



Network Appliance Platforms

Hardware Platforms for Network Computing

VP-501 User Manual

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About this Document



This manual describes the overview of the various functionalities of this product, and the information you need to get it ready for operation. It is intended for those who are:

- responsible for installing, administering and troubleshooting this system or Information Technology professionals.
- assumed to be qualified in the servicing of computer equipment, such as professional system integrators, or service personnel and technicians.

The latest version of this document can be found on Lanner's official website, available either through the product page or through the [Lanner Download Center](#) page with a login account and password.

Icon Descriptions

The icons are used in the manual to serve as an indication of interest topics or important messages. Below is a description of these icons:

Icon	Usage
 Note or Information	This mark indicates that there is something you should pay special attention to while using the product.
 Warning or Important	This mark indicates that there is a caution or warning and it is something that could damage your property or product.

Online Resources

To obtain additional documentation resources and software updates for your system, please visit the [Lanner Download Center](#). As certain categories of documents are only available to users who are logged in, please be registered for a Lanner Account at <http://www.lannerinc.com/> to access published documents and downloadable resources.

Technical Support

In addition to contacting your distributor or sales representative, if there are any technical queries, you could submit a support ticket to our [Lanner Technical Support](#) department.

Documentation Feedback

Your feedback is valuable to us, as it will help us continue to provide you with more accurate and relevant documentation. To provide any feedback, comments or to report an error, please email to contact@lannerinc.com. Thank you for your time.

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Contact Information

Taiwan Corporate Headquarters

Lanner Electronics Inc.

7F, No.173, Sec.2, Datong Rd.
Xizhi District, New Taipei City 22184,
Taiwan

立端科技股份有限公司

221 新北市汐止區
大同路二段 173 號 7 樓
T: +886-2-8692-6060
F: +886-2-8692-6101
E: contact@lannerinc.com

USA

Lanner Electronics Inc.

47790 Westinghouse Drive
Fremont, CA 94539
T: +1-855-852-6637
F: +1-510-979-0689
E: sales_us@lannerinc.com

Europe

Lanner Europe B.V.

Wilhelmina van Pruysenweg 104
2595 AN The Hague
The Netherlands
T: +31 70 701 3256
E: sales_eu@lannerinc.com

China

Beijing L&S Lancom Platform Tech. Co., Ltd.

Guodong LOFT 9 Layer No. 9 Huinan Road,
Huilongguan Town, Changping District, Beijing
102208 China
T: +86 010-82795600
F: +86 010-62963250
E: service@ls-china.com.cn

Canada

Lanner Electronics Canada Ltd

3160A Orlando Drive
Mississauga, ON
L4V 1R5 Canada
T: +1 877-813-2132
F: +1 905-362-2369
E: sales_ca@lannerinc.com

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Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.
- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

- ▶ Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- ▶ This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.



Note

1. An unshielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used.
2. Use only shielded cables to connect I/O devices to this equipment.
3. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



Important

1. Operations in the 5.15-5.25GHz band are restricted to indoor usage only.
2. This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

Safety Guidelines

Follow these guidelines to ensure general safety:

- ▶ Keep the chassis area clear and dust-free during and after installation.
- ▶ Do not wear loose clothing or jewelry that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- ▶ Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- ▶ Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- ▶ Disconnect all power by turning off the power and unplugging the power cord before installing or removing a chassis or working near power supplies
- ▶ Do not work alone if potentially hazardous conditions exist.
- ▶ Never assume that power is disconnected from a circuit; always check the circuit.

Consignes de sécurité

Suivez ces consignes pour assurer la sécurité générale :

- ▶ Laissez la zone du châssis propre et sans poussière pendant et après l'installation.
- ▶ Ne portez pas de vêtements amples ou de bijoux qui pourraient être pris dans le châssis. Attachez votre cravate ou écharpe et remontez vos manches.
- ▶ Portez des lunettes de sécurité pour protéger vos yeux.

- ▶ N'effectuez aucune action qui pourrait créer un danger pour d'autres ou rendre l'équipement dangereux.
- ▶ Coupez complètement l'alimentation en éteignant l'alimentation et en débranchant le cordon d'alimentation avant d'installer ou de retirer un châssis ou de travailler à proximité de sources d'alimentation.
- ▶ Ne travaillez pas seul si des conditions dangereuses sont présentes.
- ▶ Ne considérez jamais que l'alimentation est coupée d'un circuit, vérifiez toujours le circuit. Cet appareil génère, utilise et émet une énergie radiofréquence et, s'il n'est pas installé et utilisé conformément aux instructions des fournisseurs de composants sans fil, il risque de provoquer des interférences dans les communications radio.

Lithium Battery Caution

- ▶ There is risk of explosion if the battery is replaced by an incorrect type.
- ▶ Dispose of used batteries according to the instructions.
- ▶ Installation should be conducted only by a trained electrician or only by an electrically trained person who knows all installation procedures and device specifications which are to be applied.
- ▶ Do not carry the handle of power supplies when moving to another place.
- ▶ Please conform to your local laws and regulations regarding safe disposal of lithium battery.
- ▶ Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery can result in an explosion.
- ▶ Leaving a battery in an extremely high temperature environment can result in an explosion or the leakage of flammable liquid or gas.
- ▶ A battery subjected to extremely low air pressure may result in an explosion or the leakage of flammable liquid or gas.

Avertissement concernant la pile au lithium

- ▶ Risque d'explosion si la pile est remplacée par une autre d'un mauvais type.
- ▶ Jetez les piles usagées conformément aux instructions.
- ▶ L'installation doit être effectuée par un électricien formé ou une personne formée à l'électricité connaissant toutes les spécifications d'installation et d'appareil du produit.
- ▶ Ne transportez pas l'unité en la tenant par le câble d'alimentation lorsque vous déplacez l'appareil.

Operating Safety

- ▶ Electrical equipment generates heat. Ambient air temperature may not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Be sure that the room in which you choose to operate your system has adequate air circulation.
- ▶ Ensure that the chassis cover is secure. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
- ▶ Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. Be sure to follow ESD-prevention procedures when removing and replacing components to avoid these problems.
- ▶ Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. If no wrist strap is available, ground yourself by touching the metal part of the chassis.
- ▶ Periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

Sécurité de fonctionnement

- ▶ L'équipement électrique génère de la chaleur. La température ambiante peut ne pas être adéquate pour refroidir l'équipement à une température de fonctionnement acceptable sans circulation adaptée. Vérifiez que votre site propose une circulation d'air adéquate.
- ▶ Vérifiez que le couvercle du châssis est bien fixé. La conception du châssis permet à l'air de refroidissement de bien circuler. Un châssis ouvert laisse l'air s'échapper, ce qui peut interrompre et rediriger le flux d'air frais destiné aux composants internes.
- ▶ Les décharges électrostatiques (ESD) peuvent endommager l'équipement et gêner les circuits électriques. Des dégâts d'ESD surviennent lorsque des composants électroniques sont mal manipulés et peuvent causer des pannes totales ou intermittentes. Suivez les procédures de prévention d'ESD lors du retrait et du remplacement de composants.
- ▶ Portez un bracelet anti-ESD et veillez à ce qu'il soit bien au contact de la peau. Si aucun bracelet n'est disponible, reliez votre corps à la terre en touchant la partie métallique du châssis.
- ▶ Vérifiez régulièrement la valeur de résistance du bracelet antistatique, qui doit être comprise entre 1 et 10 mégohms (Mohms).

Mounting Installation Precautions

The following should be put into consideration for rack-mount or similar mounting installations:

- ▶ Do not install and/or operate this unit in any place that flammable objects are stored or used in.
- ▶ The installation of this product must be performed by trained specialists; otherwise, a non-specialist might create the risk of the system's falling to the ground or other damages.
- ▶ Lanner Electronics Inc. shall not be held liable for any losses resulting from insufficient strength for supporting the system or use of inappropriate installation components.
- ▶ Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
- ▶ Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of airflow required for safe operation of the equipment is not compromised.
- ▶ Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- ▶ Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- ▶ Reliable Grounding - Reliable grounding of rack mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Installation & Operation

- ▶ This equipment must be grounded. The power cord for product should be connected to a socket-outlet with earthing connection.
Cet équipement doit être mis à la terre. La fiche d'alimentation doit être connectée à une prise de terre correctement câblée
- ▶ Suitable for installation in Information Technology Rooms in accordance with Article 645 of the National Electrical Code and NFPA 75.
Peut être installé dans des salles de matériel de traitement de l'information conformément à l'article 645 du National Electrical Code et à la NFPA 75.
- ▶ The machine can only be used in a restricted access location and must be installed by a skilled person.
Les matériels sont destinés à être installés dans des EMPLACEMENTS À ACCÈS RESTREINT.
- ▶ Some USB devices may not be compatible with the system. If you encounter an error, please remove the USB device and restart the system.

Warning

Class I Equipment. This equipment must be earthed. The power plug must be connected to a properly wired earth ground socket outlet. An improperly wired socket outlet could place hazardous voltages on accessible metal parts.

"Product shall be used with Class 1 laser device modules."

Avertissement

Équipement de classe I. Ce matériel doit être relié à la terre. La fiche d'alimentation doit être raccordée à une prise de terre correctement câblée. Une prise de courant mal câblée pourrait induire des tensions dangereuses sur des parties métalliques accessibles.

"Le produit doit être utilisé avec des modules de dispositifs laser de classe 1."



CAUTION: TO DISCONNECT POWER, REMOVE ALL POWER CORDS FROM UNIT.

注意：要断开电源，请将所有电源线从本机上拔下。

WARNUNG: Wenn Sie das Gerät zwecks Wartungsarbeiten vom Netz trennen müssen, müssen Sie beide Netzteile abnehmen.

ATTENTION: DÉBRANCHER LES TOUT CORDONS D'ALIMENTATION POUR DÉCONNECTER L'UNITÉ DU SECTEUR.

Electrical Safety Instructions

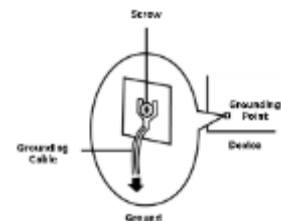
Before turning on the device, ground the grounding cable of the equipment. Proper grounding (grounding) is very important to protect the equipment against the harmful effects of external noise and to reduce the risk of electrocution in the event of a lightning strike. To uninstall the equipment, disconnect the ground wire after turning off the power. A ground wire (green-and-yellow) is required and the part connecting the conductor must be greater than 4 mm² or 10 AWG.

Consignes de sécurité électrique

- ▶ Avant d'allumer l'appareil, reliez le câble de mise à la terre de l'équipement à la terre.
- ▶ Une bonne mise à la terre (connexion à la terre) est très importante pour protéger l'équipement contre les effets néfastes du bruit externe et réduire les risques d'électrocution en cas de foudre.
- ▶ Pour désinstaller l'équipement, débranchez le câble de mise à la terre après avoir éteint l'appareil.
- ▶ Un câble de mise à la terre est requis et la zone reliant les sections du conducteur doit faire plus de 4 mm² ou 10 AWG.

Grounding Procedure for DC Power Source

- ▶ Connect the grounding cable to the ground.
- ▶ The protection device for the DC power source must provide 30 A current.
- ▶ This protection device must be connected to the power source before DC power.



Procédure de mise à la terre pour source d'alimentation CC

- ▶ Branchez le câble de mise à la terre à la terre.
- ▶ L'appareil de protection pour la source d'alimentation CC doit fournir 30 A de courant.
- ▶ Cet appareil de protection doit être branché à la source d'alimentation avant l'alimentation CC.

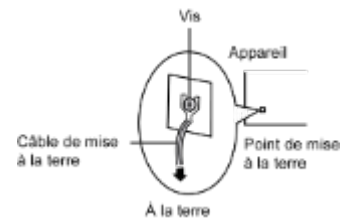


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CHAPTER 1: PRODUCT OVERVIEW

The VP-501, a 1U network security platform with NXP® Layerscape® LX2160 CPU, is designed for networking, industrial applications and virtualized networks and embedded systems that require an advanced data path and network peripheral interfaces.

