seeed studio

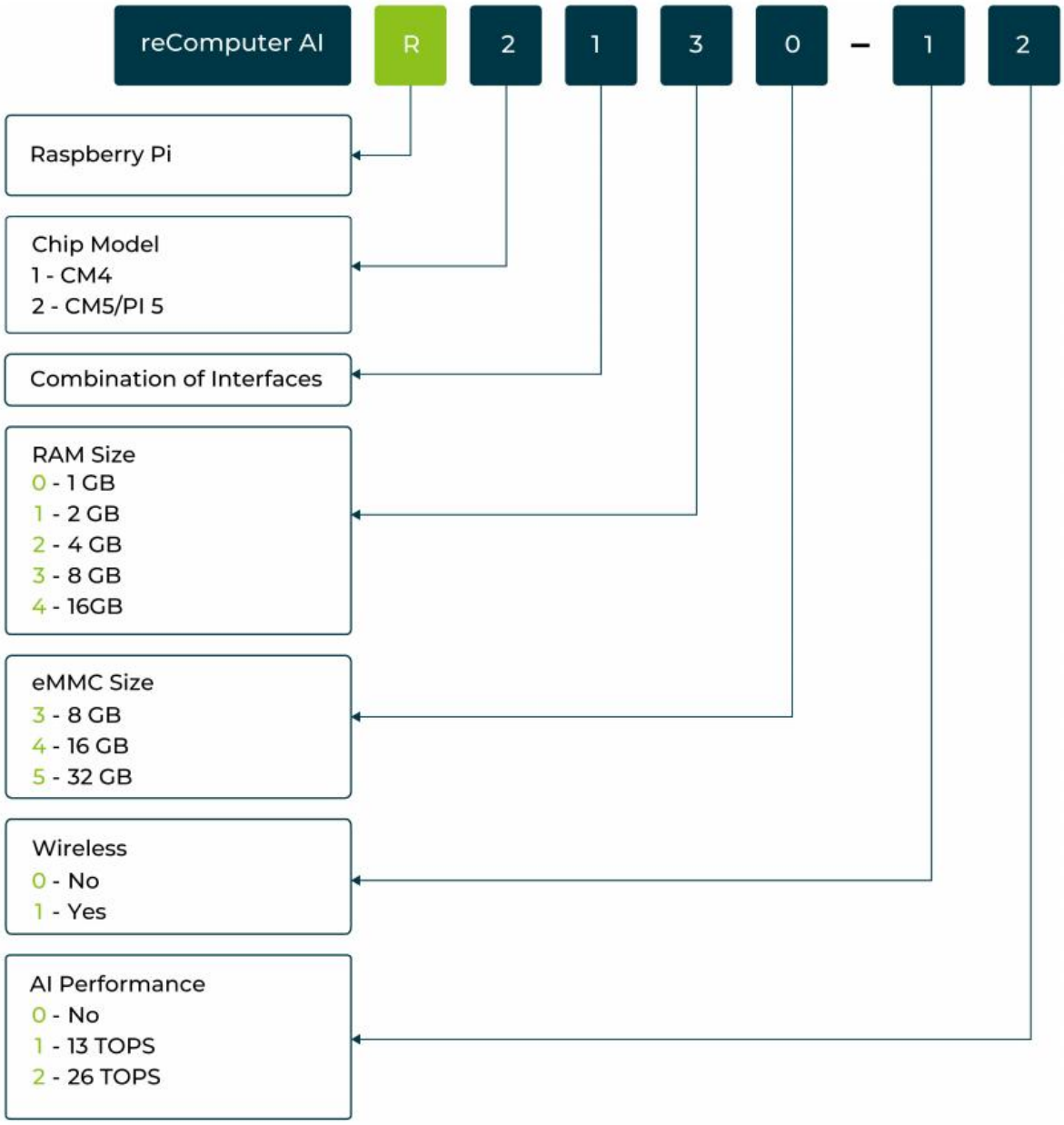
Powered by Raspberry Pi

reComputer AI Industrial R2000

User Manual

Edge AI Computer

Naming Conventions



For example, the naming of 8GB RAM and 32GB eMMC CM5 module with Wi-Fi and BLE function, 26TOPS AI accelerator ***for edge AI Computer is reComputer AI Industrial R2135-12.***

Contents

C1. Introduction

1.1 Overview

The reComputer AI Industrial R2000 is powered by Raspberry Pi CM5 and Hailo AI accelerator, this compact edge AI system delivers 26 TOPS for real-time multi-channel vision processing. With a quad-core Cortex-A76 CPU, up to 16GB RAM, 64GB eMMC, and a versatile interface, it ensures seamless integration into industrial AI applications.

Designed for 24/7 reliability, it features wide voltage input (9-36V), hardware watchdog, and robust cooling, operating stably in -20°C to 65°C environments. Ideal for smart factories, surveillance, and AIoT, this solution brings powerful AI computing to the edge.

Application

Network Video Recording (NVR)

Integrate the AI into NVR systems for real-time video analytics, object detection, and anomaly detection, enhancing security and efficiency.

Digital Signage

Upgrade existing digital signage solutions with AI capabilities such as audience analytics, facial recognition, and dynamic content adaptation based on viewer demographics and behaviors.

Smart Retail

Build next-gen Smart Retail solutions with AI-powered features such as visual product recognition and customer behavior tracking.

Smart Transportation

Intelligent traffic management and smart parking solutions.

1.2 Feature

Industrial-Grade Reliability

- High Accuracy RTC and hardware watchdog
- Clear dual-sided LED indicators help check operational status quickly
- High-quality metal case, compatible with DIN-rail and Wall installation
- Wide temperature support -20°C to 65°C
- ESD: EN61000-4-2, level 3
- EFT: EN61000-4-4, level 2
- Surge: EN61000-4-5, level 2
- Production Lifetime: Until at least December 2036

Powerful Performance

- Powered by Raspberry Pi CM5
- Broadcom BCM2712 quad-core 64-bit Arm Cortex-A76 (Armv8) SoC @ 2.4GHz
- Up to 16GB RAM and 64GB eMMC

High-Efficiency AI Computing

- Powered by Hailo AI accelerator
- Up to 26 Tera-Operations Per Second (TOPS) for AI compute
- Support TensorFlow, TensorFlow Lite, Keras, PyTorch & ONNX

Rich Wireless Capabilities

- On-chip Wi-Fi
- On-chip BLE
- Mini-PCIe: LTE, USB LoRa®, USB Zigbee

Rich Interfaces

- 2x HDMI2.0
- 1x 10M/100M/1000M Ethernet
- 2x Type-A USB3.2
- 1x Type-C USB2.0(USB console for OS update)
- 1x Standard SIM card slot

