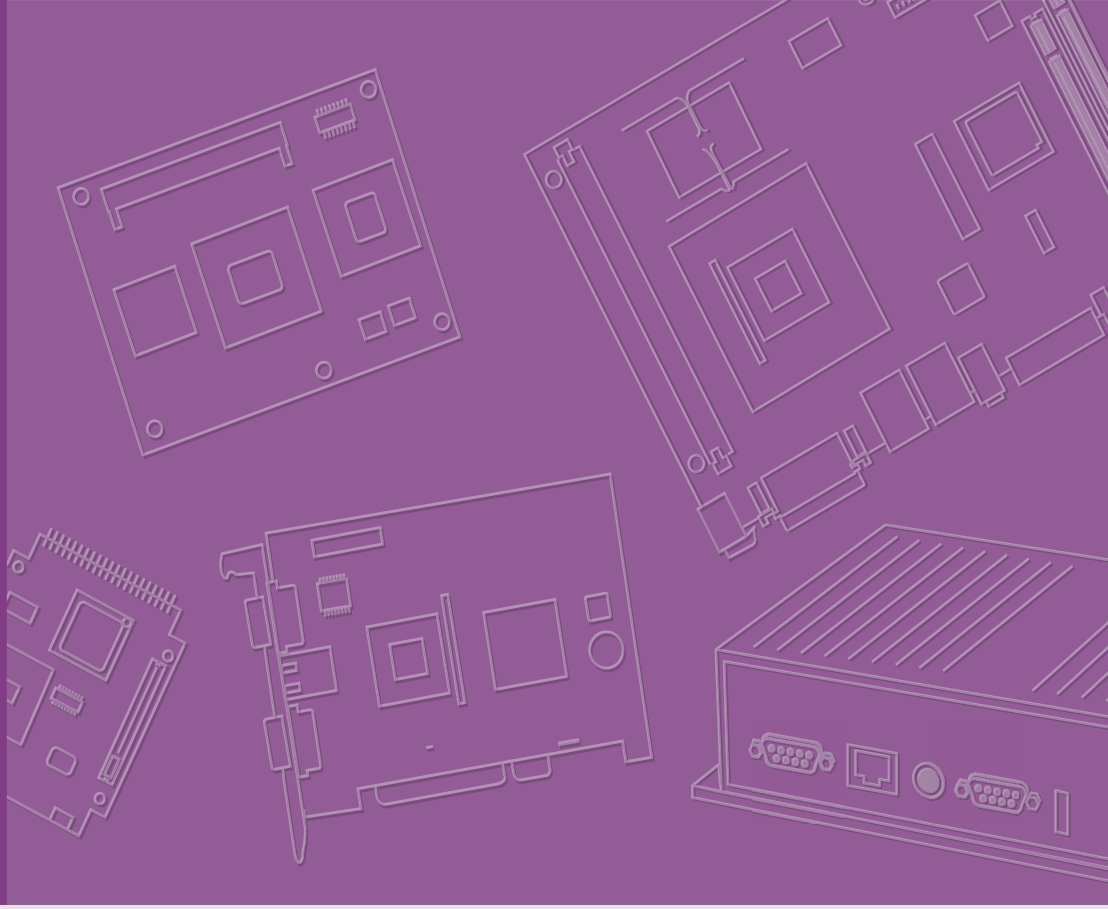

User Manual

EPC-R5710

NXP i.MX 8M Plus Edge AI Box Computer

ADVANTECH

Enabling an Intelligent Planet

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Acknowledgments

Product Warranty (2 years)

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

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which 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 of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

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 you get 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 an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Part No. 2006R57100 Edition 1

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Declaration of Conformity

FCC Class B

Note: 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 instructions, 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 help.

Ordering Information

Part Number	Description
EPC-R5710NQ-BLA1E	NXP 8M Plus Edge AI Box Computer, 4GB LDDR4,16GB EMMC, 0-50°C
EPC-R5710NQ-ALA1E	NXP 8M Plus Edge AI Box Computer, 6GB LDDR4,16GB EMMC, 0-50°C
EPC-R5710IQ-XLA1E	NXP 8M Plus Edge AI Box Computer, 2GB LDDR4,16GB EMMC, -40-70°C
EPC-R5710IQ-BLA1E	NXP 8M Plus Edge AI Box Computer, 4GB LDDR4,16GB EMMC, -40-70°C
EPC-R5710IQ-ALA1E	NXP 8M Plus Edge AI Box Computer, 6GB LDDR4,16GB EMMC, -40-70°C

Packing List

Before installation, please ensure the following items have been shipped.

- 1 x EPC-R5710 Box Computer
- 2 x Wall Mount

Optional Accessories

Part Number	Description
96PSA-A36W12W7	ADP A/D 100-240V 36W 12V WO/PFC
1702002605	Power Cord 3P EU 10A 250V 183 cm (72 in)
1702031801	Power Cord 3P UK 10A 250V 183 cm (72 in)
1702002600	Power Cord UL 3P 10A 125V 183 cm (72 in)
1700008921	Power Cord 3P PSE 183 cm (72 in)
1700009652	Power Cord CCC 3P 10A 250V 187 cm (73.6 in)
968DD00064	Quectel RM500Q-GL m.2 Wireless 5G Module
1750008569-01	Cable Ant. SMA/F-BH MHF/113 BLK L300 mm for 5G
1750009372-01	Ant. SMA/M 90/180 5G BLK 167 mm RG178 for 5G
1990038961N000	Thermal Pad PG45A K=4.5 45*30*2MM for 5G
968AD00584	Quectel EC20CEFHLG Mini PCIe 4G module
1750007965-01	Antenna Cable R/P SMA (M) to MHF4, 300 mm (11.8 in) for 4G
1750008303-01	Antenna AN0727-64SP6BSM for 4G
1970005269T000	HD R2 32x32x27.4MM SC EPC-R5710 for 4G
1990016840S000	Thermal Pad 32x32x1.5mm GR-Hm K=6 for DAC-SC01 for 4G
AIW-154BN	AzureWave AW-CM276MA Wi-Fi 5 module
AIW-165BN	AzureWave AW-XM458MA Wi-Fi 6 module
1750007965-01	W-iFi Coaxial Cable, SMA (M) to MHF4, 300 mm for Wi-Fi 5 / Wi-Fi 6
1750008717-01	Wi-Fi Dual band 2.4G and 5G Antenna for Wi-Fi5 / Wi-Fi 6
1970005268T000	HD R2 20x20x27.4MM SC EPC-R5710 for Wi-Fi 5 / Wi-Fi 6/ Hailo H8 AI Card
1990031873N020	Thermal Pad 20x20x2.5 mm (t) K=4.0 TP TG4040 for Wi-Fi 5
1990033689N000	Thermal Pad 20x20x1 mm TP K=1.2 Eapus XR-HL for Wi-Fi 6
1990030557N000	Thermal Pad 70x62x2 mm XR-HL K=1.2 TP Eapus for SSD
968DD00322	Hailo-8 HM218B1C2KAE 2230 A+E Key M.2 module AI Module 26 Tops
1990011911N000	Thermal Pad 20x20x1.0 mm GR-Hm K=6 for Hailo H8 AI card
1700019474	Debug cable D-SUB 9P(F)/D-SUB 9P(F) 100 cm

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this user manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get 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 does not work well, or you cannot get it to work according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.

DISCLAIMER: This set of instructions is given according to IEC 704-1. 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 not touch any components on the CPU card or other cards while the PC is on.

Contents

Chapter 1

General Introduction

This chapter gives background information on the EPC-R5710.

Sections include:

- Introduction
- Specifications

1.1 Introduction

EPC-R5710 is an edge AI industrial gateway that combines NXP's powerful video coding/decoding and AI capabilities. It offers either 2.3 or 26 TOPS of NPU AI computing power, multiple network ports, various industrial interfaces, storage options, and support for wireless technologies including 5G/4G and Wi-Fi 5/6. Additionally, it features an 8-way MIC array for audio and video AI analysis as well as integrated cloud collaboration functions. EPC-R5710 can handle various PLC data acquisition tasks and industrial protocol conversions.

With its high performance and high quality, the EPC-R5710 is widely used in AI video surveillance, machine vision, and industrial data acquisition applications in the fields of security, smart cities, smart transportation, smart factories, and energy and power industries.

1.2 Product Features

1.2.1 Specifications

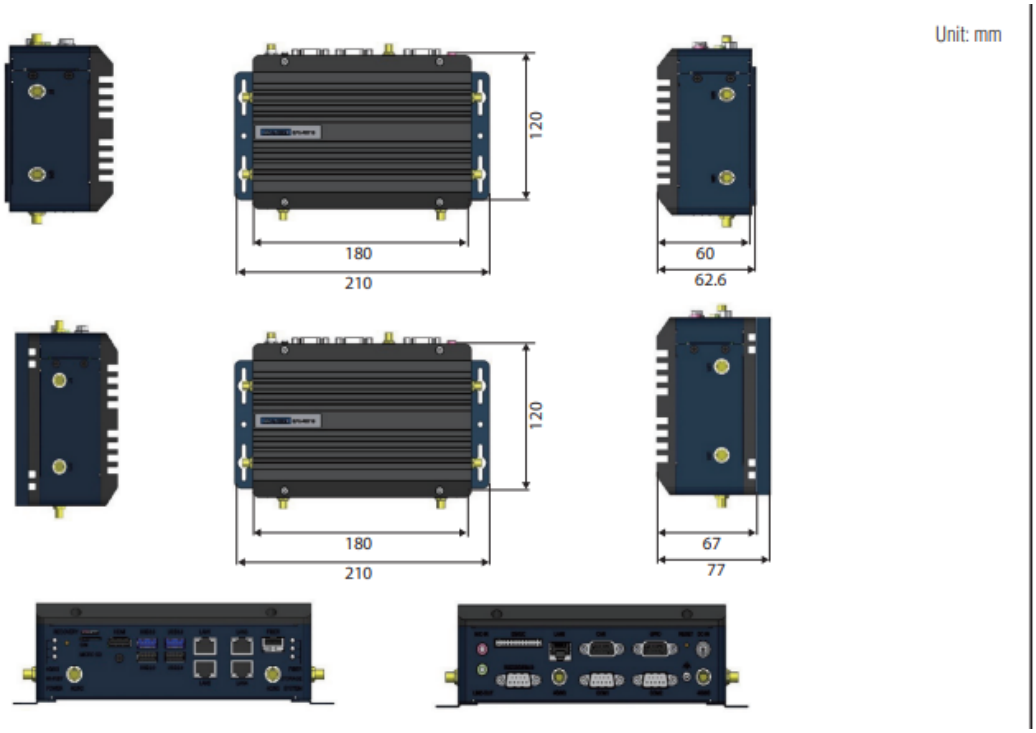
Table 1.1: Specifications

Processor	CPU/GPU	NXP i.MX 8M Plus Cortex-A53 Dual/Quad Core (up to 1.8GHz), GPU GC7000UL
	NPU	2.3 TOPS Neural Network performance, extend 26 TOPS AI card
	MCU	1 x Arm Cortex –M4F core
Memory	Technology	LPDDR4
	Capacity	2GB/4GB/6GB on board
	Flash	16/32GB EMMC NAND Flash for OS and 8MB SPI NOR Flash for boot loader
Graphics	HDMI	1 x HDMI 2.0, 1920x1080
	Graphics Engine	GC7000UL with 2D/3D Graphics Acceleration supporting 1G Pixel/s, OpenVG 1.1, Open GL ES 3.1, Vulkan, and Open CL 1.2 FP.
	H/W Video Codec	Decoder: H.265, H.264, VP8/9 1080p Encoder: H.264, VP8 1080p
Ethernet	Ethernet	5 x 10/100/1000 Mbps (route/switch) 1 x 1G FSP fiber
Watchdog Timer	Watchdog Timer	1~6527s, default 60s
RTC	RTC	Support
TPM/TCM	TPM/TCM	Support
Front I/O	Ethernet	4 x 10/100/1000 Mbps, 1 x 1G FSP fiber
	USB	2 x USB 3.0 Type-A host, 2 x USB 2.0 Type-A host
	HDMI	1 x HDMI 2.0, 1920x1080
	Micro SD	1 x Micro SD socket
	SIM	1 x standard SIM socket

Table 1.1: Specifications		
Rear I/O	Ethernet	1 x 10/100/1000 Mbps
	Audio	1 x Mic, 1 x Line-out,
	MIC Array	2 x I2S+1xI2C, supports 8 channels, MIC array (digital or analog)
	CAN	1 x CAN FD (-40~70°C), 1 x CAN (0~50°C)
	Serial Port	2 x RS232/RS422/RS485 1 x 2-wire RS232 or debug port (default: Debug)
	GPIO	5 x GPIO (3.3V Level)
Indicator	LED	6 Green LED for power, system, storage, 5G,4G,Wi-Fi and fiber status
Expansion	Mini PCIe	1 x mini PCIe slot (only USB 2.0 signal for 4G/GPS)
	M.2 E-Key	1 x M.2 E-Key slot (for Wi-Fi 5 / Wi-Fi 6, BT and 26 TOPS AI card)
	M.2 B-Key	1 x M.2 B-Key (USB 3.0 for 5G)
	SATA	1 x SATA 2.0 Header (2.5-inch SSD)
	Antenna Holes	8 (5G/4Gx4 & Wi-Fi/BTx2&BTx1&GPSx1)
Mechanical	System	180 x 120 x 60 mm or 180 x120 x 67 mm (for AI card)
	Mounting	Wall mount
Power	Power supply	12V 3A DC-in
Environment	Operating temperature	0-50°C, -40~70°C
	Operating humidity	5 ~ 95% relative humidity, non-condensing
Operating System		Linux Yocto
Certifications		CCC/CE/FCC Class B

1.3 Mechanical Specifications

- **Dimensions:** Normal temperature: 180 x 120 x 62 mm. Wide temperature: (AI) 180 x 120 x 67 mm
- **Reference weight:** 1.3 kg (including the whole package)



1.3.1 Electrical Specifications

- **Power supply type:** DC-in 12V
- **RTC battery:**
  - Typical voltage: 3V
  - Normal discharge capacity: 210 mAh

1.4 Environmental Specifications

- **Operating temperature:** -40 ~ 70°C, 0 ~ 50°C
- **Operating humidity:** 5% ~ 95% relative humidity, non-condensing
- **Storage temperature:** -40 ~ 85°C (-40 ~ 185°F)
- **Storage humidity:** 5% ~ 95% relative humidity, non-condensing

Chapter 2

H/W Installation

This chapter gives mechanical and connector information on the EPC-R5710.

