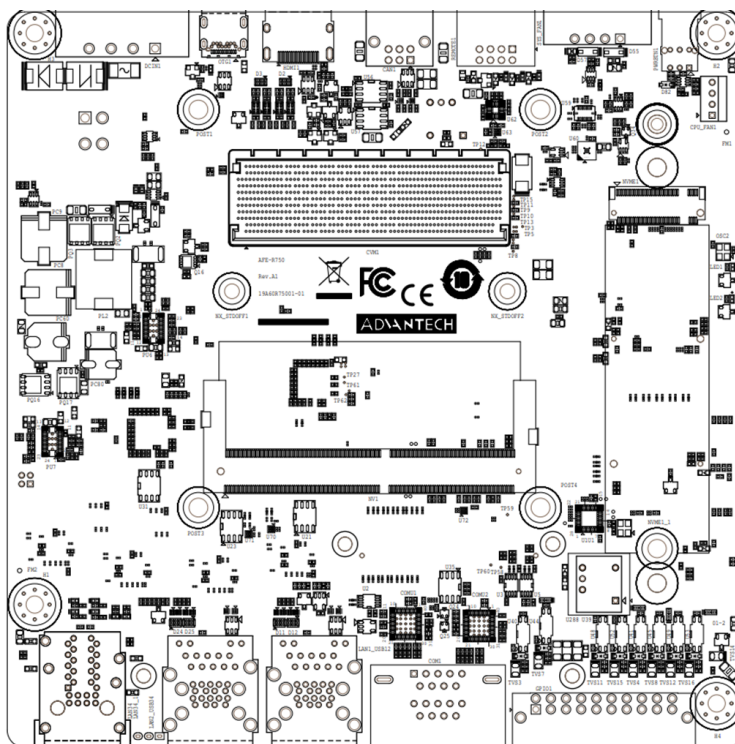
The jumper settings are schematically diagrammed in this manual as follows:



A pair of needle-nose pliers may be necessary when working with jumpers. Users with concerns regarding the ideal hardware configuration for your application should contact your local distributor or sales representative before making any changes. Usually, only a standard cable is required to make most connections.

2.2.2 Jumper List

■ TOP SIDE of the ASR-A701



■ BOTTOM SIDE of the ASR-A701

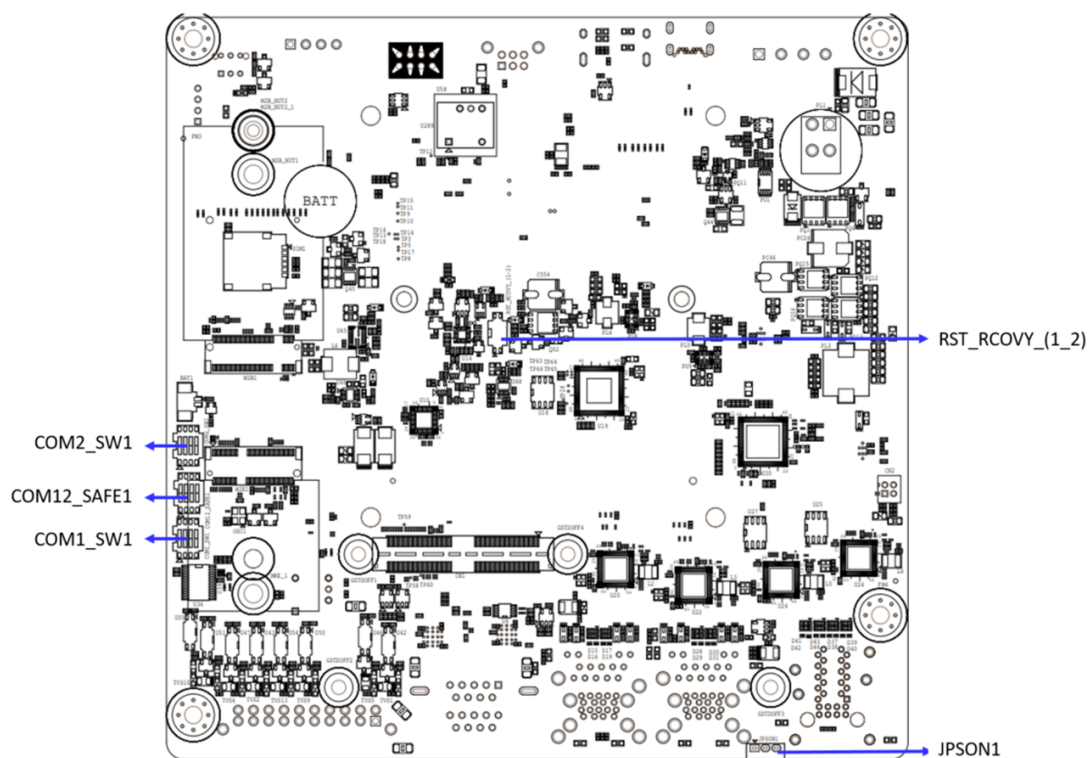
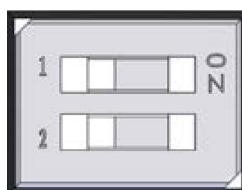


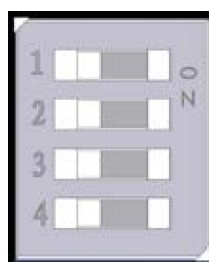
Table 2.1: Jumper Settings

Location	Function
RST_RCOVY_(1_2)	System reset and system image recovery
COM12_SAFE1	Fail safe
COM1_SW1	COM1 SW RS232/422/485 mode selection
COM2_SW1	COM2 SW RS232/422/485 mode selection
PWRBTN1	System power button

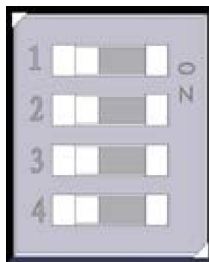
2.2.3 Jumper and Connector Locations

**Table 2.2: Reset and Recovery Switch**

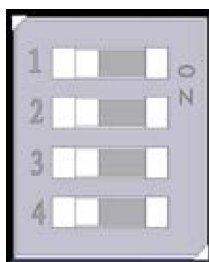
	Mode/Description	Pin1	Pin2
RST_RCOVY_(1_2) Setting	Reset Device	ON: Enable OFF: Disable (Default)	
	Recovery Device	-	ON: Enable OFF: Disable (Default)

**Table 2.3: COM Port Failsafe Function Selection**

	Mode/Description	Pin1	Pin2	Pin3	Pin4
COM12_SAFE1 Setting	Default	OFF	OFF	OFF	OFF
	COM1 RS485_TX/RX external pull high / RS422_TX/RX external GND	-	-	ON	ON
	COM2 RS485_TX/RX external pull high / RS422_TX/RX external GND	ON	ON	-	-

**Table 2.4: COM1 Port Mode Selection**

	Mode/Description	Pin1	Pin2	Pin3	Pin4
COM1_SW1 (COM1) Setting	RS-232 (Default)	OFF	OFF	OFF	OFF
	RS-422	ON	OFF	OFF	OFF
	RS-422 (Enable Termination Resistor)	ON	OFF	ON	OFF
	RS-485 (Software flow control)	ON	ON	OFF	ON
	RS-485 (Enable Termination Resistor)	ON	ON	ON	OFF
	RS-485 (Enable Termination Resistor)	ON	ON	ON	ON
	Loopback	OFF	ON	OFF	OFF

**Table 2.5: COM2 Port Mode Selection**

	Mode/Description	Pin1	Pin2	Pin3	Pin4
COM2_SW1 (COM2) Setting	RS-232 (Default)	OFF	OFF	OFF	OFF
	RS-422	ON	OFF	OFF	OFF
	RS-422 (Enable Termination Resistor)	ON	OFF	ON	OFF
	RS-485 (Software flow control)	ON	ON	OFF	ON
	RS-485 (Enable Termination Resistor)	ON	ON	ON	OFF
	RS-485 (Enable Termination Resistor)	ON	ON	ON	ON
	Loopback	OFF	ON	OFF	OFF

