

ASR-A501

Rockchip RK3588 Cortex-A76 +
A55 4' Single Board Computer

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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.

Ordering Information

Part No.	Description
ASR-A501-M0A1	4'SBC RK3588 2.4GHz, 8GB DDR, 64GB eMMC, 0~70 °C
ASR-A501-M1A1	4'SBC RK3588J 2.0GHz, 8GB DDR, 64GB eMMC, -40~85 °C

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

- 1 x ASR-A501
- 1 x Heatsink with Screws
- 1 x Terminal Plug 2Pin, 3 x Terminal Plug 2x4Pin
- 1 x China ROHS

Optional Accessories

Part No.	Description
1700035538-01	Debug port & CAN cable for ASR-A501
96PSA-A60W24T2-3	AC to DC adapter, DC 24V 60W, 0 ~ 40°C
1702002605	Power cord 3P EU 10A 250V 183cm
1702031801	Power cord 3P UK 10A 250V 183cm
1702002600	Power cord 3P UL 10A 125V 180cm
1700000237	Power cord 3P PSE 183 cm
1700009652	Power cord CCC 3P 10A 250V 183cm
AFE-RM01-4PA1	Extension board, 4 AHD/4 USB2.0/4 DI/4DO/M.2 Key-M
AFE-RM02	Extension board, USB2.0/4 DI/4DO/M.2 Key-M
AFE-RM02-4PA1	Extension board, 4 GMSL/4 USB2.0/4 DI/4 DO/M.2 key-M
AFE-RM02-6PA1	Extension board, 6 GMSL/4 USB2.0/4 DI/4 DO/M.2 key-M
EWM-W179M201E	WiFi6/BT, RTL8852BE Wifi: PCIe, BT: USB
1751000651-01	Dipole Ant. WiFi 6E SMA/M-R BLK L111.7mm IP54
1751000649-01	Cable Ant. SMA/F MHF4L/113 BLK L100mm
968DD0342*	5G Module, RM520NGLAA-M20-SGASA M.2 Key-B
1750009372-01	Ant.SMA/M 90/180 5G BLK 167mm RG178
1751000625-01	Cable Ant. SMA/F MHF4L/113 BLK L150mm
968DD00443*	4G Module, EM05CNFD-128-SGAS M.2 Key-B
1700035537-01	2 x RS232/485 F cable D-SUB 9P(M)x2 15cm

*Please contact us to get suitable cellular module for your region.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all AC outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or sprayed detergent.
4. For pluggable equipment, the power outlet should be 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 and 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 the equipment from the power source to avoid damage from transient over-voltage.
12. Never pour liquid into an opening as this can cause fire or electrical shock.
13. Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.
14. If one of the following occurs, have the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into 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. **DISCLAIMER:** These instructions are provided according to IEC 704-1 specifications. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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Chapter 1

Introduction

This chapter introduces the ASR-A501 Product.

Sections include:

- Introduction
- Specifications

1.1 Introduction

The Advantech ASR-A501 is a 4-inch single-board computer powered by the Rockchip RK3588 SoC, featuring quad Arm Cortex-A76 and quad Cortex-A55 processors, a 6 TOPS NPU, and a high-performance Arm Mali-G610 3D graphics engine.

The ASR-A501 offers a wide range of interfaces, including 2 × USB 3.0, 4 × Gigabit Ethernet, 2 × CAN FD, 4 × COM ports, and 1 × HDMI. Expansion options include 1 × M.2 B-key slot (PCIe x1/SATA/USB 3.0) and 1 × M.2 E-key slot (PCIe x1/USB 2.0). The system also supports multiple camera inputs (GMSL or AHD) through extension boards such as the AFE-RM01 or AFE-RM02.

The ASR-A501 supports multiple operating systems, including Debian 12 with RT patch and Android 14. It also integrates Advantech Power Suite, ROS, and EtherCAT, helping accelerate application development and system integration.

1.2 Specifications

Table 1.1: Specifications

Processor System	CPU	Rockchip RK3588 Arm Quad Cortex-A76 2.4GHz and Quad Cortex-A55 1.8GHz
	NPU	Neural network acceleration engine up to 6.0 TOPS
Memory	Capacity	On-board LPDDR4 up to 8/16GB
	Flash	64/128 GB eMMC NAND Flash for O.S
Graphics	Graphics Engine	Arm Mali-G610 MP4 GPU, High performance OpenGL ES 1.1, 2.0 and 3.2, OpenCL 2.2, Vulkan1.2 etc.
	H/W Video Codec	Decoder: H.265/VP9 8K@60fps, H.264 8K@30fps, H.263, VC-1, VP8, MVC, AV1, MPEG-4/2/1 Encoder: H.265/H.264 8K@30fps, Multi-channel encoder in parallel for less resolution
Display	Display out	1 x HDMI2.0 3840*2160@30Hz
Ethernet	Chipset & Speed	2 x RTL8211FS 10/100/1000 Mbps 1 x RTL8119I 10/100/1000 Mbps 1 x Intel I226 2.5Gbps
I/O	PCIe	2 x PCIe 3.0 1 lane through 120-pin B2B connector
	USB	1 x USB3.2 Gen1 by 1 Type A 1 x USB3.2 Gen1 by 1 Type A/OTG 1 x USB2.0, through 120-pin B2B connector
	Audio	1 x Mic in/Line out
	SDIO	1 x Micro SD Slot
	UART	2 x RS-232/485 (Default RS-232, s/w configured) 2 x RS-485 1 x Debug
	CAN	2 x CAN FD (5M)
	I2C	2 x I2C, through 120-pin B2B connector
	SPI	1 x SPI, through 120-pin B2B connector
	Camera Input	2 x MIPI-CSI x 4lane, through 120-pin B2B connector

Table 1.1: Specifications		
Expansion	M.2 Socket	1 x E-Key 2230 (PCIe2.1, USB2.0) 1 x B-Key 3052 (SATA/PCIe*, USB3.0)
	B2B Connector	2 x MIPI-CSI 4 Lane, 1 x USB2.0, 1xUART, 1x I2C, 1 x SPI, through 120-pin B2B connector
	SIM Slot	1 x Nano SIM Slot
Power	Power Supply Voltage	12-24V DC-in
Environment	Operational Temperature	0 ~ 70 °C/-40~85 °C
Mechanical	Dimensions (W x D)	165 x 115 mm (5.7 ~ 4.01 in)
Certifications		CE EMC/FCC Class B/UKCA/IC
Operation System		Debian12, Android14

*Note: Support offered upon request.

1.3 Mechanical Specifications

- **Dimensions:** (D x W) 165 x 115 mm (5.7 ~ 4.01 in)
- **Height on Top:** Under 18 mm (Without heatsink)
- **Reference Weight:** 150.3g (Without heatsink)

1.3.1 Dimensions

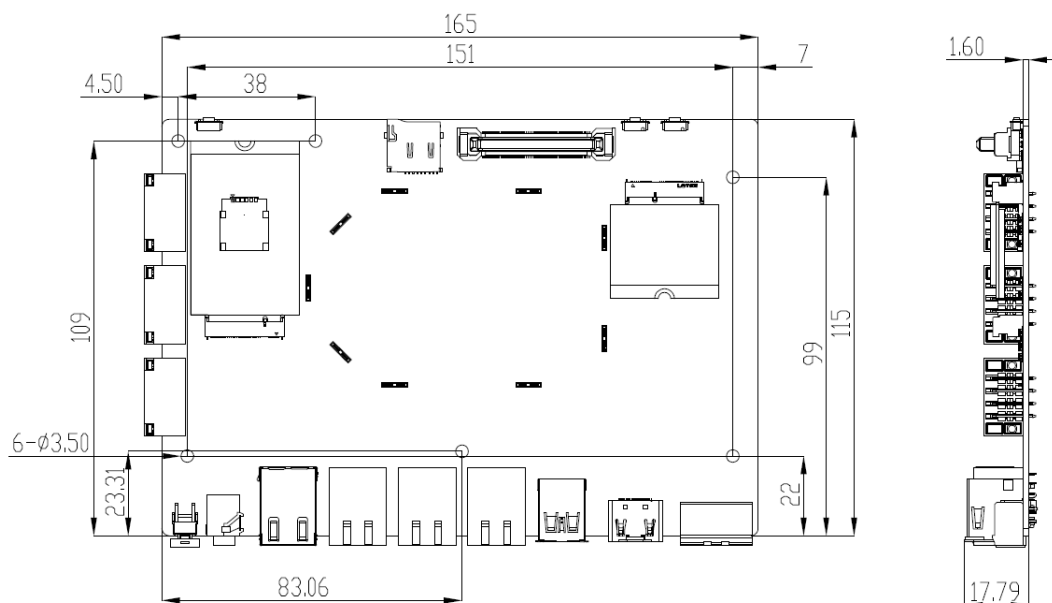


Figure 1.1 ASR-A501 Mechanical Diagram

1.3.2 Quick Installation Guide

This section provides instructions for installing the heat sink and extension board for the ASR-A501. Please follow the diagram below for assembly.