1.3 Specification

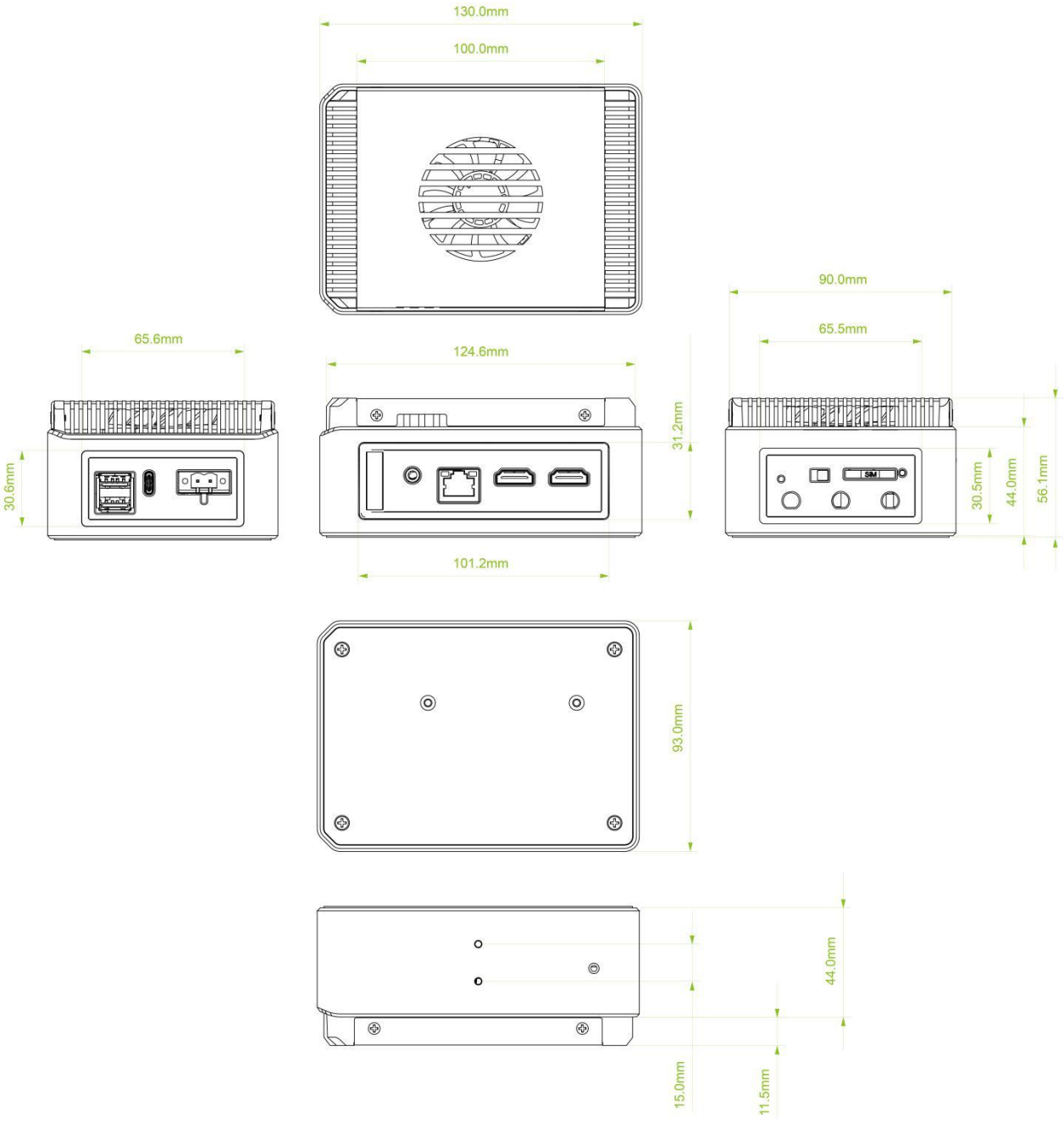
Parameter	Description
Basic	
CPU	Raspberry Pi Compute Module 5, 2.4GHz quad-core 64-bit Arm Cortex-A76
GPU	Raspberry Pi Compute Module 5, VideoCore VII
AI Processor	Hailo-8 M.2 Acceleration Stick, 26 Tera-Operations Per Second
RAM	8GB
eMMC	32GB
System Spec	
Power Input	DC 9V~36V, 2-pin Terminal Block
Video Decoder	4Kp60 HEVC decoder
Interface	
Ethernet	1x 10/100/1000 Mbps, RJ45
USB	2x USB 3.2 Ports, USB-A; 1x USB 2.0 Port, USB-C, for debug and update OS;
Display	2x Standard HDMI Ports, HDMI 2.0
Audio	1x 3.5mm Audio Jack
M.2 Slot	1x USB 3.0 to M.2 slot, M.2 M-key 2280; 1x PCIe 3.0 to M.2 slot, M.2 M-key 2242;
Mini-PCIe	1x Mini-PCIe for 4G/LoRaWan module
SIM Card	1x Standard SIM Card Slot
LED	3x LEDs, Power/ACT/4G
Button/Switch	1x Reset Button; 1x Boot Switch;
Wireless Communication	
Wi-Fi 2.4/5.0 GHz	On-chip Wifi 5
BLE 5.0	On-chip BLE5.0
4G Cellular	4G LTE (Optional)
LoRa®	USB LoRa® (Optional)
Antenna	3x Antenna Hole
Ambient Conditions	
Ingress Protection	IP40
Operating Temperature	-20~65 °C

Operating Humidity	10~95% RH
Others	
Watchdog	Hardware Watch Dog
RTC	High Accuracy RTC
Security	Encryption Chip TPM2.0/ATECC608A (Optional)
Heat Dissipation	Heatsink with Fan
Warranty	2 years
Production Lifetime	Until December 2036
Certification	CE, FCC, Telec, RoHS, REACH
Watchdog	Hardware Watch Dog
Mechanical	
Dimension(W x H x D)	130mm*93mm*55.5mm
Enclosure	Aluminum Alloy Casing with PC Side Panels
Mounting	Din-rail/Wall
Weight(Net)	688g
Statement	Options marked require additional purchase according to accessories list.

Component and Interface Status Statement	
Reserved	Designated for future use or expansion.
Optional	Non-essential components, users can choose to include or exclude.
Occupied	Currently in use and integral to product functionality.
Included	Essential components provided with standard package.

1.4 Dimension

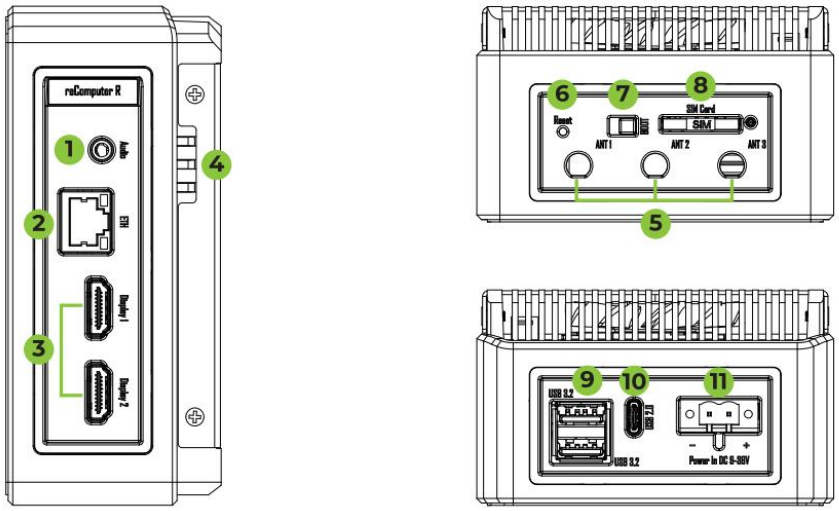
Mechanical	
Dimension(W x H x D)	130mm*93mm*55.5mm
Enclosure	Aluminum Alloy Casing with PC Side Panels
Mounting	DIN-rail/Wall
Weight(Net)	688g



C2. Hardware Overview

2.1 System Overview

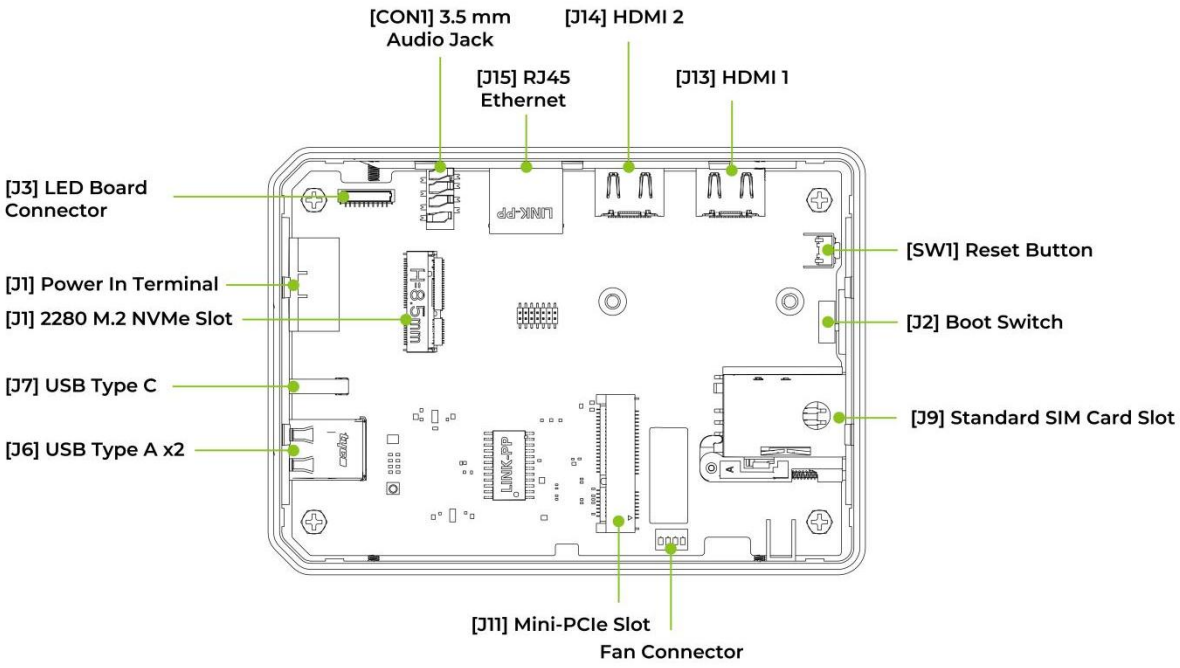
2.1.1 Interface Overview



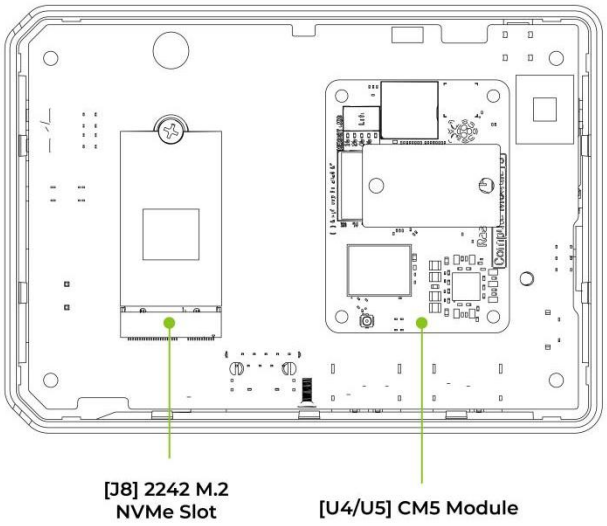
1. 3.5mm Audio Jack
2. 1000M Ethernet
3. 2x Standard HDMI
4. LED
5. 3 x Reserved Antenna Ports for Wireless
6. Reset Hole
7. Boot Switch
8. Standard SIM Card Slot
9. 2 x USB-A 3.2 Host
10. Serial Console
11. Power In