2.3 Connectors

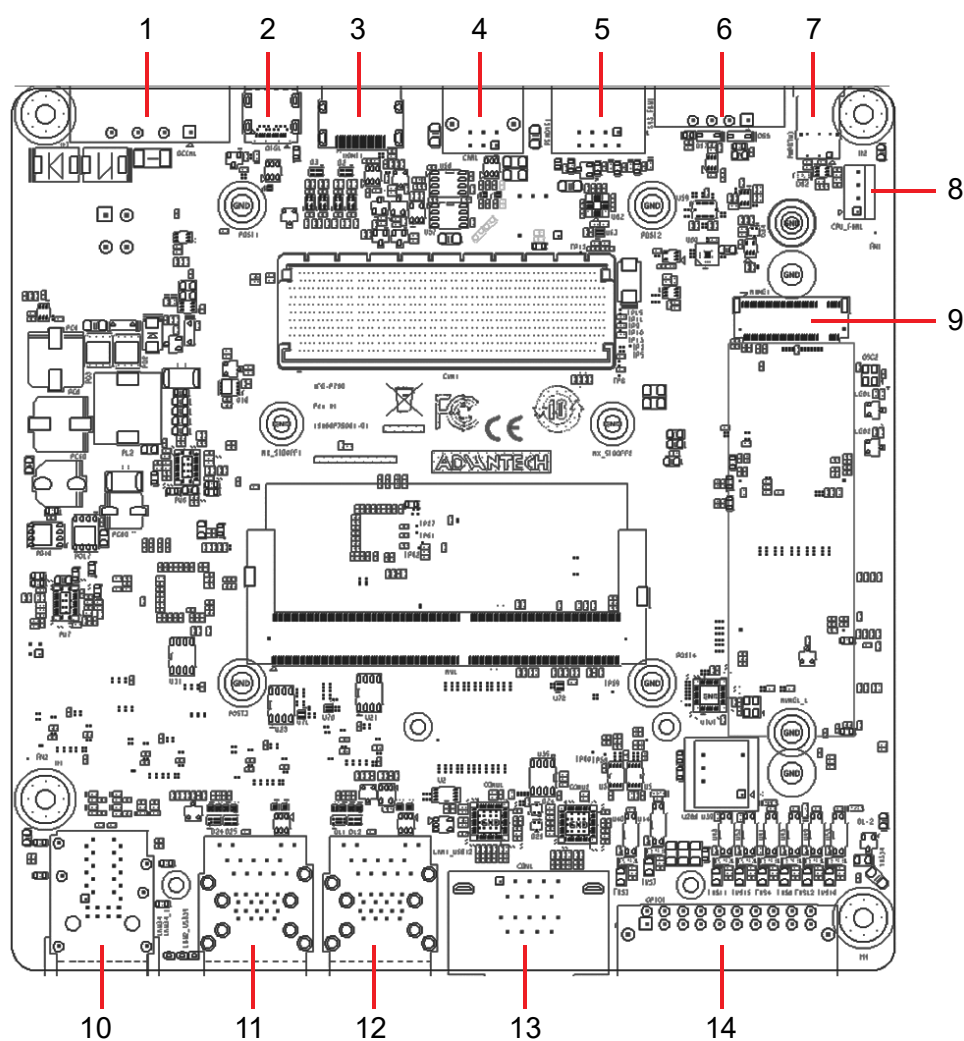


Figure 2.1 Top Layer Overview

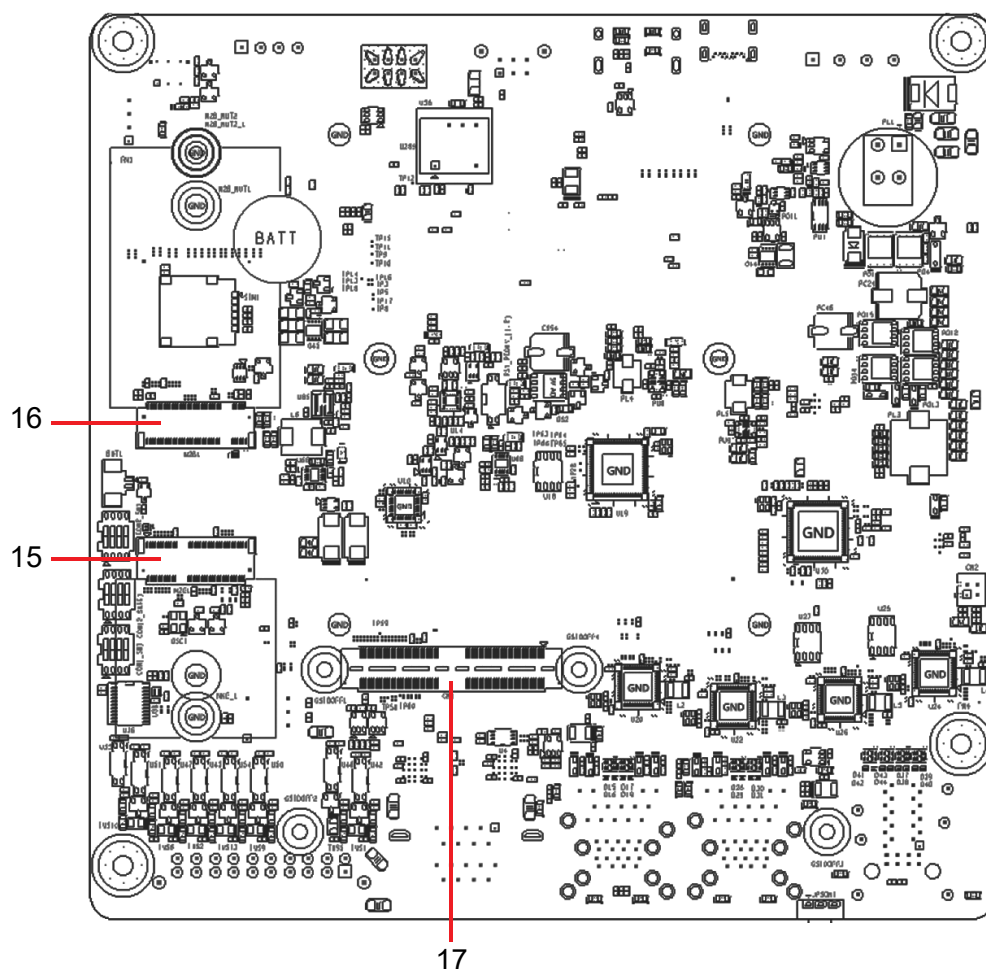


Figure 2.2 Bottom Layer Overview:

Table 2.6: Connector

Item	Description	Part Reference
1	DC IN power connector	DCIN1
2	TYPE-C (flash image Recovery mode)	OTG1
3	HDMI display	HDMI1
4	CAN BUS	CAN1
5	Remote conn	REMOTE1
6	FAN CONN I/O	SYS_FAN1
7	power button	PWRBTN1
8	FAN CONN internal	CPU_FAN1
9	M.2 M-KEY Connector	NVME1
10	LAN CONN	LAN1/2
11	RJ-45 + USB 3.2 Gen2 stack connector	LAN3_USB12
12	RJ-45 + USB 3.2 Gen2 stack connector	LAN4_USB34
13	COM PORT	COM12
14	GPIO 16-bit isolation CONN I/O	GPIO1
15	M.2 E-KEY Connector	M2E1
16	M.2 B-KEY Connector	M2B1
17	GMSL MIPI-120PIN Connector	CN1

