
FPC-821X Series

Robust Box PC with Intel® 13th Gen Core™
i9/i7/i5/i3 Processor

User's Manual

Version 1.0



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Revision History

Version	Release Time	Description
1.0	2024.02	Initial release

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Copyright Notice

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Declaration of Conformity

CE

The CE symbol on the computer indicates that it is in compliance with the directives of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Preface

NOTE:

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

RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

Important Safety Instructions

Read these safety instructions carefully

1. Read all cautions and warnings on the equipment.
2. Place this equipment on a reliable surface when installing. Dropping it or letting it fall may cause damage
3. Make sure the correct voltage is connected to the equipment.
4. For pluggable equipment, the socket outlet should be near the equipment and should be easily accessible.
5. Keep this equipment away from humidity.
6. The openings on the enclosure are for air convection and protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
7. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
8. Never pour any liquid into opening. This may cause fire or electrical shock.
9. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
10. If one of the following situations arises, get the equipment checked by service personnel:
 - a. The power cord or plug is damaged.
 - b. Liquid has penetrated into the equipment.
 - c. The equipment has been exposed to moisture.
 - d. The equipment does not work well, or you cannot get it to work according to the user's manual.
 - e. The equipment has been dropped or damaged.
 - f. The equipment has obvious signs of breakage.
11. Keep this User's Manual for later reference.

Warning

The Box PC and its components contain very delicately Integrated Circuits (IC). To protect the Box PC and its components against damage caused by static electricity, you should always follow the precautions below when handling it:

1. Disconnect your Box PC from the power source when you want to work on the inside.
2. Use a grounded wrist strap when handling computer components.
3. Place components on a grounded antistatic pad or on the bag that came with the Box PC, whenever components are separated from the system.

Replacing Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.

Do not throw lithium batteries into the trash can. It must be disposed of in accordance with local regulations concerning special waste.

Technical Support

If you have any technical difficulties, please consult the user's manual first at:
<http://www.arbor-technology.com>

Please do not hesitate to e-mail our customer service when you still cannot find out the answer.

E-mail: info@arbor.com.tw

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

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Chapter 1

Introduction

1.1. The Computer

FPC-821X_Series



- Fanless Design
- Wide Range DC Power Input (9 ~36V)
- Various Video Interfaces (VGA + DVI-D+DP)
- TPM2.0 support
- Optional Wi-Fi6 or LTE/5G Wireless Connectivity
- Rugged Design for Shock/Vibration Protection
- Memory support up to 64GB

1.2. Specifications

FPC-821X_Series

System	
CPU	Intel® 13 th Gen. Core™ i9/i7/i5/i3 processor in LGA1700 socket
Memory	2 x 260-pin DDR4 SO-DIMM sockets, supporting 3200 MHz SDRAM up to 64GB
Chipset	Intel® H610E
Graphics	Integrated Intel® HD Graphics
ATA	2 x Serial ATA ports with 600MB/s HDD transfer rate
LAN Chipset	3 x Intel® WGI226V 2.5GbE controllers
Watchdog Timer	1~255 levels reset
I/O	
Serial Port	4 x RS-232 ports DB-9 connectors. (COM1 and COM2 are RS-232/422/485 configurable)
Selectable Port	1 x DB25 connector for DIO (8 in/8 out) port or LPT port (either one, default is DIO)
USB Port	2 x USB 3.2 Gen2 ports (10Gbps) 4 x USB 3.2 Gen1 ports (5Gbps) Support internal USB dongle (Optional)
LAN	3 x RJ-45 ports for 2.5GbE
Video Port	1 x DB-15 female connector for Analog RGB
	1 x DP
	1 x DVI-D female connector for digital video output
	(*Support 3 independent display)
Audio	Mic-in/Line-out
Expansion Bus	1 x Mini-card socket interconnected with SIM card socket (Full size)
	1 x M.2 E Key (2230) for WiFi (CNVi Only)
	1 x M.2 B key(2242/3052/2280) w/(PCIex2+USB3.0+SATA) interconnected with SIM for 5G / LTE expansion or for storage
	1 x PCIe x16 slot +1 x PCI slot (FPC-8211)
	1 x PCIe x16 slot +1 x PCIe x8 slot (via x 1 lane) (FPC-8212)
2 x PCI (FPC-8213)	

Introduction

Environmental	
Operating Temp.	-20 ~ 70°C (-4 ~ 158°F), ambient w/ air flow (w/ 35W TDP CPU, fanless) -20 ~ 55°C (-4 ~ 131°F), ambient w/ air flow (w/ 65W TDP CPU, fanless)
Storage Temp.	-40 ~ 85°C (-40 ~ 185°F)
Operating Humidity	10 ~ 95% @ 55°C (non-condensing)
Vibration	3 Grms/5~500Hz/random operation w/ SSD
Shock	Operating 40G (11ms), Non-operating 60G with SSD
Qualification	
Certification	CE, FCC Class A
Power Requirement	
Power Input	DC 9~36V input (w/ 4-pin terminal block, combining remote power on/off switch)
Power Consumption	MAX 65W (w/35W TDP CPU, w/o I/O card) MAX 95W (w/65W TDP CPU, w/o I/O card)
Storage	
Type	2 x 2.5" drive bays (Optional support RAID0,1 ,BTO) 1 x CFast socket, outside accessible
Mechanical	
Construction	Aluminum alloy
Mounting	Wall-mount
Weight	5.8 kg (12.78 lb)
Dimensions (W x D x H)	268 x 195 x 125 mm
OS Support	
Windows 10 IOT Linux (Ubuntu 22.04)	
Ordering Information	
FPC-8211	Fanless system w/ 1 x PCI + 1 x PCIe x16
FPC-8212	Fanless system w/ 1 x PCIe x8 + 1 x PCIe x16
FPC-8213	Fanless system w/ 2 x PCI

1.3. Inside the Package

Upon opening the package, carefully inspect the contents. If any of the items is missing or appears damaged, contact your local dealer or distributor. The package should contain the following items:



1 x FPC-821X Series
Robust System



1 x User's Manual

1.4.1. Optional Accessories

The following items are normally optional, but some vendors may include them as a standard package, or some vendors may not carry all the items.

WMK-7000 Wall-mount kit for FPC-7XXX Series



PAC-120W6B-FSP-ES 120W AC/DC 19V adapter kit w/ 2-pin/3-pin/4-pin block



PAC-180W6B-FSP-ES 180W AC/DC 19V adapter kit w/ 2-pin/3-pin/4-pin block

Introduction

1.4.2. Optional Configuration (CTOS* Kit)

Make the computer more tailored to your needs by selecting one or more components from the list below to be fabricated to the computer.

240GB SSD	Intel® 2.5" 240GB SATAIII SSD kit	
MK-4C-4G/8G/16G/32G	DDR4-3200 8GB/16GB/32GB SDRAM DIMM kit	
WIFI-IN2550	Intel AX200NGW M.2 Wi-Fi 6 module w/ 2 x 30cm internal wires	
ANT-H11	1 x 2dBi HSUPA antenna	
ANT-D11	1 x WiFi dual-band 2.4G/5G antenna	
Core™ i9-13900E	Intel® 13 th Gen. Core™ i9-13900E processor, 36M, 1.8G	
Core™ i9-13900TE	Intel® 13 th Gen. Core™ i9-13900TE processor, 36M, 1.0G	
Core™ i7-13700E	Intel® 13 th Gen. Core™ i7-13700E processor, 30M, 1.9G	
Core™ i7-13700TE	Intel® 13 th Gen. Core™ i7-13700TE processor, 30M, 1.1G	
Core™ i5-13500E	Intel® 13 th Gen. Core™ i5-13500E processor, 24M, 2.4G	
Core™ i5-13500TE	Intel® 13 th Gen. Core™ i5-13500TE processor, 12M, 1.3G	
Core™ i3-13100E	Intel® 13 th Gen. Core™ i3-13100E processor, 12M, 3.3G	
Core™ i3-13100TE	Intel® 13 th Gen. Core™ i3-13100TE processor, 12M, 2.4G	

*CTOS means Configure-to-Order Service.

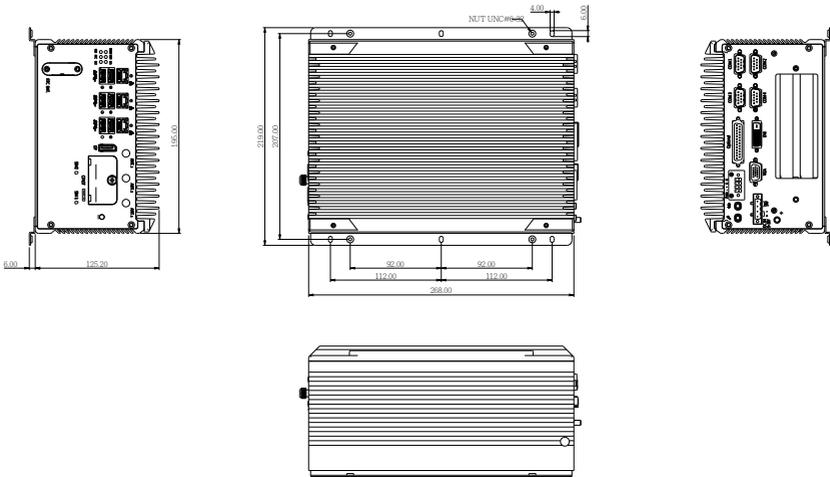
Chapter 2

System Overview

System Overview

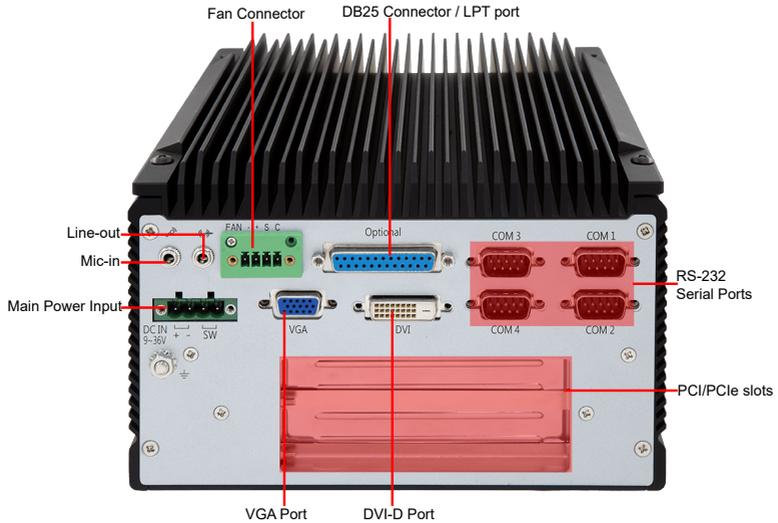
2.1. Dimensions

FPC-821X_Series



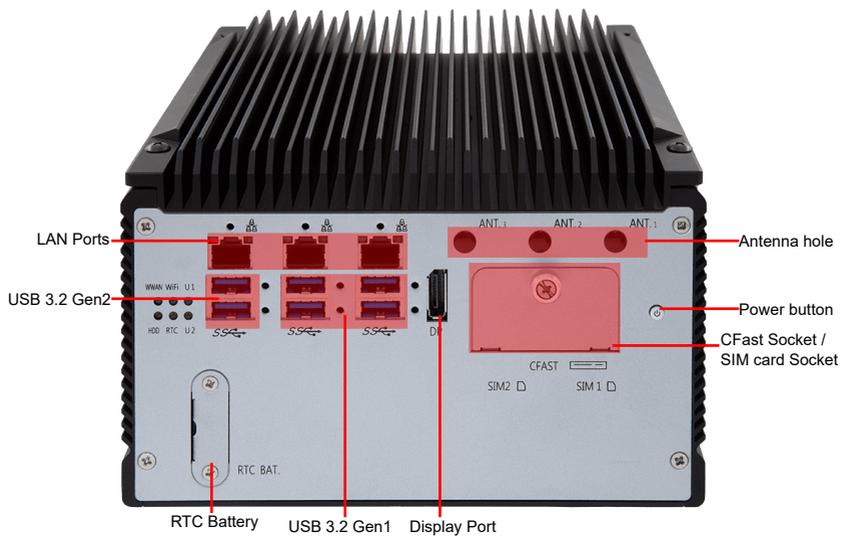
2.2. Take A Tour

2.2.1. FPC-821X_Series Rear View



System Overview

2.2.2. FPC-821X_Series Front View



2.3. Driver Installation Notes

The CPU module supports Windows 10 64-bit and Linux. To install the drivers, please go to our website at www.arbor-technology.com and download the driver pack from the product page. Then extract the downloaded file and follow the sequence below to install the drivers:

Chipset → **Graphic** → **Audio** → **Other drivers**

The driver path is listed as below:

Windows 10

Driver	Path
Chipset	\\Chipset\10.1.19165.8332\SetupChipset.exe
LAN	\\LAN\Wired_driver_28.0_x64\Wired_driver_28.0_x64.exe \\LAN\Wired_PROSet_28.0_x64\Wired_PROSet_28.0_x64.exe
VGA	\\Graphics\Intel Graphics Driver Production Version 101.4314\win64\installer.exe
Audio	\\Audio\64bit\0006-64bit_Win7_Win8_Win81_Win10_R279.exe
ME	\\ME\Intel_CSME_16.1.25.1865V6_B0Corporate\Main_DCH\SetupME.exe
Serial IO	\\Serial IO\SerialIO_30.100.2221.20_RPL-PCH_21H2\SetupSerialIO.exe

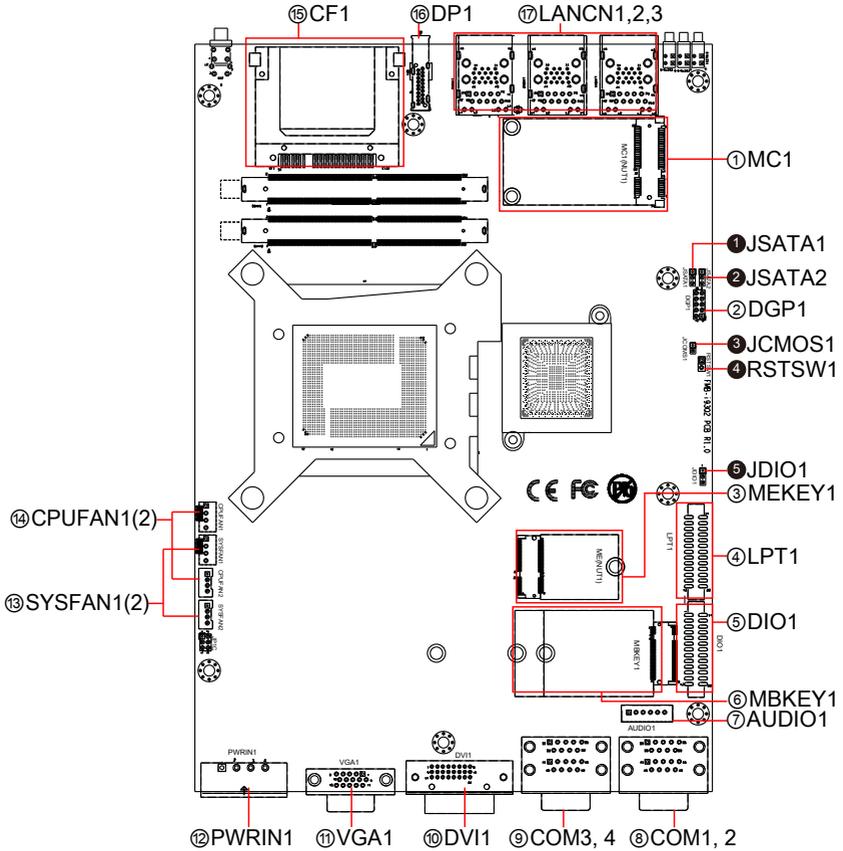
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Chapter 3

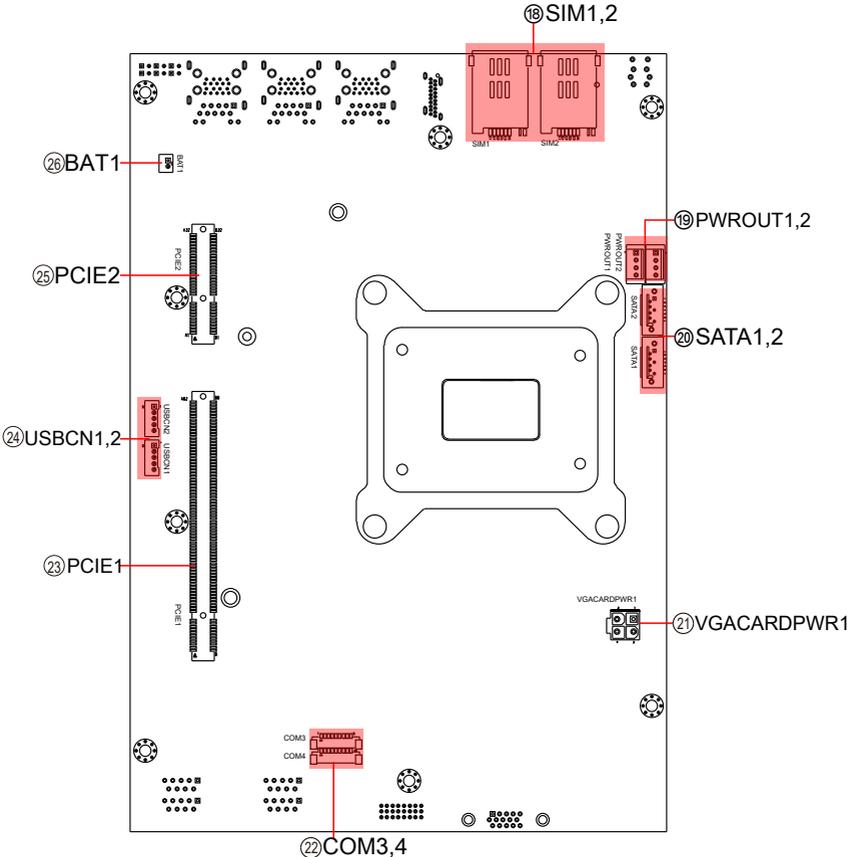
System Configuration

3.1. Board Layout

Board Top



Board Bottom



Engine of the Computer

Jumpers

Label	Description
① JSATA1	SATA mode
② JSATA2	SATA mode
③ JCMOS1	Clear CMOS selection
④ RSTSW1	Reset Button
⑤ JDIO1	VCC_DIO (5V/12V)

Connectors

Label	Description
① MC1	PCI Express Mini-card socket
② DGP1	Onboard 10-pin header
③ MEKEY1	M.2 E-Key socket
④ LPT1	On-board parallel port connector
⑤ DIO1	Digital IO Connector
⑥ MBKEY1	M.2 B-Key socket
⑦ AUDIO1	Onboard Type 6pin connector
⑧ COM1, COM2	RS-232/422/485 Selectable Serial Port
⑨ COM3, COM4	RS232 connectors
⑩ DVI1	DVI-D connector
⑪ VGA	Analog RGB
⑫ PWRIN1	Power Input Terminal Block
⑬ SYSFAN1,2	Fan power connector
⑭ CPUFAN1,2	Fan power connector
⑮ CF1	CFast Card Type I/II slot
⑯ DP1	DisplayPort connector
⑰ LANCN1,2,3	Stacked 2.5GbE RJ-45 & USB 3.1 Connectors
⑱ SIM1,2	Nano SIM card socket
⑲ PWROUT1,2	SATA HDD power connector
⑳ SATA1, 2	Serial ATA connector

②①	VGACARDPWR1	VGA card power
②②	COM3, COM4	RS-232 Serial Port (Optional)
②③	PCIE1	PCI x16 expansion Slot
②④	USBCN1,2	USB 2.0 connectors
②⑤	PCIE2	PCI x4 expansion Slot
②⑥	BAT1	RTC Battery

3.2. Pinheaders and Connectors

3.2.1. Pinheaders

① JME1

Function: Clear CMOS Selection
Jumper Type: 2.00mm pitch, 1x2-pin header
Setting:

Pin	Description	
Short	Clear CMOS	
Open	Keep CMOS (default)	

② JACCON1

Function: ACC ON Mode selection(for debug)
Jumper Type: 2.00mm pitch, 1x2-pin header
Setting:

Pin	Description	
Short	ACC ON Mode	
Open	Car mode	

③ JDIO

Function: Digital I/O VCC out put voltage
Jumper Type: Onboard 2.00mm-pitch 1x3-pin header
Setting:

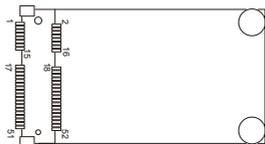
Pin	Description	
Short 1-2	12V	
Short 2-3	5V (default)	

3.2.2. Connectors

3.2.2.1 Main board

① MC2

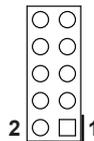
Function: PCI Express Mini-card Full socked
Connector Type: Onboard 0.8mm pitch 52-pin edge card connector.
Pin Assignment:



② DGP1

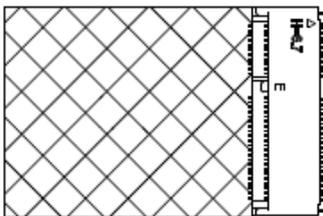
Function: Onboard 10-pin header
Connector Type: 2.00mm-pitch 2x5-pin header
Pin Assignment:

Pin	Description	Pin	Description
1	ESPI_CLK	2	GND
3	ESPI_CS0#	4	ESPI_IO0
5	ESPI_RST#	6	V3.3A
7	ESPI_IO3	8	ESPI_IO2
9	V3.3S	10	ESPI_IO1



③ MEKEY1

Function: M.2 E-Key socket (w/ PCIe + USB 2.0) for optional Wi-Fi/BT
Connector Type: M.2 E-Key 2230 Socket
Pin Assignment: The pin assignments conform to the industry standard.

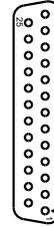


Engine of the Computer

④ LPT1

Function: On-board Parallel Port Connector
Connector Type: 2.00mm pitch 2 x13-pin box header
Pin Assignment:

Pin	Desc.	Pin	Desc.
1	STB#	14	AFD#
2	PD0	15	ERR#
3	PD1	16	INIT#
4	PD2	17	SLIN#
5	PD3	18	GND
6	PD4	19	GND
7	PD5	20	GND
8	PD6	21	GND
9	PD7	22	GND
10	ACK#	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SLCT	26	N.C

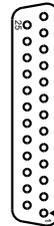


Rear side connector

⑤ DIO1

Function: Digital IO Connector
Connector Type: 2.0mm pitch 2x13 pin box header
Pin Assignment:

Pin	Desc.	Pin	Desc
1	DIO0	14	DIO8
2	DIO1	15	DIO9
3	DIO2	16	DIO10
4	DIO3	17	DIO11
5	DIO4	18	DIO12
6	DIO5	19	DIO13
7	DIO6	20	DIO14
8	DIO7	21	DIO15
9	+5V	22	GND
10	+5V	23	GND
11	N.C	24	N.C
12	N.C	25	N.C
13	N.C	26	N.C



Rear side connector

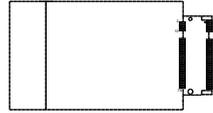
Note: For either the DI/O port (default) or the LPT port, please refer to the pin definition for the DB25 Connector.