Sections include:

- I/O Information

2.1 Connectors

Table 2.1: Connector & Button List	
DCIN	12V DC Jack
AUDIO1	Audio Jack (Mic-In & Line-Out)
MICA	Microphone Array
COM1	COM1 or Console
COM2	COM2
COM3	COM3
CAN	CAN
CN31	CAN Impedance Select
GPIO	GPIO
LAN1	LAN1 (RJ-45)
LAN2	LAN2 (RJ-45)
LAN3	LAN3 (RJ-45)
LAN4	LAN4 (RJ-45)
LAN5	LAN5 (RJ-45)
SFP	SFP Connector
USB1	USB 3.0 Type-A
USB4	USB 2.0 Type-A
USB2	USB 3.0 Type-A
USB5	USB 2.0 Type-A
SATA	SATA
SATA_PWR	SATA_PWR Connector
M.2	M.2 E-Key for Wi-Fi/BT
5G_M.2	M.2 B-Key for 5G_M.2
AICON	AI 3.3V Power
MPCIE	Mini PCIe Card for LTE
NANO_SIM	NANO SIM
MICRO_SD	Micro SD
HDMI	HDMI
RST	Reset Button
RECOVERY	Recovery Button

2.2 Mechanical

2.2.1 Connector Locations

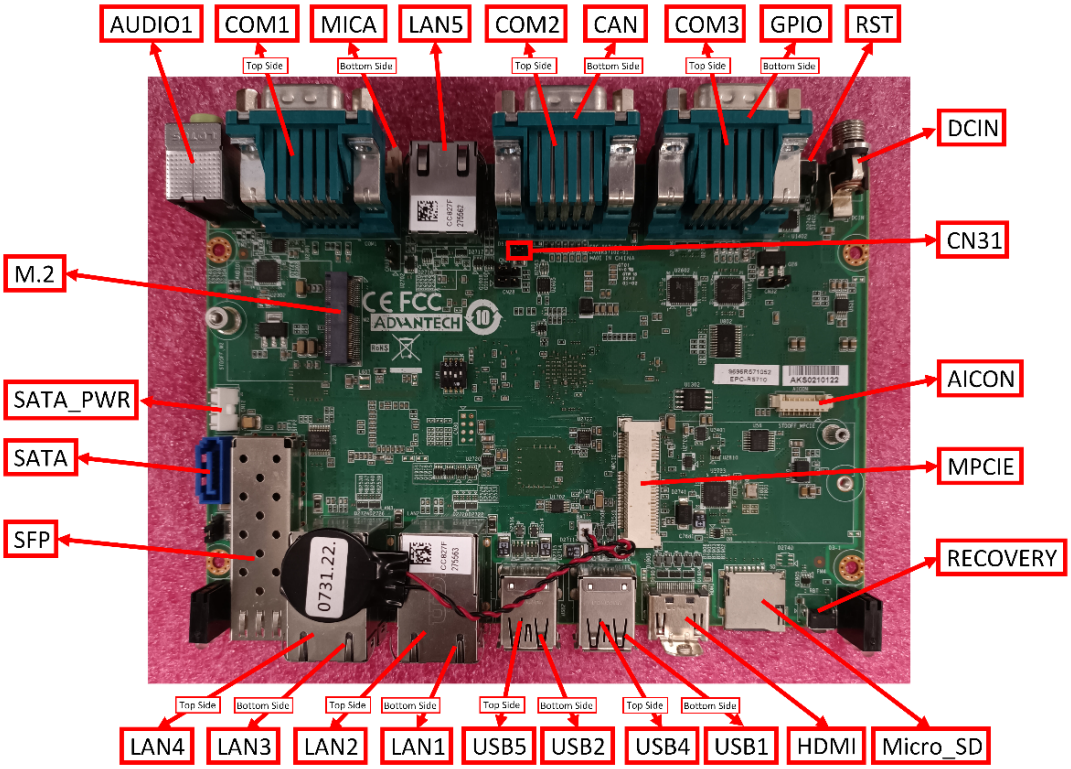


Figure 2.1 Connector Layout (Connector Side)

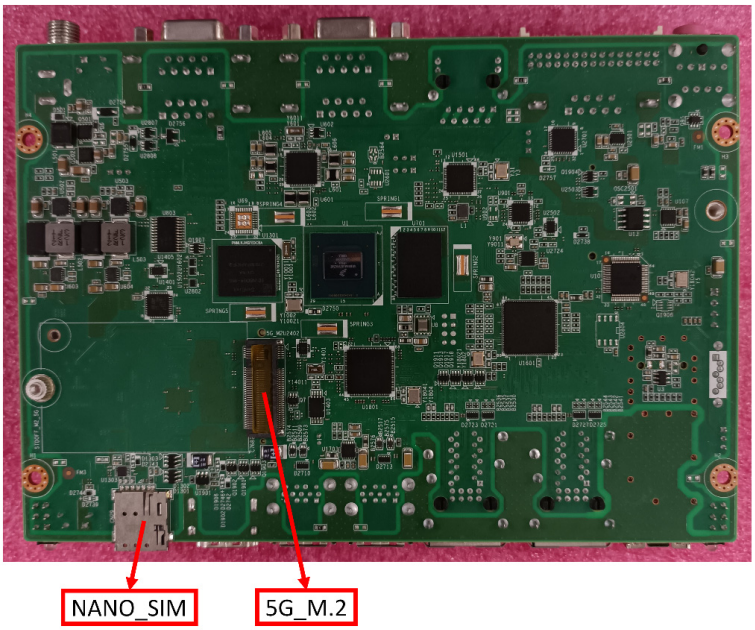
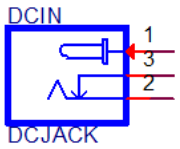


Figure 2.2 Connector Layout (CPU Side)

2.3 Pin Assignments

Table 2.2: DC-In: 12V DC Jack	
Part Number	1652005684-04
Manufacturer	CONTACT TECHNOLOGY CORP.
MPN	DC-456113M-2.5-S141
Pin	**Pin Name**
1	12V
2	GND
3	GND



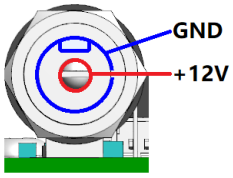
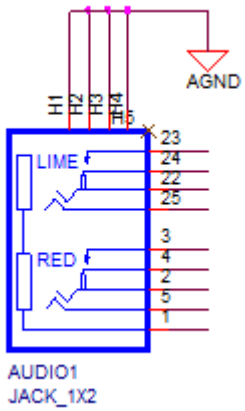


Table 2.3: AUDIO: Audio Jack (Mic-In & Line-Out)	
Part Number	1652006702-01
Manufacturer	LOTES Co.,Ltd.
MPN	ABA-JAK-038-K26
Pin	**Pin Name**
1	GND
2	NC
3	NC
4	NC
5	MIC_IN
22	LINEOUT_L
23	NC
24	NC
25	LINEOUT_R



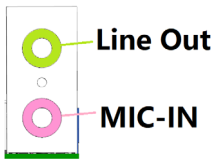
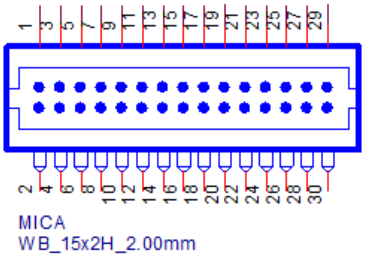


Table 2.4: MIC Array: Microphone Array	
Part Number	1653008436-01
Manufacturer	JIH VEI Electronics Co.,Ltd.
MPN	24W2140-30D10-01T-3-CF01
Pin	**Pin Name**
1	GND
2	GND
3	MICA_GPIO4
4	I2C3_SCL (1.8V)
5	MICA_GPIO3
6	I2C3_SDA (1.8V)
7	MICA_GPIO2_1V8
8	GND
9	MICA_GPIO1_1V8
10	PDM_STREAM3
11	+V1.8_AUD
12	PDM_STREAM2
13	+V3.3_AUD
14	PDM_STREAM1
15	GND
16	GND
17	SAI2_RXD0
18	SAI5_RXD0_PDM_STREAM0
19	SAI2_RXC
20	SAI5_RXC_PDM_CLK
21	GND
22	GND
23	SAI2_RXFS
24	SAI5_RXFS
25	GND
26	GND
27	SAI2_MCLK
28	SAI5_MCLK
29	GND
30	GND



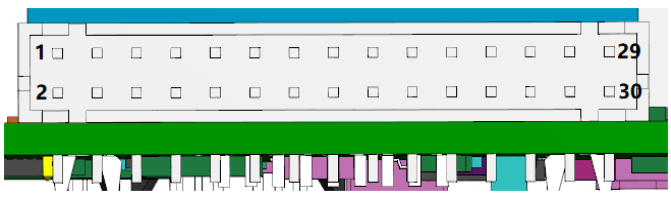
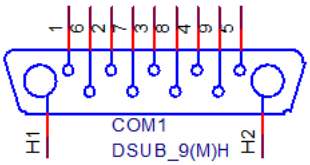


Table 2.5: COM1: COM1 or Console	
Part Number	1654010425
Manufacturer	Foxconn Interconnect Technology
MPN	DM10151-N5W3-4F
Pin	**Pin Name**
1	NC
2	RX
3	TX
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC



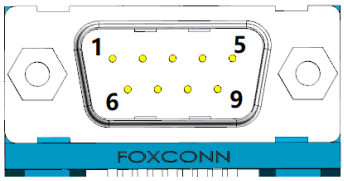
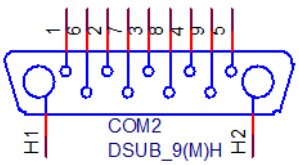


Table 2.6: COM2: COM2			
Part Number	1654010425		
Manufacturer	Foxconn Interconnect Technology		
MPN	DM10151-N5W3-4F		
Pin	**Pin Name**		
	RS485 Mode	RS422 Mode	RS232 Mode
1	Do not connect	TX-	Do not connect
2	Do not connect	TX+	RX
3	Data+	RX+	TX
4	Data-	RX-	Do not connect
5	GND	GND	GND
6	NC	NC	NC
7	Do not connect	Do not connect	RTS
8	Do not connect	Do not connect	CTS
9	NC	NC	NC



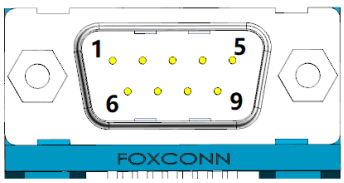
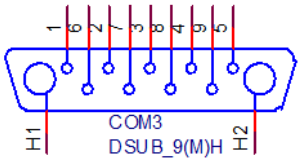


Table 2.7: COM3: COM3			
Part Number	1654010425		
Manufacturer	Foxconn Interconnect Technology		
MPN	DM10151-N5W3-4F		
Pin	**Pin Name**		
	RS485 Mode	RS422 Mode	RS232 Mode
1	Do not connect	TX-	Do not connect
2	Do not connect	TX+	RX
3	Data+	RX+	TX
4	Data-	RX-	Do not connect
5	GND	GND	GND
6	NC	NC	NC
7	NC	NC	NC
8	NC	NC	NC
9	NC	NC	NC



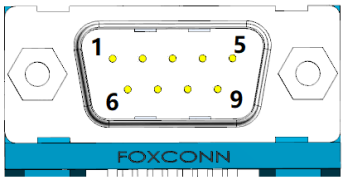
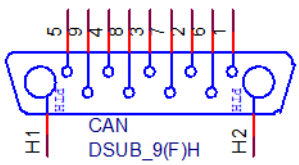


Table 2.8: CAN: CAN	
Part Number	1654008866
Manufacturer	YIMTEX ELECTRONIC CO., LTD.
MPN	41709S1NSACR
Pin	**Pin Name**
1	NC
2	CAN_L
3	GND
4	NC
5	GND
6	GND
7	CAN_H
8	NC
9	NC



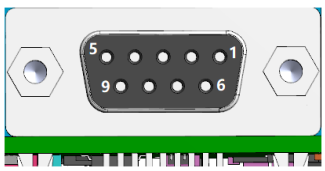
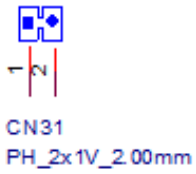


Table 2.9: CN31: CAN Impedance Select	
Part Number	1653002101-02
Manufacturer	JIH VEI Electronics Co.,Ltd.
MPN	21N12050-02S10B-01G-4/2.8
Pin	**Pin Name**
1	CAN_H
2	CAN_L to 120ohm Resistor



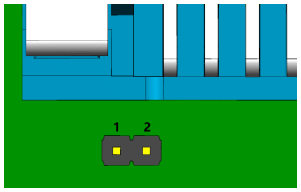
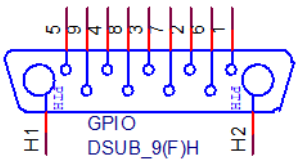


Table 2.10: GPIO: GPIO	
Part Number	1654008866
Manufacturer	YIMTEX ELECTRONIC CO., LTD.
MPN	41709S1NSACR
Pin	**Pin Name**
1	GPIO6
2	GPIO4
3	GPIO2
4	GPIO1
5	GND
6	GPIO5
7	NC
8	NC
9	+V3.3_DUAL_GPIO



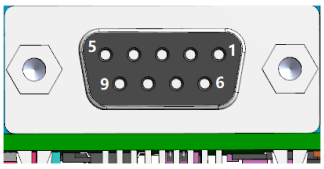


Table 2.11: LAN1 + LAN2: LAN1 (RJ-45) & LAN2 (RJ-45) LAN3 + LAN4: LAN3 (RJ-45) & LAN4 (RJ-45)	
Part Number	1654014682-01
Manufacturer	UDE Corp.
MPN	RM3-CL-0003

Table 2.12: LAN5: LAN5 (RJ-45)	
Part Number	1654013046-01
Manufacturer	UDE Corp.
MPN	RT7-194ATAMF

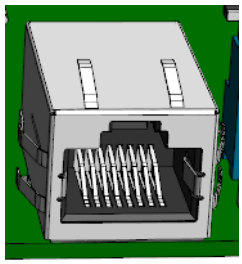


Table 2.13: SFP: SFP	
Part Number	1654011667-01 + 1654011666-01
Manufacturer	Nextronics Engineering Corp.
MPN	Z-8270000000000 + Z-8281110000000

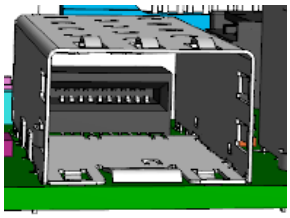


Table 2.14: USB1 + USB4: USB 3.0 (Type-A) & USB 2.0 (Type-A) USB2 + USB5: USB 3.0 (Type-A) & USB 2.0 (Type-A)	
Part Number	1654010199
Manufacturer	Foxconn Interconnect Technology
MPN	UEA1112C-UHS6-4F

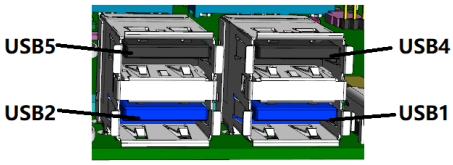


Table 2.15: SATA: SATA	
Part Number	1654013393-01
Manufacturer	Win Win Precision Industrial CO., Ltd.
MPN	WATM-07DBN4A2B8UW4

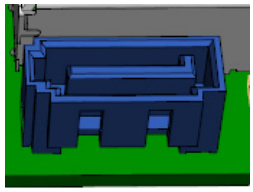
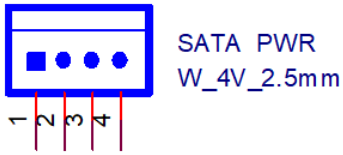


Table 2.16: SATA_PWR: SATA_PWR Connector	
Part Number	1655003891
Manufacturer	JIH VEI Electronics Co.,Ltd.
MPN	24W1161-04S10-01T
Pin	**Pin Name**
1	+V5
2	GND
3	GND
4	+VIN(12V)



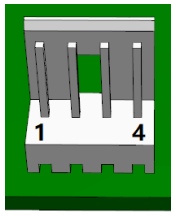
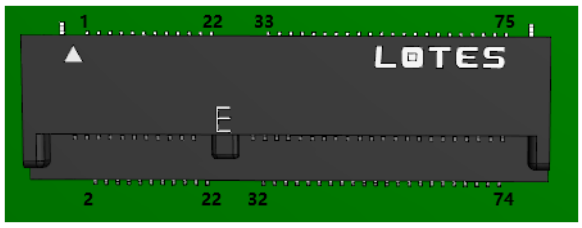