2.3.1 DC IN Power Connector (DCIN1)

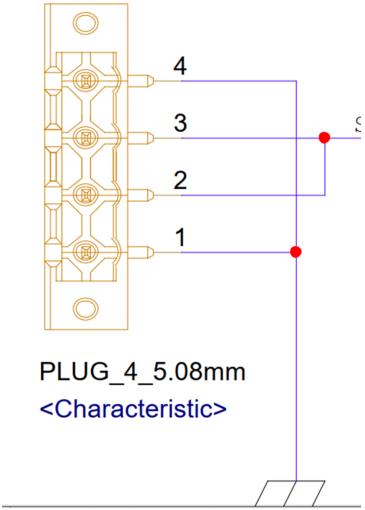


Table 2.7: DC IN Power Connector (DCIN1)

Pin	Signal
1	GND
2	ADAPTER VOLTAGE
3	ADAPTER VOLTAGE
4	GND

2.3.2 TYPE-C (Recovery Mode Only) (OTG1)

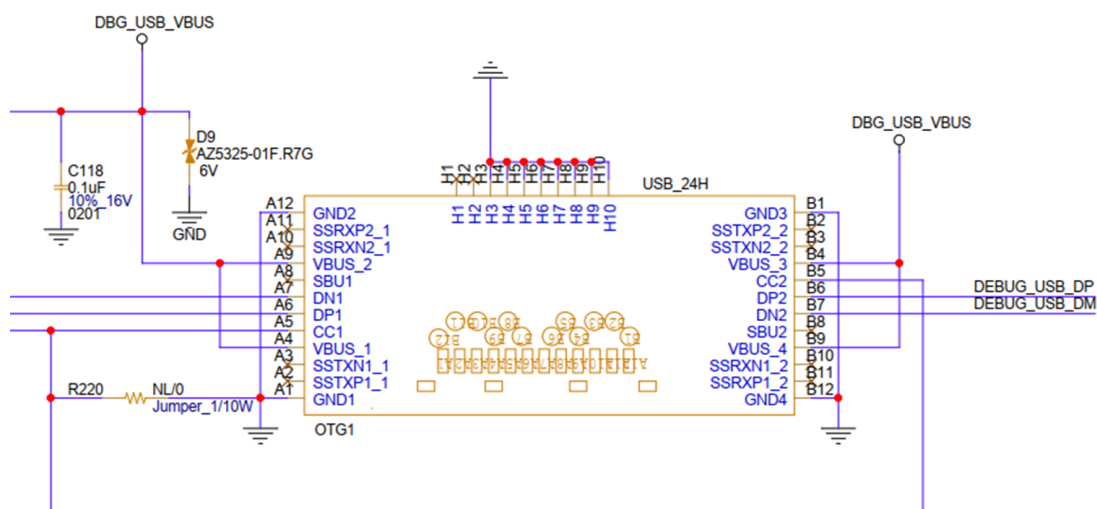


Table 2.8: TYPE-C (Recovery Mode Only) (OTG1)

Type-C Receptacle A Pin Layout		
Pin	Signal	Description
A1	GND	Ground return
A2	SSTXp1	N/A
A3	SSTXn1	N/A
A4	VBUS	Bus power
A5	CC1	OTG_ID (none used)
A6	Dp1	DEBUG_USB_DP
A7	Dn1	DEBUG_USB_DM
A8	SBU1	Sideband use (SBU)
A9	VBUS	Bus power
A10	SSRXn2	N/A
A11	SSRXp2	N/A
A12	GND	Ground return
Type-C Receptacle B Pin Layout		
Pin	Signal	Description
B12	GND	Ground return
B11	SSTXp1	N/A
B10	SSTXn1	N/A
B9	VBUS	Bus power
B8	SBU2	Sideband use (SBU)
B7	Dn2	DEBUG_USB_DM
B6	Dp2	DEBUG_USB_DP
B5	CC2	Configuration channel
B4	VBUS	Bus power
B3	SSRXn2	N/A
B2	SSRXp2	N/A
B1	GND	Ground return

2.3.3 HDMI Display (HDMI1)

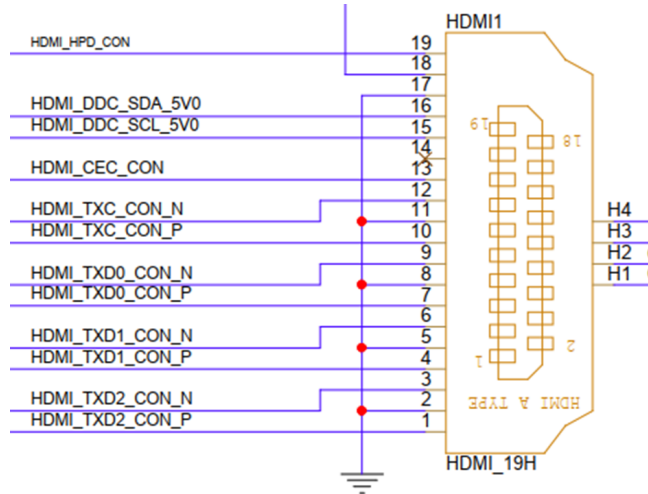


Table 2.9: HDMI Display (HDMI1)

Pin	Signal
1	HDMI_TXD2_CON_P
2	GND
3	HDMI_TXD2_CON_N
4	HDMI_TXD1_CON_P
5	GND
6	HDMI_TXD1_CON_N
7	HDMI_TXD0_CON_P
8	GND
9	HDMI_TXD0_CON_N
10	HDMI_TXC_CON_P
11	GND
12	HDMI_TXC_CON_N
13	HDMI_CEC_CON
14	NC
15	HDMI_DDC_SCL_5V0
16	HDMI_DDC_SDA_5V0
17	GND
18	VDD_5V0_HDMI_CON
19	HDMI_HPD_CON

NC represents "No Connection".

2.3.4 CAN Bus (CAN1)

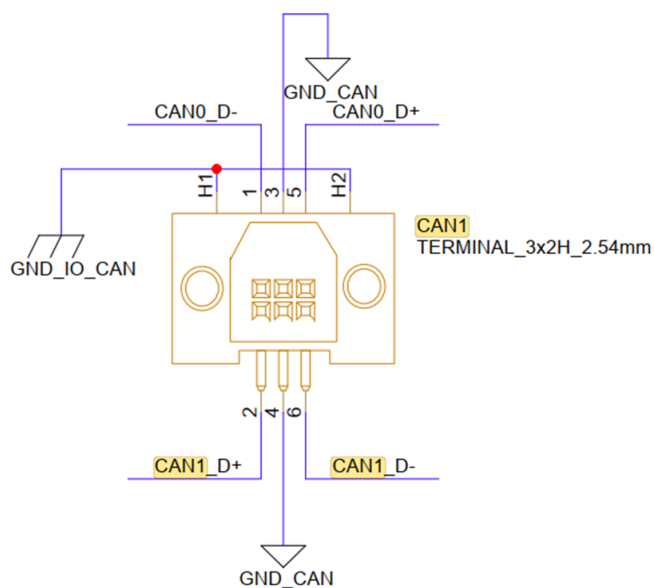


Table 2.10: CAN Bus (CAN1)

