ARES-5310

Fanless DIN-Rail Embedded System with Intel® Atom™ x7 / Celeron® Processor

User's Manual

Version 1.0

P/N: 4017531000100P

2019.10

Revision History

Version	Date	Description
1.0	2019.10	Initial release

Copyright Notice

The information in this document is subject to change without prior notice in order to improve the reliability, design and function. It does not represent a commitment on the part of the manufacturer.

Under no circumstances will the manufacturer be liable for any direct, indirect, special, incidental, or consequential damages arising from the use or inability to use the product or documentation, even if advised of the possibility of such damages.

Declaration of Conformity

CE

The CE symbol on your product 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.

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.

Technical Support

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

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

https://www.arbor-technology.com

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. About this Manual

This manual covers several SKUs of the ARES-5310. Product features, installation images and BIOS screens may vary from model to model.

The table below lists the ARES-5310 SKUs and the major variants:

	CPU	DI/DO	LAN	COM	Storage
ARES-5310-E3950A	Atom™ x7-E3950	4 x DI, 4 x DO	3 x GbE LAN	4 x COM	1 x 2.5" HDD/SSD tray
ARES-5310-E3950P	Atom™ x7-E3950	16 x DI, 16 x DO	2 x GbE PoE, 1 x GbE LAN	4 x COM	1 x M.2 M-Key
ARES-5310-E3950S	Atom™ x7-E3950	4 x DI, 4 x DO	2 x GbE PoE, 1 x GbE LAN	4 x COM	1 x M.2 M-Key
ARES-5310-N3350A (BTO)	Celeron® N3350	4 x DI, 4 x DO	3 x GbE LAN	4 x COM	1 x 2.5" HDD/SSD tray
ARES-5310-N3350P (BTO)	Celeron® N3350	16 x DI, 16 x DO	2 x GbE PoE, 1 x GbE LAN	4 x COM	1 x M.2 M-Key

1.2. Specifications

System	
CPU	Soldered onboard Intel® Atom™ x7-E3950 / Celeron® N3350 Processor, Max.12W TDP
Memory	1 x 204-pin DDR3L SO-DIMM sockets, supporting 1866MHz SDRAM up to 8GB
Chipset	SoC
Graphics	Intel® HD Graphic 505
LAN Chipset	3 x Intel® i211AT PCIe controller (Co-Layout i210-IT)
Watchdog Timer	1~255 levels reset
I/O	
Serial Port	4 x RS232 (Default)/422/485 (DB-9 male connector) (Switch via BIOS)
USB Port	4 x USB 3.0/2.0 (Type A connector)

LAN	3 x RJ-45 ports for GbE LAN (For -E3950A & -N3350A) 2 x RJ-45 ports for PoE IEEE802.3af + 1 x GbE LAN (For -E3950P/S & -N3350P)
Video Port	1 x HDMI connector (Up to 3840 x 2160@30Hz)
	1 x VGA connector (Up to 1920 x 1080@60Hz)
Digital I/O	4 x DI, 4 x DO (For -E3950A/S & -N3350A) 16 x DI, 16 x DO w/ 2kV isolation (For -E3950P & -N3350P)
Expansion Bus	1 x Mini PCIe slot (PCIe x1+ USB2.0, Full size) 1 x Mini PCIe slot (USB2.0, Full size)
SIM	1 x internal on-board nano SIM slot
Storage	
Type	64GB eMMC on-board
	1 x 2.5" HDD/SSD tray (For -E3950A & -N3350A) 1 x M.2 M-Key, 2242, SATA3.0 (For -E3950P/S & -N3350P)
Environmental	
Operating Temp.	-20 ~ 70 °C (-4 ~ 158°F), ambient w/ air flow
Storage Temp.	-40 ~ 80°C (-40 ~ 176°F)
Operating Humidity	10-95% @ 70°C (non-condensing)
Vibration	5~500Hz 3 Grms X,Y,Z axis w/ eMMC, according to IEC 68-2-64
Shock & Crash	10G peak acceleration (11 m sec. duration), operation
	30G peak acceleration (11 m sec. duration), nonoperation
	According to IEC 68-2-27
Qualification	
Certification	CE, FCC Class A
Power Requirement	
Power Input	DC 9~36V (4 pin DCin terminal block: V+, V-, SW-, SW+)
Ignition Switch	2-pin terminal block: IGN & GND

Power Consumption	Typ. 55W
Mechanical	
Construction	Metal + Aluminum Alloy
Mounting	DIN-rail / Wall Mount
Weight	1.7Kg
Dimensions (W x D x H)	180 x 125 x 70 mm (7.07" x 4.9" x 2.75")
OS Support	
Windows 10 IoT, Linux: Ubuntu (Kernel: 3.1X)	

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 ARES-5310 (Product outlook varies according to your model)

1 x **Accessory Box** that contains the following items:

- User's manual
- Screws/cable
- 4-pin plug for terminal block

1.4. Ordering Information

ARES-5310-E3950A	ARES-5310 w/ E3950, 1 x HDMI, 1 x VGA, 4 x COM, 4 x DI/DO, 3 x GbE LAN, 4 x USB3.0, 1 x 64GB eMMC, and 1 x 2.5" HDD/SSD tray
ARES-5310-E3950P	ARES-5310 w/ E3950, 1 x HDMI, 1 x VGA, 4 x COM, 16 x DI/DO, 2 x PoE, 1 x GbE LAN, 4 x USB3.0, 1 x 64GB eMMC, and 1 x M.2 M Key storage
ARES-5310-E3950S	ARES-5310 w/ E3950, 1 x HDMI, 1 x VGA, 4 x COM, 4 x DI/DO, 2 x PoE, 1 x GbE LAN, 4 x USB3.0, 1 x 64GB eMMC, and 1 x M.2 M Key storage
ARES-5310-N3350A (BTO)	ARES-5310 w/ N3350, 1 x HDMI, 1 x VGA, 4 x COM, 4 x DI/DO, 3 x GbE LAN, 4 x USB3.0, 1 x 64GB eMMC, and 1 x 2.5" HDD/SSD tray
ARES-5310-N3350P (BTO)	ARES-5310 w/ N3350, 1 x HDMI, 1 x VGA, 4 x COM, 16 x DI/DO, 2 x PoE, 1 x GbE LAN, 4 x USB3.0, 1 x 64GB eMMC, and 1 x M.2 M Key storage

