

User's Manual



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50M- 00081-1020

Preface

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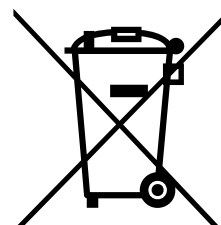
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Revision History

Revision	Release Date	Description of Change(s)
1.0	2022-07-08	Initial release
1.1	2022-07-25	Correct OS update instructions
1.2	2022-11-14	Correct ground cable ring terminal size, power supply pinout, specifications; remove MAXN power mode

Conventions



Information to prevent minor physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



Information to prevent serious physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

Table of Contents

Preface	2
1 Overview	6
1.1 Introduction	6
1.2 Features	7
1.2.1 AVA-RAGX(I) with Jetson AGX Xavier™ Industrial	7
1.3 Package Contents	9
1.4 Optional Accessories	9
2 System Description	10
2.1 Module Specifications	10
2.2 System Specifications	11
2.3 Block Diagram	14
2.4 Mechanical Dimensions	15
2.5 Mechanical Layout	16
2.5.1 Front View	16
2.5.2 Rear View	16
2.6 Power Specifications	17
2.6.1 AVA-RAGXI Power Consumption	17
2.6.2 AVA-RAGX	18
3 Getting Started	19
3.1 Removing the Chassis Bottom Cover	19
3.2 Installing M.2 E Key Modules	20
3.3 Installing an M.2 M Key 2280 SATA Module	21
3.4 Installing an M.2 B-key 3042 LTE/5G Module	22
3.5 Installing micro-USIM Card	23
3.6 Wall or Surface Mounting	24
3.7 Installing a microSD Card	25
3.8 Connecting a Ground Cable	26
3.9 Connecting Peripherals	26
3.10 Connecting the Power Supply	27
3.11 Starting the System	28
4 System Interfaces	29
4.1 External Connectors	29
4.1.1 GbE M12 X-code Connectors	29
4.1.2 USB 3.0 Connector	29
4.1.3 COM DB9 Connectors	30
4.1.4 DC Power Input M12 Connector	30
4.1.5 HDMI Connector	31
4.1.6 COM DB9 Connectors	31
4.1.7 DIO DB9 Connectors	32
4.2 Internal Connectors	33
4.2.1 M.2 M Key 2280 SATA Module Connector	33
4.2.2 M.2 B-key 3042 LTE/5G Module Connector	34
4.2.3 M.2 E Key 2230 Wi-Fi Module Connector	35

4.3	Buttons and LEDs	36
4.3.1	Power Button	36
4.3.2	Reset Button	36
4.3.3	Recovery Button	36
4.3.4	Status LEDs	37
5	Software Upgrade	38
5.1	Operating System Update Procedure	38
5.2	User-Defined LED Sample Code	39
	Important Safety Instructions	42
	Getting Service	43

1 Overview

1.1 Introduction

The AVA-RAGX(I) is a fanless AI-enabled video analytics platform equipped with the NVIDIA® Jetson AGX Xavier™ Series system-on-module. This EN50155 certified AIoT platform is designed for both wayside and onboard deployment with its wide range 16.8-137.5V DC input, isolated and rugged I/O interfaces, and extended operating temperature from -20°C to 70°C for real-time video/graphic analysis applications. The target applications include but are not limited to:

- Train Station Surveillance
- Onboard Video Security
- Passenger Information Systems
- Railroad Hazard/intrusion Detection

The AVA-RAGXI model is equipped with an industrial version of the NVIDIA® Jetson AGX Xavier™ Series system-on-module, supporting wide operating temperature, ECC memory, and long life cycle.

1.2 Features

1.2.1 AVA-RAGX(I) with Jetson AGX Xavier™ Industrial

AVA-RAGXI is equipped with NVIDIA® Jetson AGX Xavier™ Industrial (JAXi).
 AVA-RAGX is equipped with NVIDIA® Jetson AGX Xavier™ Commercial (JAX).

- Volta GPU
- Carmel CPU
- 32GB LPDDR4x
- 64GB eMMC
- 64MB NOR

● Volta GPU

GPC Configuration			Performance (peak)	Operating Freq. per Core (up to)
Number of TPC	CUDA Cores	Tensor Cores		
4	512	64	10 TFLOPS / 32 TOPS	JAXi: 1.21 GHz JAX: 1.37 GHz

● Carmel GPU

CPU Configuration			CPU Cores	Operating Freq. per Core (up to)
CPU Cluster	L2 Cache	L3 Cache		
4x dual-core	8MB	4MB	8	JAXi: 2.03 GHz JAX: 2.26 GHz

● Memory Subsystem LPDDR4x

Size	Max. Bandwidth	Max. Bus Frequency	ECC Support
32GB	136.5 GB/s	2133MHz	JAXi: Yes (enabled by SW) JAX: No

● Storage

- Supports 64GB eMMC 5.1 flash storage with 8-bit bus width, max. bus frequency: 200MHz
- 1x microSD card slot (internal on SOM)
- 1x microSD card slot (rear panel)
- 1x M.2 2280 M-key NVMe slot, PCIe x4 Gen4

● Front Panel I/O:

- 4x M12-X-coded supports PoE IEEE 802.3at by BOM option, PSE total max. power 40W for 4 ports with 1.5kVac (2100VDC) isolation
- 2x USB 3.0 Type A
- 1x thermal block 4 input/4 output for 24-110VDC with 1.5kVDC isolation
- 1x DB-9 COM port
- 2x DB-9 CAN ports

● Rear Service I/O

- 1x M12 S-coded male connector for power input
- 1x HDMI 2.0 with lockable connector
- 2x USB 3.0 Type A
- 1x USB 2.0 OTG for image update
- 1x USIM slot
- 1x microSD card slot

● Connectivity Options

- 1x M.2 B-key 3042/52 for 5G/LTE module by USB 3.0
- 1x external accessible USIM socket in 2FF mini-SIM (25x15mm)
- 1x M.2 A/E key 2230 for Wi-Fi via PCIe x1 or BT via USB 2.0
- 4+2x SMA antenna on rear side

● Input Voltage:

- Nominal Voltage: 24VDC, 36VDC, 72VDC and 110VDC (EN50155 compliant)

1.3 Package Contents

Please check that your package contains the items below. If you discover damaged or missing items, please contact your vendor.

- AVA-RAGX(I) Series AI-Enabled Video Analytics Platform
- Wall-mount bracket and screw pack
- 5G module SIMCOM 8202G thermal kit
- M12 S-coded 4-pin female connector for user to make power cable (P/N: 30-51044-0000-A0)



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

M.2 5G Sub-6G Module (P/N: 29-08202-F000)

- 1x M.2 3042 5G module (SIMCom SIM8202G-M2, Multi-Band 5G NR/LTE-FDD/LTETDD/HSPA+ module)

M.2 LTE Module (P/N: 29-D0042-G000)

- 1x M.2 3042 module (Quectel EM06-E, LTE-A Cat 6/ WCDMA/UMTS/HSPA(+), GNSS)

160W Adapter with M12 S-coded Cable (P/N:91-95311-000#)

- 1x M12 S-coded 4-pin (female) to 14-pin cable
- AC-DC 160W output 24V/6.67Ap adapter

2 System Description

2.1 Module Specifications

NVIDIA® Jetson™ AGX Xavier Series System-on-Module (SOM)		
Feature	Jetson AGX Xavier Commercial	Jetson AGX Xavier Industrial
Module Specifications		
GPU	NVIDIA Volta™ architecture with 512 NVIDIA® CUDA® cores and 64 Tensor cores	
CPU	8-core NVIDIA Carmel Arm®v8.2 64-bit CPU, 8MB L2 + 4MB L3	
DL Accelerator	GPU (22.6 TOPs) and 2x NVDLA Engines (5.7 TOPs each)	GPU (19.8 TOPs) and 2x NVDLA Engines (5.27 TOPs each)
Vision Accelerator	2x 7-Way VLIW Vision Processor (1.1 DL INT8 TOP)	
Memory	8/16/32 GB 256-bit LPDDR4x	32 GB 256-bit LPDDR4x w/ECC
Storage	32 GB eMMC	64 GB eMMC
QSPI NOR	Not supported	64 MB
Networking: RGMII	10/100/1000 Mbit	
Video Encode	4x 4K60 (H.265) 8x 4K30 (H.265) 16x 1080p60 (H.265) 32x 1080p30 (H.265) 30x1080p30 (H.264)	2x 4K60 (H.265/H.264) 6x 4K30 (H.265/H.264) 12x 1080p60 (H.265/H.264) 24x 1080p30 (H.265/H.264)
Video Decode	2x 8K30 (H.265) 6x 4K60 (H.265) 12x 4K30 (H.265) 26x 1080p60 (H.265) 52x 1080p30 (H.265) 30x 1080p30 (H.264)	2x 8K30 (H.265) 4x 4K60 (H.265) 8x 4K30 (H.265) 18x 1080p60 (H.265) 36x 1080p30 (H.265) 24x 1080p30(H.264)
Mechanical	100 mm x 87 mm x 15.23 mm	
Input Voltage	HV rail: 9V to 20V MV rail: 5V	
Operating Temperature Range	-25°C to 80°C	-40°C to 85°C
Interfaces		
USB 2.0	4x	
USB 3.0	3x (3.1)	
PCIe	x1 (Gen4) + 1 x2 + 1 x4 + 1 x8. All support Root Port. Only x8 has both Root Port and Endpoint support.	
Display	Three multi-mode (e)DP 1.4/HDMI™ 2.0a One HDMI connector with lockable on the front panel support HDMI2.0a/b (up to 6Gbps) standard specification. It can connect to VGA, DVI, Display Port monitors via HDMI to VGA adapter cable, HDMI to DVI adapter cable, and HDMI cable. HDMI Supports HDMI2.0a/b, resolutions up to 4096 x 2160 at 60Hz	
CSI	16 lanes (4x4 or 6x2 or 6x1) MIPI CSI-2 D-PHY 1.2 (2.5Gb/s per pair, total up to 40 Gbps) C-PHY 1.1 (1.7Gsym/s per trio, total up to 62 Gbps)	

