

AI Computing Server SE5

User Guide

File Version V1.1

Release Date 2020.09.01

Preface

Summary

This file is about the product features, specifications, system architecture, application scenarios, installation configuration, etc. of the AI computing box SE5 (hereinafter referred to as SE5).





Target Readers

This document is mainly targeted to the following personnel:

- Enterprise administrators and users;
- Enterprise developers and pre-sales personnel.

Signs

The meanings of these signs are as follows:

Sign	Name	Description
	Danger	Indicates a highly dangerous situation that, if not avoided, may result in death or serious injury.
	Warning	Indicates a potentially dangerous situation that, if not avoided, may result in death or serious injury.
	Precaution	Indicates a potentially hazardous situation that, if not avoided, may lead to equipment damage, data loss, performance degradation or unpredictable results.
	Description	For important or key information. Not safety warnings.

Revisions

File Version	Release Date	Corresponding Hardware	Description
V1.0	2020-07-09	SE5021x Series SE5121x Series	First official release.
V1.1	2020-09-01	SE5022x Series SE5122x Series	File update for new hardware version.

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1 Safety

1.1 General Safety

Instruction

When operating and installing the equipment, please pay attention to the equipment identifications and safety precautions described in the manual.

The “Danger”, “Warning” and “Precautions” mentioned in the manual are only supplements to safety matters and do not represent all possible situations.

Installation requirements

The personnel who operate, install and maintain the equipment must understand all safety precautions and master correct operations. The installation requirements are as follows:

- Equipment operation, installation and maintenance must be done by trained personnel.
- Equipment maintenance must be done by authorized personnel of our company.
- Equipment components replacement must be done by authorized personnel of our company.
- The operator shall contact our company in time in case of equipment failure and abnormality when installing.

Grounding Requirements

- The grounding operation shall be completed before equipment installation. The ground wire shall be removed after the removal of the equipment.
- It is forbidden to carry out any operation on the equipment when it is not grounded or poorly grounded.
- Please check the grounding before operating the equipment to ensure it is well grounded.

Personal Safety

- Please wear anti-static clothes, gloves and wristbands for equipment installation and operation. Please remove conductive ornaments to avoid short circuit and electric shock damage.
- It is strictly prohibited to operate and install equipment in dangerous environment, such as thunderstorm weather, flammable environment, etc.

Equipment Safety

- Ensure that the equipment is firm and reliable under any installation mode, such as installation on table, wall or bracket.

- Ensure that the equipment is well grounded before startup. Remove the ground wire after shutdown of SE5.
- Anti-static gloves are required for maintenance window operation. Please use a screwdriver to remove or install the maintenance window cover.
- It is strictly prohibited to cover or block the ventilation panel of the equipment.
- It is strictly prohibited to remove the sealant plug, such as the antenna rubber plug.
- The equipment needs to be grounded with a three-core power cord.

1.2 Electrical Safety

Harsh Environment

- It is strictly prohibited to operate the equipment with AC in thunderstorm weather for fear of fatal danger.
- It is strictly prohibited to carry out outdoor equipment operations in thunderstorm weather for fear of fatal danger.
- It is strictly prohibited to operate nonstandard under high-voltage power supply for fear of fatal danger.

Equipment Power Supply




- It is strictly prohibited to remove the power cord when the equipment is powered on for fear of physical injury caused by electric sparks.
- Turn off the power switch before removing the power cord.
- Before connecting the power cord to the equipment, make sure the positive and negative electrodes are placed correctly.
- Ensure that the connection is firm after the equipment power cord is connected to the equipment.

Static Electricity

- Electrostatic discharge shall be carried out before equipment operation so as to prevent static electricity generated by human friction and movement.
- Wear an anti-static wristband and ground its terminal before touching and holding the device.

1.3 Equipment Sign

Equipment safety signs are as follows:

Sign	Name	Description
	High Temperature	This sign indicates that the surface temperature is high. Do not directly touch the equipment shell without wearing protecting gloves.
	Static Electricity	This sign indicates that this area is an electrostatic sensitive area. Do not touch the equipment directly. Please wear anti-static gloves or wristbands when operating in this area.
	Grounding	This sign indicates that the equipment needs external grounding. Connect the equipment with the grounding point of the cabinet or workbench through the protective ground wire to ensure its normal operation.

2 Product Introduction

2.1 Product Overview

AI computing box SE5 is an edge computing product with high performance and low power consumption. Equipped with self-developed TPU chip BM1684, its INT8 computing power ups to 17.6TOPS. It can process 16-channel HD video at the same time and support 38-channel 1080P HD video hardware decoding and 2-channel encoding. As an edge computing device supporting wide temperature and multiple interfaces, SE5 can be flexibly applied in a variety of scenarios such as intelligent security, traffic, industrial park and retailing. It supports diversified algorithms with an aim to realize facial control, video structured analysis and commodity recognition and enable AI for traditional industries.

2.2 Product Features

Ultra-high Computing and Codec Capability

- Support up to 17.6T@INT8 peak computing power or 2.2T@FP32 high-accuracy computing power.
- Support up to 16-channel 1080P HD video whole processing.
- Support 38-channel 1080P HD video hardware decoding and 2-channel encoding.

Rich Interfaces and Flexible Deployment

- Rich interfaces: USB, HDMI, RS-485, RS-232, SATA, custom I/O, etc.
- Support - 20 °C to + 60 °C wide temperature working environment.
- Supports IP40 protection level and fanless heat dissipation (for specific models).
- Optional SATA storage and 2TB storage capacity (for specific models).
- Optional support for LTE wireless return (for specific models).

High Reliability and Encrypted Protection

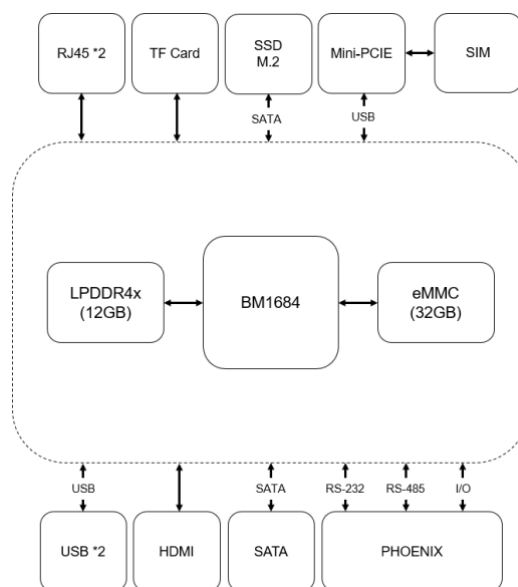
- Support primary and backup partition for development with eMMC storage.
- Support abnormality warning and protection.
- Support programmable encryption chips for privacy protection.

Easy-to-Use Tool Chain for Flexible Development

- BM1684 BMNNSDK2 integrated deep learning development kit.
- Support Caffe/TF/Pytorch/Mxnet/Paddle.
- Support mainstream models and custom operators.
- Support Dockerizing and rapid algorithm deployment.

2.3 System Framework

The system framework of SE5 is shown in Figure 2-1:



2-1 SE5 System Framework

2.4 Application Scenario

SE5 has a wide range of application scenarios, including but not limited to the following. See in Figure 2-2 for typical architecture:

- Intelligent Security: dynamic and static comparison and recognition, structured video analysis, trace analysis;
- Intelligent Traffic: checkpoint monitoring, road occupation snapping, comprehensive monitoring and intelligent parking;
- Intelligent Industrial Park: attendance management, access control, improvement based on the old equipment;
- Intelligent Retailing: bread, beverage and dish identification, visual unmanned container, senseless payment.

