VAC-1000 USER Manual

Arm-based Edge AI Computing System
24-core Foxconn Cortex-A53 MPU with AI Accelerator Card

Vecow

1.1.0 Edition 20220525

Record of Revision

Version	Date	Page	Description	Remark
1.00	2021/08/24	All	Official Release	
1.10	2022/05/25	iv,1,3,4,5,6,51,53	Update	

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Declaration of Conformity

FCC

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 it is not installed and used in accordance with the instruction manual, it 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.

CE

The products described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

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Order Information

Part Number	Description
VAC-1000-W16E	VAC-1000, 24-core Foxconn Cortex-A53 MPU, Lightspeeur® AI Accelerator Card, 16G WT DDR4 ECC RAM, 1 GigE LAN, 1 IPMI, 2 USB 3.0, 1 SSD, 1 M.2, 9V to 55V DC-in, -40°C to 70°C
VAC-1000-16E	VAC-1000, 24-core Foxconn Cortex-A53 MPU, Lightspeeur® AI Accelerator Card, 16G DDR4 ECC RAM, 1 GigE LAN, 1 IPMI, 2 USB 3.0, 1 SSD, 1 M.2, 9V to 55V DC-in, 0°C to 55°C
VAC-1100-W16E	VAC-1100, 24-core Foxconn Cortex-A53 MPU, Hailo AI Accelerator Card, 16G WT DDR4 ECC RAM, 1 GigE LAN, 1 IPMI, 2 USB 3.0, 1 SSD, 1 M.2, 9V to 55V DC-in, -40°C to 70°C
VAC-1100-16E	VAC-1100, 24-core Foxconn Cortex-A53 MPU, Hailo AI Accelerator Card, 16G DDR4 ECC RAM, 1 GigE LAN, 1 IPMI, 2 USB 3.0, 1 SSD, 1 M.2, 9V to 55V DC-in, 0°C to 55°C

Optional Software

Part Number	Description
NX Witness VMS	Network Optix IP Video Management System (VMS) and Video Surveillance Software

Optional Accessories

Part Number	Description
PWA-60WP3-WT	60W, 24V, 90V AC to 264V AC Power Adapter with 3-pin Terminal Block, Wide Temperature -30°C to +70°C
PWA-60WP3-WT-12V	60W, 12V, 90V AC to 264V AC Power Adapter with 3-pin Terminal Block, Wide Temperature -30°C to +70°C
DIN-RAIL	DIN Rail Kit for VAC-1000
M.2 Storage Module	M.2 Key M PCIe Storage Module

Table of Contents

1

GENERAL INTRODUCTION

1.1 Overview

VAC-1000 Series is an Arm-based Edge AI Computing System. Powered by 24-core Foxconn Cortex-A53 MPU, running with Hailo-8™/Lightspeeur® AI accelerator card, VAC-1000 series delivers improved efficiency and integration for broad adoption of the latest IoT Edge computing solutions.

VAC-1000 Series is a compact design yet provides mighty configurations. It features simplified I/O interfaces including 1 GigE LAN, 1 IPMI, 2 USB 3.0, 1 Micro USB and equipped with 1 SATA and 1 M.2 form factor storage. With 9V to 55V wide range DC-in and -40°C to 70°C operating temperature supported, the fanless VAC-1000 Series provides industrial-grade trusted reliability.

With up to 16GB DDR4 2133 memory and optional NX Witness VMS (Video Management System) supported, VAC-1000 provides a server-grade computing capability. Furthermore, VAC-1000 Series supports mainstream deep learning framework such as TensorFlow, ONNX, Caffe and PyTorch for AI-enabled vision applications, providing a comprehensive solution optimized for Public Surveillance, Traffic Vision, Smart Retail, Factory Automation and any AIoT/ Industry 4.0 applications.

1.2 Features

- 24-core Foxconn Cortex-A53 Server-grade Computing
- Advanced AI Accelerator supports up to 26 Tera-Operations Per Second (TOPS)
- 1 DDR4 2133MHz Memory with ECC, support up to 16GB
- 9V to 55V wide range DC Power Input
- 1 GigE LAN, 1 IPMI, 2 USB 3.0, 1 Micro USB
- M.2 Key M 2280 for PCIe NVMe SSD
- Support Cross-Platform IP video management system (VMS) for real-time surveillance

1.3 Product Specification

1.3.1 Specifications of VAC-1000

System	
Processor	24-core Arm Cortex-A53 Processor (Foxconn FXN3102)
Memory	1 DDR4 2133MHz/16GB ECC SO-DIMM
Flash	1 SPI Flash, 512MB
EEPROM	1 SPI EEPROM, 512KB
OS	Ubuntu Server 18.04 LTS
AI Accelerator	
Processor	Lightspeeur® 2801S Neural Accelerator, up to 5.6 TOPS
Framework	TensorFlow, Caffe, PyTorch
I/O Interface	
USB	2 USB 3.0 Type A
Micro USB	• 1 Micro USB console port for debug (External) • 1 Micro USB console port for firmware update (Internal)
LED	Power, SSD
Storage	
SATA	1 SATA III (6Gbps)
M.2	1 M.2 Key M Socket (2280, PCIe)
eMMC	1 64GB eMMC, supports MMC4.41/HS200
Ethernet	
LAN	10/100/1000 Base-T Ethernet GigE LAN, RJ45 connector
IPMI	10/100/1000 Base-T Ethernet IPMI, RJ45 connector
Power	
Power Input	9V to 55V, DC-in
Power Interface	3-pin Terminal Block : V+, V-, Frame Ground
Software	
Operating System	Ubuntu Server 18.04LTS(Linux kernel 4.14.0) Supports bootup from Flash drive/eMMC Supports backup from Flash drive File System : EXT4
Toolchain	gcc-linaro-6.4.1-2017.11-x86_64_aarch64-linux-gnu
Script Language	Python
Mechanical	
Dimensions	170mm x 118mm x 40mm (6.7" x 4.6" x 1.6")
Weight	0.9 kg (2.0 lb)
Mounting	• Wallmount by mounting bracket • DIN Rail Mount (Optional)

Environment	
Operating Temperature	VAC-1000-W16E : -40°C to 70°C(-40°F to 158°F) VAC-1000-16E : -0°C to 55°C (32°F to 131°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% Humidity, non-condensing
Relative Humidity	95% at 55°C
Shock	• IEC 60068-2-27 • SSD : 50G @ wallmount, Half-sine, 11ms
Vibration	• IEC 60068-2-64 • SSD : 5Grms, 5Hz to 500Hz, 3 Axis
EMC	CE, FCC, EN50155, EN50121-3-2

1.3.2 Specifications of VAC-1100

System	
Processor	24-core Arm Cortex-A53 Processor (Foxconn FXN3102)
Memory	1 DDR4 2133MHz/16GB ECC SO-DIMM
Flash	1 SPI Flash, 512MB
EEPROM	1 SPI EEPROM, 512KB
OS	Ubuntu Server 18.04 LTS
AI Accelerator	
Processor	Hailo-8™ AI Processor, up to 26 TOPS
Framework	TensorFlow, ONNX
I/O Interface	
USB	2 USB 3.0 Type A
Micro USB	• 1 Micro USB console port for debug (External) • 1 Micro USB console port for firmware update (Internal)
LED	Power, SSD
Storage	
SATA	1 SATA III (6Gbps)
M.2	1 M.2 Key M Socket (2280, PCIe)
eMMC	1 64GB eMMC, supports MMC4.41/HS200
Ethernet	
LAN	10/100/1000 Base-T Ethernet GigE LAN, RJ45 connector
IPMI	10/100/1000 Base-T Ethernet IPMI, RJ45 connector
Power	
Power Input	9V to 55V, DC-in
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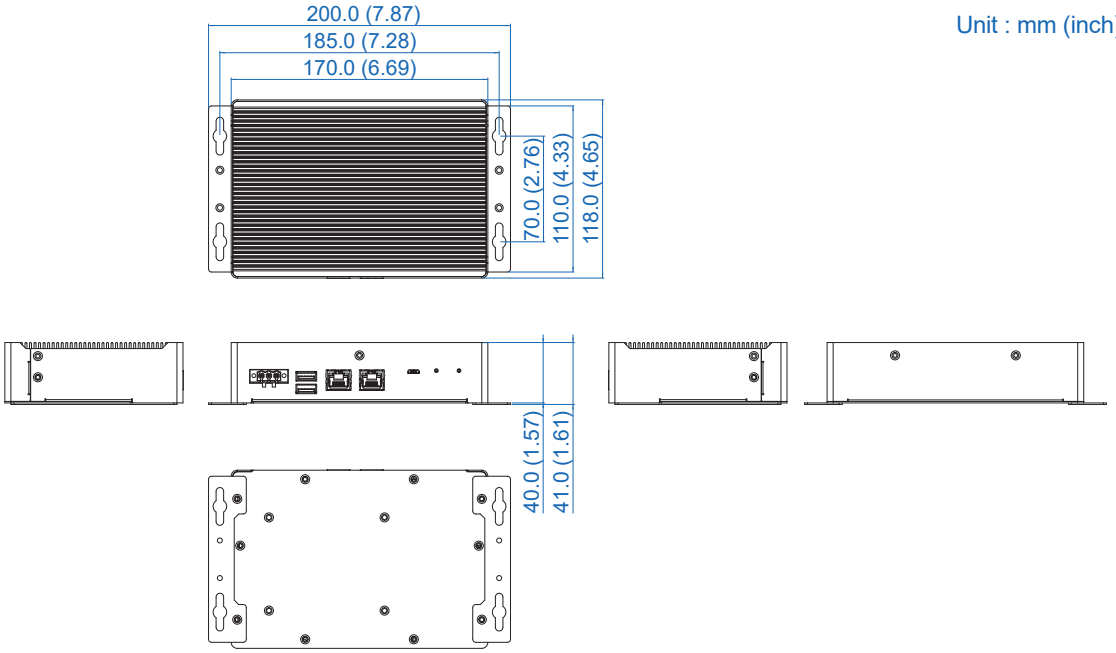
Shock	• IEC 60068-2-27 • SSD : 50G @ wallmount, Half-sine, 11ms
Vibration	• IEC 60068-2-64 • SSD : 5Grms, 5Hz to 500Hz, 3 Axis
EMC	CE, FCC, EN50155, EN50121-3-2

1.4 Mechanical Dimension

Unit : mm (inch)



2

GETTING TO KNOW YOUR VAC-1000/1100

2.1 Packing List

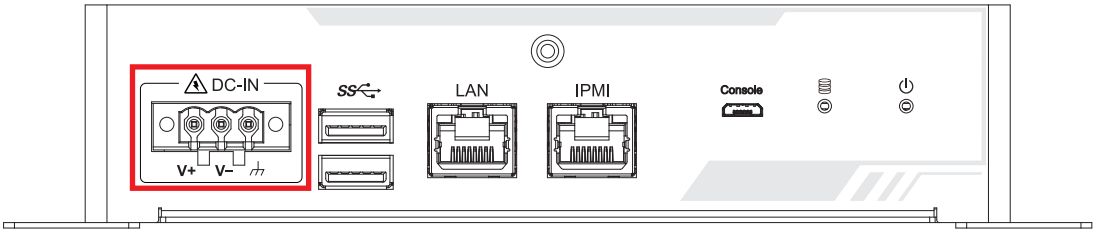
Item	Description	Qty
1	VAC-1000 Arm-based Edge AI Computing System (According to the configuration of you order, VAC-1000 series may contain SSD/HDD and M.2. Please verify these items if necessary.)	1

Item	Description	Outlook	Usage	P/N	Qty
1	Terminal block 3-pin (5.0mm)		DC-IN	51-2411R03-S1K	1
2	SATA Cable		SSD/HDD	61-13C2211-366	1
3	PHILLPIS M3 x 4L, Ni + Ny		M.2 module card	53-2426204-80B	2
4	Flat M3x4L		Wall Mount Bracket and SSD/HDD	53-M000450-301	8
5	Wall Mount Bracket		Mount	62-03P0834-000	2

2.2 Front Panel I/O & Functions

In Vecow VAC-1000 series, all I/O connectors are located on the front panel. Most of the general connections to computer devices, such as USB, LAN, IPMI, Console port and LED indicators are placed on the front panel.