Table 2.17: M.2: M.2 E-Key for Wi-Fi/BT	
Part Number	1654012663-01
Manufacturer	LOTES Co.,Ltd.
MPN	APCI0163-P001A
Pin	**Pin Name**
1	GND
2	+V3.3_M2
3	USB3+
4	+V3.3_M2
5	USB3-
6	NC
7	GND
8	NC
9	NC
10	NC
11	NC
12	NC
13	NC
14	NC
15	NC
16	NC
17	NC
18	GND
19	NC
20	UART1_WAKE# (3.3V)
21	NC
22	UART1_RXD (1.8V)
23	NC
	KEY
32	UART1_TXD (1.8V)
33	GND
34	UART1_CTS# (1.8V)
35	PCIE_TX+ (CPU -> Module)
36	UART1_RTS# (1.8V)
37	PCIE_TX- (CPU -> Module)
38	NC
39	GND
40	NC
41	PCIE_RX+ (CPU <- Module)
42	NC
43	PCIE_RX- (CPU <- Module)
44	NC
45	GND
46	NC
47	PCIE_CLK+
48	NC
49	PCIE_CLK-

Table 2.17: M.2: M.2 E-Key for Wi-Fi/BT	
50	M2_SYSCLK (32.768KHz 3.3V)
51	GND
52	M2_RST# (3.3V)
53	PCIE_CLKREQ# (3.3V)
54	M2_BT_DIS2# (3.3V)
55	M_PCIE_WAKE# (3.3V)
56	M2_W_DIS1# (3.3V)
57	GND
58	I2C2_SDA (1.8V)
59	NC
60	I2C2_SCL (1.8V)
61	NC
62	NC
63	GND
64	NC
65	NC
66	NC
67	NC
68	NC
69	GND
70	NC
71	NC
72	+V3.3_M2
73	NC
74	+V3.3_M2
75	GND



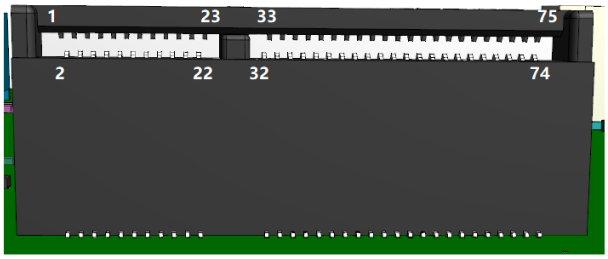


Table 2.18: 5G_M.2: M.2 B-Key for 5G_M.2	
Part Number	1654011348-01
Manufacturer	Foxconn Interconnect Technology
MPN	AS0BC21-S40BB-7H
Pin	**Pin Name**
1	NC
2	+V3.3_5G
3	GND
4	+V3.3_5G
5	GND
6	5G_PWR_OFF# (3.3V)
7	USB7+
8	5G_W_DIS# (3.3V)
9	USB7-
10	NC
11	GND
	KEY
20	NC
21	NC
22	NC
23	WAKEUP_HOST_5G (3.3V)
24	NC
25	10K pull up to 1.8V
26	NC
27	GND
28	NC
29	USB3.0 RX- (CPU <- Module)
30	UIM_RESET
31	USB3.0 RX+ (CPU <- Module)
32	UIM_CLK
33	GND
34	UIM_DATA
35	USB3.0 TX- (CPU -> Module)
36	UIM_VCC
37	USB3.0 TX+ (CPU -> Module)
38	NC
39	GND
40	NC
41	NC
42	NC
43	NC
44	NC
45	GND
46	NC
47	NC
48	NC
49	NC

Table 2.18: 5G_M.2: M.2 B-Key for 5G_M.2	
50	NC
51	GND
52	NC
53	NC
54	NC
55	NC
56	NC
57	GND
58	NC
59	NC
60	NC
61	NC
62	NC
63	NC
64	NC
65	NC
66	NC
67	5G_RESET# (OD)
68	NC
69	5G_DET# (1.8V)
70	+V3.3_5G
71	GND
72	+V3.3_5G
73	GND
74	+V3.3_5G
75	NC

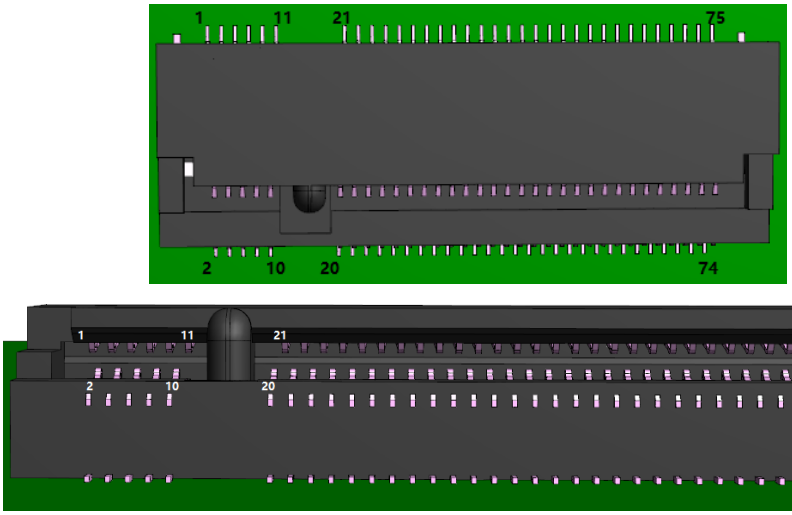
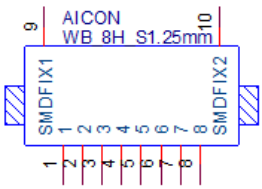


Table 2.19: AI Power CONN: AI 3.3V Power	
Part Number	1655908120
Manufacturer	Aces Electronics Co., Ltd.
MPN	85204-08001
Pin	**Pin Name**
1	+V3.3
2	+V3.3
3	+V3.3
4	+V3.3
5	GND
6	GND
7	GND
8	GND



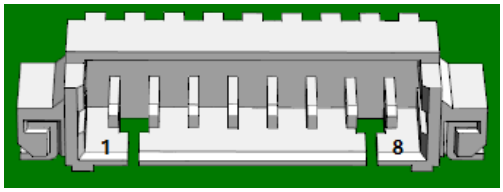


Table 2.20: Mini PCIe: Mini PCIe Card for LTE	
Part Number	1654006715
Manufacturer	Aces Electronics Co., Ltd.
MPN	88911-5204M
Pin	**Pin Name**
1	NC
2	+V3.3_MINICARD
3	NC
4	MINICARD_DET# (10K pull up to 3.3V)
5	NC
6	NC
7	NC
8	UIM_VCC
9	GND
10	UIM_DATA
11	NC
12	UIM_CLK
13	NC
14	UIM_RESET
15	GND
16	NC
	KEY
17	NC
18	GND
19	NC

Table 2.20: Mini PCIe: Mini PCIe Card for LTE	
20	MINICARD_W_DIS# (1.8V)
21	GND
22	MINICARD_RESET# (1.8V)
23	NC
24	+V3.3_MINICARD
25	NC
26	GND
27	GND
28	NC
29	GND
30	NC
31	NC
32	NC
33	NC
34	GND
35	GND
36	USB6-
37	GND
38	USB6+
39	+V3.3_MINICARD
40	GND
41	+V3.3_MINICARD
42	NC
43	GND
44	NC
45	NC
46	NC
47	NC
48	NC
49	NC
50	GND
51	NC
52	+V3.3_MINICARD

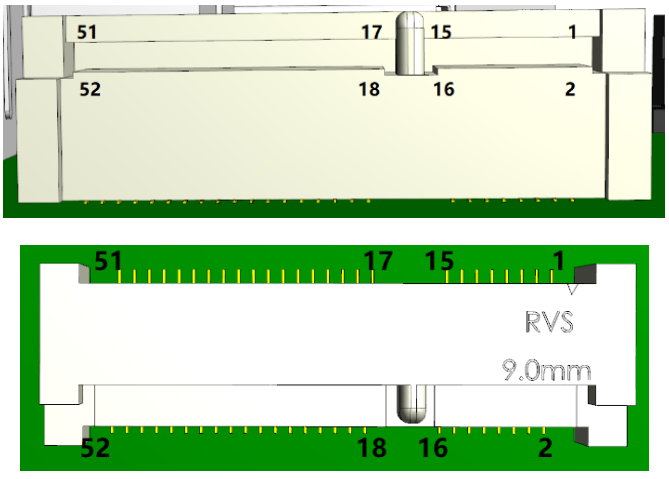


Table 2.21: NANO_SIM: NANO SIM	
Part Number	1651003388-01
Manufacturer	HAMBURG INDUSTRIES CO., LTD.
MPN	N080613-SICR20

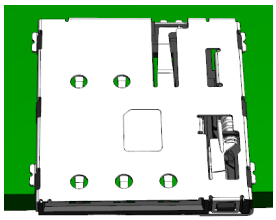


Table 2.22: MICRO_SD: Micro SD	
Part Number	1654010821-01
Manufacturer	SUNFUN TECH. LTD
MPN	TFPS-N02(01T)

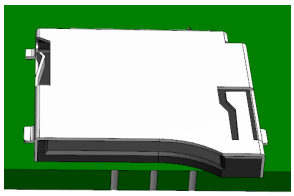


Table 2.23: HDMI: HDMI	
Part Number	1654013618-01
Manufacturer	LOTES Co.,Ltd.
MPN	AHDM0043-P002C

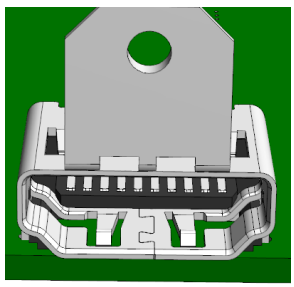
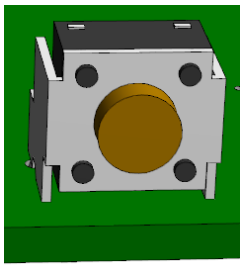


Table 2.24: Reset: Reset Button RECOVERY: Recovery Button	
Part Number	1600003862-01
Manufacturer	DIPTRONICS MANUFACTURING INC.
MPN	DTSA-62NQAA



Chapter 3

Software Functionality

This chapter details the software functions of EPC-R5710.

3.1 Quick Start Guide

3.1.1 Debug Port Connection

a. The EPC-R5710 debug port is on the front side at COM1 / DEBUG. Please connect the RS-232 female-to-female cable 1700019474 to your USB-to-RS232 cable to your PC terminal.

b. Note: The debug cable needs to be purchased separately.

Part No.	Description	Photo
1700019474	RS-232 Cable DB9 female to DB9 female	

3.1.2 Debug Port Settings

EPC-R5710 can communicate with host servers using serial cables. Common serial communication programs such as HyperTerminal, TeraTerm, or PuTTY can be used in these cases. The following example describes the serial terminal setup using HyperTerminal on a Windows host:

1. Connect EPC-R5710 with your PC by using a serial cable.
2. Open HyperTerminal on your Windows PC and select the settings as shown in Figure 2.1 below.
3. When switching on the power, the green LED indicator on the TOP side of the board will be lit up to indicate that the EPC-R5710 box computer has booted up normally. (Figure 2.2)
4. When the Wi-Fi and 4/5G modules are inserted, the Wi-Fi and 4/5G indicators are on. When the module obtains the IP, the corresponding LED will flash.

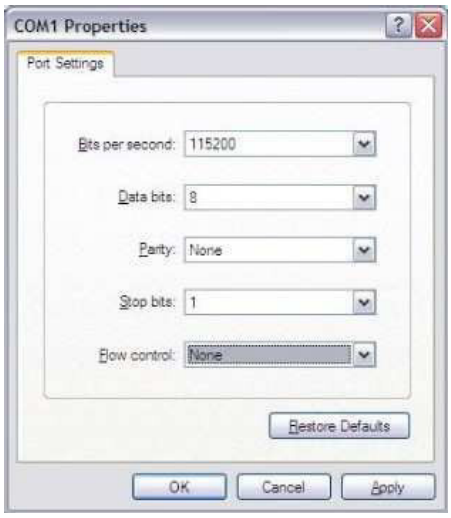


Figure 3.1 HyperTerminal

Figure 3.2 Power LED Indicator

3.2 Display

Note! *If code examples are copy/pasted directly from a PDF, there may be line breaks that are unwanted when code is pasted. We recommend the user manually remove any line breaks in their editor application. Alternatively, contact technical support for original code in a format of their choice.*

3.2.1 HDMI

When the HDMI cable is connected, the default resolution from edid (1920x1080) will be displayed on the screen. Maximum display resolution is 1920x1080.

Check resolutions:

```
# modetest -c
```

3.3 Audio

Step 1: Check the audio codec.

Card 0 is IMX digital array audio, Card 1 is sgtl5000 audio, Card 2 is HDMI audio

```
# cat /proc/asound/cards
0 [imxaudiomicfil ]: imx-audio-micfi - imx-audio-micfil
                     imx-audio-micfil
1 [sgtl5000]: sgtl5000 - sgtl5000 sgtl5000
2 [audiohdmi]: audio-hdmi - audio-hdmi
audio-hdmi
```

3.3.1 Audio codec (sgtl5000)

1. Set MIC and headphone:

```
# amixer -c1 set Mic 32%
Simple mixer control 'Mic',0
  Capabilities: volume volume-joined
  Playback channels: Mono
  Capture channels: Mono
  Limits: 0 - 3
  Mono: 1 [33%] [20.00dB]
#amixer -c1 set Lineout 100%
Simple mixer control 'Lineout',0
  Capabilities: pvolume
  Playback channels: Front Left - Front Right Limits: Playback 0 - 31
  Mono:
  Front Left: Playback 31 [100%] [0.00dB]
  Front Right: Playback 31 [100%] [0.00dB]
#amixer -c1 set PCM 100%
Simple mixer control 'PCM',0
  Capabilities: pvolume
  Playback channels: Front Left - Front Right
  Limits: Playback 0 - 192
  Mono:
  Front Left: Playback 192 [100%]
  Front Right: Playback 192 [100%]
```

2. sgtl5000 Record and Playback:

```
# arecord -Dplughw:1,0 -t wav -d 5 -c 2 -V stereo audio-luyin.wav
# aplay -Dplughw:1,0 audio-luyin.wav
```

3.3.2 HDMI Playback

```
# arecord -Dplughw:1,0 -t wav -d 5 -c 2 -V stereo audio-luyin.wav
# aplay -Dplughw:2,0 audio-luyin.wav
```

3.3.3 Mic array Record and playback

Step 1: Check audio codec

```
# cat /proc/asound/cards
0 [imxaudiomicfil ]: imx-audio-micfi - imx-audio-micfil
                     imx-audio-micfil
1 [sgtl5000]: sgtl5000 - sgtl5000
              sgtl5000
2 [audiohdmi]: audio-hdmi - audio-hdmi
               audio-hdmi
```

Step 2: Record with mic array and Playback with HDMI

```
# arecord -Dplughw:0,0 -t wav  -d 5 -c 2  -V stereo mic-array-luyin.wav
# aplay -Dplughw:2,0 mic-array-luyin.wav
```

3.4 Mini-PCIe: 4G

- Test 4G with Quectel EC20CEFHLG Module

Step 1: Connect the PCIe card to Mini PCIe slot.