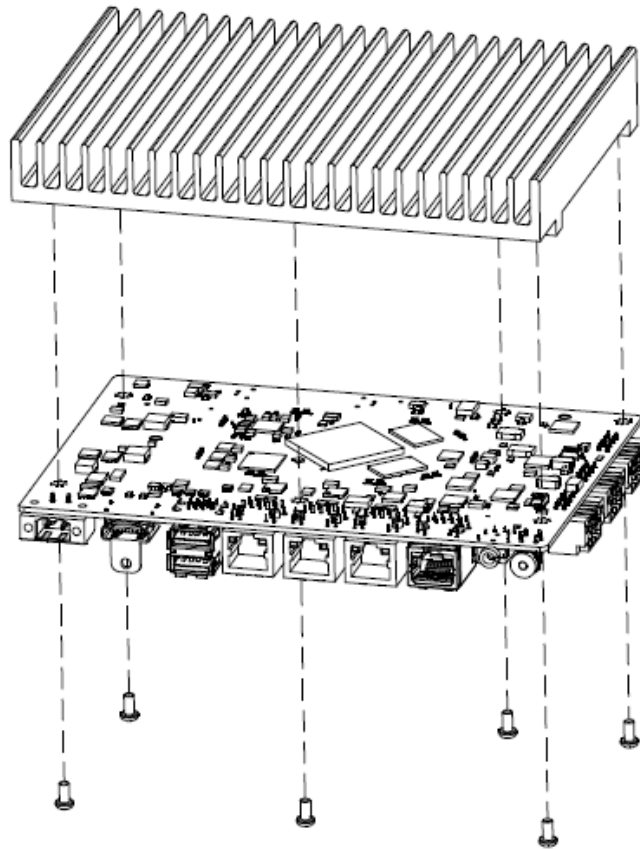


Figure 1.2 ASR-A501 & Heatsink Installation

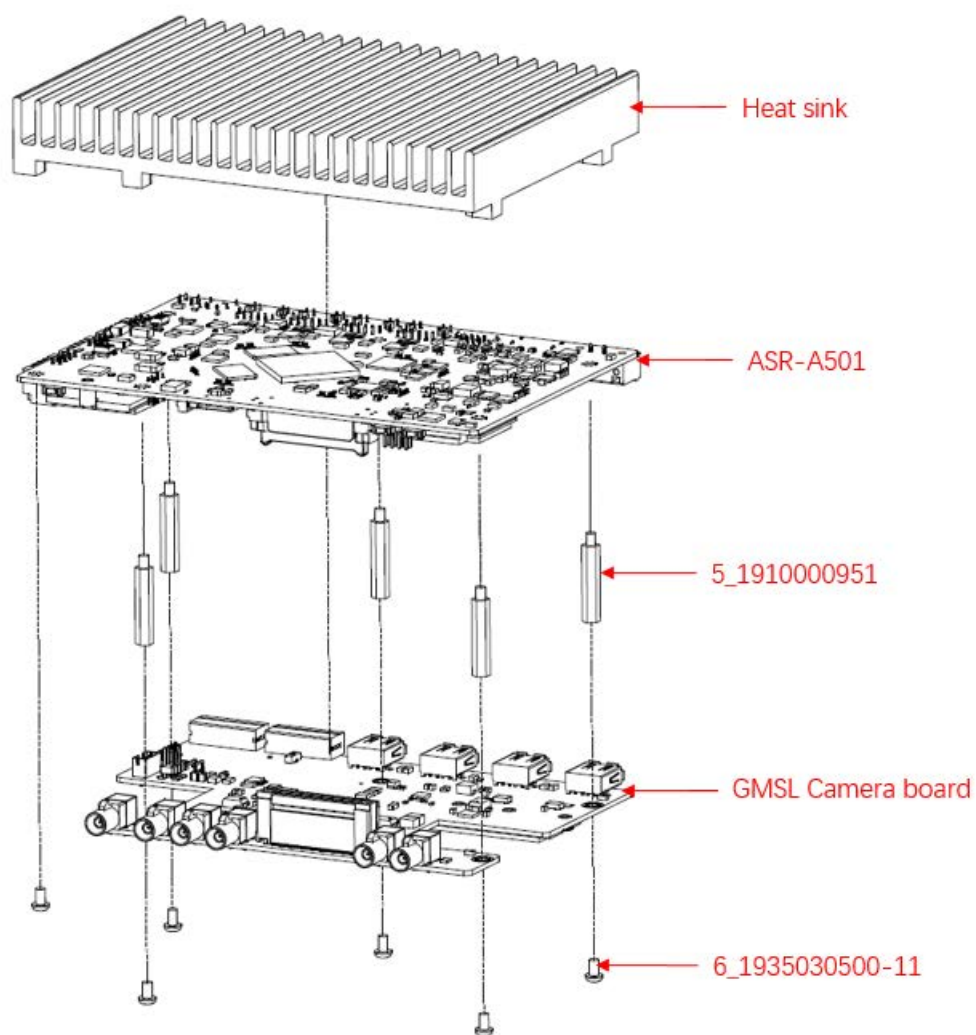


Figure 1.3 ASR-A501 & Heat sink & AFE-RM02 Installation

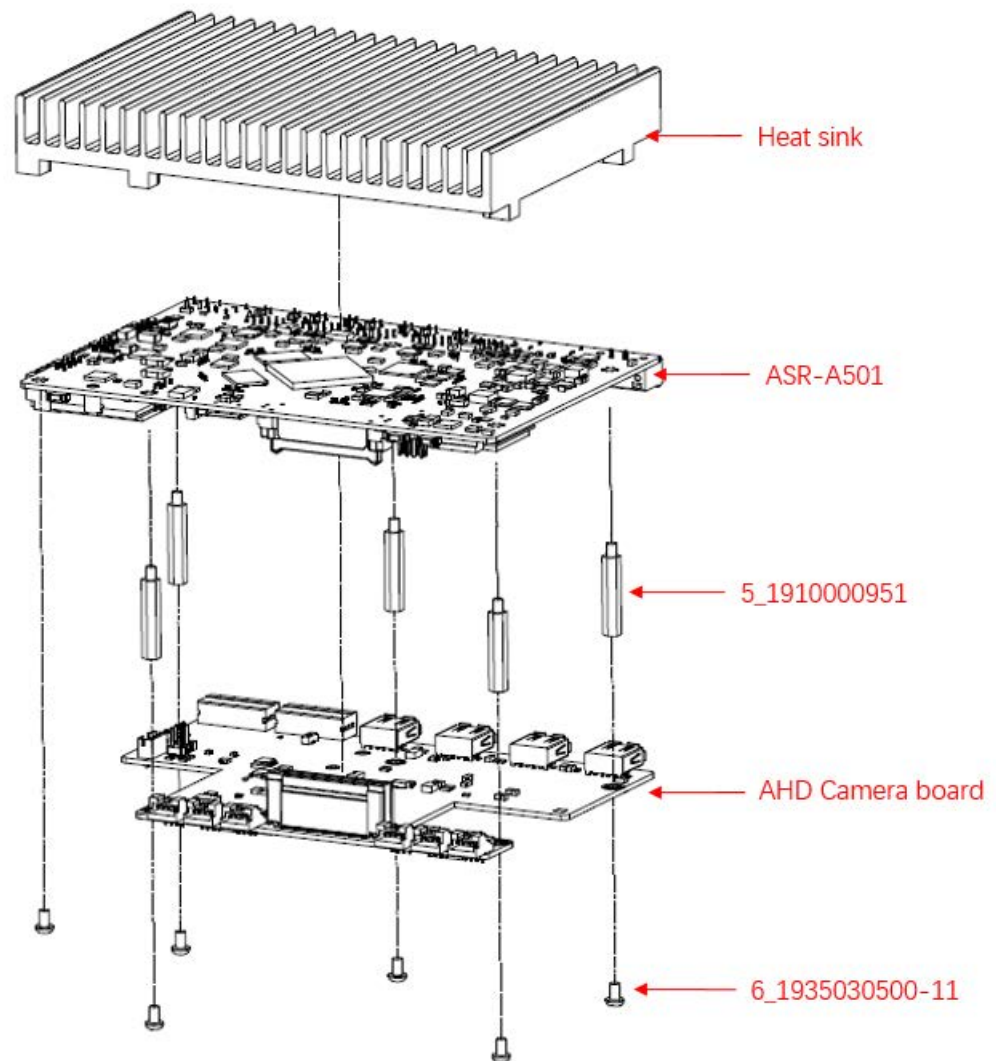
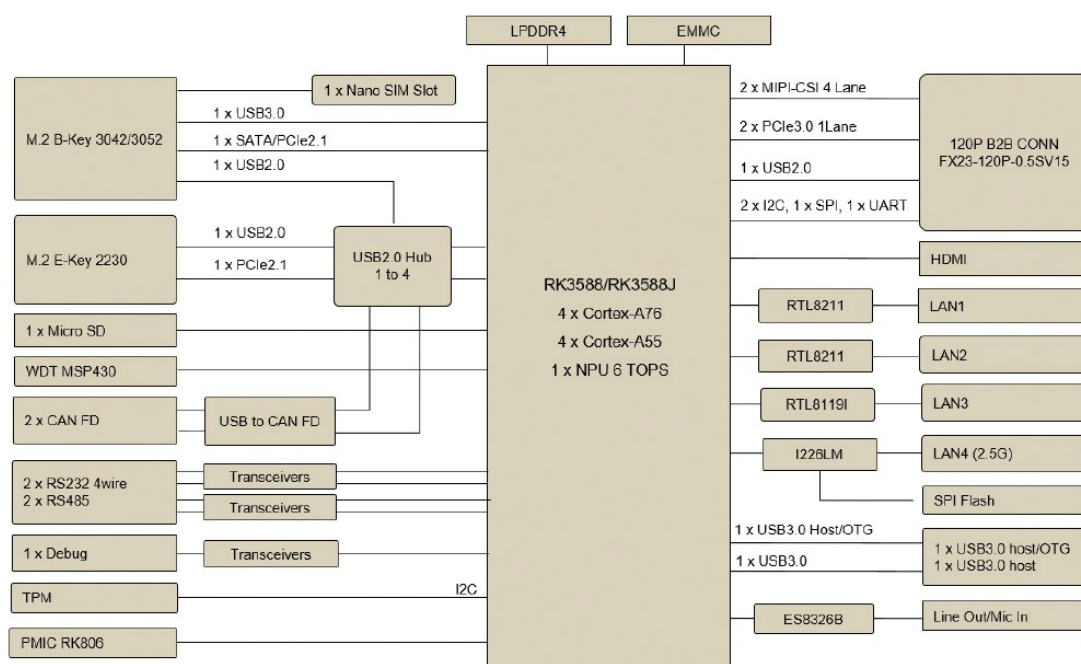


Figure 1.4 ASR-A501 & Heatsink & AFE-RM01 Installation

1.4 Electrical Specifications

- **Power Supply Voltage:** DC-in 12-24V
- **RTC Battery:**
 - Typical voltage: 3V
 - Normal discharge capacity: 210mAH

1.5 Block Diagram



Chapter 2

H/W Installation

This chapter details mechanical and connector information for the ASR-A501.

Sections include:

- Connector Information
- Block Diagram

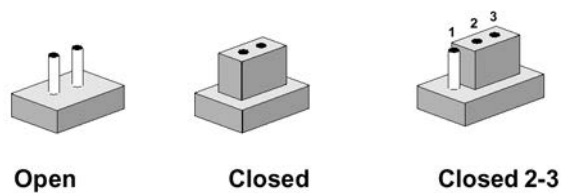
2.1 Introduction

The following sections show the internal jumper settings and the external connector pin assignments for different applications.

2.2 Jumpers

2.2.1 Jumper Description

You may configure ASR-A501 to match the needs of your application 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, you 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. In this case you would connect either pins 1 and 2, or 2 and 3.



The jumper settings are schematically depicted in this manual as follows.



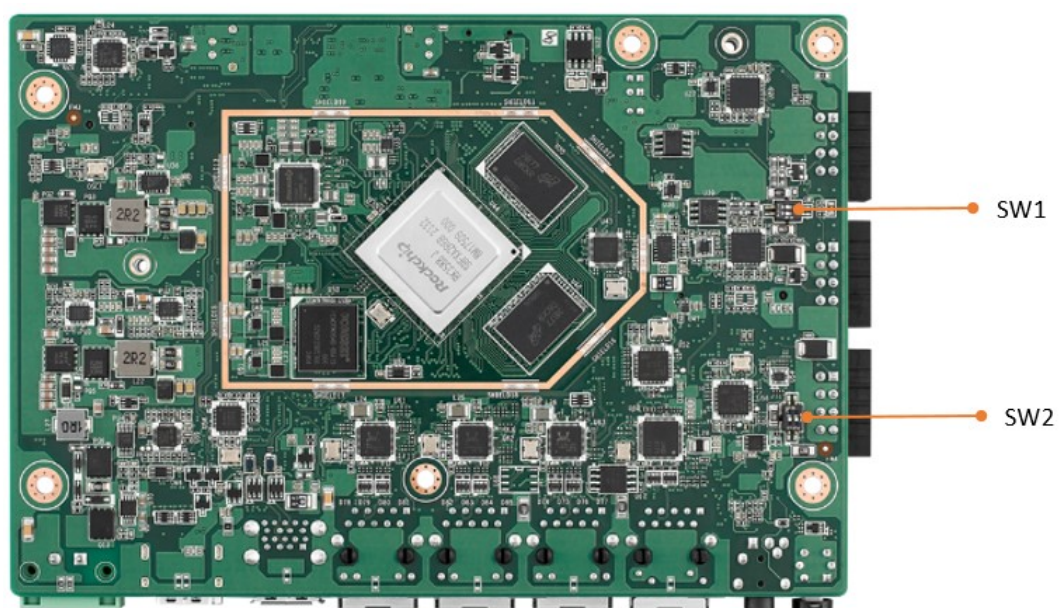
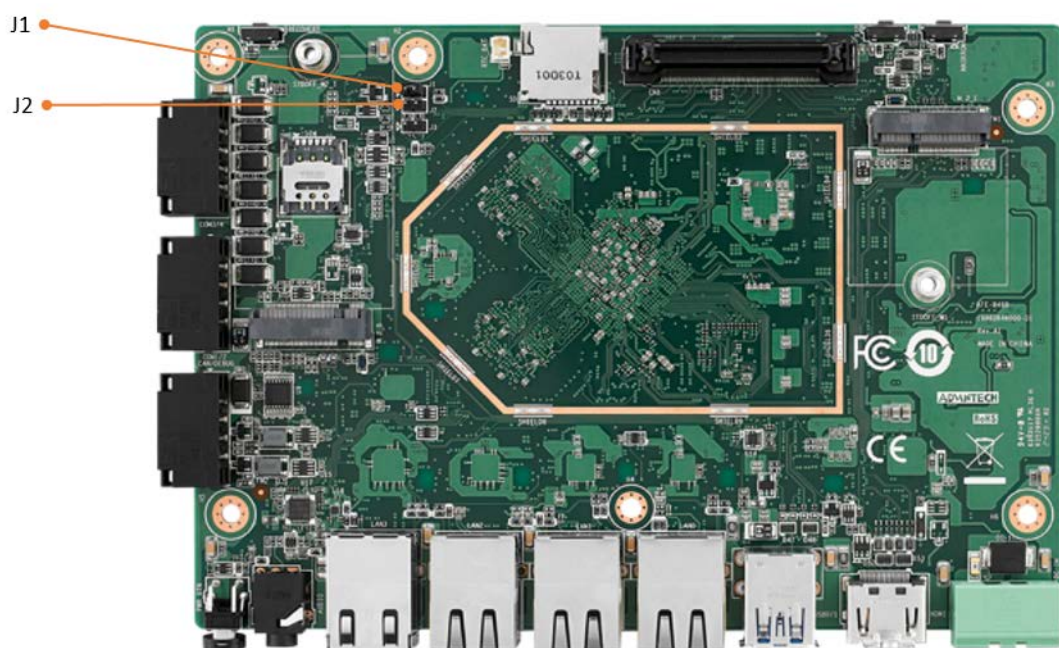
A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes. Generally, you simply need a standard cable to make most connections.

2.2.2 Jumper List

Table 2.1: Jumper List

Position	Description
SW1	COM2/4 485 Terminal
SW2	CAN FD Terminal
J1	USB0 OTG Mode selection, default USB3.0 host
J2	ATX/AT Mode Selection, default AT mode

2.2.3 Jumper Locations



2.2.4 Jumper Settings

Table 2.2: SW1: COM2/4 485 Terminal

Setting	Function
1 ON	COM4 Terminal 120 ohm (Default)
1 OFF	COM4 NO Terminal 120 ohm
2 ON	COM2 Terminal 120 ohm (Default)
2 OFF	COM2 NO Terminal 120 ohm



Table 2.3: SW2: CAN1/2 Terminal

Setting	Function
1 ON	CAN2 Terminal 120 ohm (Default)
1 OFF	CAN2 NO Terminal 120 ohm
2 ON	CAN1 Terminal 120 ohm (Default)
2 OFF	CAN1 NO Terminal 120 ohm

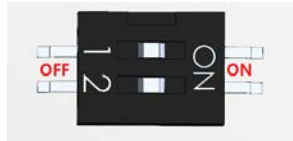


Table 2.4: J1: USB0_OTG Mode Select

Setting	Function
1-2	OTG Host (Default)
1-X	OTG Slave

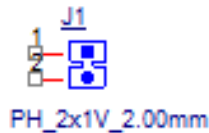
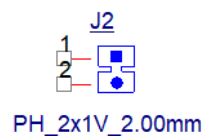


Table 2.5: J2: ATX/AT Mode Select

Setting	Function
1-2	ATX Mode
1-X	AT Mode (Default)

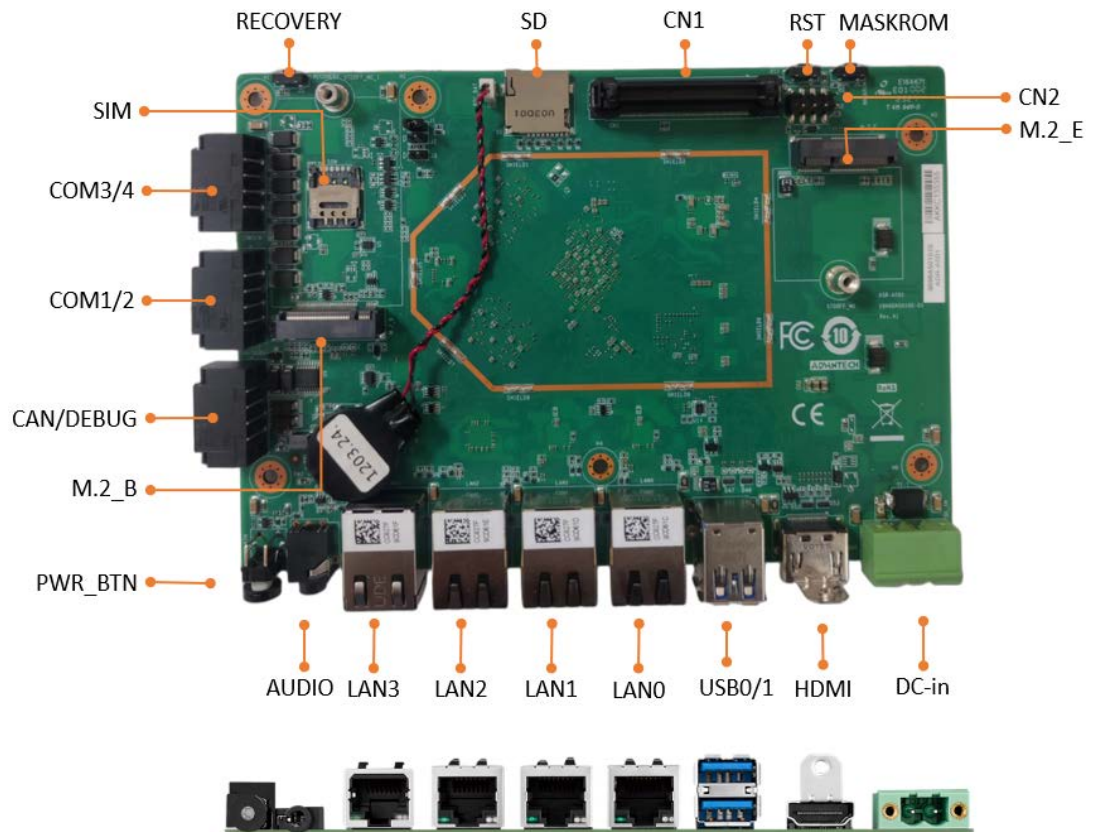


2.3 Connectors

Table 2.6: Connectors

Position	Description
AUDIO	Lineout/MIC in Audio Jack
COM1/2	RS232/485 Ports
COM3/4	RS232/485 Ports
CAN/DEBUG	CAN FD and Debug Ports
CN1	Board to Board Connector
CN2	PWR_SW#/PWR_LED/RST_BTN# Connector
DC-IN	12~24V DC_IN
HDMI	HDMI Connector
LAN0	LAN Connector
LAN1	LAN Connector
LAN2	LAN Connector
LAN3	LAN Connector
M.2_E	M.2_E Key Slot
M.2_B	M.2_B Key Slot
MASKROM	Maskrom Button
PWR_BTN	Power Button
RST	RST Button
RECOVERY	Recovery Button
SIM	Nano SIM Card Slot
SD	Micro SD Card Slot
USB0/1	USB3.0/USB2.0 OTG Type A Connector

2.4 Connector Locations



2.5 Connector Pin Definition

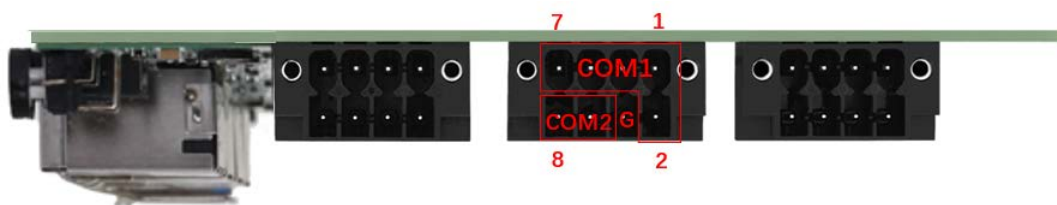
Table 2.7: Audio: Audio Connector

Pin	Pin Name
1	NL
2	HP_DET#
3	GND_AUDIO
4	HP_LOUT
5	HP_ROUT
6	GND_AUDIO
7	MIC_IN



Table 2.8: COM1/2: RS232/485 Connector

Pin	Pin Name
1	COM1_RX_485+
2	COM1_485-
3	COM1_TX
4	GND
5	COM1_RTS#
6	COM2_485-
7	COM1_CTS#
8	COM2_485+

**Table 2.9: COM3/4: RS232/485 Connector**

Pin	Pin Name
1	COM3_RX_485+
2	COM3_485-
3	COM3_TX
4	GND
5	COM3_RTS#
6	COM4_485
7	COM3_CTS#
8	COM4_485+

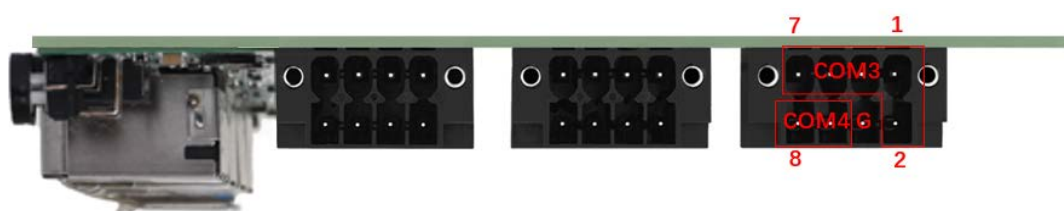
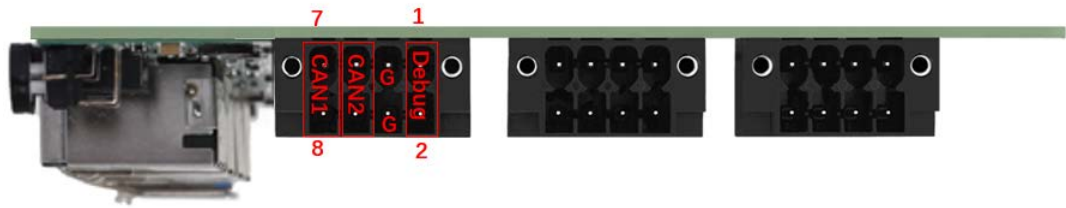