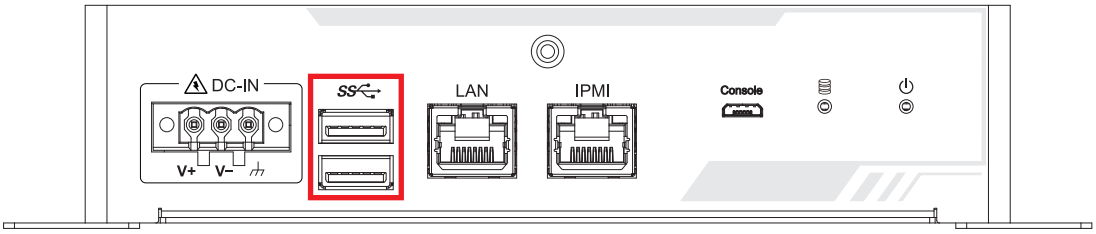
2.2.1 Power Terminal Block



VAC-1000 supports 9V to 50V DC power input.

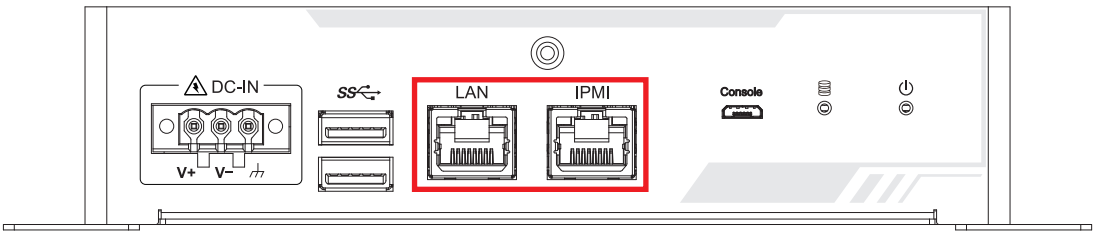
Pin No.	Definition
1	V+
2	V-
3	Chassis Ground

2.2.2 USB 3.0



There are two USB 3.0 connections available supporting up to 5GB per second data rate in the front side of VAC-1000. It also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

2.2.3 10/100/1000 Mbps Ethernet Port

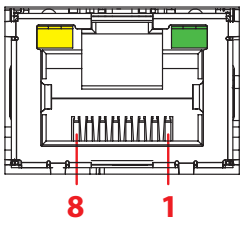


There are two 8-pin RJ-45 jacks supporting 10/100/1000 Mbps Ethernet connections in the front side of VAC-1000. LAN port and IPMI port both are powered by RTL8211FI-CG Ethernet engine. The pin out of LAN and IPMI are listed in the following chart :

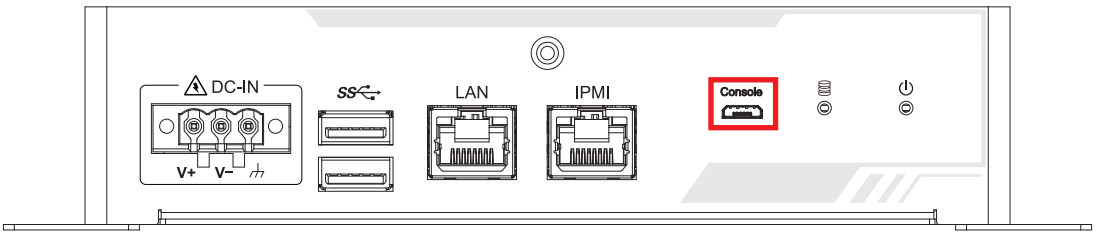
Pin No.	10/100 Mbps	1000Mbps
1	E_TX+	MDI0_P
2	E_TX-	MDI0_N
3	E_RX+	MDI1_P
4	-----	MDI2_P
5	-----	MDI2_N
6	E_RX-	MDI1_N
7	-----	MDI3_P
8	------	MDI3_N

Each LAN port is supported by a standard RJ-45 connector with LED indicators to present active/link/speed statuses of the connection. The LED indicator on the left top corner becomes twinkling yellow when the cable is properly connected to a 100Mbps Ethernet network; the LED indicator on the right top corner becomes twinkling green when the cable is properly connected to a 1000Mbps Ethernet network.

LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Left	Yellow	Off	Twinkling Yellow	Off
Right	Green	Off	Off	Twinkling Green

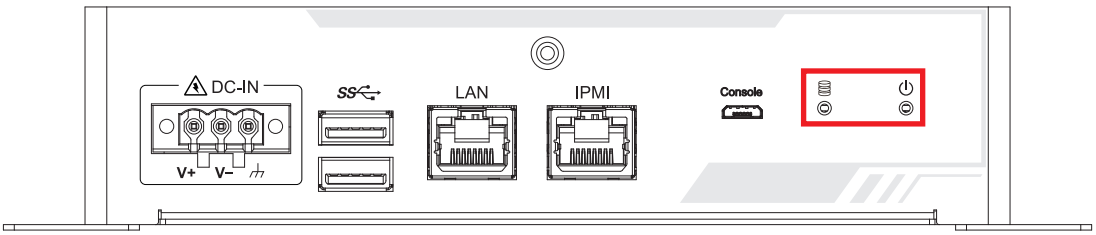


2.2.4 Console Port



System COM Port, Micro USB to UART that connects to the Cortex-A53 serial port.

2.2.5 Power and Status LED Indicators

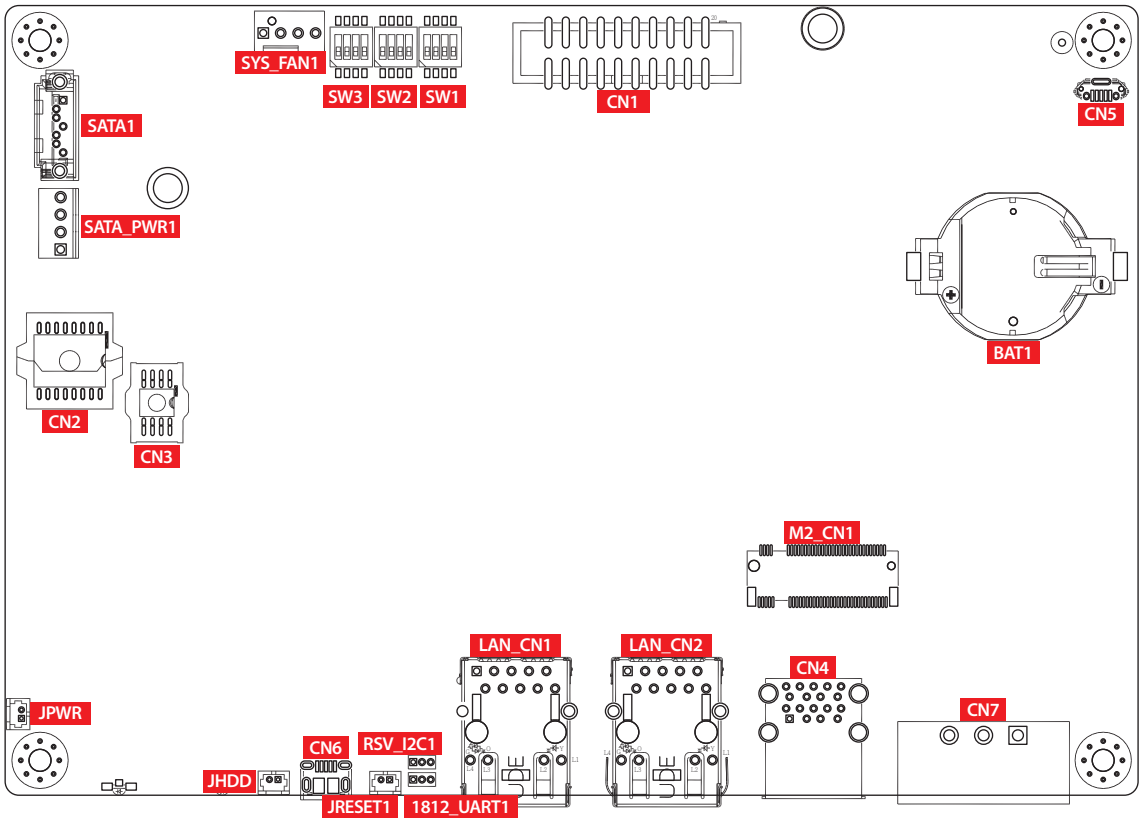


Yellow (HDD LED) : SATA hard drive LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.
Green (Power LED) : If the LED is solid green, it indicates that the system is powered on.

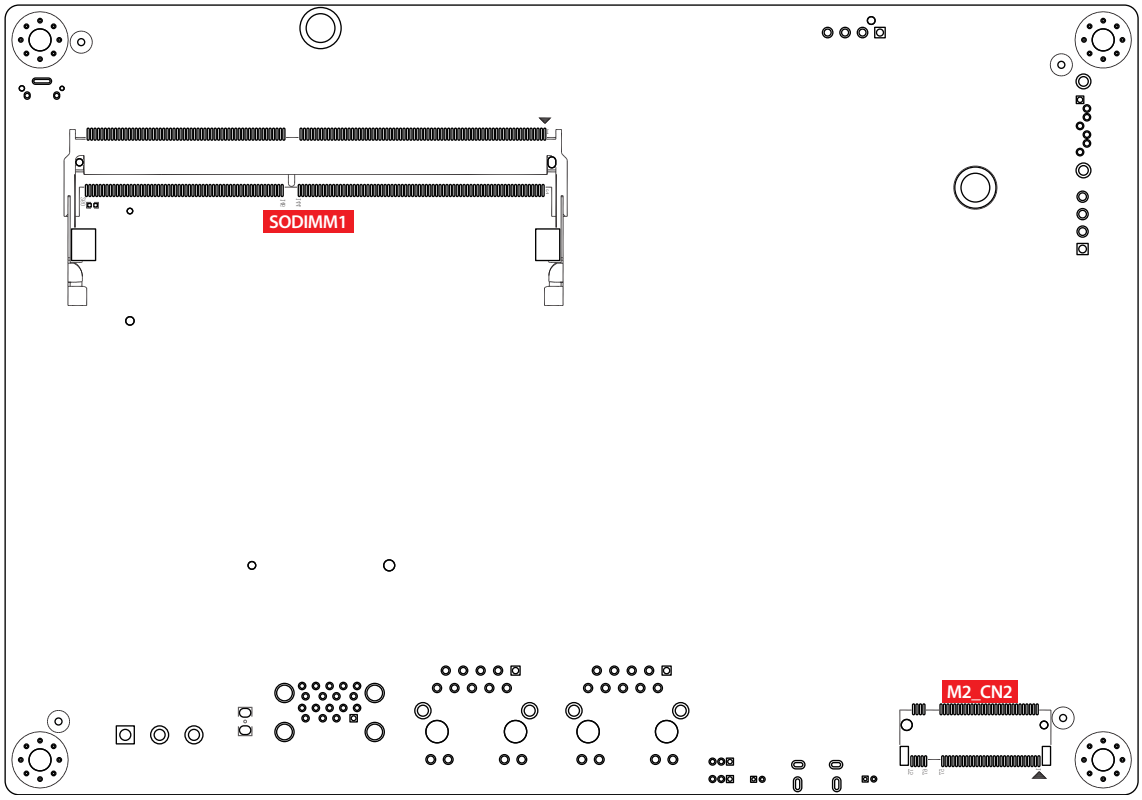
LED Color	Power Status	System Status
Yellow	HDD	On/Off : Storage status, function or not. Twinkling : Data transferring.
Green	Power	System power status (on/off)

2.3 Main Board Connectors & Jumper Locations

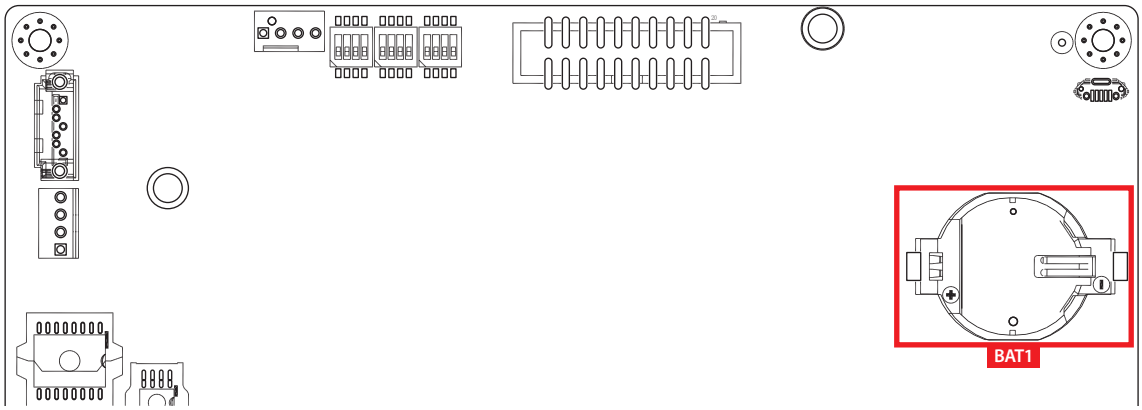
Top view :



Bottom view :