Step 2: Execute the Quectel-CM command to connect the network.

```
# quectel-CM &
# ping -I wwan0 8.8.8.8
```

3.5 M.2 E-Key: Wi-Fi 5/6

3.5.1 Wi-Fi 6: Test Wi-Fi 6 with AzureWave AW-XM458MA Module (PCIe Interface)

Either Wi-Fi and Bluetooth mode can be selected, but not both. When switching is required, the system needs to be restarted.

```
# modprobe mlan_wifi6
# modprobe moal_wifi6 drv_mode=1 ps_mode=2 auto_ds=2 cfg80211_wext=0xf cal_data_cfg=none fw_name=nxp/pcieuart9098_combo_v1.bin host_mlme=1
# wpa_passphrase "SSID" Password > /tmp/wpa.conf
# wpa_supplicant -d -B -i mlan0 -c /tmp/wpa.conf -Dnl80211
# udhcpc -i mlan0
```

Ping network

```
ping -I mlan0 8.8.8.8
```

```
root@imx8mpepcr5710a1:~# ping -I mlan0 8.8.8.8
PING 8.8.8.8 (8.8.8.8) from 192.168.50.238 mlan0: 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=113 time=48.3 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=113 time=47.5 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=113 time=44.9 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 44.873/46.875/48.266/1.451 ms
```

- Test Bluetooth with AW-XM458MA Wi-Fi 6 Module (UART Interface).

Either Wi-Fi or Bluetooth mode can be selected, but not both. When switching is required, the system needs to be restarted.

```
# modprobe mlan_wifi6
# modprobe moal_wifi6 drv_mode=1 ps_mode=2 auto_ds=2 cfg80211_wext=0xf cal_data_cfg=none fw_name=nxp/pcieuart9098_combo_v1.bin host_mlme=1
# hciattach /dev/ttymxc0 any 3000000 flow nosleep
# hciconfig hci0 up
# hcitool scan
```

3.5.2 Wi-Fi 5: Test Wi-Fi 5 with the AW-CM276MA Module (PCIe Interface)

Either Wi-Fi or Bluetooth mode can be selected, but not both. When switching is required, the system needs to be restarted.

```
# modprobe mlan_5x17283_pcie_8997
# modprobe moal_5x17283_pcie_8997 drv_mode=1 cal_data_cfg=none cfg80211_wext=0xf fw_name=nxp/pcieuart8997_combo_v4_5x17283.bin
# wpa_passphrase "SSID" Password > /tmp/wpa.conf
# wpa_supplicant -d -B -i mlan0 -c /tmp/wpa.conf -Dnl80211
# udhcpc -i mlan0
```

Ping network

```
ping -I mlan0 8.8.8.8
```

```
root@imx8mpepcr5710a1:~# ping -I mlan0 8.8.8.8
PING 8.8.8.8 (8.8.8.8) from 192.168.50.238 mlan0: 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=113 time=48.3 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=113 time=47.5 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=113 time=44.9 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 44.873/46.875/48.266/1.451 ms
```

- Test Bluetooth with the AW-CM276MA Wi-Fi 5 Module (UART Interface).

Either Wi-Fi or Bluetooth mode can be selected, but not both. When switching is required, the system needs to be restarted.

```
# modprobe mlan_5x17283_pcie_8997
# modprobe moal_5x17283_pcie_8997 drv_mode=1 cal_data_cfg=none cfg80211_wext=0xf fw_name=nxp/pcieuart8997_combo_v4_5x17283.bin
# hciattach /dev/ttymxc0 any 115200 flow
# hciconfig hci0 up
# hcitool -i hci0 cmd 0x3f 0x0009 0xc0 0xc6 0x2d 0x00
# killall hciattach
# hciattach /dev/ttymxc0 any -s 3000000 3000000 flow
# hciconfig hci0 up
# hcitool scan
```

3.6 M.2 B-Key: 5G

3.6.1 Test 5G with Quectel RM500QGLAB Module

Step 1: Connect the PCIe card to the Mini M.2 B-Key slot.

Step 2: Execute the Quectel-CM command to connect to the network.

```
# quectel-CM &
# ping -I wwan0 8.8.8.8
```

3.7 Serial Port

For COM serial port pin definitions, please refer to section 2.4 of the previous chapter for more information.

Self-connect the TXD and RXD of each COM port.

3.7.1 RS-232 loopback test

Step 1:

description

COM2 and COM3 need to be configured under uboot as either of 232, 485, or 422 modes.

Example: both as 232

```
u-boot=> setenv uart_mode 2:0,3:0
u-boot=> saveenv
Saving Environment to MMC... Writing to MMC(2)... OK
u-boot=> reset
```

```
u-boot=> setenv uart_mode 2:0,3:0
u-boot=> saveenv
u-boot=> reset
```

Step 2:

Example: com2 test

```
root@imx8mpepcr5710a1:~# stty -F /dev/ttymxc2 -echo -onlcr 115200
root@imx8mpepcr5710a1:~#  cat /dev/ttymxc2 &
[5] 12233
root@imx8mpepcr5710a1:~# echo "Serial Port Test" > /dev/ttymxc2
root@imx8mpepcr5710a1:~# Serial Port Test
```

```
#  stty -F /dev/ttymxc2 -echo -onlcr 115200
#  cat /dev/ttymxc2 &
# echo "Serial Port Test" > /dev/ttymxc2
```

Example: com3 test

```
root@imx8mpepcr5710a1:~# stty -F /dev/ttymxc3 -echo -onlcr 115200
root@imx8mpepcr5710a1:~#  cat /dev/ttymxc3 &
[4] 12037
root@imx8mpepcr5710a1:~# echo "okk" > /dev/ttymxc3
root@imx8mpepcr5710a1:~# okk
```

```
#  stty -F /dev/ttymxc3 -echo -onlcr 115200
#  cat /dev/ttymxc3 &
# echo "okk" > /dev/ttymxc3
```

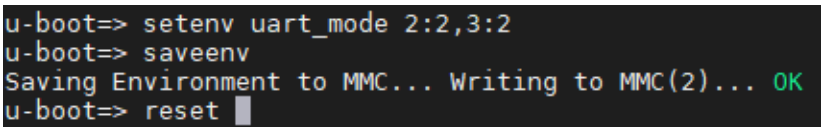
3.7.2 RS-422 test

Step 1:

description

COM2 and COM3 need to be configured under uboot as either of 232, 485, or 422 modes.

Example: both as 422




```
u-boot=> setenv uart_mode 2:2,3:2
u-boot=> saveenv
u-boot=> reset
```

Step 2:

Test RS-422 with Adam-4520I. Connect Adam-4520I to PC with DB9

Adam-4520I to comX as the following;

Adam-4520I RX- <--> DB9 Pin 1,

Adam-4520I RX+ <-->DB9 Pin 2,

Adam-4520I TX- <-->DB9 Pin 4,

Adam-4520I TX+ <--> DB9 Pin 3

Step3:

Com2

```
# stty -F /dev/ttymxc2 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
# cat /dev/ttymxc2 &
# echo "Serial Test" > /dev/ttymxc2
```

receive “Serial Test” on the PC terminal

Com3

```
# stty -F /dev/ttymxc3 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
# cat /dev/ttymxc3 &
# echo "Serial Test" > /dev/ttymxc3
```

receive “Serial Test” on the PC terminal

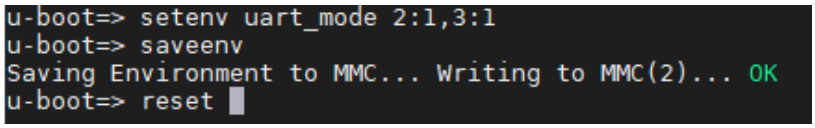
3.7.3 RS-485 test

Step1:

description

COM2 and COM3 need to be configured under uboot as either of 232, 485, or 422 modes.

Example: both as 485:




```
u-boot=> setenv uart_mode 2:1,3:1
u-boot=> saveenv
u-boot=> reset
```

Step 2:

Test RS-485 with Adam-4520I. Connect Adam-4520I to PC with DB9 cable. Connect Adam-4520I to COMX DB9 as the following:

Adam-4520I Pin 1: Data- connect to DB9 Pin 1

Adam-4520I Pin 2: Data+ connect to DB9 Pin 2

Com2

```
#stty -F /dev/ttymxc2 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
#cat /dev/ttymxc2 &
#echo test > /dev/ttymxc2
```

receive “test” on PC terminal

Com3

```
#stty -F /dev/ttymxc3 speed 115200 ignbrk -brkint -icrnl -imaxbel -opost -onlcr -isig -icanon -iexten -echo -echoe -echok -echoctl -echoke
#cat /dev/ttymxc3 &
#echo test > /dev/ttymxc3
```

receive “test” on PC terminal

3.7.4 I²C

Step 1: Check i²c device(tpm : 1----0x2e)

```
root@imx8mpepcr5710a1:~# i2cdetect -r -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- UU -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- UU --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
```

Step 2: I²c set and get

```
# i2cset -f -y 1 0x2e 0x00 0x3f
# i2cget -f -y 1 0x2e 0x00
0x3f
```

3.8 SATA Hard Disk Interface

Insert the SATA disk before booting.

After installing the SATA hard disk, we can perform read and write tests.

- According to the above content, we know sda is our SATA disk.
  Generate a random file.

```
# dd if=/dev/urandom of=data bs=1 count=1024
```

Back up

```
# dd if=/dev/sda of=backup bs=1 count=1024 skip=4096
```

Write to SATA disk

```
# dd if=data of=/dev/sda bs=1 seek=4096
```

Read and Verify

```
# dd if=/dev/sda of=data1 bs=1 count=1024 skip=4096
# diff data data1
```

If it fails, it will show as below:

```
Binary files data1 and data differ
```

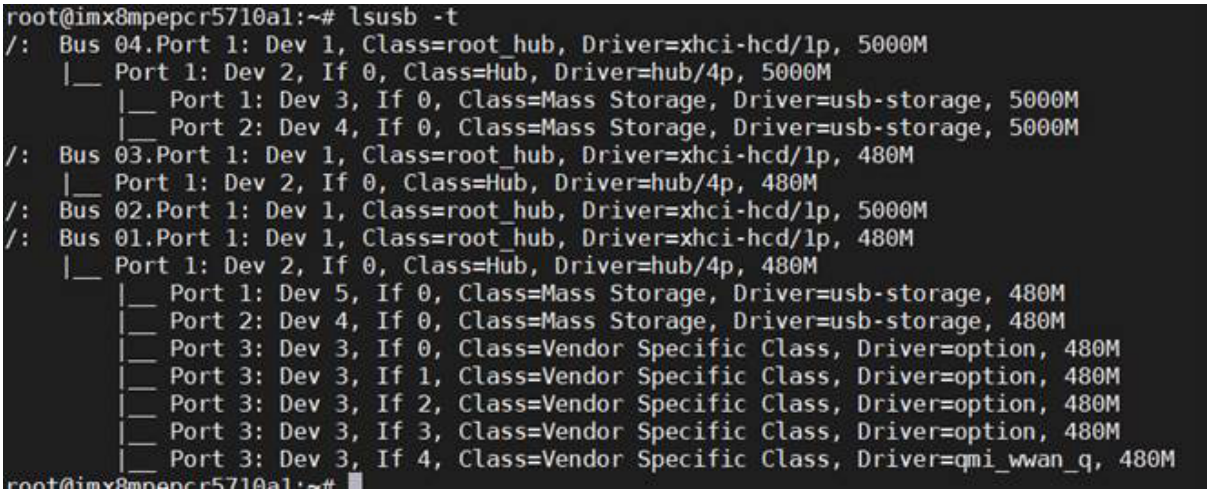
Restore

```
# dd if=backup of=/dev/sda bs=1 seek=4096
```

3.9 USB

USB disk test (USB 2.0 / USB 3.2 port)

Step 1: After inserting a USB disk to a USB 2.0 port or USB 3.2 port, issue the below command (lsusb -t) to check if the USB device is listed.



Step 2: Test (eg. if a usb disk is /dev/sdb)

```
# dd if=/dev/urandom of=data bs=1 count=1024
# dd if=/dev/sdb of=backup bs=1 count=1024 skip=4096
# dd if=data of=/dev/sdb bs=1 seek=4096
# dd if=/dev/sdb of=data1 bs=1 count=1024 skip=4096
# diff data data1
# dd if=backup of=/dev/sdb bs=1 seek=4096
```

3.10 RTC

Step 1: Disable rtc sync service.

```
# systemctl disable ntpd.service
Removed /etc/systemd/system/multi-user.target.wants/ntpd.service.
# systemctl stop systemd-timesyncd
# systemctl stop ntpdate.service
```

Step 2: Set system time to current, then write to RTC.

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

Step 3: Set one incorrect time, then read the time from RTC to verify.

```
# date 010100002000 && hwclock -r && date
Sat Jan 1 00:00:00 UTC 2000
2016-02-17 10:45:06.361513+00:00
Sat Jan 1 00:00:00 UTC 2000
```

Step 4: Restore the RTC time to system time.

```
# hwclock -s && date
Wed Feb 17 10:45:13 UTC 2016
```

3.11 eMMC/SD/SPI flash

3.11.1 Device routes and test

eMMC: /dev/mmcblk2

SD: /dev/mmcblk1

QSPI1: /dev/mtd0

For example: SD test

```
# dd if=/dev/urandom of=data bs=1 count=1024
# dd if=/dev/mmcblk1 of=backup bs=1 count=1024 skip=4096
# dd if=data of=/dev/mmcblk1 bs=1 seek=4096
# dd if=/dev/mmcblk1 of=data1 bs=1 count=1024 skip=4096
# diff data data1
# dd if=backup of=/dev/mmcblk1 bs=1 seek=4096
```

3.12 Ethernet

Eth0

As a router, eth0 is a node that allocates a network to other LAN ports. The interfaces are LAN1 to LAN4 and FIBER up to 1000M.

Eth1

Eth1 is the node of the network receiving port of LAN5.

Eth1

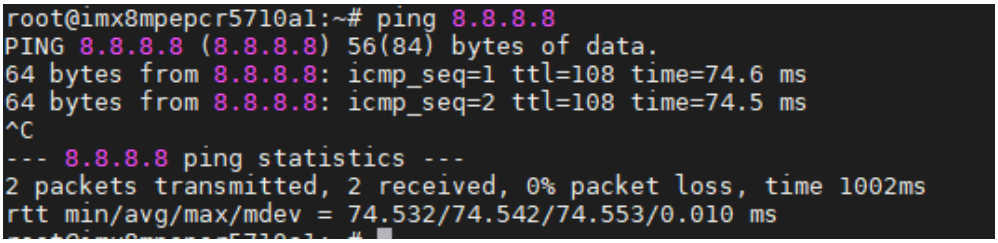
Step 1: Check Ethernet device.

```
root@imx8mpepcr5710a1:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:01:02:03:04:08
          inet addr:192.168.1.1  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::201:2ff:fe03:408/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:39 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:6566 (6.4 KiB)

eth1      Link encap:Ethernet  HWaddr 00:01:02:03:04:20
          inet addr:192.168.127.40  Bcast:192.168.127.255  Mask:255.255.255.0
          inet6 addr: fe80::201:2ff:fe03:420/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:12 errors:0 dropped:0 overruns:0 frame:0
          TX packets:45 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1731 (1.6 KiB)  TX bytes:6482 (6.3 KiB)
          Interrupt:46

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:86 errors:0 dropped:0 overruns:0 frame:0
          TX packets:86 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:6644 (6.4 KiB)  TX bytes:6644 (6.4 KiB)
```

Step 2: Connect cable and perform a ping test (eg. Eth1).