2.1.2 Mainboard Overview

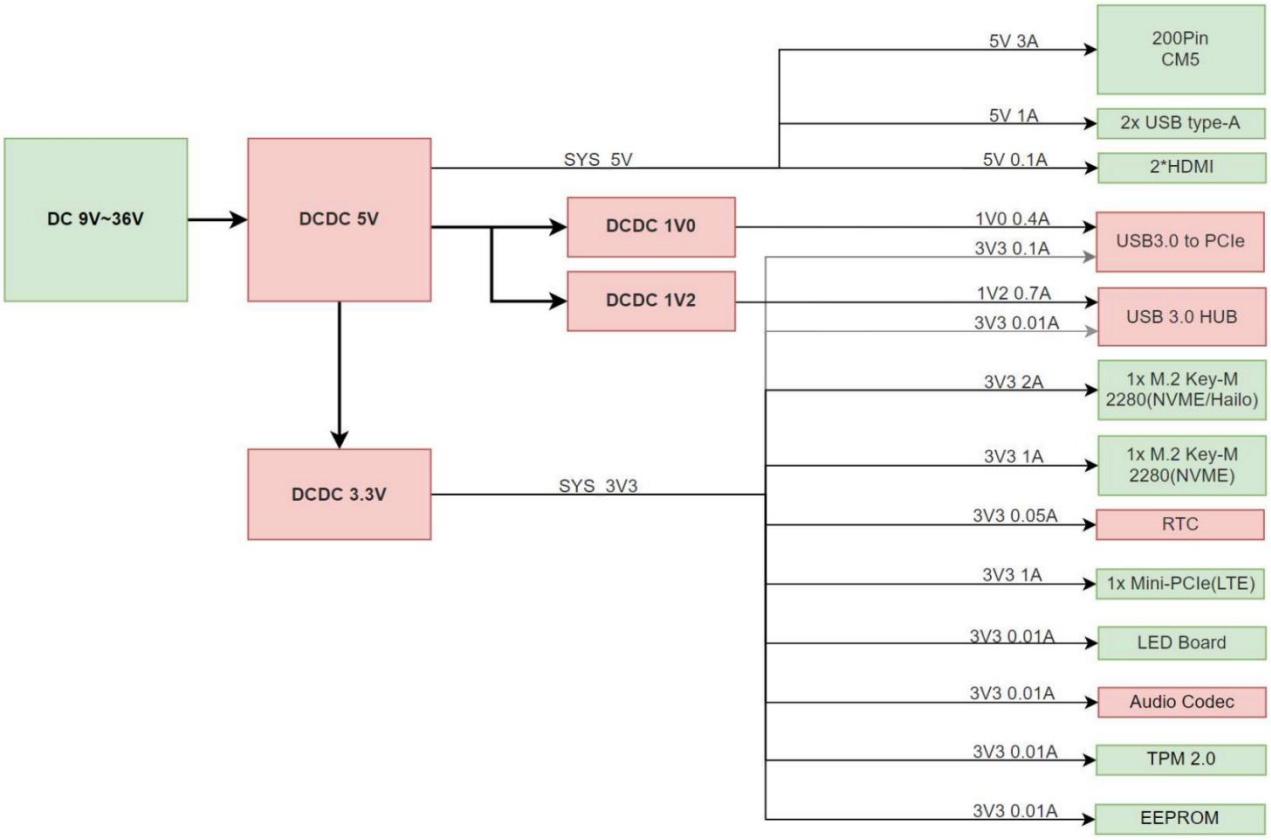
Top View



Bottom View

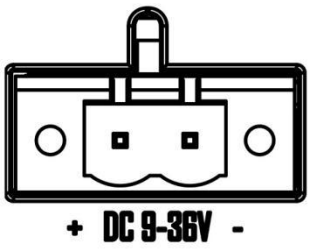


2.1.3 Power Diagram



The reComputer AI Industrial R2000 supports a wide input voltage range of DC 9V–36V, and internally utilizes multi-stage DCDC converters to generate 5V, 3.3V, 1.2V, and 1.0V power rails. These voltages provide stable power to the core processor, USB ports, HDMI, M.2 expansions, audio, RTC, and other peripheral modules, ensuring reliable operation across various application scenarios.

2-Pin Power Terminal



The reComputer AI Industrial R2000 is supplied with a terminal DC voltage of 9~36V. The power supply is connected via the 2-pin power terminal block connector. To ground the reComputer AI Industrial R2000, the ground wire can be secured to the screw located at the top left corner of the power terminal.

Power Consumption

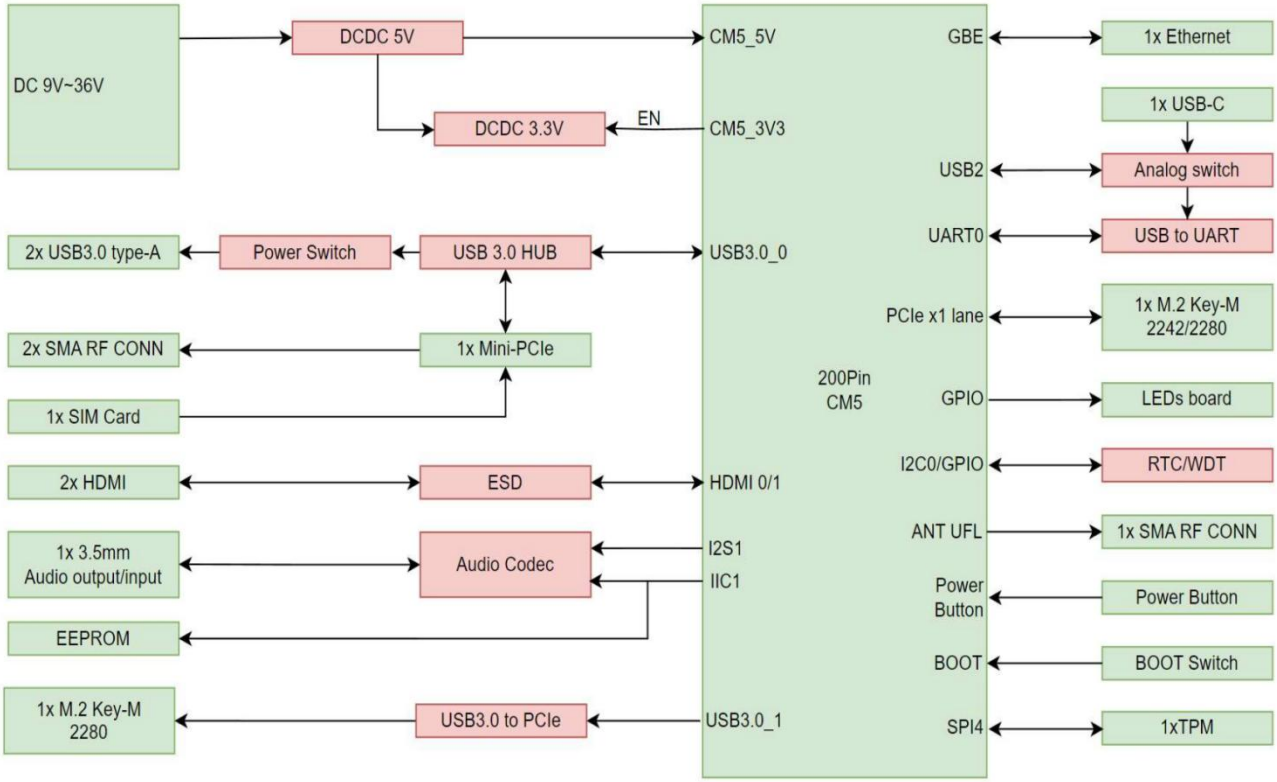
Please refer to the table below for the tested power consumption of reComputer AI Industrial R2000 in Seeed Studio's laboratory. Please note that this value is for reference only, as the test methods and environment can result in variations in the results.

Status	Voltage	Current	Power Consumption	Description
Shutdown	12V	1.1mA	0.013W	Static power consumption test in shutdown and power-off state.
Idle	12V	208mA	2.42W	To test the input current when supplying 24V power to the reComputer AI Industrial R2000 device without running any test programs.
Full Load	12V	2.08A	24.2W	Configure CPU to run at full load using the "stress -c 4" command. USB comes with a 1A load.

Power On and Power Off

The reComputer AI Industrial R2000 does not come with a power button by default, and the system will automatically start up once power is connected. When shutting down, please select the shutdown option in the operating system and wait for the system to fully shut down before cutting off power. To restart the system, simply reconnect to the power.