⑥ MBKEY1

Function: M.2 B-Key socket (w/ PCIe + USB 3.0 or SATA + USB 3.0)(either one)

Connector Type: M.2 B-Key

Pin Assignment: The pin assignments conform to the industry standard.



⑦ AUDIO1

Function: Audio connector

Connector Type: Onboard Type 6pin connector

Pin Assignment: **Pin Description**

- 1 MICL
- 2 MICR
- 3 AGND
- 4 LOU-T-L
- 5 LOU-T-R
- 6 AGND



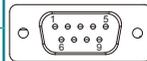
⑧ COM1 - COM2

Function: RS-232/422/485 Selectable Serial Port

Connector Type: External double-stacked 9-pin D-sub male connector

Pin Assignment:

Pin	RS-232	RS-422	RS-485
1	DCD	COM_422 TX-	COM_485 D-
2	RXD	COM_422 TX+	COM_485 D+
3	TXD	COM_422 RX+	
4	DTR	COM_422 RX-	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS		
9	RI		



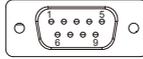
⑨ COM3 - COM4

Function: RS-232 Serial Port

Connector Type: External double-stacked 9-pin D-sub male connector

Pin Assignment:

Pin	RS-232
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

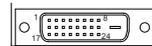


⑩ DVI-D Connector

Function: DVI-D Connector

Connector Type: DVI-D (DVI-D female connector)

Pin Assignment: The pin assignments conform to the industry standard.



DVI-D

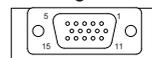
⑪ VGA1 Connector

Function: Analog RGB Connector

Connector Type: Analog RGB (D-Sub 15-pin female type)

Pin Assignment: The pin assignments conform to the industry standard.

Analog RGB



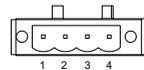
⑫ PWRIN3

Function: DC Adapter Power Input for expansion card

Connector Type: 4-Pin Terminal block

Pin Assignment:

Pin	Desc.
1	VIN+
2	VIN-
3	Switch-
4	Switch+



⑬ ⑭ **FAN Connector (SYSFAN1,2 / CPUFAN1,2)**

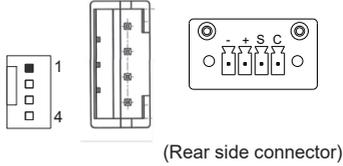
Function: Fan Power Connector

Connector Type: Onboard 2.54mm pitch 1x4-pin one-wall wafer connector

Pin Assignment:

Pin Description

1	GND
2	+12V
3	RPM
4	Control



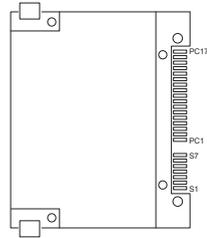
⑮ **CF1**

Function: CFast Card Type I/II slot

Connector Type: 7+17-pin CFast Card connector consisting of a SATA compatible 7-pin signal connector and a 17-pin power and control connector.

Pin Assignment:

Pin	Desc.	Pin	Desc
S1	SGND1	PC6	TBD
S2	TXP	PC7	GND
S3	TXN	PC8	LED1
S4	SGND2	PC9	LED2
S5	RXN	PC10	IO1
S6	RXP	PC11	IO2
S7	SGND	PC12	IO3
PC1	CDI	PC13	3.3V
PC2	GND	PC14	3.3V
PC3	TBD	PC15	GND
PC4	TBD	PC16	GND
PC5	TBD	PC17	CD0



⑯ **DP1**

Function: DisplayPort 1.2 Connector

Connector Type: Connect the display device to the DisplayPort 1.2 Connector

Pin Assignment: The pin assignments conform to the industry standard.

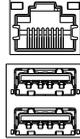


⑰ LANCN1~3

Function: LAN port and double stacked USB type A connector

Connector Type: Onboard 1.25mm pitch 9-pin Connector

Pin Assignment: The Pin assignment conform to the industry standard.



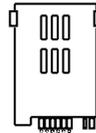
⑱ SIM1,2

Function: SIM Card Socket

Connector Type: 6-pin SIM card socket

Pin Assignment:

Pin	Desc.	Pin	Desc
C1	VCC	C2	RST
C3	CLK	C5	GND
C6	VPP	C7	I/O



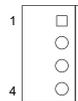
⑲ PWROUT1, 2

Function: SATA HDD Power Connector

Connector Type: 2.54mm pitch 1x4-pin one-wall connector

Pin Assignment:

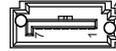
Pin	Description
1	+5V
2	GND
3	GND
4	+12V



⑳ SATA1, 2

Function: Serial ATA Connector
Connector Type: On-board Standard 7-pin Serial ATA Connector
Pin Assignment:

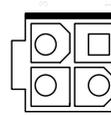
Pin	Description
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND



㉑ VGACARDPWR01

Function: VGA card power
Connector Type: onboard 2.54mm pitch 4-pin wafer
Pin Assignment:

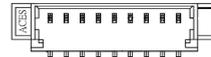
Pin	Desc.
1	GND
2	GND
3	+V12S
4	+V12S



㉒ COM3, 4

Function: RS232 Connector(COM3~COM4)
Connector Type: Onboard 1.25mm pitch 9-pin Connector
Pin Assignment:

Pin	Description
1	XDCD#
2	XDSR#
3	XRXD
4	XRTS#
5	XTXD
6	XCTS#
7	XDTR#
8	XRI#
9	GND

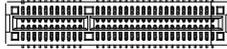


Note: The main connector is on the rear side, please refer to the ⑧ COM1 - COM4 on page 21 for COM3,4 Connector.

②③ PCIE1

Function: PCIe x 8 slot

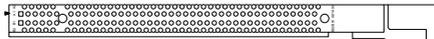
Pin Assignment: ARBOR pin define



②⑤ PCIE2

Function: PCIe x16 slot

Pin Assignment: The pin assignments conform to the industry standard.



②④ USBCN1, 2

Function: USB2.0 Wafer

Connector Type: On-board 1.25mm 1x5 pin wafer connector

Pin Assignment:

Pin	Description.
1	+5V
2	D-
3	D+
4	GND
5	GND



②⑥ BAT1

Function: RTC Battery

Connector Type: Onboard 2x1-pin box connector

Pin Assignment:

Pin	Desc.
1	BAT+
2	BAT-



Chapter 4

Installation and Maintenance

4.1. Install Hardware

The FPC-821X Series is constructed based on modular design to make it easy for users to add hardware or to maintain the computer. The following sections will guide you to the simple hardware installations for the computer.

4.1.1. Open the Computer

For the computer, removing the top and bottom covers is essential to open the computer and access the inside. Follow through the steps below to remove the top cover and bottom cover from the computer.

4.1.1.1. Remove Top Cover

All jumpers, CPU socket, MiniCard socket, SDRAM SO-DIMM slots, DIO/LPT ports are built on the top side of the main board. To access these components, the computer's top cover has to be removed. Follow through the steps below to remove the top cover.

FPC-821X Series

This section will use FPC-8211 as the installation example.

1. Loosen and remove the 4 screws as shown below.

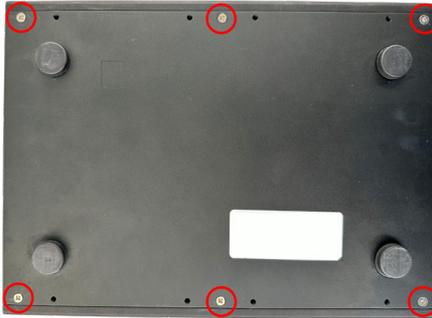


2. Carefully lift the top cover and remove the top cover from the computer. The inside of the computer is revealed.



4.1.1.2. Remove the Bottom Cover

1. Place the computer upside down on a flat surface. Loosen and remove 6 screws that securing the bottom cover.



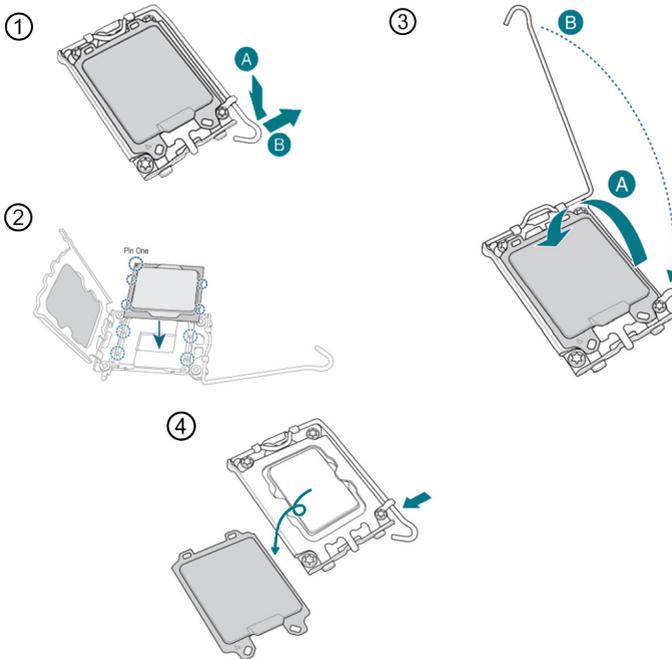
2. Lift the bottom cover and remove the cover from the computer. This should reveal the inside of the computer.



4.1.2. Install CPU

1. Remove the top cover from the computer as described in [Section 4.1.1.1. Remove Top Cover on page 28.](#)
2. Locate the CPU socket on the main board

The processor socket comes with a lever to secure the processor. Please refer to the pictures step by step as below and note that the cover of the socket must always be installed during transportation to avoid damage to the socket.



Note: Please note that, when pushing the lever down to unclip, the lever may rebound.

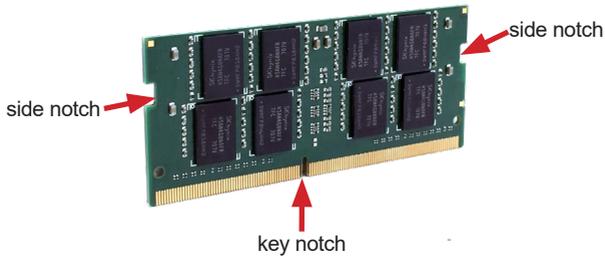
3. Restore the top and back cover to the computer by fastening the all screws.

4.1.3. Install/Uninstall Memory Modules

The main board has two memory module (DIMM) sockets. Increase memory capacity to make programs run faster on the system. The memory module for the FPC-821X Series' SO-DIMM sockets should be a 260-pin DDR4 with a

Installation & Maintenance

“key notch” off the centre among the pins, which enables the memory module for particular applications. There are another two notches at each left and right side of the memory module to help fix the module in the socket.



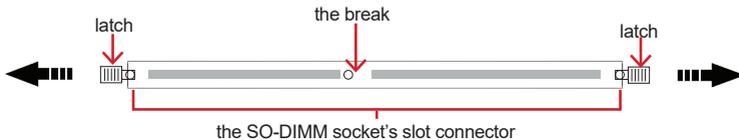
The computer has two 260-pin DDR4 SO-DIMM sockets that each socket support up to 64 GB maximum system memory. To install a memory module:

To install a DDR4 memory module:

1. Remove the top cover from the computer as described in [Section 4.1.1.1. Remove Top Cover on page 28.](#)
2. Locate the SO-DIMM sockets on the main board.