Routing function test: When LAN5 is already connected to an external network, LAN1 to LAN4 and FIBER can connect to other devices for network access.

3.13 GPIO

GPIO Pins

Pin	Numbers
GPIO1	43
GPIO2	42
GPIO3	475
GPIO4	474
GPIO5	472

Generate the path node number of the corresponding gpioX, increasing with the export order.

GPIO Loopback Test (Using GPIO1 and GPIO2 as examples)

Step 1: Connect GPIO1 and GPIO2

Step 2: Export GPIO interface.

```
# echo 43 > /sys/class/gpio/export
# echo 42 > /sys/class/gpio/export
```

Step 3: Set the GPIO direction.

```
# echo out > /sys/class/gpio/gpio1/direction
# echo in > /sys/class/gpio/gpio2/direction
```

Step 4: Read value and set output value, then check.

```
# cat /sys/class/gpio/gpio2/value
0
#echo 1 > /sys/class/gpio/gpio1/value
# cat /sys/class/gpio/gpio2/value
1
```

3.14 Watchdog

System will reboot after 1 sec.

```
# /unit_tests/Watchdog/wdt_driver_test.out 1 2 0

---- Running < /unit_tests/Watchdog/wdt_driver_test.out > test ----

Starting wdt_driver (timeout: 1, sleep: 2, test: ioctl) Trying to set timeout value=1 seconds
The actual timeout was set to 1 second
Now reading back -- The timeout is 1 second
```

3.15 CAN Bus or CAN-FD

Two epc-r5710s are required. One of them acts as the receiver and executes the command of (step1), while the other acts as the sender and executes the command of Step2.

The (CAN) ports of two machines need to be linked together.

The receiver needs to complete the line preparation.

Step1: set receiver config.

```
# ip link set can0 down
# ip link set can0 up type can bitrate 1000000
[ 1381.546624] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
# ip link set can0 up
#  candump can0
```

Step 2: Set sender config.

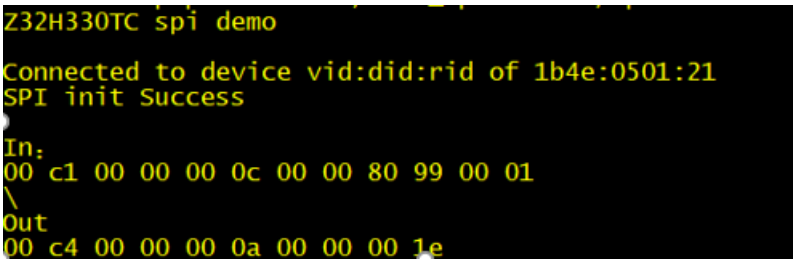
```
# ip link set can0 down
# ip link set can0 up type can bitrate 1000000
[ 1381.546624] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
# ip link set can0 up
#  cansend can0 888#11223344
```

The receiver can display the content sent by the sender.

3.16 TPM

3.16.1 Z32H330TC

Execute command (tpm-ST33HTP-Demo). If the following message appears, it is successful.



3.16.2 ST_ST33HTPH2E32AHC2

This device is an i2c communication device, and the testing method is the same as described in section 3.7.4 above.

3.17 AI Test

3.17.1 Internal NPU

The i.MX 8M Plus family focuses on the neural processing unit (NPU) and vision system, advanced multimedia, and industrial automation with high reliability.

The Neural Processing Unit (NPU) operates at up to 2.3 TOPS.

- Keyword detect, noise reduction, beamforming
- Speech recognition (i.e. Deep Speech 2)
- Image recognition (i.e. ResNet-50)

eIQ - A Python Framework for eIQ on i.MX Processors

PyeIQ is written on top of eIQ™ ML Software Development Environment and provides a set of Python classes allowing the user to run Machine Learning applications in a simplified and efficient way without spending time on cross-compilations, deployments, or reading extensive guides.

For more examples and how to run PyeIQ demos, please refer to the below web page:

http://ess-wiki.advantech.com.tw/view/AIMLinux/AddOn/Edge_AI

3.17.2 AI expansion card

This section will guide you with how to use the AI Hailo-8 extension module.

Insert the AI module, HDMI display, and USB camera, then boot and run the script of the following path to view the AI test on the screen.

Enter the following command to view the USB camera node.

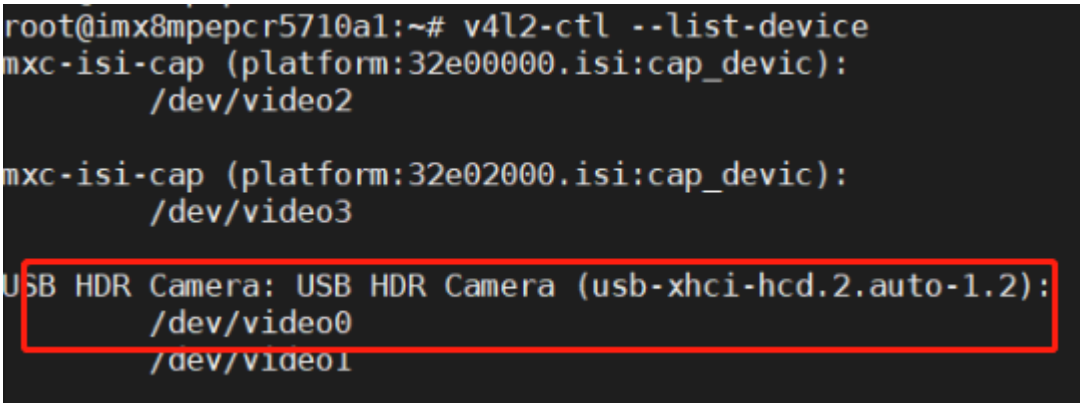
v4l2-ctl --list-device

The execution results and commands are shown in the following figure. If the result is as shown in Figure 1, enter command 1. If the result is as shown in Figure 2, please enter command 2.

Command 1:

sed -i 's/\/dev\/video[0-3]*/\/dev\/video0/g' /home/root/apps/detection/detection.sh

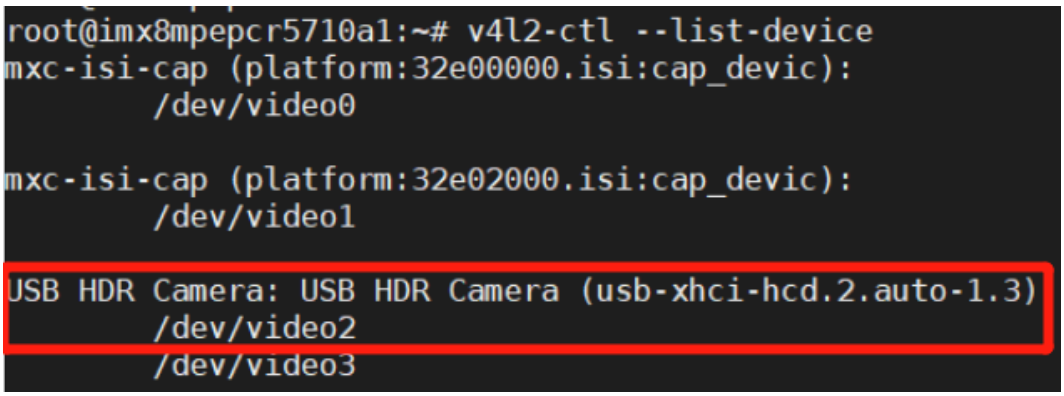
Figure 1:



Command 2:

sed -i 's/\/dev\/video[0-3]*/\/dev\/video2/g' /home/root/apps/detection/detection.sh

Figure 2:



After completing the above commands, execute the following commands:

sed -i 's/,framerate=30\/1 !/ !/g' /home/root/apps/detection/detection.sh

/home/root/apps/detection/detection.sh

Chapter 4

Module Installation

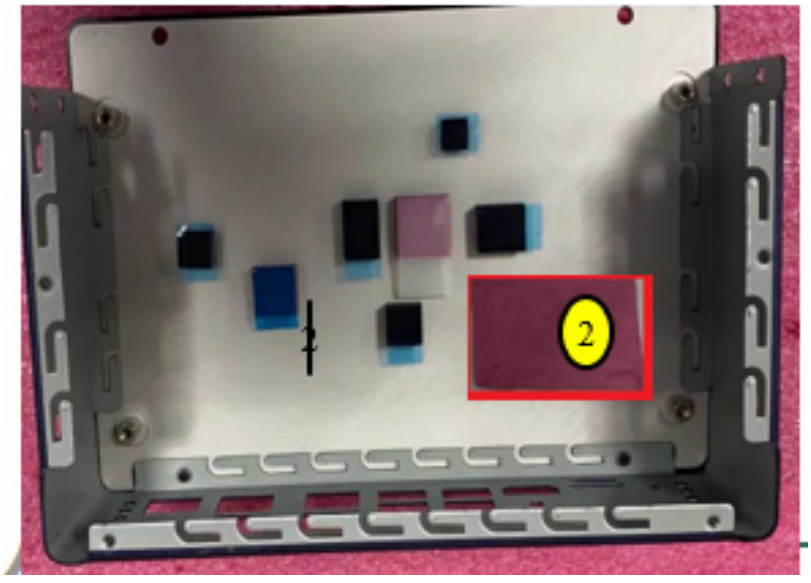
4.1 Installing a 5G Module

1. Remove the screws from the top cover.

5.0±0.5Kgf.cm

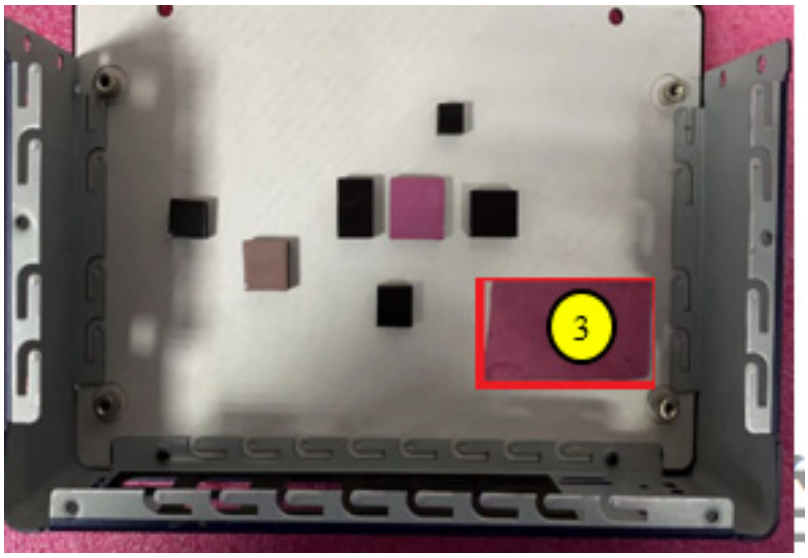
Step	Part Number	Description	Quantity
1	1930002141	Screw M3x6L R/S D=5.4 H=2 (2+) ST BZn NK	4

2. Attach the 5G thermal pad.

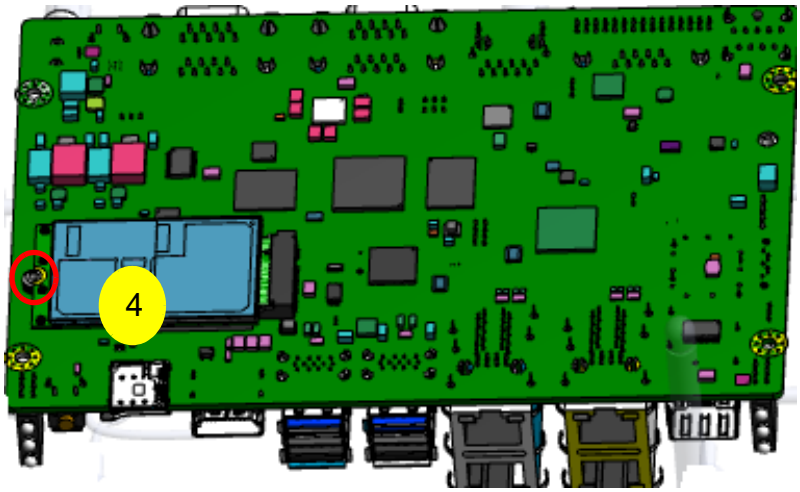


Step	Part Number	Description	Quantity
2	1990038961N000	Thermal Pad PG45A K=4.5 45*30*2MM for 5G	1

3. Remove the release paper.



4. Install the 5G module and 5G Antenna, then tighten the lock screw.

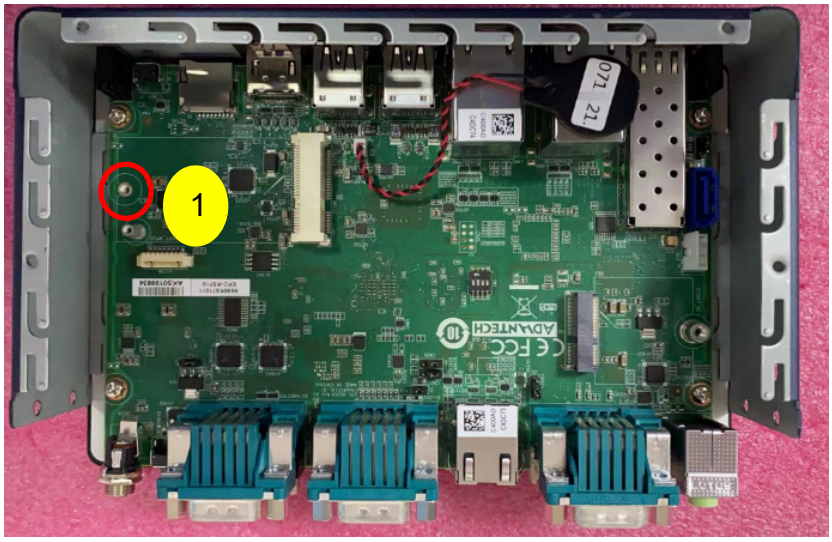


Step	Part Number	Description	Quantity
4	968DD00064	Quectel RM500Q-GL m.2 Wireless 5G Module	1
4	1750009353-01	TUBE Ant. SMA-Jack/F-BH MHF4/113 BLK 300mm for 5G	4
4	1750009372-01	Ant.SMA/M 90/180 5G BLK 167mm RG178 for 5G	4
4	193B020590	Screw M2.5x5L F/S D=4.5 H=0.8 (1+) ST BZn NK for 5G	1

5. Lock top cover.

4.2 Installing a 4G Module

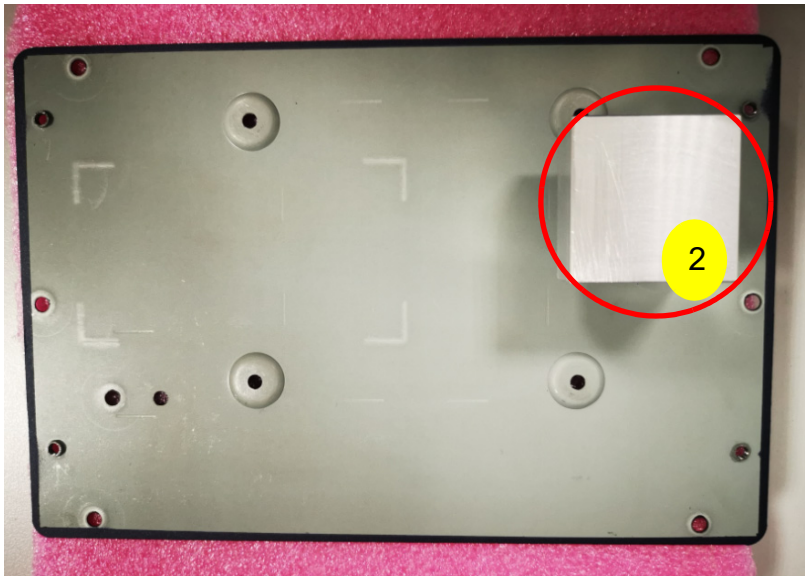
1. To install a 4G module and 4G antenna, remove the screw shown.