Pin	Signal
1	CAN0_D-
2	CAN1_D+
3	GND
4	GND
5	CAN0_D+
6	CAN1_D-

2.3.5 REMOTE CONN (REMOTE1)

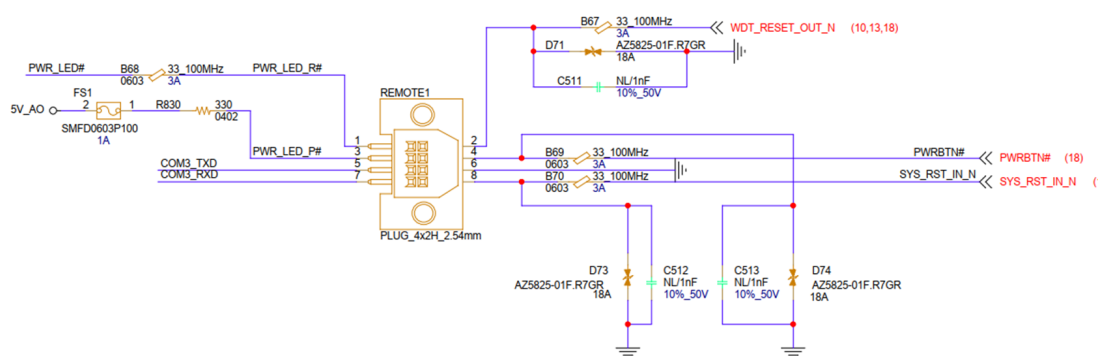


Table 2.11: REMOTE CONN (REMOTE1)

Pin	Signal
1	Power LED
2	WDT
3	PWR_LED_P#
4	Power Button
5	COM3_TXD
6	GND
7	COM3_RXD
8	Reset

2.3.6 FAN CONN I/O (SYS_FAN1)

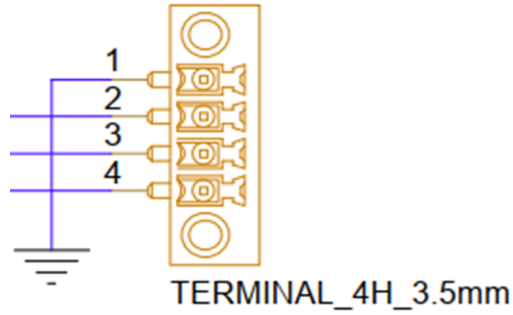


Table 2.12: FAN CONN I/O (SYS_FAN1)

Pin	Signal
1	GND
2	12V
3	SYS_FAN_TACH
4	FAN_PWM_D1

2.3.7 FAN CONN Internal (CPU_FAN1)

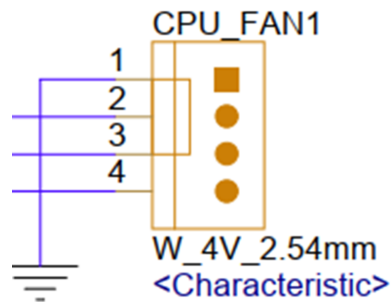


Table 2.13: FAN CONN Internal (CPU_FAN1)

Pin	Signal
1	GND
2	12V
3	CPU_FAN_TACH
4	FAN_PWM_D2

2.3.8 M.2 M-Key Connector (NVME1)

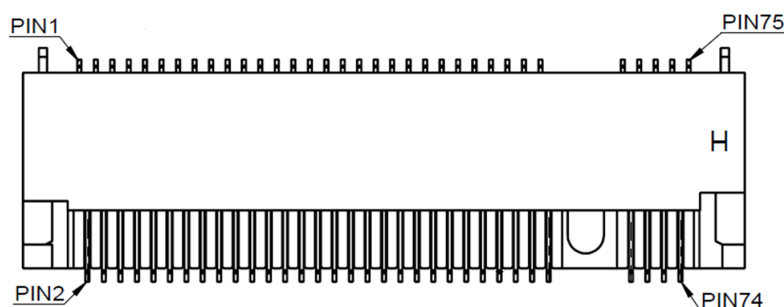


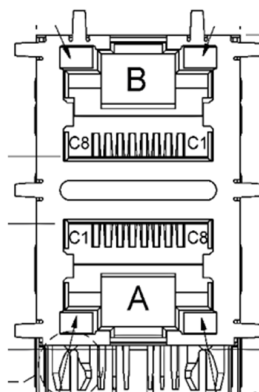
Table 2.14: M.2 M-Key Connector (NVME1)

Pin	Signal	Pin	Signal
1	GND	2	VDD_3V3
3	GND	4	VDD_3V3
5	PCIE_M2M_RX3_N	6	N/C
7	PCIE_M2M_RX3_P	8	N/C
9	GND	10	N/C
11	PCIE_M2M_TX3_N	12	VDD_3V3
13	PCIE_M2M_TX3_P	14	VDD_3V3
15	GND	16	VDD_3V3
17	PCIE_M2M_RX2_N	18	VDD_3V3
19	PCIE_M2M_RX2_P	20	N/C
21	GND	22	N/C
23	PCIE_M2M_TX2_N	24	N/C
25	PCIE_M2M_TX2_P	26	N/C
27	GND	28	N/C
29	PCIE_M2M_RX1_N	30	N/C
31	PCIE_M2M_RX1_P	32	N/C
33	GND	34	N/C
35	PCIE_M2M_TX1_N	36	N/C
37	PCIE_M2M_TX1_P	38	N/C
39	GND	40	I2C2_M2M_SCL
41	PCIE_M2M_RX0_N	42	I2C2_M2M_SDA
43	PCIE_M2M_RX0_P	44	M2M_ALERT*
45	GND	46	N/C
47	PCIE_M2M_TX0_N	48	N/C
49	PCIE_M2M_TX0_P	50	PCIE_M2M_RST
51	GND	52	PCIE_M2M_CLKREQ
53	PCIE_M2M_CLK_N	54	PCIE_M2M_WAKE
55	PCIE_M2M_CLK_P	56	N/C
57	GND	58	N/C
59	Connector Key	60	Connector Key
61	Connector Key	62	Connector Key
63	Connector Key	64	Connector Key
65	Connector Key	66	Connector Key
67	N/C	68	M2M_SUSCLK_32KHZ
69	N/C	70	VDD_3V3
71	GND	72	VDD_3V3

Table 2.14: M.2 M-Key Connector (NVME1)

73	GND	74	VDD_3V3
75	GND		

2.3.9 LAN CONN (LAN1/2)

**Table 2.15: LAN CONN (LAN1/2)**

Pin	Signal		Pin	Signal	
RA1	LAN3_MDI_P0		RA5	LAN3_MDI_P2	
RA2	LAN3_MDI_N0		RA6	LAN3_MDI_N2	
RA3	LAN3_MDI_P1		RA7	LAN3_MDI_P3	
RA4	LAN3_MDI_N1		RA8	LAN3_MDI_N3	
Pin	Signal		Pin	Signal	
RB1	LAN4_MDI_P0		RB5	LAN4_MDI_P2	
RB2	LAN4_MDI_N0		RB6	LAN4_MDI_N2	
RB3	LAN4_MDI_P1		RB7	LAN4_MDI_P3	
RB4	LAN4_MDI_N1		RB8	LAN4_MDI_N3	
LAN	LED	Position	Color	LED State	Display
LAN1 LAN2* LAN3 LAN4	Link/ Activ- ity	To the right of the connector	Green	On	Active Connection
				Blinking	Transmit/ Receive Activity
				Off	LAN link is not established
	Link Speed	AGX Orin** To the left of the connector	Green/ Orange	Green	2500 Mbps
				orange	1000 Mbps
		Orin NX*** To the left of the connector	Green/ Orange	Off	10/100 Mbps
				Green	1000 Mbps
				orange	100 Mbps
				Off	10Mbps

Note!

*The LAN2 LAN connector is upside down on the board, but it will follow the same LED indication.