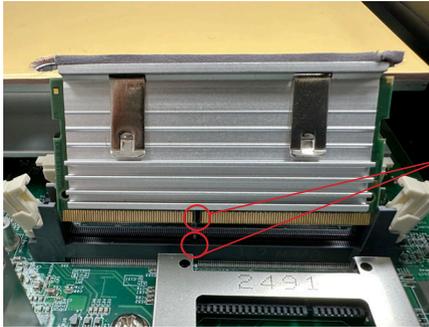
The SO-DIMM sockets are vertical type, and each socket has two latches for fixing the memory modules. The memory module can only be installed by one direction due to the notch.

3. Pull back both latches from the socket.



vertical-type SO-DIMM socket (overview)

4. Confront the memory module's edge connector side at the SO-DIMM socket. Position the memory module at the SO-DIMM socket, with the memory module's key notch aligned at the break of the SO-DIMM's slot connector.



Align the notch on the memory module with the notch in the memory socket.

5. Vertically plug the memory module to the DIMM socket. “Fully” plug the memory module until both latches auto-lock the memory module in place.



6. Restore the top and side cover to the computer.

Installation & Maintenance

To uninstall a DDR4 memory module:

1. Pull back both latches from the SO-DIMM socket.

The DDR4 memory module will be auto-released from the socket.



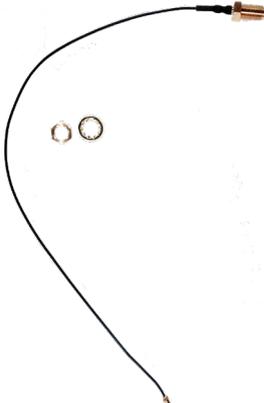
2. Remove the memory module.
3. Restore the top cover to the computer.

4.1.4. Install Wi-Fi Module

1. Remove the top cover from the computer as described in [Section 4.1.1.1. Remove Top Cover on page 28.](#)
2. Locate the **M.2 E-Key** socket for wireless module.



3. Prepare the Wi-Fi module kit. The module is a **M.2 E-Key** socket form factor, with two MHF connectors, one is “MAIN”, and the other is “AUX”.

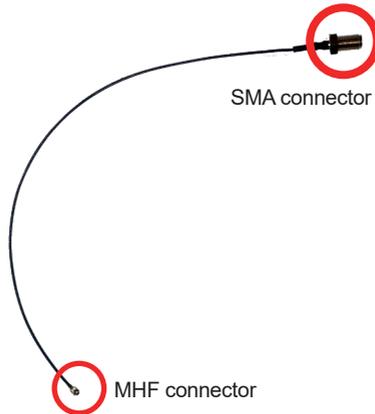


Two MHF connectors, one is “MAIN” (marked 2), the other is “AUX” (marked 1).



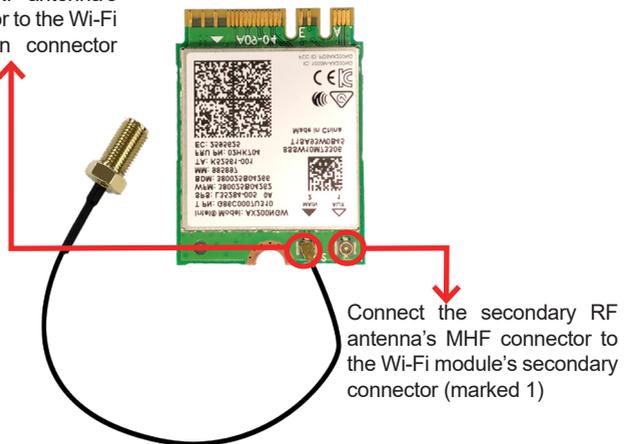
Installation & Maintenance

4. Have the RF antenna. The antenna has an SMA connector on one end and an MHF connector on the other.



5. Connect the RF antenna's MHF connector to the Wi-Fi module's main connector marked 0. If you are going to connect a secondary antenna, connect it to the connector marked 1.

Connect the RF antenna's MHF connector to the Wi-Fi module's main connector (marked 2)

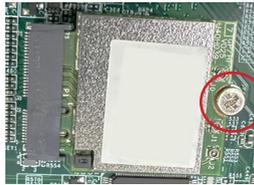


6. Plug the Wi-Fi module to the socket's connector by a slanted angle. Fully plug the module, and note the notch on the wireless module should meet the break of the connector.

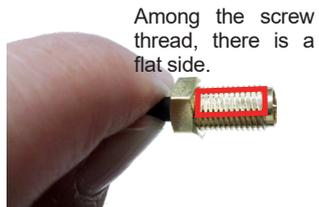
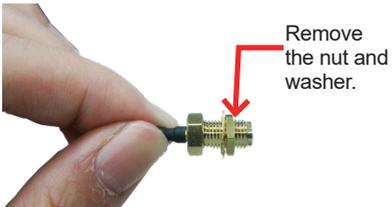


The module's key notch should meet the connector's break.

7. Press the module down and fix the module in place using one screw.



8. Locate the SMA antenna holes on front panel. Remove the plastic plug to make an antenna hole. Keep the plastic plug for any possible restoration in the future.
9. From the other end of the RF antenna, which is an SMA connector, remove the washer and the nut. Note the SMA connector has the form of a threaded bolt, with one flat side.



Installation & Maintenance

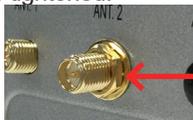
10. Pull the SMA connector through the above mentioned antenna hole. Note to meet the aforesaid flattened side with the antenna hole's flat side.



Arrange the flat side of the SMA connector to meet the flat side of the antenna hole.



11. Mount the washer first and then the nut to the SMA connector. Make sure the nut is tightened.



Mount the washer and the nut to the SMA connector. Tighten the nut.

12. Have the external antenna(s). Screw and tightly fasten the antenna(s) to the SMA connector.



4.1.5. Install Internal SATA Storage Device

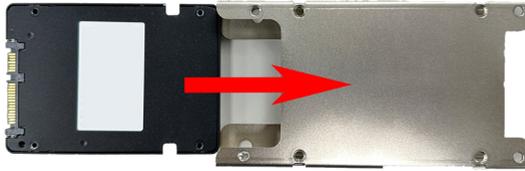
The computer supports two 2.5" SATA storage devices to work inside the computer for RAID. The following will guide you to install two SATA HDD/SSD.

1. Remove the bottom cover from the computer as described in [Section 4.1.1.2. Remove the Bottom Cover on page 30](#)
2. Find the HDD/SSD brackets inside the computer. Loosen and remove the screws as marked in the illustration below. Then dismount the bracket from the computer.



3. Slide the HDD/SSD storage device into the bracket and fix the storage device in place by fastening the 4 screws on the bracket.

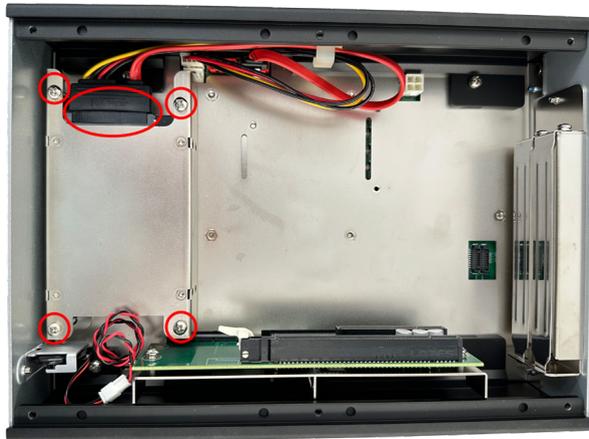
Installation & Maintenance



4. Slide the HDD/SSD storage device into the bracket and fix the storage device in place by fastening the 4 screws on the bracket.



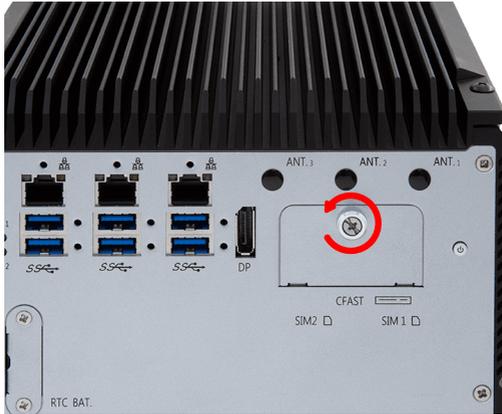
5. Install the bracket with the storage device back into the computer by refastening the 4 screws. Connect the SATA cable and power cable to the connectors on the computer.



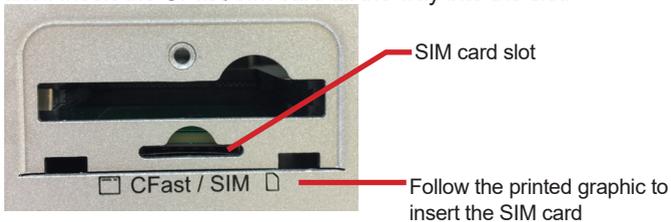
6. Restore the bottom cover to the computer.

4.1.6. Install & uninstall the CFast card / SIM card:

1. From the front panel of the computer, locate the door to the CFast / SIM card slot. Loosen the screw to remove the door.



2. Position the CFast/SIM card as directed by the graphic printed on the front panel. Insert the CFast/SIM card all the way into the slot.



3. Push-eject the CFast(SIM card) card.
4. Remove the CFast(SIM card) card.
5. Refasten the screw to close the card door.

Uninstall the CFast card / SIM card:

1. From the front panel of the computer, locate the door to the CFast / SIM card slot. Loosen the screw to remove the door.
2. Push-eject the CFast/SIM card

Installation & Maintenance

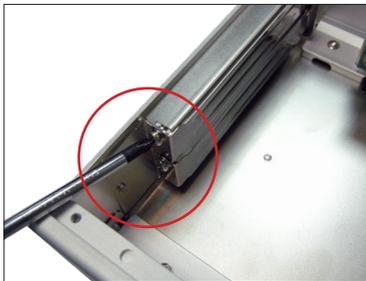
3. Remove the CFast/SIM card.
4. Refasten the screw to close the card door.

Note: Make sure to refasten the screw to close the card door each time the CFast(SIM) card is installed or uninstalled.

4.1.7. Install PCI and PCI Express Cards

To install a PCI or PCI Express card:

1. Remove the bottom cover from the computer as described in [4.1.1.2. Remove the Bottom Cover](#) on page 48.
2. To install/uninstall a PCIe or PCI card to an expansion slot, use a cross-head screwdriver to loosen the screw that secures the expansion slot bracket. If the second slot is needed, remove the plastic plug at the side cover and use a cross-head screwdriver to release the expansion slot bracket through the hole.



3. Restore the bottom cover/plastic plug to the computer.

4.2. Wire DC-in Power Source

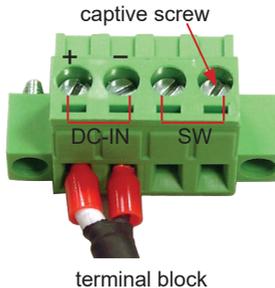
4.2.1 Automation Mode

Follow the instructions below for connecting the computer to a DC-input power source.



Warning Only trained and qualified personnel are allowed to install or replace this equipment.

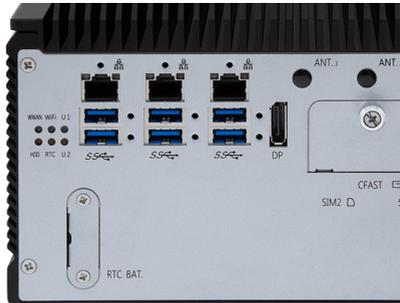
1. Before wiring, make sure the power source is disconnected.
2. Find the terminal block in the accessory box.
3. Use the wire-stripping tool to strip a short insulation segment from the output wires of the DC power source.
4. Identify the positive and negative feed positions for the terminal block connection. See the symbols printed on the rear panel indicating the polarities and DC-input power range in voltage.
5. Insert the exposed wires into the terminal block plugs. Only wires with insulation should extend from the terminal block plugs. Note that the polarities between the wires and the terminal block plugs must be positive to positive and negative to negative.
6. Use a slotted screwdriver to tighten the captive screws. Plug the terminal block firmly, which wired, into the receptacle on the rear panel.