Table 2.10: CAN/DEBUG: CAN FD/Debug Connector

Pin	Pin Name
1	TX_DEBUG
2	RX_DEBUG
3	GND
4	GND
5	CAN2_H
6	CAN2_L
7	CAN1_H
8	CAN1_L

**Table 2.11: CN1: B to B Connector Pin Definition**

Pin	Pin Name	Pin	Pin Name
1	MIPI_CSI0_RX_CLK0P	61	MIPI_CSI1_RX_CLK0P
2	MIPI_CSI0_RX_CLK0N	62	MIPI_CSI1_RX_CLK0N
3	GND	63	GND
4	MIPI_CSI0_RX_D0P	64	MIPI_CSI1_RX_D0P
5	MIPI_CSI0_RX_D0N	65	MIPI_CSI1_RX_D0N
6	GND	66	GND
7	MIPI_CSI0_RX_D1P	67	MIPI_CSI1_RX_D1P
8	MIPI_CSI0_RX_D1N	68	MIPI_CSI1_RX_D1N
9	GND	69	GND
10	MIPI_CSI0_RX_CLK1P	70	MIPI_CSI1_RX_CLK1P
11	MIPI_CSI0_RX_CLK1N	71	MIPI_CSI1_RX_CLK1N
12	GND	72	GND
13	MIPI_CSI0_RX_D2P	73	MIPI_CSI1_RX_D2P
14	MIPI_CSI0_RX_D2N	74	MIPI_CSI1_RX_D2N
15	GND	75	GND
16	MIPI_CSI0_RX_D3P	76	MIPI_CSI1_RX_D3P
17	MIPI_CSI0_RX_D3N	77	MIPI_CSI1_RX_D3N
18	GND	78	GND
19	NA	79	NA
20	NA	80	NA
21	GND	81	GND
22	NA	82	NA
23	NA	83	NA
24	GND	84	GND
25	NA	85	NA
26	NA	86	NA
27	GND	87	GND

Table 2.11: CN1: B to B Connector Pin Definition

28	NA	88	NA
29	NA	89	NA
30	GND	90	GND
31	NA	91	NA
32	NA	92	NA
33	GND	93	GND
34	MIPI_CAMERA0_CLK_M0	94	PCIE30X4_PERSTN_M1
35	GND	95	PCIE30X4_CLKREQN_M1
36	MIPI_CAMERA1_CLK_M0	96	CARRIER_PWR_ON_A
37	GND	97	RESET_L
38	MIPI_CAMERA2_CLK_M0	98	GND
39	GND	99	USB20_HOST1_z_DP
40	MIPI_CAMERA3_CLK_M0	100	USB20_HOST1_z_DM
41	GND	101	GND
42	GPIO1_D7_1V8	102	GND
43	GND	103	PCIE30_PORT0_TX1P
44	I2C1_SCL_M4_1V8	104	PCIE30_PORT0_TX1N
45	I2C1_SDA_M4_1V8	105	GND
46	I2C4_SDA_M1_1V8	106	PCIE30_PORT0_RX1P
47	I2C4_SCL_M1_1V8	107	PCIE30_PORT0_RX1N
48	GND	108	GND
49	SPI0_CLK_M2	109	SLOT_CLKP3
50	SPI0_MISO_M2	110	SLOT_CLKN3
51	SPI0_MOSI_M2	111	GND
52	SPI0_CS0_M2	112	PCIE30_PORT0_TX0P
53	GND	113	PCIE30_PORT0_TX0N
54	UART7_RX_M1	114	GND
55	UART7_TX_M1	115	PCIE30_PORT0_RX0P
56	GND	116	PCIE30_PORT0_RX0N
57	GPIO3_B2_1V8	117	GND
58	GND	118	SLOT_CLKP2
59	VCCA_1V8_S0	119	SLOT_CLKN2
60	SARADC_VIN7_HW_IDC	120	GND
P1	+VIN	H1	GND
P2	+V5	H2	GND
P3	+VIN	H3	GND
P4	+V5	H4	GND



Table 2.12: CN2: PWR_SW#/PWR_LED/RST_BTN#

Pin	Pin Name
1	PWR_SW#
2	GND
3	PWR_LED
4	GND
5	WDOG_RST#
6	GND
7	RST_BTN#
8	GND

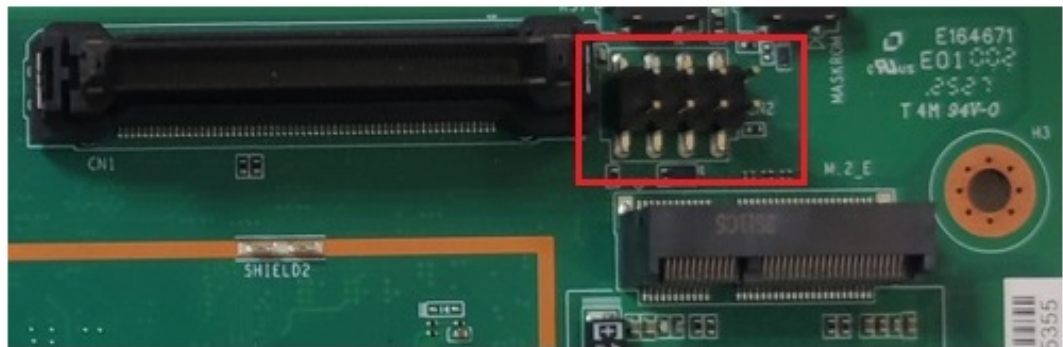


Table 2.13: DC_IN: 12~24V DC IN

Pin	Pin Name
1	DC-IN (12~24V)
2	GND



Table 2.14: HDMI: HDMI Connector

Pin	Pin Name	Pin	Pin Name
1	HDMI1_z_DATA2+	2	GND
3	HDMI1_z_DATA2-	4	HDMI1_z_DATA1+
5	GND	6	HDMI1_z_DATA1-
7	HDMI1_z_DATA0+	8	GND
9	HDMI1_z_DATA0-	10	HDMI1_z_CLK+
11	GND	12	HDMI1_z_CLK-
13	HDMI1_z_CEC	14	NL
15	HDMI1_DDC_CLK	16	HDMI1_DDC_DATA
17	GND	18	+5V_HDMI
19	HDMI1_HPD		

**Table 2.15: LAN: LAN0 Connector**

Pin	Pin Name	Pin	Pin Name
1	LAN0_z_MDI0+	11	VCC_3V3_S0
2	LAN0_z_MDI0-	12	LAN0_ACT
3	LAN0_z_MDI1+	13	LAN0_LINK100
4	LAN0_z_MDI1-	14	LAN0_LINK1000
5	GND (CAP)	H1	NL
6	GND (CAP)	H2	NL
7	LAN0_z_MDI2+	H3	GND_F
8	LAN0_z_MDI2-	H4	GND_F
9	LAN0_z_MDI3+		
10	LAN0_z_MDI3+		



Table 2.16: LAN: LAN1 Connector

Pin	Pin Name	Pin	Pin Name
1	LAN1_z_MDI0+	11	VCC_3V3_S0
2	LAN1_z_MDI0-	12	LAN1_ACT
3	LAN1_z_MDI1+	13	LAN1_LINK100
4	LAN1_z_MDI1-	14	LAN1_LINK1000
5	GND (CAP)	H1	NL
6	GND (CAP)	H2	NL
7	LAN1_z_MDI2+	H3	GND_F
8	LAN1_z_MDI2-	H4	GND_F
9	LAN1_z_MDI3+		
10	LAN1_z_MDI3+		

**Table 2.17: LAN: LAN2 Connector**

Pin	Pin Name	Pin	Pin Name
1	LAN2_z_MDI0+	11	VCC_3V3_S0
2	LAN2_z_MDI0-	12	LAN2_ACT
3	LAN2_z_MDI1+	13	LAN2_LINK100
4	LAN2_z_MDI1-	14	LAN2_LINK1000
5	GND (CAP)	H1	NL
6	GND (CAP)	H2	NL
7	LAN2_z_MDI2+	H3	GND_F
8	LAN2_z_MDI2-	H4	GND_F
9	LAN2_z_MDI3+		
10	LAN2_z_MDI3+		



Table 2.18: LAN: LAN3 Connector

Pin	Pin Name	Pin	Pin Name
R1	LAN3_MDI_A_P	L1	LAN3_LED1_2.5G#
R2	LAN3_MDI_A_N	L2	LAN3_LED0_1G#
R3	LAN3_MDI_B_P	L3	LAN3_LED2_ACT#
R4	LAN3_MDI_B_N	L4	LED_ACT3_PWR
R5	GND (CAP)	H1	NL
R6	GND (CAP)	H2	NL
R7	LAN3_MDI_C_P	H3	GND_F
R8	LAN3_MDI_C_N	H4	GND_F
R9	LAN3_MDI_D_P		
R10	LAN3_MDI_D_N		

**Table 2.19: M.2_E: M.2_E Key Connector**

Pin	Pin Name
1	GND
2	+V3.3E_M.2
3	EKEY_USB_D+
4	+V3.3E_M.2
5	EKEY_USB_D-
6	NA
7	GND
8	NA
9	NA
10	NA
11	NA
12	NA
13	NA
14	NA
15	NA
16	NA
17	NA
18	VIO_CFG
19	NA
20	NA
21	NA
22	NA
23	NA
32	NA
33	GND
34	NA

Table 2.19: M.2_E: M.2_E Key Connector

35	EKEY_PCIE_TX+
36	NA
37	EKEY_PCIE_TX-
38	NA
39	GND
40	NA
41	EKEY_PCIE_RX+
42	NA
43	EKEY_PCIE_RX-
44	NA
45	GND
46	NA
47	EKEY_PCIE_CLK+
48	NA
49	EKEY_PCIE_CLK-
50	EKEY_SUSCLK
51	GND
52	EKEY_PERST#
53	EKEY_PCIE_CLKREQ#
54	EKEY_BT_DISABLE#
55	EKEY_PEWAKE#
56	EKEY_WIFI_DISABLE#
57	GND
58	EKEY_SDA
59	NA
60	EKEY_SCL
61	NA
62	NA
63	GND
64	NA
65	NA
66	NA
67	NA
68	NA
69	GND
70	NA
71	NA
72	+V3.3E_M.2
73	NA
74	+V3.3E_M.2
75	GND



Table 2.20: M.2_B: M.2_B Key Connector

Pin	Pin Name
1	NA
2	+V3.3B_M.2
3	GND
4	+V3.3B_M.2
5	GND
6	BKEY_PWR_OFF
7	BKEY_USB_D+
8	BKEY_W_DISABLE1#
9	BKEY_USB_D-
10	NA
11	GND
20	NA
21	NA
22	NA
23	NA
24	NA
25	BKEY_DPR_1.8
26	BKEY_W_DISABLE2#
27	GND
28	NA
29	BKEY_USB3.0_RX-
30	UIM_RESET
31	BKEY_USB3.0_RX+
32	UIM_CLK

Table 2.20: M.2_B: M.2_B Key Connector

33	GND
34	UIM_DATA
35	BKEY_USB3.0_TX-
36	UIM_VCC
37	BKEY_USB3.0_TX+
38	NA
39	GND
40	NA
41	BKEY_PERP0/SATA_B+
42	NA
43	BKEY_PERP0/SATA_B-
44	NA
45	GND
46	NA
47	BKEY_PETP0/SATA_A-
48	NA
49	BKEY_PETP0/SATA_A+
50	BKEY_PERST#
51	GND
52	BKEY_CLKREQ#
53	BKEY_PCIE_CLK-
54	BKEY_PEWAKE#
55	BKEY_PCIE_CLK+
56	NA
57	GND
58	NA
59	NA
60	NA
61	NA
62	NA
63	NA
64	NA
65	NA
66	NA
67	BKEY_RESET#
68	NA
69	NA
70	+V3.3B_M.2
71	GND
72	+V3.3B_M.2
73	VIO_CFG
74	+V3.3B_M.2
75	NA



Table 2.21: MASKROM: Maskrom Button

Setting	Function
1	TEST#
2-3-4	GND



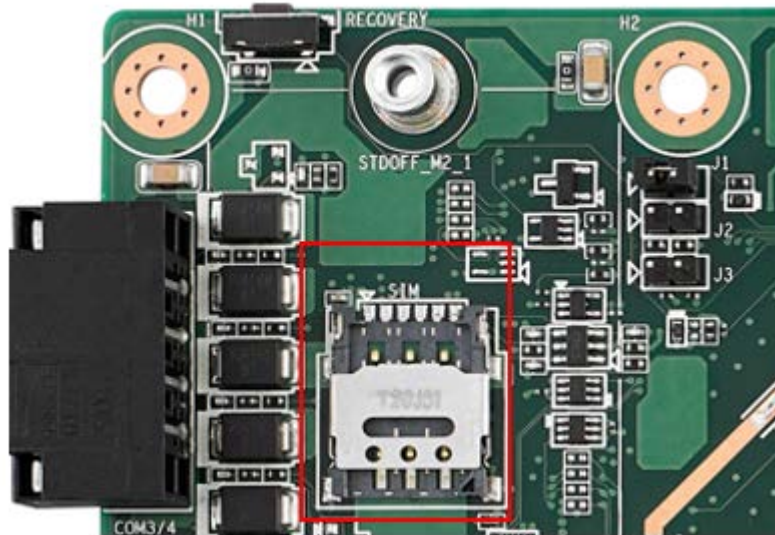
Table 2.22: PWR_BTN: Power Button

Pin	Pin Name
1	GND
2	GND
3	PWR_SW#
4	PWR_SW#
5	GND
6	PWR_LED



Table 2.23: SIM: SIM Card Slot

Pin	Pin Name
C1	UIM_VCC
C2	SIM_RST
C3	SIM_CLK
C5	GND
C6	NA
C7	SIM_DATA

**Table 2.24: SD: SD Card Slot**

Pin	Pin Name
1	SDIO_D2
2	SDIO_D3
3	SDIO_CMD
4	VCC_3V3_SD
5	SDIO_CK
6	GND
7	SDIO_D0
8	SDIO_D1

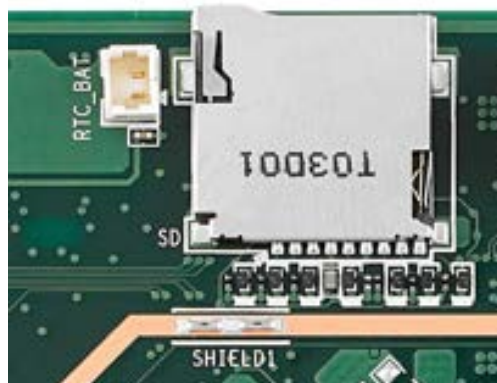


Table 2.25: RST: RST Button

Setting	Function
1	RST_BTN#
2-3-4	GND

**Table 2.26: RECOVERY: Recovery Button**

Setting	Function
1	FORCE_RECOV#
2-3-4	GND

**Table 2.27: USB: USB0/1 Connector**

Pin	Pin Name	Pin	Pin Name
1	+USB0_5V	10	+USB1_5V
2	USB0_OTG_D-	11	USB1_D-
3	USB0_OTG_D+	12	USB1_D+
4	GND	13	GND
5	USB0_RX-	14	USB1_RX-
6	USB0_RX+	15	USB1_RX+
7	GND	16	GND
8	USB0_TX-	17	USB1_TX-
9	USB0_TX+	18	USB1_TX+



2.6 Quick Start Guide

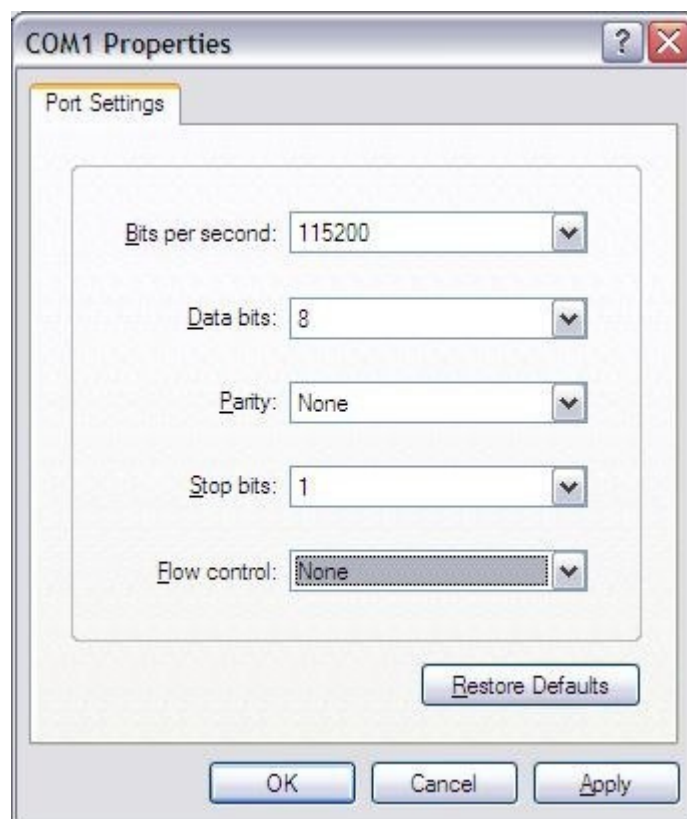
2.6.1 Debug Port Connection

1. Connect the debug port cable (1700035538-01) to the Debug port on ASR-A501.
2. Connect it to your PC using the USB to RS-232 Cable.