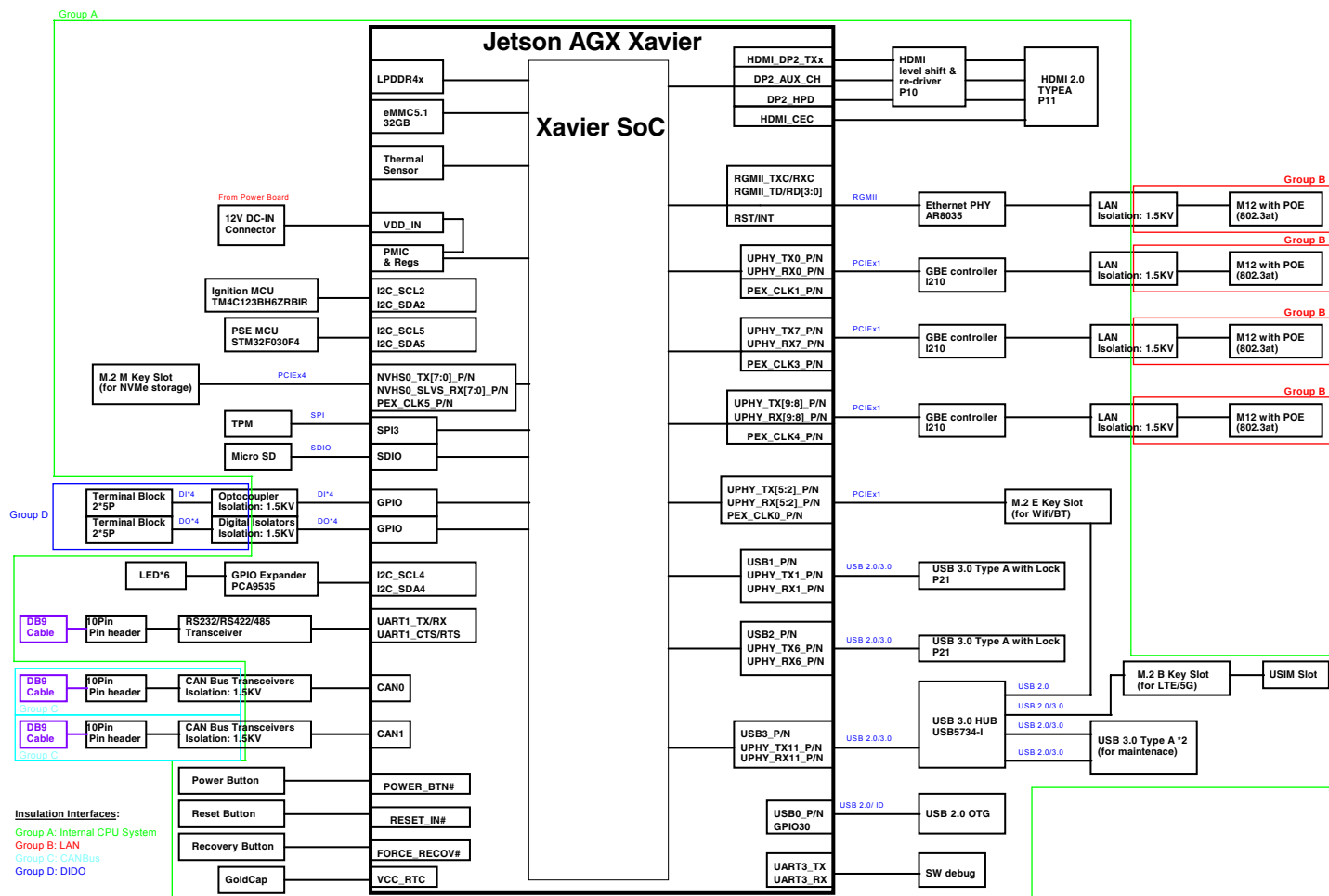
NVIDIA® Jetson™ AGX Xavier Series System-on-Module (SOM)		
Feature	Jetson AGX Xavier Commercial	Jetson AGX Xavier Industrial
Interfaces (cont'd)		
SLVS	8-lane	Not supported
Audio (I2S)	4x	3x
SDIO/SD Card	1x SD Card/SDIO	
Gigabit Ethernet	Supported	
JTAG	Supported	
Fan	PWM and Tach Input	

2.2 System Specifications

AVA-RAGX(I) System		
System-On-Module	Processor	AVA-RAGX: Xavier Jetson™ Commercial AVA-RAGXI: Xavier Jetson™ Industrial
	CPU	Carmel ARMv8.2 2.26GHz
	GPU	512-core NVIDIA Volta GPU w/ 64 Tensor Cores, 1.37GHz
	Memory	32GB 256b LPDDR4x on module
	Storage	32GB AVA-RAGX, 64GB AVA-RAGXI (on module)
Front Interfaces	GbE	4x GbE connector in M12 female X-coded connectors Support POE IEEE 802.3at by BOM option, PSE total Max. power 40W for 4 ports Isolation 1.5kVac (2100VDC) include PoE power
	USB	2x USB 3.0 in connector with lock
	Serial port	1x DB-9 RS-232/422/485 originated from AGX module, TX, RX, CTS, RTX
	DIO	1x terminal block 4 input/4 output for 24-110VDC, Isolation 1.5kVDC DI voltage: Input low(0) at value < 5V Input high(1) at Value > 12V Max input current is 4mA DO max. working voltage is 110V DO max. current 250mA
	CAN	1x DB-9 CAN-FD from AGX module, with isolation 1x DB-9 CAN-FD from AGX module, with isolation by pin-header for CAN-FD from AGX module
Rear Interfaces	Graphics	1x HDMI 2.0 with lock at rear side
	USB	1x USB 2.0 OTG port for updating OS image 1x USB 3.0 for maintenance
	Power inlet	1x 4-pin S-coded M12
	USIM	1x USIM socket, external accessible, miniSIM (25x15mm) 2FF
	Antenna	4+2x SMA antenna cutouts reserved on rear side