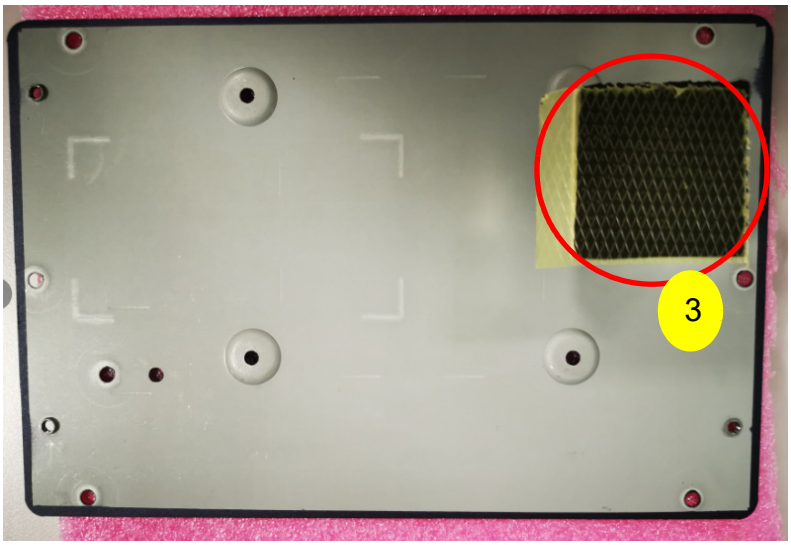
5.0±0.5Kgf.cm

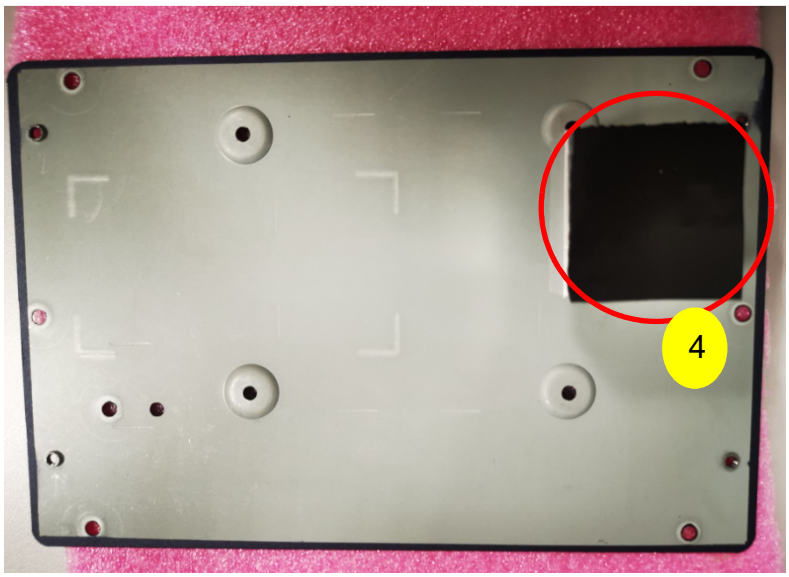
Step	Part Number	Description	Quantity
1	968AD00584	Quectel EC20CEFHLG Mini PCIe 4G module	1
1	1930000198	Screw M2x4L F/S D=4.3 H=0.8 (1+) ST Ni NK for 4G	1
1	1750007965-01	Antenna Cable R/P SMA (M) to MHF4, 300 mm (11.8 in) for 4G	2
1	1750008303-01	Antenna AN0727-64SP6BSM for 4G	2

2. Install the 4G module and heat sink, then tighten the screw.
3. Attach the 4G module thermal pad.
4. Remove the 4G module thermal pad release paper.



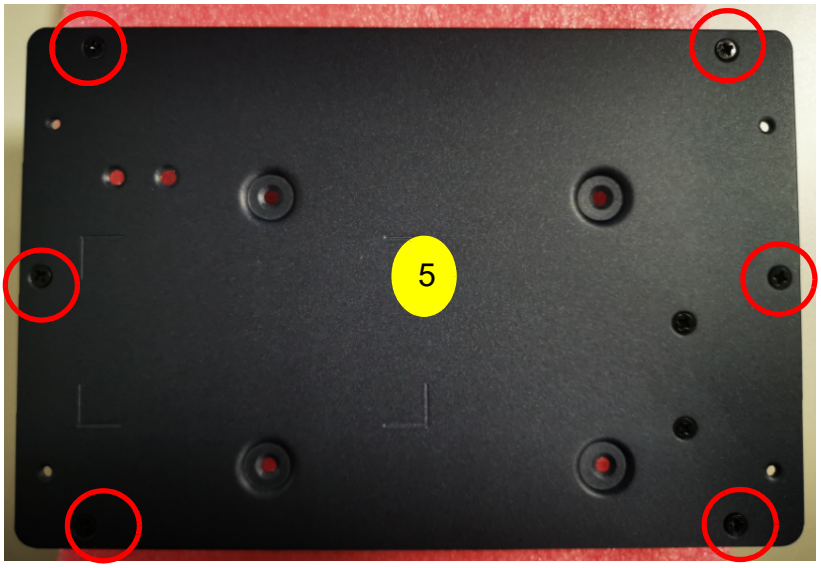

2


3


4

Step	Part Number	Description	Quantity
2	1970005269T000	HD R2 32x32x27.4MM SC EPC-R5710 for 4G	1
2	1960103065N101	Bottom Cover for EPC-R5710 Liquid 2965C	1
2	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN for 4G	2
3&4	1990016840S000	Thermal Pad 32x32x1.5 mm GR-Hm K=6 for DAC-SC01 for 4G	

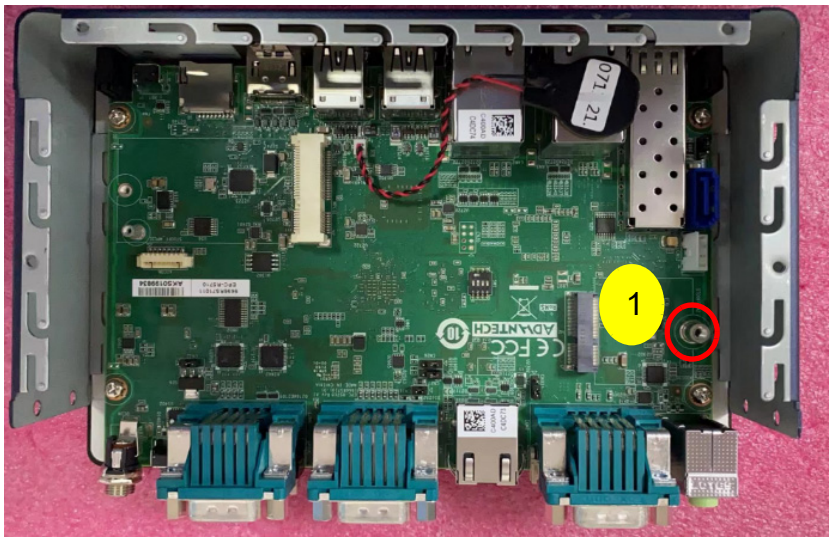
5. Secure the bottom cover with the screws.



Step	Part Number	Description	Quantity
5	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN	6

4.3 Installing a Wi-Fi 5 or Wi-Fi 6 Module

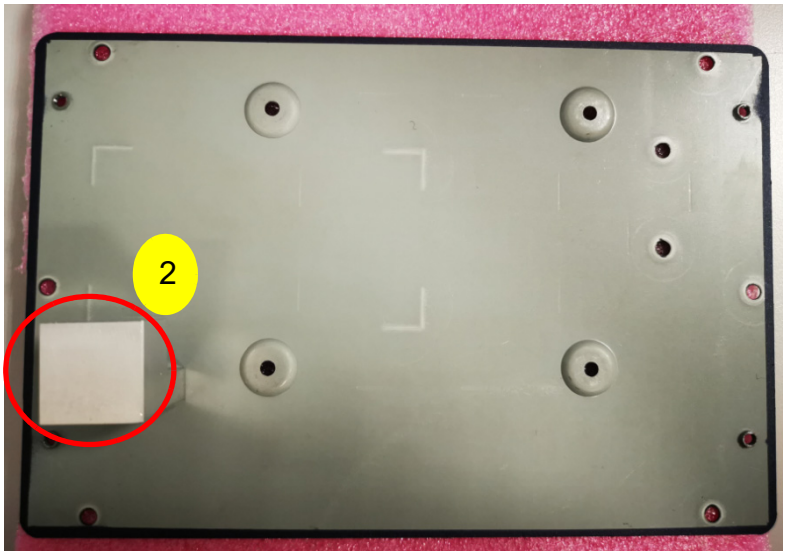
1. To install a Wi-Fi 5 or Wi-Fi 6 module and Wi-Fi 5 or Wi-Fi 6 Antenna, remove the screw shown.

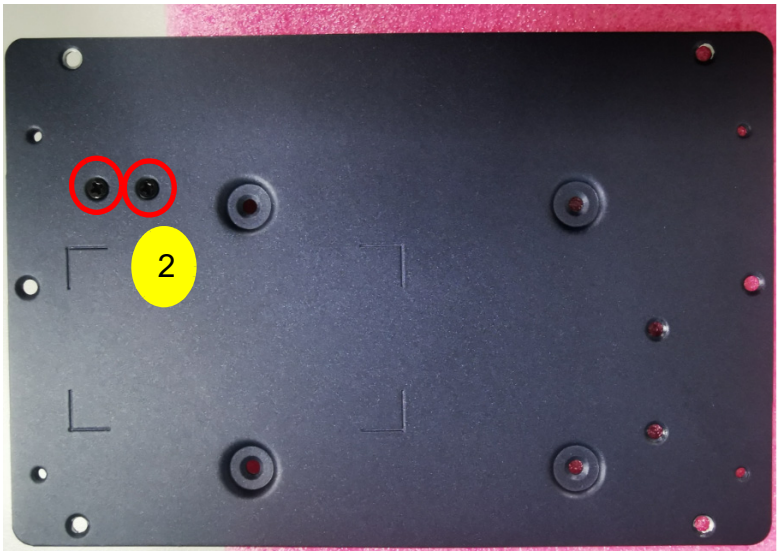


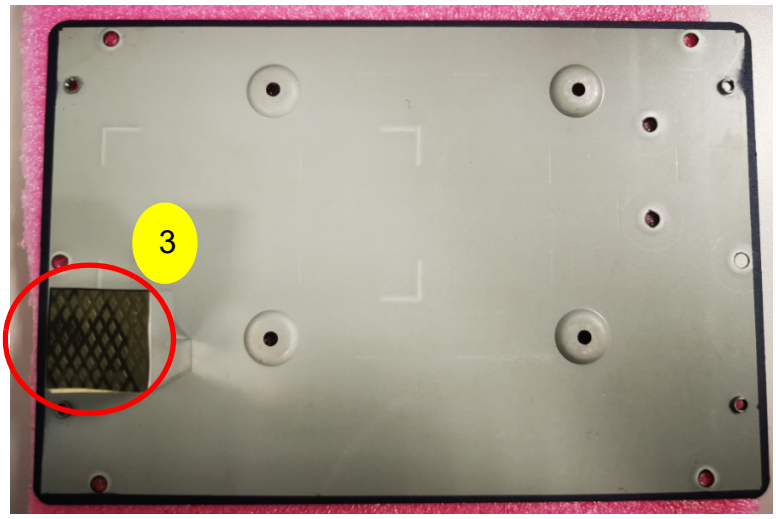
5.0±0.5Kgf.cm

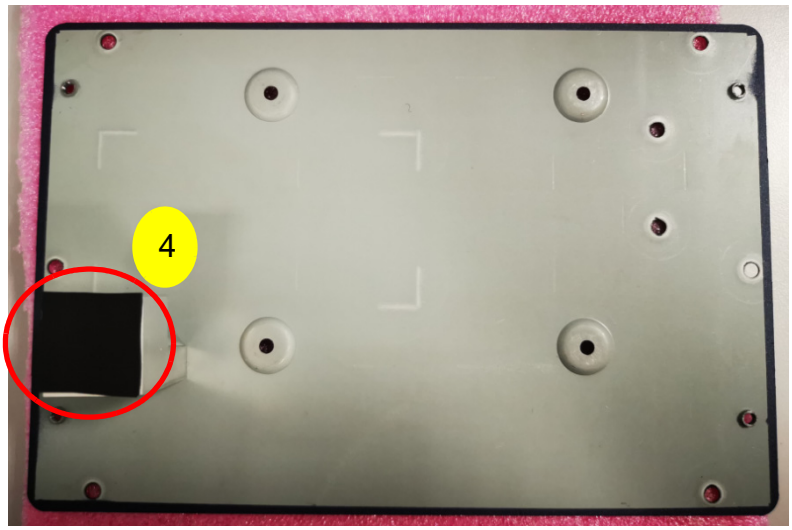
Step	Part Number	Description	Quantity
1	AIW-154BN	AzureWave AW-CM276MA Wi-Fi 5 module	1
1	AIW-165BN	AzureWave AW-XM458MA Wi-Fi 6 module	1
1	1930004486	Screw M3x6L F/S D=6.5 H=1.5 (2+) ST Ni for Wi-Fi or Hailo H8	1
1	1750007965-01	Wi-Fi Coaxial Cable, SMA (M) to MHF4, 300 mm for Wi-Fi 5 / Wi-Fi 6	2
1	1750008717-01	Wi-Fi Dual band 2.4G and 5G Antenna for Wi-Fi5 / Wi-Fi 6	2

2. Install the Wi-Fi 5 or Wi-Fi 6 module heat sink.
3. Attach the Wi-Fi 5 or Wi-Fi 6 module thermal pad.
4. Remove the Wi-Fi 5 or Wi-Fi 6 module thermal pad release paper.