** The SKU of AFE-R750-X0A1U, AFE-R750-X1A1U, AFE-R750-X2A1U

*** The SKU of AFE-R750-M0A1U, AFE-R750-M1A1U

2.3.10 RJ-45 + USB 3.2 Gen2 Stack Connector (LAN3_USB12)

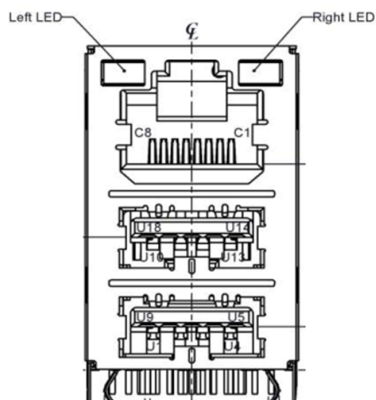


Table 2.16: RJ-45 + USB 3.2 Gen2 Stack Connector (LAN3_USB12)

Pin	Signal	Pin	Signal
U1	VDD_5V_BUS12	U10	VDD_5V_BUS12
U2	HUB1_DN_P3	U11	HUB1_DN_P4
U3	HUB1_DN_P3	U12	HUB1_DN_P4
U4	GND	U13	GND
U5	HUB1_SSRX_N_P3	U14	HUB1_SSRX_N_P4
U6	HUB1_SSRX_P_P3	U15	HUB1_SSRX_P_P4
U7	GND	U16	GND
U8	HUB1_SSTX_N_P3	U17	HUB1_SSTX_N_P4
U9	HUB1_SSTX_P_P3	U18	HUB1_SSTX_P_P4
Pin	Signal	Pin	Signal
R2	LAN1_MDI0+	R6	LAN1_MDI2+
R3	LAN1_MDI0-	R7	LAN1_MDI2-
R4	LAN1_MDI1+	R8	LAN1_MDI3+
R5	LAN1_MDI2-	R9	LAN1_MDI3-

2.3.11 RJ-45 + USB 3.2 Gen2 Stack Connector (LAN4_USB34)

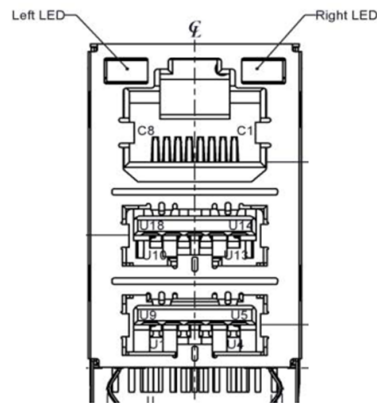


Table 2.17: RJ-45 + USB 3.2 Gen2 Stack Connector (LAN4_USB34)

Pin	Signal	Pin	Signal
U1	VDD_5V_BUS34	U10	VDD_5V_BUS34
U2	HUB1_DN_P1	U11	HUB1_DN_P2
U3	HUB1_DN_P1	U12	HUB1_DN_P2
U4	GND	U13	GND
U5	HUB1_SSRX_N_P1	U14	HUB1_SSRX_N_P2
U6	HUB1_SSRX_P_P1	U15	HUB1_SSRX_P_P2
U7	GND	U16	GND
U8	HUB1_SSTX_N_P1	U17	HUB1_SSTX_N_P2
U9	HUB1_SSTX_P_P1	U18	HUB1_SSTX_P_P2
Pin	Signal	Pin	Signal
R2	LAN2_MDI_P0	R6	LAN2_MDI_P2
R3	LAN2_MDI_N0	R7	LAN2_MDI_N2
R4	LAN2_MDI_P1	R8	LAN2_MDI_P3
R5	LAN2_MDI_N1	R9	LAN2_MDI_N3

Note! Under the system OS, it will show a different network interface name for each Ethernet port.



LAN1: enP5p3s0

LAN2: enP5p6s0

LAN3: enP5p4s0

LAN4: enP5p5s0

2.3.12 COM PORT (COM12)

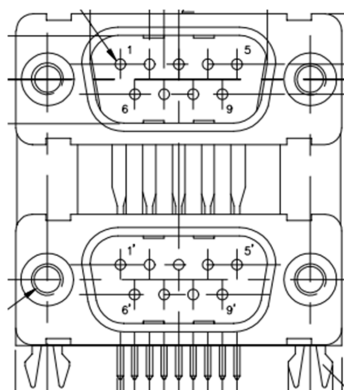


Table 2.18: COM PORT (COM12)

Pin	RS-232	RS-422	RS-485
1	DCD	Tx-	DATA-
2	RxD	Tx+	DATA+
3	TxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC

NC represents "No Connection".

Note! For the different AFE-R750 SKUs, it will show a different tty device name for each COM port.



AGX Orin:

COM1: /dev/ttyTHS1

COM2: /dev/ttyTHS2

Orin NX:

COM1: /dev/ttyTHS2

COM2: /dev/ttyTHS1

2.3.13 GPIO 16-Bit Isolation CONN I/O (GPIO1)

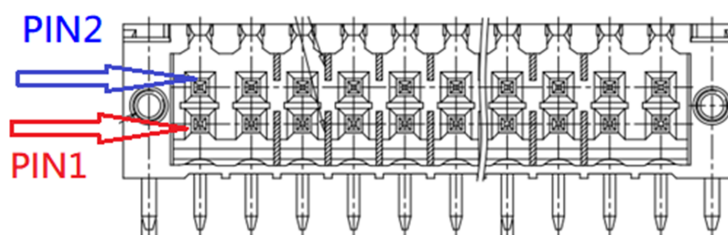


Table 2.19: GPIO 16-Bit Isolation CONN I/O (GPIO1)

Pin	Signal	Pin	Signal
1	GND_ISO	11	GND_ISO
2	GND_ISO	12	GND_ISO
3	DI1	13	DI5
4	DO1	14	DO5
5	DI2	15	DI6
6	DO2	16	DO6
7	DI3	17	DI7
8	DO3	18	DO7
9	DI4	19	DI8
10	DO4	20	DO8

2.3.14 M.2 E-Key Connector (M2E1)

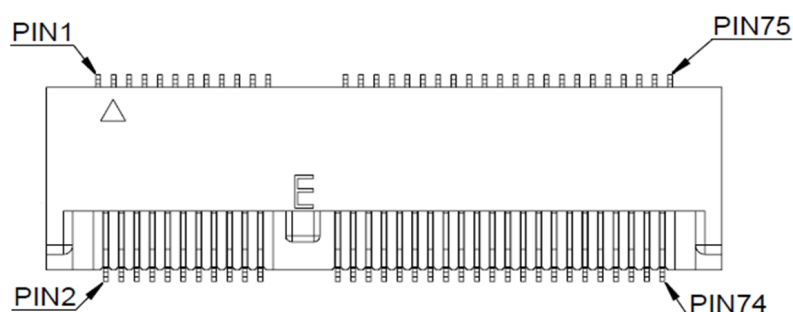


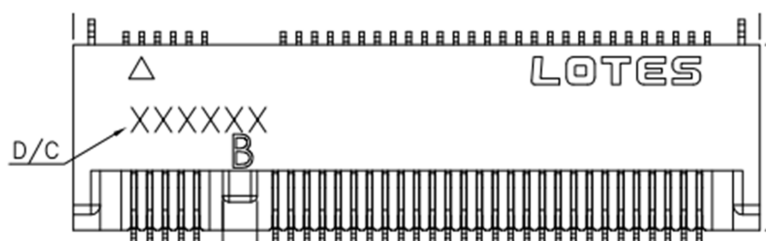
Table 2.20: M.2 E-Key Connector (M2E1)

Pin	Signal	Pin	Signal
1	GND	2	VDD_3V3_MKE
3	USB_M2E_AP_P	4	VDD_3V3_MKE
5	USB_M2E_AP_N	6	N/C
7	GND	8	M2E_I2S1_SCLK
9	M2_SDIO_CLK	10	M2E_I2S1_LRCK
11	M2_SDIO_CMD	12	M2E_I2S1_SDIN
13	M2_SDIO_D0	14	M2E_I2S1_SDOOUT
15	M2_SDIO_D1	16	N/C
17	M2_SDIO_D2	18	GND
19	M2_SDIO_D3	20	BT_M2E_WAKE_AP
21	N/C	22	N/C
23	SDIO_RESET#	24	Connector Key
25	Connector Key	26	Connector Key
27	Connector Key	28	Connector Key

Table 2.20: M.2 E-Key Connector (M2E1)