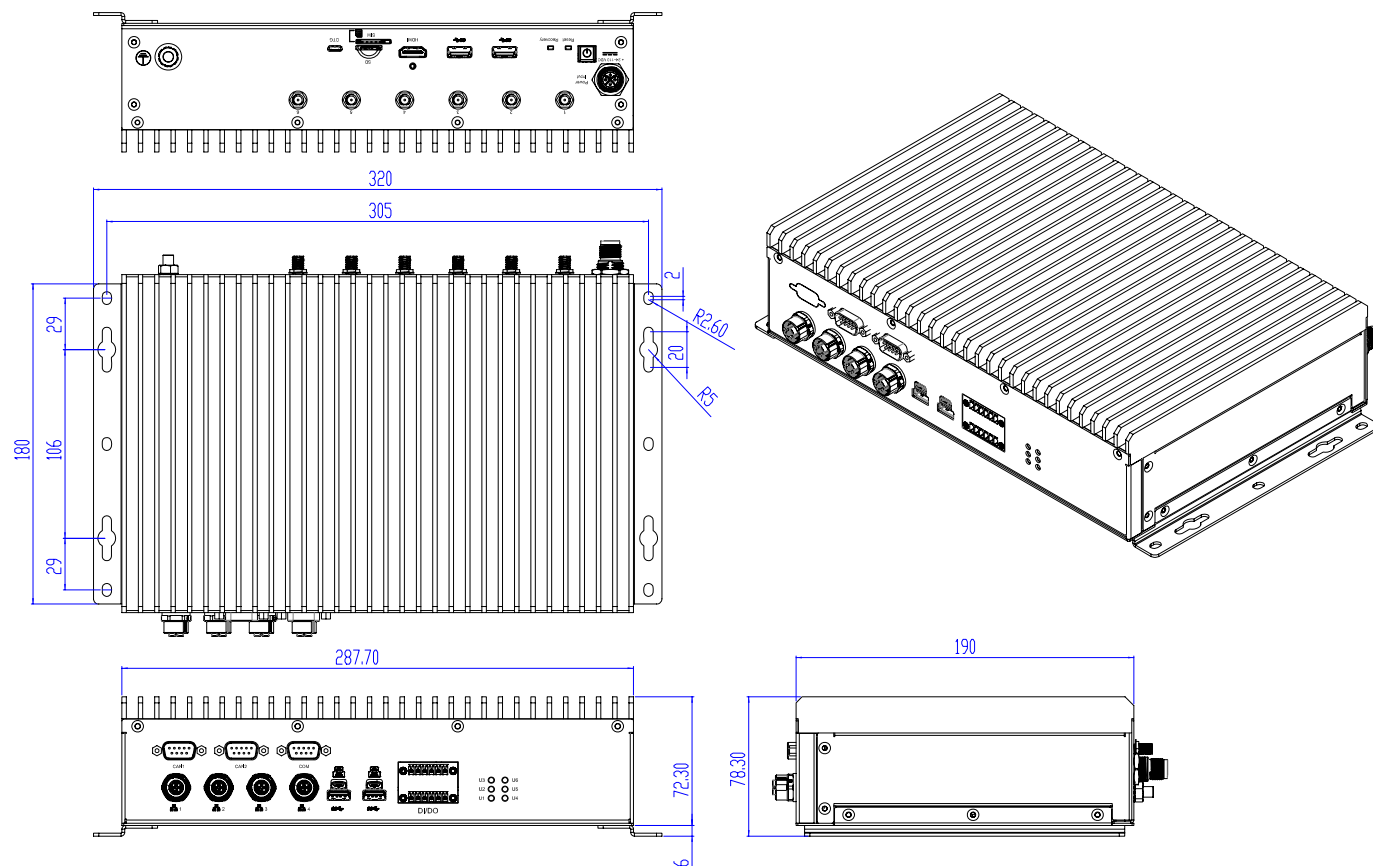
AVA-RAGX(I) System		
Internal Interfaces	Storage Expansion	1x M.2 M-Key Socket (PCIe Gen3X4) 2280 for Storage (Need NVMe SSD)
	SD Card	1x microSD
	Expansion	1x M.2 B-key 3042 (reserve mechanical design for 3052 for LTE/5G) through USB 3.0 Ideally use FR1(sub-6GHz), solution can be SIMCOM SIM8202G 3042 1x M.2 A/E key 2230 for Wifi (PCIEx1)/BT (USB2.0) Wi-Fi 5: EnLi BNA2174_M2I (29-E2174-9000, Primary)
	TPM	Supports TPM 2.0
	RTC	Real time clock (RTC) with goldcap backup (charge holds 48h)
Power	Button	Power Button, Reset Button, Recovery Button on rear
	Ignition input	Ignition control
	Power input	+24/36/72/110VDC with M12 4-pin S code connector (16.8V to 137.5V, EN50155 compliant)
	Ignition input	Ignition control
	Compliance	Compliant to Interruptions of voltage supply according EN50155 SEC. 5.1.1.4 Class S2 & C1 >=10ms
	Power Consumption	< 130W at 100% GPU loading
	Ground	M6 threaded stainless steel stud for protective grounding on rear
Operating System	Operating System	Ubuntu 18.04
Mechanical	Mounting	Wall mount
	Dimensions	288(W) x 190(D) x 78(H) mm
	IP	IP20
	Weight	≤ 6 kg (TBD)
Environmental Chamber/Shock/ Vibration	Operating temperature	AVA-RAGX: -25°C to +55°C (OT1) + 15C 10 mins. ST1 AVA-RAGXI: -25°C to +70°C (OT3) + 15C 10 mins. ST1
	Storage temperature	-40°C to 85°C
	Humidity operating	10% to 95% relative humidity (non-condensing)
	Humidity storage	5% to 95% relative humidity (non-condensing)
	Environmental	• EN50155:2017 • Low temperature storage test – EN50155 13.4.6 (Ref. to IEC60068-2-1) • Low temperature start-up test – EN50155 13.4.4 (Ref. to IEC60068-2-1) • Dry heat test – EN50155 13.4.5 (Ref. to IEC60068-2-2) • Cyclic damp heat test – EN50155 13.4.7 (Ref. to IEC60068-2-30) • Shock and vibration test – EN50155 13.4.11 (Ref. to IEC61373) • Altitude test - EN50125-1:2014, EN50125-1_4.2 (Ref. to IEC 60068-2-13) • RoHS 2.0 & REACH

AVA-RAGX(I) System		
Environmental EMC/Safety	EMI/EMC	• EN 50155:2017 Clause 4.3.6 • EMC: with reference to EN 50121-1:2017; EN 50121-3-2:2016 • EN 61000-4-2:2009; EN 61000-4-3:2006 + A1:2008 + A2:2010 • EN 61000-4-4:2012; EN 61000-4-5:2014 + A1: 2017 • EN 61000-4-6:2014 + AC: 2015 FCC 47 CFR, Part 15, Subpart B, Class A • EN IEC 61000-6-4: 2019 • EN IEC 61000-6-2: 2019
	Safety	EN 50124-1:2017
	Fire Protection	Compliant to EN45545-2:2013+A1:2015 (HL 1-3)
	Rolling stock	BS EN 50155:2017
Others	LEDs	1 x Power On LED, 6x User defined LEDs on front interface (Green: U1, U2, U3, U6; Red: U5; Yellow: U4)
	MTBF	> 218.125 Hours @40°C according to IEC/TR 62380 (TBC) Calculation Model: Telcordia Issue4 Environment: GB, GC
	Conformal Coating	All PCBs conformal coated both sides – type HumiSeal 1B73 Coating (AR) Acrylic.



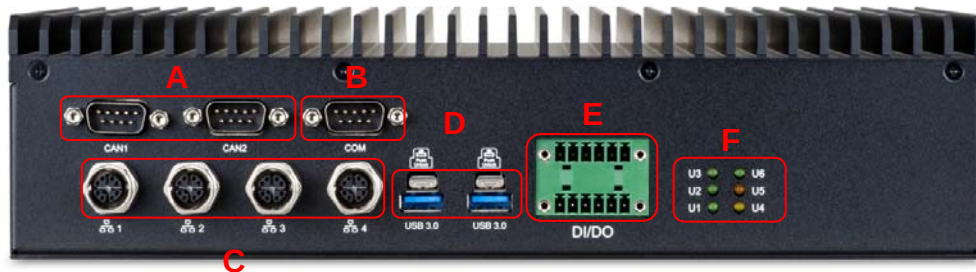
2.4 Mechanical Dimensions

Units: mm



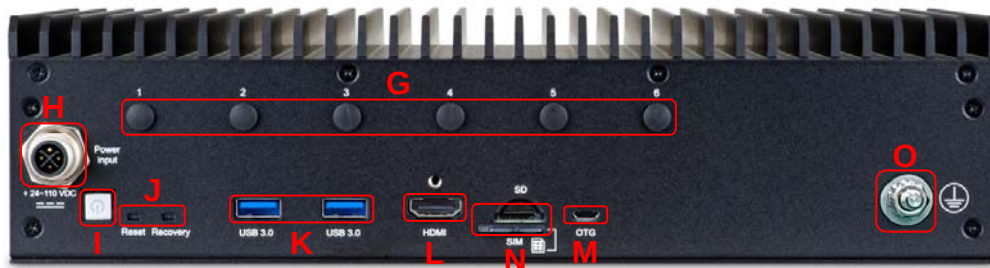
2.5 Mechanical Layout

2.5.1 Front View



A	CAN bus
B	Serial Port
C	M12 Female X-coded
D	USB 3.0 with Lock
E	DIO
F	User-Defined LEDs

2.5.2 Rear View



G	Antenna Cutouts
H	M12 4-pin S-coded
I	Power Button
J	Reset/Recovery Buttons
K	USB 3.0 Ports
L	HDMI Port
N	microSD / USIM Slots
M	Micro USB 2.0 OTG Port
O	Ground Stud

2.6 Power Specifications

The following tables present the AVA-RAGX Series power consumption data at room temperature under the following test conditions.