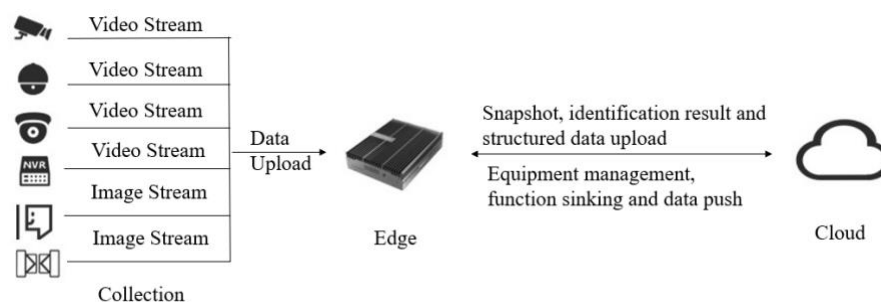


Figure 2-2 SE5 Typical Architecture

3 Specification

3.1 Technical Specification

3-1 SE5 Technical Specification

Specifications			Standard SE50 Series	Basic SE51 Series
Technical Specification	Chip	TPU	BM1684	
		CPU	8 Core A53@2.3GHz	
	Computing Capacity	INT8	17.6 TOPS	
		FP32	2.2 TFLOPS	
	Video/Image Codec	Video Decoding Capacity	1080P @960fps	
		Video Decoding Format	H.264 / H.265	
		Video Decoding Resolution	4K / 8K (Semi real time)	
		Video Encoding Capacity	1080P @50fps	
		Image Decoding Capacity	1080P 480 pages/second	
	Memory and Storage	Memory	12 GB	
		eMMC	32 GB	
	External Interface	Internet Interface	10/100/1000Mbps *2	
		USB	USB3.0 *2	N/A
		Storage	MicroSD *1	
		Display	HDMI *1	N/A
		Phoenix Terminal	RS-232 *1 / RS-485 *1 /Custom I/O	
	Extended Storage	Hard Disk	2 TB (Optional)	N/A
	Wireless Function (Optional)	LTE Wireless	Mini-PCIE 4G Module	
		Antenna	SMA Female *2	
		SIM	Standard SIM Slot	
Physical Specification	Size	Length*Width*Height	188mm*148mm*44.5mm	
	Power Supply and Consumption	Power Supply	DC 12V	
		Typical Power Consumption	≤23.5W	≤19W
Note: The hard disk and wireless functions are optional, not standard. The typical power consumption does not include the power consumption of hard disk and wireless module.				



3.2 Environment Specification

3-2 SE5 Environment Specification

Specification	Standard SE50 Series	Basic SE51 Series
Working Temperature	<ul style="list-style-type: none"> -20°C ~ +60°C (with wind) -20°C ~ +55°C (without wind) 	<ul style="list-style-type: none"> -20°C ~ +55°C (with wind) -20°C ~ +50°C (without wind)
Storage Temperature	-40°C ~ +70°C	
Working Humidity	10% ~ 90%, No condensation	
Storage Humidity	10% ~ 90%, No condensation	
Altitude	<3000m. 900m ~ 3000m, the maximum temperature specification decreases by 1 ° C every 300m above sea level.	
Heat Dissipation Mode	active dissipation with fan	negative dissipation without fan
Protection Level	IP30	IP40
Note: Working temperature is the temperature without optional functions.		



3.3 Power Specification

3-3 SE5 Power Specification

Specification	Standard SE50 Series	Basic SE51 Series
Input (AC)	Rated Input Range: 100V AC~240V AC; 50Hz; 2A Maximum Input Range: 90V AC~264V AC	
Output (DC)	Rated Output Voltage: 12V DC Rated Output Current: 5A	
Note: The above is the specification of standard power supply when the working temperature is lower than 40 °C. If the working temperature is higher than 40 °C and lower than 60 °C, we recommend you to use industrial power supply. Please contact our sales personnel for specific recommended models.		

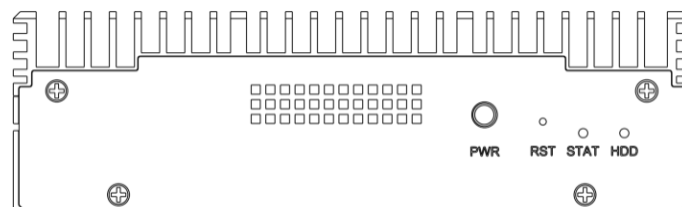


4 Operation and Installation

4.1 Panel Description

4.1.1 Mainframe Front Panel

SE5 Mainframe front panel is described as follow:



4-1 SE5 Mainframe Front Panel Description

Silkscreen Printing	Name	Description
PWR	Power Signal /Switch	<p>Power Signal:</p> <ul style="list-style-type: none"> Green (On): Indicates the system is powered on; Green (Blink): Indicates the system is powering off; Off: Indicates the system is powered off. <p>Power Switch:</p> <ul style="list-style-type: none"> When the system is powered on, press the button for 2 seconds, the system will automatically start to power off; When the system is powered on, press the button for 5 seconds, the system will compulsorily start to power off; When the system is powered off, press the button once, the system will automatically start to power on.
RST	Restart	<ul style="list-style-type: none"> Press the button once to reset the whole system; Press the button for 12 seconds to start the file recovery system.
STAT	Status Signal	<p>Red (On) when powering on. Green (On) when loading to normal status. Description as follows:</p> <ul style="list-style-type: none"> Green (On): The system is in normal operation; Red (On): The system is powering on or the equipment does not enter the system; Red (Blink): System alarm. <p>If the equipment is upgrading, the description is as follows:</p> <ul style="list-style-type: none"> Red (On): system upgrading; Green (Blink): successful upgrade; Off (On to Off): failed upgrade.
HDD	Hard Disk Status LED	<ul style="list-style-type: none"> Green (On): Indicates the HDD is normally operating; Green (Blink): Indicates accessing the HDD; N/A (Off): Indicates no HDD access or HDD error.

4.1.2 Rear Panel

The illustration and description of SE5 rear panel are as follows:

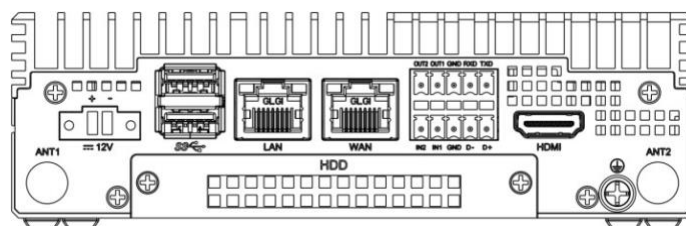
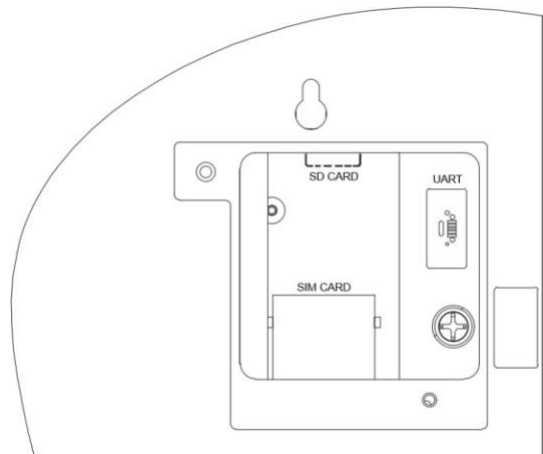