29	Connector Key	30	Connector Key
31	Connector Key	32	N/C-
33	GND	34	N/C-
35	PCIE1_M2E_TX0_P	36	N/C-
37	PCIE1_M2E_TX0_N	38	N/C-
39	GND	40	N/C-
41	PCIE1_M2E_RX0_P	42	N/C-
43	PCIE1_M2E_RX0_N	44	N/C-
45	GND	46	N/C-
47	PCIE1_M2E_CLK_P	48	N/C-
49	PCIE1_M2E_CLK_N	50	M2E_SUSCLK
51	GND	52	PCIE1_RST
53	PCIE1_M2E_CLKREQ_N	54	W_DISABLE2
55	PCIE_M2E_WAKE	56	W_DISABLE1
57	GND	58	I2C5_M2E_SDA
59	N/C-	60	I2C5_M2E_SCL
61	N/C-	62	M2E_ALERT*
63	GND	64	N/C-
65	N/C-	66	N/C-
67	N/C-	68	N/C-
69	GND	70	N/C-
71	N/C-	72	VDD_3V3_MKE
73	N/C-	74	VDD_3V3_MKE
75	GND		

2.3.15 M.2 B-Key Connector (M2B1)

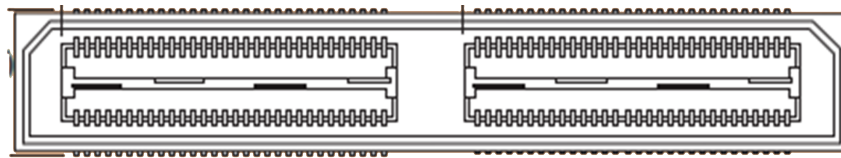
**Table 2.21: M.2 B-Key Connector (M2B1)**

Pin	Signal	Pin	Signal
1	MKB_CONFIG3	2	VDD_3V3_MKB
3	GND	4	VDD_3V3_MKB
5	GND	6	M2B1_POWER_OFF#_R
7	USB2_2_P_KB	8	M2B1_W_DISABLE#_R
9	USB2_2_N_KB	10	GNSS_PPS
11	Connector Key	12	Connector Key
13	Connector Key	14	Connector Key
15	Connector Key	16	Connector Key
17	Connector Key	18	Connector Key
19	Connector Key	20	I2S2_SCLK
21	MKB_CONFIG0	22	I2S2_DOUT

Table 2.21: M.2 B-Key Connector (M2B1)

23	M2B_WAKE_WWAN#	24	I2S2_DIN
25	M2B_SAR_N	26	M2B1_GNSS_DISABLE#_R
27	GND	28	I2S2_FS
29	M2B_USBSS_RX_N	30	UIM_RESET
31	M2B_USBSS_RX_P	32	UIM_CLK
33	GND	34	UIM_DATA
35	M2B_USBSS_TX_N	36	UIM_PWR
37	M2B_USBSS_TX_P	38	N/C
39	GND	40	I2C5_SCL_1V8_KB
41	M2B_PCl_e0_RX_N0	42	I2C5_SDA_1V8_KB
43	M2B_PCl_e0_RX_P0	44	N/C
45	GND	46	N/C
47	M2B_PCl_e0_TX_N0	48	N/C
49	M2B_PCl_e0_TX_P0	50	M2B_PLTRST#
51	GND	52	MKB_CLKREQ#
53	M2B_CLK_N0	54	M2B_PCIE_WAKE#
55	M2B_CLK_P0	56	N/C
57	GND	58	N/C
59	LAA_TX_EN (N/C)	60	(N/C) WLAN_TX_EN
61	N/C	62	N/C
63	N/C	64	N/C
65	N/C	66	N/C
67	M2B_MODULE_RESET#_R	68	SUSCLK_32KHZ_M2B
69	MKB_CONFIG1	70	VDD_3V3_MKB
71	GND	72	VDD_3V3_MKB
73	GND	74	VDD_3V3_MKB
75	MKB_CONFIG2		

2.3.16 MIPI-120PIN Connector for GMSL Board (CN1)



2.4 I/O Introduction



Figure 2.3 Front View (AGX Orin)



Figure 2.4 Rear View (AGX Orin)



Figure 2.5 Side View (AGX Orin)



Figure 2.6 Front View (Orin NX)



Figure 2.7 Rear View (Orin NX)

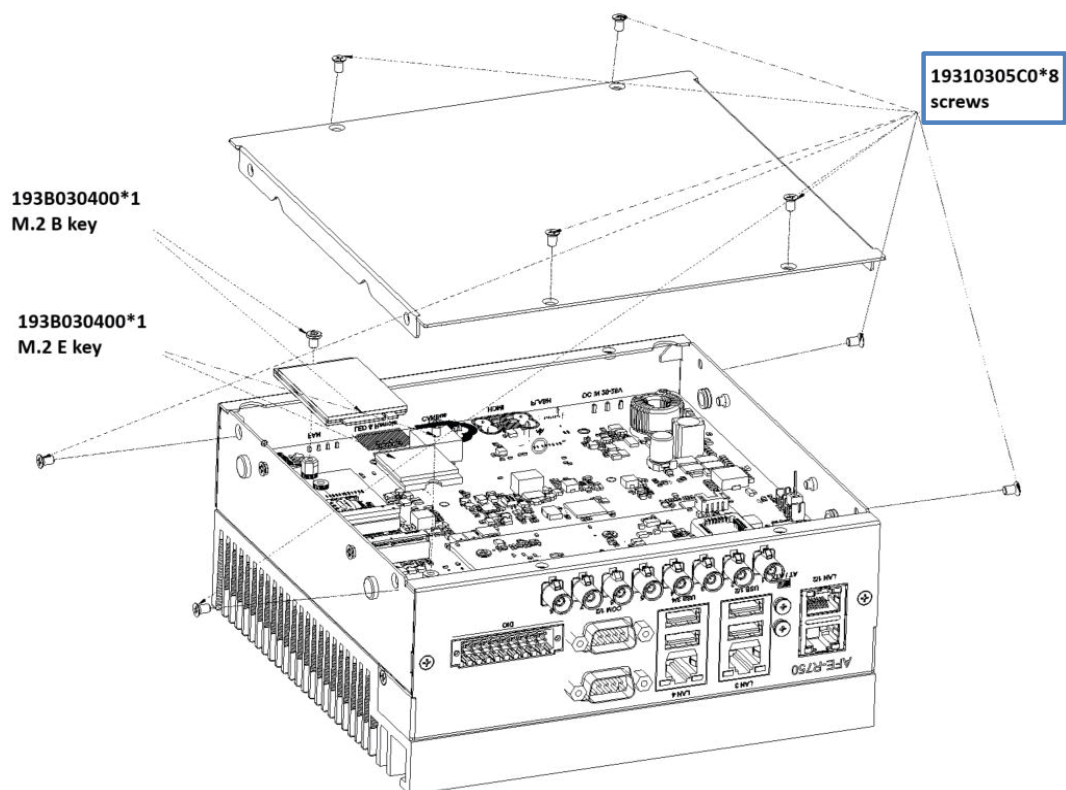


Figure 2.8 Side View (Orin NX)