- AVA-RAGX Mother Board: 55-32201-100E
(Jetson AGX Xavier & Jetson AGX Xavier Industrial)
- System-on-Module
- Power Module: 55-32202-000E
- Chassis Heat Sink: 32-60039-0000-A0
- OS: NVIDIA ARM OS

Software:

- NVIDIA ALLTEST: YOLO.mp4
- 5G module: PuTTY with stress command
- BSP:ava-ragx.1v2.4 Jetpack 4.6 [L4T 32.6.1]

Test Fixture:

- DI/Do Test Fixture
- CAN1 / CAN2 Pin to Pin
- PoE Test Fixture: 4 port total 40W
- USB Dummy Loading: 5W*3
- DC Power supply: 62006P-300-8

2.6.1 AVA-RAGXI Power Consumption

40W All Mode

AVA-RAGXI/POE		AVA-RAGXI/NPOE	
DC	40W All	DC	40W All
24V	111.36W	24V	63.12W
36V	108W	36V	61.2W
72V	103.68W	72V	61.2W
110V	103.4W	110V	61.6W

Idle Mode

AVA-RAGXI/POE	
DC	40W All
24V	26.88W
36V	27W
72V	27.36W
110V	27.5W

2.6.2 AVA-RAGX

30W All & 15W Desktop Mode

AVA-RAGX/POE			AVA-RAGX/NPOE		
DC	30W All	15W Desktop	DC	30W All	15W Desktop
24V	108.96W	100.8W	24V	59.76W	52.32W
36V	107.64W	99W	36V	60.12W	52.92W
72V	105.84W	97.92W	72V	59.76W	52.56W
110V	106.7W	99W	110V	58.3W	51.7W

Idle Mode

AVA-RAGX/NPOE		
DC	30W All	15W Desktop
24V	21.17W	21.02W
36V	20.52W	20.87W
72V	20.19W	20.08W
110V	21.6W	21.2W

3 Getting Started

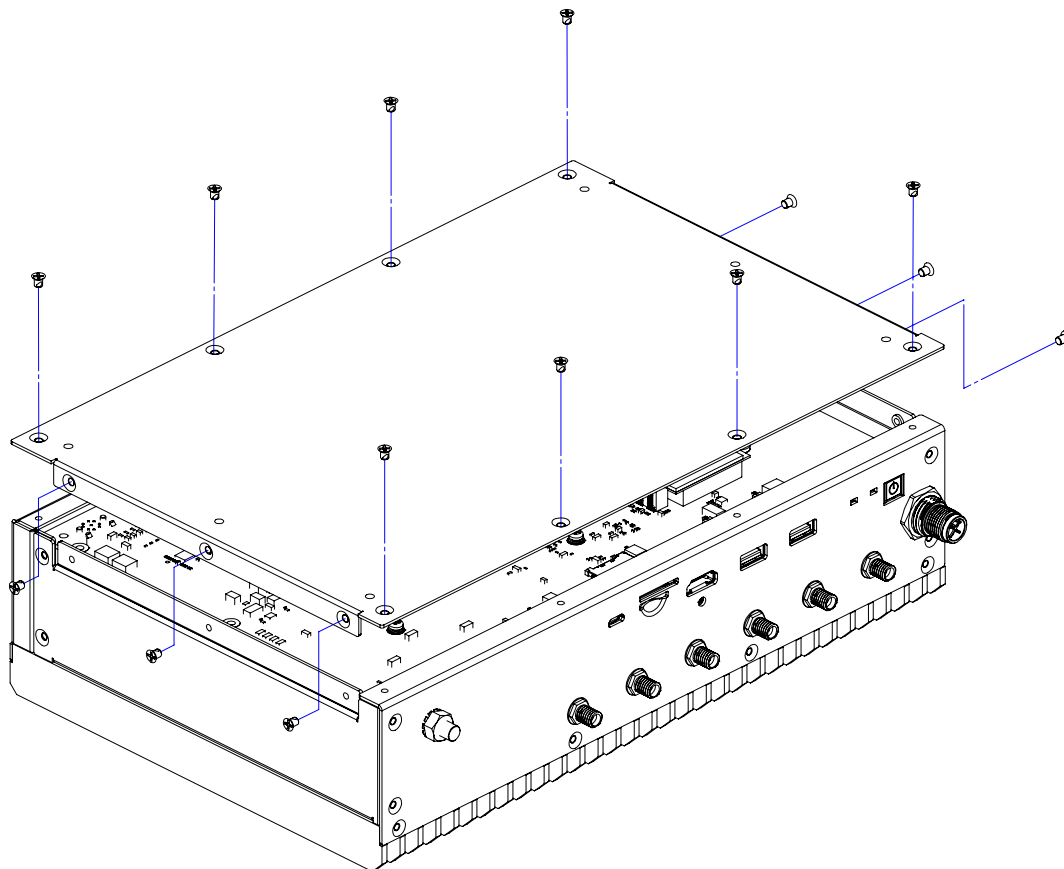
Follow the instructions describe installation of USIM cards, Wi-Fi, cellular and M.2 SATA modules; mounting brackets; ground cable; and DC power supply

Note: MXM modules must be installed at the factory. Please contact your local ADLINK representative for more information.

3.1 Removing the Chassis Bottom Cover

To install the optional modules, first remove the bottom cover as described below.

1. Place the chassis on a suitable surface with the bottom side facing up. Remove the 8 screws from the bottom side and 3 screws each from the left and right side as indicated below.



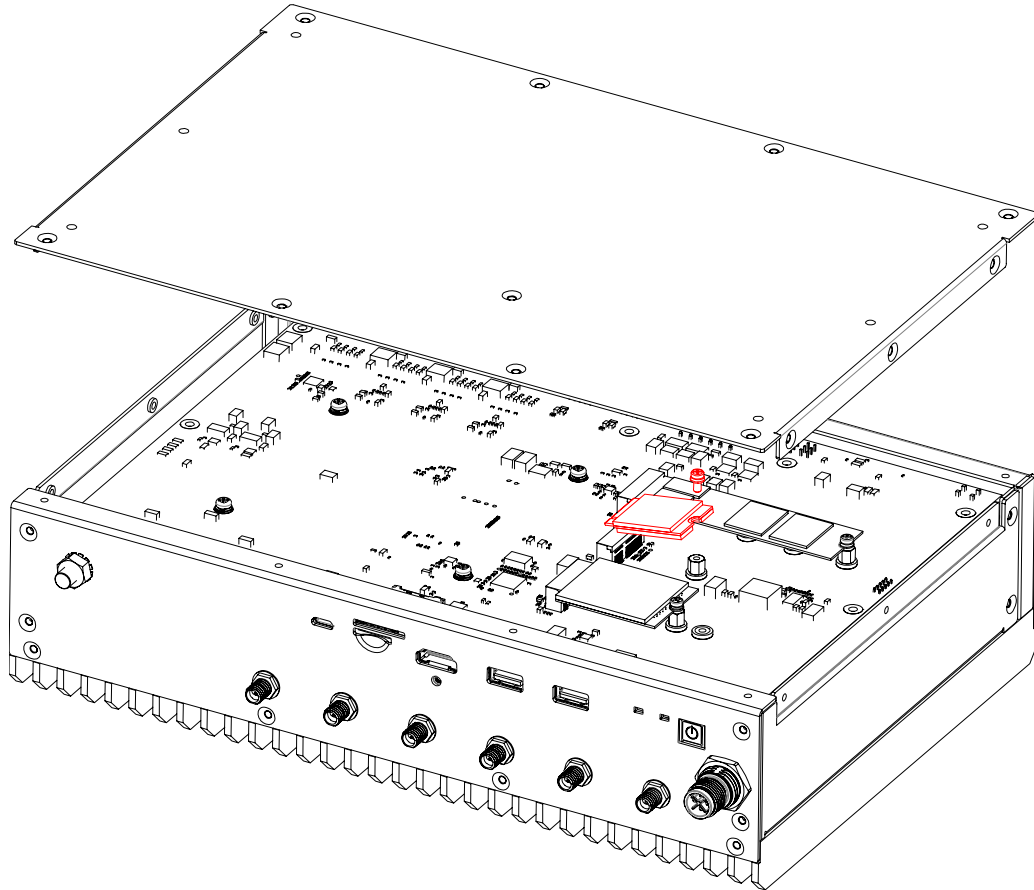
2. Lift the rear cover off of the chassis.

To re-install the bottom cover, place it in its original location and replace the 8 screws removed in Step 1.

3.2 Installing M.2 E Key Modules

Follow the instructions below to install a M.2 E key 2230 Wi-Fi or cellular module.