1.5. Accessories

1.5.1. Standard Accessories

DRK-002 DIN Rail mounting kit for ARES-5300	AI6063 DIN Rail 84 x 60 x 9mm	
M.2 to SATA adapter (for -E3950A and -N3350A only)		

1.5.2. Configure-to-Order Service

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

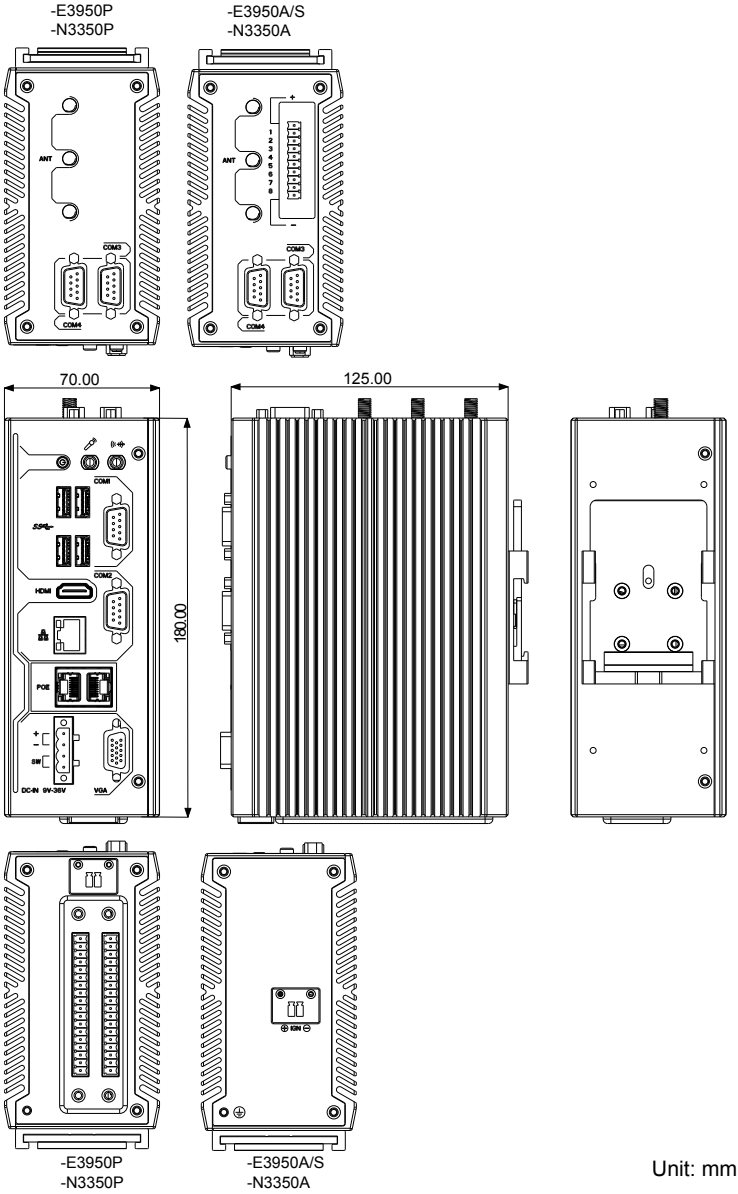
PAC-120W6B-FSP	19V/6.3A, 120W AC/DC adapter kit (For -E3950P/S & -N3350P)	
PAC-P060W-02	12V/5A, 60W AC/DC adapter kit (For -E3950A & -N3350A)	

WIFI-AT4550	Atheros QCNFA324 Wi-Fi module w/ 2*30cm internal wiring	
ANT-D11	1 x Wi-Fi Dual-band 2.4G/5G antenna	
LTE-1450	LTE Quectel EC25-E Cat 4 Mini-PCIe Wireless Kit (excluded for North of America/Euro)	
ANT-H11	2dBi HSUPA ANTENNA KIT	
MK-3C-2G/4G/8G DIMM Memory	2G/4G/8G DDR3L Memory with heat sink kit	
64GB M.2 SSD	M.2 M Key, 2242, 64GB, SATA3.0	
2.5” Storage Kit	2.5” SSD/HDD Bracket, cables, and M.2 to SATA III module card	
2.5” 32/64/128/256 GB SSD	2.5”, 32/64/128/256GB, MLC, SATA3, 7+15P	
WMK-1973	Wall-mount kit for ARES-1973	