2.6.2 Debug Port Settings

ASR-A501 can communicate with a host server using serial cables. Common serial communication programs such as HyperTerminal, Tera Term, or PuTTY can be used in these applications. The example below describes the serial terminal setup using HyperTerminal on a Windows host:

1. Connect ASR-A501 with your PC using a serial cable.
2. Open HyperTerminal on your Windows PC, and select the settings demonstrated in the photo below.



3. Insert power adapter to DC jack and power up the board. The Debug console log will be displayed on the terminal screen.

Chapter 3

Software Functionality

This chapter details the software programs on the ASR-A501.

3.1 Introduction

It is essential to validate all testing tools with the ASR-A501 evaluation kit. Ensure that you have the necessary test fixtures ready before verifying each designated I/O. If you encounter any issues during testing, please reach out to Advantech for assistance.

3.2 Command Overview

All commands in this document should be entered after the operating system has booted up and under “root” user if no special notice.

The terminal may appear as shown in the following example.

```
root@linaro-alip:/#
```

If the user is not “root”, use the following command to switch to “root”

```
linaro@linaro-alip:/$  
linaro@linaro-alip:/$ sudo su root  
root@linaro-alip:/#
```

3.2.1 Command Format

1. Commands in single line start with “# ” :

```
# command
```

Copy and run commands without “#”

2. Commands in multi-lines:

First line starts with “# ” and ends with “\”

Next line starts with “ ” and ends with “\”

Last line starts with “ ” and ends with “ ”

```
# command1 \  
command2 \  
command3 \  
command4
```

Copy and run multi-line commands without “#” simultaneously.

3. Annotations in single line start with “# #----” and end with “----# #” :

```
# #---- annotations ----# #
```

3.3 Debian Desktop Operating System

ASR-A501 is equipped with an embedded Debian Desktop operating system, which is user-friendly.

3.3.1 User and Password

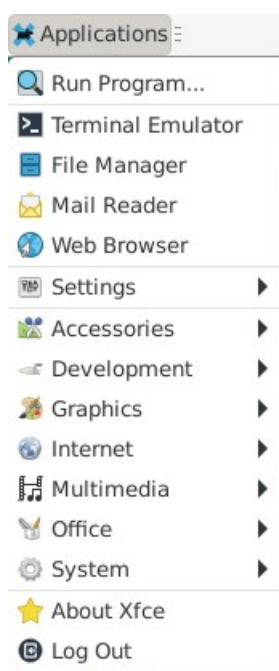
ASR-A501 has two users: root/linaro and their passwords are “123456” by default.

After the Debian Desktop system boots up, it will automatically log in to the “linaro” user.

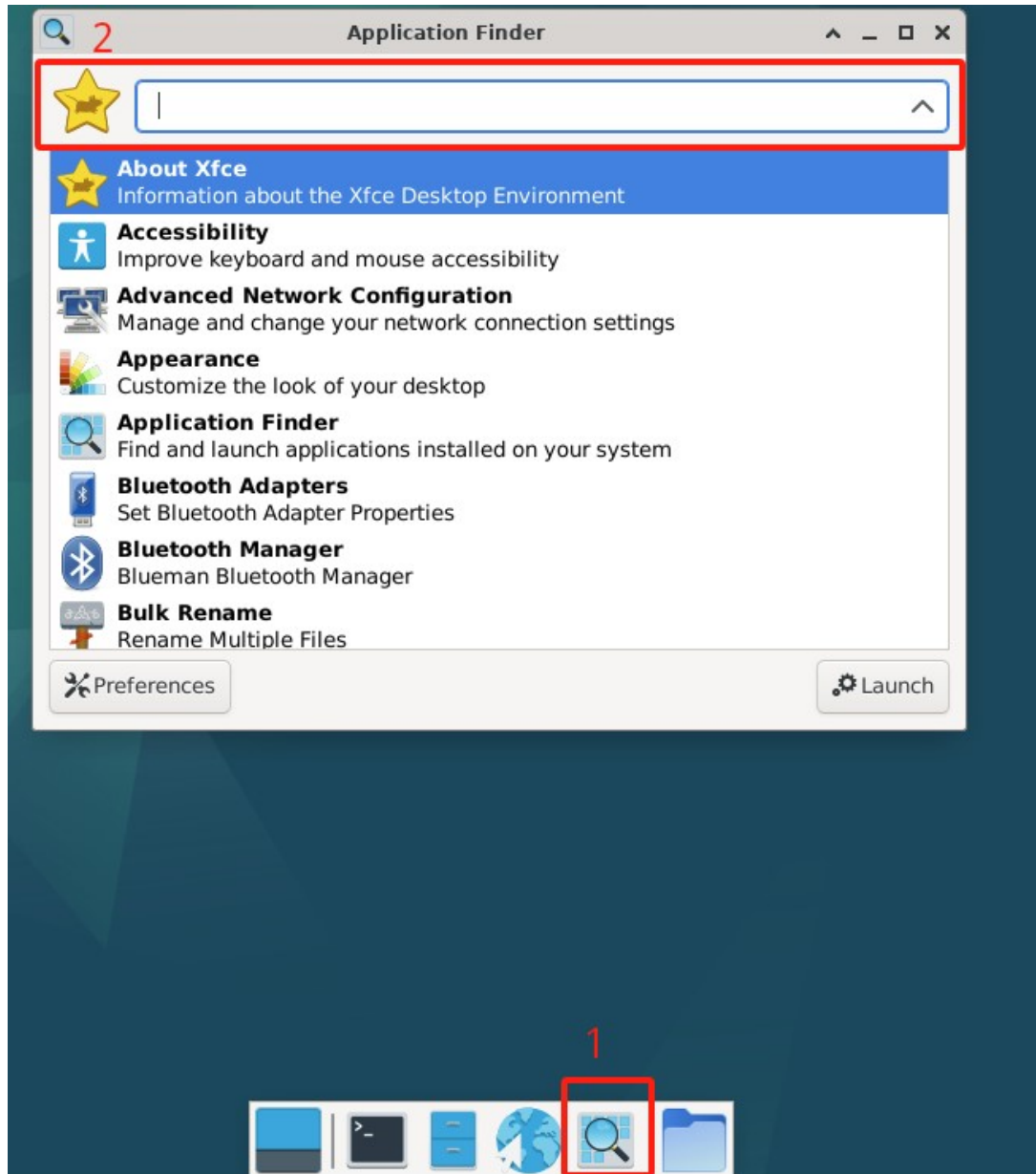
If there is a debugging serial port connected, the serial terminal automatically logs in to the “root” user.

3.3.2 Finding the Application

1. You can find the application in “Applications”.



2. Alternatively, you can search for it in the “Application Finder” list.

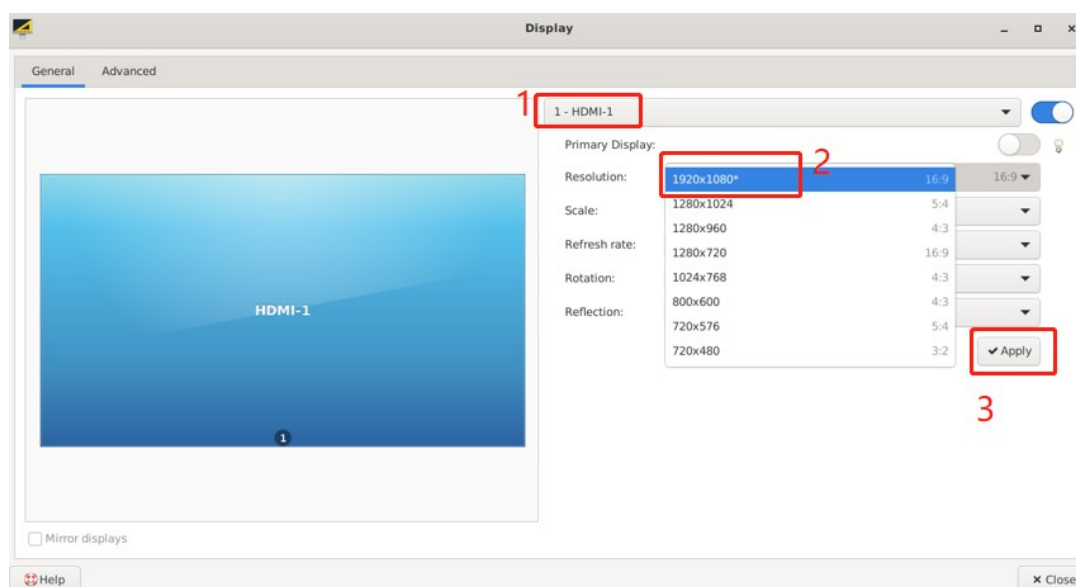


3.4 HDMI Screen

HDMI supports multiple resolutions, which can be set up using a graphical user interface (GUI).

3.4.1 Configure Resolution for HDMI screen

1. Click “Applications” -> “Settings”->“Display”.
2. Choose “HDMI-1”, then choose “Resolution”.
3. Click “Apply”.

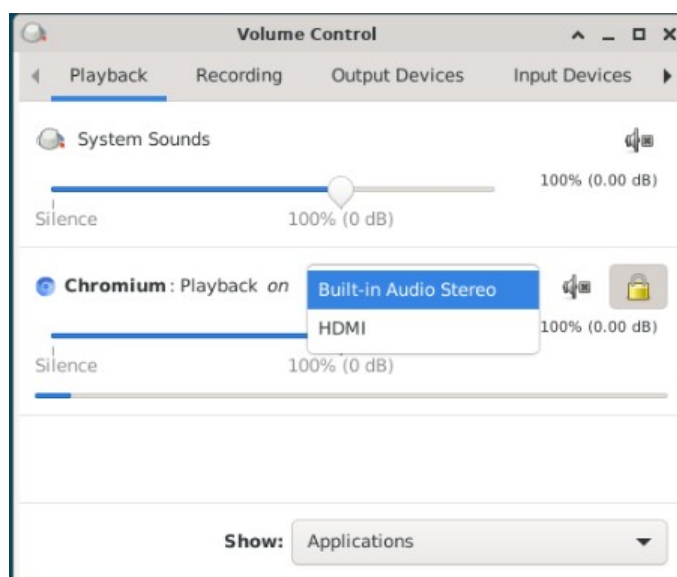


3.5 Audio

ASR-A501 supports two kinds of sound cards: “0 hdmi” and “1 es8326c”.

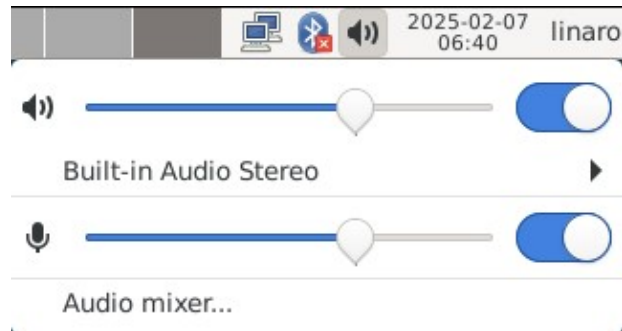
To set the default audio output for media playback, follow these steps:

1. Click “Applications” ->”Multimedia”->”PulseAudio Volume Control”.
2. Select “Built-in Audio stereo” for es8326c-codec output, or select “HDMI” for HDMI output.



3.5.1 Mute and Volume Control

Mute and volume can be configured by GUI.



3.5.2 Audio Test

1. Get sound card ID.

```
# cat /proc/asound/cards
0 [rockchiphdmi0 ]: rockchip-hdmi0 - rockchip-hdmi0
                        rockchip-hdmi0
1 [rockchipes8326c]: simple-card - rockchip,es8326-codec
                        rockchip,es8326-codec
```

2. Record.

Take Card ID 1 for example:

```
# arecord -Dplughw:1,0 -f S16_LE -r 16000 -d 10 -t wav test.wav
```

3. Playback.

Take Card ID 0 for example :

```
# aplay -Dplughw:0,0 -t wav test.wav
```

See details of the usage of “aplay”:

```
# aplay --help
... ..
-D, --device=NAME      select PCM by name
-t, --file-type TYPE   file type (voc, wav, raw or au)
... ..
```

3.6 4G/5G

3.6.1 Configure 4G/5G

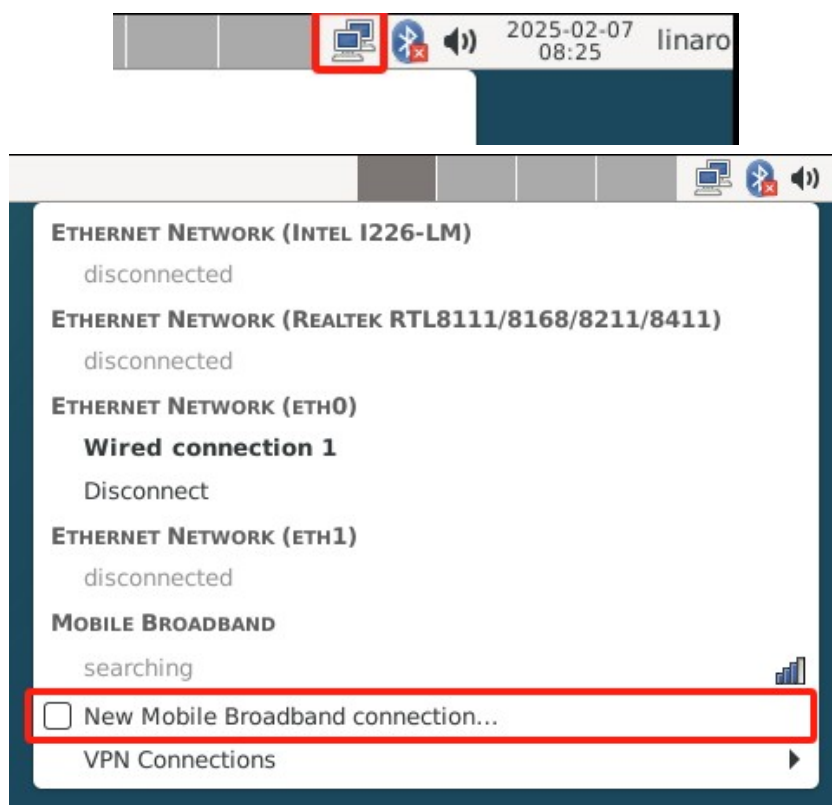
Default supported 4G module: EM05-CNFD-128-SGAS (Advantech PN: 968DD00443)

Default supported 5G module: RM520NGLAA-M20-SGASA (Advantech PN: 968DD00342)

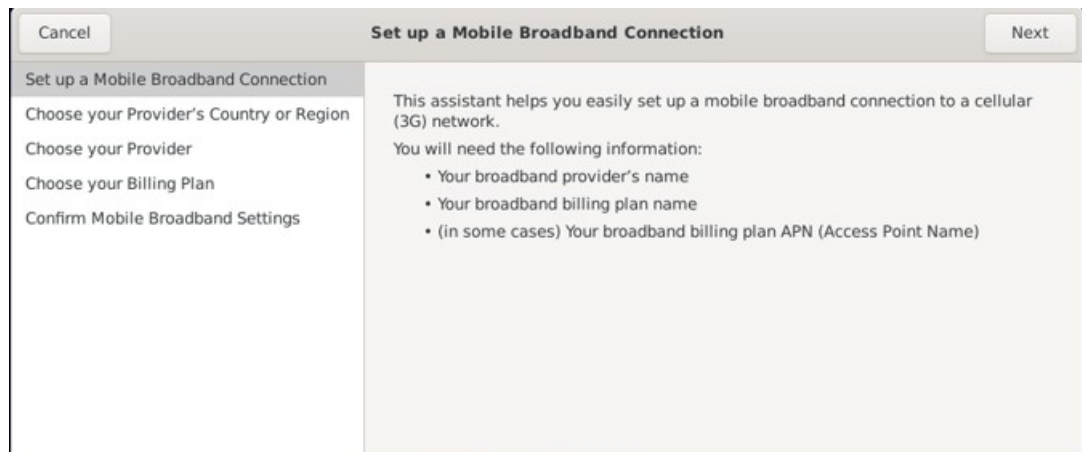
1. Power off the device, then insert 4G/5G module and SIM card.