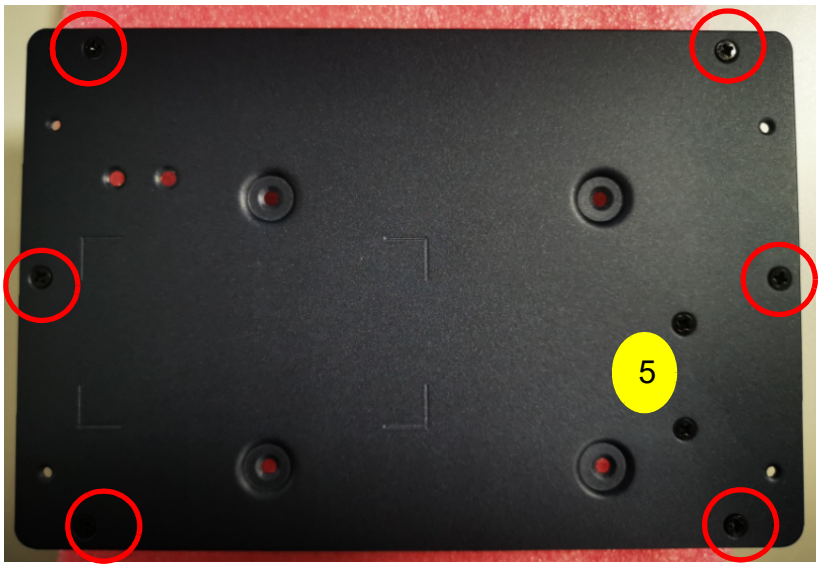



2


3


4

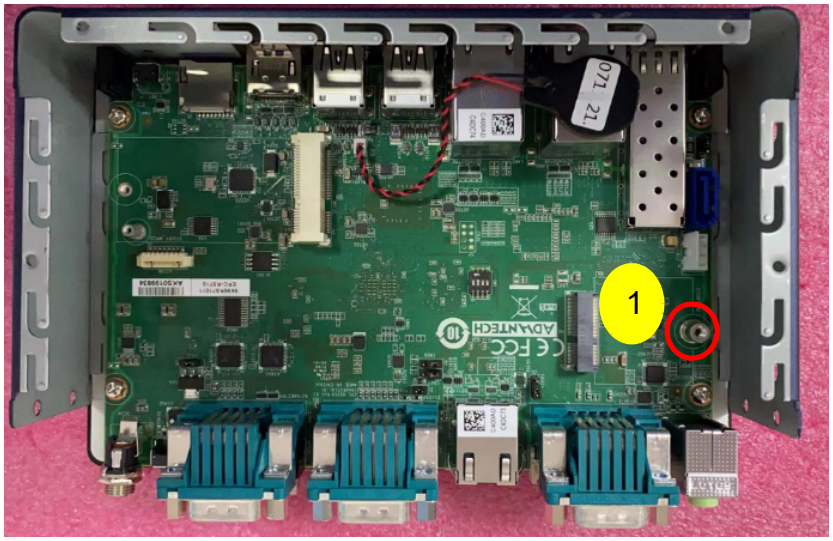
Step	Part Number	Description	Quantity
2	1970005268T000	HD R2 20x20x27.4MM SC EPC-R5710 for Wi-Fi 5 / Wi-Fi 6	1
2	1960103065N101	Bottom Cover for EPC-R5710 Liquid 2965C	1
2	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN	2
3&4	1990031873N020	Thermal pad 20x20x2.5 mm (t) K=4.0 TP TG4040 for Wi-Fi 5	1
3&4	1990033689N000	Thermal-Pad 20x20x1mm TP K=1.2 Eapus XR-HL	1



Step	Part Number	Description	Quantity
5	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN	6

4.4 Installing a Hailo H8 AI Module

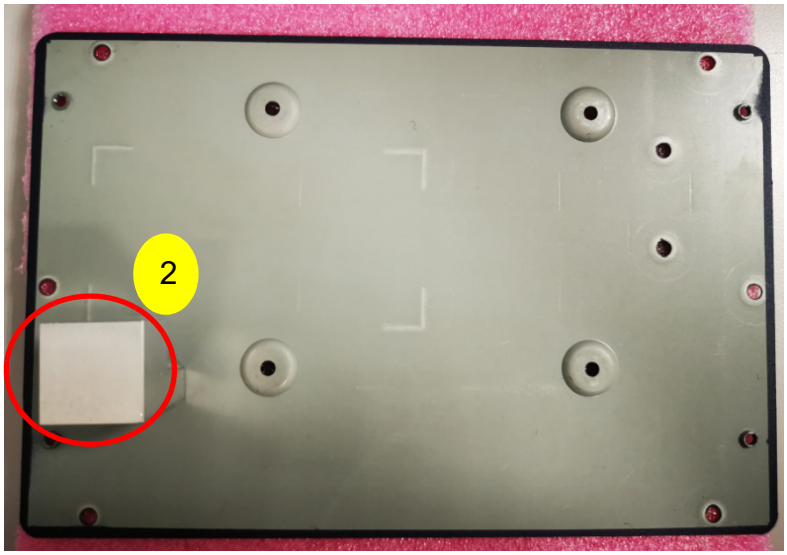
1. Install the Hailo H8 AI module using the screw shown.

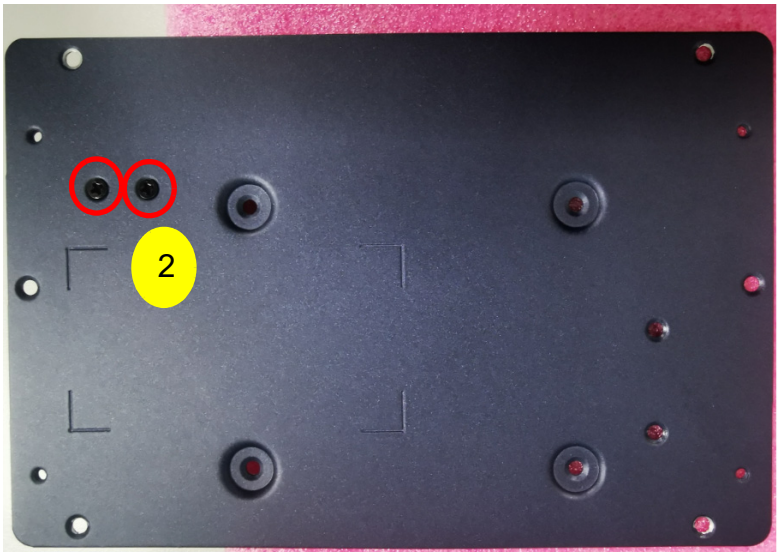


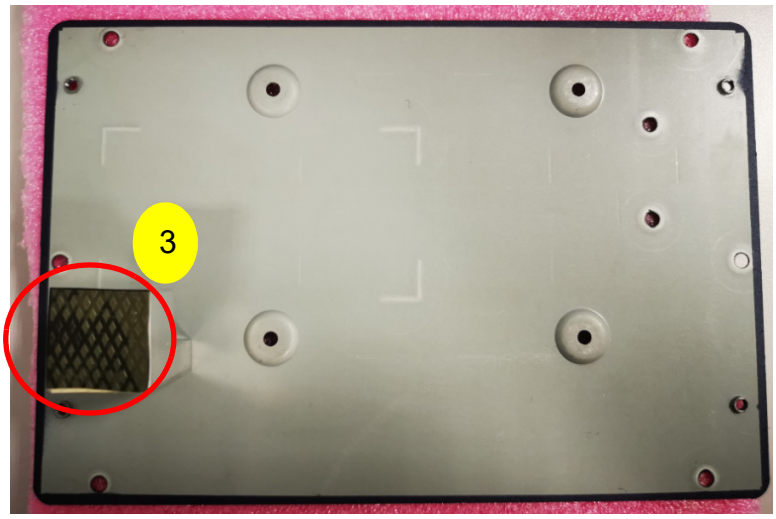
5.0±0.5Kgf.cm

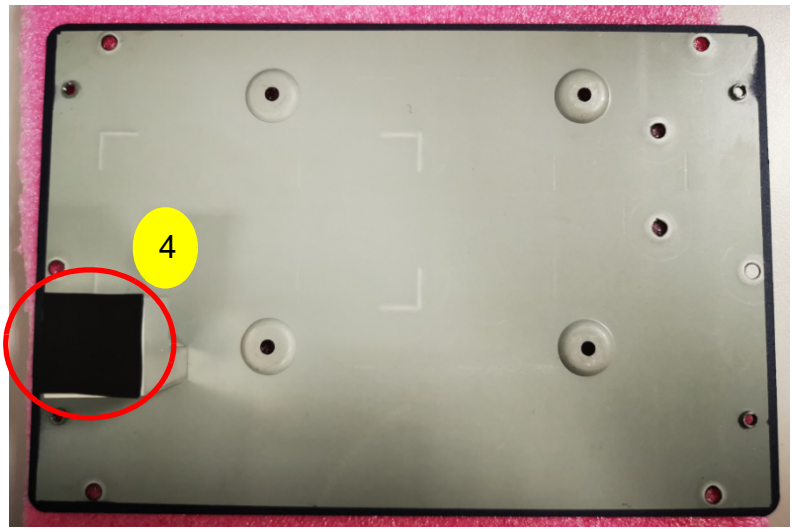
Step	Part Number	Description	Quantity
1	968DD00322	Hailo-8 HM218B1C2KAE 2230 A+E key M.2 module AI Module 26 Tops	1
1	1930004486	Screw M3x6L F/S D=6.5 H=1.5 (2+) ST Ni for Wi-Fi or Hailo H8	1

2. Install the Hailo H8 AI module heat sink.
3. Attach the Hailo H8 AI module thermal pad.
4. Remove the Hailo H8 AI module thermal pad release paper.

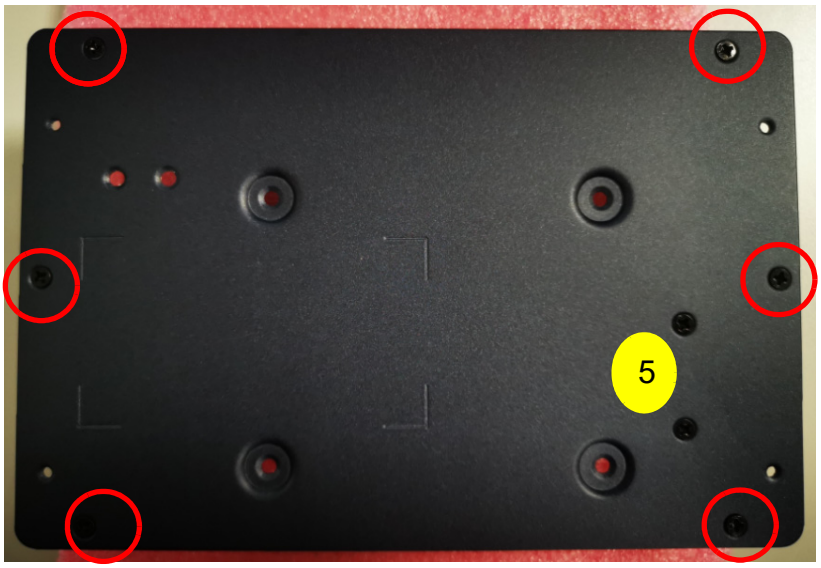








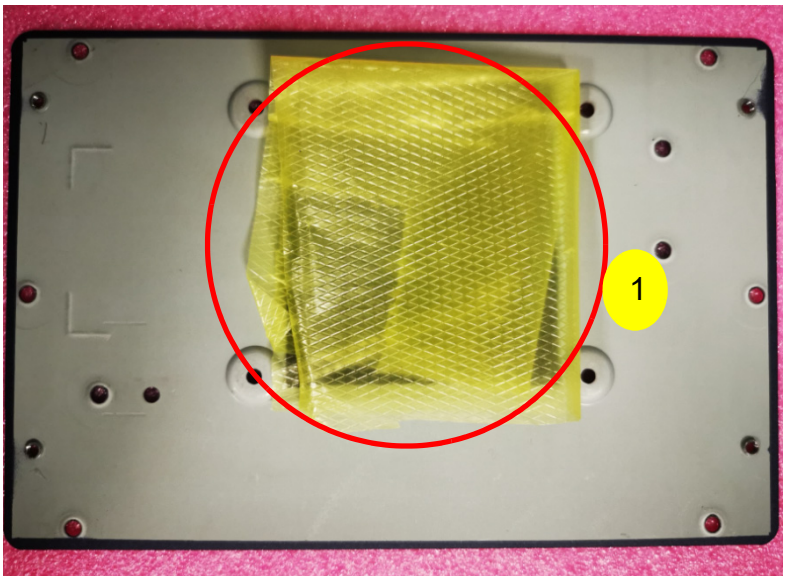
Step	Part Number	Description	Quantity
2	1970005268T000	HD R2 20x20x27.4MM SC EPC-R5710 for Wi-Fi 5 / Wi-Fi 6	1
2	1960103065N101	Bottom Cover for EPC-R5710 Liquid 2965C	1
2	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN	2
2	1990011911N000	Thermal Pad 20x20x1.0 mm GR-Hm K=6 for Hailo H8 AI card	1

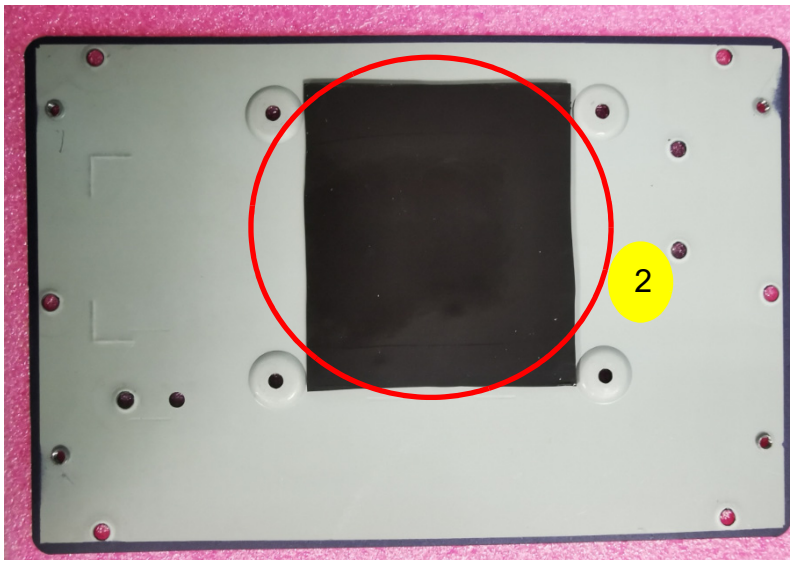


Step	Part Number	Description	Quantity
5	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN	6

4.5 Installing an SSD

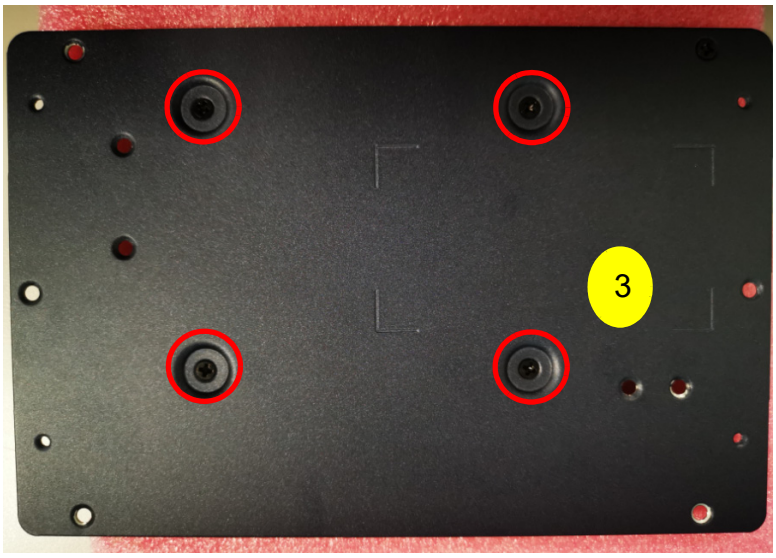
1. Attach the SSD thermal pad.
2. Remove the SSD thermal pad release paper.