1. Insert the M.2 A/E key 2230 Wi-Fi module into one of the slots as shown and secure it using two M2.5 screws

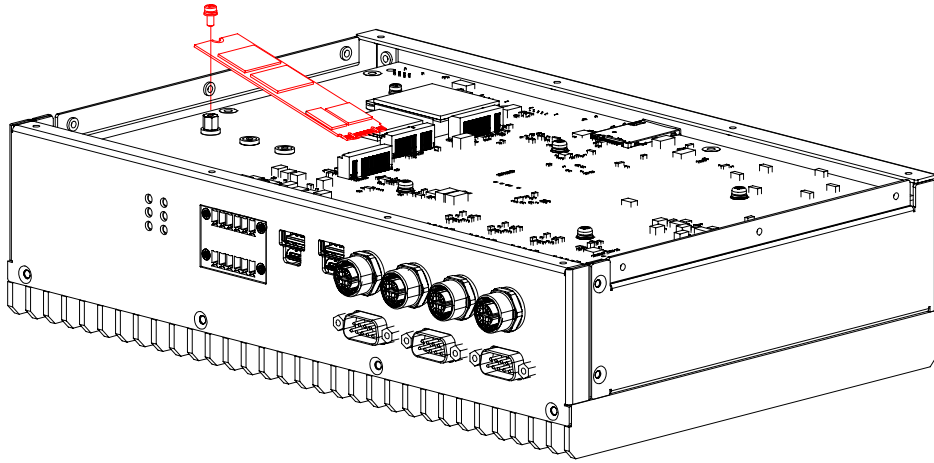


2. Connect the internal RF cables to the module and install the SMA connectors into the antenna openings.

Note: M.2 modules may require an additional thermal solution when operated above 60°C. The accessory kit includes a generic M.2 thermal pad for installation by the user. If you have any questions about thermal limitations, please contact your local ADLINK representative for more information.

3.3 Installing an M.2 M Key 2280 SATA Module

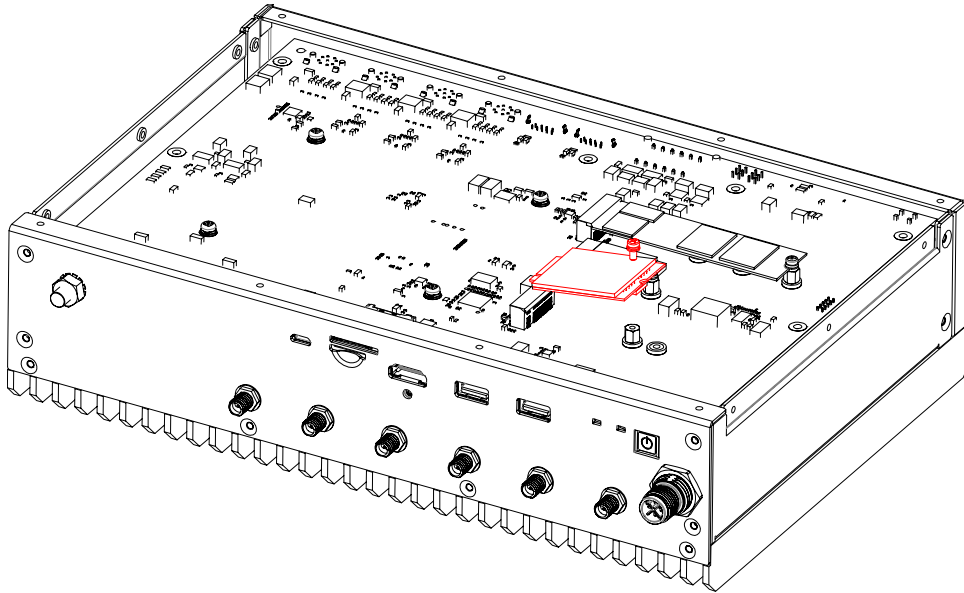
To install an M.2 2280 SATA module, insert the module into the slot and secure it with one M2.5 screw as shown.



Note: M.2 modules may require an additional thermal solution when operated above 60°C. The accessory kit includes a generic M.2 thermal pad for installation by the user. If you have any questions about thermal limitations, please contact your local ADLINK representative for more information.

3.4 Installing an M.2 B-key 3042 LTE/5G Module

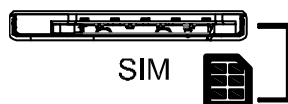
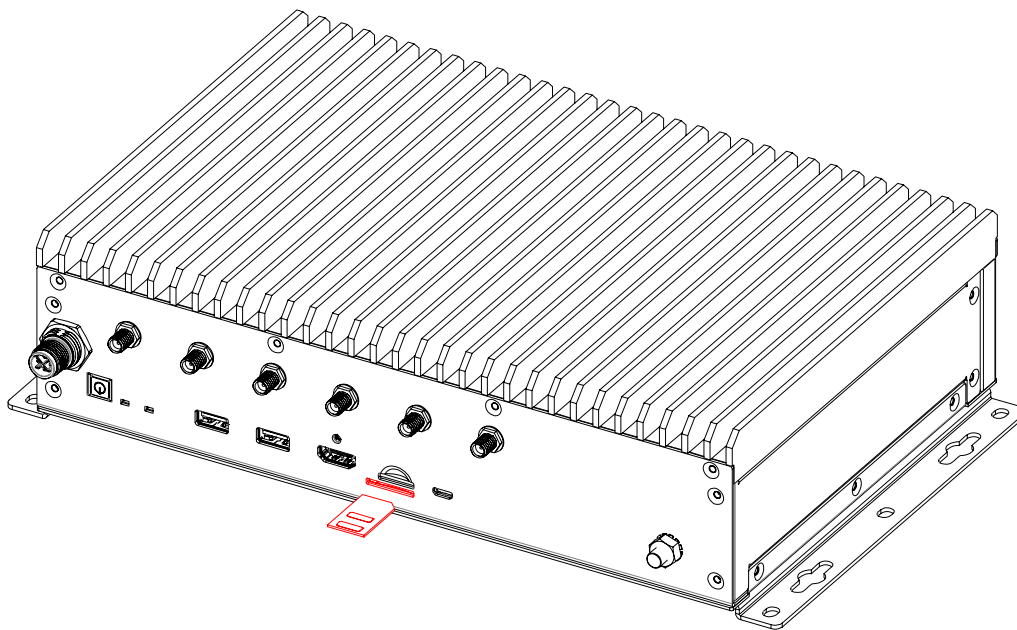
To install an M.2 B-key 3042 LTE/5G, insert the module into the slot and secure it with one M2.5 screw as shown.



Note: M.2 modules may require an additional thermal solution when operated above 60 °C. The accessory kit includes a generic M.2 thermal pad for installation by the user. If you have any questions about thermal limitations, please contact your local ADLINK representative for more information.

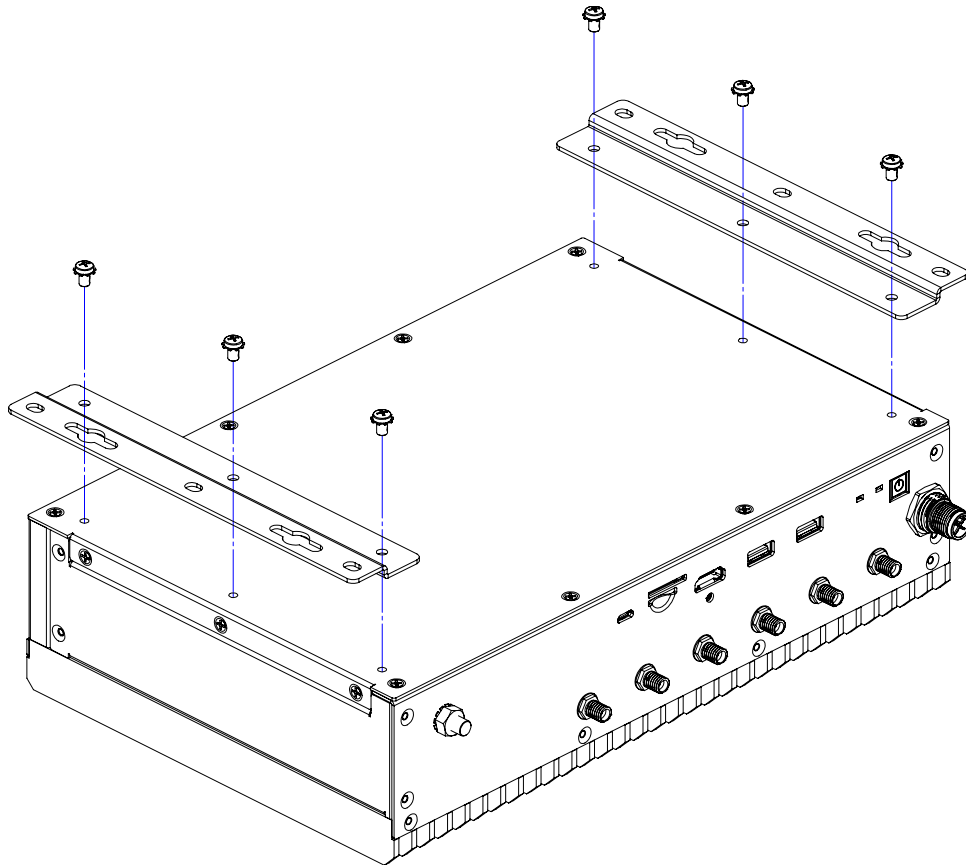
3.5 Installing micro-USIM Card

To install a micro-USIM card, insert the card into the slot on the rear panel as shown.