Table 4-2 SE5 Rear Panel Description

Silkscreen Printing	Name	Description
≡ 12V	Power Interface	2-PIN (self-locked) phoenix terminal power interface, anti-reverse plug, connected to the 2-PIN terminal power supply equipped with the mainframe.
SS	USB Interface	USB3.0 Type-A, 2 USB interfaces.
LAN	LAN Interface	LAN gigabit interface.
WAN	WAN Interface	WAN gigabit interface.
HDD	Hard Disk	Users can install 2.5-inch SATA hard disk
HDMI	HDMI Interface	Video output display, connected to the display through HDMI HD cable.
	Grounding Terminal	It is used for the grounding of the mainframe. The equipment is connected to the grounding point of the cabinet or workbench through the protective ground wire. M3 screw is required.
TXD	RS232 Sending Signal	RS232 sending signal. Equipped with RXD signal.
RXD	RS232 Receiving Signal	RS232 receiving signal. Equipped with TXD signal.
D+	RS485 Positive Pole	RS485 positive pole. Equipped with D-signal.
D-	RS485 Negative Pole	RS485 negative pole. Equipped with D+signal.
IN1	I/O1 Input	GPIO1 input. It can be used as alarm input.
OUT1	I/O1 Output	GPIO1 output. It can be used as alarm output.
IN2	I/O2 Input	GPIO2 input. It can be used as alarm input.
OUT2	I/O2 Output	GPIO2 output. It can be used as alarm output.
GND	Grounding Signal	Phoenix terminal grounding signal.
ANT1	Antenna 1	(Optional) SMA Female interface 1. It can be externally connected to SMA rod antenna.
ANT2	Antenna 2	(Optional) SMA Female interface 2. It can be externally connected to SMA rod antenna.
Note: Hard disk and wireless functions are optional, not standard; HDMI interface can only be displayed under the pre-installed SE5 face algorithm software. Devices that are not pre-installed with the software need to be supported by the user's own program.		

4.1.3 The Interior of Maintenance Window

SE5 mainframe maintenance window is described as follows:



4-3 SE5 Mainframe Maintenance Window Description

Interface / Pin	Name	Description
SD CARD	SD CARD Interface	It is used for SD card version upgrade or data storage. The rate mode is SDR104 and the maximum capacity is 2TB.
SIM CARD	SIM CARD Interface	It is used for LTE equipment authentication and configured with LTE wireless module.
UART	MicroUSB Serial Port	It is used for serial port debugging.

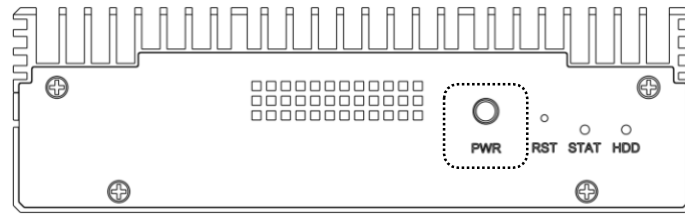
4.2 Equipment Operation

4.2.1 Power Off

SE5 supports the following two ways of powering off.

1. Press the power switch button

- **Step 1** Press the power switch on the front panel (as shown in the dotted box below) for 5 seconds.



- **Step 2** Observe the power indicator (green). If it is off, SE5 is powered off successfully.
- **The End**

2. Cut the power cable

- **Step 1** Unplug the power cable to power off SE5.
- **Step 2** Observe the power indicator (green). If it is off, SE5 is powered off successfully.
- **The End**

4.2.2 Power On

SE5 supports the following two ways of powering on.

1. Press the power switch button

- **Step 1** Press the power switch on the front panel for 2 seconds to power on.
- **Step 2** Observe the power indicator. If it turns green, SE5 is powered on successfully.
- **The End**

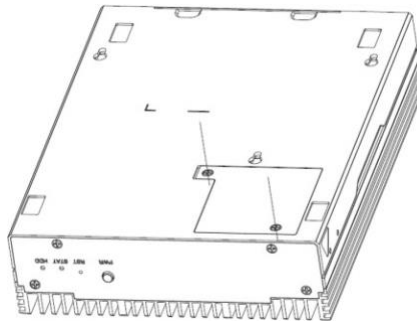
2. Connect the power cable

- **Step 1** Connect the power cable to power on SE5.
- **Step 2** Observe the power indicator. If it turns green, SE5 is powered on successfully.
- **The End**

4.2.3 Maintenance Window Operation

(Optional) The Removal of Maintenance Window Cover

- **Step 1** Power off SE5.
- **Step 2** Remove the power cable of SE5.
- **Step 3** Place SE5 on the anti-static radio station with the back upward.
- **Step 4** Unscrew 2 fixing screws (screw model M2.5x6) of the maintenance window cover plate with a screwdriver.
- **Step 5** Lift the maintenance window cover (from the groove) and take it out.
- **The End**



(Optional) Installation of Maintenance Window Cover

- **Step 1** Place SE5 on the anti-static radio station with the back upward.
- **Step 2** Align the maintenance window cover plate with the hole.
- **Step 3** Tighten the two fixing screws of the maintenance window cover plate with a screwdriver (the recommended tightening torque is $0.6\text{N} \cdot \text{m}$).
- **Step 4** Install the power cable of SE5.
- **Step 5** Power on SE5.
- **The End**

4.3 Installation Requirements

Table 4-4 SE5 Installation Requirements

Category	Item	Description
Environment	Ventilation	<ul style="list-style-type: none"> Ensure good air circulation. Leave appropriate heat dissipation space around the equipment. It is strictly prohibited to place the equipment near heat sources (such as electric heaters).
	Dustproof	<ul style="list-style-type: none"> The outdoor installation environment (such as monitoring equipment box and light pole box) must reach IP55 protection level.
	Moisture-proof	<ul style="list-style-type: none"> It is strictly prohibited to place the equipment near the water source (such as water room). It is strictly prohibited to operate the equipment in the environment of condensation, water seepage, etc.
	Electromagnetic Requirement	<ul style="list-style-type: none"> Keep away from the grounding device of the power system and do not reuse it. Keep away from high-frequency and high current equipment such as high-power radio and radar. In strong electromagnetic environment, it is recommended to use electromagnetic shielding to protect the equipment.
Applied Sites	Qualified places	<ul style="list-style-type: none"> Machine room, airtight air conditioning room, air conditioning cabinet. Corridor, underground garage, venue, non-open platform.
	Unqualified places	<ul style="list-style-type: none"> Outdoor marine surrounding environment (such as offshore, open sea and underwater).
	Cabinet	<ul style="list-style-type: none"> Standard 19-inch cabinet (with grounding, ventilation and <u>heat dissipation conditions</u>).

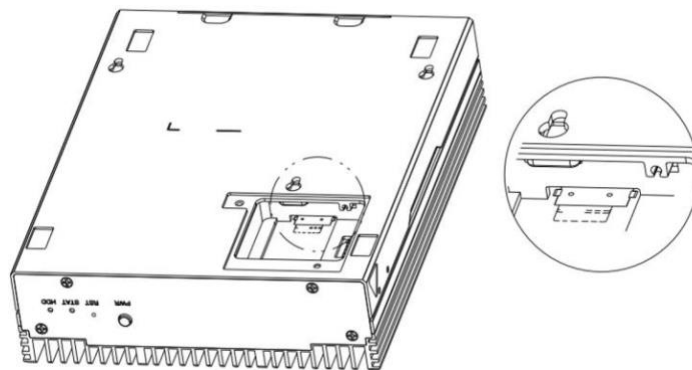
Space	Box	The box environment with IP55 protection level, good ventilation and heat dissipation conditions.
Security	Antistatic Requirement	<ul style="list-style-type: none">• Ensure that the equipment is well grounded.• Users shall wear anti-static clothes, gloves or waistbands when operating the equipment.