Main Features

- ▶ NXP® Layerscape® LX2160 SOC
- ▶ DDR4 2900MHz SODIMM, Max. 64GB
- ▶ 8x 1GbE RJ45, 2x 10GbE RJ45, 2x 10G SFP+ Ports
- ▶ 1x Console, 1x USB 3.0,
- ▶ 1x 2.5" HDD/SSD Support, M.2 Storage, M.2 LTE/5G Module Expansion, 2x dual SIM Slots

Package Content

Your package contains the following items:

- ▶ 1x Network Security Platform
- ▶ 1x Power Adaptor, 1x Console Cable, 1x SATA Cable
- ▶ 1x Nameplate
- ▶ 1x Short Ear Rackmount Kit with screws

Ordering Information

SKU No.	Main Features
VP-501A	NXP® LX2160 SoC, 2x 10G SFP+ Ports, 8x 1GbE RJ45 Ports, 2x 10GbE RJ45 Ports, 300W PSU

Optional Accessories

Model	Description
5G Kit	5G Module Kit w/ screws pack, internal antenna cables, external antennas
LTE Kit	LTE Module Kit w/ screws pack, internal antenna cables, external antennas
Rack Mount Kit	Slide Rackmount w/ screws pack

System Specifications

Form Factor		1U 19" Rackmount
Platform	CPU Processor	NXP® LX2160SE72029B SOC
	CPU TDP	Up to 27.2W
	CPU Socket	BGA1517 onboard
	Chipset	SoC
BIOS		AMI SPI Flash BIOS
System Memory	Technology	DDR4 2900 MHz SODIMM
	Max. Capacity	Up to 64GB
	Socket	2x 260-pin SODIMM
Networking	Ethernet Ports	8x 1GbE RJ45 Ports; 2x 10GbE RJ45 Ports; 2x 10G SFP+ (via XFi)
Storage	HDD/SSD Support	1x 2.5" Internal HDD/SSD Bracket
	Onboard Slots	1x M.2 (SATA) 2280 B-Key
I/O Interface	Reset Button	1x Reset Button (Default Software Reset Control by GPIO)
	LED Indicators	Power/Status/Storage LED Indicators, refer to Appendix A
	Power Button	1x Power ON/OFF Button
	Console Port	1x RJ45 Console Port
	USB Port	1x USB 3.0 Port
	Power Input	AC Power Inlet on PSU
	Antenna Hole	4x Antenna Holes
Expansion	M.2 Slot	1x M.2 for LTE/5G
	SIM Card Slot	1x Dual SIM Slot
Miscellaneous	Watchdog	Yes
	Internal RTC w/ Li Battery	Yes
	TPM	Yes
Cooling	Processor	Passive CPU Heatsink
	System	3x Smart Fans
Environmental Parameters	Temperature	0°C ~40°C Operating; -40°C ~70°C Non-Operating
	Humidity (RH)	5%~90% Operating; 5%~ 95% Non-Operating
System Dimensions	WxDxH	438 x 44 x 321mm
	Weight	TBC
Package Dimensions	(WxDxH)	533 x 209 x 497mm
	Weight	TBC
Power	Type/Watts	300W Single ATX PSU
	Input	AC 100~240V @60~50 Hz
OS Support		Linux
Approvals and Compliance		RoHS, CE/FCC Class A, UL, UKCA

Front Panel



No.	Description	
F1	Antenna	4x SMA Antenna Holes for LTE/5G Module (Optional)
F2	LED Indicators	Power/Status/HDD LED Indicators, refer to Appendix A
F3	Power Switch	1x Power ON/OFF Switch
F4	Reset Button	1x Reset Button
F5	Console Port	1x RJ45 Console Port
F6	USB Port	1x USB 3.0 Ports
F7	LAN Port	8x 1GbE RJ45 Ethernet Ports; 2x 10GbE RJ45 Ethernet Ports
F8	SFP Port	2x 10G SFP+ Ports
F9	NIC Module	1x NCS2 Slim Type NIC Module (Optional)

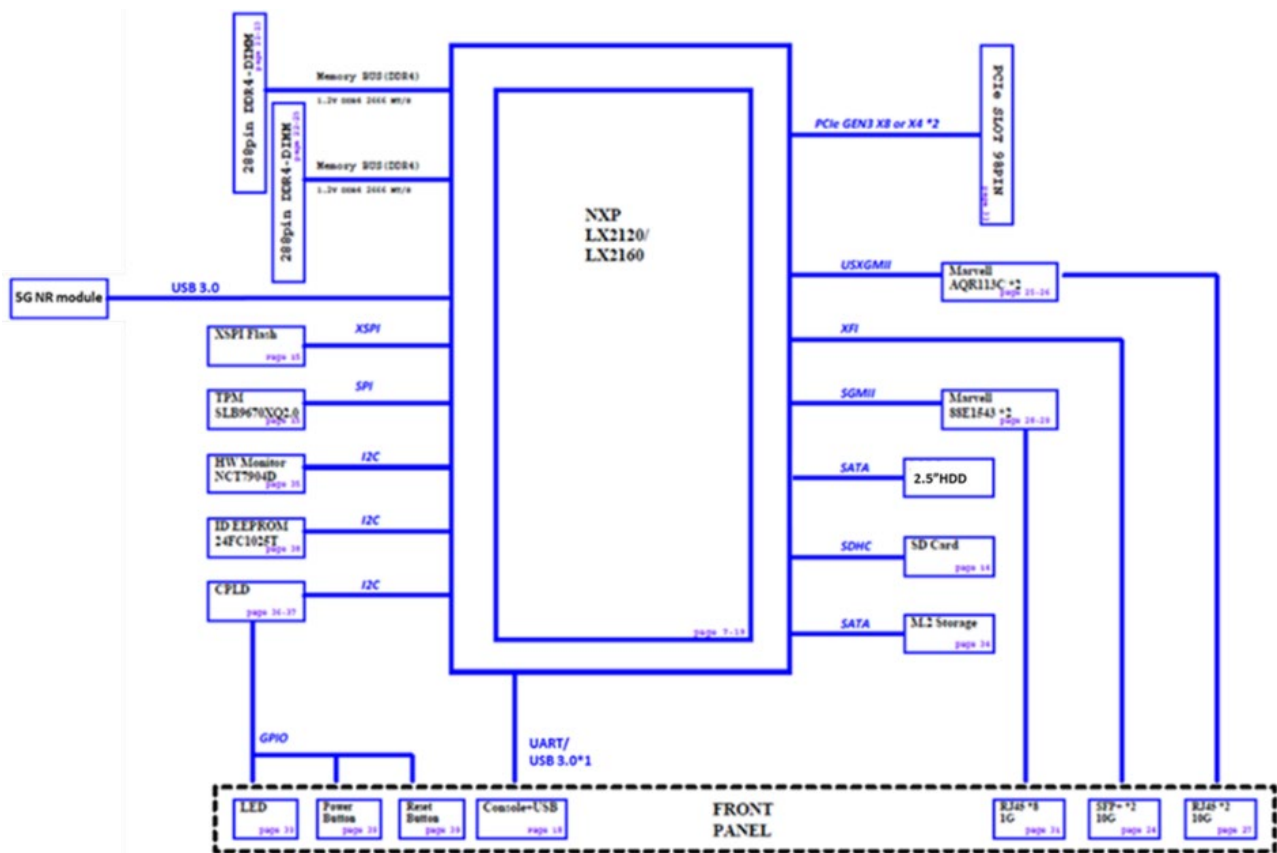
Rear Panel



No.	Description	
R1	Ground Screw	1x Grounding Hole/Screw
R2	ESD Screw	1x ESD Jack
R3	Cooling Fan	3x Cooling Smart Fans
R4	Power Switch	1x ATX Slim Type Power Switch
R5	Power Supply	1x 300W Single PSU

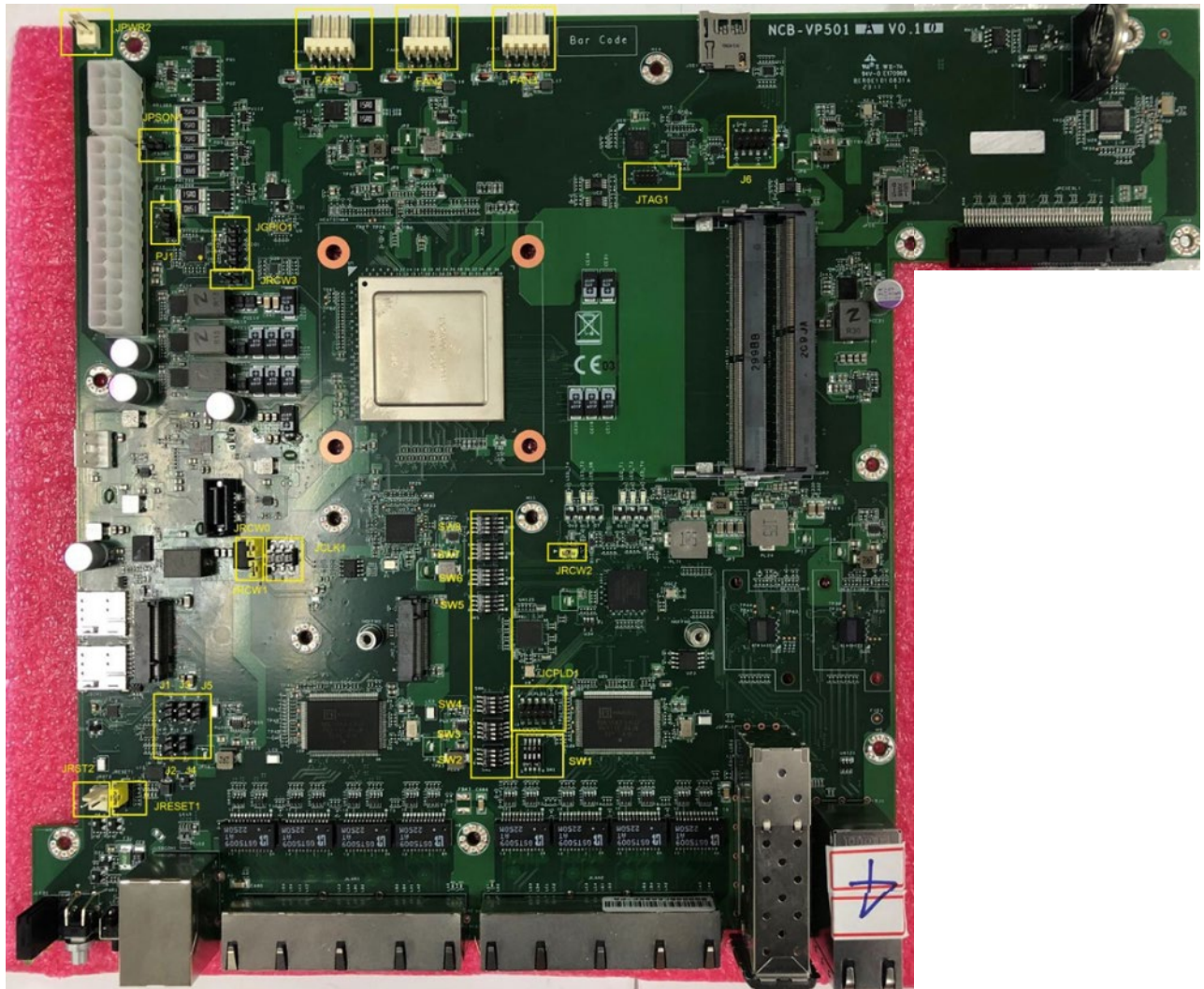
CHAPTER 2: MOTHERBOARD INFORMATION

Block Diagram



Jumpers and Connectors

The following displays the connectors and jumpers on the motherboard layout.

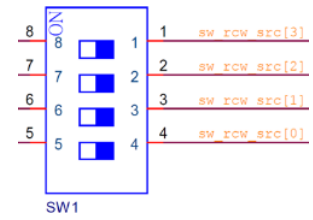


Jumper Setting and Connector Pin-out

The following references the pin assignments and internal connectors of VP-501.