2.1.4 Block Diagram



2.2 Interface Description

Interface	
Ethernet	1x 10/100/1000 MbpS (supports POE*)
USB	2x USB-A 3.2 Host
	1x USB-C 2.0 (for flashing OS)
HDMI	2x HDMI 2.0
Audio	1x 3.5mm Audio output/input
SIM Card Slot	1x SIM Card Slot, supports Standard SIM Card
M.2 Slot	2x M.2 Slot, supports M.2 NVMe SSD and AI Acceleration
Mini-PCIe	1x Mini PCIe Slot
LED	3x LED indicators
Reset Button	1x Reset Button
Boot Switch	1x Boot Switch

2.2.1 LED Indicator Status

The reComputer AI Industrial R2000 features 3 LED indicators that serve to signal the machine's operational status. Please refer to the table below for the specific functions and status of each LED:

LED Indicator	Color	Status	Description
PWR	Green	On	The device has been connected to power.
		Off	The device is not connnected to power.
ACT	Orange		Under Linux this pin will flash to signify eMMC access. If any error occurs during booting, then this LED will flash an error pattern which can be decoded using the look up table(Raspberry Pi Documentation - Configuration) on the Raspberry Pi website.
USER	Green/Red/Blue		Need to be defined by user.
LTE	Green	On	The dial-up is successful and the connection is normal.
		Off	LTE signal is not connected or the device is not powered on.

ACT Status table

Long flashes	Short flashes	Status
0	3	Generic failure to boot
0	4	start*.elf not found
0	7	Kernel image not found
0	8	SDRAM failure
0	9	Insufficient SDRAM
0	10	In HALT state
2	1	Partition not FAT
2	2	Failed to read from partition

2	3	Extended partition not FAT
2	4	File signature/hash mismatch - Pi 4
4	4	Unsupported board type
4	5	Fatal firmware error
4	6	Power failure type A
4	7	Power failure type B

If the ACT LED blinks in a regular four blink pattern, it cannot find bootcode(start.elf).

If the ACT LED blinks in an irregular pattern then booting has started.

If the ACT LED doesn't blink, then the EEPROM code might be corrupted, try again without anything connected to make sure. For more detail please check the Raspberry Pi forum:

STICKY: Is your Pi not booting? (The Boot Problems Sticky) - Raspberry Pi Forums.

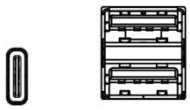
For more detail please check the Raspberry Pi forum: https://forums.raspberrypi.com//viewtopic.php?f=28&t=58151

2.2.2 Boot Switch

The Boot Switch of The reComputer AI Industrial R2000 is connected to the nRPI_BOOT pin of CM5. This switch provides users with the option to select the boot source between eMMC and USB. In normal mode, the switch should be set away from the side with the "BOOT" label, enabling the system to boot from eMMC. Conversely, when users need to flash the system image, they should set the switch towards the "BOOT" label, allowing the system to boot from the Type-C USB interface.

Switch Position	Mode	Description	nRPI-BOOT
	Normal mode	Boot from eMMC	Low
	Flash mode	Boot from USB	High

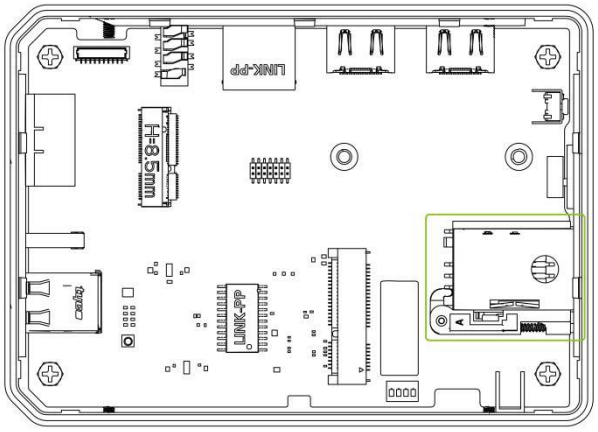
2.2.3 USB



The reComputer AI Industrial R2000 is equipped with one USB Type-C port and two USB Type-A ports. Please refer to the table below for their functions and descriptions.

Type	Quantity	Protocol	Function	Description
Type-C	*1	USB2.0	USB-Device	Used for serial port debugging, burning image, etc.
Type-A	*2	USB3.2	USB-Host	Connect different USB devices such as flash drives, USB keyboards or mouses.

2.2.4 SIM Slot(Internal)



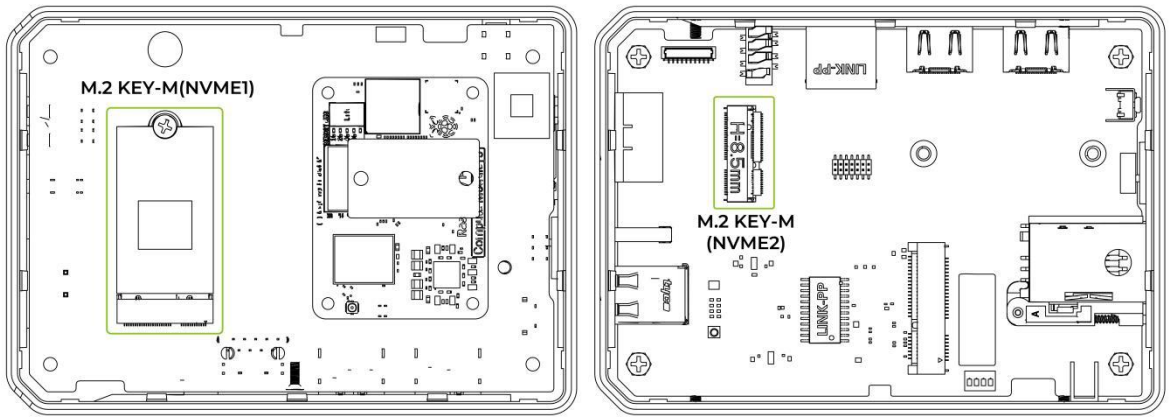
The reComputer AI Industrial R2000 series equipment includes an internal Standard SIM card slot, which is used to install Standard SIM card for obtaining 4G signals.

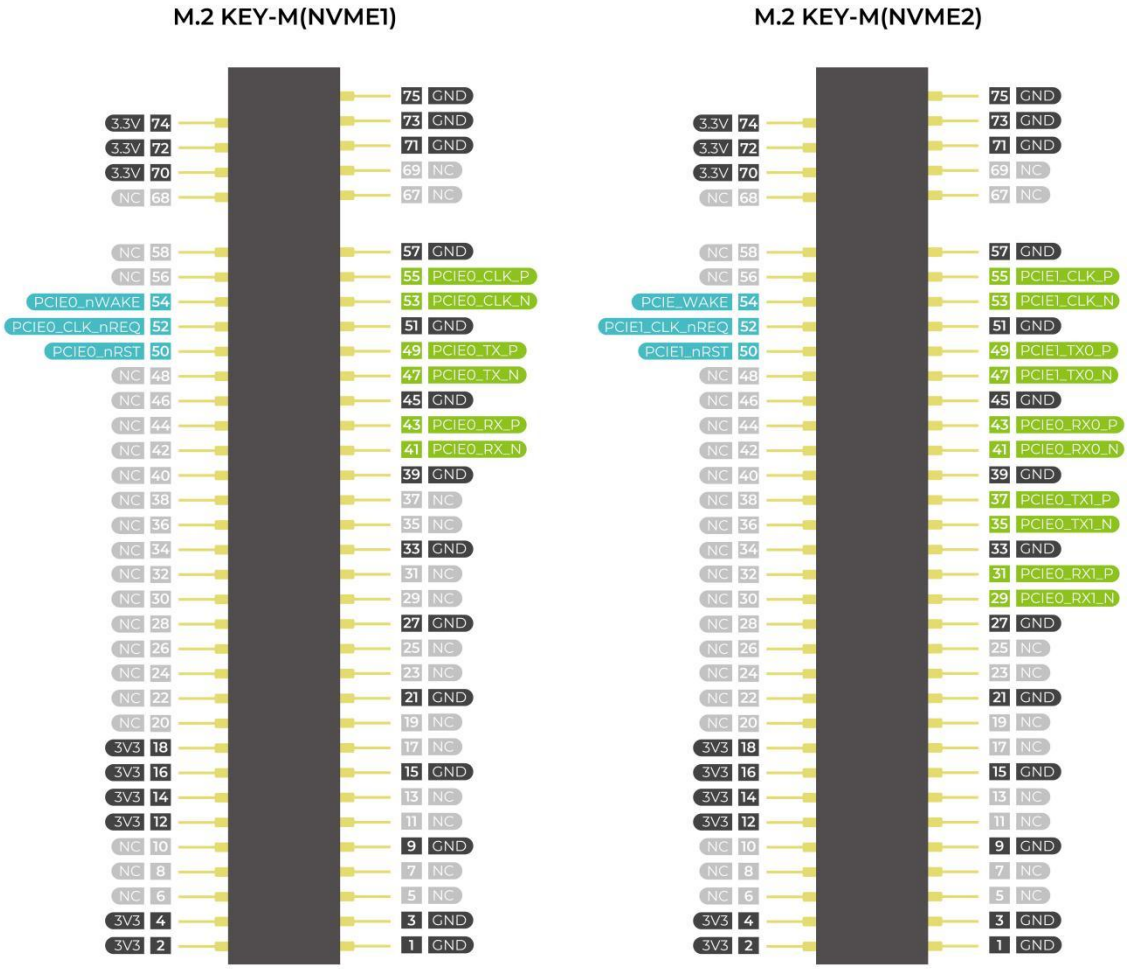
The size differences between standard SIM, Micro SIM and Nano SIM cards are as follows:

Note

Please note that the standard version of reComputer AI Industrial R2000 *does not come with a 4G module. If you require 4G functionality, an additional 4G module must be purchased separately. For more information, please refer to section "3.7 4G Cellular over Mini-PCIe ".*

2.2.5 M.2 Slot





The reComputer AI Industrial R2000 is equipped with two M.2 Key-M slots (NVMe1 and NVMe2) for NVMe M.2 2280 SSD and AI Acceleration, allows for high-speed storage expansion, enabling users to enhance the performance and capacity of their system.