4.3 Replace RTC Battery

Users can replace RTC battery without losing settings. To replace the RTC battery:

1. Remove the 2 screws that secure the RTC service battery window.



2. Pull out the RTC battery and disconnect the battery cable from its connector on the system board.
3. Using a non-metallic tool, pry up the RTC battery from the adhesive that secures it to bracket.
4. Replace the RTC battery and reconnect the battery cable to the connector on the system board.
5. Restore the service window and fasten the 2 screws to secure the RTC service battery window.

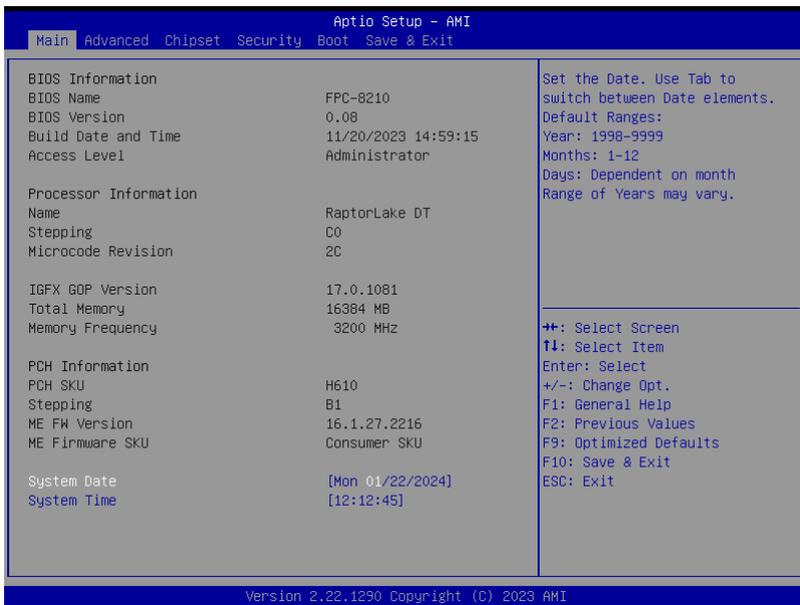
Chapter 5

BIOS

BIOS

The BIOS Setup utility for the FPC-821X Series is featured by American Megatrends Inc to configure the system settings stored in the system's BIOS ROM. The BIOS is activated once the computer powers on. When the computer is off, the battery on the main board supplies power to BIOS RAM.

To enter the BIOS Setup utility, keep hitting the “Delete” key upon powering on the computer.



The featured settings are:

Menu	Description
Main	See 5.1. Main on page 48
Advanced	See 5.2. Advanced on page 49
Chipset	See 5.3. Chipset on page 63
Security	See 5.4. Security on page 67
Boot	See 5.5. Boot on page 69
Save & Exit	See 5.6. Save & Exit on page 70

Key Commands

The BIOS Setup utility relies on a keyboard to receive user's instructions. Hit the following keys to navigate within the utility and use the utility.

Keystroke	Function
← →	Moves left/right between the top menus.
↓ ↑	Moves up/down between highlight items.
Enter	Selects an highlighted item/field.
Esc	<ul style="list-style-type: none"> ▶ On the top menus: Use Esc to quit the utility without saving changes to CMOS. (The screen will prompt a message asking you to select OK or Cancel to exit discarding changes. ▶ On the submenus: Use Esc to quit current screen and return to the top menu.
Page Up / +	Increases current value to the next higher value or switches between available options.
Page Down / -	Decreases current value to the next lower value or switches between available options.
F1	Opens the Help of the BIOS Setup utility.
F2	Previous values
F9	Optimized defaults
F10	Exits the utility saving the changes that have been made. (The screen then prompts a message asking you to select OK or Cancel to exit saving changes.)

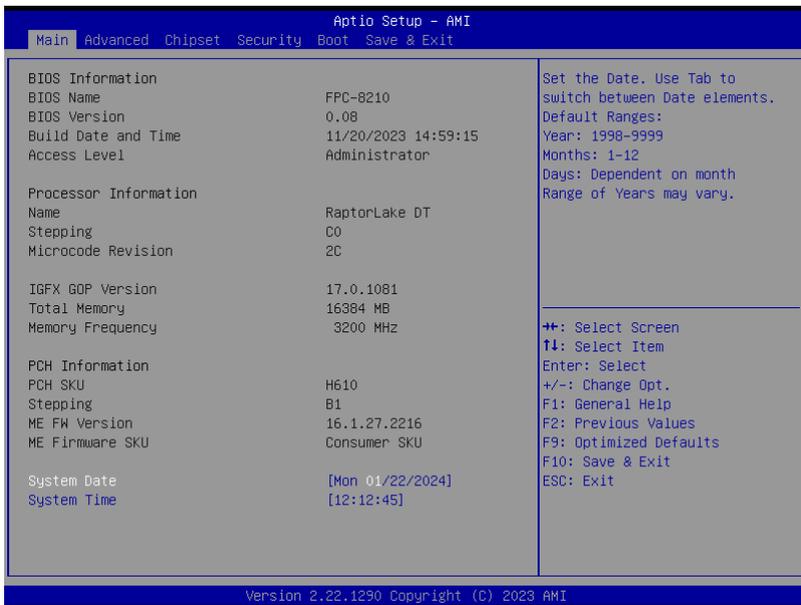
Note: Pay attention to the "WARNING" that shows at the left pane onscreen when making any change to the BIOS settings.

This BIOS Setup utility is updated from time to time to improve system performance and hence the screenshots hereinafter may not fully comply with what you actually have onscreen.

BIOS

5.1. Main

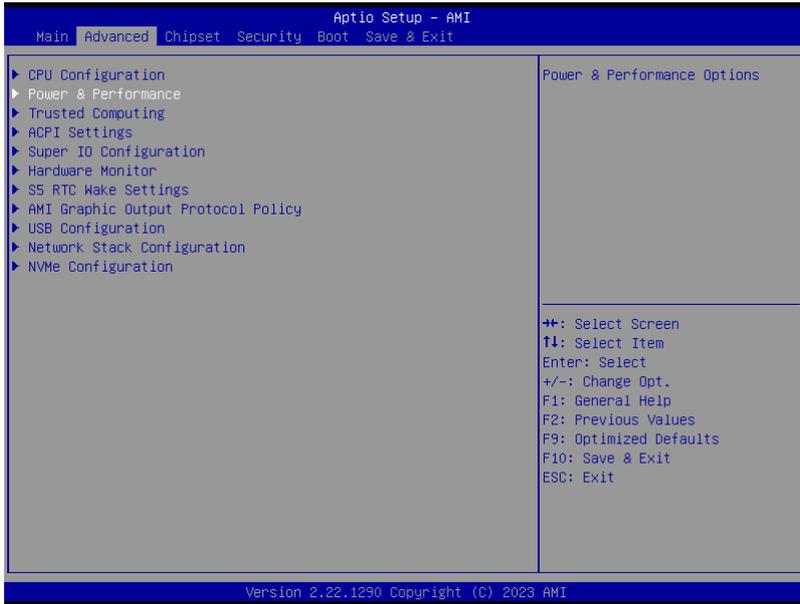
The **Main** menu features the settings of **System Date** and **System Time** and displays some BIOS info.



The featured settings are:

Setting	Description
System Date	<p>Set the system date. Use Tab to switch between Data elements. Note that the 'Day' automatically changes when you set the date.</p> <ul style="list-style-type: none"> ▶ The date format is: Day: Sun to Sat Month: 1 to 12 Date: 1 to 31 Year: 1998 to 2099
System Time	<p>Set the system time. Use Tab to switch between Time elements.</p> <ul style="list-style-type: none"> ▶ The time format is: Hour: 00 to 23 Minute: 00 to 59 Second: 00 to 59

5.2. Advanced

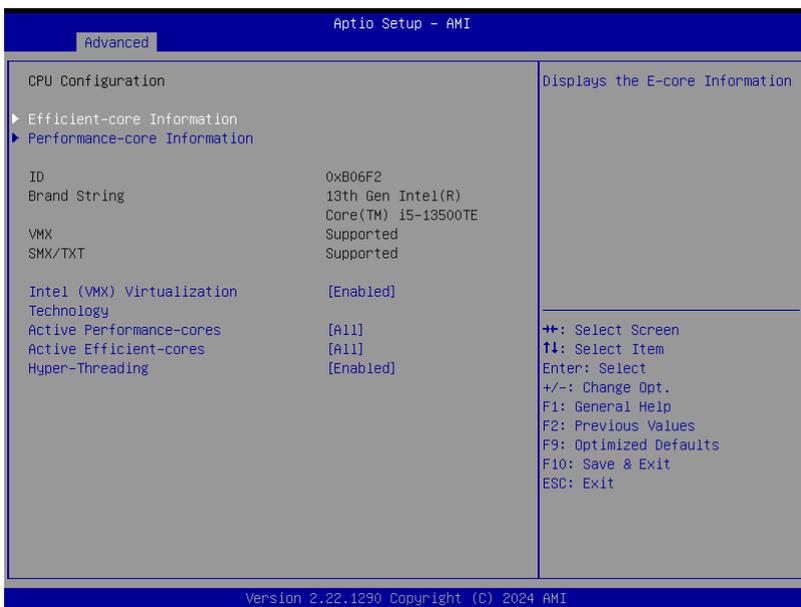


The featured settings and submenus are:

Setting	Description
CPU Configuration	See 5.2.1. CPU Configuration on page 50
Power & Performance	See 5.2.2. Power & Performance on page 51
Trusted Computing	See 5.2.3. Trusted Computing on page 53
ACPI Settings	See 5.2.4. ACPI Settings on page 54
Super IO Configuration	See 5.2.5. Super IO Configuration on page 55
Hardware Monitor	See 5.2.6. Hardware Monitor on page 56
AMI Graphic Outut protocol policy	See 5.2.7. AMI Graphic Outut protocol policy on page 57
S5 RTC Wake Settings	See 5.2.8. S5 RTC Wake Settings on page 58
USB Configuration	See 5.2.9. USB Configuration on page 59
Network Stack Configuration	See 5.2.10. Network Stack Configuration on page 61
NVMe Configuration	See 5.2.11. NVMe Configuration on page 62

BIOS

5.2.1. CPU Configuration



The features settings are:

Setting	Description
Intel (VMX) Virtualization Technology	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology. ▶ Options: Enabled (default) or Disabled
Active Performance Cores	Number of cores to enable in each processor package. ▶ Options: All (default) and 1
Active Efficient-Cores	Number of cores to enable in each processor package. ▶ Options: All (default) and 1
Hyper-Threading	Enabled (default) for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized or Hyper-Threading Technology). When disabled only one thread per enabled core is enabled.