SW1

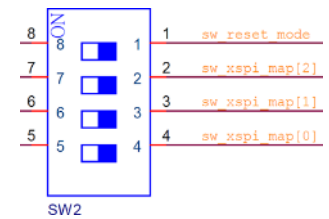
SW_RCW_SRC [3:0]	Function
0000	Hard-coded RCW
1000	SDHC1 SD Card
1111	Booting XSPI NOR <input type="checkbox"/>



SW2

sw_reset_mode	Function
0	Ignore RESET_REQ_B ←
1	Trigger system reset on RESET_REQ_B

sw_xspi_map [2:0]	Function
000	Normal ←



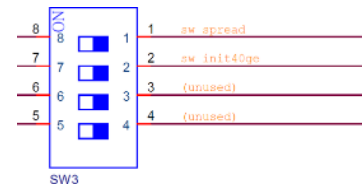
SW3

sw_spread	Function
0	100MHz clock for PCIe is fixed ←
1	100MHz clock for PCIe is modulated

sw_init40ge	Function
0	CS4223 40GE PHY is not self configured ←
1	CS4223 40GE PHY is self configured on reset

sw_slotclk	Function
0	PCIE slots clocked only when card installed ←
1	PCIE slots clocked always

SW2_4	Function
0	Unused ←



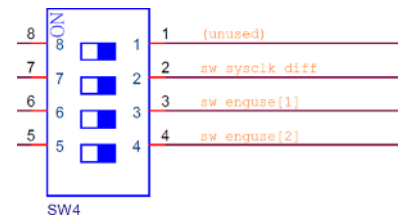
SW4

SW2_5	Function
0	Unused ←

sw_sysclk_diff	Function
0	Extended DDR reset timing ←
1	Standard DDR reset timing

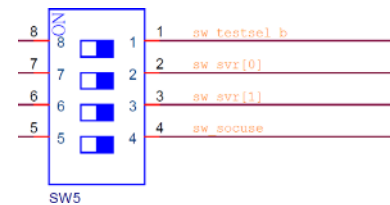
sw_enguse[1]	Function
0	Unused ←

sw_enguse[2]	Function
0	Single Ended DDRCLK ←
1	Use Differential SYSCLK

**SW5**

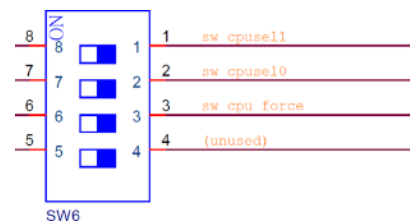
Sw_testsel_b + sw_svr[0:1]	Function
001	reserved
011	LX2120A/E
101	LX2080C/E
111	LX2160A/E ←

sw_socuse	Function
1	Normal mode (do not change) ←

**SW6**

sw_cpuse1[1:0]+sw_cpu_force	Function
000	Unused
011	CPLD setting ←

SW3_8	Function
0	Unused ←



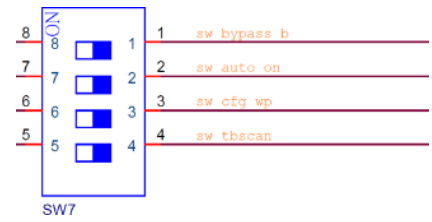
SW7

sw_bypass_b	Function
0	Disable thermal monitors and other alarms
1	Normal Operation ←

sw_auto_on	Function
0	Normal power on/off ←
1	Always power up

sw_cfg_wp	Function
0	Allow write to SYSID and UEFI flash
1	Write protect SYSID and UEFI flash ←

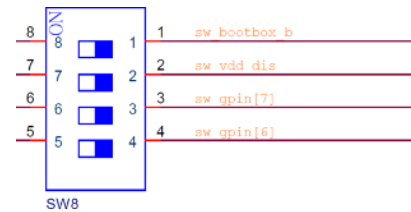
sw_tbscan	Function
0	Boundary Scan Mode
1	Debugging Mode ←

**SW8**

sw_bootbox_b	Function
0	Enable boot box mode
1	Normal operating mode ←

sw_vdd_dis	Function
0	Enable VDD power supply ←
1	Disable VDD power supply

sw_gpin[7:6]	Function
00	Software/end user defined ←

**JGPIO1: Vo: 1.8V; Pull High**

Pin	Description
1	EVT0_B
2	EVT1_B
3	EVT2_B
4	EVT3_B
5	EVT4_B



JRCW0 (Do Not Use Jumper)

Pin	Description
1	GND
2	UART2_SOUT

**JRCW1 (Do Not Use Jumper)**

Pin	Description
1	GND
2	UART1_SOUT

**JRCW2 (Do Not Use Jumper)**

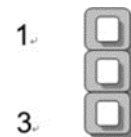
Pin	Description
1	GND
2	ASLEEP

**JRCW3 (Do Not Use Jumper)**

Pin	Description
1	GND
2	CLKOUT

**JRESET1**

Pin	Description
1	HW_RST
2	RSTBTN_N
3	SW_RST



Jumper:

1-2 Hardware Reset (Default)

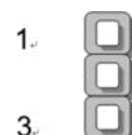
2-3 Software Reset

JRST2: For Testing

Pin	Description
1	RSTBTN_N
2	GND

**PJ1:**

Pin	Description
1	SMB_SDA
2	SMB_SCL
3	GND



J1

Pin	Description
1	AUDIO_0
2	1.8V

**J2**

Pin	Description
1	AUDIO_1
2	3.3V

**J3**

Pin	Description
1	AUDIO_2
2	3.3V

**J4**

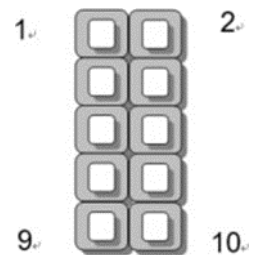
Pin	Description
1	DEVSLP
2	3.3V

**J5**

Pin	Description
1	DEVSLP
2	3.3V

**JCPLD1**

Pin	Description
1	JTAG_PLD_TCK
2	GND
3	JTAG_PLD_TMO
4	+P3V3_AUX_CPLD
5	JTAG_PLD_TMS
6	N/A
7	N/A
8	N/A
9	JTAG_PLD_TDI
10	GND



JCLK1

Pin	Description
1	8T49N285_SCL
2	GND
3	8T49N285_SCL
4	+P5V
5	N/A
6	+P5V

**JPSON1**

Pin	Description
1	ATX_ON_B
2	GND

**JPWR2**

Pin	Description
1	PWRBTN_N
2	GND

**FAN1**

Pin	Description
1	CPUFANOUT1_R
2	N/A
3	CPUFANIN_R
4	+P12V_ATX
5	GND

**FAN2**

Pin	Description
1	CPUFANOUT2_R
2	N/A
3	AUXFANIN0_R
4	+P12V_ATX
5	GND

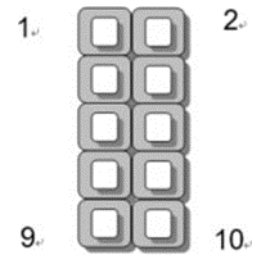


FAN3

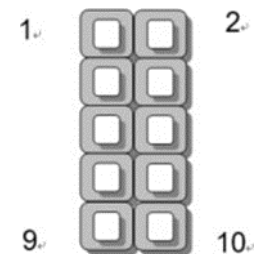
Pin	Description
1	CPUFANOUT3_R
2	N/A
3	AUXFANIN1_R
4	+P12V_ATX
5	GND

**JTAG1**

Pin	Description
1	JTAG_VREF
2	PROC_TMS
3	GND
4	PROC_TCK
5	GND
6	PROC_TDO
7	N/A
8	PROC_TDI
9	GND
10	JTAG_RST_B

**J6**

Pin	Description
1	+P1V8_NOR
2	N/A
3	XSPI_A_CS0_B
4	+P1V8_NOR
5	XSPI_A_D1
6	XSPI_A_D3
7	XSPI_A_D2
8	XSPI_A_SCK
9	GND
10	XSPI_A_D0



CHAPTER 3: HARDWARE SETUP

To reduce the risk of personal injury, electric shock, or damage to the system, please remove all power connections to shut down the device completely and wear ESD protection gloves when handling the installation steps.

Opening the Chassis

1. Power off the system and remove all power connections.
2. Loosen and remove the two (2) screws on the rear panel.



3. Gently slide the chassis cover slightly back a bit.



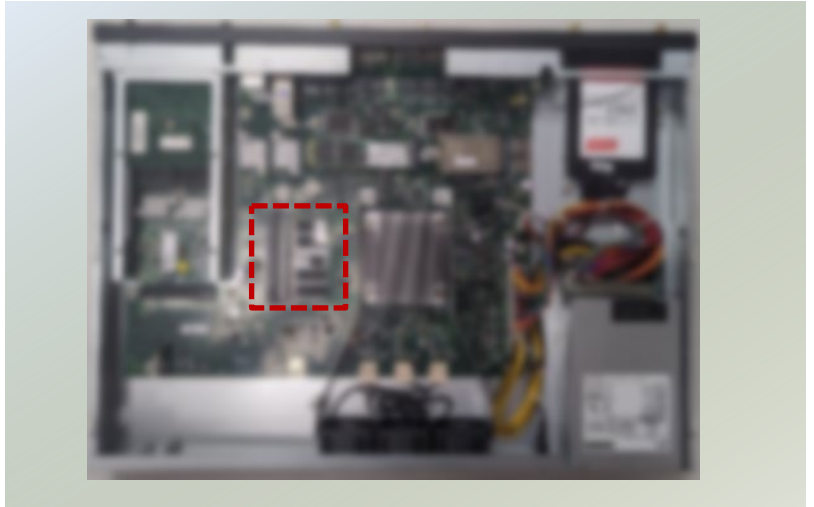
4. Lift the chassis cover up, to remove.



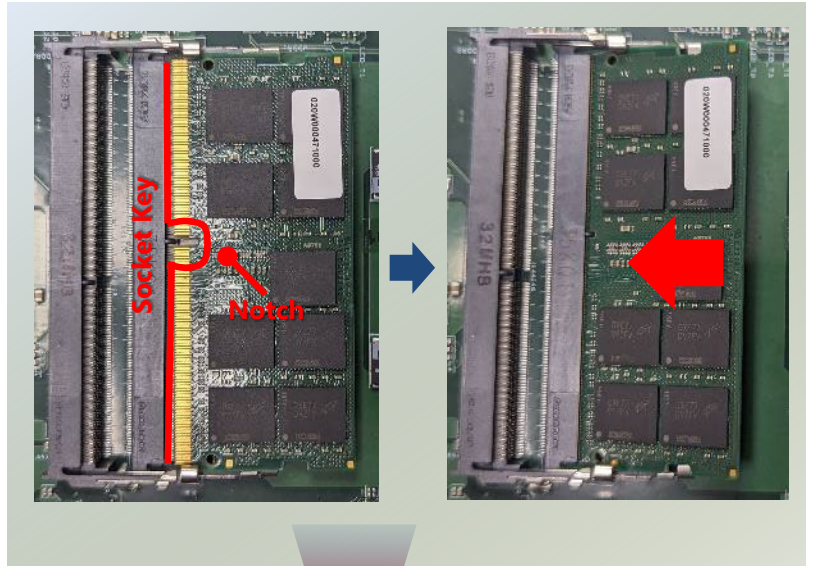
Installing the System Memory

The motherboard supports two memory slots for DDR4 2900MHz SO-DIMM for additional system memory expansion. Please follow the steps below to install the DIMM memory module.

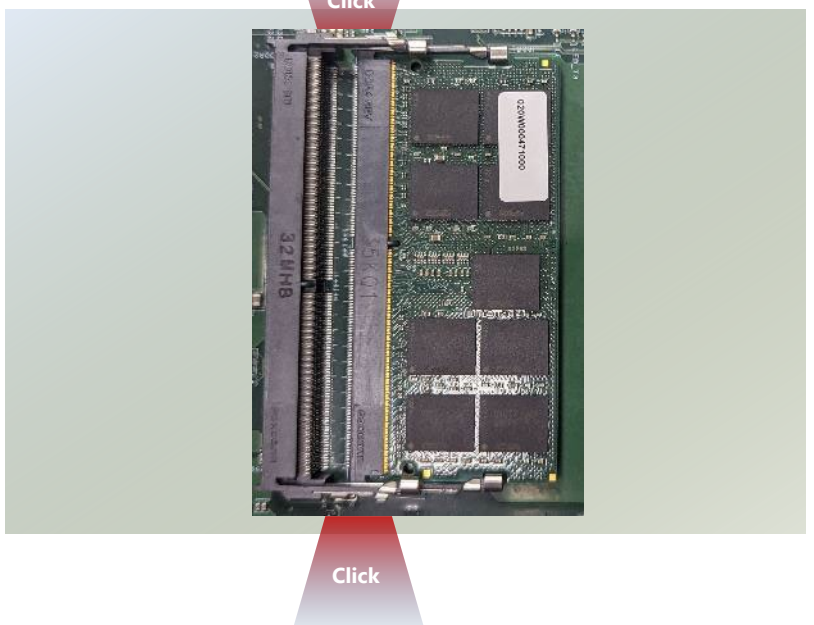
1. Power off the system, turn the system around, and open the chassis cover.
2. Locate the DIMM socket on the motherboard.