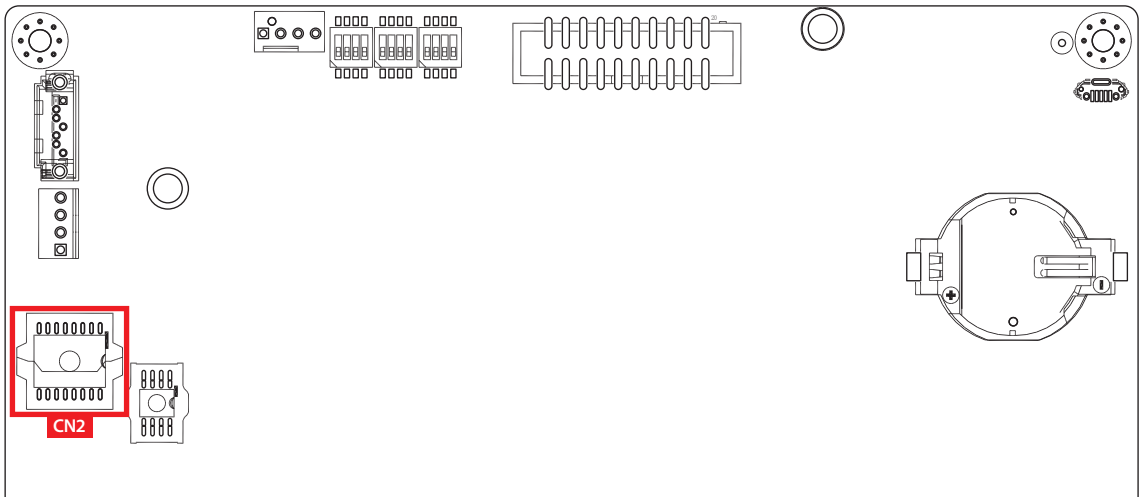


2.3.1 BAT1 : CR2032 Button Cell Battery Holder



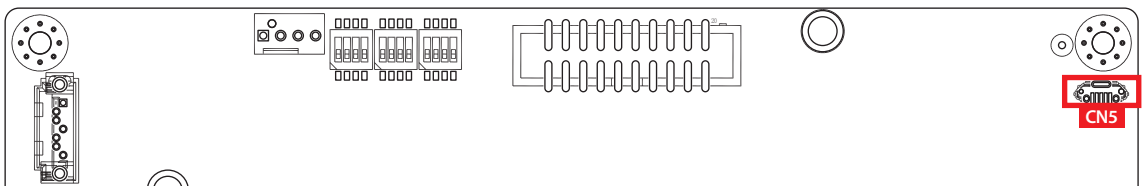
System has a built-in CR2032 battery holder that allows the real-time clock to keep the clock running remain operational when the system is disconnected from power.

2.3.2 CN2 : BIOS Socket



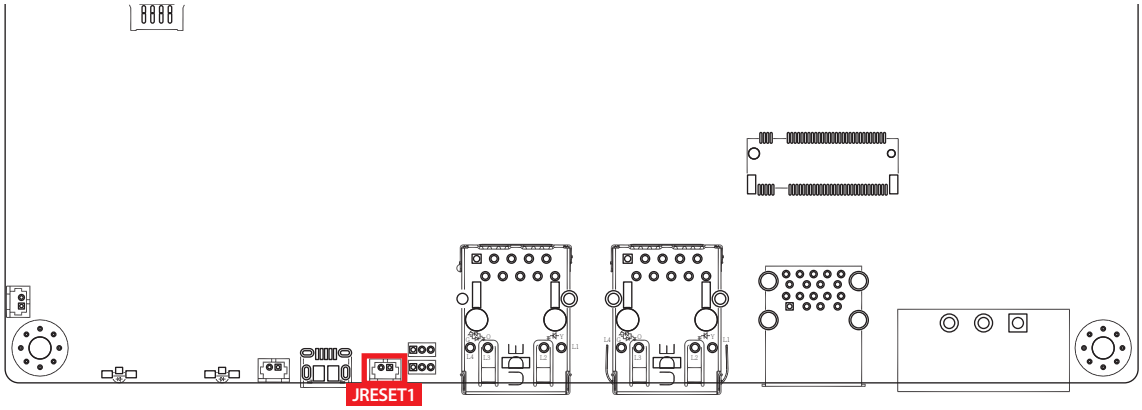
If the BIOS needs to be changed, please contact the Vecow RMA service team.

2.3.3 CN5 : Micro-B USB (Vertical 180°) Console Port



Cortex-M3 Console, Micro USB (R180°) to UART that connects to the Cortex-M3 serial port for firmware update.

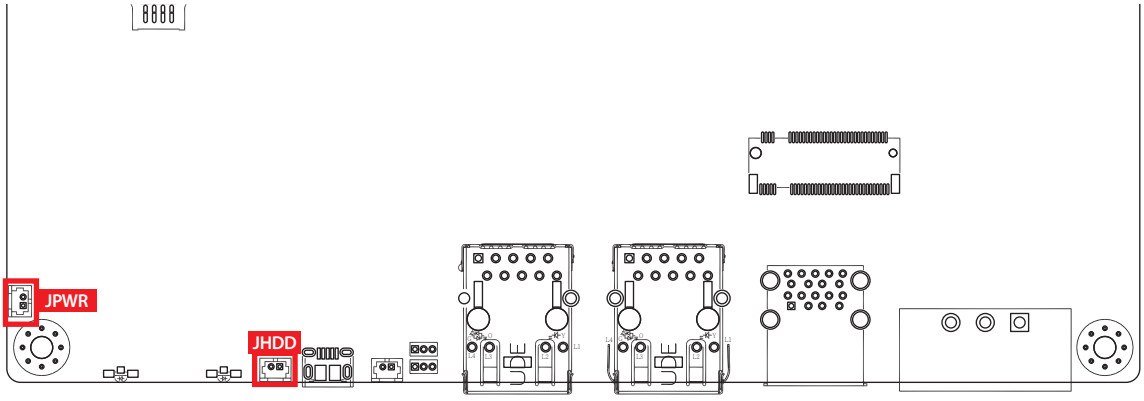
2.3.4 JRESET1 : Reset Header for Cable Out Use



This is used to execute hardware system reset function.
The pin out of Header is listed in following table :

Pin No.	Definition
1	BTN_RESET
2	GND

2.3.5 JPWR, JHDD : LED Header for Cable Out Use



These pin headers can be used as a backup for the following functions : Power LED indicator, Hard Drive LED indicator.

The pin out of headers are listed in following table :

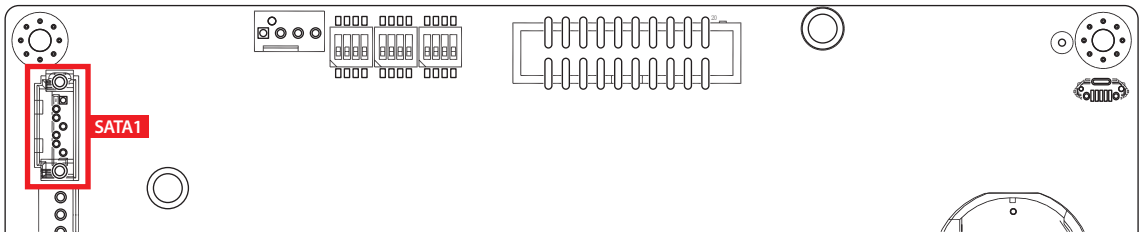
JPWR :

Pin No.	Definition
1	PWR_LED_P
2	PWR_LED_N

JHDD :

Pin No.	Definition
1	HDD_LED_P
2	HDD_LED_N

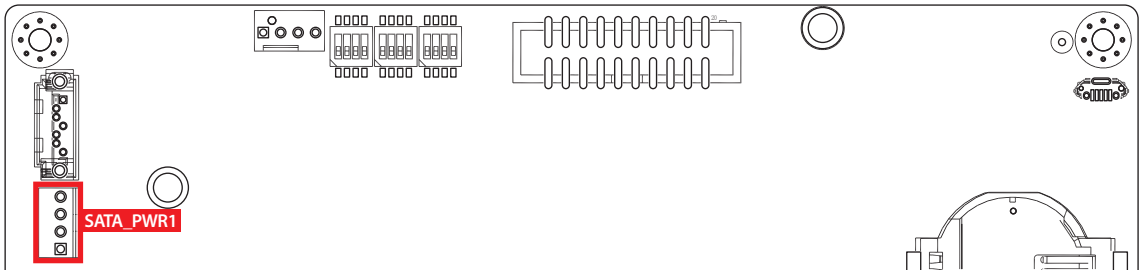
2.3.6 SATA1 : SATA III Connector



There is onboard high performance Serial ATA III (SATA III) on VAC-1000. It supports higher storage capacity with less cabling effort and smaller required space. The pin assignments of SATA1 is listed in the following table :

Pin No.	Definition	Pin No.	Definition
1	GND	5	RXN
2	TXP	6	RXP
3	TXN	7	GND
4	GND		

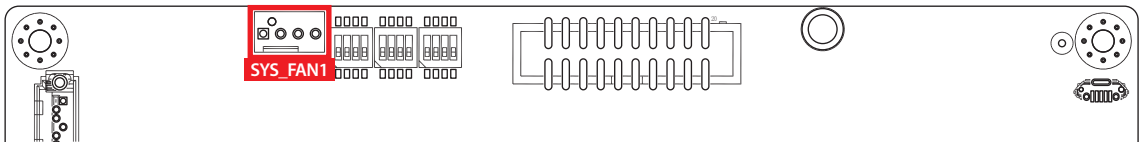
2.3.7 SATA_PWR1 : SATA Power Connector



The VAC-1000 is also equipped with one SATA power connectors. It supports 5V (Up to 2A) and 12V (Up to 2A) currents to the hard drive or SSD. The pin assignments of SATA_PWR1 is listed in the following table :

Pin No.	Definition	Pin No.	Definition
1	+12V	3	GND
2	GND	4	+5V

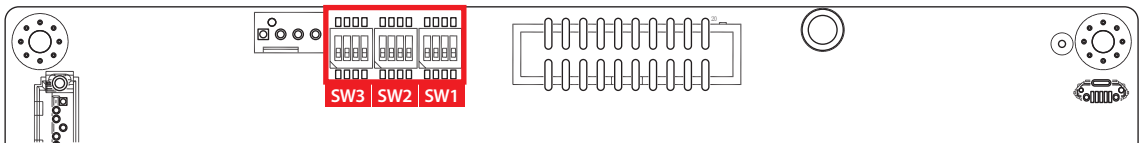
2.3.8 SYS_FAN1



The fan power connector is for additional thermal requirements. The pin assignments of SYS_FAN1 is listed in the following table :

Pin No.	Definition	Pin No.	Definition
1	GND	3	-
2	+12V (1.5A max)	4	-

2.3.9 SW1, SW2, SW3 : DIP Switch



Users can use the DIP switch (ON/OFF) to toggle between operation modes of the mainboard.
The setting of the Dip switch are listed in following table :

SW1 :

Pin No.	Normal Mode	Firmware update mode
1	OFF	OFF
2	OFF	OFF
3	ON	ON
4	ON	ON

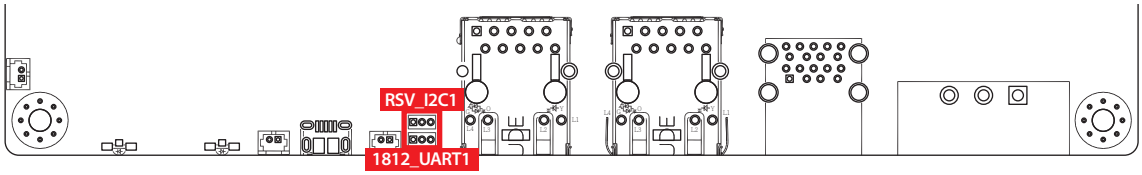
SW2 :

Pin No.	General mode	Firmware update mode
1	ON	ON
2	ON	ON
3	OFF	ON
4	OFF	OFF

SW3 :

Pin No.	General mode	Firmware update mode
1	OFF	OFF
2	OFF	OFF
3	OFF	OFF
4	OFF	OFF

2.3.10 RSV_I2C1, 1812_UART1 : 3 Pin Header for Debug Use



These pin headers for the following functions : RSC_I2C1 for CPU debug, 1812_UART1 for ASM1812 debug.