Note! *Make sure the device is power off before insert 4G/5G module and SIM card, otherwise the device 4G/5G module and/or SIM card may be damaged.*

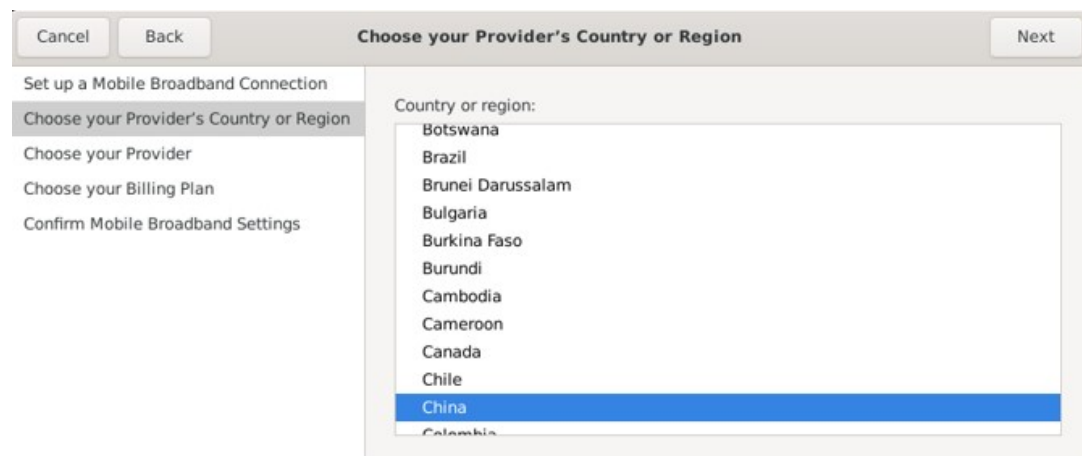
2. Power on the device, Click network connection icon, then choose “New Mobile Broadband connection”.



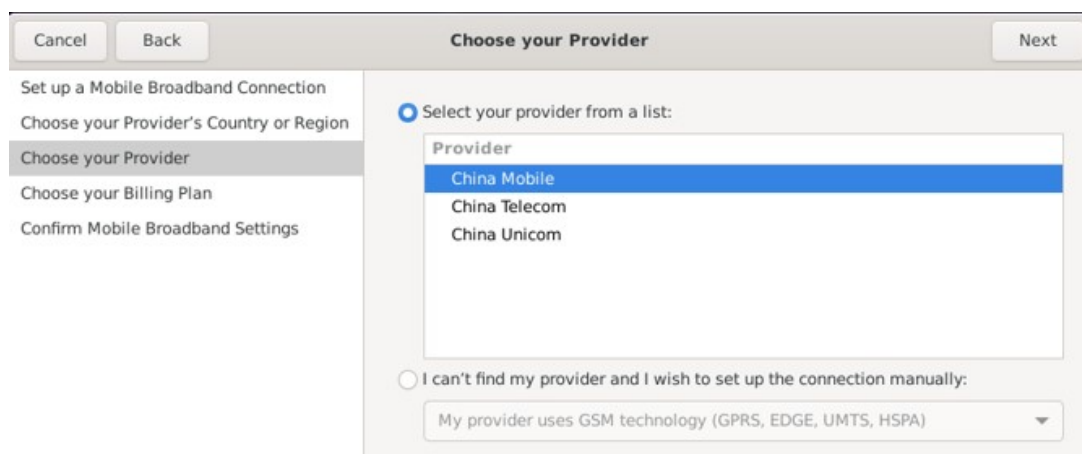
Then you will see the following window, click “Next” button to the next step.



3. Choose Provider's country or region of the SIM card you insert in STEP 0.



4. Choose or Set the Provider's name.



5. Choose or Set APN.

6. Confirm your config and finish.

3.6.2 4G/5G Test

After connection, 4G/5G will create a net point “wwan0”.

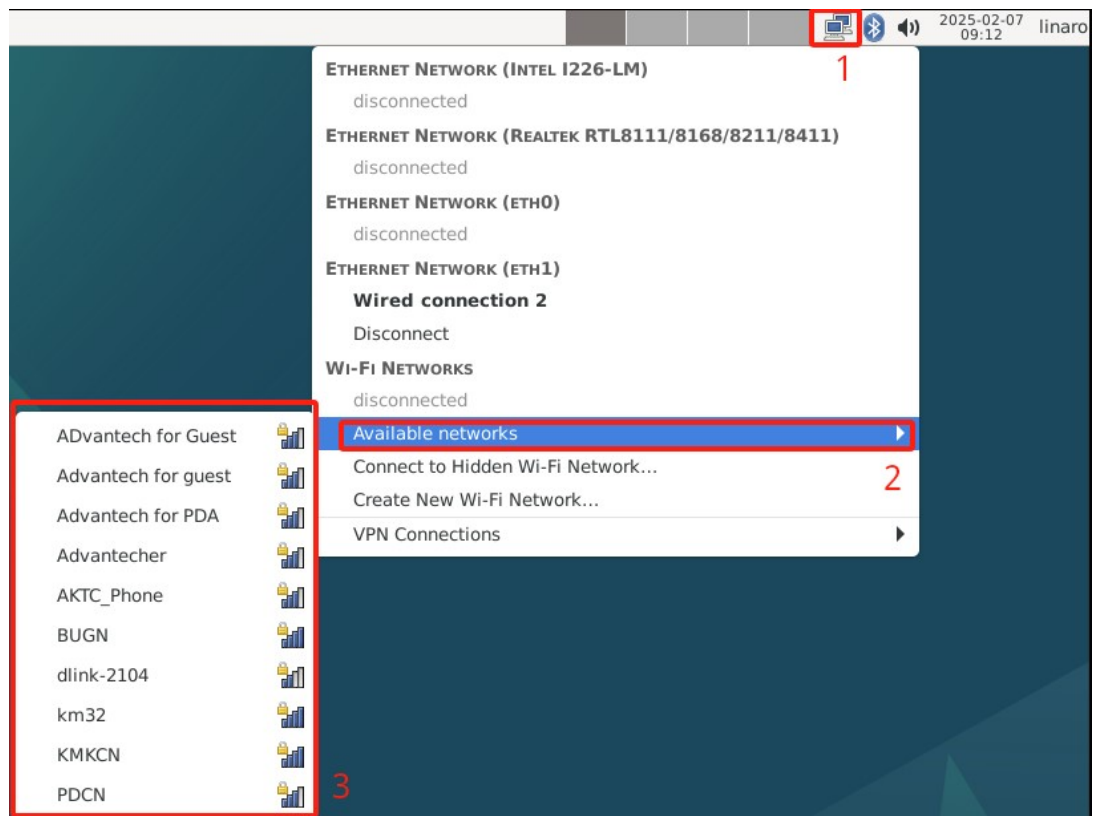
```
# ping -I wwan0 www.advantech.com
```

3.7 WiFi/BT

3.7.1 Configuring WiFi

Default supported ADVANTECH Wi-Fi6 module: EWM-W179M201E

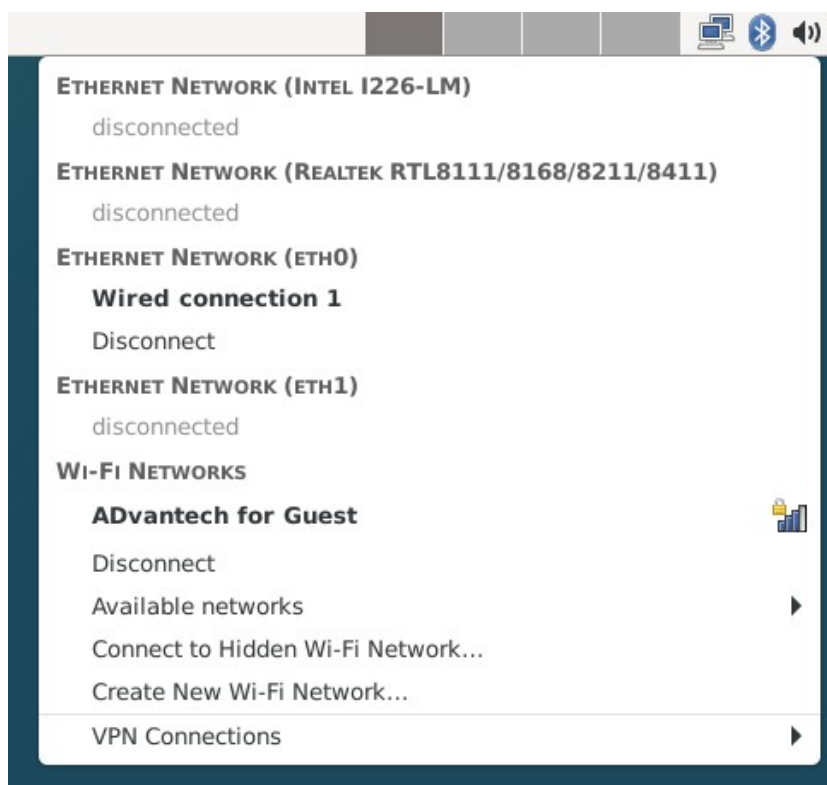
1. Click the network icon in the top right corner of the screen and click the line of “Available networks” to select a Wi-Fi connection (for example: Advantech for guest).



2. Enter the Wi-Fi password to connect to the device.



3. If the password is correct, the device will connect quickly.



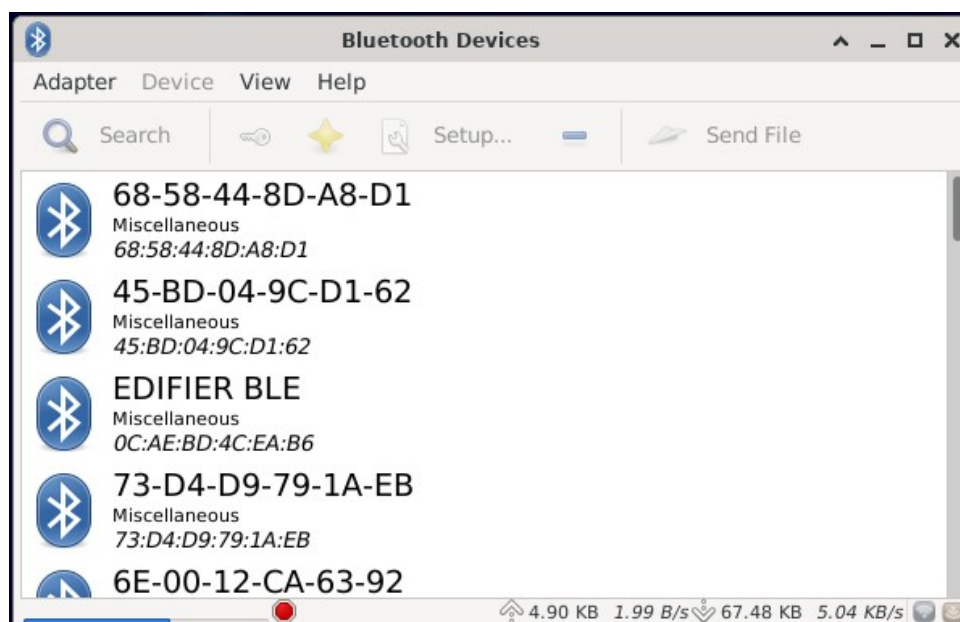
3.7.2 WIFI Test

After connection, Wi-Fi will create a net point "wlan0".

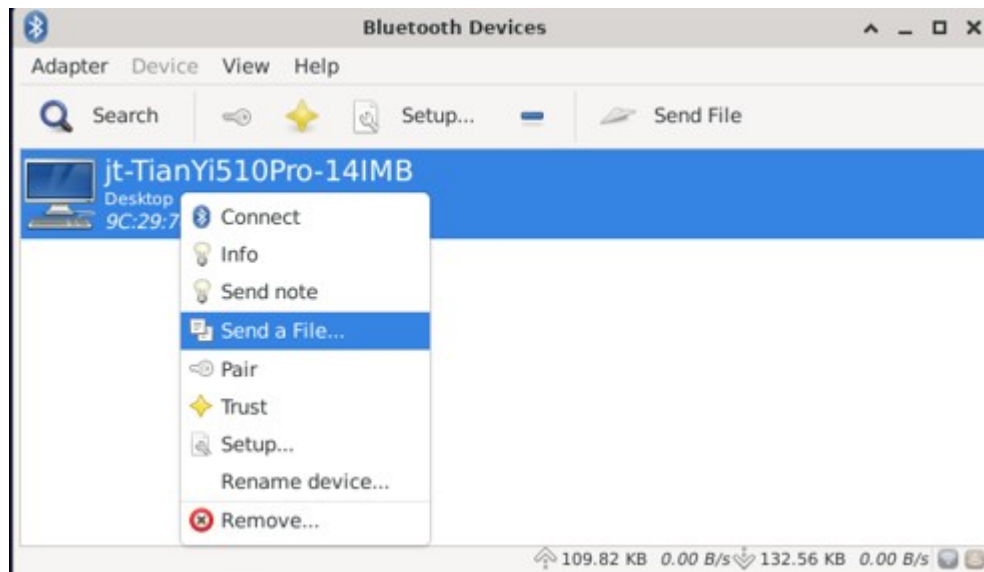
```
# ping -I wlan0 www.advantech.com
```

3.7.3 BT Test

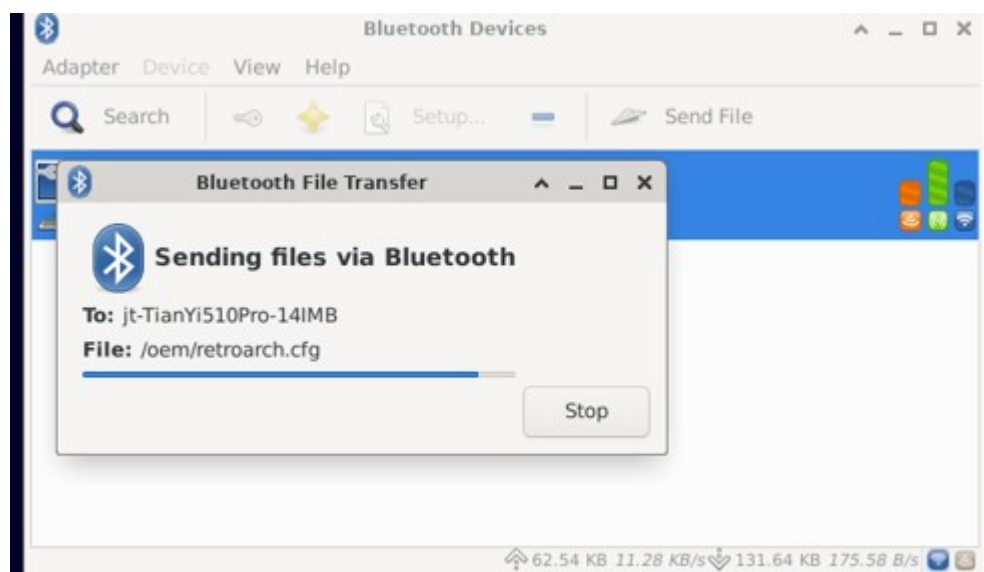
1. Click "Applications" -> "Settings"-> "Bluetooth manager".
Click the "Search" button to search for Bluetooth devices.



2. Right-click to select a device, such as “jt-TianYi510Pro-14IMB”, and send a file.



3. ASR-A501 will start sending files when the receiver device, such as “jt-TianYi510Pro-14IMB”, confirms blue tooth reception.