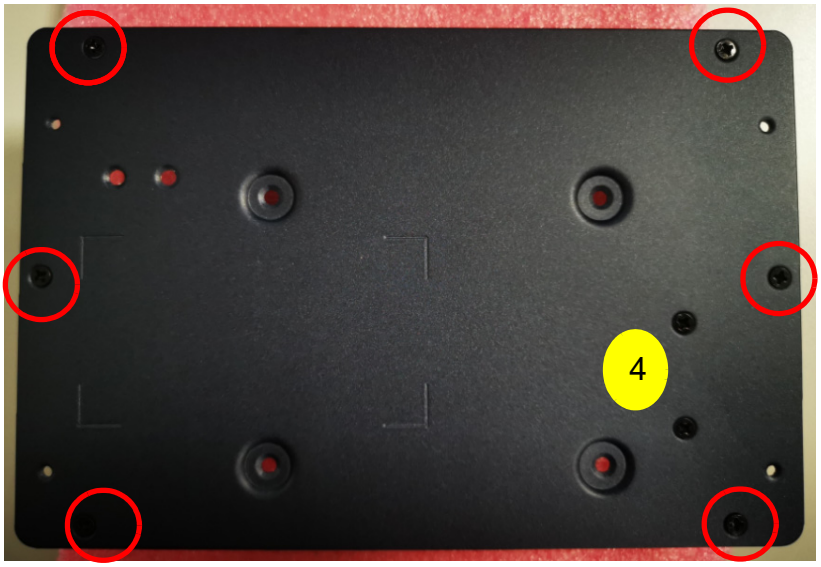


Step	Part Number	Description	Quantity
1&2	1990030557N000	Thermal Pad 70x62x2 mm XR-HL K=1.2 TP Eapus	1
1&2	1960103065N101	Bottom Cover for EPC-R5710 Liquid 2965C	1

3. Install the SSD and lock it in place with the screws.



Step	Part Number	Description	Quantity
3	1930008529	Screw M3*4.0L S/S D=4.8 H=0.8 (2+) ST/H BZn	4



Step	Part Number	Description	Quantity
4	1930004789-21	Screw M3*6L S/S D=5.0 H=1.0 (2+) ST BZN	6

Chapter 5

System Recovery

5.1 System Recovery

This section provides detailed procedures for restoring the eMMC image. If you destroy the onboard flash image by accident, you can recover a system with the following steps.

5.1.1 Installing the system from an SD card

Note! *If code examples are copy/pasted directly from a PDF, there may be line breaks that are unwanted when code is pasted. We recommend the user manually remove any line breaks in their editor application. Alternatively, contact technical support for original code in a format of their choice.*

1. Copy imx-image-full-imx8mpepcr5710a1-xxxxxx.rootfs.sdcard package to your desktop.
2. Insert an SD card into the PC.
3. Make a bootable SD card. For example, the node of an SD card is /dev/sdv.

```
#umount /dev/sdv*
```

```
# dd if=./imx-image-full-imx8mpepcr5710a1-xxxx.rootfs.sdcard of=/dev/sdv bs=1M ; sync
```

4. Insert an SD card and copy imx-image-full-imx8mpepcr5710a1-xxxxxx.rootfs.sdcard to a USB disk.
5. Insert a USB disk and SD card, then boot the whole system from the SD card by changing SW1 to 1-2 ON, 3-4 OFF.
6. Enter the USB disk folder and make a bootable emmc.

```
# cd /run/media/sda1/
# umount /dev/mmcblk2*
# dd if=./imx-image-full-imx8mpepcr5710a1-xxxx.rootfs.sdcard of=/dev/mmcblk2 bs=1M ;
sync
```

5.1.2 System recovery button with SD card

Function: It is used to upgrade or use the operating system on the SD card.

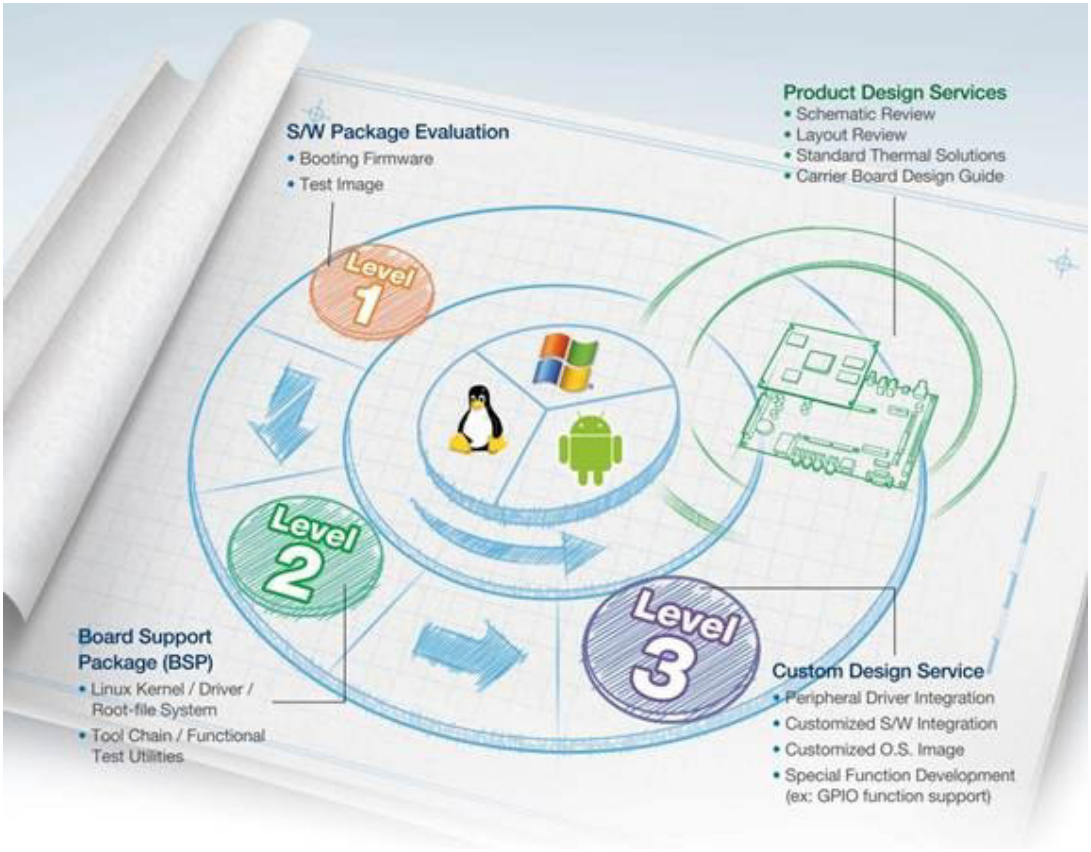
Operation method: Press the recovery button, plug in the power supply, power on the machine, press it for 2 seconds, and start it from the SD card; After starting from the SD card, whether the customer needs to upgrade or use the SD card system is customizable by the customer (by modifying the files on the SD card).

Chapter 6

Advantech Services

This chapter outlines Advantech's Design-In services, technical support, and warranty policy for EPC-R5710.

6.1 RISC Design-In Services



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

Easy Development

Advantech has support firmware, root file-systems, BSP, and other developer tools for customers. This helps customers more easily develop their carrier boards and differentiate their embedded products and applications.

- Full Range of RISC Product Offerings
- Comprehensive Documentation Support

Design Assistance Service

Advantech provides a checklist for engineers to easily check their schematics and also review based on customer carrier board schematics. These services are preventative and help to catch design errors before they happen. It helps to save a lot of time and cost with regard to 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 and more flexible solutions for customer's thermal designs, Advantech provides thermal solution services including modularized thermal solutions and customized thermal solutions.

- Standard Thermal Solutions
- Customized Thermal Solutions

Embedded Software Services

Advantech offers drivers, software integration, customized firmware, root file systems and Linux images. This allows customers to save a lot of time and focus on core development.

- Embedded Linux/ Android OS
- Advantech boot loader customization

With the proliferation of industrial computing, a whole range of new applications has been developed, resulting in a fundamental change in the IPC industry. In the past, System Integrators (SI) were used to completing projects without outside assistance, but now, many SIs have moved on from these working models. Due to diverse market demands and intense competition, cooperation for (both upstream and downstream) vertical integration has become a much more effective way to create competitive advantages. As a result, ARM-based CPU modules were born out of this trend. Concentrating all necessary components on the CPU module and placing other parts on the carrier board in response to market requirements for specialization provides greater flexibility while retaining low power consumption credentials.

Advantech has been involved in the industrial computer industry for many years and has found that customers usually have the following issues when implementing modular designs.

General I/O Design Capability

Although customers possess the ability for vertical integration and have enough know-how and core competitiveness in professional application fields, the lack of expertise and experience in general power and I/O design causes many challenges for them, especially in integrating CPU modules into their carrier boards.

Data Acquisition

Even if customers can obtain sufficient information to make the right decisions for specialized vertical applications, some customers encounter difficulties with platform design in general and communicating with CPU or chipset manufacturers. This can increase the challenges and risks of designing carrier boards which can impact time-to-market of products.

Software Development and Modification

Compared to x86 architectures, RISC architectures use simpler instruction sets; therefore, the software for x86 platforms cannot be used on RISC platforms. System integrators (SIs) must develop unique software for their systems and integrate the hardware and software themselves. Unlike x86 platforms, RISC platforms have less support for board support packages (BSPs) and drivers. Although driver support is provided, SIs are still required to integrate them into the system core. Moreover, the BSPs provided by CPU manufacturers are typically aimed at carrier board design. Thus, they may not be an appropriate environment for software development.

To address this issue, Advantech proposed the concept of streamlined Design-In support services for RISC-based computer-on-modules (COMs). With a dedicated design-in services team, Advantech actively participates in carrier board design and problem solving. Our services not only enable customers to effectively distribute their resources but also reduce R&D costs and hardware investment.

Because of our close relationship with leading CPU and chipset manufacturers such as ARM, TI, and Freescale, Advantech helps solve communication and technical support difficulties, which also reduces the uncertainties of product development. Advantech's software team focuses on providing comprehensive BSPs and assists customers with establishing a software development environment for RISC platforms.

Advantech's RISC Design-In services help customers overcome challenges to achieve a faster time-to-market. Along with our multi-stage development process, which includes planning, design, integration, and validation, Advantech's RISC Design-In services provide comprehensive support during the phases discussed in the following sections.

Planning Stage

Before deciding to adopt Advantech RISC COM, customers must go through a complete survey process, including 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 during the development of RISC COMs. During the planning stage, customers can use the CSB evaluation board to assess RISC modules and test peripheral hardware. Moreover, Advantech provides standard software BSPs for RISC COMs to allow customers to define the product specifications and verify I/O and performance. We not only offer hardware planning and technology consultations but also software evaluations and recommendations regarding peripheral modules (such as Wi-Fi, 3G, and Bluetooth modules). Resolving customer concerns is Advantech's main target at this stage. Because product evaluation is the key task in the planning stage, especially regarding performance and specifications, we try to help our customers conduct all the necessary tests for their RISC COM.

Design Stage

When a product moves into the design stage, Advantech will supply a carrier board design guide for reference. The carrier board design guide provides pin definitions of the COM connector with limitations and recommendations for carrier board design. This gives customers a clear guideline to follow during carrier board development. Regarding different form factors, Advantech offers a complete pin-out checklist for different form factors, such as Q7, ULP, and RTX2.0, to enable customers to examine the carrier board signals and layout design accordingly. In addition, our team is able to assist customers with reviewing the placement/layout and schematics to ensure the carrier board design meets all their requirements. For software development, Advantech's RISC software team can assist customers with establishing an environment for software development and evaluating the time and resources required. If customers outsource software development to a third party, Advantech can also cooperate with the third party and provide consultation services. With Advantech's expert support, the design process becomes much easier and the product quality is enhanced to meet all customer criteria.

Integration Stage

This phase comprises hardware and software integration, application development, and peripheral module implementation. Because they may lack the knowledge and experience of certain platforms, customers may need to spend some time analyzing integration problems. Additionally, the implementation of peripheral modules depends a lot on the driver designs on carrier boards, and RISC platforms typically have less support for ready-made drivers on the carrier board. Thus, customers may have to figure out the best solution through trial and error. Advantech's team has years of support experience and extensive hardware/software development knowledge. Consequently, we can support customers by providing expert advice and information, which will shorten the development time and enable more effective product integration.

Validation Stage

After the customer's ES sample is completed, the next step is a series of verification steps. In addition to verifying the product's functionality, the product's efficiency must also be tested at this stage, particularly with RISC platforms.

Advantech plays a supportive role in helping customers solve problems during the testing and verification process and will provide suggestions and tips as well. Through an efficient verification process backed by our technical support team, customers are able to optimize their applications with less hassle. Furthermore, Advantech's team can provide professional consultation services about further testing and equipment usage. This allows customers to find the appropriate tools to efficiently identify and solve problems and further enhance the quality and performance of their products.

6.2 Contact Information

Below is the contact information for Advantech customer service.

Region/Country	Contact Information
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

Alternatively, you can contact the Advantech service team via our website.

https://www.advantech.com/en/support

Our technical support engineers will provide a quick response to your queries.

6.3 Global Service Policy

6.3.1 Warranty policy

Below is the warranty policy for Advantech products:

6.3.1.1 Warranty period

Advantech-branded off-the-shelf products and 3rd-party off-the-shelf products used to assemble Advantech Configure-to-Order products are entitled to a 2-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, by default, carry a 15-month regional warranty service. The actual product warranty terms and conditions may vary based on sales contract.

All 3rd-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.

6.3.1.2 Repairs under warranty

It is possible to obtain a replacement (cross-shipment) during the first 30 days of the purchase through your original ADVANTECH supplier to arrange DOA replacement if the products were purchased directly from ADVANTECH and the product is DOA (Dead-on-Arrival). The DOA cross-shipment excludes any shipping damage, customized and/or build-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 reconstructive products from ADVANTECH back to customers' sites will be at ADVANTECH's expense.

6.3.1.3 Exclusions from warranty

The product is excluded from warranty if:

- The product has been found to be defective after expiry of the warranty period.
- The warranty has been voided by removal or alteration of the 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 lighting strike, flood, earthquake, etc.
- Product updates/upgrades and tests were performed upon the request of customers who are without warranty.

6.3.2 Repair process

6.3.2.1 Obtaining an RMA number

All returns from customers must be authorized with an ADVANTECH RMA (Return Merchandise Authorization) 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 website: 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 the "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.

6.3.2.2 Returning the product for repair

It's possible customers can save time and meet end-user requirements by returning defective products to an authorized ADVANTECH repair facility without an extra cross-region charge. It is required to contact the local repair center before offering global repair service.

It is recommended to send cards without accessories (manuals, cables, etc.). Remove any unnecessary components from the card, such as CPU, DRAM, or CF cards. If you send all these parts back (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 the European Community 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 the clearance time of goods:

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 the line "Invoice for customs purposes only with no commercial value" on the shipment invoice.
3. Show RMA numbers, product serial numbers, and warranty status on the shipment invoice.
4. Add information about the country of origin of the goods.

In addition, please attach an invoice with the RMA number to the carton, then write the RMA number on the outside of the carton and attach the packing slip to save handling time. Please also 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 unrepaired items at the customer's cost if inappropriately packed.

"Door-to-Door" transportation such as speed-post is recommended for delivery; otherwise, the sender should bear additional charges such as clearance fees if Air-Cargo is utilized.

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.

6.3.2.3 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 there is failure caused for 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 lighting 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 there is failure caused 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.

6.3.2.4 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.

6.3.2.5 Custody of products submitted for repair

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

6.3.2.6 Shipping back to a 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 shipments. If you require any special arrangements, please indicate this when shipping the product to us.

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Please verify specifications before quoting. This guide is intended for reference purposes only.

All product specifications are subject to change without notice.