Chapter 2

Getting Started

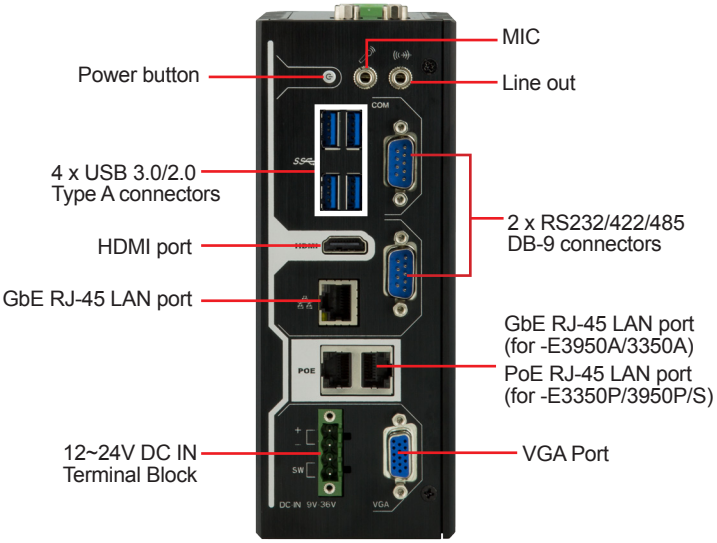
2.1. Dimensions



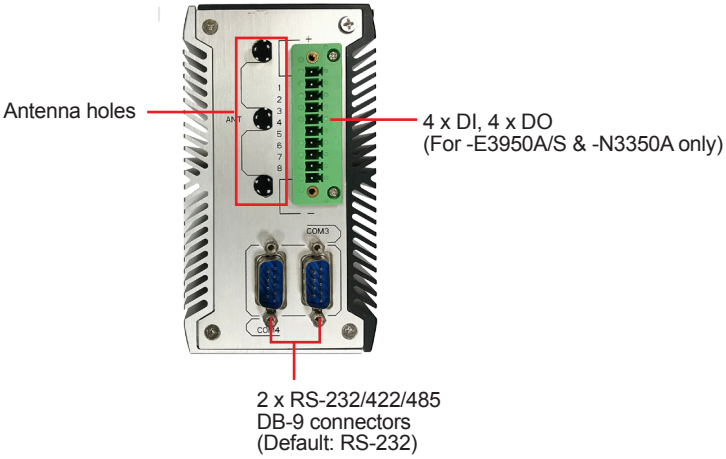
Unit: mm

2.2. Overiew

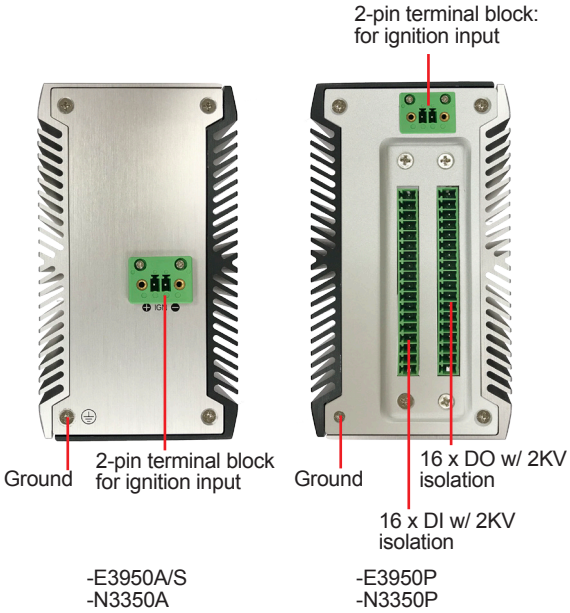
2.2.1. Front View



2.2.2. Top View



2.2.3. Bottom View



2.3. LED Status

LED	Color	Description
Power button	Green	Solid: The system is in operation(S0 status)
	Red	Solid: The system is in sleep/hibernation state (S3/S4) or power off mode (S5)

2.4. Driver Installation Note

For operating system of Windows 10, please go to our website at **www.arbor-technology.com** and download the driver pack from the product page. Then unzip the downloaded file and follow the sequence below to install the drivers to prevent errors:

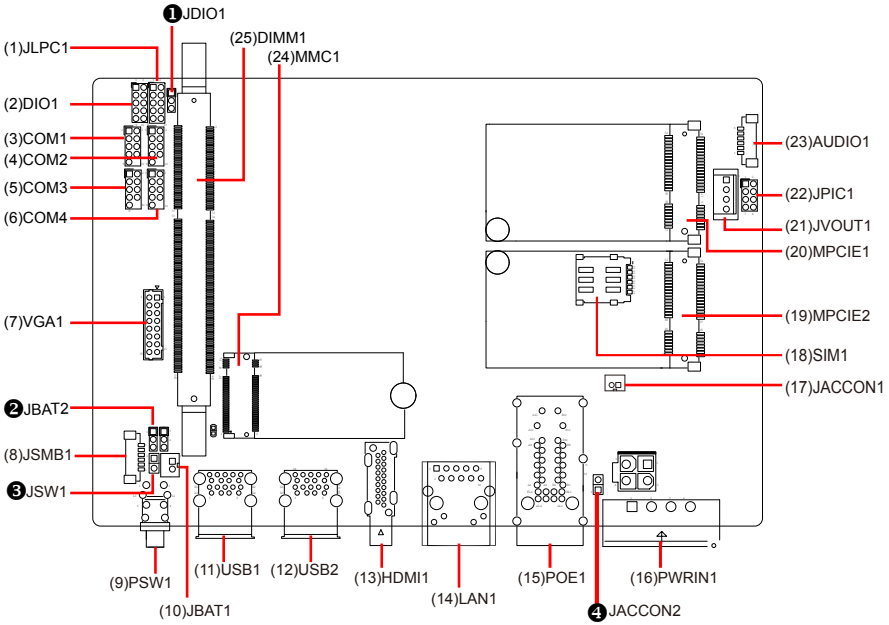
Chipset → Graphics → LAN → TXE → Audio

Chapter 3

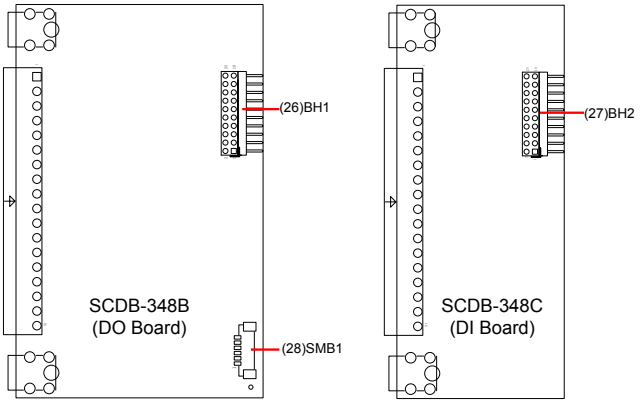
Engine of the Computer

3.1. Board Overview

Main Board



Daughter Board (for -E3950P/N3350P only)



Jumpers

Label	Description
❶JDIO1	DIO Voltage Jumper
❷JBAT2	CMOS Jumper Setting
❸JSW1	Power Button Jumper
❹JACCON2	Vehicle Acc Mode Selection Jumper

Connectors

Label	Description
(1)JLPC1	External 80 Port Pin Header
(2)DIO1	Digital I/O Connector (for -E3950A/E3950S/N3350A)
(3)~(6)COM1~4	RS-232/422/485 Selectable Serial Port
(7)VGA1	VGA Connector
(8)JSMB1	SMbus Wafer Connector for DIO
(9)PSW1	Power Button
(10)JBAT1	RTC Battery Connector
(11)(12)USB1, 2	USB 3.0/2.0 Stacked Connectors
(13)HDMI1	HDMI Connector
(14)LAN1	RJ-45 Ethernet Connector
(15)POE1	RJ-45 ports for GbE PoE
(16)PWRIN1	Power Input Terminal Block
(17)JACCON1	Ignition Power Connector
(18)SIM1	SIM Card Socket
(19)MPCIE2	Mini PCIe card connector with USB and Nano SIM slot
(20)MPCIE1	Mini PCIe card connector with USB and PCIe x1
(21)JVOUT1	Power Out Connector for Expansion
(22)JPIC1	PIC Programming Pin Header
(23)AUDIO1	Audio Connector
(24)MMC1	M.2 M-Key Connector
(25)DIMM1	DDR3L SO-DIMM Socket
(26)BH1	DI board connector
(27)BH2	DO board connector
(28)SMB1	SMbus Connector for DIO