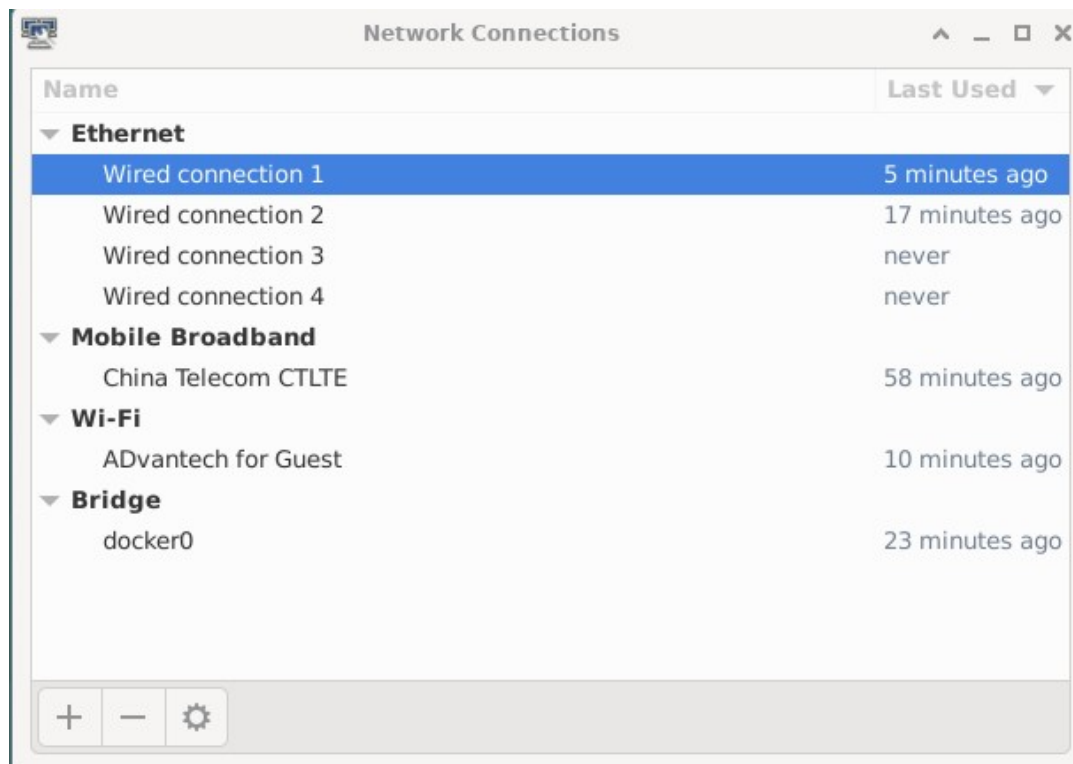


3.8 Ethernet

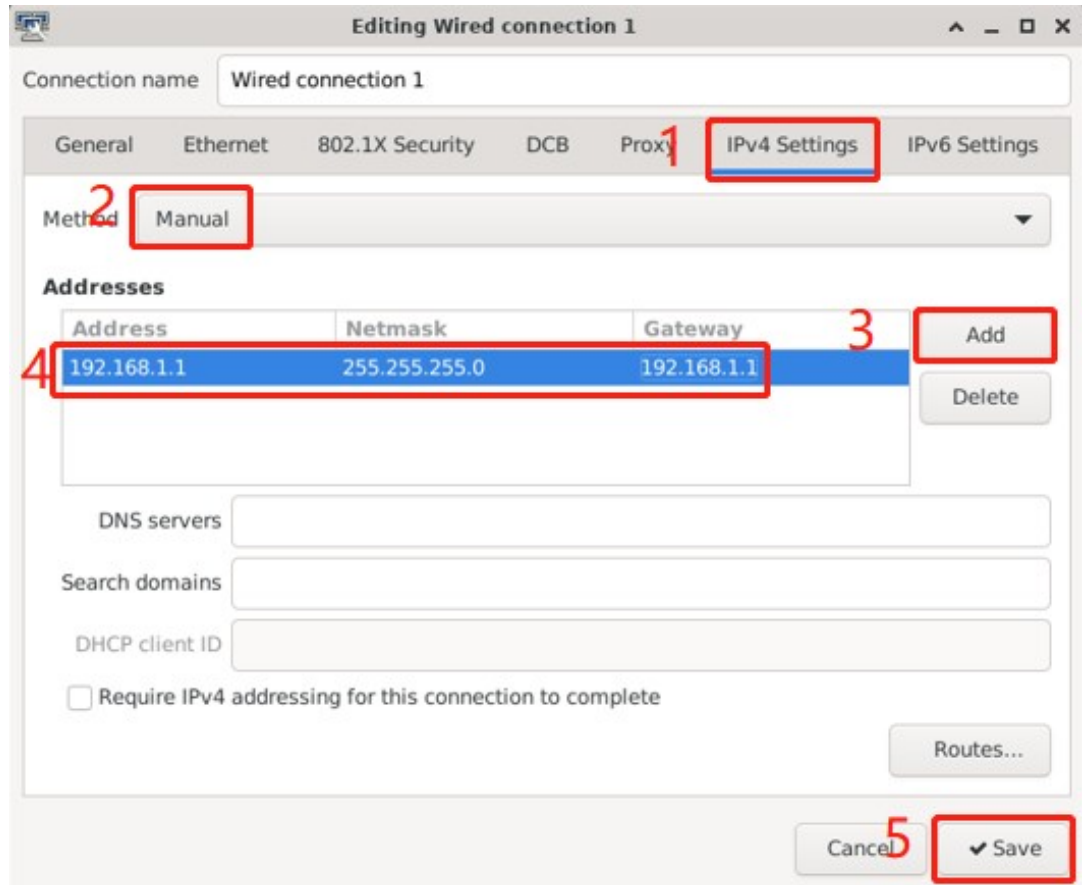
ASR-A501 supports four Ethernet ports: eth0, eth1, eth2, eth3. All ports are using the “DHCP” mode by default. The following configurations and tests are taking eth0 as an example.

3.8.1 Configure to Static IP

1. Click “Applications” -> “Settings” -> “Advanced Network Configuration”.

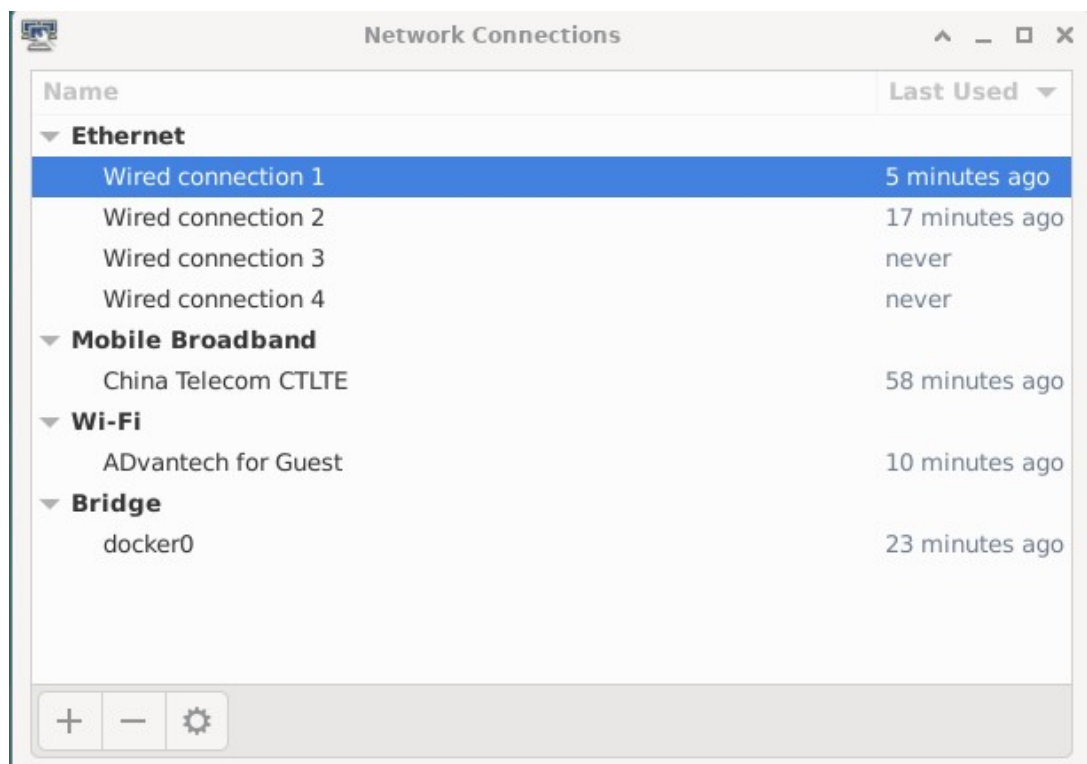


2. Double-click “Wired Connection 1” to configure it.

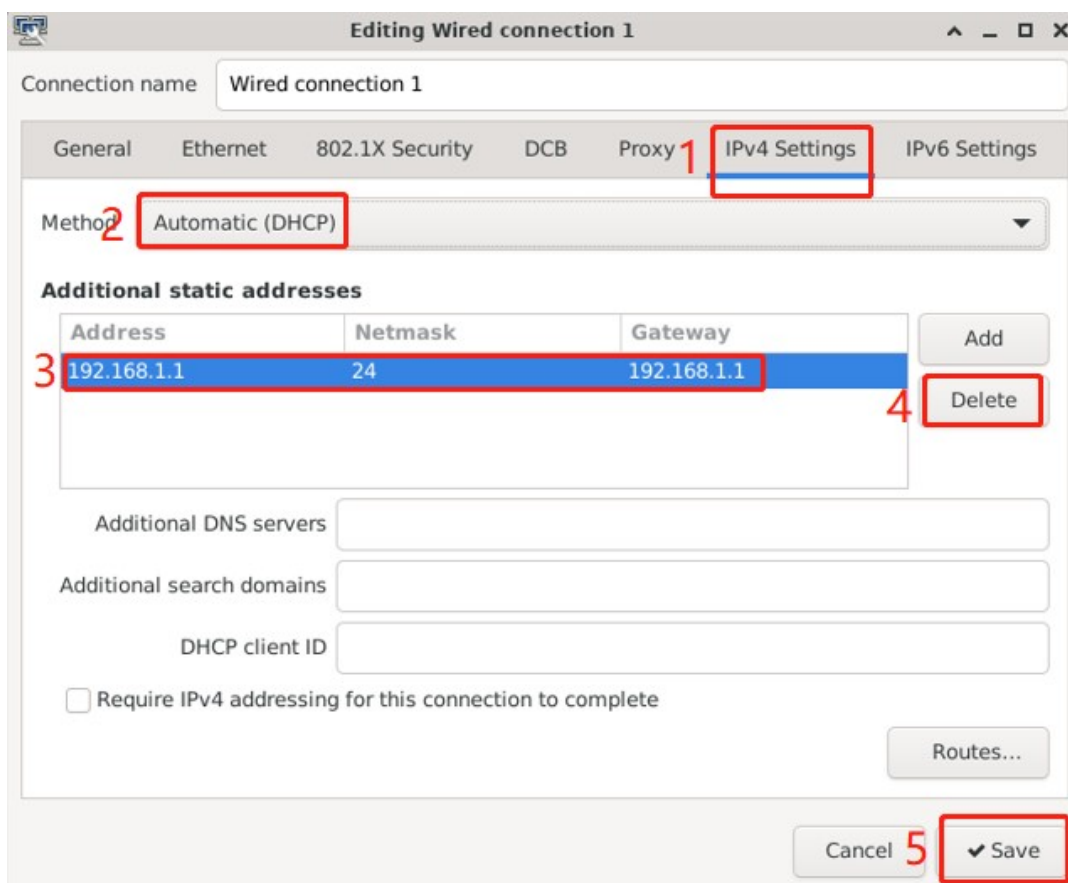


3.8.2 Configure to DHCP

1. Click “Applications” -> “Settings -> “Advanced Network Configuration”.



2. Double-click “Wired Connection 1” to configure it.



3.8.3 Ethernet Test

After connection, Ethernet will create a net point “eth0”, “eth1”, “eth2” and “eth3”.

```
# #---- Test eth0 ----# #
# ping -I eth0 www.advantech.com

# #---- Test eth1 ----# #
# ping -I eth1 www.advantech.com

# #---- Test eth2 ----# #
# ping -I eth2 www.advantech.com

# #---- Test eth3 ----# #
# ping -I eth3 www.advantech.com
```

3.9 UART

User Debian/Linux UART/serial port access is through the tty-devices. The tty-devices have different names depending on UART drivers for different boards.

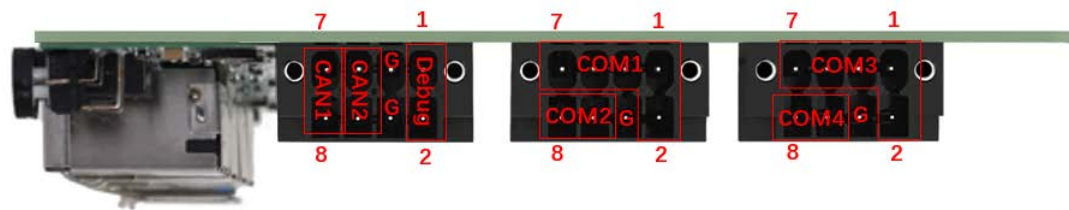


Table 3.1: UART

Device Node	ASR-A501	COM Port Name
/dev/ttyFIQ0	CAN/DEBUG_DEBUG	Debug
/dev/ttyS3	COM4	RS485
/dev/ttyS5	COM2	RS485
/dev/ttyS6	COM1	RS232 4-wire or RS485 (Default RS232)
/dev/ttyS7	CN1	RS232 2-wire
/dev/ttyS9	COM3	RS232 4-wire or RS485 (Default RS232)

3.9.1 Configure RS232 or RS485

ttyS3 and ttyS5 support only RS485 mode, whereas ttyS6 and ttyS9 support configuration for both RS232 and RS485 modes. The default mode is RS232.

Set RS232 or RS485 separately (0 means RS232;1 means RS485):

Set ttyS6 to RS232 mode and ttyS9 to RS232 mode.

```
# fw_setenv uart_mode_cpu 6:0,9:0
# reboot
```

Set ttyS6 to RS232 mode and ttyS9 to RS485 mode.

```
# fw_setenv uart_mode_cpu 6:0,9:1
# reboot
```

Set ttyS6 to RS485 mode and ttyS9 to RS232 mode.

```
# fw_setenv uart_mode_cpu 6:1,9:0
# reboot
```

Set ttyS6 to RS485 mode and ttyS9 to RS485 mode.

```
# fw_setenv uart_mode_cpu 6:1,9:1
# reboot
```

3.9.2 Configure Parameters

Use “stty” command to configure serial port parameters. The commonly used parameters include “Baud rate”, “Data bits”, “Stop bits”, “Parity”, “Flow control”.

See details of the usage of “stty”:

```
# stty --help
... ..
csN          set character size to N bits, N in [5..8]
[-]cstopb    use two stop bits per character (one with '-')
[-]parenb    generate parity bit in output and expect parity bit in
input
[-]crtcts    enable RTS/CTS handshaking
... ..
```

For example, set COM4

“Baud rate” to 115200

“Data bits” to 8

“Stop bits” to 1

“Parity” to None

“Flow control” to None

```
# stty -F /dev/ttyS3 115200 cs8 -parenb -cstopb -crtcts
```

3.9.3 Send and Receive Data

Taking COM4 as receiver and COM2 as sender:

```
# #---- COM4 as receiver ----# #
# stty -F /dev/ttyS3 115200 cs8 -cstopb -parenb -crtcts
# cat /dev/ttyS3 &

# #---- COM2 as sender ----# #
# stty -F /dev/ttyS5 115200 cs8 -cstopb -parenb -crtcts
# echo pass > /dev/ttyS5

# #----If no error, the receiver will receive "pass"----# #
pass
```

- Note!**
1. Receiver should run before sender.
 2. The “serial port parameters” should be the same for sender and receiver.



3.10 TPM

The Trusted Platform Module (TPM) is a hardware chip that safeguards the security of computer systems. It can securely store sensitive data, preventing it from being stolen. It generates unique identifiers based on hardware and software configurations, which are used for platform authentication. Additionally, it can serve as a hardware random number generator and an encryption accelerator.

ASR-A501 supports one external tpm.