4.4 Optional Installation

4.4.1 MicroSD Card Installation

Operation Steps

- **Step 1** Power off SE5.
- **Step 2** Remove the power cable of SE5.
- **Step 3** Place SE5 on the anti-static station with the back upward.
- **Step 4** Unscrew the two fixing screws of the maintenance window cover plate with a screwdriver and place them properly. Remove the maintenance window cover plate.
- **Step 5** Insert MicroSD card into the slot.
- **Step 6** Install the maintenance window cover plate and tighten the two fixing screws with a screwdriver.
- **Step 7** Connect the SE5 power cable and power on.
- **The End.**



4.4.2 SIM Card Installation (Functional)

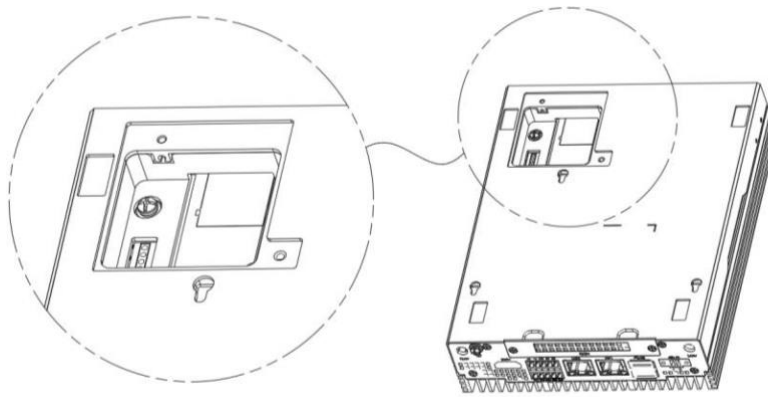
Description

- The wireless function is optional and supported by a separate product series. Please contact our sales personnel for details.
- SIM card is a non-standard accessory which needs to be purchased by the user.

Steps

- **Step 1** Power off SE5.
- **Step 2** Remove the power cable of SE5.
- **Step 3** Place SE5 on the anti-static station with the back up.
- **Step 4** Unscrew the two fixing screws of the maintenance window cover plate with a

screwdriver and place them properly. Remove the maintenance window cover plate.



- **Step 5** Insert SIM card into the slot.
- **Step 6** Install the maintenance window cover plate and tighten the two fixing screws with a screwdriver.
- **Step 7** Connect the SE5 power cable and power on.
- **The End**

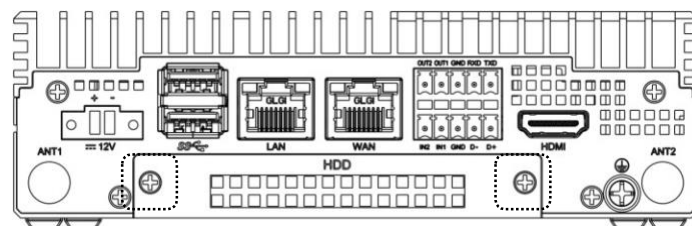
4.4.3 Hard Disk Installation (Optional)

Description

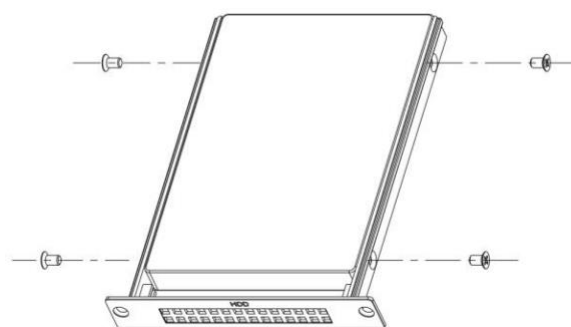
- The hard disk function is optional. It supports 2.5-inch 7mm high SATA or SSD hard disk.
- The supporting capacity of hard disk is no more than 2TB. Hard disk is a non-standard accessory and needs to be purchased by users according to their needs.

Steps

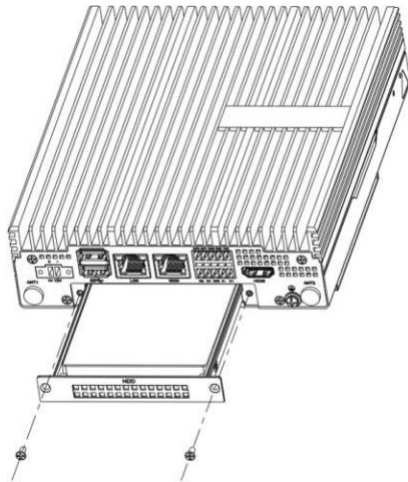
- **Step 1** Power off SE5.
- **Step 2** Remove the power cable of SE5.
- **Step 3** Put SE5 on the anti-static station, unscrew the screws on both sides of the hard disk bin with a cross screwdriver (as shown in the dotted box below) and place it properly. Open the hard disk bin.



- **Step 4** Place the hard disk device label upward. Fasten four M3 screws on both sides of the hard disk holder.



- **Step 5** Insert the fixed hard disk holder into the hard disk bin and tighten it with two fixing screws.



- **Step 6** Connect the power cable and power on SE5.
- **The End**

4.5 Equipment Installation

4.5.1 Desk Installation



Precaution

- Ensure that the equipment is well grounded.
- Ensure that the desk is stable and the ventilation and heat dissipation environment is good.
- It is forbidden to cover the air outlet or shell surface of SE5 panel.

Steps

- **Step 1** Place SE5 on the desk.
- **Step 2** Connect external cables, see in 4.6 External Cables.
- **Step 3** Power on SE5, see in 4.2.2 Power On
- **The End**

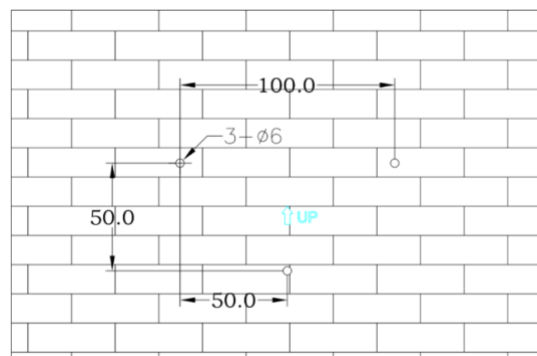
4.5.2 Wall Installation

Description

- The accessories package includes 3 self-tapping screws and 3 expansion hoses for fixing the wall bracket.
- Ensure that the selected perforated wall has a thickness of more than 50cm and a bearing capacity of more than 10kg.
- Ensure that the installed bracket is parallel to the ground without skewing.

Steps

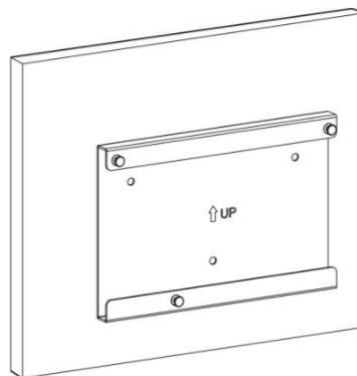
- **Step 1** Use your electric tools to drill holes on the wall according to the distance shown in the figure below.



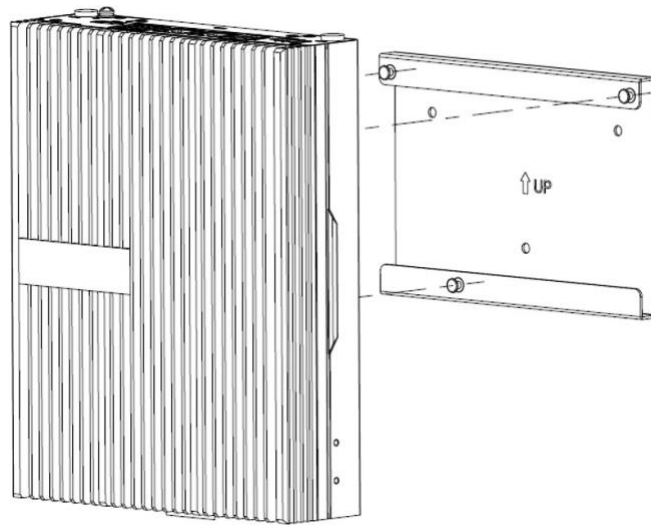
- **Step 2** Use your hammer to knock the three expansion hoses in the accessory bag into the hole.



- **Step 3** Fasten the bracket on the wall with 3 self-tapping screws in the accessories package.



- **Step 4** Hang the SE5 host into the nail on the bracket.