3.2.1. Jumpers

❶ JDIO1

Function: DIO Voltage Setting
Jumper Type: 2.00 mm pitch 1x3-pin header
Setting:

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

❷JBAT2

Function: CMOS Jumper Setting
Jumper Type: 2.00 mm pitch 1x3-pin header
Setting:

Pin	Description	
1-2	Keeps CMOS (default)	
2-3	Clears CMOS	

❸JSW1

Function: Power Button Jumper
Jumper Type: 2.54 mm pitch 1x2-pin header
Setting:

Pin	Description	
Short	Power button on	
Open	Power button off (default)	

❸JACCON2

Function: Vehicle Acc Mode Selection
Jumper Type: Onboard 2.00mm-pitch 2-pin header
Setting:

Pin	Description	
Short	For automation mode (default)	
Open	For vehicle mode	

3.2.2. Connectors

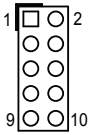
(1) JLPC1

Function: External 80 Port Pin Header

Connector Type: 2.00 mm pitch 2x5 pin box header

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	CLK	2	GND
3	FRAME#	4	LAD0
5	PLTRST#	6	NC
7	LAD3	8	LAD2
9	VCC3	10	LAD1



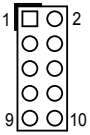
(2) DIO1

Function: Digital I/O Connector (for -E3950A/, -N3350A)

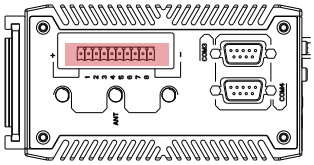
Connector Type: 2.00 mm pitch 2x5 pin box header

Pin Assignment:

Pin	Desc.	Pin	Desc.
1	DIO0	2	DIO1
3	DIO2	4	DIO3
5	+5V/12V	6	DIO4
7	DIO5	8	DIO6
9	DIO7	10	GND



External connector



-E3950A/S, -N3350A

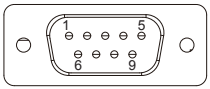
(3)~(6) COM1~4

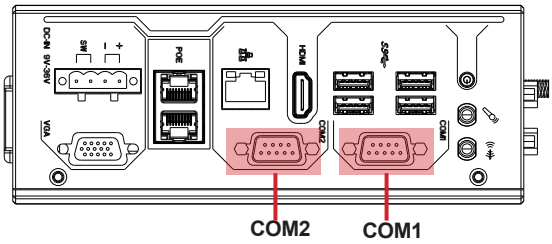
Function: RS-232/422/485 Selectable Serial Port

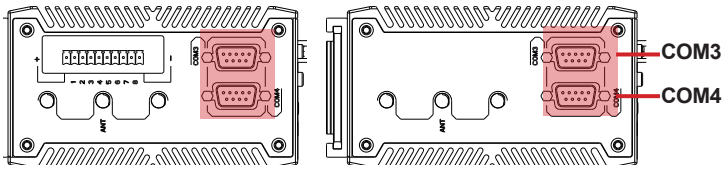
Connector Type: External 9-pin D-sub male connector

Pin Assignment:

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







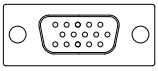
-E3950A/S, -N3350A

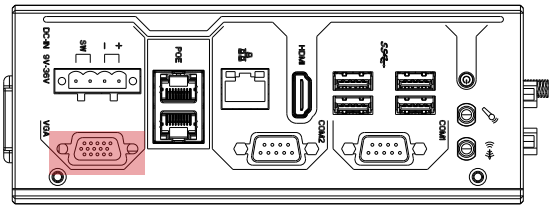
-E3950P, -N3350P

(7) VGA1

Function: VGA Connector
Connector Type: D-Sub 16-pin female connector
Pin Assignment:

Pin	Description	Pin	Description
1	CRT_R	2	CRT_G
3	CRT_B	4	N.C
5	GND	6	GND
7	GND	8	GND
9	VCC5	10	GND
11	N.C	12	CRT_SDA
13	CRT_HSYNC	14	CRT_VSYNC
15	CRT_SCL	16	N.C

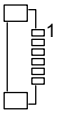




(8) JSMB1

Function: SMbus Wafer connector for DIO
Connector Type: 1.25mm pitch 1x6 wafer connector
Pin Assignment:

Pin	Desc.
1	+V3.3S
2	GND
3	CLK
4	GND
5	DATA
6	+V12S



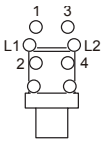
(9) PSW1

Function Power Button

Connector Type: LED tact switch with green and red colors

Pin Assignment:

Pin	Description	Pin	Description
1	GND	3	BTN
L1	SW1_LED_N	L2	SW1_LED_P
2	N/A	4	N/A



(10) JBAT1

Function: RTC battery connector

Connector Type: Onboard 2x1-pin box connector

Pin Assignment:

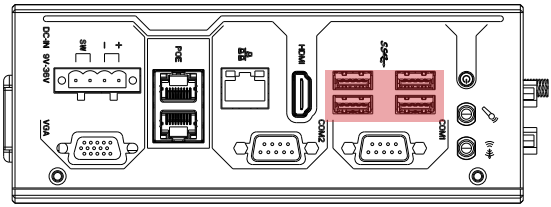
Pin	Desc.
1	BAT+
2	BAT-

(11)(12) USB1, 2

Function: USB 3.0/2.0 Stacked Connectors

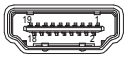
Connector Type: Double-stacked USB 3.0/2.0 type A connectors

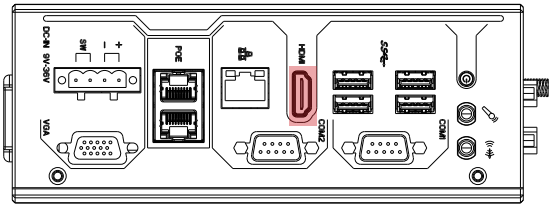
Pin Assignment: The pin assignments conform to the industry standard.



(13) HDMI1

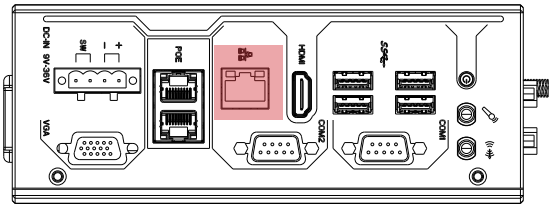
Function: HDMI connector
Connector Type: 19-pin HDMI connector
Pin Assignment: The pin assignments conform to the industry standard.