3.6 Wall or Surface Mounting

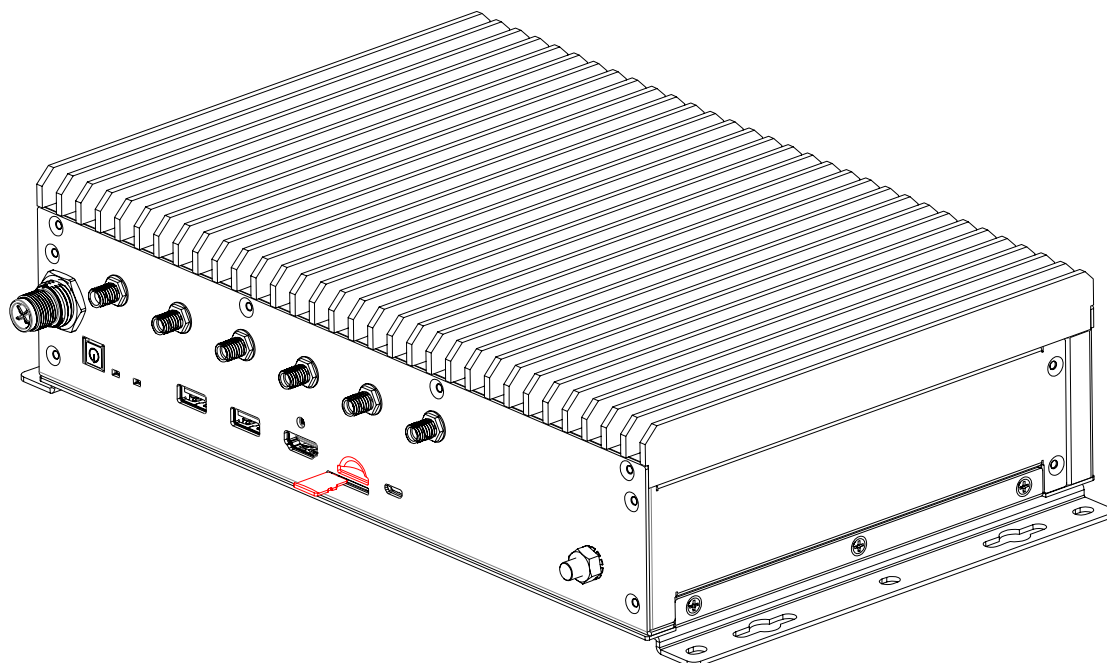
The AVA-RAGX can be wall or surface mounted using the wall mount brackets and screws provided. If wall mounting, make sure the wall can support the weight of the device. Secure the brackets to the chassis using the 6 screws provided as shown.



Refer to 2.4 Mechanical Dimensions on page 15 for bracket mounting hole dimensions.

3.7 Installing a microSD Card

To install a microSD card, insert the card into the slot on the rear panel as shown



3.8 Connecting a Ground Cable



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 M6 size ring terminal.
- Slide the ring terminal onto the ground stud and secure it with the locking M6 nut.



3.9 Connecting Peripherals

Connect all the peripheral devices needed for your system to function (e.g. KB/MS, display, etc.).

3.10 Connecting the Power Supply



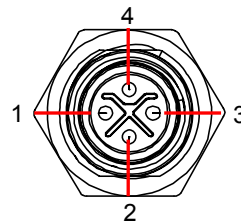
Connect the ground cable before making any other connections. When disassembling the system, always detach the ground cable last.



- 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 with specifications of the system

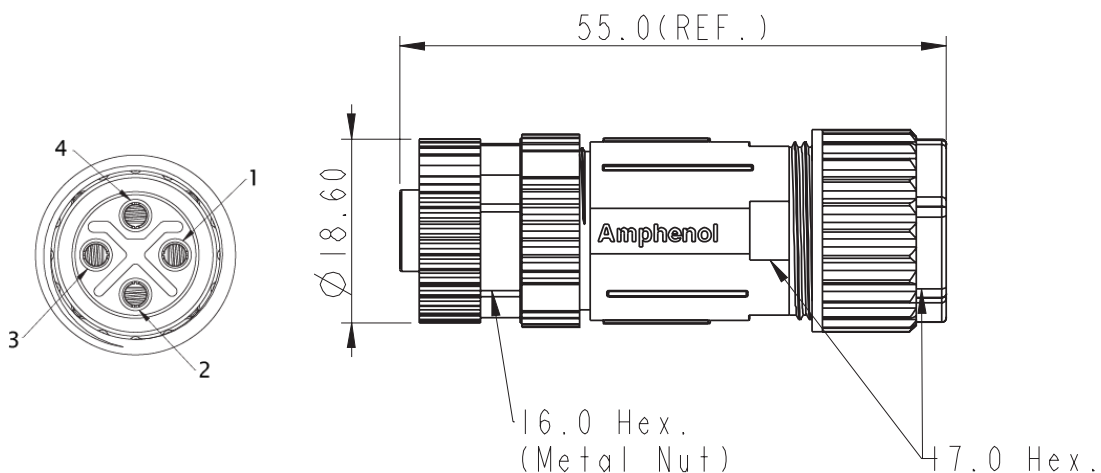
Connect the power supply to the 4-pin M12 connector on the rear of the chassis the device will power up when the power supply is turned on.

Pin #	Signal
1	Ignition
2	Vin+
3	Vin-
4	NA



Note: The user must provide the +24/36/72/110VDC to Pin 1 Ignition

An M12 S-coded 4-pin female connector (P/N: 30-51044-0000-A0) is provided for the user to make their own power cable.



3.11 Starting the System

Connect the DC power supply to the M12 4-pin connector on the rear panel. The AVA-RAGX will power on and boot up into the installed Linux Ubuntu OS.

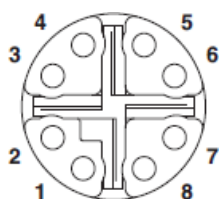
4 System Interfaces

4.1 External Connectors

Please refer to 2.5.1 Mechanical Layout Front View on page 16 for connector locations.

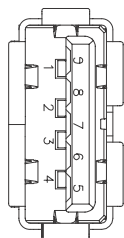
4.1.1 GbE M12 X-code Connectors

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

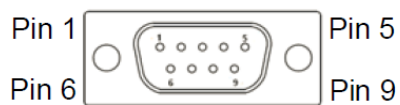


4.1.2 USB 3.0 Connector

Pin #	Signal Name
1	+5V_USB3
2	USB2_P0_DN
3	USB2_P0_DP
4	GND
5	USB3_P0_RXN
6	USB3_P0_RXP
7	GND
8	USB3_P0_TXN
9	USB3_P0_TXP



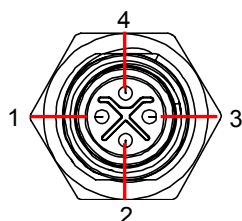
4.1.3 COM DB9 Connectors



Pin #	RS-232	RS-422	RS-485
Pin1	DCD	TXD-	D-
Pin2	RXD	TXD+	D+
Pin3	TXD	RXD+	NA
Pin4	DTR	RXD-	NA
Pin5	GND	GND	GND
Pin6	DSR	NA	NA
Pin7	RTS	NA	NA
Pin8	CTS	NA	NA
Pin9	RI	NA	NA

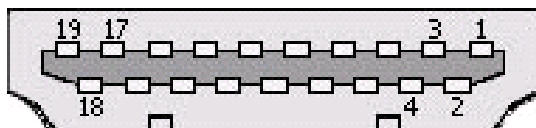
4.1.4 DC Power Input M12 Connector

Pin #	Signal
1	Ignition
2	Vin+
3	Vin-
4	NA



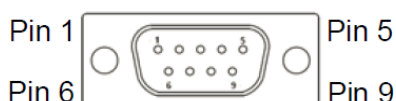
4.1.5 HDMI Connector

One HDMI connector with lockable on the front panel support HDMI2.0a/b (up to 6Gbps) standard specification. It can connect to VGA, DVI, Display Port monitors via HDMI to VGA adapter cable, HDMI to DVI adapter cable, and HDMI cable. HDMI Supports HDMI2.0a/b, resolutions up to 4096 x 2160 at 60Hz



Pin #	Signal	Pin #	Signal
Pin1	TMDS Data2+	Pin 11	TMDS Clock Shield
Pin2	TMDS Data2 Shield	Pin 12	TMDS Clock–
Pin3	TMDS Data2–	Pin13	CEC
Pin4	TMDS Data1+	Pin 14	Reserved
Pin5	TMDS Data1 Shield	Pin 15	SCL
Pin6	TMDS Data1–	Pin 16	SDA
Pin7	TMDS Data0+	Pin 17	DDC/CEC Ground
Pin8	TMDS Data0 Shield	Pin 18	+5V Power
Pin9	TMDS Data0–	Pin 19	Hot Plug Detect
Pin10	TMDS Clock+		

4.1.6 COM DB9 Connectors



Pin #	Port 0	Port 1
1	NC	NC
2	Port 0 CAN L	Port 1 CAN L
3	CANx_ISOGND	CANx_ISOGND
4	NC	NC
5	Sx_GND	Sx_GND
6	CANx_ISOGND	CANx_ISOGND
7	Port 0 CAN H	Port 1 CAN H
8	NC	NC
9	NC	NC

4.1.7 DIO DB9 Connectors

The location and pin definitions of the optional DIO connectors are as shown below.