3.10.1 Check TPM Device

List tpm device.

```
# ls /dev/tpm*  
/dev/tpm0 /dev/tpmrm0
```

It is also possible to check tpm activity with the following command.

```
# i2cdump -f -y 6 0x2e
```

3.10.2 Usage

Here are two ways to use tpm:

1. Python scripts

Python scripts can be used to send simple commands to the TPM device. For instance, hereafter is a simple script for sending a TPM2_GetRandom command and requesting 16 random bytes.

```
import binascii  
with open('/dev/tpm0', 'r+b', buffering=0) as tpm :  
    tpm.write(binascii.unhexlify(b'800100000000c00000017b0010'))  
    print(tpm.read())
```

After writing the desired code to a file (for instance named TPM2_GetRandom.py), execute it with the following command:

```
# python3 TPM2_GetRandom.py
```

2. C language scripts

In the same way as Python scripts, C language scripts can be used to send commands to the TPM device. The previous example for sending a TPM2_GetRandom command and requesting 16 random bytes is also achieved with the following code:

```
#include <stdio.h>
int main()
{
    FILE *tpm;
    char str[] = "\x80\x01\x00\x00\x00\x0c\x00\x00\x01\x7b\x00\x10";
    char buffer[100];
    int i, n;
    tpm = fopen("/dev/tpm0", "rb+");
    if (tpm == NULL){
        printf("ERROR: Could not open driver file.\n");
        return -1;
    }
    n=fwrite(str, 1, sizeof(str), tpm);
    if (n != sizeof(str)){
        printf("ERROR: Could not write bytes to TPM.\n");
        fclose(tpm);
        return -1;
    }
    n = fread(buffer, 1, sizeof(buffer), tpm);
    printf("TPM Response: ");
    for (i=0; i<n; i++){
        printf("%x ", buffer[i]);
    }
    printf("\n");
    fclose(tpm);
    return 0;
}
```

Save these instructions to a TPM2_GetRandom.c file. C language scripts are different from Python scripts because they have to be compiled before they are executed by the terminal. To compile the script, use the following command:

```
# gcc TPM2_GetRandom.c -o TPM2_GetRandom
```

Then to execute the script:

```
# ./TPM2_GetRandom
```

3.11 RTC

Set the system to the current time then set the RTC.

```
# date 021710452016 && hwclock -w && date
Wed Feb 17 10:45:00 UTC 2016
Wed Feb 17 10:45:01 UTC 2016
```

Set one incorrect time, then read RTC to verify.

```
# date 010100002000 && hwclock -r && date
Sat Jan 1 00:00:00 UTC 2000
2016-02-17 10:49:08.417688+00:00
Sat Jan 1 00:00:00 UTC 2000
```

Restore the RTC time to system time.

```
# hwclock -s && date
Wed Feb 17 10:46:58 UTC 2016
```

3.12 Watchdog

A Watchdog Timer (WDT) is a hardware circuit that can reset the computer system in case of a software fault.

ASR-A501 supports one external watchdog.

The default value of timeout is 60 seconds, and it can be set from 1 second to 6527 seconds.

3.12.1 Check Watchdog Device

List watchdog device.

```
# ls /dev/watchdog
/dev/watchdog
```

3.12.2 Usage

Here are two ways to use watchdog:

1. Use “echo” command.

Writing any character except the specific magic character 'V' will open the watchdog, and write once before the timeout (60 seconds by default) passes, otherwise the system will reboot.

```
# echo A > /dev/watchdog
```

Writing the specific magic character 'V' to stop the watchdog.cc

```
# echo V > /dev/watchdog
```

2. Write a program using “ioctl”

See more details in [BSP]/kernel/Documentation/watchdog/watchdog-api.rst

3.13 CAN

ASR-A501 has two CAN ports.

Use the “candump” and “cansend” tools directly to send and receive messages. The tools have been embedded into the system.

3.13.1 Check network ports

Check network ports of can0 and can1:

```
# ifconfig -a
... ..
can0: flags=193<UP,RUNNING,NOARP> mtu 16
    unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen
    10 (UNSPEC)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

can1: flags=193<UP,RUNNING,NOARP> mtu 16
    unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen
    10 (UNSPEC)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
... ..
```

3.13.2 Configure

Use “ip” command to configure can port.

See details of the usage of “ip link”:

```
# ip link help
... ..
ip link set { DEVICE | dev DEVICE | group DEVGROUP }
[ { up | down } ]
[ type TYPE ARGS ]
... ..
```

```
# ip link help can
... ..
ip link set DEVICE type can
[ bitrate BITRATE [ sample-point SAMPLE-POINT] ] |
[ dbitrade BITRATE [ dsample-point SAMPLE-POINT] ] |
[ fd { on | off } ]
... ..
```

For example, set can0
"bitrate rate" to 1000000
"dbitrate rate" to 2000000
"fd" to on

```
# #---- For can0 ----# #
# ip link set can0 down
# ip link set can0 type can bitrate 1000000 dbitrate 2000000 fd on
# ip link set can0 up
```

3.13.3 Send and Receive Data

As receiver

```
# #---- As receiver ----# #
# ip link set can0 down
# ip link set can0 type can bitrate 1000000 dbitrate 2000000 fd on
# ip link set can0 up
# candump can0 &
```

As sender

```
# #---- As sender ----# #
# ip link set can1 down
# ip link set can1 type can bitrate 1000000 dbitrate 2000000 fd on
# ip link set can1 up
# cansend can1 123##155

# #----If no error, the receiver will receive the following data----
# #
can0  123  [01]  55
```

See more details of the usage of "candump" and "cansend":

```
# candump --help
# cansend --help
```

- Note!**
1. Receiver should run before sender.
 2. The "bitrate" and "dbitrate" should be the same for sender and receiver.



3.14 PCIE

ASR-A501 supports two PCIE ports. Using the PCIE disk (SQF-C8BV2-128G-EDE) to test the M.2_B-KEY PCIE interface. Using the WIFI module (EWM-W179M201E) Wi-Fi functionality to test the M.2_E-KEY PCIE interface.

M.2_B-KEY PCIE TEST Preparation:

Insert PCIE disk.

- Note!**
- Make sure the device is power off before insert PCIE disk, otherwise the device and/or PCIE disk may be damaged.
 - Make sure PCIE disk is partitioned and formatted.



List disk information

```
# fdisk -l /dev/nvme0n1
Disk /dev/nvme0n1: 119.24 GiB, 128035676160 bytes, 250069680 sectors
Disk model: SQF-C8BV2-128GEDE
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x217a69bc
```

Device	Boot	Start	End	Sectors	Size	Id	Type
/dev/nvme0n1p1		2048	250069679	250067632	119.2G	83	Linux

Check mount point

```
# mount | grep nvme
/dev/nvme0n1p1 on /run/media/nvme0n1p1 type ext4 (rw,relatime)
```

Speed Test

Read Speed

```
# echo 3 > /proc/sys/vm/drop_caches
# dd if=/dev/nvme0n1 of=/dev/zero bs=1M count=400
400+0 records in
400+0 records out
419430400 bytes (419 MB, 400 MiB) copied, 0.728982 s, 575 MB/s
```

Write Speed

```
# echo 3 > /proc/sys/vm/drop_caches
# dd if=/dev/zero of=/dev/nvme0n1 bs=1M count=400
400+0 records in
400+0 records out
419430400 bytes (419 MB, 400 MiB) copied, 0.915896 s, 458 MB/s
```

M.2_E-KEY PCIE TEST:

Please refer to Section 3.7 for the connection of the WiFi module EWM-W179M201E. If the WiFi function works properly, it indicates that the PCIE function is normal and in use.

3.15 SATA

The M.2_B-KEY interface of the ASR-A501 supports two types of signals, and the specific type depends on the configuration you have purchased. One is the PCIE signal, and the other is the SATA signal. To test the M.2_B-KEY SATA signal, can use the SATA disk (model: IM2S3334 - 512GCTB4).

M.2_B-KEY SATA TEST Preparation:

Insert the SATA disk.

Note!



- Make sure the device is powered off before inserting the SATA disk; otherwise, the device and/or the SATA disk may be damaged.
- Make sure the SATA disk is partitioned and formatted.

List disk information.

```
# fdisk -l /dev/sda
Disk /dev/sda: 476.94 GiB, 512110190592 bytes, 1000215216 sectors
Disk model: ADATA_IM2S3334-5
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: FFB00BF9-6A9C-4985-9940-119F64E2245F

Device            Start          End          Sectors      Size  Type
/dev/sda1          2048          616447       614400       300M  EFI System
/dev/sda2          616448        878591       262144       128M  Microsoft reserved
/dev/sda3          878592       630026239   629147648    300G  Microsoft basic
data
/dev/sda4        630026240   1000215182  370188943    176.5G  Microsoft basic
data
```

Check mount point

```
# mount | grep sda
/dev/sda1 on /run/media/sda1 type vfat (rw,rela-
time,gid=6,fmask=0007,dmask=0007,allow_utime=0020,codep-
age=936,iocharset=utf8,shortname=mixed,errors=remount-ro)
/dev/sda4 on /run/media/sda4 type fuseblk (rw,rela-
time,user_id=0,group_id=0,allow_other,blksize=4096)
/dev/sda3 on /run/media/sda3 type fuseblk (rw,rela-
time,user_id=0,group_id=0,allow_other,blksize=4096)
```

Speed Test.

Read Speed

```
# echo 3 > /proc/sys/vm/drop_caches
# dd if=/dev/sda of=/dev/zero bs=1M count=400
400+0 records in
400+0 records out
419430400 bytes (419 MB, 400 MiB) copied, 0.866038 s, 484 MB/s
```

Write Speed

```
# echo 3 > /proc/sys/vm/drop_caches
# dd if=/dev/zero of=/dev/sda bs=1M count=400
400+0 records in
400+0 records out
419430400 bytes (419 MB, 400 MiB) copied, 0.234872 s, 1.8 GB/s
```

3.16 More Technical Support and Assistance

Click on the screenshot or link below to get more information about Advantech Arm computing products.

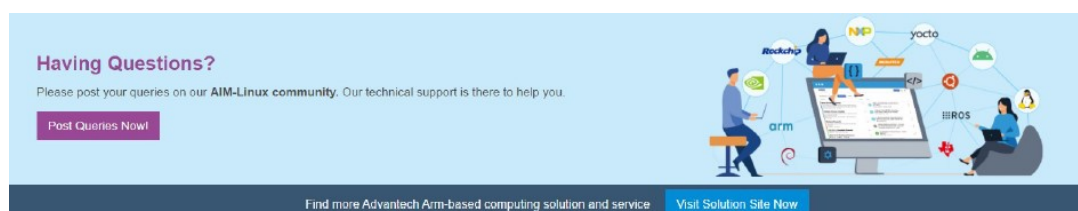


ESS-WIKI (advantech.com.tw)

<http://ess-wiki.advantech.com.tw/view/RISC>

Also, you can post your questions or queries on our AIM-Linux community.

Click on the screenshot or link below to join us now.



Advantech AIM-Linux Community - Welcome to the Advantech AIM-Linux Community!

<https://forum.aim-linux.advantech.com>

Chapter 4

Firmware Upgrade

This chapter introduces Advantech's method of creating an SD card for automatic burning operating systems on ASR-A501.

4.1 Create “update.img”

1. Download Release Image to PC (Windows OS).
2. Decompress the Image, double click mkupdate.bat in folder “rockdev”.

名称	修改日期	类型	大小
image	2023/6/9 17:53	文件夹	
AFPTool.exe	2023/6/9 16:52	应用程序	229 KB
mkupdate.bat	2023/6/9 16:52	Windows 批处理文件	1 KB
package-file	2023/6/9 16:52	文件	1 KB
px3se-mkupdate.bat	2023/6/9 16:52	Windows 批处理文件	1 KB
px3se-package-file	2023/6/9 16:52	文件	1 KB
px30-mkupdate.bat	2023/6/9 16:52	Windows 批处理文件	1 KB

```
Android Firmware Package Tool v2.27
----- PACKAGE -----
Add file: .\package-file
package-file.Add file: .\package-file done, offset=0x800, size=0x263, userspace=0x1
Add file: .\Image\MiniloaderAll.bin
bootloader.Add file: .\Image\MiniloaderAll.bin done, offset=0x1000, size=0x761c0, userspace=0xed
Add file: .\Image\parameter.txt
parameter.Add file: .\Image\parameter.txt done, offset=0x77800, size=0x227, userspace=0x1, flash_address=0x00000000
Add file: .\Image\uboot.img
uboot.Add file: .\Image\uboot.img done, offset=0x78000, size=0x400000, userspace=0x800, flash_address=0x00004000
Add file: .\Image\misc.img
misc.Add file: .\Image\misc.img done, offset=0x478000, size=0xc000, userspace=0x18, flash_address=0x00006000
Add file: .\Image\boot.img
boot.Add file: .\Image\boot.img done, offset=0x484000, size=0x2191200, userspace=0x4323, flash_address=0x00008000
Add file: .\Image\rootfs.img
rootfs.Add file: .\Image\rootfs.img done, offset=0x2615800, size=0x16b200000, userspace=0x2d6400, flash_address=0x00078000
Add file: .\Image\recovery.img
recovery.Add file: .\Image\recovery.img done, offset=0x16d815800, size=0x2b19800, userspace=0x5633, flash_address=0x00028000
Add file: .\Image\osm.img
osm.Add file: .\Image\osm.img done, offset=0x17032f000, size=0x11f5000, userspace=0x23ea, flash_address=0x01c78000
Add file: .\Image\userdata.img
userdata.Add file: .\Image\userdata.img done, offset=0x171524000, size=0x44e000, userspace=0x89c, flash_address=0x01cb8000
Add CRC...
Make firmware OK!
----- OK -----

g _os_type:androidos
*****rkImageMaker ver 2.23*****
Generating new image, please wait...
Writing head info...
Writing boot file...
Writing firmware...
Generating MDS data...
MDS data generated successfully!
New image generated successfully!

r format
\rockdev>rem update.img is new format, Image\update.img is old format, so delete olds

\rockdev>del Image\update.img

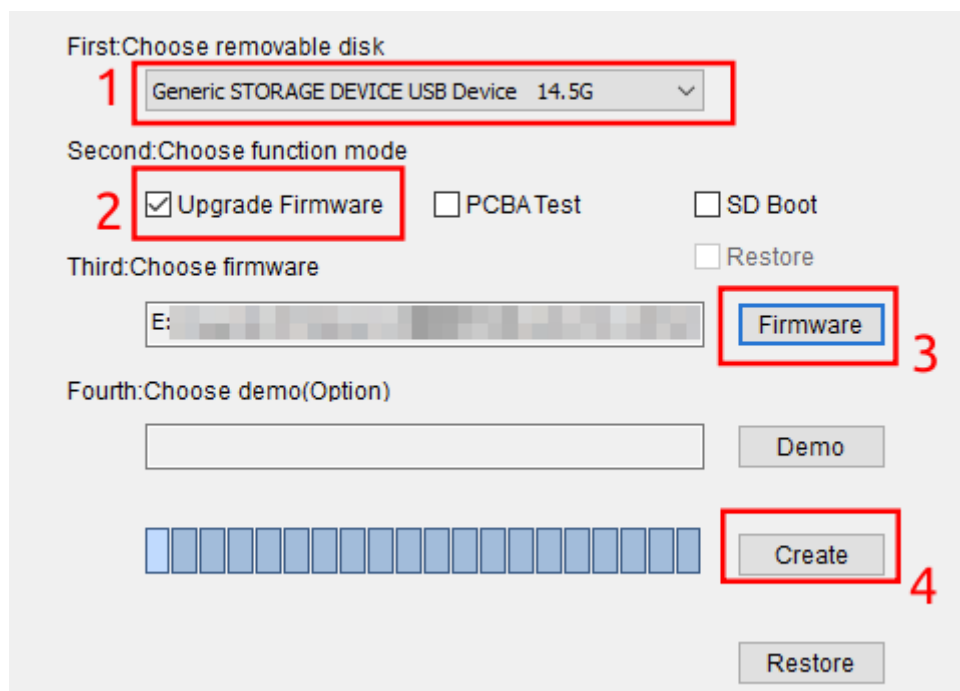
\rockdev>pause

请按任意键继续...
```

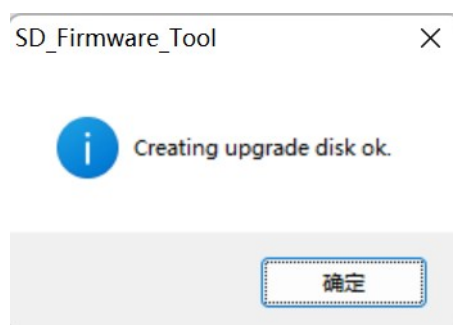
You can find the “update.img” in the folder “rockdev”.