2.5 Installation

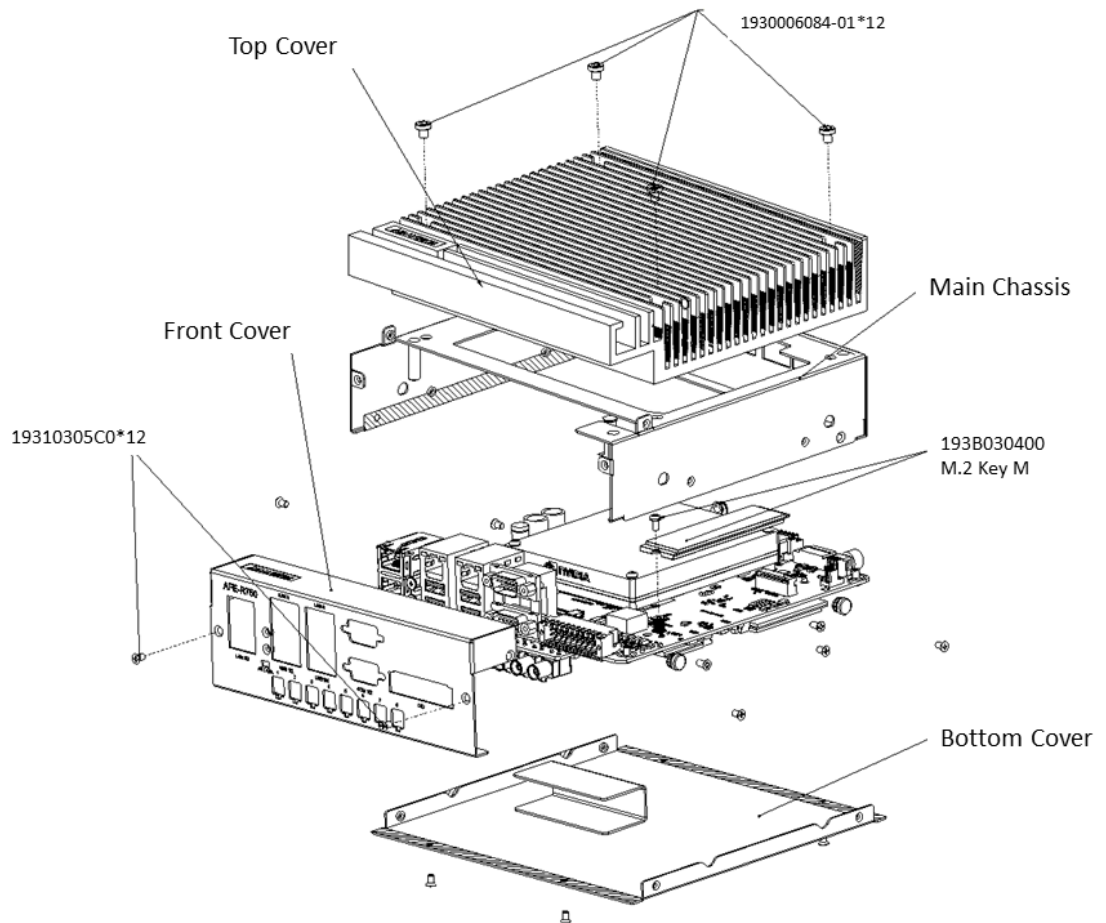
2.5.1 M.2 B-Key / E-Key Installation

1. Loosen the 8 screws (19310305C0) from the bottom, left and right side of the AFE-R750 as shown in the picture below.
2. Install the M.2 B-Key / E-Key module with screws (193B030400).
3. Secure the bottom cover with 8 screws (19310305C0).



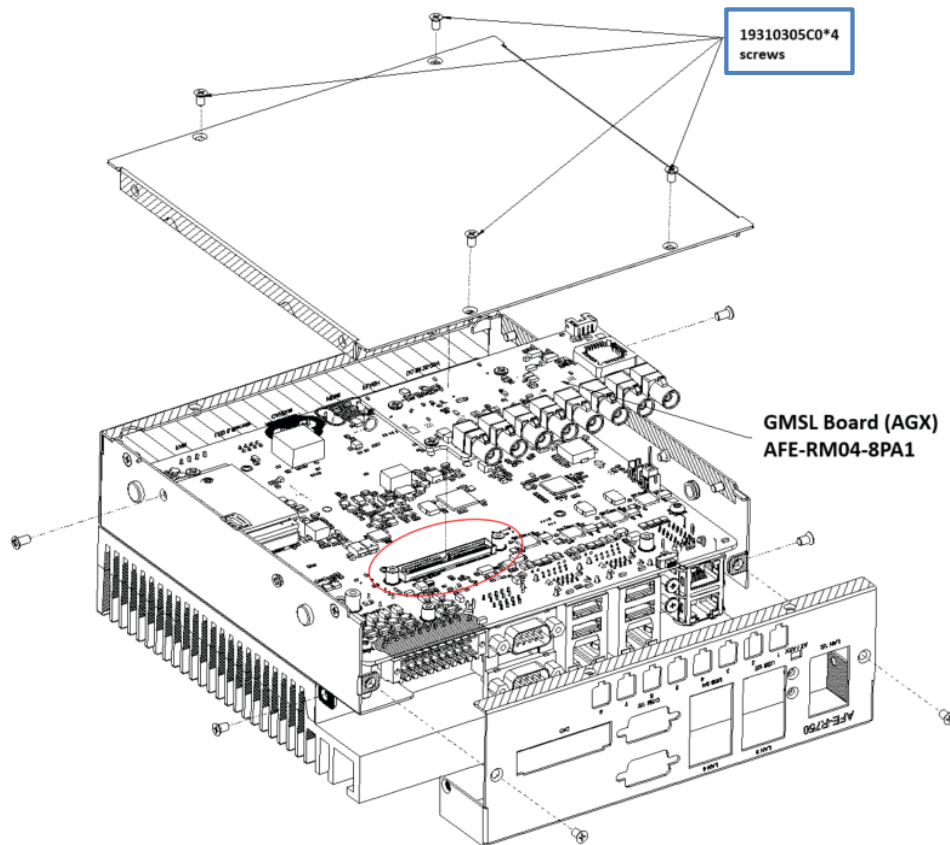
2.5.2 M.2 M-Key Installation

1. Loosen the 4 screws (1930006084-01) on the top cover of the AFE-R750.
2. Install the M.2 M-Key module with one screw (193B030400).
3. Secure the top cover with 4 screws (1930006084-01).



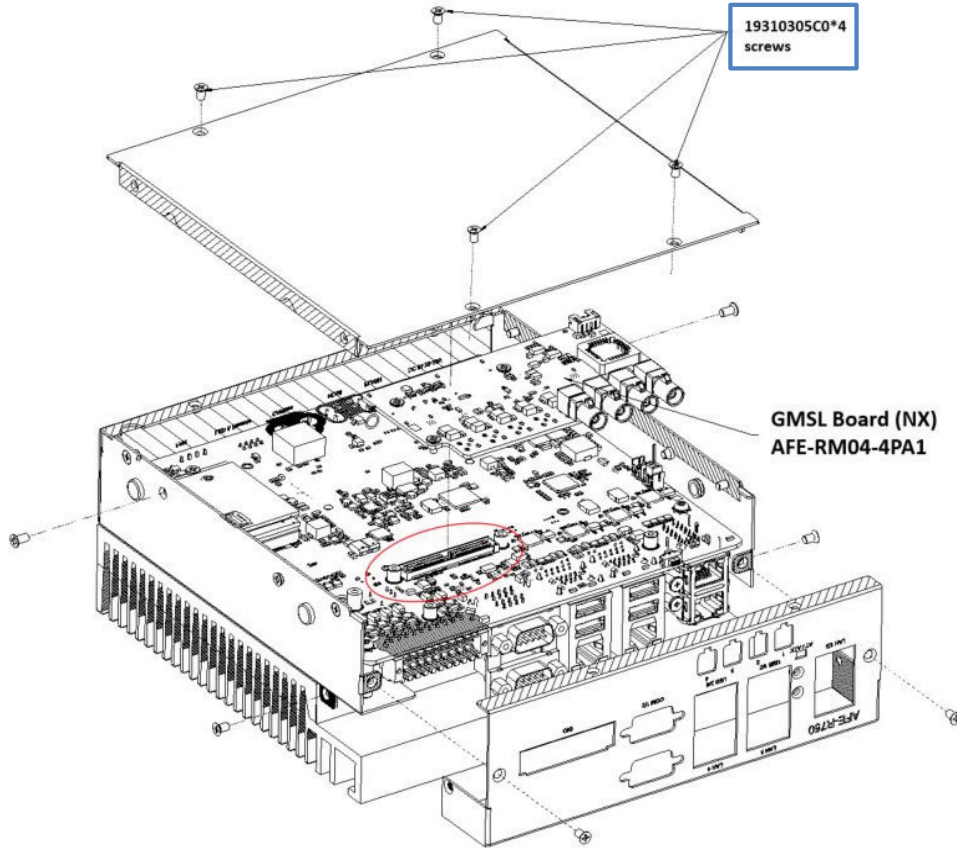
2.5.3 GMSL Board (AFE-RM04-8PA1) Installation

1. Loosen the 4 screws (19310305C0) of the bottom of the AFE-R750 shown in the picture below.
2. Install the GMSL board (AFE-RM04-4PA1) on the connector.
3. Secure the bottom cover with 4 screws (19310305C0).