- **Step 5** Connect the external cable, see in 4.6 External Cable.
- **Step 6** Power on SE5, see in 4.2.2 Power On.
- **The End**

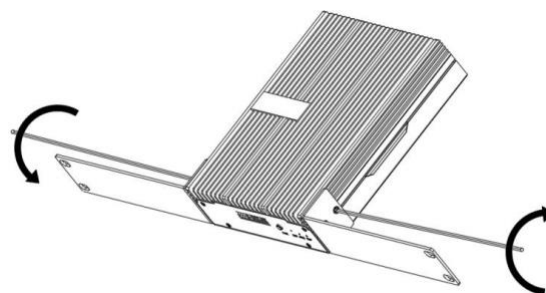
4.5.3 Cabinet Installation

Description

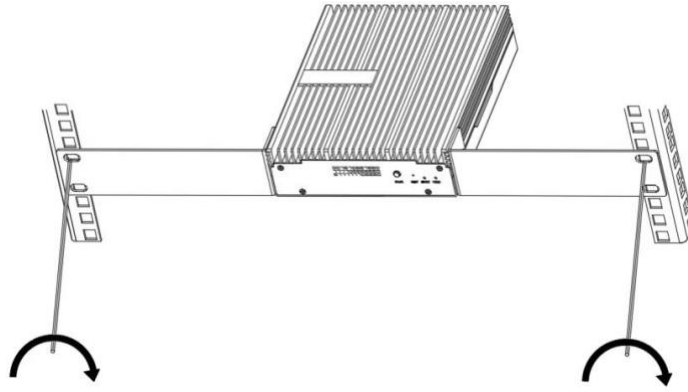
- The installation of cabinet requires the installation of hanging ears on both sides of the equipment. The hanging ears are non-standard accessories. Please contact our sales personnel for assistance.
- M6 screw with spring washer is required to fix the 19-inch vertical support. Please contact our sales personnel for assistance.
- Ensure good ventilation and heat dissipation of the equipment. Leave a heat dissipation space no less than one equipment height in the vertical direction.

Steps

- **Step 1** Align the lug with the threaded holes on both sides of the SE5 host, and fasten the M3 countersunk screw with a screwdriver.



- **Step 2** Thread the M6 screw with spring washer through the SE5 lug and the vertical support hole of the 19-inch cabinet and fasten it with the nut.



- **Step 3** Connect external cable, see in 4.6 External Cable.
- **Step 4** Power on SE5, see in 4.2.2 Power On.
- **The End**

4.6 External Cable

4.6.1 Grounding Cable



Precaution

- In order to avoid damage to equipment caused by lightning strike and interference, SE5 needs to be grounded through grounding cable.
- It is forbidden to power on SE5 before grounding.

Preparation

- Tools: Antistatic band, cross screwdriver, multimeter.
- Auxiliary materials: grounding cable, M3 screw (prepared by the user).

Steps

- **Step 1** Wear an antistatic band or wristband.
- **Step 2** Unscrew the M3 screw of the grounding terminal located on the right side of the interface panel with a cross screwdriver and place it properly.
- **Step 3** Fix one end (conductor) of the grounding cable on the grounding terminal through M3 screw.



- **Step 4** Connect the other end of the grounding cable to the grounding terminal connecting the earth (such as wall, etc.).
- **Step 5** Check the grounding point, adjust the multimeter to the ohm gear, and measure that the resistance between the grounding point and the grounding terminal is less than 5 Ω .
- **The End**

4.6.2 Ethernet Cable

Preparations

- Tools: anti-static waistband.
- Auxiliary materials: Category 5E cable. It is recommended to use shielded twisted pair cable.

Steps

- **Step 1** Put on anti-static waistband.
- **Step 2** Connect one end of the network cable to SE5 network port and the other end to the other equipment's network port.
- **The End**

4.6.3 Phoenix Terminal



Description

- The SE5 accessory package contains two 5-PIN single row Phoenix terminals for user-made cables.
- Please strictly follow the signal arrangement sequence of the screen printing on the equipment panel for self-developed cable sequence. See in 4.1.2 Rear Panel.

Steps

- **Step 1** Put on anti-static waistband.
- **Step 2** Connect one end of the phoenix terminal to SE5 phoenix terminal port and the other end to the other equipment's phoenix terminal port.
- **The End**

4.6.4 Power Cable

Precaution

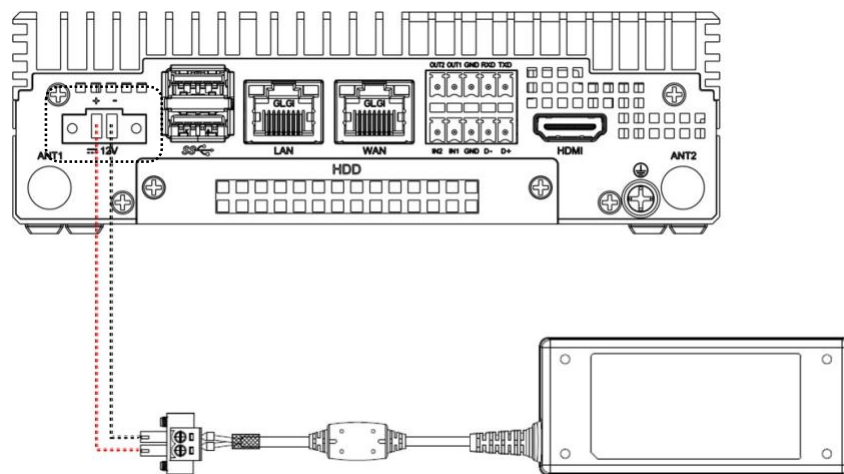
- It is recommended to use the supporting adapter to power SE5.
- SE5 power adapter only works under 40 °C. If the working temperature is higher than 40 °C and lower than 60 °C, it is recommended to use industrial power supply with working temperature higher than 60 °C. Please contact our sales personnel for specific models.
- It is forbidden to power SE5 before finishing connection between SE5 and the power cable.

Preparation

- Tools: Antistatic bracelet or wristband, slotted screwdriver
- Auxiliary materials: SE5 power adapter.

Steps

- **Step 1** Put on anti-static waistband.
- **Step 2** Insert the power cable of the power adapter into the 2-PIN power terminal (as shown in the dotted box below). Use a slotted screwdriver to tighten the slotted screws on both sides of the phoenix terminal.



- **Step 3** Connect the three-phase AC connector of the power adapter to the 220V AC power supply system.
- **The End**

4.6.5 HDMI Cable (Optional)

Description

- HDMI display is only supported on SE5 devices with preset LiteOs background management system. See in **5.6 LiteOs Background Management System** for more details.
- Users who want to customize the development of application software need to develop HDMI software applications by themselves.
- HDMI HD video cable is a non-standard auxiliary material, which shall be purchased by users.

Steps

- **Step 1** Put on an antistatic bracelet or wristband.
- **Step 2** Plug one end of the HDMI HD video cable into the HDMI connector on the rear panel of SE5, and the other end into the display with HDMI interface.
- **The End**

4.6.6 LTE Antenna (Optional)

Description

- The wireless function is optional and supported by a separate product series. Please contact our sales personnel for details.
- LTE antenna is a non-standard accessory. For the product series supporting wireless function, LTE antenna is supplied as standard.
- LTE antenna is vertically polarized. It is recommended that the equipment be placed vertically when placed on the table and parallel to the equipment when hanging on the wall.