4.2 Using SDDiskTool to Create Upgrade SD

1. Insert an SD Card to your PC (Windows OS).
2. Decompress the SDDiskTool by double clicking the SD_Firmware_Tool.exe
3. Create an upgrade SD card
 - a. Choose the SD device.
 - b. Choose "Upgrade firmware"
 - c. Choose an update.img path
 - d. Create an update SD



4. successful creation of your upgrade SD card.



4.3 Upgrade or Recovery ASR-A501

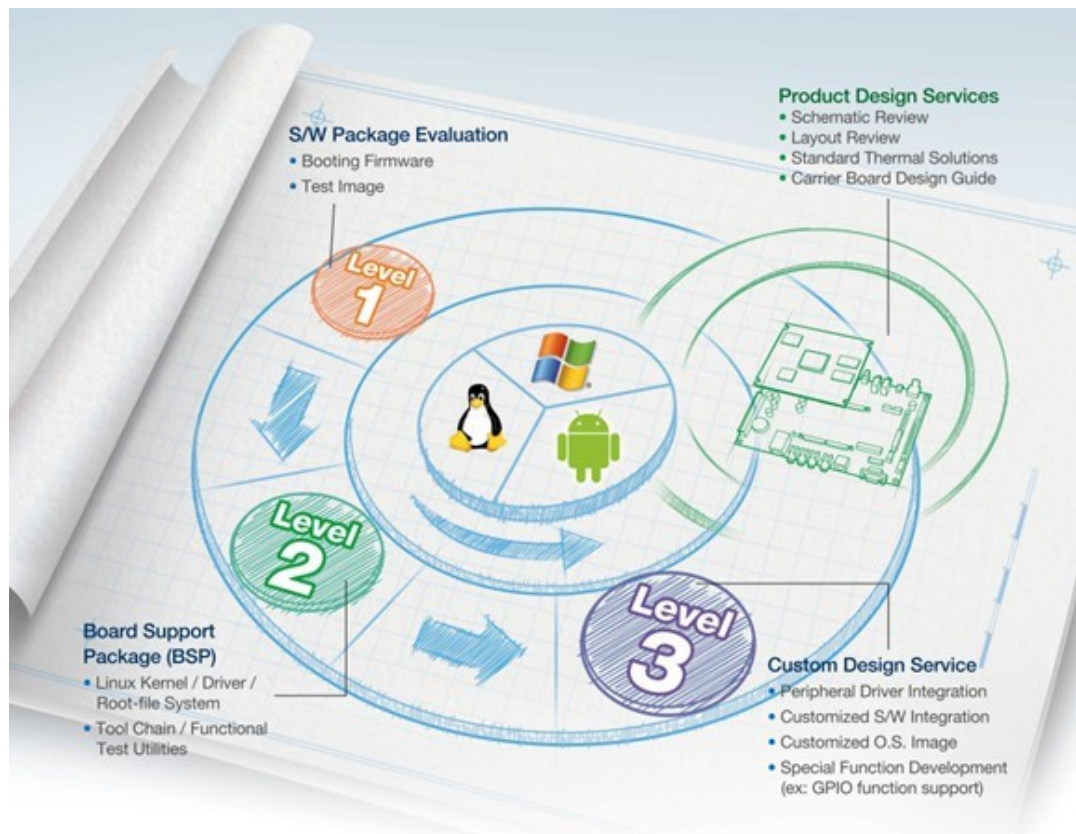
1. Power off ASR-A501.
2. Insert the upgrade SD card into ASR-A501.
3. Power on ASR-A501. It will automatic enter recovery mode to upgrade the system.
4. If the upgrade is a success, you will get the "Please remove the SD Card!, wait for reboot" message on the screen and debug console.
5. Remove the SD card.

Chapter 5

Advantech Services

This chapter details Advantech's Design-in services, technical support, and warranty policy for the ASR-A501 evaluation kit.

5.1 RISC Design-In Services



Advantech RISC Design-in services help customers reduce the time and work associated with designing new carrier boards. We handle the complexities of technical research and greatly minimize the development risks associated with carrier boards.

Easy Development

Advantech supports firmware, root file-system, BSP, and other development tools for customers. These tools help customers develop their carrier board and differentiate their embedded products and applications.

- Full range of RISC products
- Comprehensive document support

Design Assistance Service

Advantech provides engineers with a schematic checklist and review services based on customer carrier board specifications. These services prevent design errors before they occur. This saves time and reduces costs associated with developing carrier boards.

- Schematic review
- Placement and layout review
- Debugging assistance services
- General/Special reference design database

Thermal Solution Services

In order to provide quicker flexible solutions for customer's thermal designs, Advantech provides services including both modularized thermal solutions and customized thermal solutions

- Standard thermal solutions
- Customized thermal solutions

Embedded Software Services

This service provides support drivers, software integration/customized firmware, root file-system, and Linux image — Enabling users to save time and focus on their core development.

- Embedded Linux/Android OS
- Advantech boot loader customization

With the spread of industrial computing, a whole range of new applications has been developed, resulting in a fundamental change in the IPC industry. Due to diverse market demands and intense competition, cooperation on vertical integration is an effective way to create competitive advantages. As a result, ARM-based CPU modules have grown in popularity. Concentrating all necessary components on CPU modules and placing other parts on the carrier board provides greater flexibility while retaining low power consumption credentials.

Advantech has identified the following common questions concerning the implementation of modular designs.

General I/O Design Capability

Users can typically perform vertical integration. However, lack of expertise and experience in general power and I/O design can cause challenges; especially when integrating CPU modules into carrier boards.

The Acquisition of Information

Despite obtaining sufficient information for making decisions concerning specialized vertical applications, some customers encounter difficulties dealing with platform design, communicating with the CPU, or chipset manufacturers. These challenges in carrier board design can negatively impact the time-to-market at the expense of market opportunities.

Software Development and Modification

Compared to x86 architectures, RISC architectures use simpler instruction sets. Software support for x86 platforms cannot be used on RISC platforms. System integrators (SI) need to develop software for their system and integrate it with hardware themselves. Unlike x86 platforms, RISC platforms are not well supported by Board Support Packages (BSP) and drivers. While driver support is provided, system integration still requires a lot of effort. The BSP provided by CPU manufacturers is usually tailored for carrier board design, making system integration for software difficult.

Addressing this, Advantech introduced Streamlined Design-in Support Services for RISC-based Computer on Modules (COM). With a dedicated professional design-in services team, Advantech actively participates in carrier board design and problem solving. Advantech's services not only enable customers to effectively distribute their resources, but also reduce R&D costs and hardware investment.

By virtue of a cooperative relationship with leading original manufacturers of CPUs and chipsets, such as ARM, TI, and NXP, Advantech helps solve communication and

technical support difficulties. This can reduce the uncertainties in product development. Advantech's professional software team focuses on providing complete Board Support Packages. They also help customers create a software development environment for their RISC platforms.

Advantech RISC design-in services helps customers reduce time to market by overcoming their problems through streamlined services.

Planning Stage

Before deciding to adopt Advantech RISC COM, customers must go through a complete survey process, detailing product features, specifications, and compatibility testing with software. Advantech offers a RISC Customer Solution Board (CSB) as an evaluation tool for carrier boards which are simultaneously designed when developing RISC COMs. In the planning stage, customers can use this evaluation board to assess RISC modules and test peripheral hardware. Advantech provides standard software Board Support Packages (BSP) for RISC COM, so that customers can define their product's specifications while simultaneously verifying I/O and performance. Advantech also offers software evaluation and peripheral module recommendations (such as Wi-Fi, 3G, and BT). At this stage, Advantech seeks to resolve customer concerns. Product evaluation with a focus on performance and specification is vital during the planning period. Therefore, Advantech helps their customers conduct all the necessary tests for their RISC COM.

Design Stage

Advantech will supply a reference carrier board design guide when a product moves into the design stage. The carrier board design guide provides pin definitions for the COM connectors with limitations and recommendations for carrier board design. This design guide gives customers clear guidelines during their carrier board development. Advantech offers a complete pin-out check list for different form factors such as Q7, ULP and RTX 2.0, enabling carrier board signals and layout design examination. Advantech's team helps customers review the placement/layout and schematics. This helps carrier board designs fulfill customers' requirements. Advantech's RISC software team assists in establishing an environment for software development while evaluating the time and resources needed. Advantech can also cooperate with third parties to provide proficient consulting services in software development. With Advantech's professional support, the design process is eased and product quality is improved; thus meeting customer targets.

Integration Stage

This phase comprises HW/SW integration, application development, and peripheral module implementation. Due to the lack of knowledge and experience using platforms, customers need to spend a certain amount of time on analyzing integration problems. In addition, peripheral module implementation is relevant to driver designs on carrier boards. RISC platforms usually have less support for ready-made drivers on carrier boards, therefore users need to learn by trial and error to get the best solution with the least effort. Advantech's team has years of experience in customer support and HW/SW development. Advantech supports customers with professional advice and information shortening development time and enabling effective product integration.

Validation stage

After the completion of a customer's ES sample there is a series of verification steps. In addition to verifying a product's functionality, testing a product's efficiency is an important stage for RISC platforms. Through an efficient verification process, backed by Advantech's technical support, customers optimize their applications with ease. Advantech's team can provide professional consulting services regarding further testing and equipment usage. This helps customers find the right tools to efficiently identify and solve problems to enhance product quality and performance.

5.2 Contact Information

The contact information for Advantech customer service is below:

Table 5.1: Contact Information

Region/Country	Contact Information
United States of America	1-888-576-9688
Brazil	0800-770-5355
Mexico	01-800-467-2415
Europe (Toll Free)	00800-2426-8080
Singapore & SAP	65-64421000
Malaysia	1800-88-1809
Australia (Toll Free)	1300-308-531
China (Toll Free)	800-810-0345 800-810-8389 Sales@advantech.com.cn
India (Toll Free)	1-800-425-5071
Japan (Toll Free)	0800-500-1055
Korea (Toll Free)	080-363-9494 080-363-9495
Taiwan (Toll Free)	0800-777-111
Russia (Toll Free)	8-800-555-01-50

You can also reach our service team through the website below; our technical support engineer will provide a quick response once the form is completed:

http://www.advantech.com.tw/contact/default.aspx?page=contact_form2&subject=Technical+Support

5.3 Technical Support and Assistance

5.3.1 Warranty Policy

The warranty policy for Advantech products is detailed below:

5.3.1.1 Warranty Period

Advantech branded off-the-shelf products and third party off-the-shelf products used to assemble Configure-to-Order products are entitled to a two year complete and prompt global warranty service. Product defects in design, materials, and workmanship are covered from the date of shipment.

All customized products will carry a 15 month regional warranty service by default. The actual product warranty terms and conditions may vary based on sales contract.

All third party products purchased separately will be covered by the original manufacturer's warranty and time period, and shall not exceed one year of coverage through Advantech.

5.3.1.2 Repairs under Warranty

It is possible to obtain a replacement (Cross-Shipment) during the first 30 days of the purchase. Contact your original Advantech supplier to organize returns for Dead on Arrival products (if the products were purchased directly from Advantech). The DOA Cross-Shipment excludes any damage incurred during shipping as well as customized and/or built-to-order products.

For those products which are not DOA, the return fee to an authorized Advantech repair facility will be at the customers' expense. The shipping fee for refurbished products from Advantech back to customers' sites will be Advantech's expense.

5.3.1.3 Exclusions from Warranty

The product is excluded from warranty if:

- The product has been found to be defective after expiry of the warranty period
- Warranty has been voided by removal or alternation of product or part identification labels
- The product has been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or failure caused which Advantech is not responsible whether by accident or other cause. Such conditions will be determined by Advantech at its sole unfettered discretion
- The product is damaged beyond repair due to a natural disaster such as a lightning strike, flood, earthquake, etc.
- Product updates/upgrades and tests upon the request of customers who are without warranty

5.3.2 Repair Process

5.3.2.1 Obtaining an RMA Number

All returns from customers must be authorized with an Advantech Return Merchandise Authorization (RMA) number. Any returns of defective units or parts without valid RMA numbers will not be accepted; they will be returned to the customer at the customer's cost without prior notice.

An RMA number is only an authorization for returning a product; it is not an approval for repair or replacement. When requesting an RMA number, please access Advantech's RMA web site: <http://erma.Advantech.com.tw> with an authorized user ID and password.

You must fill out basic product and customer information and describe the problems encountered in detail in "Problem Description". Vague entries such as "does not work" and "failure" are not acceptable.

If you are uncertain about the cause of the problem, please contact Advantech's Application Engineers (AE). They may be able to find a solution that does not require sending the product for repair.

The serial number of the whole set is required if only a key defective part is returned for repair. Otherwise, the case will be regarded as out-of-warranty.

5.3.2.2 Returning Products for Repair

It's possible for customers to save time and meet end-user requirements by returning defective products to any authorized Advantech repair facility without an extra cross-region charge. Customers are required to contact the local repair center before using global repair services.

Customers should send cards without accessories (manuals, cables, etc.). Remove any unnecessary components from the card, such as CPU, DRAM, and CF Card. If you return these parts (because you believe they may be part of the problem), please note clearly that they are included. Otherwise, Advantech is not responsible for any items not listed. Make sure the "Problem Description" is enclosed.

European Customers that are located outside European Union are requested to use UPS as the forwarding company. We strongly recommend adding a packing list to all shipments. Please prepare a shipment invoice according to the following guidelines to decrease goods clearance time:

1. Give a low value to the product on the invoice, or additional charges will be levied by customs that will be borne by the sender.
2. Add information "Invoice for customs purposes only with no commercial value" to the shipment invoice.
3. Show RMA numbers, product serial numbers, and warranty status on the shipment invoices.
4. Add information about the goods Country of origin.
5. In addition, please attach an invoice with RMA number to the box, then write the RMA number on the outside of the box and attach the packing slip to save handling time. Please address the parts directly to the Service Department and mark the package "Attn. RMA Service Department".

All products must be returned in properly packed ESD material or anti-static bags. Advantech reserves the right to return items at the customer's cost if inappropriately packed.

"Door-to-Door" transportation such as speed post is recommended for delivery. The sender should bear additional charges such as clearance fees if Air-Cargo is adopted.

Should DOA cases fail, Advantech will take full responsibility for the product and transportation charges. If the items are not DOA, but fail within warranty, the sender will bear the freight charges. For out-of-warranty cases, customers must cover the cost and take care of both outward and inward transportation.

5.3.2.3 Service Charges

The product is excluded from warranty if:

- The product is repaired after expiry of the warranty period
- The product is tested or calibrated after expiry of the warranty period, and a No Problem Found (NPF) result is obtained
- The product, though repaired within the warranty period, has been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or suffered a failure for which Advantech is not responsible — whether by accident or other cause. Such conditions will be determined by Advantech at its discretion
- The product is damaged beyond repair due to a natural disaster such as a lightning strike, flood, earthquake, etc.
- Product updates and tests upon the request of customers who are without warranty

If a product has been repaired by Advantech, and within three months after such a repair the product requires another repair for the same problem, Advantech will do this repair free of charge. However, such free repairs do not apply to products which have been misused, abused, or subjected to unauthorized disassembly/modification; placed in an unsuitable physical or operating environment; improperly maintained by the customer; or have failed for reasons for which Advantech is not responsible whether by accident or other cause.

Please contact your nearest regional service center for a detailed service quotation. Before we start out-of-warranty repairs, we will send you a pro forma invoice (P/I) with the repair charges. When you remit the funds, please reference the P/I number listed under “Our Ref”. Advantech reserves the right to deny repair services to customers that do not return the DOA unit or sign the P/I. Meanwhile, Advantech will scrap defective products without prior notice if customers do not return the signed P/I within 3 months.

5.3.2.4 Repair Report

Advantech returns each product with a “Repair Report” which shows the result of the repair. A “Repair Analysis Report” is also provided to customers upon request. If the defect is not caused by Advantech design or manufacturing, customers will be charged US\$60 or US\$120 for in-warranty or out-of-warranty repair analysis reports respectively.

5.3.2.5 Custody of Products Submitted for Repair

Advantech will retain custody of a product submitted for repair for one month while it is waiting the return of a signed P/I or payment (A/R). If the customer fails to respond within such period, Advantech will close the case automatically. Advantech will take reasonable measures to stay in proper contact with the customers during this one month period.

5.3.2.6 Shipping Back to Customer

The forwarding company for RMA returns from Advantech to customers is selected by Advantech. Per customer requirement, other express services can be adopted, such as UPS, FedEx etc. The customer must bear the extra costs of such alternative shipment. If you require any special arrangements, please indicate this when shipping the product to us.



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