The pin out of Headers are listed in following table :

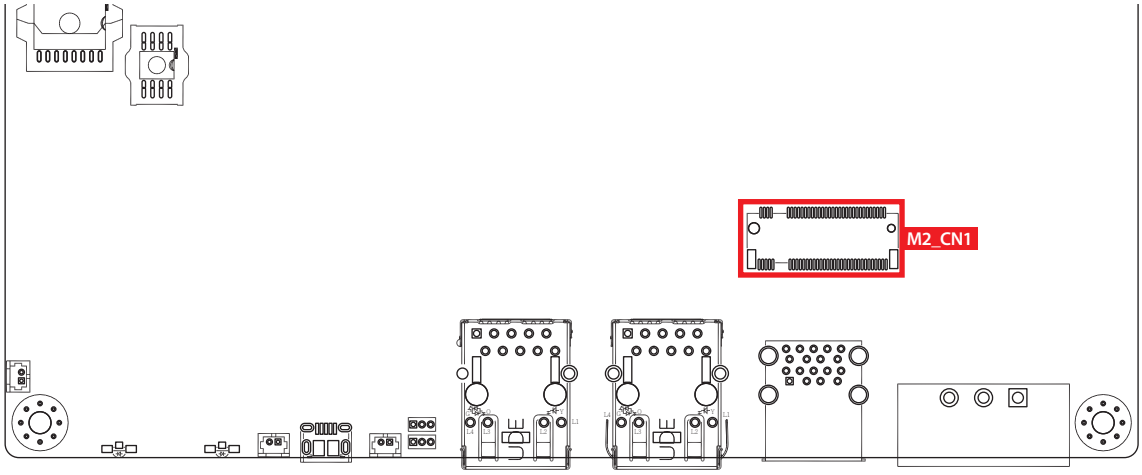
RSV_I2C1 :

Pin No.	Definition
1	GND
2	I2C_SCL
3	I2C_SDA

1812_UART1 :

Pin No.	Definition
1	GND
2	UART_RX
3	UART_TX

2.3.11 M2_CN1 : PCIe Gen2 M.2 key M Slot for M.2 SSD Support

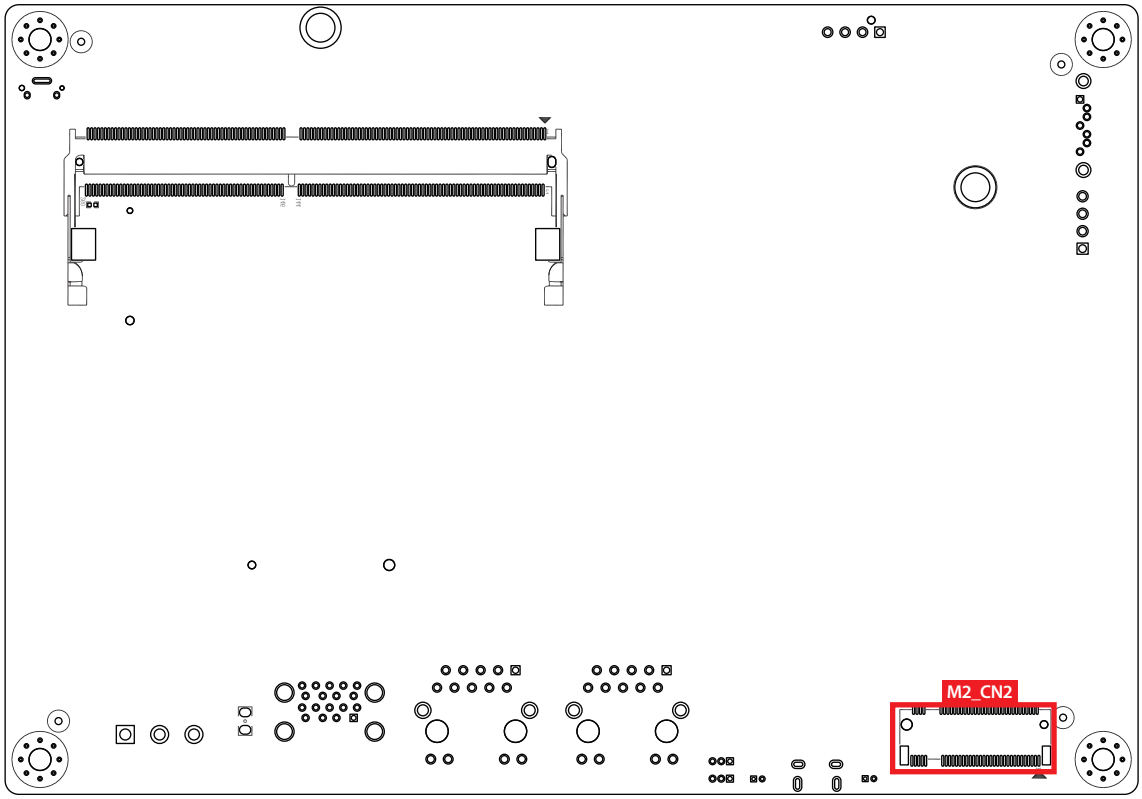


The supported M.2 module card type is 2280. The pin assignments of M2_CN1 in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
75	Ground		
73	Ground	74	3.3V
71	Ground	72	3.3V
69	PEDET	70	3.3V
67	Ground	68	NC
Mechanical Key			
57	Ground	58	NC
55	REFCLKp	56	NC
53	REFCLKn	54	PEWAKE#
51	Ground	52	CLKREQ#
49	PETp0	50	PERST#
47	PETn0	48	NC
45	Ground	46	NC
43	PERp0	44	NC
41	PERn0	42	NC
39	Ground	40	NC
37	PETp1	38	NC

Pin No.	Signal Name	Pin No.	Signal Name
35	PETn1	36	NC
33	Ground	34	NC
31	PERp1	32	NC
29	PERn1	30	NC
27	Ground	28	NC
25	PETp2	26	NC
23	PETn2	24	NC
21	Ground	22	NC
19	PERp2	20	NC
17	PERn2	18	3.3V
15	Ground	16	3.3V
13	PETp3	14	3.3V
11	PETn3	12	3.3V
9	Ground	10	LED1#
7	PERp3	8	NC
5	PERn3	6	NC
3	Ground	4	3.3V
1	Ground	2	3.3V

2.3.12 M2_CN2 : PCIe Gen2 M.2 Key M Slot for AI Accelerator Card Support

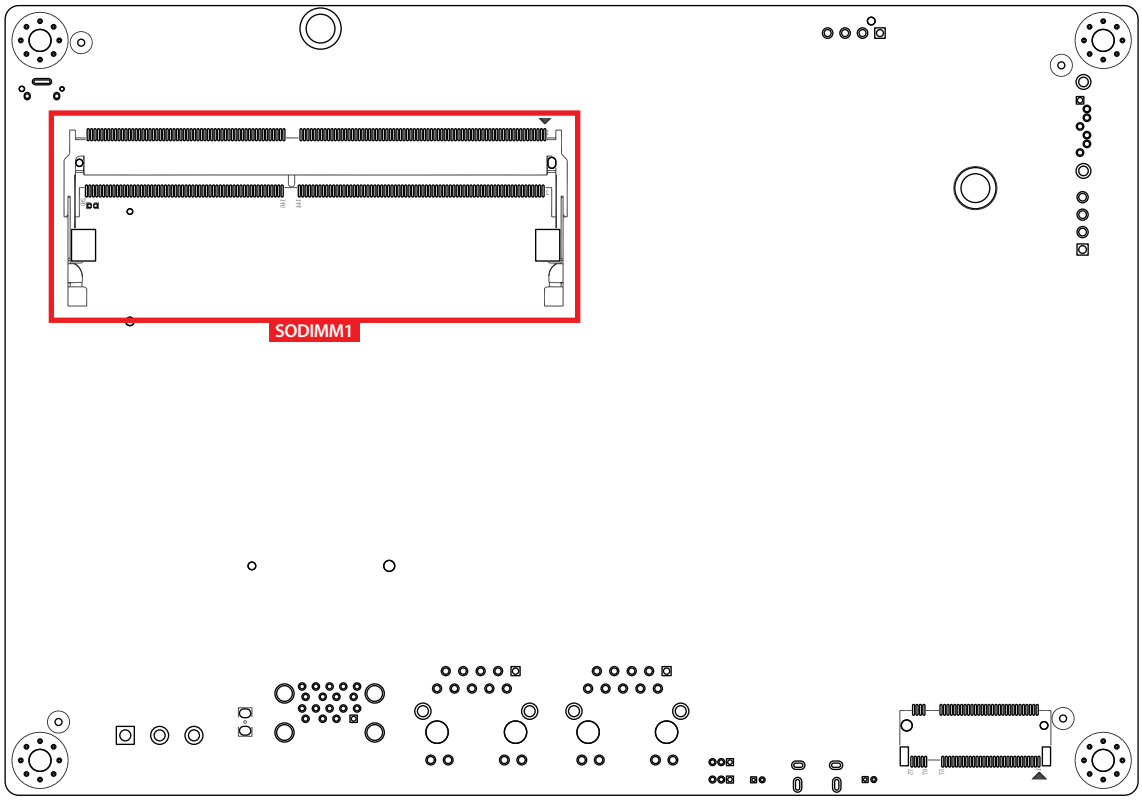


The supported M.2 module card type is 2280. M2_CN2 is pre-installed with the Hailo-8™/Lightspeeur® AI Accelerator Card. The pin assignments of M2_CN2 in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
75	Ground		
73	Ground	74	3.3V
71	Ground	72	3.3V
69	NC	70	3.3V
67	Ground	68	NC
Mechanical Key			
57	Ground	58	NC
55	REFCLKp	56	NC
53	REFCLKn	54	NC
51	Ground	52	NC
49	PETp0	50	PERST#

Pin No.	Signal Name	Pin No.	Signal Name
47	PETn0	48	NC
45	Ground	46	NC
43	PERp0	44	NC
41	PERn0	42	NC
39	Ground	40	NC
37	PETp1	38	NC
35	PETn1	36	NC
33	Ground	34	NC
31	PERp1	32	NC
29	PERn1	30	NC
27	Ground	28	NC
25	PETp2	26	NC
23	PETn2	24	NC
21	Ground	22	NC
19	PERp2	20	NC
17	PERn2	18	3.3V
15	Ground	16	3.3V
13	PETp3	14	3.3V
11	PETn3	12	3.3V
9	Ground	10	LED1#
7	PERp3	8	NC
5	PERn3	6	NC
3	Ground	4	3.3V
1	Ground	2	3.3V

2.3.13 M2_CN1 : PCIe Gen2 M.2 key M Slot for M.2 SSD Support (Dimension : 2280)



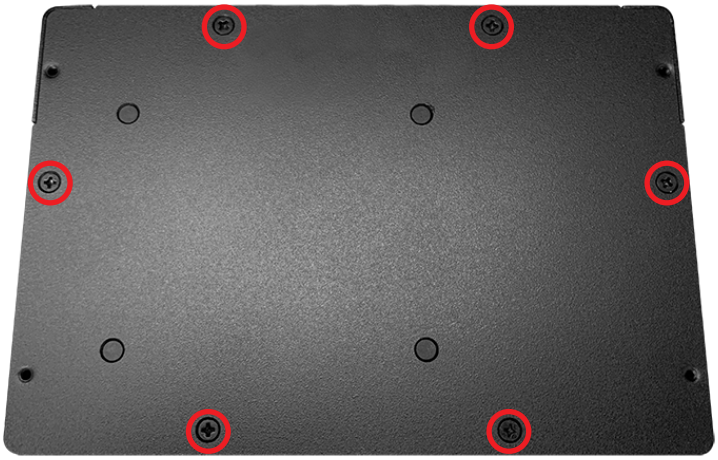
The SO-DIMM connector is suitable for a DDR4 memory module. Please refer to Appendix C for certified memory modules.

3

SYSTEM SETUP

3.1 How to Open Your VAC-1000/1100

Step 1 Remove six pcs F-M3x4L screws.



Step 2 Remove the bottom cover.

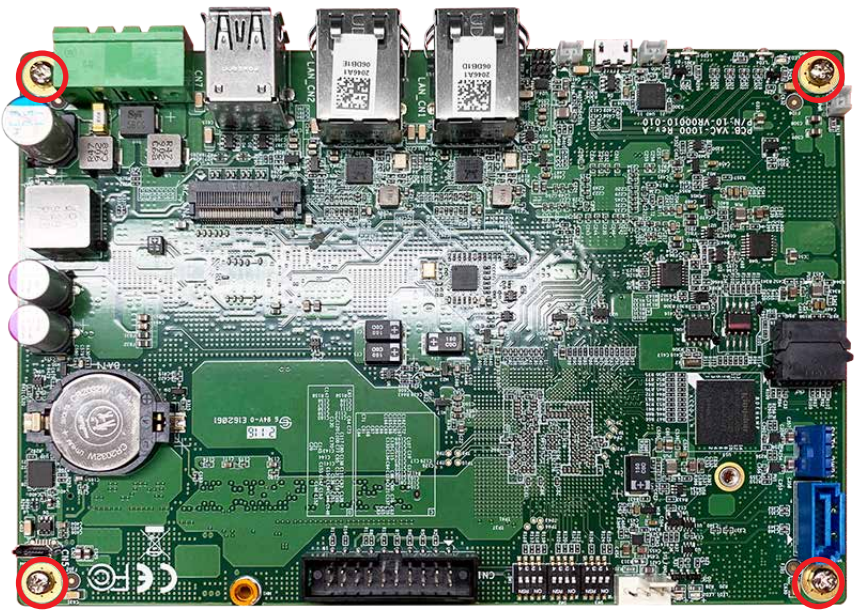
3.2 Installing DDR4 SO-DIMM Module

Step 1 Remove one pcs F-M3x4L screw for front panel.