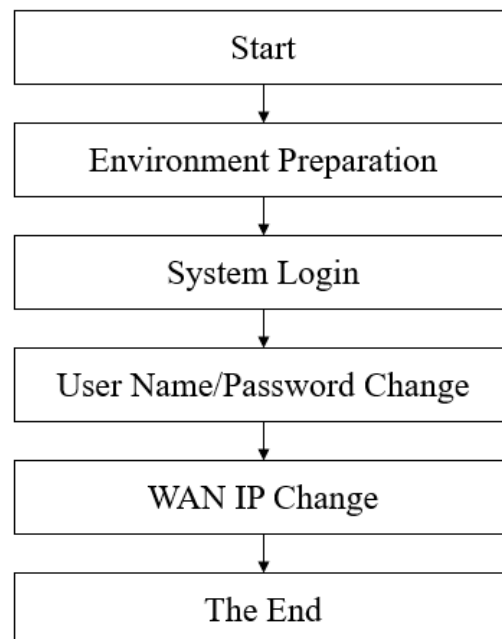
Steps

- **Step 1** Put on an antistatic bracelet or wristband.
- **Step 2** Fasten the LTE antenna to the SMA connectors on both sides of the SE5 rear panel.
- **Step 3** Bend the LTE antenna vertically (if the equipment is placed on the table) or parallel to the equipment (if the equipment is placed on the wall).
- **The End**

5 Initial Configuration

5.1 Configuration Process

SE5 needs to be pre-installed with LiteOs background management system. It is recommended that users log in to the LiteOs system through Google Chrome to complete login and configuration. The process is shown in the figure below:



Environment Preparation

- Set Google Chrome as default.
- (Optional) Use HDMI cable to connect SE5 to the monitor.

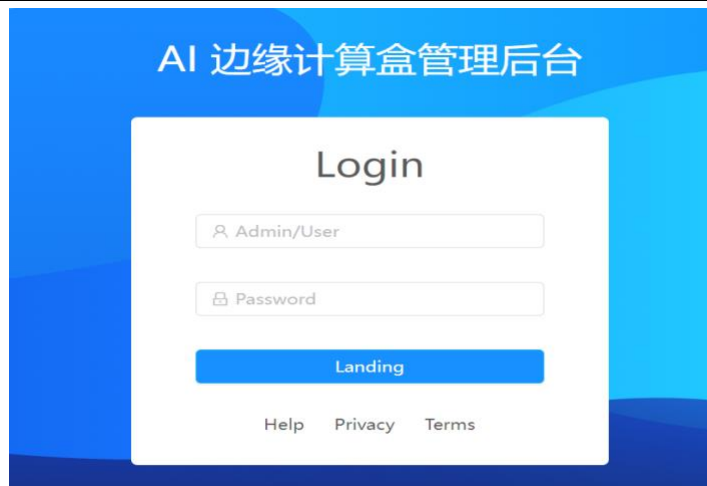
5.2 System Login

Description

- By default, log in to the LiteOs system through the LAN port. The WAN port is used for service transmission.
- LAN: Static IP by default for the login of LiteOs system. The IP address is 192.168.150.1.
- WAN: DHCP to obtain IP dynamically by default. It can be set as static IP after logging in to LiteOs as needed.
- After obtaining the WAN port IP, users can also use the WAN port IP address to log in.

Steps

- **Step 1** Ensure the LAN interface has been connected.
- **Step 2** Click Chrome browser and type in “https://192.168.150.1”.



- **Step 3** Default user name: admin; Default password: admin
- **Step 4** Click “Landing”.
- **The End**

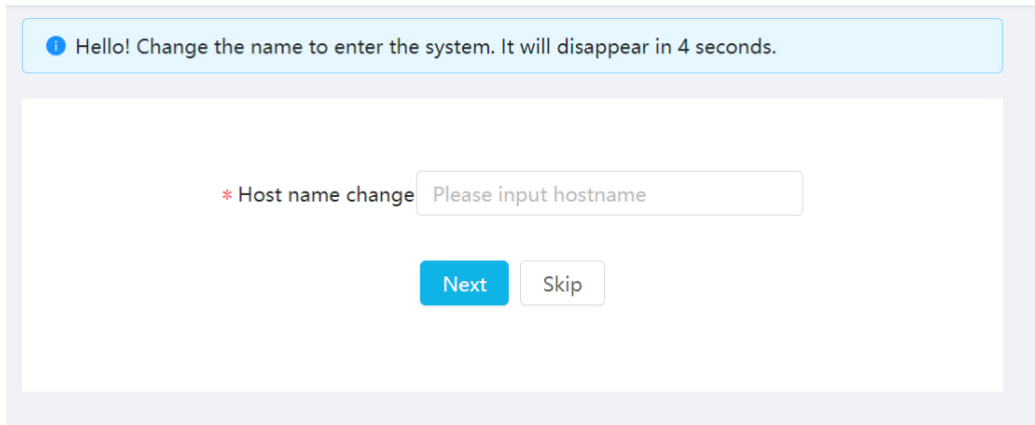
5.3 Initial Configuration Guidance

Description

- Users who log in to the system for the first time need to set "host name" and "working mode" through configuration guidance.
- The LAN IP address (192.168.150.1) is a static IP enforced by the LiteOs system and cannot be modified.
- The “management platform mode” in the “working mode” is used for the connection between LiteOs system and third-party system or business consoles.

Steps

- **Step 1** Land the LiteOS system. Set “Host name change” and click NEXT.



- **Step 2** Set “Installation IP site_LAN”. Because the static IP Address cannot be modified, click NEXT directly.

Installation IP site_LAN

Connection type: Static IP Address ▾

Ip Address: 192.168.150.1

Subnet Mask: 255.255.255.0

Gateway:

DNS: 192.168.150.1

Current network speed 100Mb/s (Recommended network speed 1000Mb/s)

Next Back

- **Step 3** Set “Installation IP site_WAN” and select “Connection type” as “Dynamic IP Address” or “Static IP Address”; If “Dynamic IP Address” is selected, click NEXT; If “Static IP Address” is selected, fill in “IP address”, “Subnet Mask”, “Gateway” and “DNS” and click NEXT.

Installation IP site_WAN

Connection type: Dynamic IP Address ▾

Ip Address: 192.168.1.103

Subnet Mask: 255.255.255.0

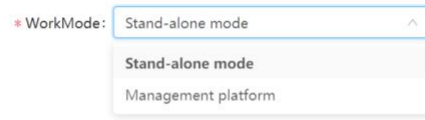
Gateway: 192.168.1.1

DNS:

Current network speed 100Mb/s (Recommended network speed 1000Mb/s)

Next Back

- **Step 4** Select “WorkMode” as “Stand-alone mode”, and click NEXT to complete the initial configuration guidance.



-
- **The End**

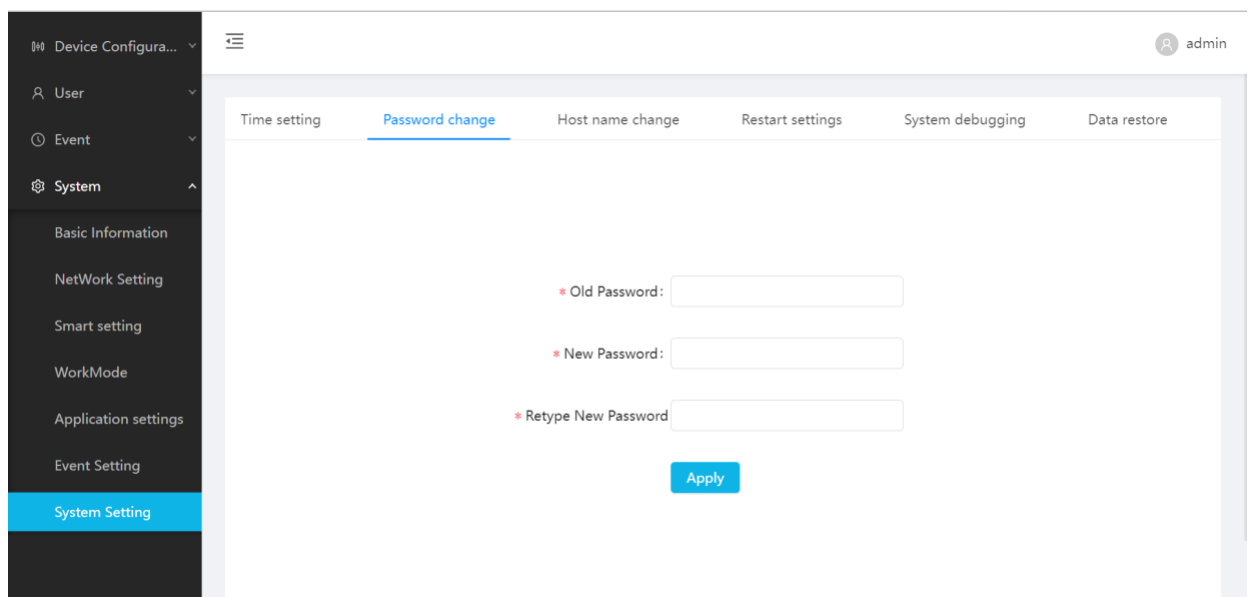
5.4 User Name / Password Change

Description

In consideration of user security, it is recommended that users change their user name and password in time.