3. Align the notch of the module with the socket key in the slot.
4. Insert the module into the slot at a diagonal angle and press down until it is firmly seated by the clips on both sides.



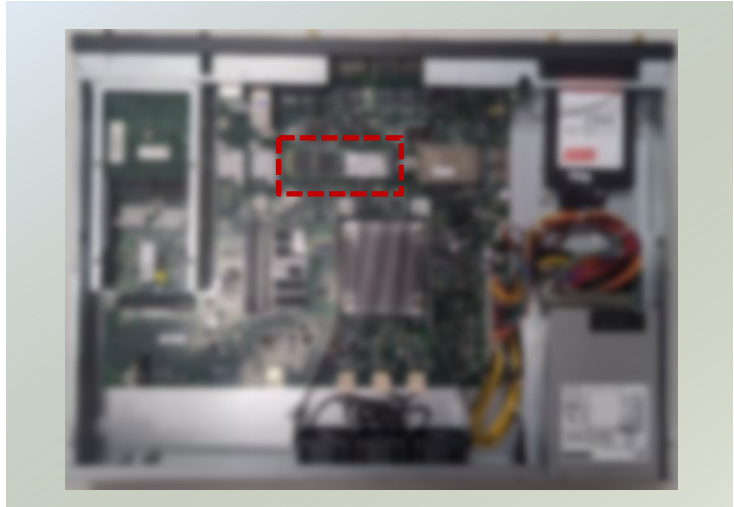
5. Repeat the steps to insert a second DIMM module.



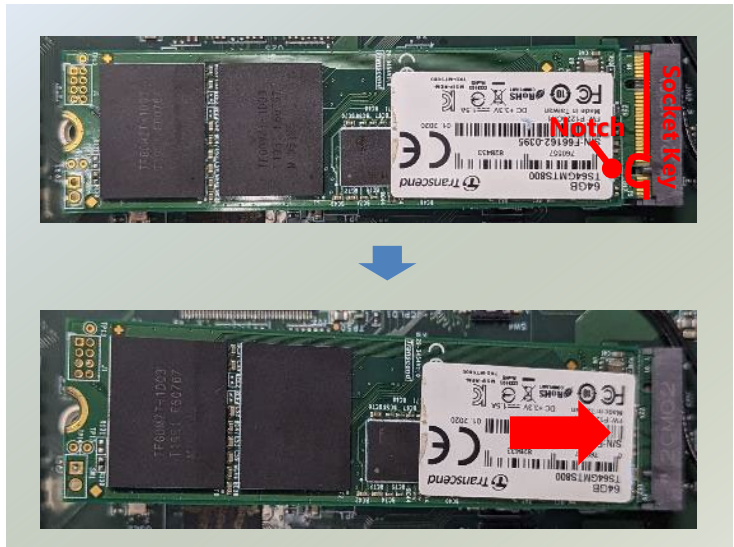
Installing M.2 Storage Module (Optional)

The system supports one M.2 slot for additional data storage. Please follow the steps for installation.

1. Power off the system and open the chassis cover.
2. Locate the M.2 slot on the motherboard.



3. Align the notch of the M.2 storage card with the socket key in the pin slot.
4. Insert the M.2 storage card pins at a 30-degree angle into the socket until it is fully seated.



5. Vertically push down on the module card and secure it with a screw.

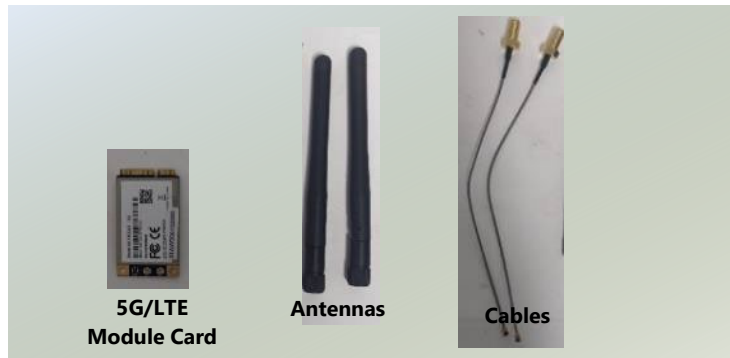


Installing LTE/5G Module Card (Optional)

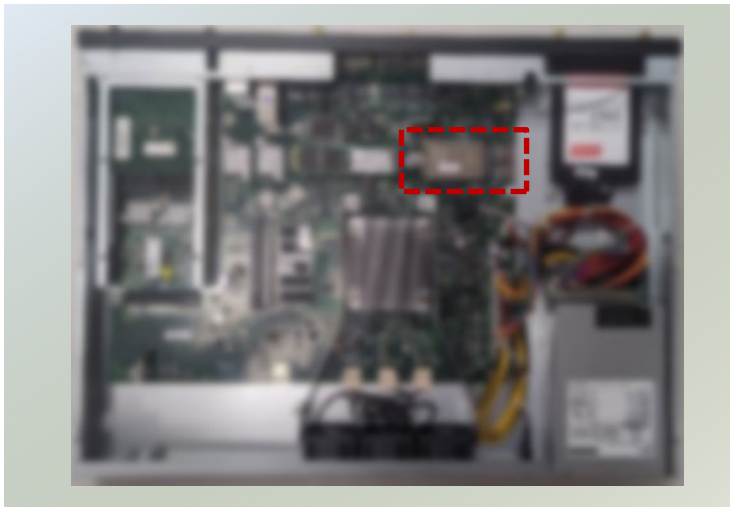
The motherboard provides one M.2 slot for an LTE/5G module card expansion. An LTE module will require two (2) antennas, and a 5G module requires four (4) antennas. Please follow the steps for installation.

The LTE/5G Module Card Kit contains the following:

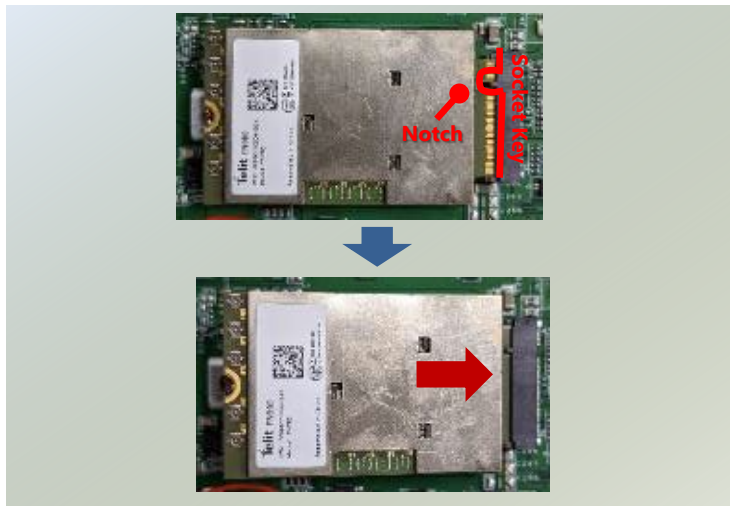
- ▶ 1x LTE/5G Module Card
- ▶ 2x or 4x SMA to IPEN Cables
- ▶ 2x or 4x Antennas



1. Power off the system and open the chassis cover.
2. Locate the M.2 slot on the motherboard.



3. Align the notch of the LTE/5G module card with the socket key in the pin slot.
4. Insert at 30 degrees into the socket until it is fully seated.



5. Vertically push down on the module card and secure it with one (1) screw.



Installing 5G Antennas

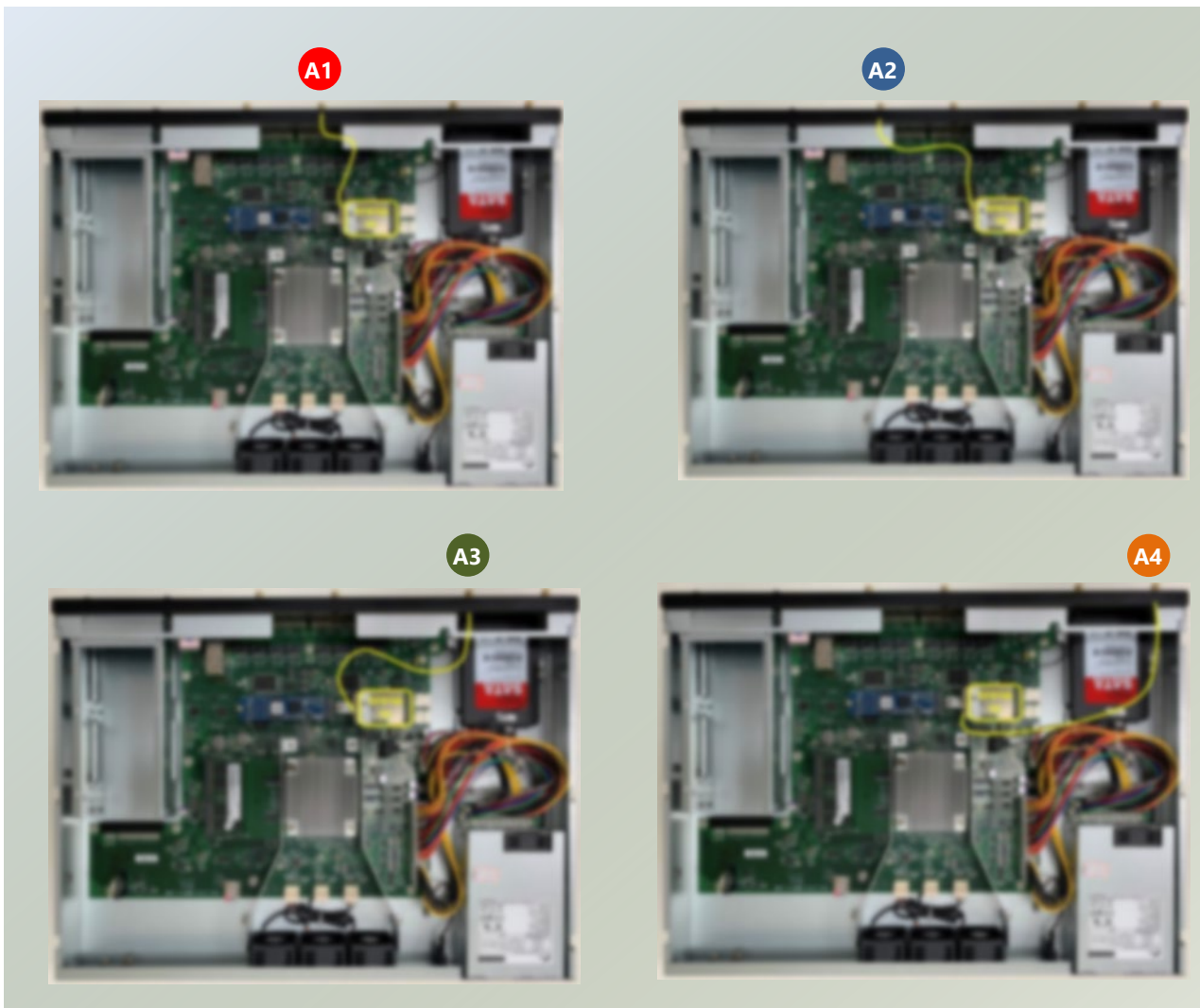
Front Panel



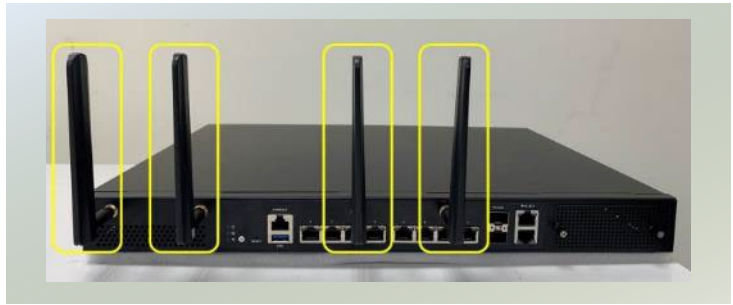
1. Locate the four (4) antenna hole placement (A1, A2, A3, A4). Locate the four (4) antenna IPEX connectors on the 5G module card.



2. Connect the RF cables to the IPEX connectors on the 5G module card and screw the other end of the cables in the antenna holes.