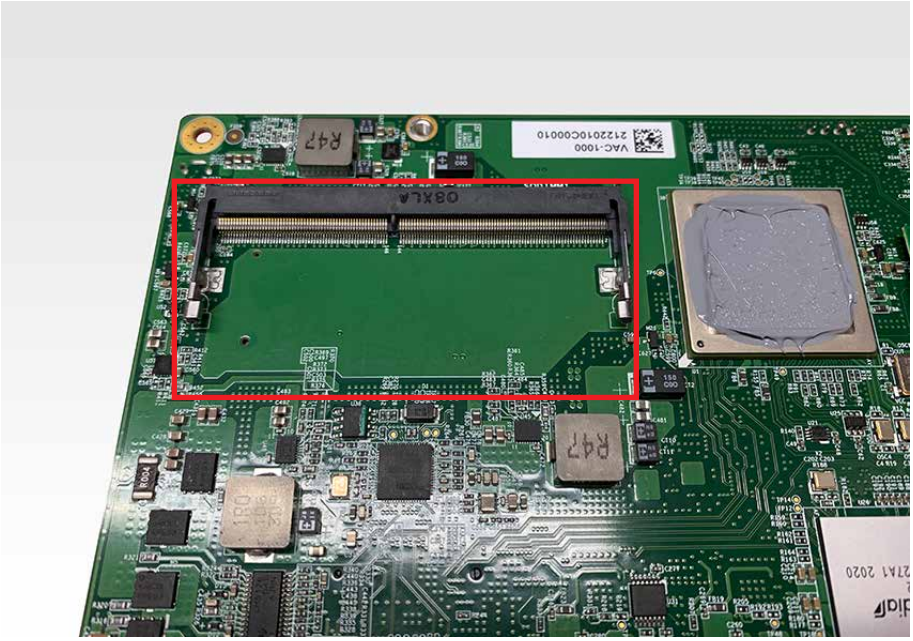
Step 2 Remove two pcs F-M3x4L screws for rear panel.

Step 3 Remove four pcs F-M3x4L screws for both sides.

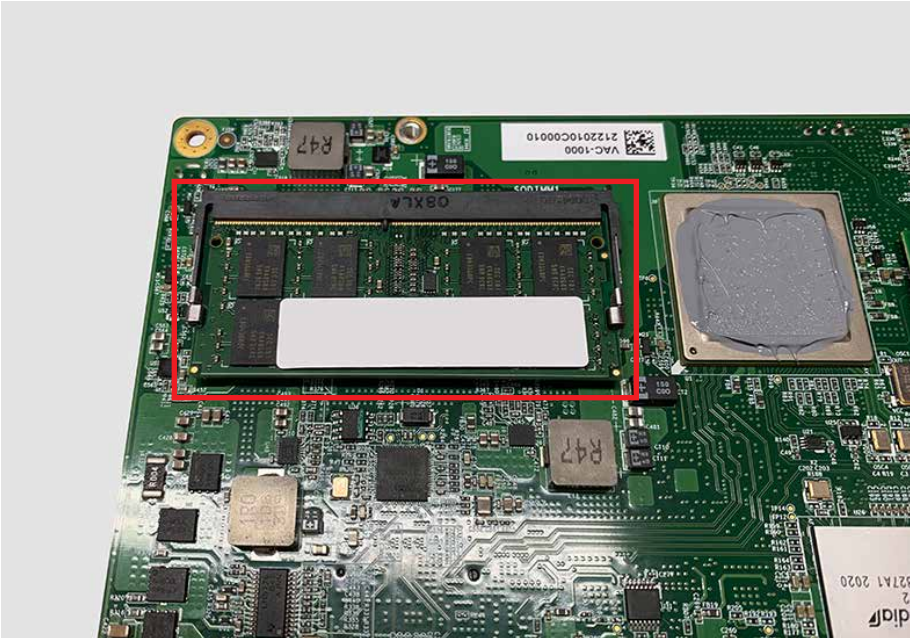
Step 4 Remove four pcs PH-M3x4L screws on the motherboard.



Step 5 Install DDR4 RAM module into SO-DIMM slot.

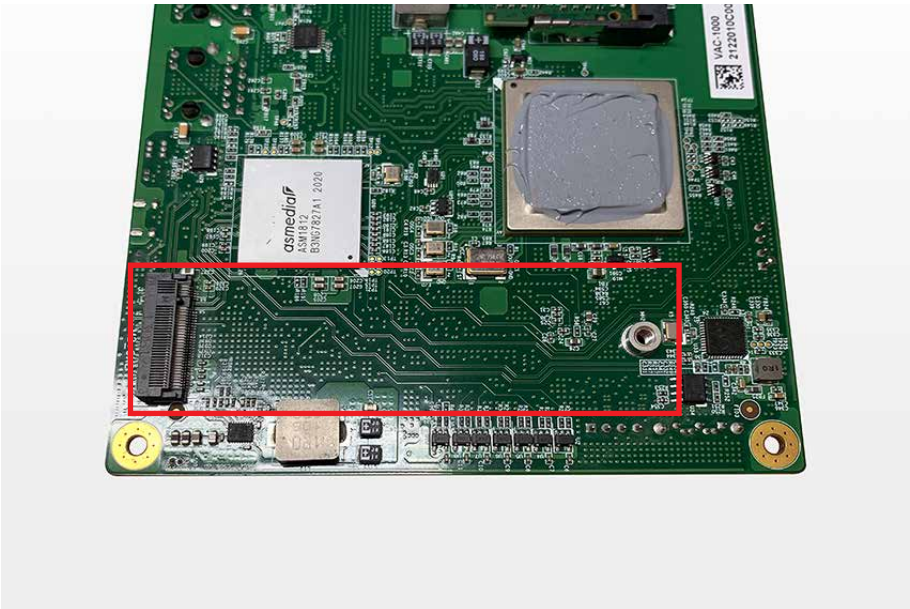


Step 6 Make sure the RAM module is locked by the memory slot.

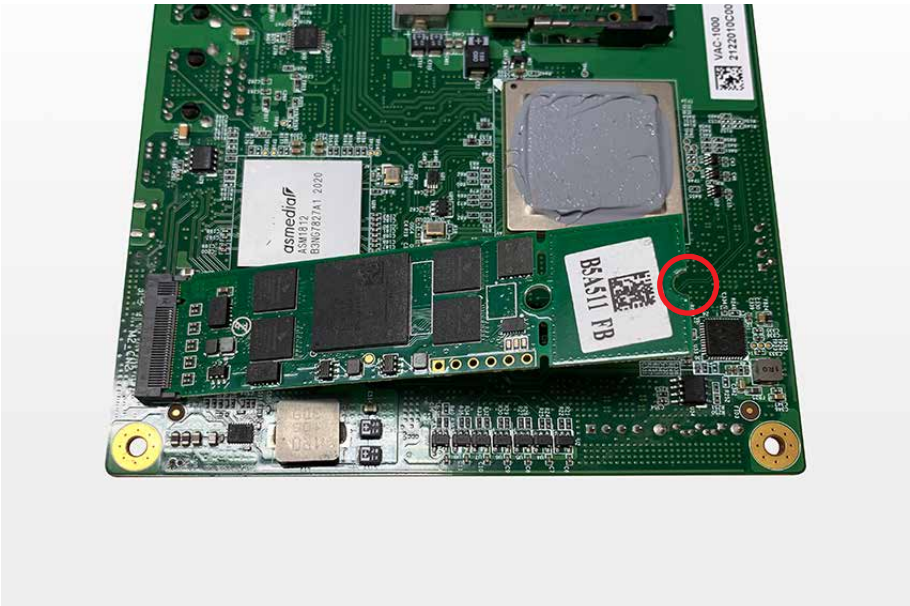


3.3 Installing M.2

Step 1 Install M.2 card into the M.2 slot.

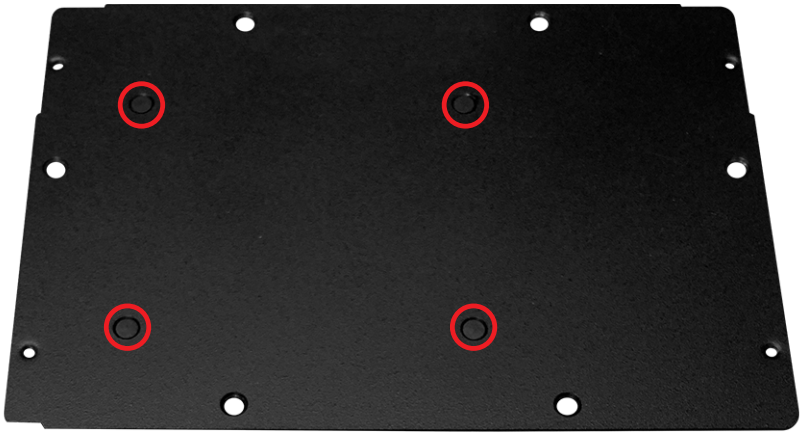


Step 2 Fasten one PH-M3x4L screw.

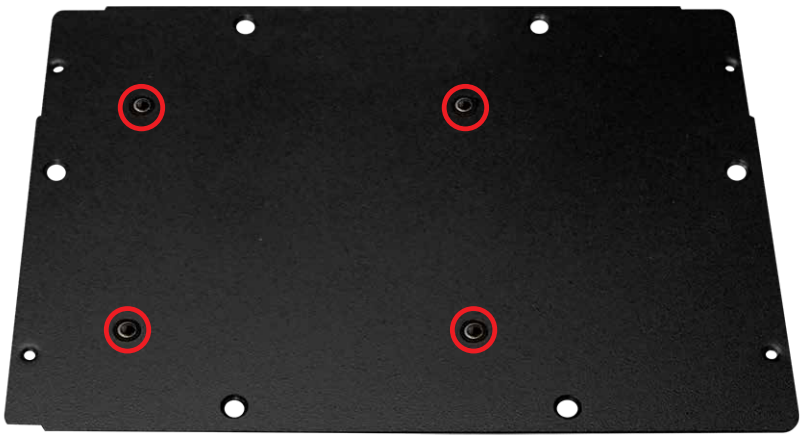


3.4 Installing SSD/HDD

Step 1 Remove four pcs rubber on bottom cover.



Step 2 Install SSD/HDD and fasten four pcs F-M3x4L screws.

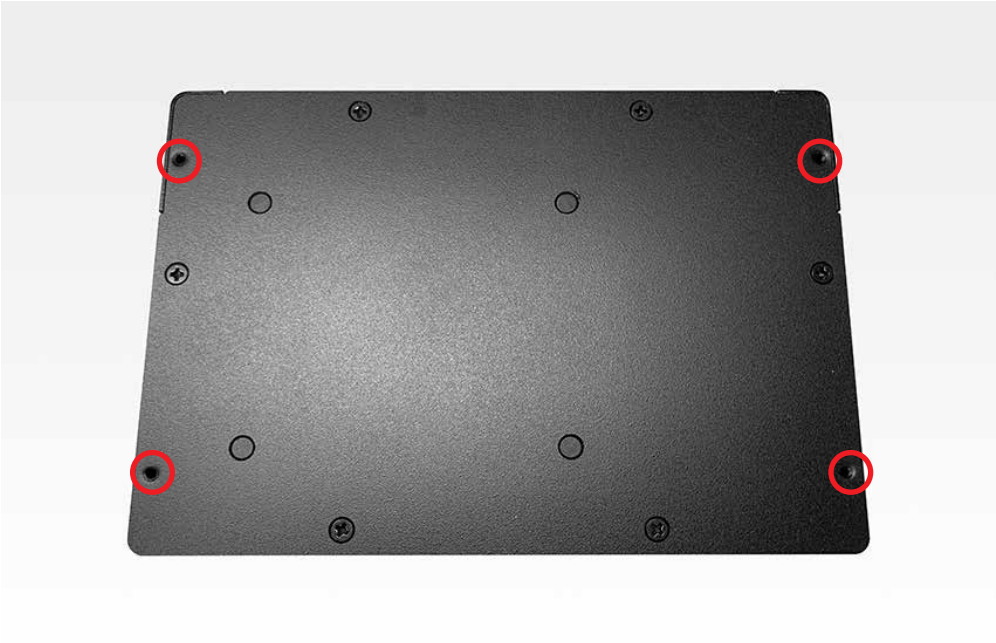


Step 5 Install SATA cable and into the motherboard.