5.2.2. Power & Performance

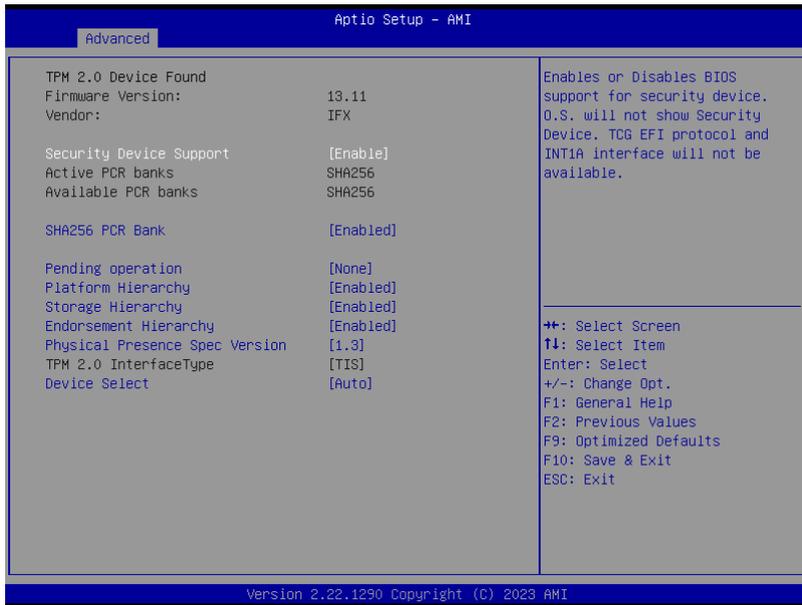


The features settings are:

Setting	Description
CPU - Power management Control	<p>CPU - Power Management Control Options Control CPU Power Management:</p> <ul style="list-style-type: none"> ▶ Options: Boot performance mode: Max Battery, Max Non-Turbo performance, Turbo performance(Default) <p>Control CPU Power Management:</p> <p>Intel(R) SpeedStep(tm):</p> <ul style="list-style-type: none"> ▶ Options: Disable(Default), Enabled <p>Turbo Mode: Enable/Disable peocessor Turbo Mode.</p> <ul style="list-style-type: none"> ▶ Options: Turbo Mode: Disable(Default), Enabled <p>CPU - Power Management Control Options</p>

GT - Power Management Control	<p>RC6(Render Standby): Check to enable render standby ▶ Options: Disabled / Enabled(Default)</p> <p>Maximum GT frequency: Maxium GT frequency limited by the user. Choose between 300MHz and 1450MHz. ▶ Options: Default Max Frequency(Default), 100Mhz~1200Mhz</p> <p>Disable Turbo GT Frequency: Enabled/Disabled GT Frequency. Options: Disabled(Default) / Enabled</p>
--------------------------------------	---

5.2.3. Trusted Computing



The features settings are:

Setting	Description
Security Device Support	Enable (default) or Disable BIOS support for security device.
Pending operation	Schedule an Operation for the security Device. Your computer will reboot during restart in order to change State of Security Device. ▶ Options: None (default) and TPM Clear

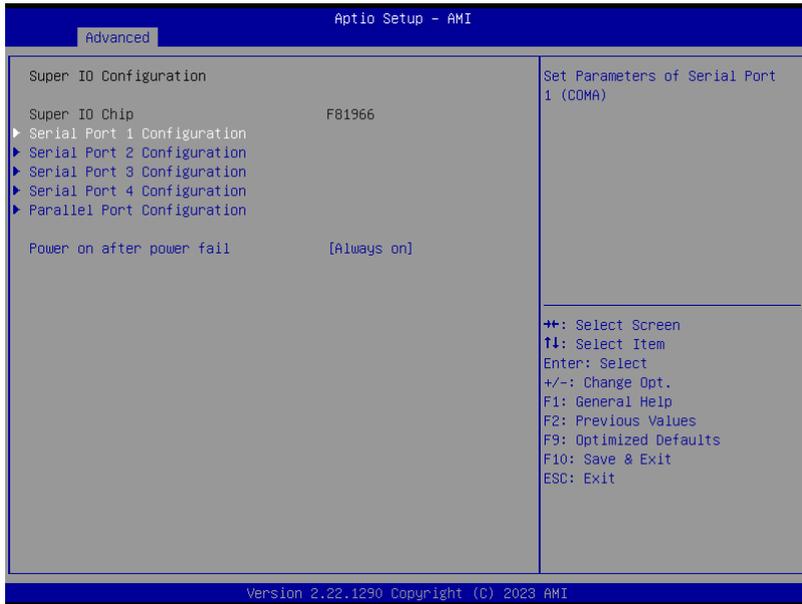
5.2.4. ACPI Settings



The features settings are:

Setting	Description
Enable Hibernation	Enables (default) or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Select ACPI sleep state the system will enter when the SUSPEND button is pressed. ▶ Options: Suspend Disabled and S3 (Suspend to RAM) (default)

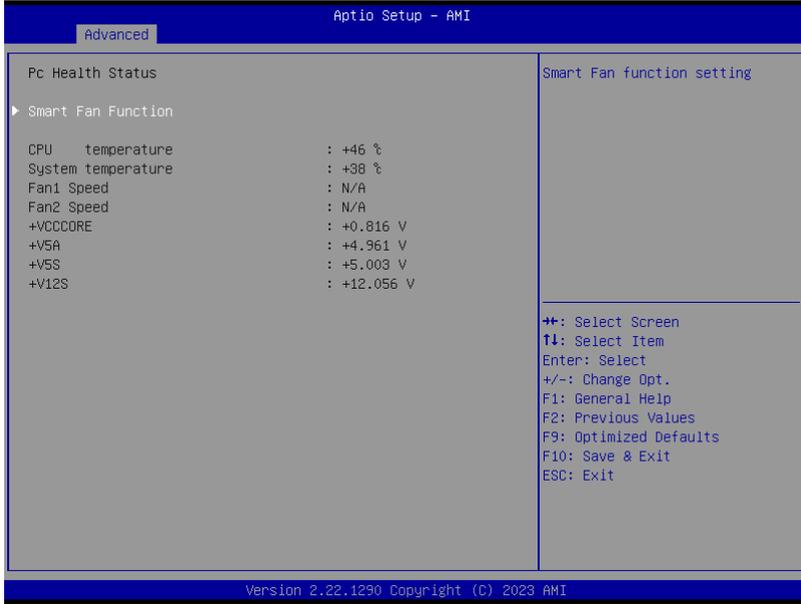
5.2.5. Super IO Configuration



Super IO Chip F81866 Settings

Setting	Description
Serial Port Configuration	
Serial Port	Enable (default) or Disable Serial Port (COM).
Mode Select	Select RS-232 (default), RS-422 , RS-485 , RS-422 Termination Resistor or RS-485 Termination Resistor
Parallel Port Configuration	
Parallel Port	Enable (default) or Disable Parallel Port (LPT/LPTE).
Device Mode	Change the printer port mode: ▶ Options: STD Printer Mode (default) ; SPP Mode ; EPP-1.9 and SPP Mode ; EPP-1.7 and SPP Mode ; ECP Mode ; ECP and EPP 1.9 Mode ; ECP and EPP 1.7 Mode

5.2.6. Hardware Monitor

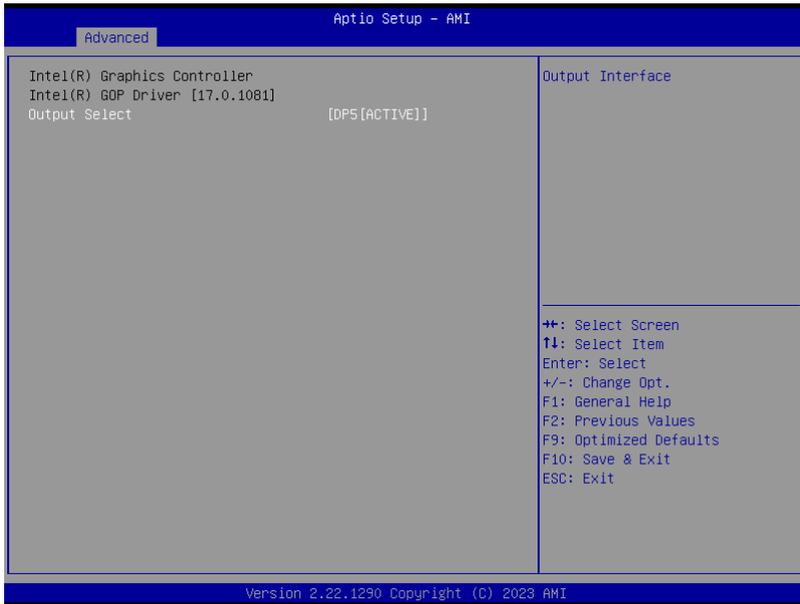


The features settings are:

Setting	Description
CPUFAN SmartFan Function SYSFAN SmartFan Function	Fan Mode: Auto Boundary 1~4 & Segment Speed 1~5 Auto fan speed control. Fan speed will follow different temperature by different PRM 1-100. Fan Mode: Manual (0%~100%)

Note: CPUFAN & SYSFAN functions only apply to SKUs with smart fan. If your SKU doesn't come with smart fan, ignore these settings.

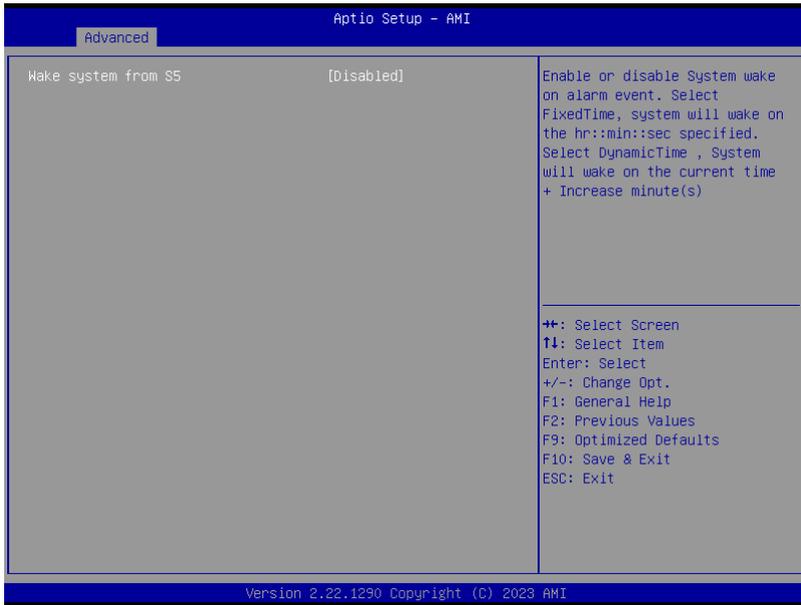
5.2.7. AMI Graphic Output protocol policy



The features settings are:

Setting	Description
Output select	Output Select

5.2.8. S5 RTC Wake Settings



The features settings are:

Setting	Description
Wake System from S5	<p>Enable or Disable (default) system wake on alarm event.</p> <ul style="list-style-type: none"> Options available are: <ul style="list-style-type: none"> Disabled (default): Fixed Time: System will wake on the hr::min::sec specified. DynamicTime: If selected, you need to set Wake up minute increase from 1 - 5. System will wake on the current time + increase minute(s).

5.2.9. USB Configuration

Advanced		Aptio Setup - AMI	
USB Configuration		Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.	
USB Module Version	31		
USB Controllers: 1 XHCI			
USB Devices: 1 Drive, 1 Keyboard, 2 Hubs			
Legacy USB Support	[Enabled]		
XHCI Hand-off	[Enabled]		
USB Mass Storage Driver Support	[Enabled]		
USB hardware delays and time-outs:		++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit	
USB transfer time-out	[20 sec]		
Device reset time-out	[20 sec]		
Device power-up delay	[Auto]		
Mass Storage Devices:			
KingstonDataTraveler 3.0PMAP	[Auto]		
Version 2.22.1290 Copyright (C) 2023 AMI		64	

The features settings are:

Setting	Description
Legacy USB Support	Enables/disables legacy USB support. ► Options available are Enabled (default), Disabled and Auto . ► Select Auto to disable legacy support if no USB device are connected. ► Select Disabled to keep USB devices available only for EFI applications.
XHCI Hand-off	This is a workaround for OSeS without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver. ► The optional settings are: Enabled (default) / Disabled .
USB Transfer time-out	Use this item to set the time-out value for control, bulk, and interrupt transfers. ► Options: 1 sec , 5 sec , 10 sec , 20 sec (default).