(14) LAN1

Function: RJ-45 Ethernet connectors
Connector Type: RJ-45 connector that supports 10/100/1000Mbps fast Ethernet
Pin Assignment: The pin assignments conform to the industry standard.



(15) POE1

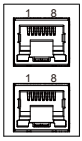
Function: For -E3950P/S, -N3350P: RJ-45 Stacked Ports for GbE PoE

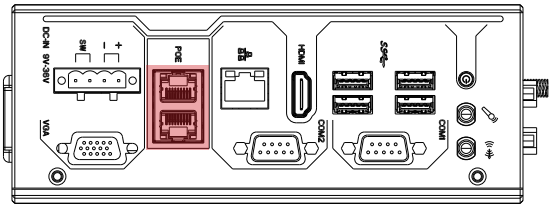
For -E3950A, N3350A: RJ-45 Stacked Ports for GbE

Connector Type: For -E3950P/S, -N3350P: RJ-45 connector that supports 10/100/1000Mbps fast Ethernet and PoE

For -E3950A, N3350A: RJ-45 connector that supports 10/100/1000Mbps fast Ethernet

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





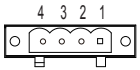
(16) PWRIN1

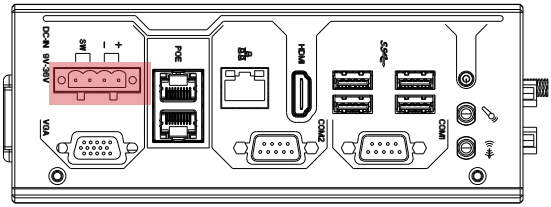
Function: Power input terminal block

Connector Type: Onboard 5.00 mm pitch 1x4-pin terminal block

Pin Assignment:

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



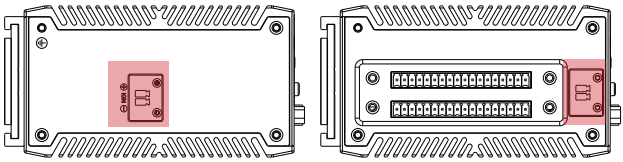


(17) JACCON1

Function: Ignition Power Connector
Connector Type: Onboard 2x1-pin box connector
Pin Assignment:

Pin	Desc.
1	ACC_ON+
2	GND

External connector



-E3950A/S, -N3350A -E3950P, -N3350P

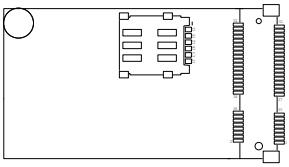
(18) SIM1

Function: SIM Card Socket
Connector Type: 6-pin SIM card socket
Pin Assignment:

Pin	Desc.	Pin	Desc
C5	GND	C1	POWER VOLTAGE
C6	NC	C2	RESET SIGNAL
C7	I/O	C3	CLOCK SIGNAL

(19) MPCIE2

Function: 52P Mini PCIe card connector with USB and Nano SIM slot
Connector Type: Onboard 0.8mm pitch 52-pin edge card connector
Pin Assignment: The pin assignments conform to the industry standard.



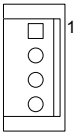
(20) MPCIE1

Function: 52P Mini PCIe card connector with USB and PCIe x1
Connector Type: Onboard 0.8mm pitch 52-pin edge card connector
Pin Assignment: The pin assignments conform to the industry standard.

(21) JVOUT1

Function: Power out connector for expansion
Connector Type: Onboard 2.50 mm pitch 1x4-pin header
Pin Assignment:

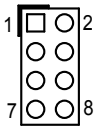
Pin	Desc.
1	+V12S
2	GND
3	GND
4	+V5S



(22) JPIC1

Function: PIC programming pin header
Connector Type: Onboard 2.00mm-pitch 2x4-pin header
Pin Assignment:

Pin	Description	Pin	Description
1	VCC5	2	PIC_RX
3	PIC_TX	4	ICSP-CLK
5	ICSP-DAT	6	GND
7	VCC5	8	MCU_RST



(23) AUDIO1

Function: Audio Connector

Connector Type: 1.25 mm pitch 1x6 wire to board connector

Pin Assignment:

Pin	Desc.
1	MIC_L
2	MIC_R
3	GND
4	GND
5	Line Out_L
6	Line Out_R

(24) MMC1

Function: M.2 M-Key Connector

Connector Type: M.2 75-pin M-Key (socket 3) connector for SATA-III SSD storage, supporting 22x42 module

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

(25) DIMM1

1 x 204-pin DDR3L SO-DIMM sockets, supporting 1866MHz SDRAM up to 8GB

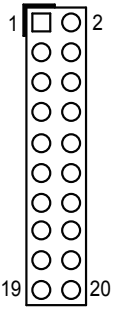
(26)(27) BH1, BU2

Function: DI/DO board connector

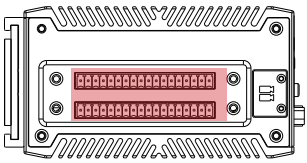
Connector Type: BH1:
2.00 mm-pitch 2x10-pin header for connection to DI Board (SCDB-348C)
BH2:
2.00 mm-pitch 2x10-pin header for connection to DO Board (SCDB-348B)

Pin Assignment:

Pin	Description	Pin	Description
1	DI_VDD	2	+V5S
3	GND	4	GND
5	GPIO17	6	GPIO16
7	GPIO15	8	GPIO14
9	GPIO13	10	GPIO12
11	GPIO11	12	GPIO10
13	GPIO27	14	GPIO26
15	GPIO25	16	GPIO24
17	GPIO23	18	GPIO22
19	GPIO21	20	GPIO20



External connector



-E3950P, -N3350P

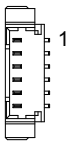
(28) SMB1

Function: SMbus Wafer connector for DIO

Connector Type: 1.25mm pitch 1x6 wafer connector

Pin Assignment:

Pin	Desc.
1	+V3.3S
2	GND
3	CLK
4	GND
5	DATA
6	+V12S



Chapter 4

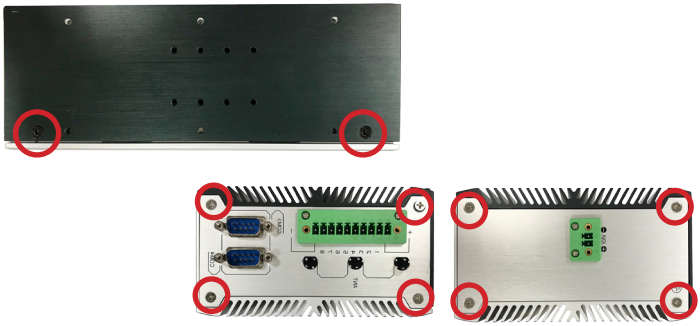
Installation & Maintenance

4.1. Disassembling and Assembling the Computer

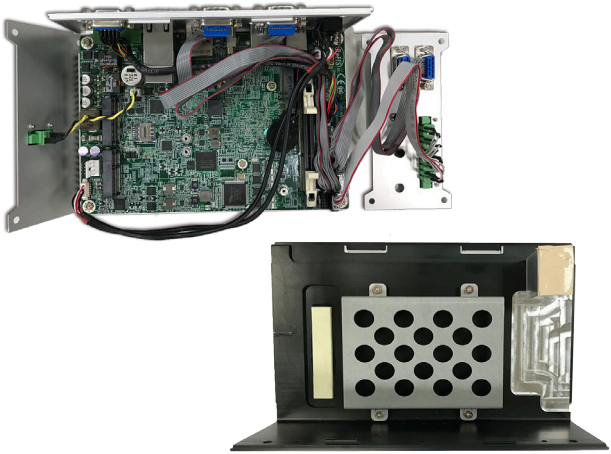
4.1.1. Disassembling the Computer

To use onboard jumpers/connectors or to install/remove internal components, you will need to open the computer to access the inside of the computer. Follow through the guide below to disassembly the computer. (Product photo varies according to the SKUs. But the disassembling procedures for various SKUs are basically the same.)

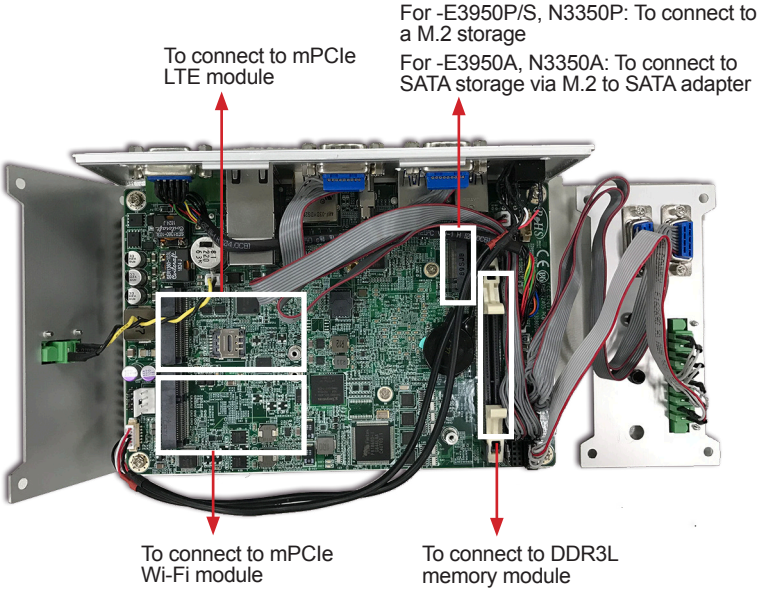
1. Remove the screws on the rear, bottom and top sides as shown below .



2. Then lift the L shape chassis away from the assembly.



3. Then you are ready to access the components on the main board and make required configurations and connections.



4.1.2. Assembling the Computer

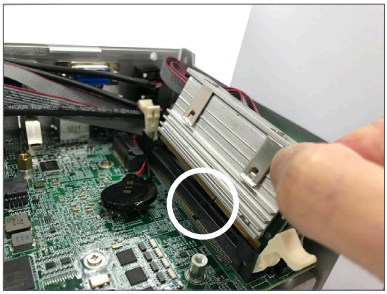
After you make required hardware installation and jumpers settings, assemble the computer by performing the proceeding steps in reverse order.

4.2. Installing the Hardware

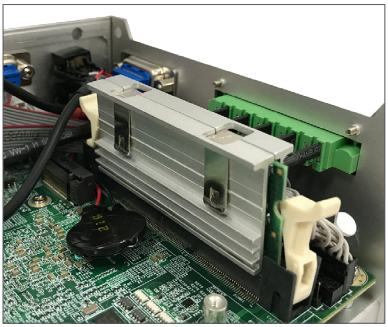
4.2.1. Installing a Memory Module

The computer has one 204-pin DDR3L SO-DIMM socket that support up to 8 GB maximum system memory. To install a memory module:

1. Open the latches fully at both ends of the memory module socket. Align the notch on the memory module with the key in the module socket.

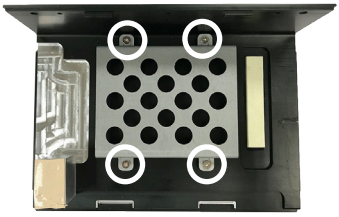


2. Press it fully into the socket until the latches lock in place.

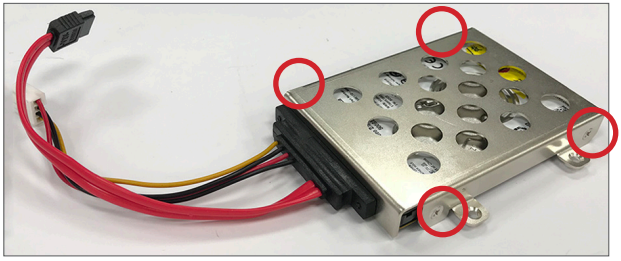


4.2.3. Installing a SSD/HDD (for -E3950A, -N3350A)

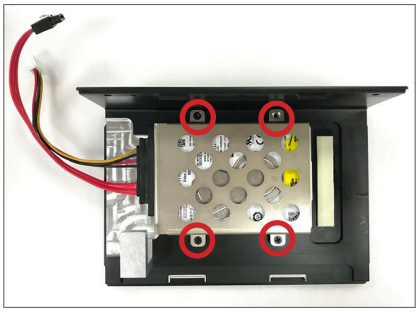
1. Remove the hard drive bay from the L-shape chassis by loosening the 4 screws.