3. Then, screw on the four (4) antennas on the outside of the system.



Installing LTE Antennas

Front Panel



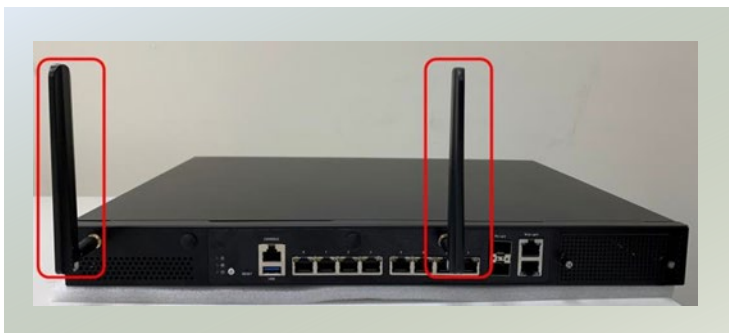
1. Locate the two (2) antenna hole placement (A1, A2). Locate the two (2) antenna IPEX connectors on the LTE module card.



2. Connect the RF cables to the IPEX connectors on the LTE module card and screw the other end of the cables in the antenna holes.



3. Then, screw on the two (2) antennas on the outside of the system.



Installing SIM Cards

The dual SIM card slot supports the LTE/5G module card. Please follow the steps below for SIM card placement.

1. Locate the SIM slots next to the LTE/5G module on the motherboard.



2. Insert and push the SIM card, gold contacts facing downwards, all the way in until it clicks into place. Repeat if dual SIM cards will be place.

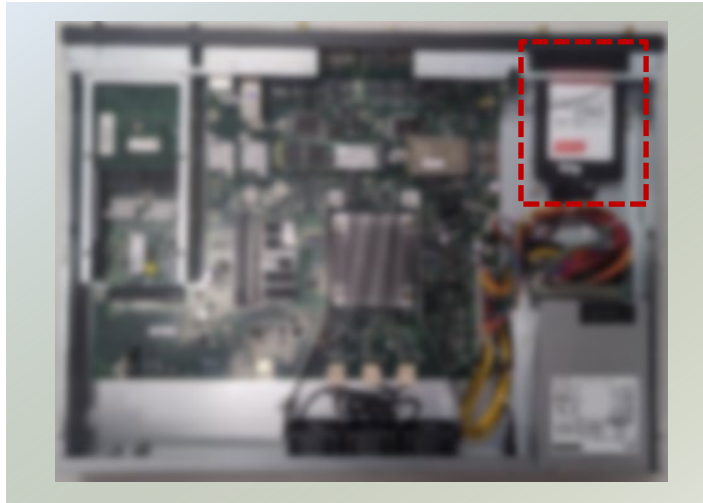


3. To remove the SIM cards, use your fingertips to push it once, to have the card automatically eject.

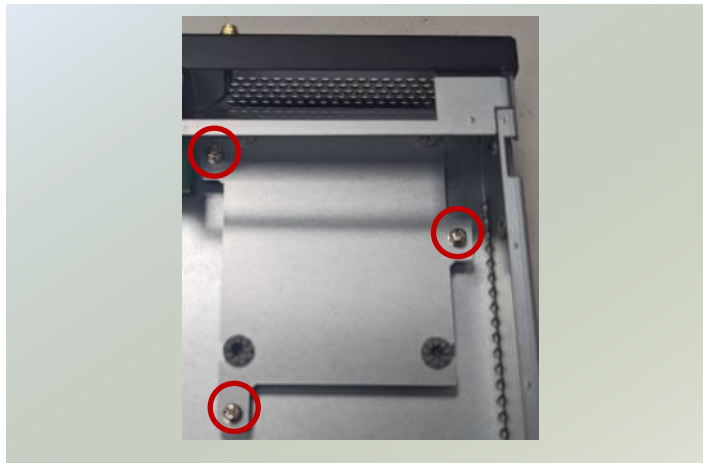
Installing Disk Drive(s) (Optional)

The HDD/SSD bay supports one 2.5" SATA HDD/SSD for additional data storage. Please follow the steps below for installation.

1. Power off the system and open the chassis cover.
2. Locate the disk tray placement inside the system.



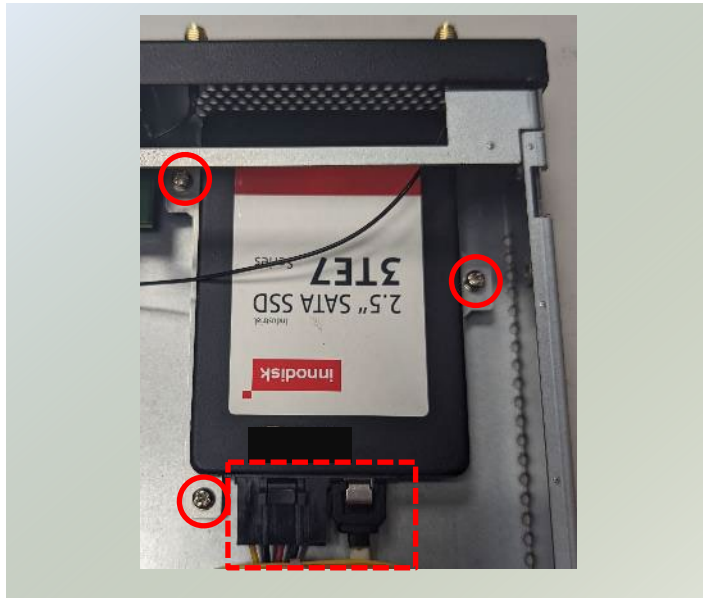
3. Loosen the three (3) screws that secures the HDD/SSD tray and take the tray out.



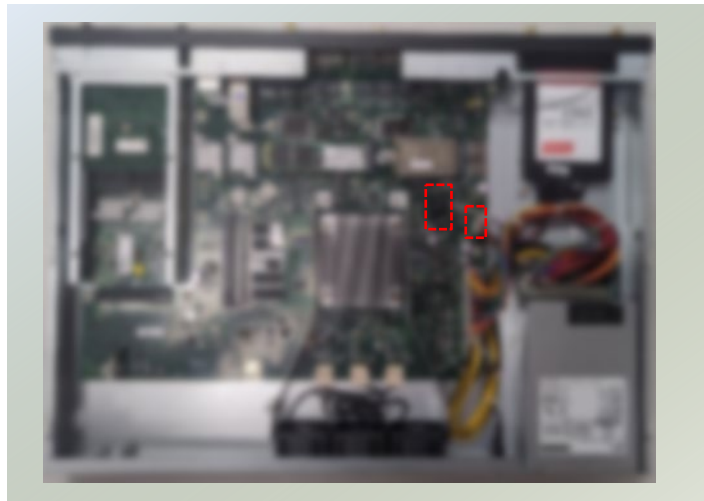
4. Slide one 2.5" HDD/SSD into the tray, and secure with four (4) screws on the rear side. Make sure the SATA contacts are facing outwards.



5. Place the tray (with the disk drive now installed) back to its original place inside the system. Secure with the original three (3) screws. Attach the SATA data cable and power cable to the HDD/SSD.



6. Then, insert the other end of the SATA data cable and power cable into the corresponding connector on the mother board.



Installing NIC Modules (Optional)

VP-501 comes with one NIC module slot for expansion. Follow the stems for installation.

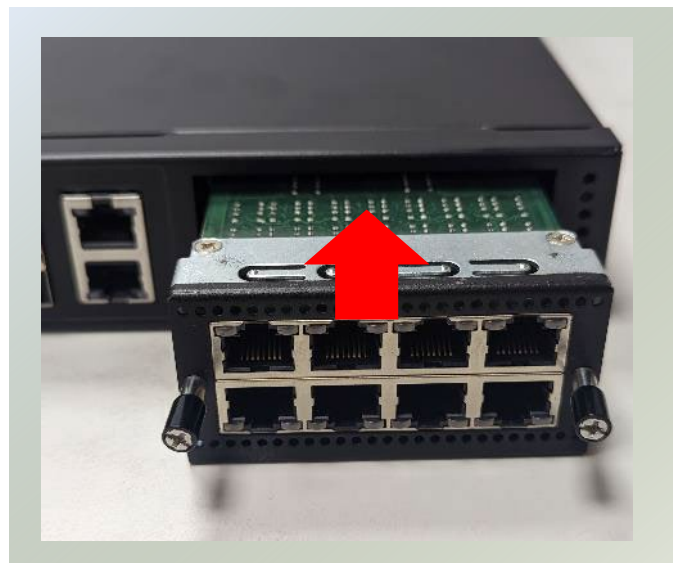
1. Locate the NIC module slot on the front panel of the system.



2. Rotate clockwise and loosen the two (2) lock-screws, and remove the NIC module slot door.



3. Insert your NIC module. (The module shown here is for reference only.)



4. Once the module is firmly seated, rotate counter-clockwise and tighten the two (2) lock screws.

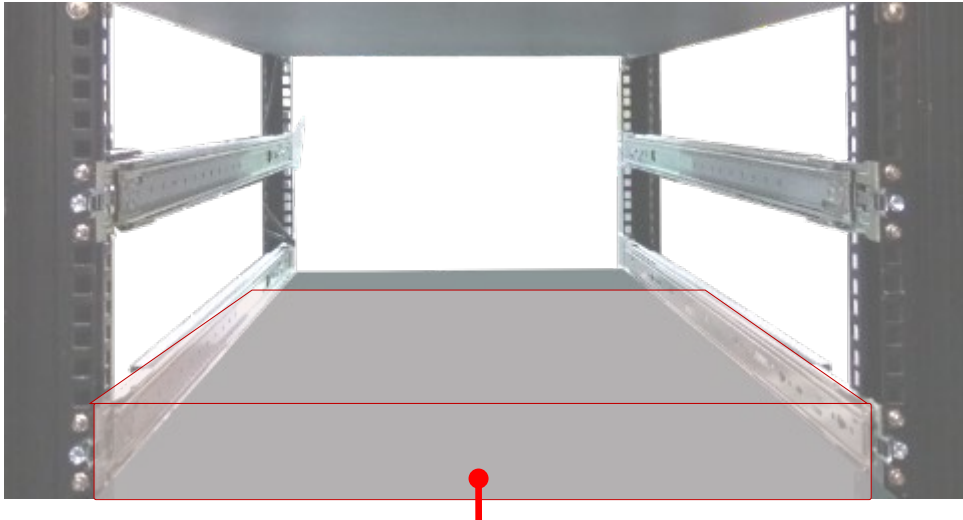


Mounting the System

There are two methods for installing this system into a rack:

► With **Mounting Ear Brackets** only

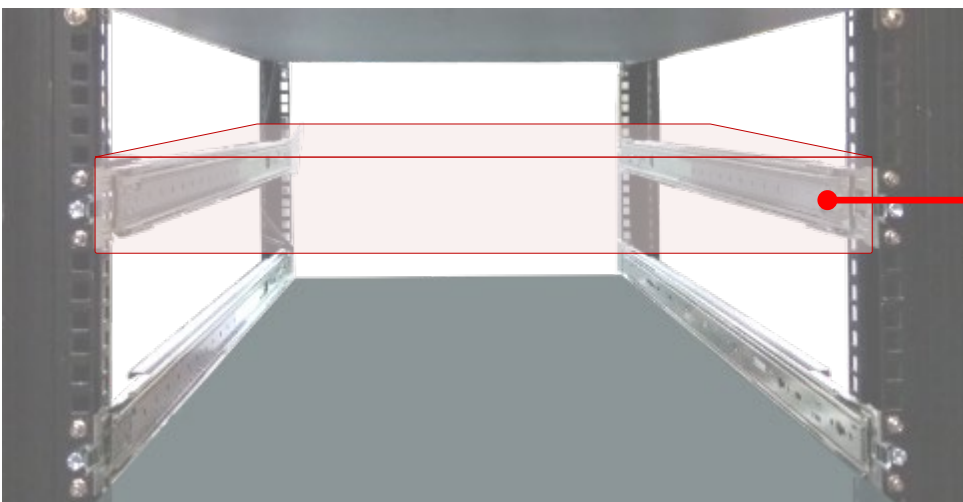
This method is quick and easy by fixing this system to the front posts of the rack, but it also makes servicing the system more difficult. Please note that the use of these brackets must go with a rack shelf or slide rails to prevent the chassis from falling over, for the bracket assembly alone cannot provide sufficient support to the chassis.



The system shall be installed on the rack along with a shelf or slide rails, for the "Mounting Ears" are meant to secure the system, not to support it.