Steps

- **Step 1** Log in to LiteOS system.
- **Step 2** Select “System Setting>Password change” to enter the password change interface.



The screenshot shows the LiteOS system settings interface. On the left is a dark sidebar menu with options: Device Configuration, User, Event, System, Basic Information, NetWork Setting, Smart setting, WorkMode, Application settings, Event Setting, and System Setting (highlighted in blue). The main content area has tabs: Time setting, Password change (active), Host name change, Restart settings, System debugging, and Data restore. Under the 'Password change' tab, there are three input fields labeled 'Old Password:', 'New Password:', and 'Retype New Password:', each with a red asterisk indicating a required field. Below these fields is a blue 'Apply' button. The top right corner shows a user profile icon and the name 'admin'.

- **Step 3** Type in “Old Password”, “New Password”, “Retype New Password”, and click “Apply”.
- **The End**

5.5 WAN IP Change and Access

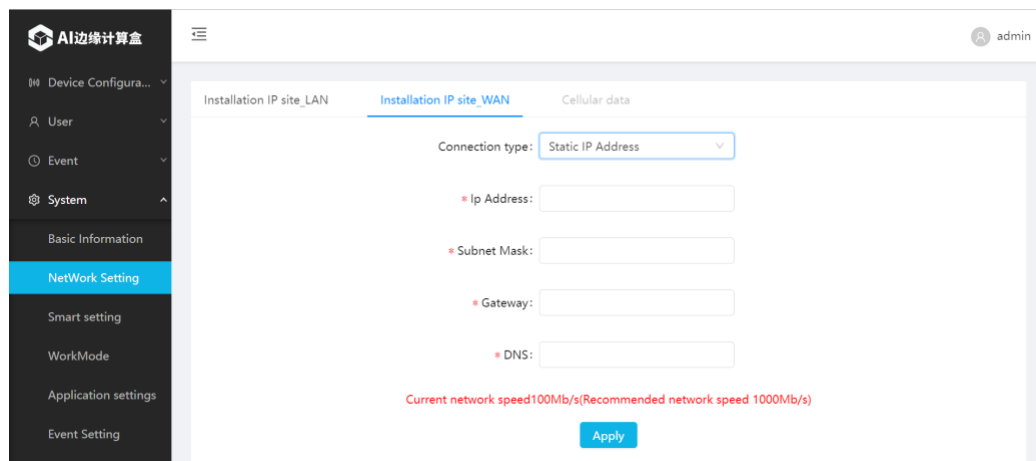
5.5.1 WAN IP Change

Description

- Users can change the WAN IP according to the network IP allocation scheme where SE5 is located or the established IP address. Restart to takes effect.

Steps

- **Step 1** Land the LiteOS system.
- **Step 2** Select “System > Network Setting” and click “Installation IP site_WAN”.



- **Step 3** Select “Connection type” as “Static IP Address”.
- **Step 4** Set “IP address”, “Subnet Mask”, “Gateway” and “DNS”, and click “Apply”.
- **The End**

5.5.2 WAN IP Access

Description

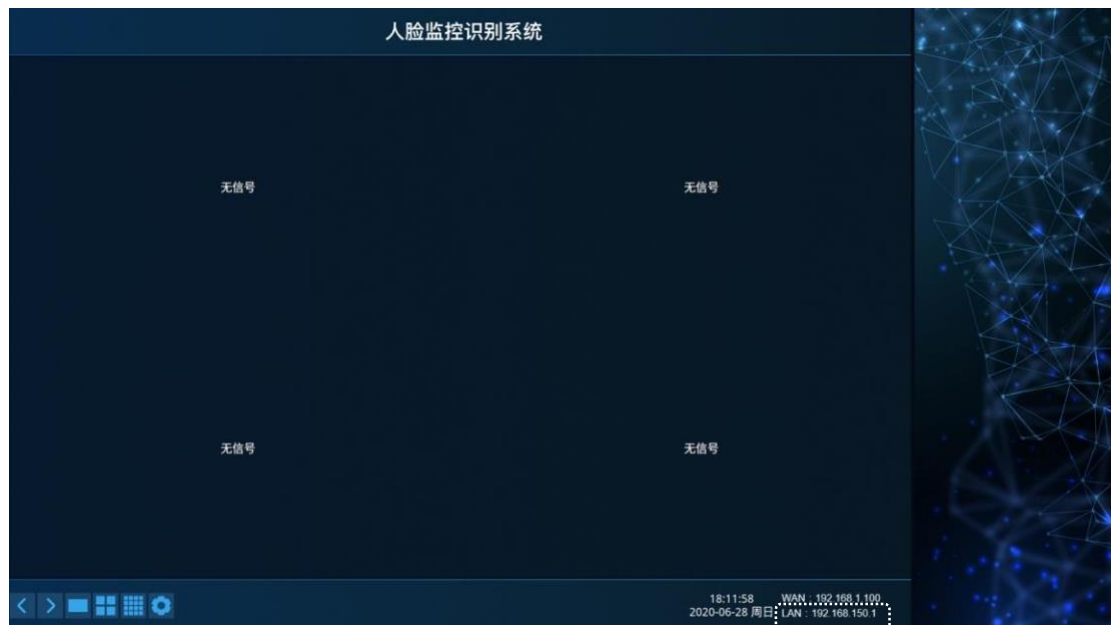
- There are three ways to obtain Wan IP address, namely, LiteOs system view, HDMI view and IP Scanner.
- If users develop their own application software, they cannot view the IP address through LiteOs system and HDMI.

1 LiteOS System View

- **Step 1** Land the LiteOs system and check “system > device information” or “system > Network Settings” to obtain the IP address
- **The End**

2 HDMI View

- **Step 1** Use the HDMI cable to connect the SE5 to the monitor.
- **Step 2** Observe the “WAN” in the lower right corner of the screen (as shown in the dotted box below) to obtain the IP address.



- The End

3 IP Scanner

- **Step 1** Download and install IP Scanner on “<https://www.advanced-ip-scanner.com/cn/>”.
- **Step 2** Confirm the IP address of SE5 through the manufacturer “XXXXXX Technologies Inc”.
- The End



5.6 LiteOS Background Management System

LiteOs background management system is mainly used for equipment management of SE5. Users can obtain equipment information and upgrade configuration through LiteOs system. Together with the face algorithm charging suite, it supports 16-channel HD video streams whole face processing. It also supports the adaptation and integration of third-party business platforms. The system is oriented to face detection, recognition and comparison in intelligent industrial park, community and retailing.

Description

- SE5 is preset with LiteOs background management system. Users can configure the equipment accordingly.
- In addition to device management, the preset face algorithm related functions of LiteOs system do not support commercial use. They are for reference only.
- Users in need of face algorithm function can contact our salesperson for business quotation and purchase the commercial version.