Pin #	Port 0/1
1	CN_DI0
2	CN_DI2
3	DI_COM
4	CN_DO0
5	CN_DO2
6	P_+VDO_EXT01
7	CN_DI1
8	CN_DI3
9	DI_COM
10	CN_DO1
11	CN_DO3
12	ISO_DIDO_GND

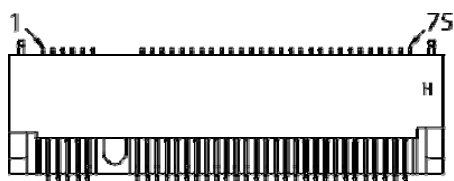
4.2 Internal Connectors

4.2.1 M.2 M Key 2280 SATA Module Connector



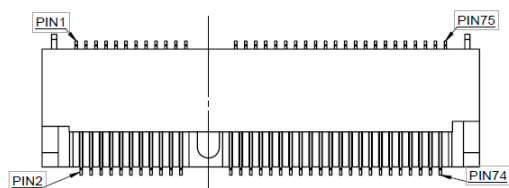
Pin	Signal Name	Pin	Signal Name
1	M2B_CONFIG_3	2	P_3V3_M2M
3	GND	4	P_3V3_M2M
5	NVHS0_RX3_N	6	N/C
7	NVHS0_RX3_P	8	N/C
9	GND	10	N/C
11	NVHS0_TX3_N	12	P_3V3_M2M
13	NVHS0_TX3_P	14	P_3V3_M2M
15	GND	16	P_3V3_M2M
17	NVHS0_RX2_N	18	P_3V3_M2M
19	NVHS0_RX2_P	20	N/C
21	M2B_CONFIG_0	22	N/C
23	NVHS0_TX2_N	24	N/C
25	NVHS0_TX2_P	26	N/C
27	GND	28	N/C
29	NVHS0_RX1_N	30	N/C
31	NVHS0_RX1_P	32	N/C
33	GND	34	N/C
35	NVHS0_TX1_N	36	N/C
37	NVHS0_TX1_P	38	DEVSLP
39	GND	40	N/C
41	NVHS0_RX0_N	42	N/C
43	NVHS0_RX0_P	44	N/C
45	GND	46	N/C
47	NVHS0_TX0_N	48	N/C
49	NVHS0_TX0_P	50	PCIE_RST5_N
51	GND	52	PCIE_CLKREQ5_N
53	PCIE_REF5_CLKN	54	PCIE_WAKE_N
55	PCIE_REF5_CLKP	56	N/C
57	GND	58	N/C
M-key			
67	PCIE_RST5_N	68	M.2_M_SUSCLK
69	M2B_CONFIG_1	70	P_3V3_M2M
71	GND	72	P_3V3_M2M
73	GND	74	P_3V3_M2M
75	M2B_CONFIG_2		

4.2.2 M.2 B-key 3042 LTE/5G Module Connector



Pin	Signal Name	Pin	Signal Name
1	CONFIG_3	2	P_3V3_M2B
3	GND	4	P_3V3_M2B
5	GND	6	P_3V3_M2B
7	USB_DS1_DP	8	P_3V3_M2B
9	USB_DS1_DN	10	N/C
11	GND		
KEY-B			
21	M2_CONFIG_0	20	N/C
23	N/C	22	N/C
25	N/C	24	N/C
27	GND	26	N/C
29	USB_SSDS1_RXN_CN	28	N/C
31	USB_SSDS1_RXP_CN	30	M2_UIM_RST_R
33	GND	32	M2_UIM_CLK_R
35	USB_SSDS1_TXN_CN	34	M2_UIM_DATA_R
37	USB_SSDS1_TXP_CN	36	P_+3V3_UIM_M2
39	GND	38	N/C
41	N/C	40	N/C
43	N/C	42	N/C
45	GND	44	N/C
47	N/C	46	N/C
49	N/C	48	N/C
51	GND	50	MP2_RST_N
53	N/C	52	N/C
55	N/C	54	N/C
57	GND	56	N/C
59	N/C	58	N/C
61	N/C	60	N/C
63	N/C	62	N/C
65	N/C	64	N/C
67	WWAN_RESET-L	66	M2_USIM_DET_R
69	M2_CONFIG_1	68	N/C
71	GND	70	P_3V3_M2B
73	GND	72	P_3V3_M2B
75	M2_CONFIG_2	74	P_3V3_M2B

4.2.3 M.2 E Key 2230 Wi-Fi Module Connector



Pin	Signal Name	Pin	Signal Name
1	GND	2	P_3V3_M2E
3	USB_DS4_DP	4	P_3V3_M2E
5	USB_DS4_DN	6	N/C
7	GND	8	N/C
9	N/C	10	N/C
11	N/C	12	N/C
13	N/C	14	N/C
15	N/C	16	N/C
17	N/C	18	GND
19	N/C	20	N/C
21	N/C	22	N/C
23	N/C	24	N/C
Key E			
33	GND	32	N/C
35	PCIe_x4_TX0_P	34	N/C
37	PCIe_x4_TX0_N	36	N/C
39	GND	38	CL_RST-L
41	PCIe_x4_RX0_P	40	CL_DATA
43	PCIe_x4_RX0_N	42	CL_CLK
45	GND	44	N/C
47	PCIE_REF0_CLKP	46	N/C
49	PCIE_REF0_CLKN	48	N/C
51	GND	50	M2E_SUSCLK
53	PCIE_CLKREQ0_N	52	PCIE_RST0_N
55	PCIE_WAKE_N	54	M2E_BT
57	GND	56	M2E_WiFi
59	N/C	58	M2E_SMBDATA
61	N/C	60	M2E_SMBCLK
63	GND	62	M2E_ALERT
65	N/C	64	N/C
67	N/C	66	PCIE_RST0_N
69	GND	68	N/C
71	N/C	70	M2E_PEWAKE1
73	N/C	72	P_3V3_M2E
75	GND	74	P_3V3_M2E

4.3 Buttons and LEDs

4.3.1 Power Button

The power button is non-latched, with a blue LED indicator. System is turned on when the button is depressed, and the power LED lights. If the system hangs, depressing the button for 5 seconds to turn off the system completely.

System status	Power Button LED
Idle on OS	On
Suspend	Blinking (1Hz)
Hibernation	Blinking (1Hz)
Power Off	Off

4.3.2 Reset Button

The reset button is a non-latched. The system is restarted when the button is depressed. If the system hangs, press the button to restart the system.

4.3.3 Recovery Button

Press this button to force the system into recovery mode only when flashing the operating system. Refer to 5.1 Operating System Update Procedure on page 38.

4.3.4 Status LEDs



LED indicator	Color	Description
SATA Drive	Red	When blinking, indicates the SATA drive is active.
Watchdog (WD)	Amber	Indicates watchdog timer status. When watchdog timer starts, the LED flashes. When the timer is expired, the system will auto reboot.
Diagnostic	Green	If lit continuously, indicates no physical storage is connected. If blinking, indicates no memory is installed on either SO-DIMM socket.
U1	Green	The LED is Green color for User control
U2	Green	The LED is Green color for User control
U3	Green	The LED is Green color for User control
U4	Yellow	The LED is Yellow color for User control
U5	Red	The LED is Red color for User control
U6	Green	The LED is Green color for User control

5 Software Upgrade

To upgrade the system software, follow the steps below.



5.1 Operating System Update Procedure

To update the operating system, perform the following steps.