► With **Slide Rail Kit + Mounting Ear Brackets**

This method is rather complicated, but the slidable rails allow you to access the system easily while securing it in the rack solidly.



The Slide Rail Kit can secure the system while providing sufficient weight support for the device.

Installing the System Using Mounting Ear Brackets Only

1. Check the accessory pack for the following items:

- ▶ 1x Screw Pack
- ▶ 2x Ear Brackets



Screw Pack



Ear Brackets

2. Align the bracket to the side of the chassis and make sure the screw-holes are matched, and then secure the bracket onto the chassis with the two (2) provided screws.



3. Repeat Step 2 to attach the bracket to the other side of the chassis.



4. Install the chassis into the rack with the brackets fixed onto the posts using the provided screws. The actual approach you adopt and the needed parts for assembly will depend on the supporting accessory (shelf or rail kit) you use.



Installing the System Using the Slide Rail Kit (with Mounting Ear Brackets)

1. Check the package contents of the Slide Rail Kit. The kit shall include the following items:

- ▶ 1x pack of M4X4L screws (for securing the Rail Brackets on the system)
- ▶ 1x pack of 7.1 Round Hole screws (for securing the system on the rail posts)
- ▶ 2x Slide Rails



M4X4L Screws



7.1 Round Hole Screws



Slide Rails

A rail consists of the following parts:

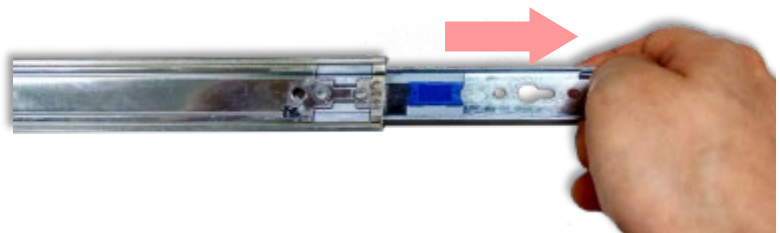


2. Unpack a slide rail and slide the Inner Rail all the way to the end.

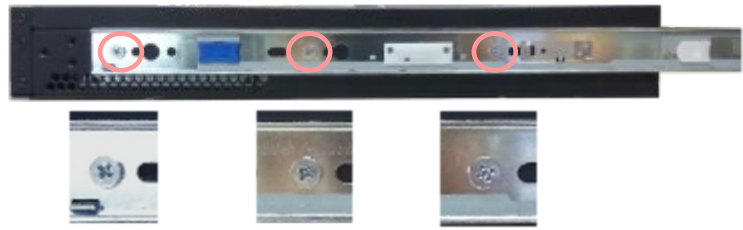


3. Stretch the Rail Bracket to the fullest.

4. Remove the Rail Bracket from the Inner Rail by pushing the Release Tab on the bracket outwards while sliding it out.



5. Align the bracket to the side of the chassis and make sure the screw-holes are matched, and then secure the bracket onto the chassis with three provided M4X4L screws.



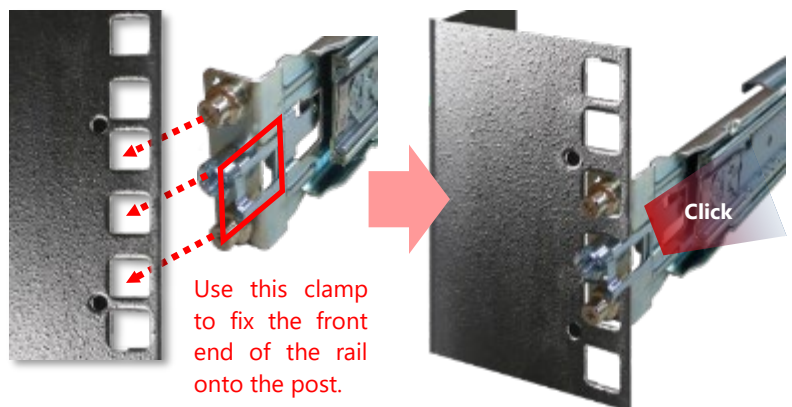
Align the screws with the holes indicated on the brackets and the screw holes on the side of the chassis.

6. Repeat Steps 2~5 to attach the bracket to the other side of the chassis.
7. Follow the instructions in Installing the System Using Mounting Ear Brackets Only to attach the Mounting Ear Brackets.

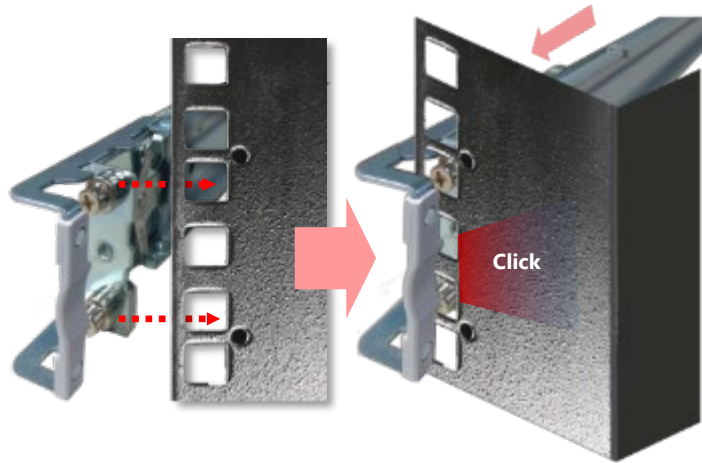


Now, you shall install the slide rail assemblies onto the rack.

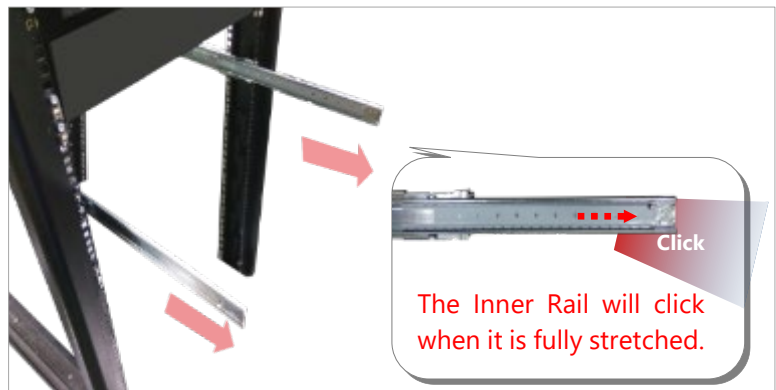
8. This slide rail kit does NOT require screw-fixing. Simply aim at three available screw holes on the rack front and snap the rail front into the rack post as shown in the image. You should hear a "click" sound once it is firmly attached.



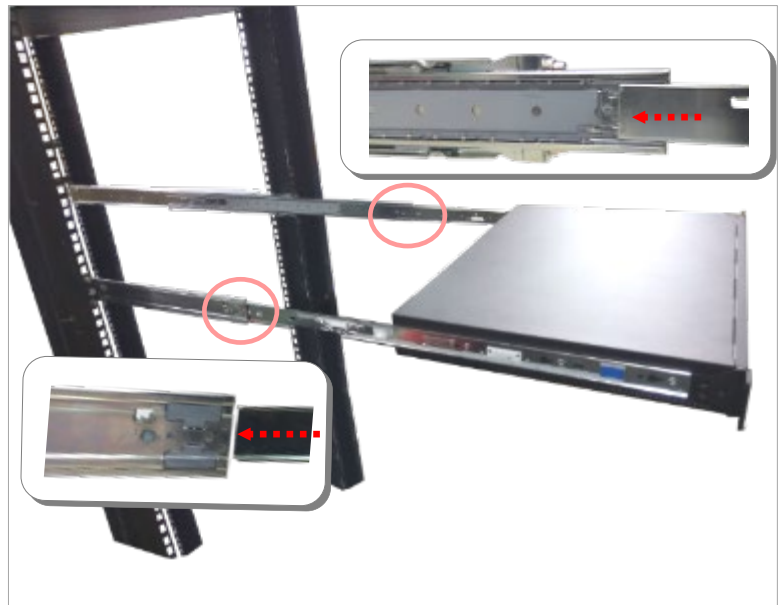
9. For the rear rack installation, slide the rail to aim and engage the bolts on the rail's rear end with the two available holes on the post, and the rail assembly will click into place.



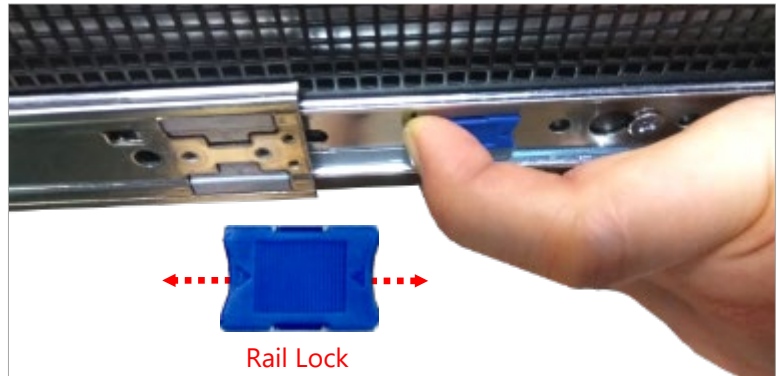
10. Stretch both of the Inner Rails out to their fullest extent. You will hear a click sound when they are fully stretched and locked.



11. Hold the system with its front facing you, lift the chassis and gently engage the brackets on the system while aligning them with the Inner Rails as shown in the image, and then push the system into the cabinet.



12. While pushing in the system, also push and hold the Rail Lock tab on both brackets.



Push the system all the way in until it stops.



To remove the system from the rack, gently pull it outwards, towards you, while pushing the Release Tab on both sides of the brackets.



CHAPTER 4: SOFTWARE SETUP

Overview

The software setup mainly covers the following two aspects:

1. Creating a Boot Disk

You can burn the SD image onto an SD card, M.2 SSD, SATA Disk, etc. Simply insert one of these boot disks into the board, and the system will boot into Ubuntu ARM OS. This is primarily used for evaluating system performance and some functionality.

(1) Burning environment: Windows 10

(2) Download Link:

- ▶ Lanner VP-501 SD image <https://www.lannerinc.com/support/download-center/software>
- ▶ Free burning software <https://sourceforge.net/projects/win32diskimager/>

2. Build the System Software:

By downloading LSDK source code from the NXP official website and applying the software patch file for Lanner VP-501, then you can compile three types of images: bootloader, Linux kernel, and root filesystem. After burning these three images onto an SD card, you can boot the VP-501 system using the compiled software.

(1) Execution Environment: Ubuntu 20.04 Desktop

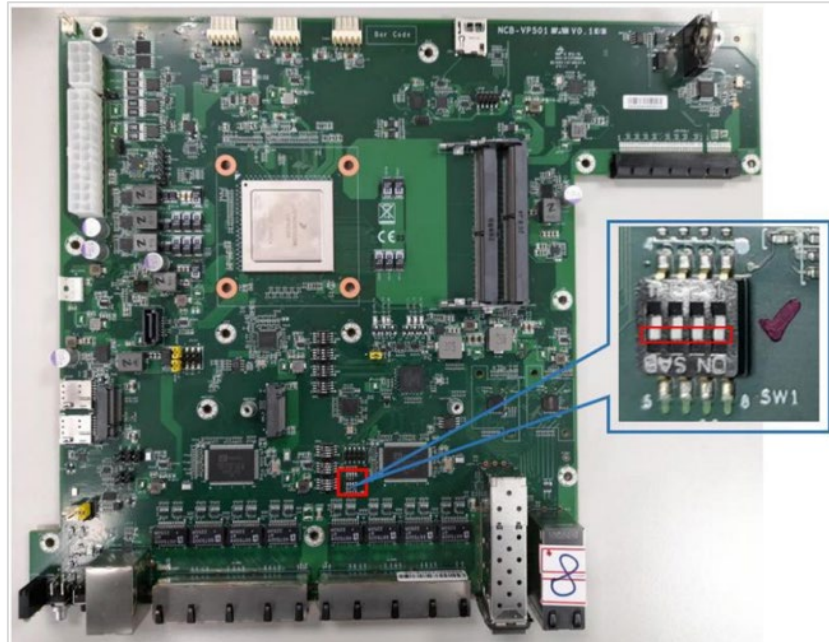
(2) Download Link:

- ▶ NXP LSDK <https://lsdk.github.io/index.html>
- ▶ Lanner VP-501 LSDK patch files <https://www.lannerinc.com/support/download-center/software>