- NVMe1 (bottom slot): Supports M.2 2280 size;
- NVMe2 (top slot): Pre-installed with an Hailo-8 AI accelerator
- Only PCIe-based NVMe SSDs are supported. SATA SSDs are not supported.

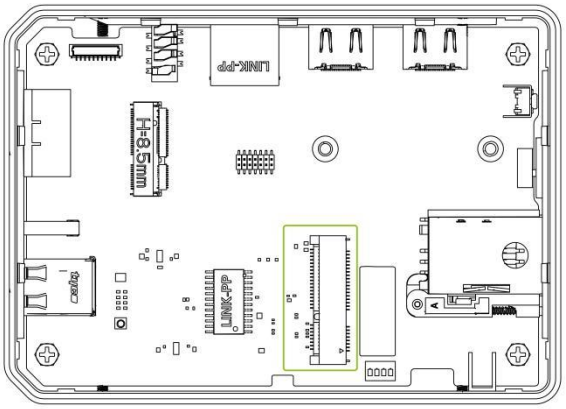
Note

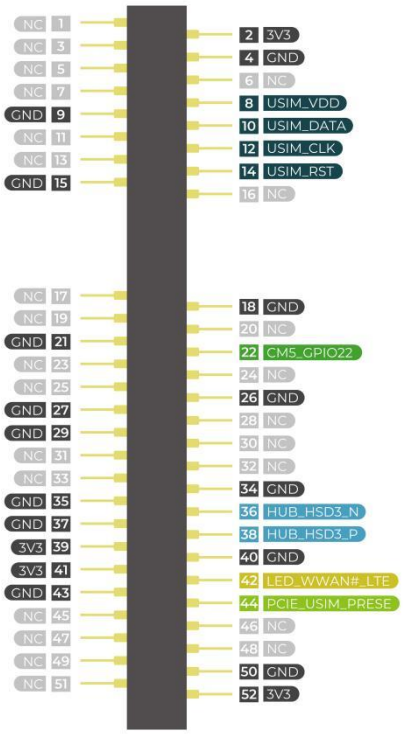
There are two main uses for SSD cards:
*1. **High Capacity Storage:** SSD cards can be utilized for high-capacity storage needs.*
*2.**Boot Drive with Image:** Another usage involves using the SSD both as a high-capacity storage and for storing system images, allowing booting directly from the SSD card.*
It's important to note that not all SSD cards available in the market support the second usage. Therefore, if you inten d to use it as a boot drive and are unsure about which model to purchase, we recommend opting for our recommend ed 1TB SSD(SKU 112990267). This model has been tested and verified for boot functionality, reducing the risk of compat ibility issues and minimizing trial and error costs.

2.2.6 Mini-PCIe Slot

The reComputer AI Industrial R2000 includes a Mini PCIe slot designed primarily for 4G LTE modem modules (e.g., Quectel EC20/EC25).

- Supports: Standard Mini PCIe modules
- Signal interfaces: USB 2.0, UART, SIM card, RESET, etc
- SIM card is routed to onboard SIM card socket
- Control signals: W_DISABLE, PERST, WAKE supported
- Integrated ESD protection for enhanced reliability



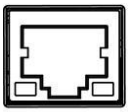


Slot	Supported Protocol
Mini-PCIe	4G LTE
	USB LoRa®
	USB Zigbee

2.2.7 Reset Hole

There is a Mini Push Button Switch located in the reset hole of the reComputer AI Industrial R2000. By pressing this button with a thin object, the CM4 can be reset. This pin when high signals that the CM4 has started. Driving this pin low resets the module.

2.2.8 Ethernet RJ45



Name	Type	Speeds	PoE
ETH0	CM5 native Gigabit Ethernet	10/100/1000 Mbit/s	Not Supported

reComputer AI Industrial R2000 comes with a standard RJ45 Gigabit Ethernet port (GbE), using a MagJack integrated transformer for better signal quality and EMI protection.

- Interface standard: IEEE 802.3 10/100/1000Mbps;
- Uses a Gigabit PHY with 4 differential pairs (TX/RX);
- Supports auto-negotiation and full-duplex communication;
- Includes common mode chokes, ESD protection, and isolation capacitors;
- Onboard green/yellow LEDs indicate link and activity status.

2.2.9 HDMI

reComputer AI Industrial R2000 comes with two standard HDMI Type-A ports, labeled HDMI0 and HDMI1, which support high-resolution video output. The system is capable of delivering display resolutions up to 4K at 60Hz and supports simultaneous dual HDMI output, making it suitable for multi-display applications.

2.2.10 RTC

reComputer AI Industrial R2000 includes an onboard RTC (PCF8563T) to maintain time across power cycles, enabling it to maintain timekeeping functionality even in the event of power loss.

Note

For details of RTC testing, please refer to section 3.9.

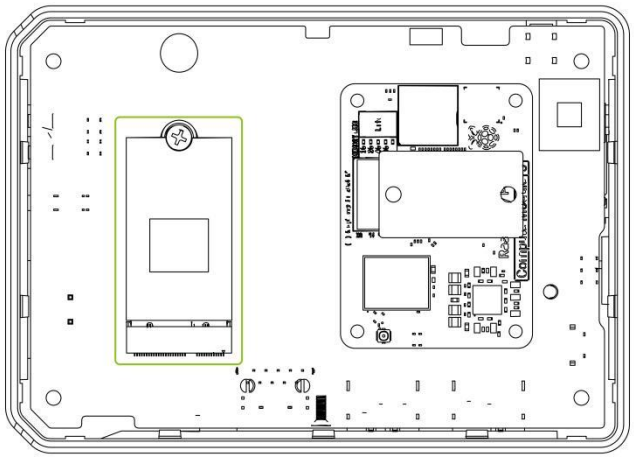
2.2.11 Watchdog

reComputer AI Industrial R2000 comes equipped with an independent hardware watchdog circuit that ensures automatic system reboot in case of abnormal system crashes. The watchdog circuit is implemented through RTC and allows for flexible feeding times from 1 to 255 seconds.

Note

For details of watchdog testing, please refer to section 3.10.

2.2.12 M.2 AI Acceleration



The reComputer AI Industrial R2000 includes a Hailo-8 AI accelerator module, pre-installed in the NVMe2 M.2 slot, delivering 26 TOPS of computing power for real-time multi-channel AI vision processing.

Note

For details of AI Accelerator testing, please refer to section 3.13.

2.3 Optional Interfaces and Module

The reComputer AI Industrial R2000 supports a rich selection of expansion modules and accessories, making it suitable for a wide range of scenarios and requirements. If you are interested in customizing the reComputer AI Industrial R2000, please contact odm@seeed.cc for more information.

Here is the accessories and optional modules list:

Remark	Item	Product Name	SKU
These three module must be used together for LoRaWAN® Function	LoRa® Module	Region optional LoRaWAN Gateway Module(USB)-US915	114992991
		Region optional LoRaWAN Gateway Module(USB)-EU868	114992628
This accessory is required for WiFi function	Wi-Fi/BLE Antenna	Raspberry Pi Compute Module 4 Antenna Kit	114992364
4G antenna with 4G module for 4G function, GPS antenna with 4G module for GPS function	4G module	LTE Cat4 EC25-AFXGA-mini-PCIe Module - for North American	113991134
		LTE Cat 4 EC25-EUXGR-mini-PCIe Module - for EMEA and Thai	113991135
		LTE Cat 4 EC25-AUXGR-mini-PCIe Module - for Australia	113991174
		LTE Cat 4 EC25-EFA-mini-PCIe Module - for Thai	113991214
		LTE Cat 4 EC25-EMGA-mini-PCIe Module - for Malaysia	113991234

		LTE Cat 4 EC25-JFA-mini-PCIe	113991296
	4G Antenna	4G Antenna Kit for 4G module	110061502
	GPS Antenna	GPS Antenna Kit for EC25 4G Module	110061521
	Encryption chip TPM2.0	TPM2.0 Module with infineon SLB9670	114993114
	SSD Card	NVMe M.2 2280 SSD 2TB	114993467
		NVMe M.2 2280 SSD 1TB	112990267
		512GB NVMe M.2 PCIe Gen3x4 2280 Internal SSD	112990247
		256GB NVMe M.2 PCIe Gen3x4 2280 Internal SSD	112990246
		128GB NVMe M.2 PCIe Gen3x4 2280 Internal SSD	112990226

2.3.1 Wi-Fi/BLE

The reComputer AI Industrial R2000 is powered by the CM5 with an onboard Wi-Fi/BLE version, providing the same Wi-Fi/BLE parameters as the CM5. For detailed parameter information, please refer to the Raspberry Pi official website.

2.3.2 4G Module

The reComputer AI Industrial R2000 mainboard features one Mini-PCIe slots, with Mini-PCIe slot supporting a 4G module using the USB protocol. The EC25 4G module from Quectel has been fully tested to be compatible with the reComputer AI Industrial R2000.