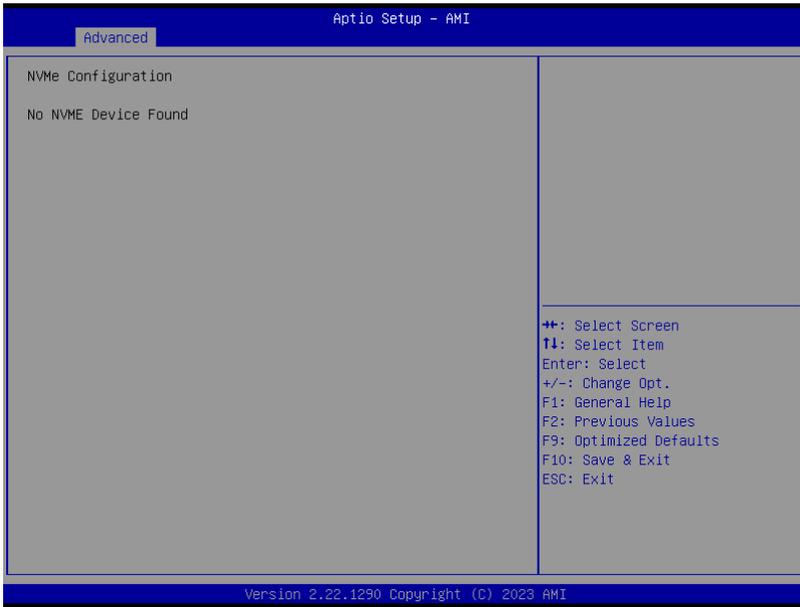
Device reset time-out	Use this item to set USB mass storage device start unit command time-out. ▶ Options available are: 10 sec, 20 sec (default), 30 sec, 40 sec
Device power-up delay	Use this item to set maximum time the device will take before it properly reports itself to the host controller. 'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor. ▶ Options available are: Auto: Default Manual: Select Manual you can set value for the following sub-item: 'Device Power-up delay in seconds', the delay range in from 1 to 40 seconds, in one second increments.

5.2.10. Network Stack Configuration



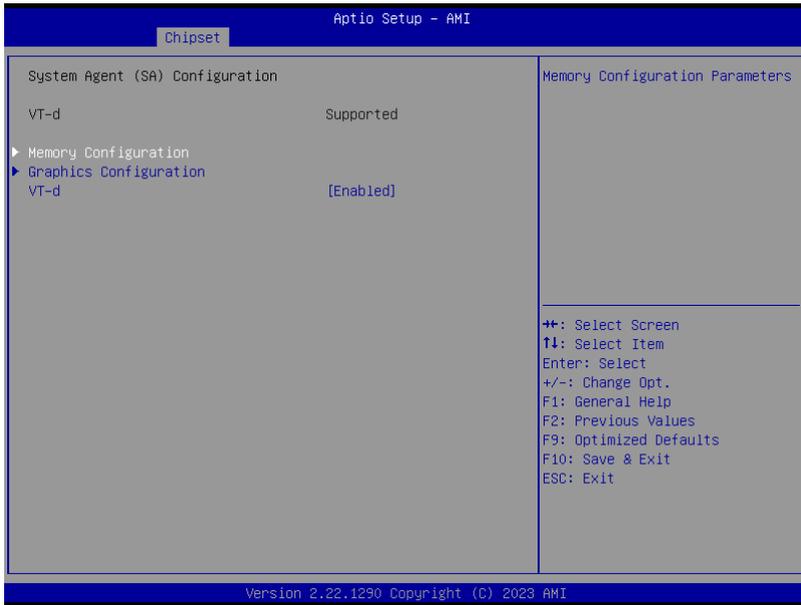
Access this submenu to view the NVMe controller and driver information.

5.2.11. NVMe Configuration



Access this submenu to view the NVMe controller and driver information.

5.3. Chipset

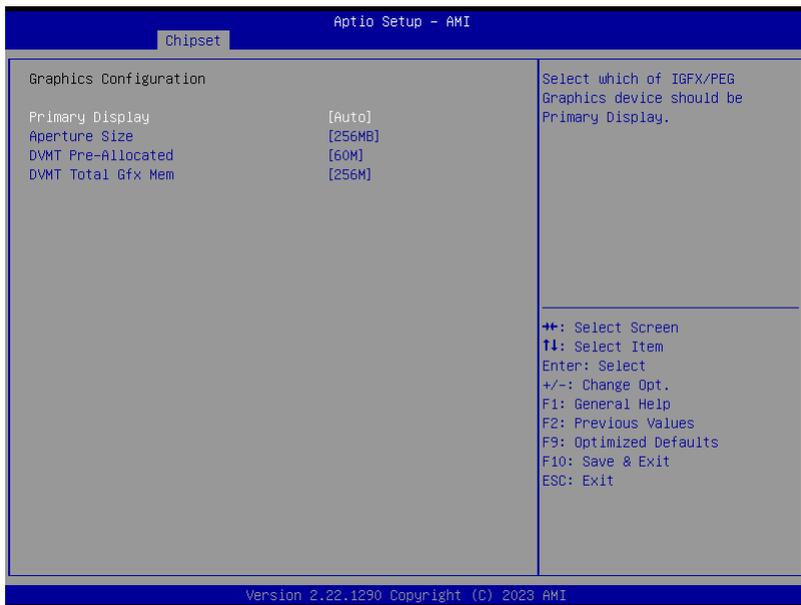


The **Chipset** menu controls the system’s chipset.

The features settings are:

Setting	Description
System Agent (SA) Configuration	
Memory Configuration	Access this submenu to view the memory configuration.
Graphics Configuration	See 5.3.1.1. Graphics Configuration on page 64
VT-d	Enable (default) or Disable VT-d function

5.3.1. Graphics Configuration



The features settings are:

Setting	Description
Primary Display	Select the Graphics device which will be activated as Primary Display. ▶ Options available are Auto (default), IGFX , PEG and PCI
Aperture Size	Select the Aperture Size. Note that above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048MB aperture. To use this feature, please disable CSM support. ▶ Options: 128MB , 256MB (default), 512MB , 1024MB and 2048MB
DVMT Pre-Allocated	Select the DVMT 5.0 Pre-allocated (Fixed) Graphic Memory size used by the Internal Graphic Device. ▶ 60M is the default.
DVMT Total Gfx Mem	Select the DVMT 5.0 Total Graphic Memory size used by the Internal Graphic Device. ▶ Options: 128M , 256M (default) and Max .

5.3.2. PCH-IO Configuration

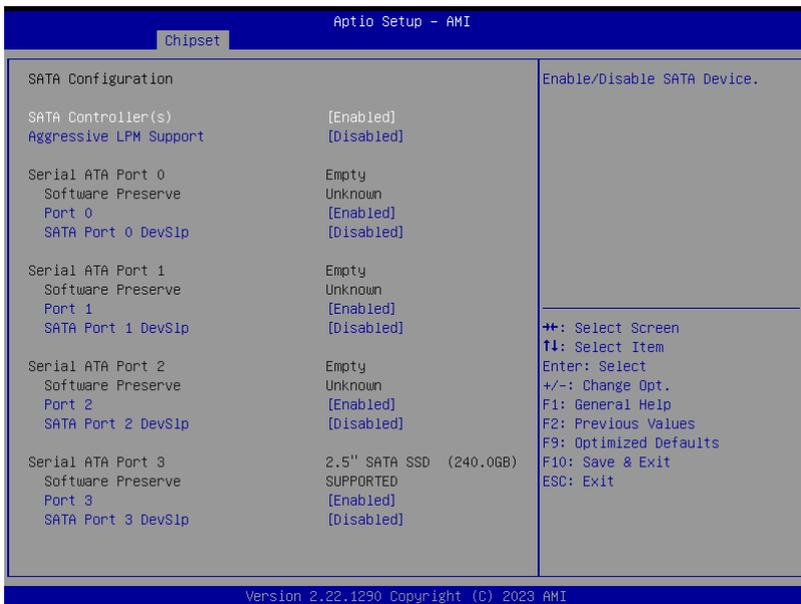


PCH-IO Configuration:

Setting	Description
PCI Express Configuration	PCI Express Root Port Settings ▶ POE LAN1: Enable (default) / Disable ASPM: Disable (default) / L1 / Auto L1 Substates: Disable (default) / L1.1 / L1.2 PCIe Speed: AUTO / Gen1 / Gen2 / Gen3 / Gen4 ▶ POE LAN2: Enable (default) / Disable ASPM: Disable (default) / L1 / Auto L1 Substates: Disable (default) / L1.1 / L1.2 PCIe Speed: AUTO / Gen1 / Gen2 / Gen3 / Gen4 ▶ POE LAN3: Enable (default) / Disable ASPM: Disable (default) / L1 / Auto L1 Substates: Disable (default) / L1.1 / L1.2 PCIe Speed: AUTO / Gen1 / Gen2 / Gen3 / Gen4
SATA Configuration	Enable / Disable (default) xDCI (USB OTG Device).

5.3.3. SATA Configuration

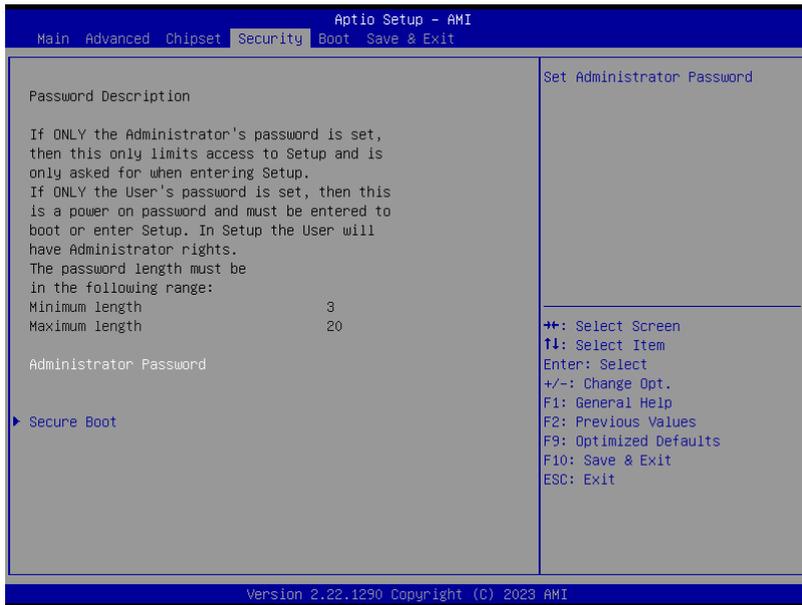
BIOS



The features settings are:

Setting	Description
SATA Controller(s)	Enabled (default) / Disabled SATA device(s).
Aggressive LPM Support	Enabled / Disabled (default) PCH to aggressively enter link power state.
Serial ATA Port 0~3	Enabled (default) / Disabled SATA port
Serial ATA Port 0~3 DevSlp	SATA device information. Enabled (default) / Disabled the SATA port.