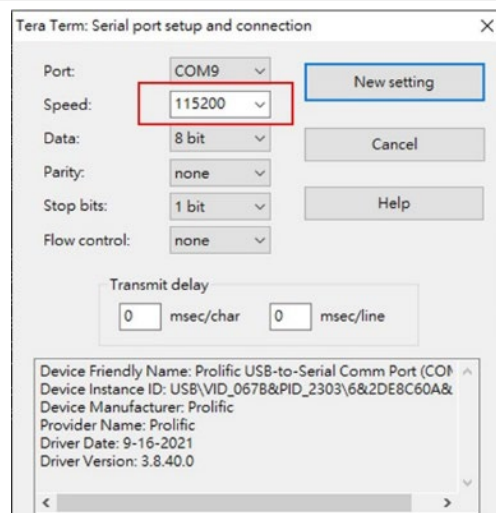
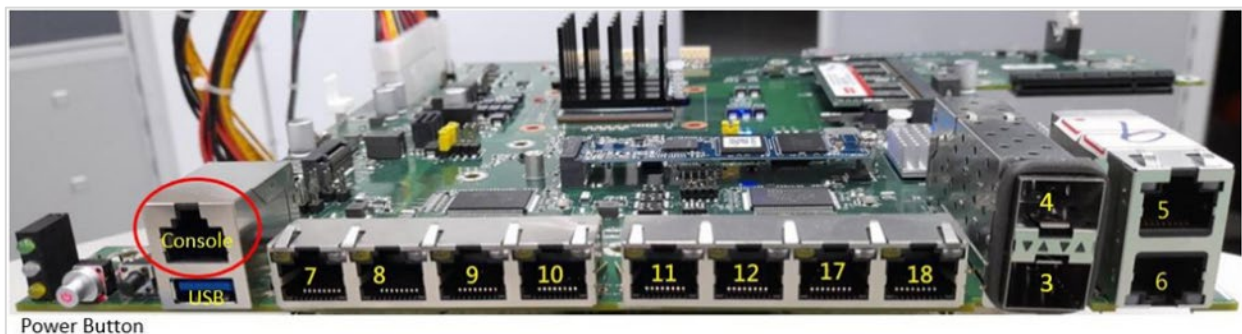
Create a Boot Disk

Preparatory Work

1. The NOR-Flash on the VP-501 board already has the bootloader pre- burned. DIP switch SW1 must be set to 1111 as shown in the diagram to boot from NOR-Flash.



2. When connecting the computer's COM port to the board's console port, the speed setting in the terminal software should be configured to 115200 baud rate.



3. If the DIP switch SW1 are set correctly, the console should display the following messages when the VP-501 board is powered on.

```

NOTICE: 8 GB DDR4, 64-bit, CL=19, ECC on
NOTICE: BL2: Booting BL31
NOTICE: BL31: v2.4(release):VP-501-0-g8c653995e
NOTICE: BL31: Built : 16:03:48, Sep 27 2023
NOTICE: Welcome to lx2160ardb BL31 Phase

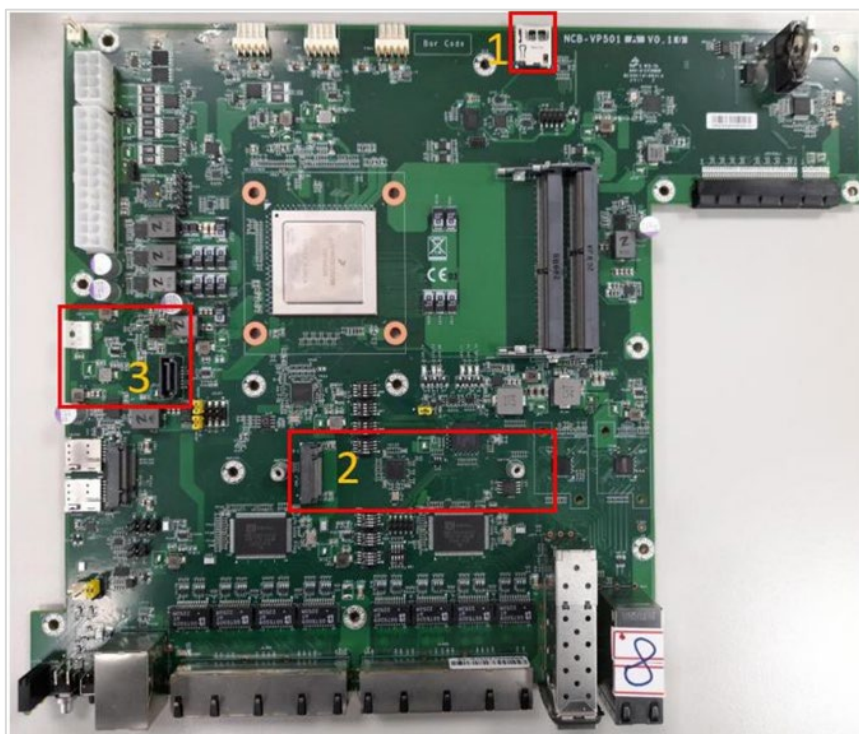
U-Boot 2021.04-00002-g738d9fb5e1-dirty (Sep 27 2023 - 16:03:42 +0800)

SoC: LX2160AE Rev2.0 (0x87361020)
Clock Configuration:
CPU0(A72):1900 MHz CPU1(A72):1900 MHz CPU2(A72):1900 MHz
CPU3(A72):1900 MHz CPU4(A72):1900 MHz CPU5(A72):1900 MHz
CPU6(A72):1900 MHz CPU7(A72):1900 MHz CPU8(A72):1900 MHz
CPU9(A72):1900 MHz CPU10(A72):1900 MHz CPU11(A72):1900 MHz
CPU12(A72):1900 MHz CPU13(A72):1900 MHz CPU14(A72):1900 MHz
CPU15(A72):1900 MHz
Bus: 600 MHz DDR: 2600 MT/s
Reset Configuration Word (RCW):
00000000: 4c6b6b30 244c004c 00000000 00000000
00000010: 00000000 0e010000 00000000 00000000
00000020: 01a001a0 00002580 00000000 03000606
00000030: 08040000 00000001 00000000 00000000
00000040: 00000000 00000000 00000000 00000000
00000050: 00000000 00000000 00000000 00000000
00000060: 00000000 00000000 00027085 00000000
00000070: 0d870010 00150000
Model: NXP Layerscape LX2160ARDB Board
Board: LX2160AE Rev2.0-RDB, Board version: A, boot from FlexSPI DEV#0

```

4. The boot disk options for the VP-501 board include the following choices. This document explanation uses the SD card as an example.

- (1) SD Card
- (2) M.2 M-Key SSD
- (3) SATA Disk



Burn the SD Card Image File

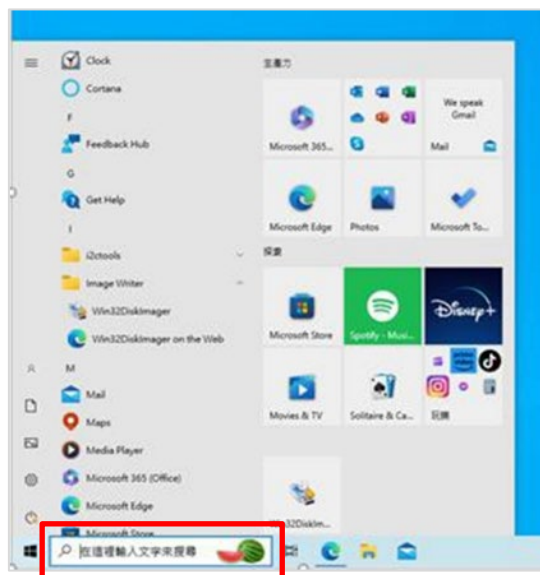
1. Install Win32DiskImager



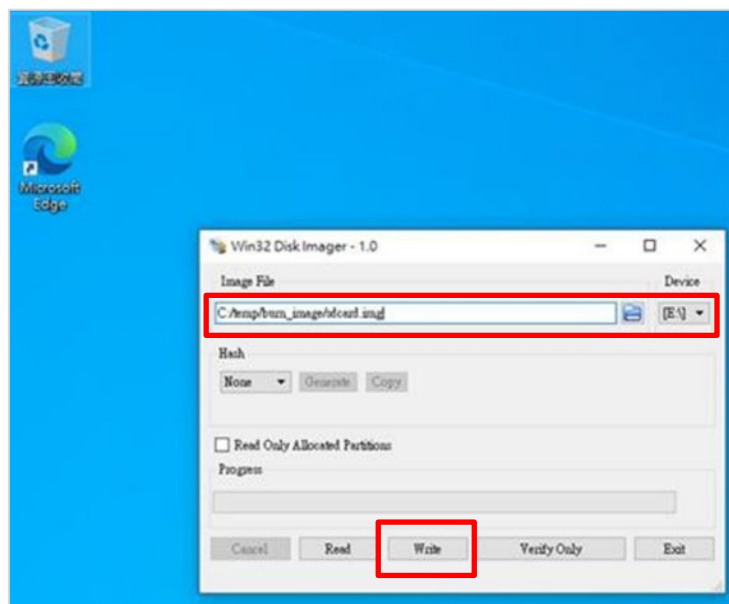
2. Insert the SD card into the PC.



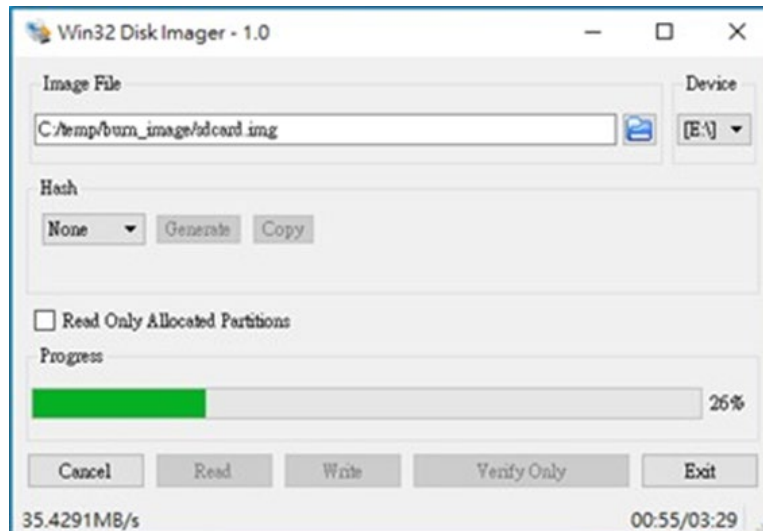
3. Run Win32DiskImager



4. Select the sdcad.img downloaded from Lanner website.



5. Write the image to the SD card.



6. After the burning process is complete, you can then insert the SD card into VP-501 to boot up the system.



7. Successful Boot-up

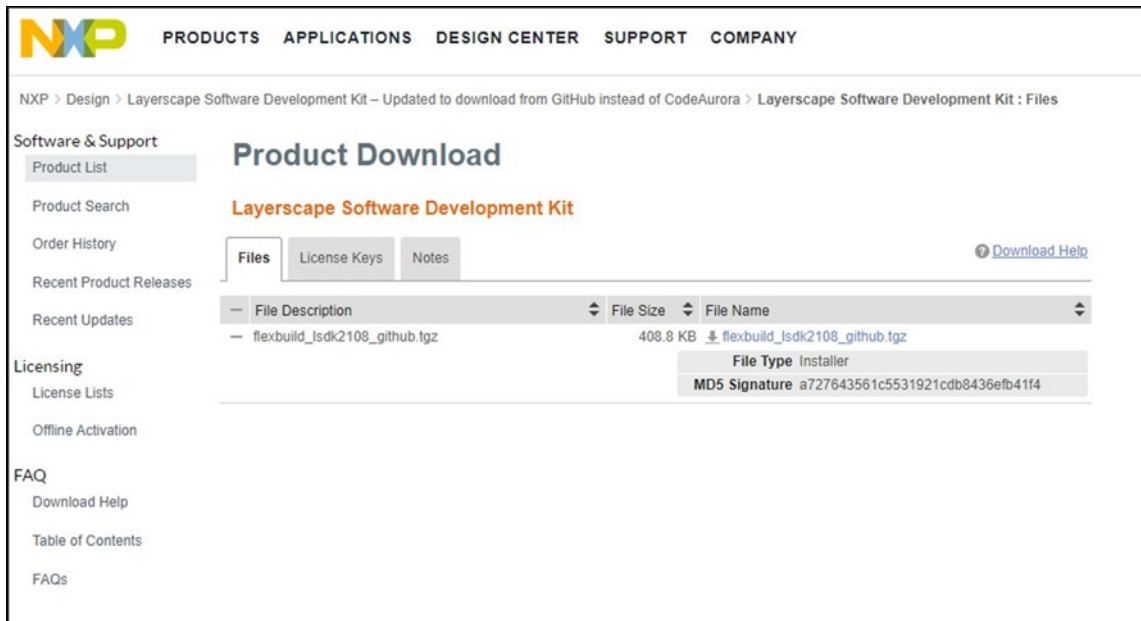
```

COM9 - Tera Term VT
File Edit Setup Control Window KanjiCode Help
[ OK ] Finished Resets System Activity Data Collector.
[ OK ] Finished Permit User Sessions.
Starting Docker Application Container Engine...
[ OK ] Started Serial Getty on ttyAMA0.
Starting Set console scheme...
[ OK ] Finished Set console scheme.
[ OK ] Created slice system-getty.slice.
[ OK ] Started Getty on tty1.
[ OK ] Reached target Login Prompts.
[ OK ] Started LSB: Execute the kexec -e command to reboot system.
Starting LSB: Load kernel image with kexec...
[ OK ] Started LSB: Load kernel image with kexec.
[ OK ] Started System Logging Service.
[ OK ] Started Virtual Machine an...ontainer Registration Service.
[ OK ] Started Login Service.
Starting Virtualization daemon...
[ OK ] Started OpenBSD Secure Shell server.

NXP LSDK 2108 main (custom based on ubuntu 20.04)
localhost login: root
Password:
Welcome to NXP LSDK 2108 main (custom based on ubuntu 20.04) (GNU/Linux 5.10.35-
LB5110+ aarch64)
    
```