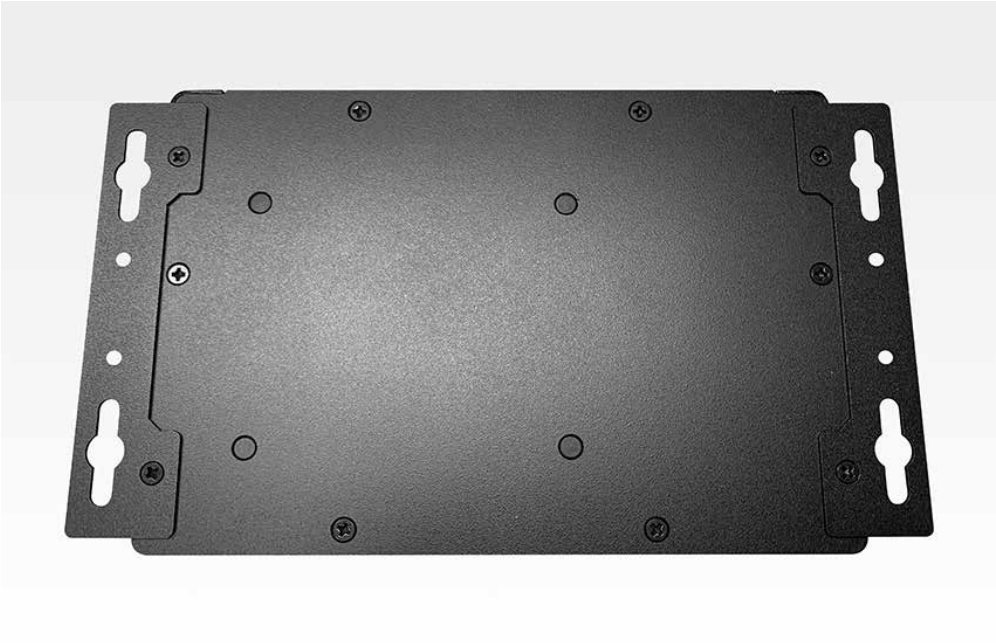
3.5 Mount Your VAC-1000/1100

Wall Mount

Step 1 Wall mount bracket screw holds.

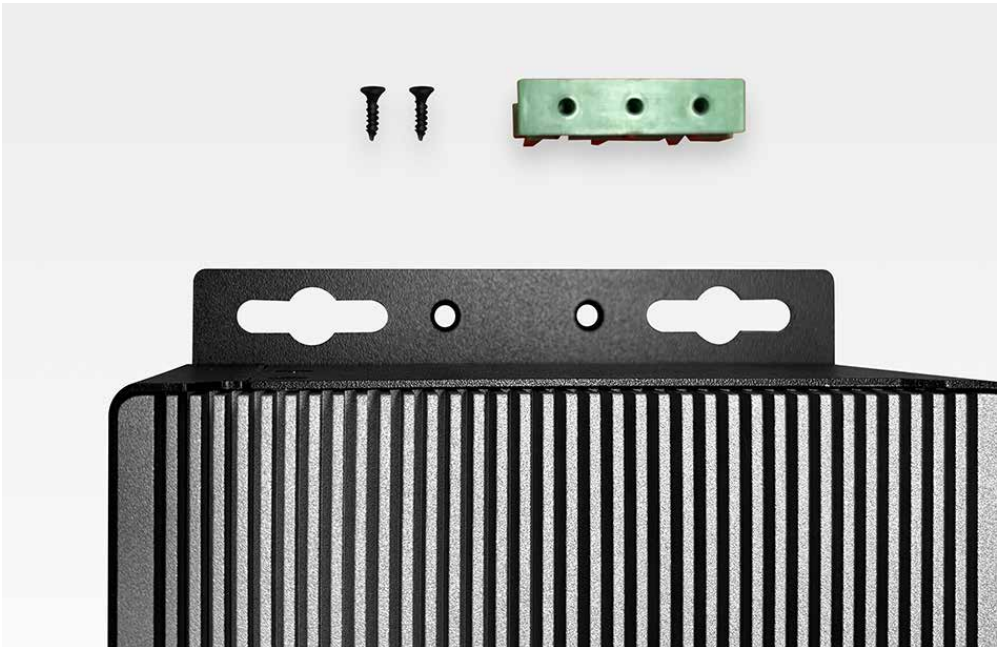


Step 2 Install wall mount bracket then fasten four pcs F-M3x4L screws.

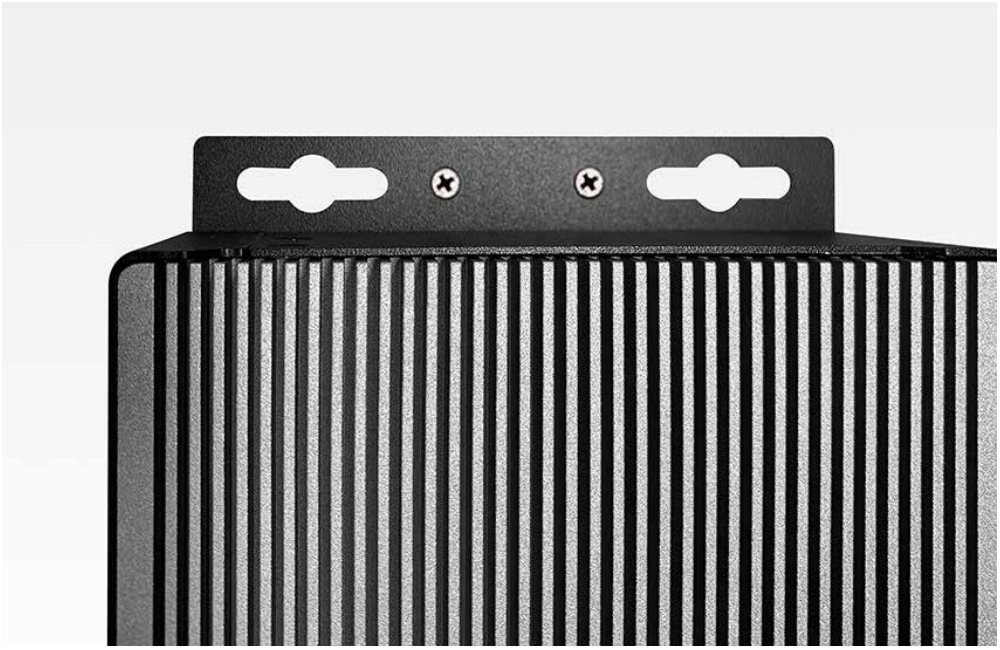


Din Rail (The wall mount bracket must be installed first.)

Step 1 Din rail kit and screws.



Step 2 Install din rail kit then fasten screws.



Step 3 Complete photo.

Step 4 Complete photo on both sides.

4

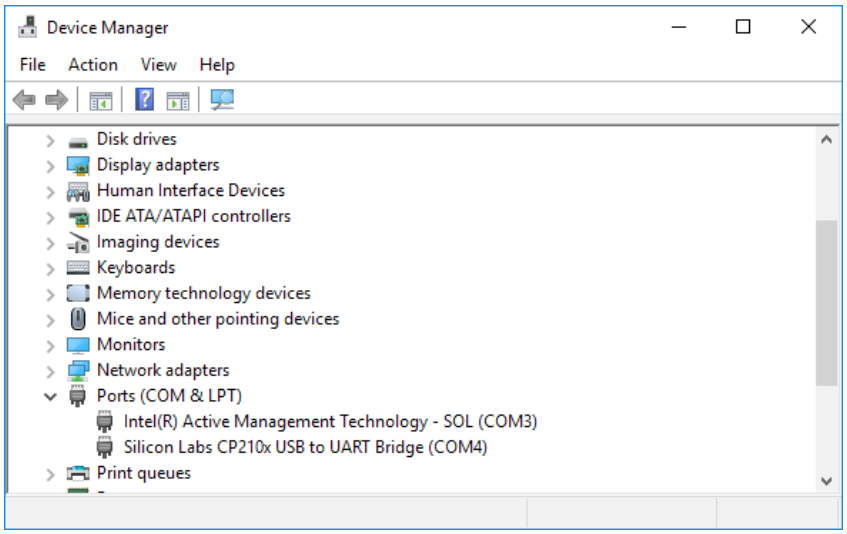
SOFTWARE SETUP

4.1 Connecting to VAC-1000/1100

Connect the power supply to the DC-IN jack. The VAC-1000will power on automatically. There is no power button to power on the device.

4.1.1 Connecting through the Serial Console

Use the micro USB cable to connect the PC and VAC-1000 ports. Open device manager in Windows to confirm the COM Port number.



4.2 User Account Management

4.2.1 Switch to the Root Account

Wait for the system to display the login prompt (**VAC-series login:**), then you can login using the default user (account : **ubuntu**, password : **ubuntu**) or the user your created earlier. After logging into the system, use the following command to switch to the root account to get maximum management permissions :

```
ubuntu@VAC-series:~$>sudo su
```

4.2.2 Creating and Deleting User Account

The two following commands can be used to create new users and assign administrator privileges :

Using the new user '**tester**' as an example :

```
ubuntu@VAC-series:~$>sudo adduser <user_name>
ubuntu@VAC-series:~$>sudo usermod -aG sudo <user_name>
ubuntu@VAC-series:~$ sudo adduser tester
Adding user `tester' ...
Adding new group `tester' (1001) ...
Adding new user `tester' (1001) with group `tester' ...
Creating home directory `/home/tester' ...
Copying files from `/etc/skel' ...
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
Is the information correct? [Y/n] y
ubuntu@VAC-series:~$ sudo usermod -aG sudo tester
ubuntu@VAC-series:~$>sudo deluser --remove-home <user_name>
```

With the deletion of the user 'tester' as an example :

```
ubuntu@VAC-series:~$>sudo deluser --remove-home tester
Looking for files to backup/remove ...
Removing files ...
Removing user `tester' ...
Warning: group `tester' has no more members.
Done.
```

4.2.3 Remove the Default User Account

To delete the default user account, users must first switch to a created user account and then use the following command to perform the deletion :

```
ubuntu@VAC-series:~$>su <user_name>
ubuntu@VAC-series:~$>sudo deluser --remove-home ubuntu
```

Using the user 'tester' to delete the default account as an example :

```
ubuntu@VAC-series:~$ su tester
Password:
tester@VAC-series:/home/ubuntu$ cd ~
tester@VAC-series:~$ sudo deluser --remove-home ubuntu
```

4.3 Network Settings

4.3.1 Configuring Ethernet Interfaces

Settings for the system network is configured using the Netplan tool, and the setting file is written with the YAML syntax; important fields are as follows :

Field	Value	Description
dhcp4	yes or no	Set whether to use dhcp; yes : use dhcp, no : use fixed IP
addresses	<IP>/<mask> or [<IP>, <IP>]	Set the fixed IP of the network interface or use the nameservers field to specify the DNS server
gateway4	<IP>	Specify network gateway IP
nameservers	N/A	Use the addresses field to specify the DNS server

The name of the network interface on the system is **'NETSEC1'**, and the setting file path is **'/etc/netplan/01-netcfg.yaml'**; the following command is needed to use vi to change the content :

```
ubuntu@VAC-series:~$>sudo vi /etc/netplan/01-netcfg.yaml
```

```
network:
   version: 2
   renderer: networkd
ethernets:
      NETSEC1:
        dhcp4: true
```

If dhcp is to be used to set the network interface, the following example can be used to perform settings :

If a fixed IP is used for the network interface, the following example can be used as reference to perform settings :

```
network:
   version: 2
   renderer: networkd
   ethernets:
      NETSEC1:
        addresses:
-        192.168.1.199/24
        gateway4: 192.168.1.1
        nameservers:
            addresses: [8.8.8.8, 1.1.1.1]
```

4.4 System Administration

4.4.1 Get the OS Version

The following command can be used to get information on the current system Linux version.

```
ubuntu@VAC-series:~$ cat /etc/os-release
NAME="Ubuntu"
VERSION="18.04.4 LTS (Bionic Beaver)"
ID=ubuntu
ID_LIKE=debian
PRETTY_NAME="Ubuntu 18.04.4 LTS"
VERSION_ID="18.04"
HOME_URL="https://www.ubuntu.com/"
SUPPORT_URL="https://help.ubuntu.com/"
BUG_REPORT_URL="https://bugs.launchpad.net/ubuntu/"
PRIVACY_POLICY_URL="https://www.ubuntu.com/legal/terms-and-policies/
privacy-policy"
VERSION_CODENAME=bionic
UBUNTU_CODENAME=bionic
```

The following command can be used to get the system kernel version.