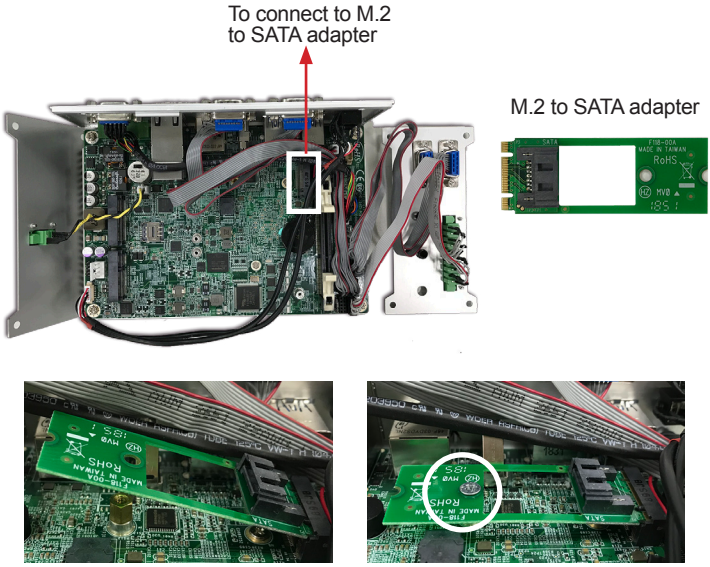
2. Slide the 2.5” HDD or SSD storage device into the drive bay and ensure it connects to the SATA connector. Using the 4 screws coming with the storage device kit, fix the storage device in place to the bracket.



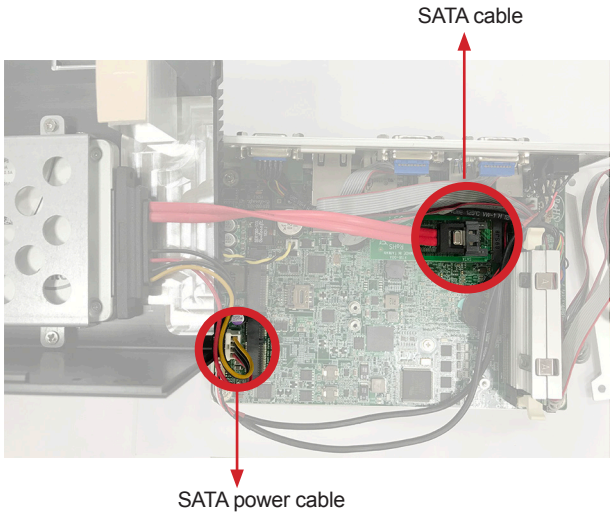
3. Secure the drive bay back to the L-shape chassis by fastening the 4 screws you removed in Step 1.



4. Locate the M.2 on-board connector. Connect the provided M.2 to SATA adapter to the M.2 connector and use the provided screw to secure it in place.



5. Connect the SATA cable to the SATA connector on the adapter. Then connect the SATA power cable to the SATA power connector on the main board.

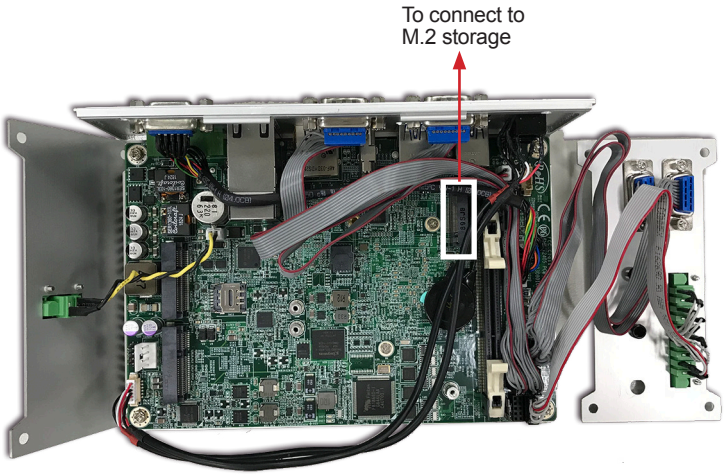


6. Reassemble the computer by performing the steps in 4.1.2. Assembling the Computer on page 27 in reverse order.

4.2.4. Installing an M.2 Module

The computer has a M.2 M-Key socket for SATA-III SSD storage in 22 x 42 form factor. To install a M.2 storage:

1. Locate the M.2 on-board connector.



2. Insert the M.2 module into the socket by aligning the notch on the module with the small slot on the M.2 socket.

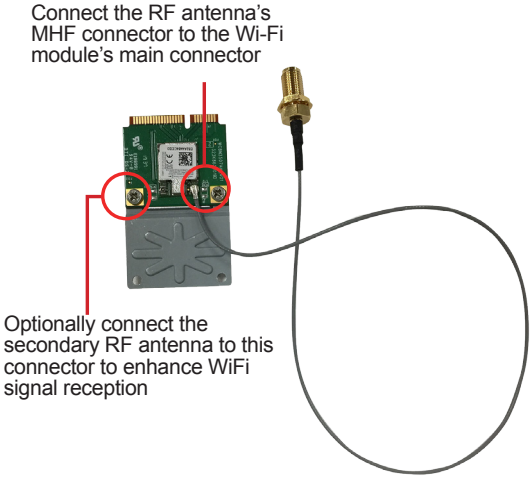
3. Insert and fasten the screw into the standoff.

4.2.4. Installing Wi-Fi Module

The computer has a mPCIe socket for Wi-Fi module installation. To install a Wi-Fi module:

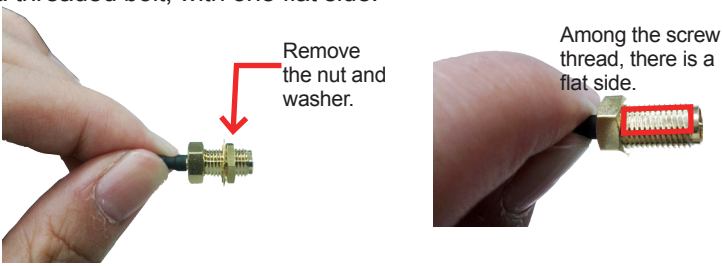
1. In order to make the half-size Wi-Fi module compatible with the Mini-card socket, extend the Wi-Fi module with a “mini half bracket”. Join them together by using two screws.