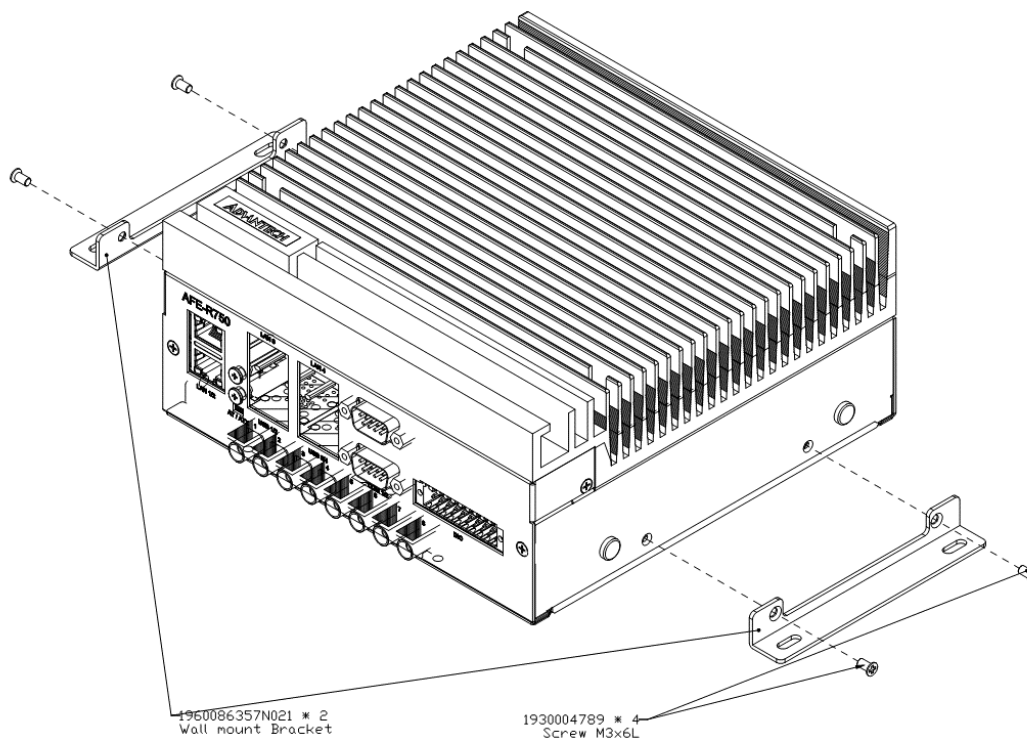
2.5.4 GMSL Board (AFE-RM04-4PA1) Installation

1. Loosen the 4 screws (19310305C0) from the bottom of the AFE-R750 as shown in the picture below.
2. Install the GMSL board (AFE-RM04-4PA1) on the connector.
3. Secure the bottom cover with 4 screws (19310305C0).



2.5.5 Mounting Kit Installation

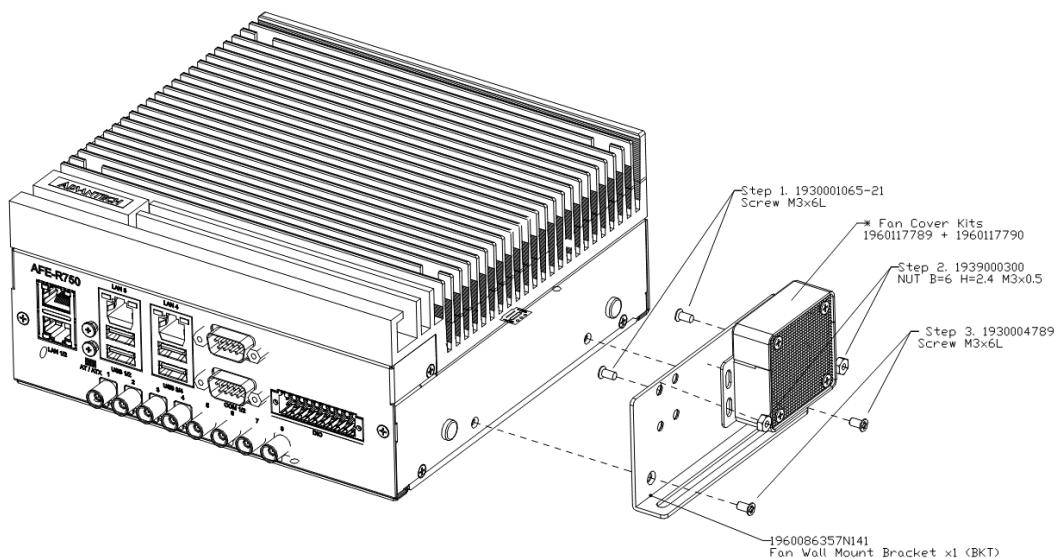
Use screws (19330004789) to attach the wall mount brackets (1960086357N021) to both sides of the chassis separately.



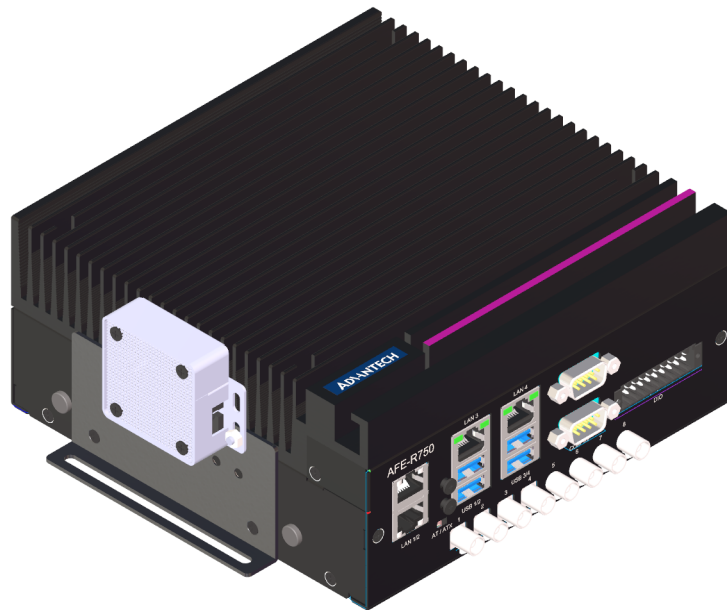
2.5.6 Fan Kit for the AFE-R750

(AMK-A0057) Installation

1. Assemble the fan cover kit (1960117789N001 + 1960117790N001).
2. Align and tighten the screws (1930001065-21) and nuts (1939000300) to secure the fan cover kit onto the fan wall mount bracket.
3. Use screws (1930004789) to attach the entire fan kit (AMK-A0057) to the side of the AFE-R750.



*Customers can adjust the locking position of the FAN KIT according to their usage requirements. Below is a diagram for reference.





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