4.4.2 Set the Time Zone

The following command can be used to set.

```
ubuntu@VAC-series:~$tzselect
Please identify a location so that time zone rules can be set correctly.
Please select a continent, ocean, "coord", or "TZ".
 1) Africa
 2) Americas
 3) Antarctica
 4) Asia
 5) Atlantic Ocean
 6) Australia
 7) Europe
 8) Indian Ocean
 9) Pacific Ocean
10) coord - I want to use geographical coordinates.
11) TZ - I want to specify the time zone using the Posix TZ format.
#? 4
Please select a country whose clocks agree with yours.
 1) Afghanistan          18) Israel              35) Palestine
 2) Armenia              19) Japan               36) Philippines
 3) Azerbaijan           20) Jordan              37) Qatar
 4) Bahrain              21) Kazakhstan          38) Russia
 5) Bangladesh           22) Korea (North)       39) Saudi Arabia
 6) Bhutan               23) Korea (South)       40) Singapore
 7) Brunei               24) Kuwait              41) Sri Lanka
 8) Cambodia             25) Kyrgyzstan          42) Syria
 9) China                26) Laos                43) Taiwan
10) Cyprus               27) Lebanon             44) Tajikistan
11) East Timor           28) Macau               45) Thailand
12) Georgia              29) Malaysia            46) Turkmenistan
13) Hong Kong            30) Mongolia            47) United Arab Emirates
14) India                31) Myanmar (Burma)     48) Uzbekistan
15) Indonesia            32) Nepal               49) Vietnam
16) Iran                 33) Oman                50) Yemen
17) Iraq                 34) Pakistan
#? 43
The following information has been given:

        Taiwan

Therefore TZ='Asia/Taipei' will be used.
Selected time is now:   Fri Oct  2 18:10:18 CST 2020.
Universal Time is now:  Fri Oct  2 10:10:18 UTC 2020.
Is the above information OK?
1) Yes
2) No
#? 1

You can make this change permanent for yourself by appending the line
        TZ='Asia/Taipei'; export TZ
to the file '.profile' in your home directory; then log out and log in again.

Here is that TZ value again, this time on standard output so that you
can use the /usr/bin/tzselect command in shell scripts:
Asia/Taipei
```

4.4.3 Adjusting the Time and Set the Time to RTC

The following command can be used to set the system time and save it into the RTC (Real Time Clock)

```
ubuntu@VAC-series:~$ sudo date -s "2 OCT 2020 18:00:00"
Fri Oct  2 18:00:00 CST 2020
ubuntu@VAC-series:~$ sudo hwclock -w
```

4.5 Determining Available Driver Space

The following command can be used to find out the current hard drive space usage condition.

```
ubuntu@VAC-series:~$ df -h --total
```

Filesystem	Size	Used Avail	Use%	Mounted on
udev	3.9G	0	3.9G	0%/dev
tmpfs	798M	8.7M	790M	2% /run
/dev/mmcblk0p2	58G	7.4G	47G	14% /
tmpfs	3.9G	0	3.9G	0% /dev/shm
tmpfs	5.0M	0	5.0M	0% /run/lock
tmpfs	3.9G	0	3.9G	0% /sys/fs/cgroup
tmpfs	798M	0	798M	0% /run/user/1000
total	71G	7.5G	60G	11% -

4.6 Shutting Down the Device

The following command can be used to shut down the system properly.

```
ubuntu@VAC-series:~$>sudo shutdown -h now
```

4.7 USB External Storage

When users use external USB for storage, it must first be connected to the system.

4.7.1 Mount USB Driver

Fdisk must be used first to confirm the address of the USB storage.

You might find an address like /dev/sda; we will use the following command to connect it to the system.

```
ubuntu@VAC-series:~$>sudo fdisk -l
Disk /dev/sda: 245 MiB, 256900608 bytes, 501759 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x00000000
```

This way the content of the USB storage will be connected to the /mnt directory.

```
ubuntu@VAC-series:~$>sudo mount /dev/sda /mnt
```

4.7.2 Remove USB Driver

Users can use the IPMI command of VAC-series Linux or use the external IPMI port to connect to VAC-1000 and monitor VAC-1000 remotely.

```
ubuntu@VAC-series:~$>sudo umount /dev/sda
```

4.8 IPMI Operations

Users can use the IPMI command of VAC-1000 Linux or use the external IPMI port to connect to VAC-1000 and monitor VAC-1000 remotely.

The default IP of the external IPMI port is 192.168.1.101.

4.8.1 Get the IPMI Port IP Address

Users can use the following command to acquire the IP address of the current IPMI port. The default IPMI IP address of the system is 192.168.1.101.

```
ubuntu@VAC-series:~$ sudo ipmitool lan print
Set in Progress         : Set Complete
Auth Type Support       : NONE
Auth Type Enable        : Callback : NONE
                        : User     : NONE
                        : Operator : NONE
                        : Admin    : NONE
                        : OEM      : NONE
IP Address Source       : Static Address
IP Address              : 192.168.1.101
Subnet Mask             : 255.255.255.0
MAC Address             : 70:20:84:a9:81:52
SNMP Community String : public
IP Header               : TTL=0x40 Flags=0x00 Precedence=0x00 TOS=0x10
Gratituous ARP Intrvl   : 0.0 seconds
802.1q VLAN ID          : Disabled
802.1q VLAN Priority    : 0
RMCP+ Cipher Suites     : 0,1,2,3
Cipher Suite Priv Max   : aaaaXXXXXXXXXX
                        : X=Cipher Suite Unused
                        : c=CALLBACK
                        : u=USER
                        : o=OPERATOR
                        : a=ADMIN
                        : O=OEM
Bad Password Threshold : Not Available
```

4.8.2 Set the IPMI Port IP Address

The following command can be used to set the IP address of the IPMI port.

ubuntu@VAC-series:~$**sudo ipmitool lan set 1 ipaddr 192.168.1.110**
Setting LAN IP Address to 192.168.1.110

4.8.3 Get Power Status by IPMI

The following command can be used to read the power status of the system with the IPMI function 2.

ubuntu@PC:~$ **sudo ipmitool -I lanplus -H 192.168.1.101 -U admin -P adminpass power status**
Chassis Power is on

4.8.4 Power On Remote VAC-1000 by IPMI

The following command can be used to power on BOX VAC-1000 iedge remotely with the IPMI function.

ubuntu@PC:~$ **sudo ipmitool -I lanplus -H 192.168.1.101 -U admin -P adminpass power on**

4.8.5 Power Off Remote VAC-1000 by IPMI

ubuntu@PC:~$ sudo ipmitool -I lanplus -H 192.168.1.101 -U admin -P adminpass power off.

ubuntu@PC:~$ **sudo ipmitool -I lanplus -H 192.168.1.101 -U admin -P adminpass power off**

4.8.6 Get Sensor Status by IPMI

he following command can be used to read the status of sensors inside VAC-1000 with the IPMI function.

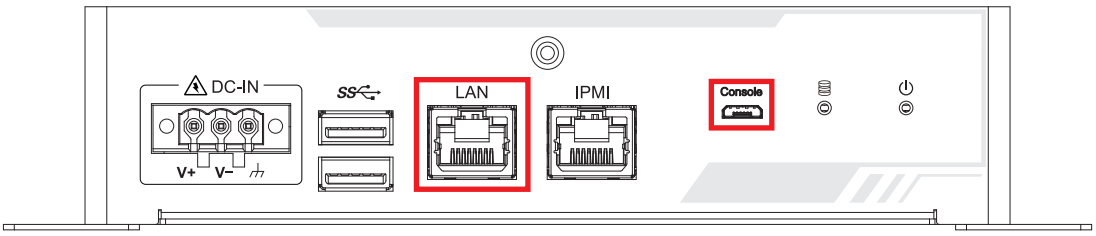
```
ubuntu@PC:~$ sudo ipmitool -I lanplus -H 192.168.1.101 -U admin -P
adminpass sdr
Sensor-1         | 51 degrees C      | ok
Sensor-2         | 51 degrees C      | ok
Sensor-3         | 50 degrees C      | ok
Sensor-4         | 51 degrees C      | ok
Sensor-5         | 51 degrees C      | ok
Sensor-6         | 51 degrees C      | ok
Sensor-7         | 51 degrees C      | ok
DDR1-Temp        | 45 degrees C      | ok
```

Sensor Name	Comments
Sensor-1	CPU temperature sensor 1
Sensor-2	CPU temperature sensor 2
Sensor-3	CPU temperature sensor 3
Sensor-4	CPU temperature sensor 4
Sensor-5	CPU temperature sensor 5
Sensor-6	CPU temperature sensor 6
Sensor-7	CPU temperature sensor 7
DDR1-Temp	DDR temperature sensor

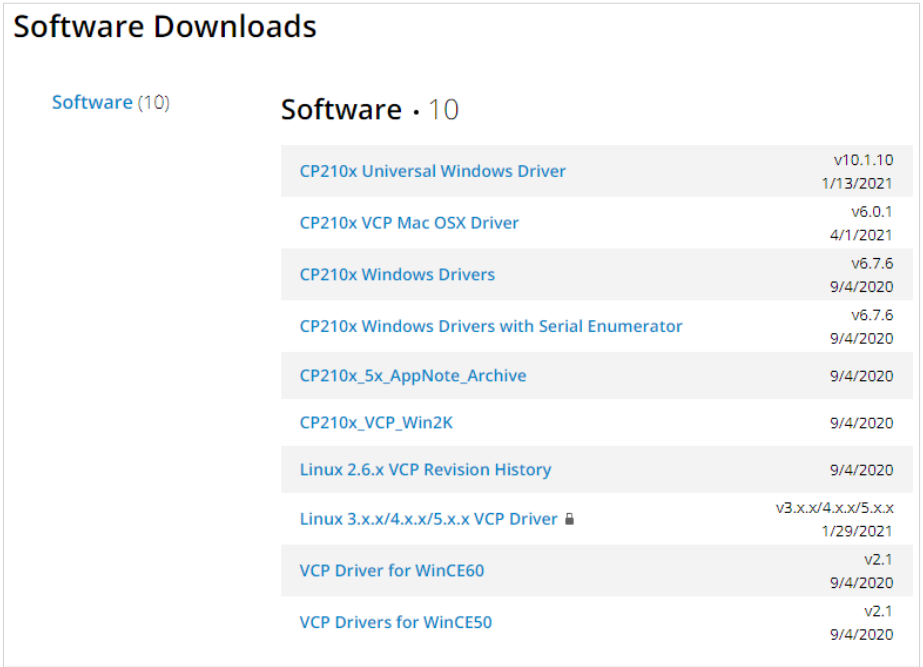
APPENDIX A : AI Module Guide

A.1 Development Environmental Setup

Step 1 Prepare a host computer to connect with VAC-1000/1100. Connect VAC-1000/1100 to host PC through the LAN port or the console port. The default LAN static IP is 192.168.1.100.



Step 2 Download and Install VCP Drivers for the host computer at https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers



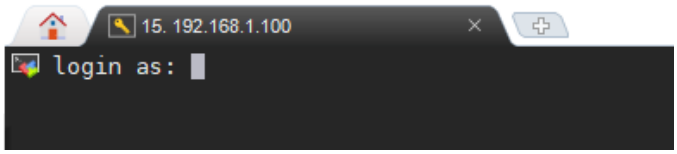
Software Downloads

Software (10)

Software · 10

CP210x Universal Windows Driver	v10.1.10 1/13/2021
CP210x VCP Mac OSX Driver	v6.0.1 4/1/2021
CP210x Windows Drivers	v6.7.6 9/4/2020
CP210x Windows Drivers with Serial Enumerator	v6.7.6 9/4/2020
CP210x_5x_AppNote_Archive	9/4/2020
CP210x_VCP_Win2K	9/4/2020
Linux 2.6.x VCP Revision History	9/4/2020
Linux 3.x.x/4.x.x/5.x.x VCP Driver	v3.x.x/4.x.x/5.x.x 1/29/2021
VCP Driver for WinCE60	v2.1 9/4/2020
VCP Drivers for WinCE50	v2.1 9/4/2020

Step 3 Set up the connection between your host computer and VAC-1000/1100 by PuTTY.
Username : ubuntu
Password : ubuntu



A.2 How to use GTI Module

A.2.1 How to use GTI Module

Step 1 Change directory to liteDemo.

Command line input :

```
$ cd Apps/liteDemo
```

```
$ make
```

Step 2 Execute the compiled executable file.