1. Download the released manufacturing image (MFI) package and extract the tarball file.
For example:
 - AVA-RAGX (NVIDIA Jetson AGX Xavier Commercial): mfi_jetson-ava-ragx-emmc-1v2.2.tbz2
 - AVA-RAGX (NVIDIA Jetson AGX Xavier Industrial): mfi_jetson-ava-ragx-emmc-ind-1v2.2.tbz2
2. Put the AVA-RAGX into reset/recovery mode.
 - Power on the AVA-RAGX.
 - Press and hold the recovery button, and then press the reset button.
 - Release the reset button and recovery button.
3. Connect the AVA-RAGX's OTG port to the host with an OTG micro-usb cable.
4. Open a terminal on the host PC and run the following command:
 - \$ lsusb
5. Look for "Nvidia Corp." in the terminal output (an example is circled in red in the screenshot below). If found, the host PC has recognized the client and you may proceed. If not, check the OTG cable connection and perform troubleshooting as needed until the client is recognized

```
File Edit View Search Terminal Help
adlink@adlink:~$ lsusb
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 015: ID 046e:6000 Behavior Tech. Computer Corp.
Bus 001 Device 016: ID 045e:00cb Microsoft Corp. Basic Optical Mouse v2.0
Bus 001 Device 024: ID 0955:7f21 Nvidia Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
adlink@adlink:~$
```

6. Run the following commands in the directory that contains your downloaded BSP file:

- # sudo tar mfi_jetson-ava-ragx-emmc -<version>.tbz2
- # cd mfi_jetson-ava-ragx-emmc -<version>
- # sudo ./nvmflash.sh

5.2 User-Defined LED Sample Code

```
#!/bin/bash

# Check script is running as root
if [ "$EUID" -ne 0 ]
then echo "Please run as root"
exit
fi

SCRIPT_DIR="$(dirname $(readlink -f "${0}"))"
SCRIPT_NAME="$(basename "${0}")"

LED1_IDX="1"
LED2_IDX="2"
LED3_IDX="3"
LED4_IDX="4"
LED5_IDX="5"
LED6_IDX="6"

LED1_MAX_BRIGHTNESS="255"
LED2_MAX_BRIGHTNESS="255"
LED3_MAX_BRIGHTNESS="255"
LED4_MAX_BRIGHTNESS="255"
LED5_MAX_BRIGHTNESS="255"
LED6_MAX_BRIGHTNESS="255"

LED1_BRIGHTNESS="0"
LED2_BRIGHTNESS="0"
LED3_BRIGHTNESS="0"
LED4_BRIGHTNESS="0"
LED5_BRIGHTNESS="0"
LED6_BRIGHTNESS="0"

showLED () {
echo -e "=====+=====+=====+=====+"
echo -e "|          AVA-RAGX LED Status          |"
echo -e "+-----+-----+-----+"
echo -e "| LED NO | max_brightness | brightness |"
echo -e "=====+=====+=====+"
echo -e "| LED1 |   ${LED1_MAX_BRIGHTNESS}   |   ${LED1_BRIGHTNESS}   |"
echo -e "+-----+-----+-----+"
echo -e "| LED2 |   ${LED2_MAX_BRIGHTNESS}   |   ${LED2_BRIGHTNESS}   |"
echo -e "+-----+-----+-----+"
echo -e "| LED3 |   ${LED3_MAX_BRIGHTNESS}   |   ${LED3_BRIGHTNESS}   |"
echo -e "+-----+-----+-----+"
echo -e "| LED4 |   ${LED4_MAX_BRIGHTNESS}   |   ${LED4_BRIGHTNESS}   |"
echo -e "+-----+-----+-----+"
echo -e "| LED5 |   ${LED5_MAX_BRIGHTNESS}   |   ${LED5_BRIGHTNESS}   |"
echo -e "+-----+-----+-----+"
echo -e "| LED6 |   ${LED6_MAX_BRIGHTNESS}   |   ${LED6_BRIGHTNESS}   |"
}
```

```

    echo -e "+=====+=====+=====+=====+"
}

getLED_MAX_BRIGHTNESS () {
    LED1_MAX_BRIGHTNESS=`cat /sys/class/leds/LED${LED1_IDX}/max_brightness`
    LED2_MAX_BRIGHTNESS=`cat /sys/class/leds/LED${LED2_IDX}/max_brightness`
    LED3_MAX_BRIGHTNESS=`cat /sys/class/leds/LED${LED3_IDX}/max_brightness`
    LED4_MAX_BRIGHTNESS=`cat /sys/class/leds/LED${LED4_IDX}/max_brightness`
    LED5_MAX_BRIGHTNESS=`cat /sys/class/leds/LED${LED5_IDX}/max_brightness`
    LED6_MAX_BRIGHTNESS=`cat /sys/class/leds/LED${LED6_IDX}/max_brightness`
}

getLED_BRIGHTNESS () {
    LED1_BRIGHTNESS=`cat /sys/class/leds/LED${LED1_IDX}/brightness`
    LED2_BRIGHTNESS=`cat /sys/class/leds/LED${LED2_IDX}/brightness`
    LED3_BRIGHTNESS=`cat /sys/class/leds/LED${LED3_IDX}/brightness`
    LED4_BRIGHTNESS=`cat /sys/class/leds/LED${LED4_IDX}/brightness`
    LED5_BRIGHTNESS=`cat /sys/class/leds/LED${LED5_IDX}/brightness`
    LED6_BRIGHTNESS=`cat /sys/class/leds/LED${LED6_IDX}/brightness`
}

setLED_BRIGHTNESS () {
    LED_IDX=$1
    LED_BRIGHTNESS=$2

    if [[ ${LED_IDX} != "1" && ${LED_IDX} != "2" && ${LED_IDX} != "3" && ${LED_IDX} -ne "4" &&
    ${LED_IDX} -ne "5" && ${LED_IDX} -ne "6" ]]; then
        echo "Invalid LED index !!"
        exit
    fi

    if [[ ${LED_BRIGHTNESS} != "0" && ${LED_BRIGHTNESS} != "1" ]]; then
        echo "Invalid LED brightness value !!"
        exit
    fi

    `echo ${LED_BRIGHTNESS} > /sys/class/leds/LED${LED_IDX}/brightness`
}

usage () {
    echo "${SCRIPT_NAME} Usage:"
    echo "-----"
    echo "(A)${SCRIPT_NAME} [-h|--help] : show this help."
    echo "(B)${SCRIPT_NAME} [--show] : show LED status."
    echo "    e.g. ${SCRIPT_NAME} --show"
    echo "(C)${SCRIPT_NAME} [--set LED_IDX LED_BRIGHTNESS] : set the DO value."
    echo "    LED_IDX: [1|2|3|4|5|6], LED_BRIGHTNESS: [0|1]"
    echo "    e.g. ${SCRIPT_NAME} --set 3 1"
    echo "-----"
    exit
}

if [ $# -ge 1 ]; then
    if [ "$1" = "-h" ]; then
        usage
    elif [ "$1" = "--help" ]; then
        usage
    elif [ "$1" = "--show" ]; then
        getLED_MAX_BRIGHTNESS
        getLED_BRIGHTNESS
    fi
fi

```

```
        showLED
    elif [ "$1" = "--set" ]; then
        if [ $# -ne 3 ]; then
            usage
        else
            setLED_BRIGHTNESS $2 $3
            getLED_MAX_BRIGHTNESS
            getLED_BRIGHTNESS
            showLED
        fi
    else
        usage
    fi
else
    usage
fi
```

Important Safety Instructions

For user safety, please read and follow all **instructions**, **WARNINGS**, **CAUTIONS**, and **NOTES** marked in this manual and on the associated equipment before handling/operating the equipment.

- Read these safety instructions carefully.
- Keep this user's manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment:
 - Turn off power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
 - Keep equipment away from water or liquid sources;
 - Keep equipment away from high heat or high humidity;
 - Keep equipment properly ventilated (do not block or cover ventilation openings);
 - Make sure to use recommended voltage and power source settings;
 - Always install and operate equipment near an easily accessible electrical socket-outlet;
 - Secure the power cord (do not place any object on/over the power cord);
 - Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
 - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.
- A Lithium-type battery may be provided for backup power.



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

- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.
- Equipment must be serviced by authorized technicians when:
 - The power cord or plug is damaged;
 - Liquid has penetrated the equipment;
 - It has been exposed to high humidity/moisture;
 - It is not functioning or does not function according to the user's manual;
 - It has been dropped and/or damaged; and/or,
 - It has an obvious sign of breakage.

Getting Service

Ask an Expert: <http://askanexpert.adlinktech.com>

ADLINK Technology, Inc.

Address: No. 66, Huaya 1st Rd., Guishan District
Taoyuan City 333411, Taiwan
333411 桃園市龜山區華亞一路 66 號
Tel: +886-3-216-5088
Fax: +886-3-328-5706
Email: service@adlinktech.com

Ampro ADLINK Technology, Inc.

Address: 6450 Via Del Oro, San Jose, CA 95119-1208, USA
Tel: +1-408-360-0200
Toll Free: +1-800-966-5200 (USA only)
Fax: +1-408-600-1189
Email: info@adlinktech.com

ADLINK Technology (China) Co., Ltd.

Address: 上海市浦东新区张江高科技园区芳春路 300 号 (201203)
300 Fang Chun Rd., Zhangjiang Hi-Tech Park, Pudong New Area
Shanghai, 201203 China
Tel: +86-21-5132-8988
Fax: +86-21-5132-3588
Email: market@adlinktech.com

ADLINK Technology GmbH

Address: Hans-Thoma-Strasse 11, D-68163, Mannheim, Germany
Tel: +49-621-43214-0
Fax: +49-621 43214-30
Email: emea@adlinktech.com

Please visit the Contact page at www.adlinktech.com for information on how to contact the ADLINK regional office nearest you.