Basic functions

- Equipment information query.
- Equipment status query.
- Network configuration.
- Time synchronization configuration.
- Firmware upgrade, etc.

Features of Face Algorithm Charging Suite

- Support face detection, tracking, recognition, feature detection and other algorithms.
- Support the whole process of face recognition of 16-channel dynamic video stream or 32-channel image stream.
- Support the mixed use of IPC, face capture machine, face gate, access control machine and other types of acquisition equipment.
- Support the millisecond reaction speed under the large base library scale with the recognition time of less than 0.5 seconds.
- Support stand-alone and management platform modes, which can be adapted and integrated by third-party business platforms.
- Support automatic database building by strangers and self-optimization and update of the bottom database, which can complete synchronization between designated networked SE5.
- Support database access control.

6 Software Deployment

6.1 System Upgrade

Description

- It is recommended to use MicroSD card to upgrade SE5. Please contact us to get the latest version required.
- Please select “FAT32” or “EXT4” for the type of formatted file system and ensure a partition.
- The entire process will last 15 to 20 minutes.

Steps

- **Step 1** Wear an antistatic waistband.
- **Step 2** Prepare a MicroSD card with a capacity of no less than 16GB.
- **Step 3** Format the MicroSD card to ensure a partition, such as “/dev/sda1”.
- **Step 4** Copy all files needed to be upgraded to the root directory of the MicroSD card.
- **Step 5** Ensure that SE5 is powered off. Insert the MicroSD card and power on the device. The STAT light is red (Always On).
- **Step 6** Wait for the completion of upgrading. After the STAT light changes from red (always on) to green (always on), power off the device and remove the MicroSD card.
- **Step 7** Power on SE5 again after the upgrade is finished.
- **The End**

6.2 Docker Environment Construction

Description

- The following instructions are mainly for users who want to use Docker for software deployment.

Steps

- **Step 1** Download Docker software installation package “docker-ce_18.06.1~ce~3-0~debian_arm64.deb”
https://download.docker.com/linux/debian/dists/stretch/pool/stable/arm64/docker-ce_18.06.1~ce~3-0~debian_arm64.deb
- **Step 2** Log in through SSH to enter the ROOT environment for installation. Input the command: **sudo dpkg -i docker-ce_18.06.1~ce~3-0~debian_arm64.deb**, until installation is complete.
- **Step 3** Revise/lib/systemd/system/docker.service, edit start execution command: **ExecStart=/usr/bin/dockerd -g /data/docker -H unix:///var/run/docker.sock -H tcp://0.0.0.0:9527 -H fd://**
- **The End**

6.3 Hard Disk Mount

Description

- The hard disk function is optional. SE5 supports 7mm high 2.5-inch SATA or SSD hard disk.
- The supporting capacity of hard disk is no more than 2TB. It is a non-standard accessory which needs to be purchased by users as needed.
- Please format and partition the hard disk before use. Please select “FAT32”, “EXT4” or “NTFS” for the type of formatted file system.

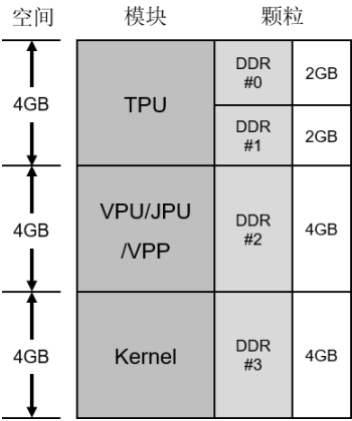
Steps

- **Step 1** Wear an antistatic bracelet or wristband.
- **Step 2** Format the hard disk and create partition.
- **Step 3** Install the formatted and partitioned hard disk. See 4.4.3 Hard Disk Installation (Optional).
- **Step 4** Log in to the device through SSH, and you can view the drive letters such as “/dev/sda1” and “/dev/sda2”.
- **Step 5** Create a folder and type the command “mkdir /media/hd-sda1”.
- **Step 6** Mount the hard disk and type the command “mount /dev/sda1 /media/hd-sda1”.
- **The End**

6.4 Memory Allocation

Description

- The memory adopts LPDDR4x with a total capacity of 12GB, which is divided into four DDR particles: 2GB, 2GB, 4GB and 4GB.
- The continuous address allocation method is adopted, in which the DDR particles corresponding to TPU are specially used for TPU calculation acceleration. The DDR particles corresponding to VPU, JPU and VPP are specially used for video image codec acceleration and cannot be used for system memory.
- The user can use the DDR particles corresponding to Kernel for the system memory, with a total capacity of 4GB. The memory space usage can be obtained through the free command.



6-1 SE5 Memory Allocation

7 Common Command Reference

Description

- The following common commands are typed and executed under Root permission. You need to log in through SSH.
- Log in to the device through SSH. The default user name is linaro and the default password is linaro.

7.1 Common Command

7-1 Common Command Reference

Command	Description
bm_get_basic_info	Used to obtain the basic information, including IP address, MAC address, system startup time, board card temperature, chip junction temperature, NPU utilization rate, etc.
bm_version	Used to check device version.
bm_get_temperature	Used to obtain equipment temperature information, including board temperature, chip junction temperature, etc.
bm_set_ip	Used to set static IP.
bm_set_ip_auto	Used to set dynamic IP.
bm_switch2box	Used to switch LiteOS system environment to Linux development environment.
bm_switch2gate	Used to restore Linux development environment to LiteOS system environment.

7.2 Other Command

7-2 Other Command

Command	Description
cat /sys/bus/i2c/devices/1-0017/information	Used to obtain MCU basic information
systemctl stop SophonHDMIStatus.service systemctl stop SophonHDMI	Used to close HDMI service
systemctl disable SophonHDMIStatus.service systemctl disable SophonHDMI	Used to forbid HDMI function
systemctl start SophonHDMIStatus.service systemctl start SophonHDMI	Used to activate HDMI service
systemctl enable SophonHDMIStatus.service systemctl enable SophonHDMI	Used to start HDMI function

8 Acronym



8-1 Acronym

Acronym	Description	Full Name
AI	Artificial Intelligence	Artificial Intelligence
ARM	BM1684 chip main control unit	Advanced RISC Machine
BM1684	Domestic deep learning tensor processor	N/A
BMNNSDK2	BM1684 deep learning development kit	N/A
Docker	Open-source application container engine	N/A
DHCP	Dynamic host configuration protocol	Dynamic Host Configuration Protocol
eMMC	A memory consisting of a flash memory and a controller	Embedded Multi Media Card
EXT4	A type of log file system under Linux	Fourth Extended Filesystem
FAT32	File allocation table which adopts 32-bit binary number	File Allocation Table 32
HDMI	High-definition multimedia interface	High-Definition Multimedia Interface
HDD	Hard disk drive	Hard Disk Drive
LTE	A long-term evolution technique of mobile communications	Long Term Evolution
SATA	Serial advanced technology attachment	Serial Advanced Technology Attachment
SSD	Solid-state drive	Solid-State Drive
TPU	Tensor processing unit	Tensor Processing Unit
USB	Universal serial bus	Universal Serial Bus

9 Appendix

9-1 Common File Update



Item	Description	Website
BMNNSDK2	BM1684 SDK Manual	https://bitmain-doc.gitbook.io/bmnnsdk2-bm1684-2-0-1/
NNToolChain	BM1684 Tool Chain Manual	https://bitmain-doc.gitbook.io/nntoolchain/
SAIL Development Kit (For Python)	SAIL Description File	https://sophon-ai-algo.github.io/sophon-inference-doc_en/
	SAIL Open-Source Project	https://github.com/sophon-ai-algo/sophon-inference
Note: The above documents will be updated from time to time. For the latest version, please contact our technical support personnel.		

Regulations

FCC Notice (FOR FCC CERTIFIED MODELS):

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EU WEEE: Disposal of Waste Equipment by Users in Private Household in the European Union



This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.