Note

Please note that if you require 4G functionality, it is necessary to purchase the corresponding 4G module and external antenna, and follow the instructions in section 4.5 "Assemble 4G/LoRa®/Zigbee Module and Antenna".

2.3.3 LoRa® Module

The Mini-PCIe slots also supports LoRa® module using the USB protocol. The WM1302 module from Seeed Studio has been fully tested to be compatible with the reComputer AI Industrial R2000.

Note

Please note that if you require LoRa® functionality, it is necessary to purchase the corresponding LoRa® module and external antenna, and follow the instructions in section 4.5 "Assemble 4G/LoRa®/Zigbee Module and Antenna".

2.3.4 SSD

The reComputer AI Industrial R2000 supports 2280 NVMe SSD through the use of the NVMe1 PCIe slot(J8).

Note

Please note that:

1- The speed test results may vary depending on the SSD model, testing method, and testing environment. The values provided here are for reference purposes only and were obtained in Seeed's laboratory.

Note

There are two main uses for SSD cards:

*1.**High Capacity Storage**: SSD cards can be utilized for high-capacity storage needs.*

*2.**Boot Drive with Image**: Another usage involves using the SSD both as a highcapacity storage and for storing system images, allowing booting directly from the SSD card.*

It's important to note that not all SSD cards available in the market support the second usage. Therefore, if you intend to use it as a boot drive and are unsure about which model to purchase, we recommend opting for our recommended 1TB SSD(SKU 112990267). This model has been tested and verified for boot functionality, reducing the risk of compatibility issues and minimizing trial and error costs.

2.3.5 Encryption Chip TPM 2.0

The TPM features Infineon's OPTIGA™ TPM SLB9670 which is compliant to the Trusted Computing Group (TCG) TPM 2.0 specification is recommended as encryption chip to the reComputer AI Industrial R2000. The chip features an SPI interface applied for port J10 on board, to enable a root of trust for platform integrity, remote attestation, and cryptographic services.

Note

Please refer to section 4.6 "Assemble TPM 2.0 Module" for instruction.

C3. Configuring System

3.1 Flashing Image

To update the firmware, first ensure that you update the drivers. Here are the steps to install and update the drivers:

1. Clone the repository with the following command:

```
git clone --depth 1 https://github.com/Seeed-Studio/seeed-linux-dtoverlays.git
```

2. Navigate into the cloned directory:

```
cd seeed-linux-dtoverlays
```

3. Run the script to install the drivers:

```
sudo ./scripts/reTerminal.sh --device reComputer-AI-box-cm5
```

4. After the installation is complete, reboot your device:

```
sudo reboot
```

This process will ensure that your drivers are up to date before updating the firmware.

3.2 Query GPIO Mappings

To query GPIO mappings and offsets, follow these steps:

1. Copy and paste the following command to query GPIO mappings:

```
cat /sys/kernel/debug/gpio
```

This command will provide you with the necessary information regarding GPIO mappings and offsets whenever needed throughout the process.

3.3 SPI Communication Testing

To test SPI communication by shorting the TPM module's MISO and MOSI pins, follow these steps:

1. Clone the spidev-test repository:

```
# Don't forget to connect to network before running command
git clone https://github.com/rm-hull/spidev-test.git
```

2. Navigate into the spidev-test directory:

```
cd spidev-test
```

3. Compile the spidev_test.c file:

```
gcc spidev_test.c -o spidev_test
```

4. Run the spidev_test program with the following command:

```
./spidev_test -D /dev/spidev0.1 -v -p hello
```

This command tests SPI communication on the specified SPI device (***/dev/spidev0.1***) with verbose output (***-v***) and sends the message "hello" (***-p hello***).

By shorting the TPM module's MISO and MOSI pins, you're effectively creating a loopback scenario, where data sent on MOSI is received on MISO. This setup allows you to test SPI communication without an actual device connected.

3.4 Wi-Fi Scanning

To scan for Wi-Fi networks:

```
sudo iwlist wlan0 scan
```

This command will list available Wi-Fi networks along with their details.

3.5 Bluetooth Scanning

To scan for Bluetooth devices:

```
sudo bluetoothctl
```

This command will open the Bluetooth control interface. From there, you can run additional commands to scan for nearby Bluetooth devices:

```
scan on
```

This command will start scanning for nearby Bluetooth devices. You can then use other commands within the ***bluetoothctl*** interface to interact with Bluetooth devices, such as pairing or connecting to them.

3.6 LoRa® over Mini-PCIe

3.6.1 LoRa® USB

For LoRa® USB, the previous commands remain the same as for LoRa® SPI. However, the final command needs to be changed to:

```
git clone https://github.com/Lora-net/sx1302_hal
cd sx1302_hal
sudo nano ./libloragw/inc/loragw_i2c.h
```

Change #define I2C_DEVICE "/dev/i2c-1" to #define I2C_DEVICE "/dev/i2c-3" like below:

```
#define I2C_DEVICE    "/dev/i2c-3"
```

Then compile the file

```
sudo make
```

Then modify the configuration code:

```
sudo nano ./tools/reset_lgw.sh
```

The result is shown as below:

```
SX1302_RESET_PIN=580     # SX1302 reset
SX1302_POWER_EN_PIN=578  # SX1302 power enable
SX1261_RESET_PIN=579     # SX1261 reset (LBT / Spectral Scan)
AD5338R_RESET_PIN=13     # AD5338R reset (full-duplex CN490 reference design)
```

Then copy the reset_lgw.sh script

```
# Copy the reset_lgw.sh script
cp ~/sx1302_hal/tools/reset_lgw.sh ~/sx1302_hal/packet_forwarder/
# Check the device name
ls /dev/spidv10.0
```

Then modify global_conf.json.sx1250.US915.USB and use lora module

```
cd ~/sx1302_hal/packet_forwarder

# change spidev0.0 to spidev10.0 of global_conf.json.sx1250.US915.USB

sed -i 's/spidev0.0/spidev10.0/g'  global_conf.json.sx1250.US915.USB

# #pull up the SX1302_RST pin first

echo 1 > /sys/class/gpio/gpio580/value

# Test global_conf.json.sx1250.US915.USB

./LoRa_pkt_fwd -c global_conf.json.sx1250.US915.USB
```

This command specifies the configuration file to be used for LoRa® USB.

3.7 4G Cellular over Mini-PCIe

Check the information of 4G Module, you will see something like usb0.

```
ifconfig
```

Display the status information of the network interface usb0.

```
ip link show usb0
```

```
# Enable the network interface named usb0.
sudo ip link set dev usb0 up
# Request an IP address from the DHCP server on the network and assign it to the usb0 interface
sudo dhclient usb0
# Check if the route is accessible.
ping 192.168.225.1
# Use usb0 to ping internet
ping -4 -I usb0 www.google.com
```

3.8 USB Hub Testing

To test the USB hub, you can use the following steps:

1. Check if the USB hub is detected by running the lsusb command. This command lists all connected USB devices, including hubs.

```
lsusb
```

Running this command should display information about the USB devices connected to your system, including any USB hubs that are present.

If the USB hub is functioning properly, you should see its details listed in the output of the ***lsusb*** command. If it's not listed, there may be an issue with the hub or its connection to the system. In such cases, you may need to troubleshoot the USB hub or its connections.

3.9 RTC

To test the Real-Time Clock (RTC) functionality, follow these steps:

1. Disable automatic time synchronization:

```
sudo systemctl stop systemd-timesyncd
sudo systemctl disable systemd-timesyncd
```

2. Set the time :

```
sudo hwclock --set --date "2024-11-12 12:00:00"
```

3. Synchronize the RTC time to the system:

```
sudo hwclock --hctosys
```

4. Check the RTC time:

```
sudo hwclock -r
```

This command will read and display the time stored in the RTC.

5. Disconnect the power source from the RTC, wait a few minutes, then reconnect it and check the RTC time again to see if it retained the correct time.

3.10 Watchdog

To perform a watchdog test, follow these steps:

1. Install the watchdog software:

```
sudo apt install watchdog
```

2. Edit the watchdog configuration file:

```
# make sure you install vim already, if haven't, can install by the command below
sudo apt-get install vim
sudo vim /etc/watchdog.conf
```

Modify the configuration as follows:

```
watchdog-device= /dev/watchdog

# Uncomment and edit this line for hardware timeout values that differ
# from the default of one minute.

watchdog-timeout  = 120

# If your watchdog trips by itself when the first timeout interval
# elapses then try uncommenting the line below and changing the
# value to 'yes'.
#watchdog-refresh-use-settimeout    = auto
# If you have a buggy watchdog device (e.g. some IPMI implementations)
# try uncommenting this line and setting it to 'yes'.
#watchdog-refresh-ignore-errors       = no
# ====================== Other system settings ========================
#
# Interval between tests. Should be a couple of seconds shorter than
# the hardware time-out value.

interval= 15

max-load-1              = 24

#max-load-5= 18

#max-load-15= 12

realtime= yes

priority= 1
```

You can adjust other settings as needed.

3. Ensure the watchdog service is running:

```
sudo systemctl start watchdog
```

4. To test the watchdog functionality, execute the following command to simulate a system hang:

```
sudo su
echo 1 > /proc/sys/kernel/sysrq
echo "c" > /proc/sysrq-trigger
```

This command triggers a kernel crash and should cause the watchdog to reboot the system.