Command line input :

```
$
```

```
liteDemo ../Models/2801/gti_gnet3_fc20_2801.model ../Data/Image_lite/bridge_c20.bin
```

Displayed output for successful test :

```
RESULT: bridge
```

```
Image inference time = 13.4 ms
```

```
FPS = 74.6269
```

A.2.2 How to use Hailo Module

Step 1 Active virtual environment.

Command line input :

```
$ source  hailo_platform_venv/bin/activate
```

Displayed output :

```
ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps$ . hailo_platform_venv/bin/activate
(hailo_platform_venv) ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps$ hailo
```

Step 2 Change directory to example for test.

Command line input :

```
$ cd /platform/hailort/examples
```

```
$ cmake -configuration .
```

Displayed output :

```
(hailo_platform_venv) ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps/platform/hailort/examples$ cmake -confuration .
-- The C compiler identification is GNU 7.5.0
-- The CXX compiler identification is GNU 7.5.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Found HailoRT: /home/ubuntu/Apps_v3.4.0/hailo_apps/platform/hailort/lib/aarch64/libhailort.so.2.4.0
-- Looking for pthread.h
-- Looking for pthread.h - found
-- Looking for pthread_create
-- Looking for pthread_create - not found
-- Looking for pthread_create in pthreads
-- Looking for pthread_create in pthreads - not found
-- Looking for pthread_create in pthread
-- Looking for pthread_create in pthread - found
-- Found Threads: TRUE
-- Configuring done
-- Generating done
-- Build files have been written to: /home/ubuntu/Apps_v3.4.0/hailo_apps/platform/hailort/examples
```

Step 3 Compile source code.

Command line input :

```
$ make
```

Displayed output :

```
(hailo_platform_venv) ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps/platform/hailort/examples$ make
Scanning dependencies of target example_hef
[ 25%] Building C object CMakeFiles/example_hef.dir/example_hef.c.o
[ 50%] Linking C executable example_hef
[ 50%] Built target example_hef
Scanning dependencies of target example_jlf
[ 75%] Building C object CMakeFiles/example_jlf.dir/example_jlf.c.o
[100%] Linking C executable example_jlf
[100%] Built target example_jlf
(hailo_platform_venv) ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps/platform/hailort/examples$ ls
CMakeCache.txt  CMakeLists.txt  README.md  cmake              example_hef    example_jlf    shortcut_50_2928_1
CMakeFiles      Makefile        build      cmake_install.cmake  example_hef.c  example_jlf.c  shortcut_net.hef
```

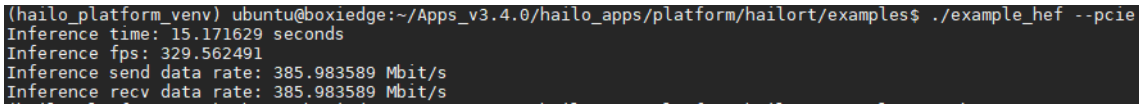
Step 4 Copy the complied library to system path.

Command line input :

```
$ cp /home/ubuntu/Apps_v3.4.0/hailo_apps/platform/hailort/lib/aarch64/libhailort.so.
2.4.0 /usr/lib/
$ ./example_hef --pcie
```

Displayed output for successful test :

```
Inference time: 15.17 seconds
Inference fps: 329.562491
```



A.3 SDK Installation/Update

A.3.1 GTI SDK Installation/Update

The GTI SDK is pre-installed on VAC-1000. The default installed version is GTI SDK V4.2. If there is a newer version of the SDK, it will be released on our product page resource section.

Step 1 Download the GTI SDK to the host computer. Make sure to download all the SDK files and combine them into a single zip file.

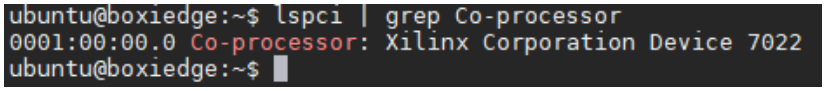
Step 2 Copy the GTI SDK zip file to the VAC-1000 by USB device.

Step 3 Check if the GTI card is detected.

Command line input :

```
$ lspci | Co-processor
```

Displayed output :



Step 4 Install the required packages.

Command line input :

```
$ sudo apt update
$ sudo apt install  libopencv-dev python-opencv
$ sudo apt-get install libusb-1.0-0 libusb-1.0-0-dev
```

Step 5 Unzip the GTI SDK on the VAC-1000.

Command line input :

```
$ tar zxvf GTISDK-Linux_aarch64_v4.2.0.1.tar.gz
```

Step 6 Change directory to GTISDK-Linux_aarch64_v4.2.0.1.

Command line input :

```
$ cd GTISDK-Linux_aarch64_v4.2.0.1
```

Step 7 Execute installation scripts.

Command line input :

```
$ source SourceMe.env
```

If you are using eMMC USB dongles, the following message may appear.

```
eMMC rules are missing or outdated. Do you wish to install? [Y/N]
```

Type Y to proceed.

Displayed output :

```
Added eMMC udev rules as /etc/udev/rules.d/50-emmc.rules
```

If you are using FTDI USB dongles, the following message may appear.

```
FTDI rules are missing or outdated. Do you wish to install? [Y/N]
```

Type Y to proceed.

Displayed output for successful installation :

```
Response: Added FTDI udev rules as /etc/udev/rules.d/51-ftd3xx.rules
```

A.3.2 Hailo SDK Installation/Update

The Hailo SDK is pre-installed on VAC-1100. The default installed version is Hailo Tapps V3.4.0. If there is a newer version of the SDK, it will be released on our product page resource section.

Step 1 Download the Hailo SDK to the host computer. Make sure to download all the SDK files to unzip and combine into a single SDK package.

Step 2 Install the required packages.

2.1 Install Cairo.

Command line input

```
$ sudo apt-get install -y libcairo2-dev
```

2.2 Install Gobject-introspection

Command line input

```
$ sudo apt-get install -y libgirepository1.0-dev
```

2.3 Install Gstreamer

Command line input :

```
$ sudo apt-get install libgstreamer1.0-0 gstreamer1.0-plugins-base
gstreamer1.0-plugins-good  gstreamer1.0-plugins-bad gstreamer1.0-plugins-ugly
gstreamer1.0-libav gstreamer1.0-doc gstreamer1.0-tools gstreamer1.0-x
gstreamer1.0-alsa gstreamer1.0-gl gstreamer1.0-gtk3 gstreamer1.0-qt5
gstreamer1.0-pulseaudio
```

2.4 Install Tkinter

Command line input :

```
$ sudo apt-get install -y python3-tk
```

2.5 Install Python3 dev

Command line input :

```
$ sudo apt-get install -y python3.6-dev
```

2.6 Install Pip

Command line input :

```
$ sudo apt-get install -y python3-pip
```

2.7 Install Virtualenv

Command line input :

```
$ sudo apt-get install python-virtualenv
```

2.8 Install Psutil

Command line input :

```
$ pip3 install psutil
```

Step 3 Check if the Hailo card is detected.

Command line input :

```
$ lspci | grep Co-processor
```

Displayed output :

```
ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps$ lspci | grep Co-processor
0001:00:00.0 Co-processor: Device 1e60:2864 (rev 01)
ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps$
```

Step 4 Unzip Hailo SDK on the VAC-1000.

Command line input :

```
$ unzip hailo_apps_v3.4.0.zip #unzip password:AppsVersionID3.4.0
```

Step 5 Change directory to hailo_apps.

Command line input :

```
$ cd hailo_apps
```

Step 6 Execute installation scripts.

Command line input :

```
$ ./install.sh
```

Displayed output :

```
Create user guide? [Y/N]
```

Type Y to proceed

Displayed output :

```
ln: failed to create symbolic link 'hailort_user_guide.html': File exists
Config file /home/ubuntu/.hailo/config already exists. Rewrite? [Y/N]: y
```

Step 8 Install firmware.

Command line input :

```
$ sudo mkdir /lib/firmware/
```

```
$ ./install.sh --install-firmware
```

Displayed output :

```
Create user guide? [Y/N]
```

Type Y to proceed

Displayed output :

```
ln: failed to create symbolic link 'hailort_user_guide.html': File exists
Config file /home/ubuntu/.hailo/config already exists. Rewrite? [Y/N]: y
```

Step 9 Install PCIe driver :

Command line input :

```
$ ./install.sh --install-pcie-driver
```

Displayed output :

```
Create user guide? [Y/N]
```

Type Y to proceed

Displayed output :

```
ln: failed to create symbolic link 'hailort_user_guide.html': File exists
Config file /home/ubuntu/.hailo/config already exists. Rewrite? [Y/N]: y
```

Displayed output :

```
Rewrite? [Y/N]
```

Type Y to proceed

Displayed output for successful installation :

```
Requirement already satisfied: pyzmq in ./hailo_platform_venv/lib/python3.6/site-packages (from zmq->hailo-platform==3.4.0) (18.1.1)
hailo-platform is already installed with the same version as the provided wheel. Use --force-reinstall to force an installation of the wheel.
Installation is done.
Hailort Cli installed in your virtual env
ubuntu@boxiedge:~/Apps_v3.4.0/hailo_apps$
```

A.4 Additional Material

For further information regarding the GTI Lightspeeur AI module, please visit the GTI Developer Portal for more resources. Please register for a free GTI membership to download their software resources.

For further information regarding the Hailo AI module, please visit the Hailo Developer Zone for more resources.

B

APPENDIX B : POWER CONSUMPTION

Testing Board :	VAC-1000
RAM	16GB * 1
USB-1 : (USB 3.0)	USB Flash ADATA 3.0 16GB
USB-2 : (USB 3.0)	USB Flash ADATA 3.0 16GB
eMMC	64GB eMMC (eMMC64G-TX29, Support MMC4.41/HS200)
M.2 Key M PCIe-1	Foxconn AI accelerator Card
M.2 Key M PCIe-2	M.2 (P80) 3TE6 DEM28-A28DD1ECAQF-H03
SATA 0	Transcend SATA SSD420 128GB
LAN (RTL8211FI)	1.0 Gbps
IPMI (RTL8211FI)	1.0 Gbps
Power Plan	Linux Ubuntu Server 18.04 LTS
Power Source	Chroma 62006P-100-25
Test Program-1	Stress-ng Test

B.1 Foxconn-FXN3102 : 24-cores Cortex-A53 Processor, up to 1GHz

CPU	Power Input	Linux Ubuntu Server 18.04 LTS			
		Idle status CPU		Run stress-ng Test	
		Max Current	Max Consumption	Max Current	Max Consumption
24-cores Cortex-A53 Processor, up to 1GHz	9V	1.713A	15.42W	1.939A	17.45W
	12V	1.278A	15.34W	1.429A	17.15W
	24V	0.660A	15.84W	0.745A	17.87W
	36V	0.464A	16.69W	0.518A	18.66W
	50V	0.344A	17.20W	0.384A	19.22W

C

APPENDIX C : SUPPORTED MEMORY & STORAGE LIST

C.1 Supported Memory List

Testing Board	VAC-1000
Memory Test	version : 4.2.2
Stress-ng Test	version : 0.09.25

C.2 Test Item

Channel	Memory Test	Stress-ng Test
*1(DIMM 1)	PASS	PASS

C.3 Supported ECC Memory List

Brand	Info	Test Temp.(Celsius)
ADATA 16G DDR4 2400 SO-DIMM	AD4B2400316G17-BSSB	25ºC
SLINK 16GB DDR4-3200 SO-DIMM IT	J4AGDH1G8TMKI	-40ºC~70ºC
SLINK 16GB DDR4-3200 SO-DIMM	J4AGDH1G8TMKC	25ºC
Innodisk 16G DDR4 2400 SO-DIMM	M4DS-AGS1QC0J-BCFS	25ºC

C.4 Supported Storage List

Type	Brand	Model	Capacity
SATA SSD	Innodisk	3MG2-P DGS25-64GD81BC1QC	64GB
	Kingston	SUV400S37	120GB
		SA400S37	120GB
	Transcend	TS64GSSD420K	64GB
	SMART	2.5" SATA CS110 SSD 512GB	512GB
	MEMXPRO	2.5" SSD PT31 256GB ST	256GB
	FORESEE	S903S256G	256GB
M.2 PCIe SSD	TOSHIBA	KXG50ZNV512G	512GB
	Kingston	SA2000MB	250GB
	Intel	INTEL SSD 760p SERIES	128GB
	SAMSUNG	970 EVO PLUS MZ-V7S250	250GB
	Innodisk	M.2(P80)3TE6 DEM28-A28DD1ECAQF-H03	128GB

** If more help is needed, please contact Vecow

Vecow

For further support information, please visit www.vecow.com