5.4. Security



The features settings are:

Setting	Description
Administrator Password	To set up an administrator password: <ol style="list-style-type: none"> 1. Select Administrator Password. 2. An Create New Password dialog then pops up onscreen. 3. Enter your desired password that is no less than 3 characters and no more than 20 characters. 4. Hit [Enter] key to submit.
Security Boot	See 5.4.1. Security Boot on page 68 .

BIOS

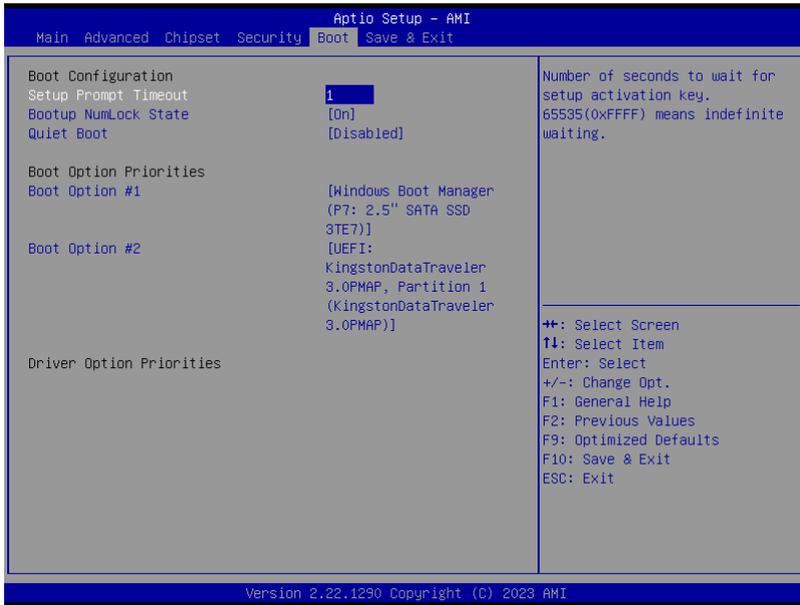
5.4.1. Security Boot



The features settings are:

Setting	Description
Secure Boot	Enable/Disable (default) secure boot.
Secure Boot Mode	Allow users to set the secure boot selector. Standard/Custom (default) mode.
Restore Factory Keys	Force system to restore default secure boot key database.
Reset to Setup Mode	Delete all secure boot key databases.
Key Management	Allow users to modify secure variables and set key management page.

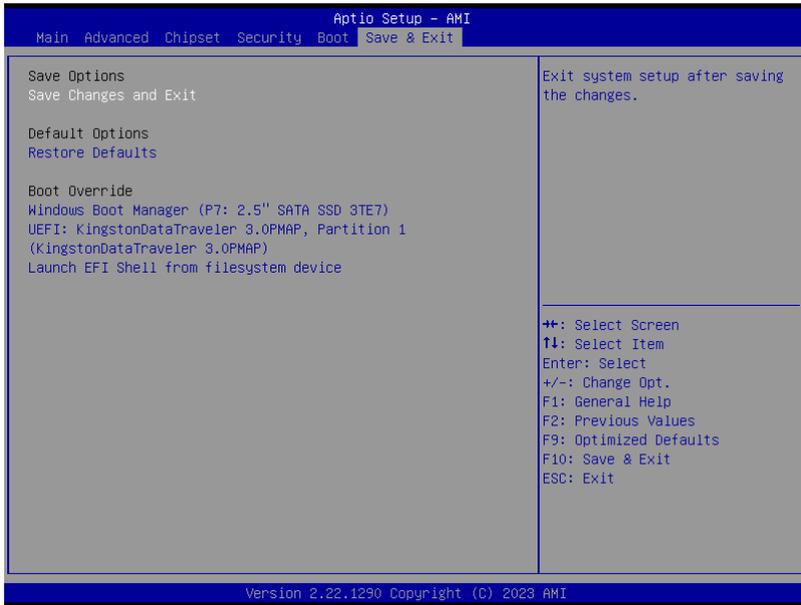
5.5. Boot



The features settings are:

Setting	Description
Setup Prompt Timeout	Set how long to wait for the prompt to show for entering BIOS Setup. <ul style="list-style-type: none"> ▶ The default setting is 1 (sec). ▶ Set it to 65535 to wait indefinitely.
Bootup NumLock State	Sets whether to enable or disable the keyboard's NumLock state when the system starts up. <ul style="list-style-type: none"> ▶ Options available are On (default) and Off.
Quiet Boot	Sets whether to display the POST (Power-on Self Tests) messages or the system manufacturer's full screen logo during booting. <ul style="list-style-type: none"> ▶ Select Disabled to display the normal POST message, which is the default.
Boot Option Priority	Set the system boot priorities.

5.6. Save & Exit



The features settings are:

Setting	Description
Save Changes and Reset	Saves the changes and quits the BIOS Setup utility.
Restore Defaults	Restores all settings to defaults. ▶ This is a command to launch an action from the BIOS Setup utility.
Boot Override	Boot Override presents a list in context with the boot devices in the system. ▶ P0 : Select the device to boot up the system regardless of the currently configured boot priority. ▶ Launch EFI Shell from filesystem device : Attempts to launch EFI Shell Application (Shell.efi) from one of the available filesystem devices.

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Appendices

A: Digital I/O Setting

Digital I/O can read from or write to a line or an entire digital port, which is a collection of lines. This mechanism helps users achieve various applications such as industrial automation, customized circuit, and laboratory testing. Take the source code below that is written in C for the digital I/O application example.

Sample Codes:

```
/*-----*  
-----*/  
#include <math.h>  
#include <stdio.h>  
#include <dos.h>  
  
int sioIndex = 0x2E;  
int sioData = 0x2F;  
  
int main(void)  
{  
    int iData;  
  
    SioGPIOMode(0xFF00);  
    delay(2000);  
  
    SioGPIOData(0x5500);  
    delay(2000);  
  
    iData = SioGPIOStatus();  
    printf(" Input : %2x \n",iData);  
    delay(2000);  
  
    SioGPIOData(0xAA00);  
    delay(2000);  
  
    iData = SioGPIOStatus();  
    printf(" Input : %2x \n",iData);  
    delay(2000);  
  
    return 0;  
}  
  
void SioGPIOMode(int iMode)  
{  
    int iTemp;  
  
    outportb(sioIndex,0x87); /* Enable  
Super I/O */  
    outportb(sioIndex,0x87);
```

```

        outportb(sioIndex, 0x07);                               /* Select
logic device - GPIO */
        outportb(sioData, 0x06);

        outportb(sioIndex, 0x30);                               /* Enable
GPIO */
        outportb(sioData, 0x01);

        iTemp = iMode & 0x00FF;
        outportb(sioIndex, 0xA0);                               /* GPIO
50~57 - Output Enable */
        outportb(sioData, iTemp);

        iTemp = (iMode & 0xFF00) >> 8;
        outportb(sioIndex, 0xF0);                               /* GPIO
00~07 - Output Enable */
        outportb(sioData, iTemp);

        outportb(sioIndex, 0xAA);                               /* Disable
Super I/O */
    }

void SioGPIOData(int iData)
{
    int iTemp;

    outportb(sioIndex, 0x87);                                   /* Enable
Super I/O */
    outportb(sioIndex, 0x87);

    outportb(sioIndex, 0x07);                                   /* Select
logic device - GPIO */
    outportb(sioData, 0x06);

    iTemp = iData & 0x00FF;
    outportb(sioIndex, 0xA1);                                   /* GPIO
50~57 - Output Data */
    outportb(sioData, iTemp);

    iTemp = (iData & 0xFF00) >> 8;
    outportb(sioIndex, 0xF1);                                   /* GPIO
00~07 - Output Data */
    outportb(sioData, iTemp);

    outportb(sioIndex, 0xAA);                                   /* Disable
Super I/O */
}

int SioGPIOStatus()
{
    int iStatus;

```

Appendices

```
        int iTemp;

        outportb(sioIndex,0x87);                               /* Enable
Super I/O */
        outportb(sioIndex,0x87);

        outportb(sioIndex,0x07);                               /* Select
logic device - GPIO */
        outportb(sioData, 0x06);

        outportb(sioIndex,0xA2);                               /* GPIO
50~57 - Status */
        iTemp = inportb(sioData);

        outportb(sioIndex,0xF2);                               /* GPIO
00~07 - Status */
        iStatus = inportb(sioData);

        outportb(sioIndex,0xAA);                               /* Disable
Super I/O */

        iStatus = (iStatus<<8) + iTemp;

        return iStatus;
```

B: Watchdog Timer (WDT) Setting

WDT is widely used for industry application to monitor the activity of CPU. Application software depends on its requirement to trigger WDT with adequate timer setting. Before WDT time out, the functional normal system will reload the WDT. The WDT never time out for a normal system. The WDT will not be reloaded by an abnormal system, then WDT will time out and auto-reset the system to avoid abnormal operation.

This computer supports 255 levels watchdog timer by software programming I/O ports.

Below is an assembly program example to disable and load WDT.

Sample Codes:

```

/*-----
----*/
#include <math.h>
#include <stdio.h>
#include <dos.h>

int sioIndex = 0x4E;          /* or 0x2E */
int sioData = 0x4F;         /* or 0x2F */

int main(void)
{
    int    iCount;
    printf("WDT Times ( 1 ~ 255 ) : \0");
    scanf("%d",&iCount);
    printf("\n");

    SioWDTStart(iCount);

    while(1)
    {
        iCount = SioWDTCount();
        printf("\r Counts : %d ",iCount);
        sleep(1);
    }

    return 0;
}

void SioWDTStart(int iCount)
{
    outportb(sioIndex, 0x87);          /* Enable
  
```

Appendices

```
Super I/O */
    outportb(sioIndex, 0x87);

    outportb(sioIndex, 0x07); /* Select
logic device - WDT */
    outportb(sioData, 0x07);

    outportb(sioIndex, 0x30); /* Enable
WDT */
    outportb(sioData, 0x01);

    outportb(sioIndex, 0xFA); /* Enable
WDRST# Output */
    outportb(sioData, 0x01);

    outportb(sioIndex, 0xF6); /* Set WDT
Timeout value */
    outportb(sioData, iCount);

    outportb(sioIndex, 0xF5); /* Set
Configure and Enable WDT timer, Start countdown */
    outportb(sioData, 0x32);

    outportb(sioIndex, 0xAA); /* Disable
Super I/O */

}

void SioWDTStop(void)
{
    outportb(sioIndex, 0x87); /* Enable
Super I/O */
    outportb(sioIndex, 0x87);

    outportb(sioIndex, 0x07); /* Select
logic device - WDT */
    outportb(sioData, 0x07);

    outportb(sioIndex, 0xF5); /* Disable
WDT timer, stop countdown */
    outportb(sioData, 0x12);

    outportb(sioIndex, 0xAA); /* Disable
Super I/O */
}

void SioWDTClear(int iCount)
{
    outportb(sioIndex, 0x87); /* Enable
Super I/O */
    outportb(sioIndex, 0x87);
```

```
        outportb(sioIndex, 0x07);                /* Select
logic device - WDT */
        outportb(sioData, 0x07);

        outportb(sioIndex, 0xF6);                /* Reset WDT
Timeout Value */
        outportb(sioData, iCount);

        outportb(sioIndex, 0xAA);                /* Disable
Super I/O */
    }

int SioWDTCount(void)
{
    int iData;

        outportb(sioIndex, 0x87);                /* Enable
Super I/O */
        outportb(sioIndex, 0x87);

        outportb(sioIndex, 0x07);                /* Select
logic device - WDT */
        outportb(sioData, 0x07);

        outportb(sioIndex, 0xF6);                /* Get count
of timer */
        iData = inportb(sioData);

        outportb(sioIndex, 0xAA);                /* Disable
Super I/O */

    return iData;
}
```