5. Monitor the system to confirm that it reboots after the specified timeout period.

These steps will help you test and ensure the functionality of the watchdog timer on your system.

3.11 TPM 2.0

If you connect TPM 2.0 module to device, the following code can help check TPM connection.

```
ls /dev | grep tpm
```

If you see ***tpm0*** and ***tpmrm0*** in the output, it means that TPM (Trusted Platform Module) devices are detected and available on your system. This indicates that the TPM hardware is recognized and accessible, which is a good sign. You can proceed with using TPM-related functionalities or applications knowing that the devices are present and accessible.

3.12 SSD

To list the disks, including the SSD, you can use the fdisk -l command. Here's how:

```
sudo fdisk -l | grep sda
```

This command will display a list of all disks connected to your system, including the SSD if it's properly detected. Look for entries that represent your SSD. They typically start with ***/dev/sd*** followed by a letter (e.g., ***/dev/sda, /dev/sdb***, etc.).

Once you identify the entry corresponding to your SSD, you can proceed with partitioning or formatting it as needed.

3.13 Hailo-8 AI Aaccelerator

Test if hailo tools and driver install successfully：

```
hailortcli fw-control identify
```

If you see the following content, it means the installation was successful.

```
Executing on device: 0001:06:00.0
Identifying board
Control Protocol Version: 2
Firmware Version: 4.20.0 (release,app,extended context switch buffer)
Logger Version: 0
Board Name: Hailo-8
Device Architecture: HAILO8L
Serial Number: HLDDLBB241600722
Part Number: HM21LB1C2LAE
Product Name: HAILO-8L AI ACC M.2 B+M KEY MODULE EXT TMP
```

```
cd hailo-rpi5-examples
# Install necessary resources
./install.sh
# Activate python environment
source setup_env.sh
# Run object detection
python basic_pipelines/detection_simple.py
```

C4. Assembly Guide

4.1 Disassembly Guide

Following these steps should help you disassemble the device without any issues.

Step 1: Remove the Six Screws at the Bottom:

- Locate and unscrew the Six screws located at the bottom of the device using an appropriate screwdriver.

Step 2: Take Off the Floor Panel:

- Once the screws are removed, carefully lift off the floor panel from the device.

Step 3: Remove the Plastic Side Panels:

- Identify the plastic side panels on three sides of the device.
- Gently pry or unsnap each side panel from the device. If they are tight, you may need to use tools, but be careful not to damage the panels.

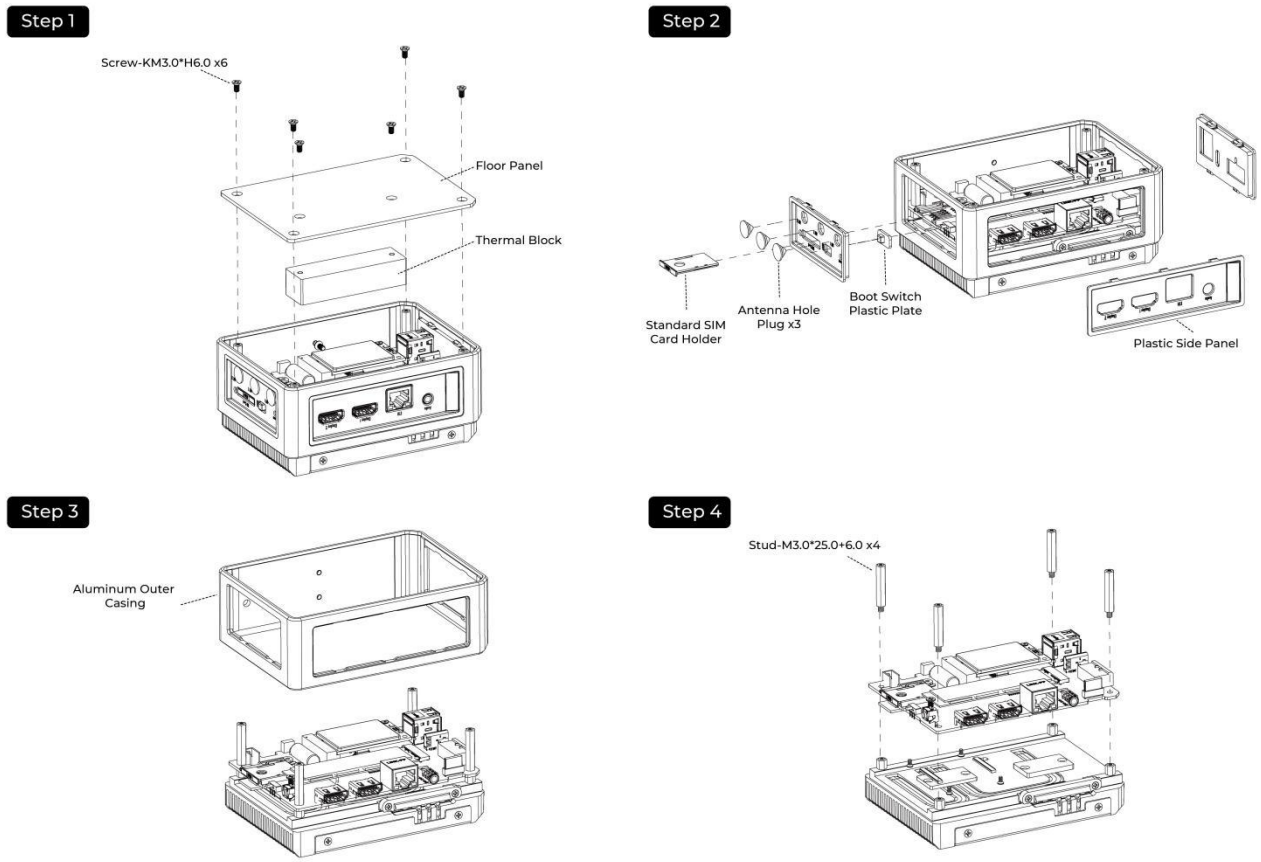
Step 4: Be Mindful of the Boot Switch Plastic Plate:

- Note the boot switch on one of the panels; it may have a small plastic plate attached.
- Ensure this plate doesn't fall off or get lost during the disassembly process.

Step 5: Take Down the Aluminum Outer Casing:

- Once the side panels are removed, you can access the aluminum outer casing.
- Carefully lift and remove the aluminum casing from the device.

Step 6: Remove the four screws that secure the PCB in place

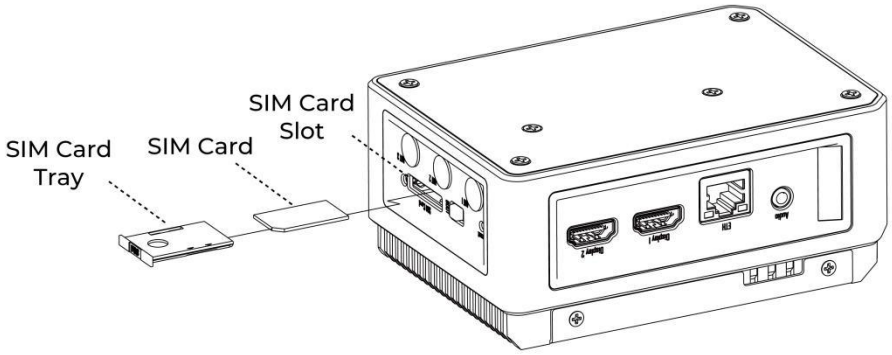


4.2 Assemble Standard SIM Card

Step 1: Pull out the SIM card tray as shown in the diagram.

Step 2: Place the SIM card correctly on the tray.

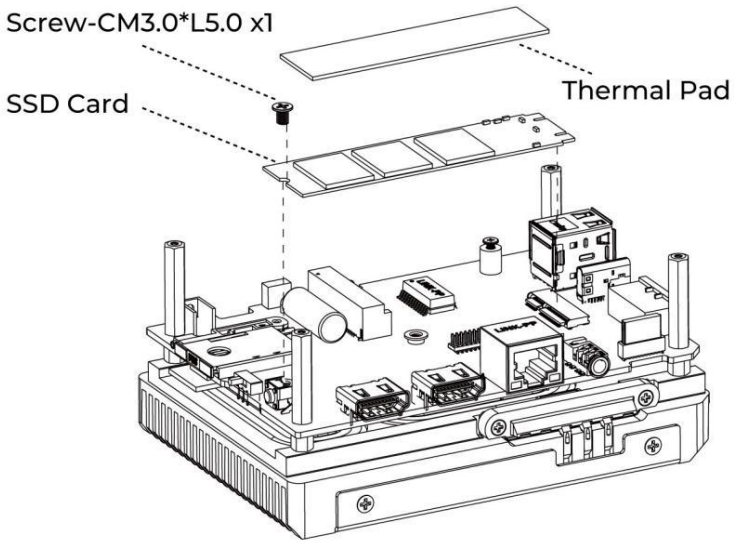
Step 3: Gently push the tray back into the device until it clicks into place.



4.3 Assemble SSD

Step 1: Remove the back cover following the disassembly guide.

Step 2: Load the SSD into the M.2 socket and lock the screws.