Build the System Software

1. Download NXP LSDK: flexbuild_lsdk2108_github.tgz from website: <https://lsdk.github.io/components.html>



2. Build Source Code

[boot package]

```
~# tar xvfz flexbuild_lsdk2108_github.tgz
~# cd flexbuild_lsdk2108_github
~# source setup.env
~# flex-builder -c ddr_phy_bin -m lx216aradb_rev2
~# flex-builder -c dp_firmware_cadence -m lx2160aradb_rev2
~# flex-builder -c fm_ucose -m lx2160aradb_rev2
~# flex-builder -c mc_bin -m lx2160aradb_rev2
~# flex-builder -c pfe_bin -m lx2160aradb_rev2
~# flex-builder -c phy_cortina -m lx2160aradb_rev2
~# flex-builder -c phy_inphi -m lx2160aradb_rev2
~# flex-builder -c qe_ucose -m lx2160aradb_rev2
~# flex-builder -c uefi_bin -m lx2160aradb_rev2
~# flex-builder -i mkrfs -r ubuntu:main
```

[kernel package]

```
~# flex-builder -c linux -a arm64 -m lx2160aradb_rev2
~# flex-builder -i mkbootpartition -m lx2160aradb_rev2
```

[bootloader package]

```
~# flex-builder -c mc_utils -m lx2160ardb_rev2
~# flex-builder -c rcw -m lx2160ardb_rev2 -b sd
~# flex-builder -c uboot -m lx2160ardb_rev2 -b sd
~# flex-builder -c atf -m lx2160ardb_rev2 -b sd
~# flex-builder -i mkfw -m lx2160ardb_rev2 -b sd
```

[rootfs package]

```
~# flex-builder -c mdio_proxy_module -r ubuntu:main
~# flex-builder -c aquantia_firmware_utility -r ubuntu:main
~# flex-builder -c pktgen_dpdk -r ubuntu:main
~# flex-builder -c restool -r ubuntu:main
~# flex-builder -c fmc -r ubuntu:main
~# flex-builder -c spc -r ubuntu:main
~# flex-builder -c dpdk -r ubuntu:main
~# flex-builder -c vpp -r ubuntu:main
~# flex-builder -c ovs_dpdk -r ubuntu:main
~# flex-builder -c aiopsl -r ubuntu:main
~# flex-builder -i merge-component -r ubuntu:main
~# flex-builder -i packrfs -r ubuntu:main
```

3. Patch Following Lanner VP-501 Code to LSDK

```
~# cd flexbuild_lsdk2108_github/configs/board
~# patch -p1 -f -i $(your_folder)/board.patch
```

```
~# cd flexbuild_lsdk2108_github/components/linux/linux
~# patch -p1 -f -i $(your_folder)/linux.patch
```

```
~# cd flexbuild_lsdk2108_github/components/firmware
~# patch -p1 -f -i $(your_folder)/firmware.patch
```

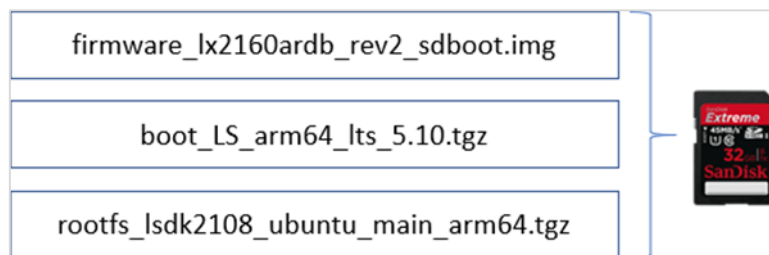
4. Rebuild Patch Source Code

```
~# flex-builder -c mc_utils -m lx2160ardb_rev2
~# flex-builder -c rcw -m lx2160ardb_rev2 -b sd
~# flex-builder -c uboot -m lx2160ardb_rev2 -b sd
~# flex-builder -c atf -m lx2160ardb_rev2 -b sd
~# flex-builder -i mkfw -m lx2160ardb_rev2 -b sd
```

```
~# flex-builder -c linux -a arm64 -m lx2160ardb_rev2
~# flex-builder -i mkbootpartition -m lx2160ardb_rev2
```

5. Burn All Image to SD Card (in case SD Card is /dev/sdb)

```
~# flex-installer -i pf -d /dev/sdb
~# flex-installer -f firmware_lx2160ardb_rev2_sdboot.img
  -b boot_LS_arm64_lts_5.10.tgz
  -r rootfs_lsdk2108_ubuntu_main_arm64.tgz
  -d /dev/sdb
```



6. Insert the SD Card into VP-501 to Boot Up System

```
COM9 - Tera Term VT
File Edit Setup Control Window KanjiCode Help
[ OK ] Finished Resets System Activity Data Collector.
[ OK ] Finished Permit User Sessions.
[ OK ] Starting Docker Application Container Engine...
[ OK ] Started Serial Getty on ttyAMA0.
[ OK ] Starting Set console scheme...
[ OK ] Finished Set console scheme.
[ OK ] Created slice system-getty.slice.
[ OK ] Started Getty on tty1.
[ OK ] Reached target Login Prompts.
[ OK ] Started LSB: Execute the kexec -e command to reboot system.
[ OK ] Starting LSB: Load kernel image with kexec...
[ OK ] Started LSB: Load kernel image with kexec.
[ OK ] Started System Logging Service.
[ OK ] Started Virtual Machine an...ontainer Registration Service.
[ OK ] Started Login Service.
[ OK ] Starting Virtualization daemon...
[ OK ] Started OpenBSD Secure Shell server.

NXP LSDK 2108 main (custom based on ubuntu 20.04)
localhost login: root
Password:
Welcome to NXP LSDK 2108 main (custom based on ubuntu 20.04) (GNU/Linux 5.10.35-
LB5110+ aarch64)
```


APPENDIX A: LED INDICATOR EXPLANATIONS

The status explanations of LED indicators on Front Panel are as follows:



Green: System Power

Red/Green: System Status

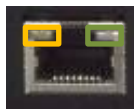
Amber: HDD Activity

LED	COLOR	LED ACTION	DESCRIPTION
Power	Green	Steady	System is powered ON
	OFF	N/A	System is powered OFF
Status	Green	Steady	LED status controlled by GPIO
	Red	Steady	
	OFF	N/A	System is powered OFF
Storage	Amber	Blinking	Storage (HDD/SATA/NVME) Active
	OFF	N/A	No Data Access

► RJ-45 LAN LED Indicators

10/100/1G

Amber



Green/Amber

► 10M/100M/1GB RJ-45 Define:

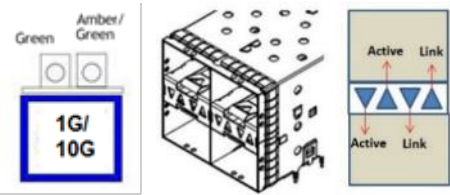
Speed	Amber (Active)	Green/Amber (Link)
10M	Blinking Amber – Indicates data access	OFF
100M	Blinking Amber – Indicates data access	ON (Green)
1G	Blinking Amber – Indicates data access	ON (Amber)

► 10Gb RJ-45 Define:

Speed	Green (Active)	Green/Amber (Link)
10/100M	Blinking / Data access	OFF
1G	Blinking / Data access	ON (Amber)
10G	Blinking / Data access	ON (Green)

1. When cable is plug-in and network is linked. Both LED will be bright. The behavior is as defined.
2. Without the Cable plug-in, the LED should be off
3. If LAN Driver controls the LED, the behavior will follow the driver

► **10Gb SFP+ Light pipe LED (top location) Define:**



Speed	Amber (Active)	Amber / Green (Link)
1G	Blinking / Data access	ON (Amber)
10G	Blinking / Steady	ON (Green)
Non-Link	OFF	OFF

1. When cable is plug-in and network is linked. Both LED will be bright. The behavior is as defined.
2. Without the Cable plug-in, the LED should be off
3. If LAN Driver controls the LED, the behavior will follow the driver

APPENDIX B: TERMS AND CONDITIONS

Warranty Policy

1. All products are under warranty against defects in materials and workmanship for a period of one year from the date of purchase.
2. The buyer will bear the return freight charges for goods returned for repair within the warranty period; whereas the manufacturer will bear the after-service freight charges for goods returned to the user.
3. The buyer will pay for repair (for replaced components plus service time) and transportation charges (both ways) for items after the expiration of the warranty period.
4. If the RMA Service Request Form does not meet the stated requirement as listed on "RMA Service, "RMA goods will be returned at customer's expense.
5. The following conditions are excluded from this warranty:
 - ▶ Improper or inadequate maintenance by the customer
 - ▶ Unauthorized modification, misuse, or reversed engineering of the product
 - ▶ Operation outside of the environmental specifications for the product.

RMA Service

Requesting an RMA#

1. To obtain an RMA number, simply fill out and fax the "RMA Request Form" to your supplier.
2. The customer is required to fill out the problem code as listed. If your problem is not among the codes listed, please write the symptom description in the remarks box.
3. Ship the defective unit(s) on freight prepaid terms. Use the original packing materials when possible.
4. Mark the RMA# clearly on the box.



Note: Customer is responsible for shipping damage(s) resulting from inadequate/loose packing of the defective unit(s). All RMA# are valid for 30 days only; RMA goods received after the effective RMA# period will be rejected.

RMA Service Request Form

When requesting RMA service, please fill out the following form. Without this form enclosed, your RMA cannot be processed.

RMA No:		Reasons to Return: <input type="checkbox"/> Repair(Please include failure details)	
		<input type="checkbox"/> Testing Purpose	
Company:		Contact Person:	
Phone No.		Purchased Date:	
Fax No.:		Applied Date:	
Return Shipping Address: _____			
Shipping by: <input type="checkbox"/> Air Freight <input type="checkbox"/> Sea <input type="checkbox"/> Express _____			
<input type="checkbox"/> Others: _____			
Item	Model Name	Serial Number	Configuration

Item	Problem Code	Failure Status

***Problem Code:**

01: D.O.A. 02: Second Time R.M.A. 03: CMOS Data Lost 04: FDC Fail 05: HDC Fail 06: Bad Slot	07: BIOS Problem 08: Keyboard Controller Fail 09: Cache RMA Problem 10: Memory Socket Bad 11: Hang Up Software 12: Out Look Damage	13: SCSI 14: LPT Port 15: PS2 16: LAN 17: COM Port 18: Watchdog Timer	19: DIO 20: Buzzer 21: Shut Down 22: Panel Fail 23: CRT Fail 24: Others (Pls specify)
--	---	--	--

Request Party

Confirmed By Supplier

Authorized Signature / Date

Authorized Signature / Date