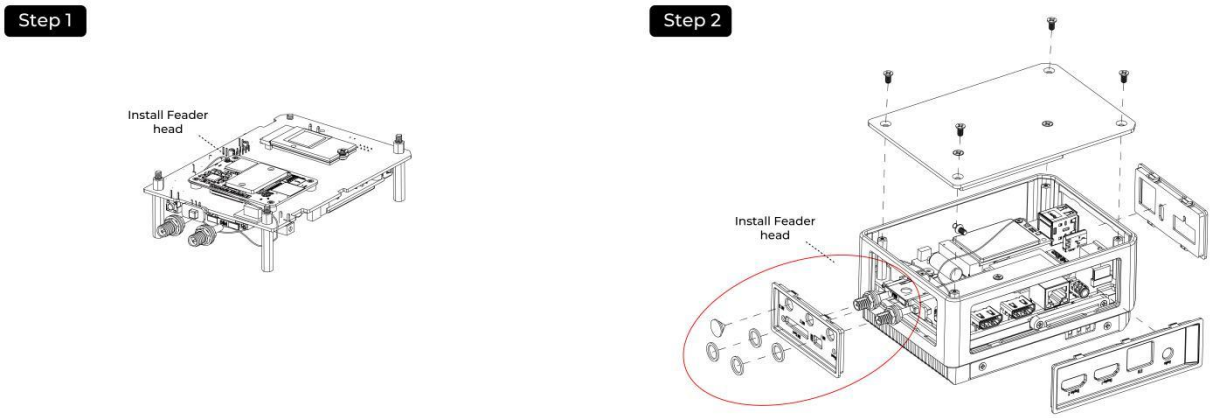


4.4 Assemble Wi-Fi/BLE Antenna

Step 1: Disassemble the entire device following section 4.1 "Disassembly Guide".

Step 2: Connect the feeder line from the CM5 module to antenna hole following the illustrastions below.

Step 3: Assemble the device for usage.



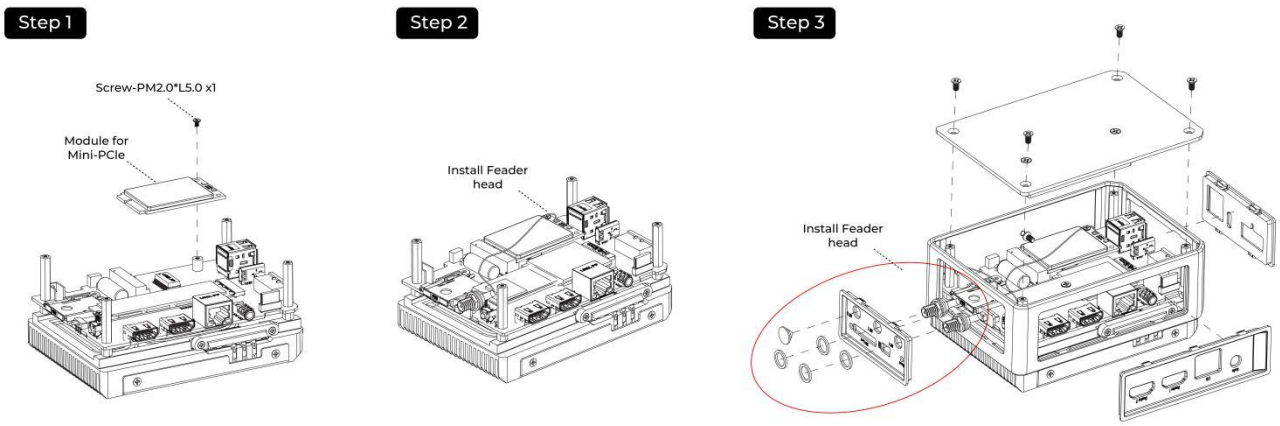
4.5 Assemble 4G/LoRa®/ Module and Antenna

Step 1: Make sure the module for Mini-PCIe slots is loaded above the SSD card.

Step 2: Make sure the module for Mini-PCIe slots is loaded above the SSD card.

Step 3: Load the 4G module/LoRa® Module/Zigbee Module(following the matching relationship of each slot according to section"2.2.8") into the Mini-PCIe slot and lock the screws.

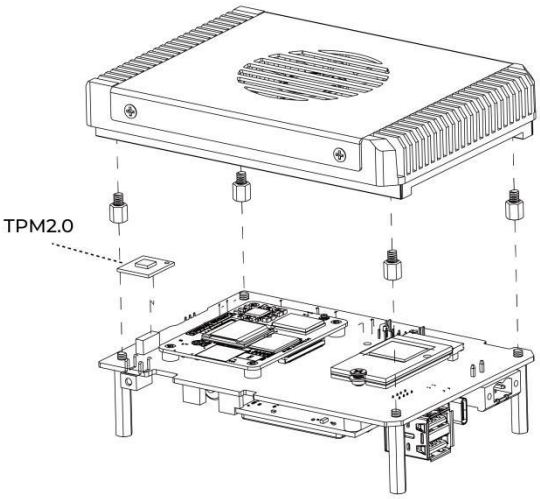
Step 4: Install the feeder line following the pictures below.



4.6 Assemble TPM 2.0 Module

Step 1: Remove the back cover following the disassembly guide.

Step 2: Load the TPM 2.0 module into the J13 socket.



4.7 Mounting Guide

4.7.1 DIN-rail Mounting Guide

reComputer AI Industrial R2000 Series offers DIN-rail installation method. The DIN-rail clip and installation screws are included in the packaging. Follow the diagram to correctly attach the DIN-rail clip to the mounting holes on the side of the device. Once the screws are securely fastened, you can then install the device onto the mounting rail.

Step 1: Place the device and rail clip on the upper edge of the standard profile rail at the position shown and push the device down.

Step 2: Swing the rail clip of the device from below through the standard profile rail.

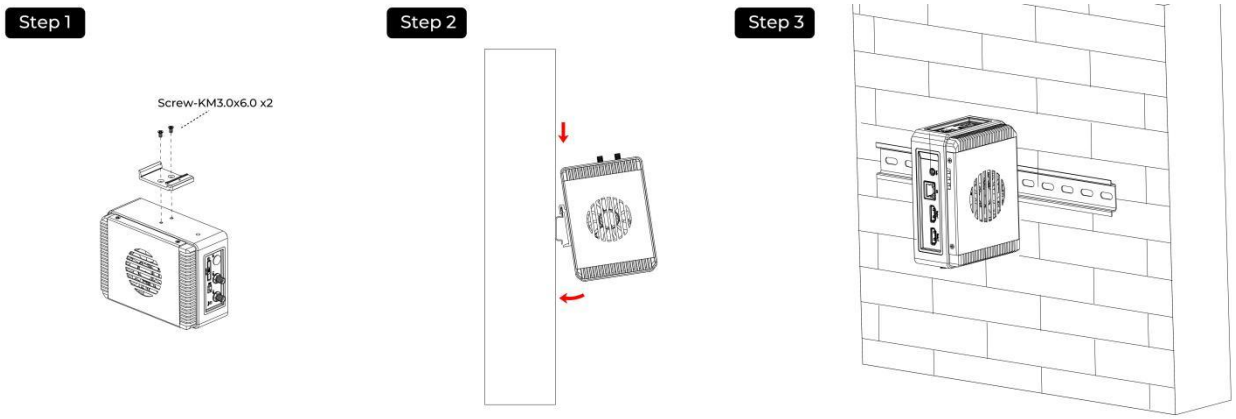
Step 3: Push the device in the direction of the standard profile rail. You will hear the device click into place.

Removing

Step 1: Push down the device until it is released by the rail clip.

Step 2: Swing the device out of the standard profile rail.

Step 3: Lift the device up and of



C5. Warranty & Support

5.1 Warranty

1. From the date of sale, the company provides 24 months free warranty for the products.

2. Warranty coverage is limited to products purchased from the official Seeed Studio website or authorized distributors. Customers need to keep receipts and purchase vouchers.

3. The products to be repaired shall be properly packaged and transported, and the customer shall be responsible for any loss or damage during transportation.

4. During the warranty period, the freight and maintenance costs arising from product quality failures shall be borne by Seeed Studio. If the warranty period exceeds 24 months, Seeed Studio will charge the fee for replacing parts according to the product failure, and the freight is borne by the user.

5. During the free warranty period, in case of any of the following events, Seeed Studio has the right to refuse service or charge materials and service fees at its discretion.

Product failure or damage caused by improper use by users.

The product label is damaged and the product information cannot be identified.

Even within the warranty period, if the product has functional issues or is difficult to repair due to improper customer use, unaut- horized disassembly or modification, poor operating environment, improper maintenance, accidents, or other reasons. Seeed Studio reserves the right to make judgments on the above situations and collect maintenance fees.

Other unavoidable external factors cause product failure and damage.

The above warranty regulations are only applicable to the above Seeed Studio reComputer R1100 series, other products are not applicable!

5.2 Support

Quick start guide:

https://wiki.seeedstudio.com/recomputer_r/

Tech support email:

If you encounter any issues while deploying or testing, please don't hesitate to contact our technical support team at techsupport@seeed.io, or refer to our online knowledge base, https://wiki.seeedstudio.com.

Customized service email:

For further information about customizations, welcome you to directly reach out at edge@seeed.cc, we will provide prompt reply.

Discord:

Discord community:

Welcome to join our official community, where you can exchange product-related questions and get relevant support.

https://discord.seeed.cc