2. Connect the RF antenna’s MHF connector to the Wi-Fi module.

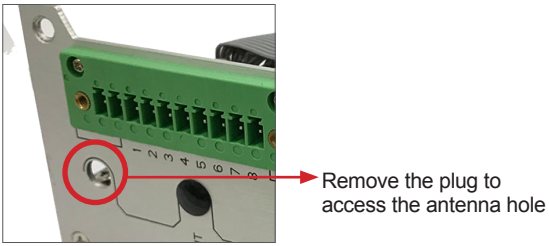


3. Plug the Wi-Fi module into the Mini-card socket by a slanted angle. Fully plug the module, and note the notch on the Wi-Fi module should meet the break on the connector.
   Press down the module and fix the module in place by fastening the screw.

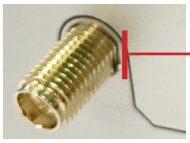
4. From the SMA end of the RF antenna, remove the washer and the nut. Save the washer and nut for later use. Note that the SMA connector is in the form of a threaded bolt, with one flat side.



5. Remove the plastic plug from the antenna hole. Keep the plastic plug for any possible restoration in the future.

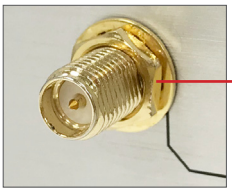


6. Pass the SMA connector through the above mentioned antenna hole. Make sure that you align the connector's flat side with the antenna hole's flat side.



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

7. 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.

8. If you are using two antennas, repeat the steps above for another antenna.
9. Have an external antenna. Screw and tightly fasten the antenna to the SMA connector. Swivel the antenna to an angle of best signals.

4.3. Ground the Computer

Follow the instructions below to ground the computer to land. Be sure to follow every grounding requirement in your place.

> **Warning** Whenever the unit is installed, the ground connection must always be made first of all and disconnected lastly.

1. See the illustration below. Remove the ground screw from the rear panel.

2. Attach a ground wire to the rear panel with the screw.

-E3950A/S
-N3350A

-E3950P
-N3350P

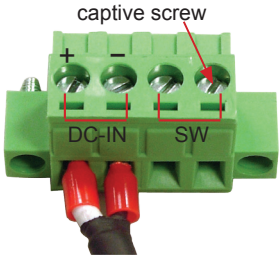
4.4. Wire DC-in Power Source

4.4.1 Automation Mode

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

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

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.



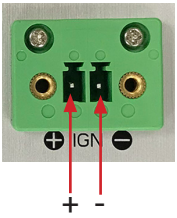
terminal block

4.4.2 Vehicle Application Mode

Follow the instructions below for connecting the computer to a vehicle power source.

1. Make sure JACCON2 jumper is open for vehicle power mode. (Refer to 3.2.1. Jumpers on page 14.)

2. For vehicle application, DC power Input wiring pin configuration is as below. Please connect the Acc pin with your car Acc, and the device will be activated when you turn your ignition key to Acc.



4.3. Mounting

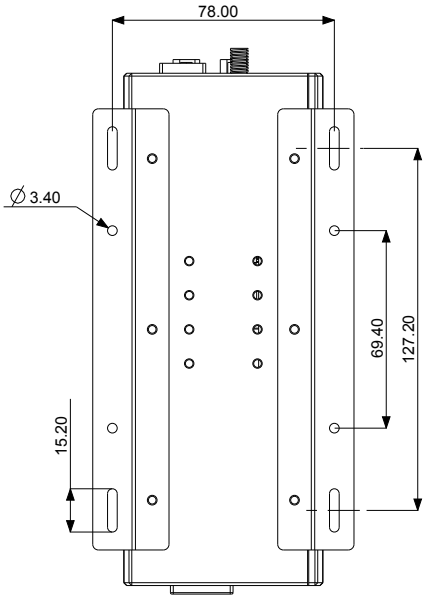
4.3.1 Wall Mount

To wall mount the computer using the optional wall-mount kit:

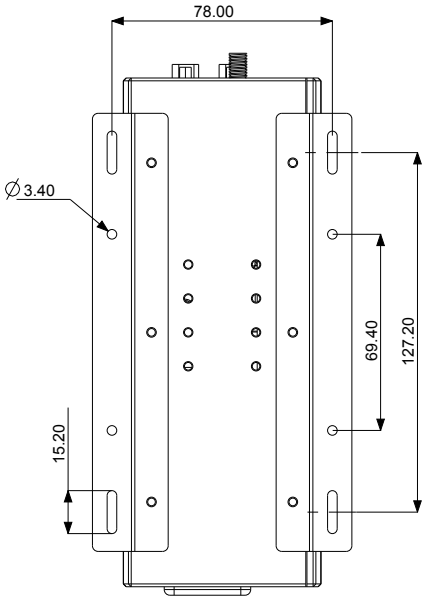
1. Select a proper mounting location with adequate wall strength to support the mounted unit.
2. Locate the 6 screw holes on the computer's rear side. Use the screws included in the wall-mount kit to assemble the brackets to the computer's rear side.

   Suggested mounting screws. M3x3mm screws (qty: 6).

3. Use the other screw holes and cutouts on both wall-mount brackets to mount the computer to a wall.



-E3950A/N3350A/E3950S

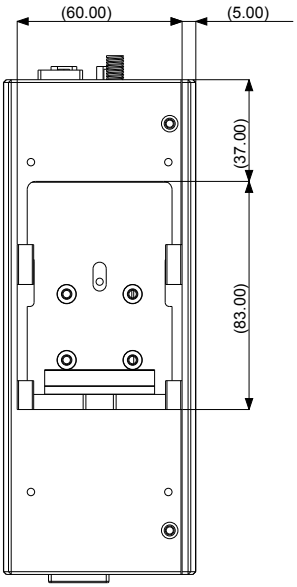


-E3950P/N3350P

4.3.1 DIN-Rail Mounting

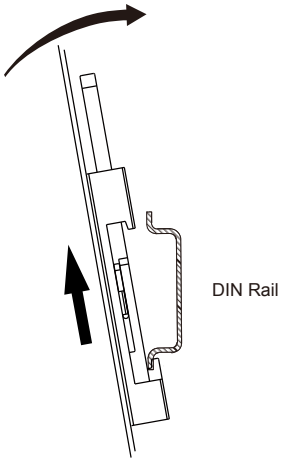
To mount the computer using the provided DIN-rail mounting kit:

1. Select a proper mounting location with adequate wall strength to support the mounted unit.
2. Screw the DIN-rail mounting clip to the rear side of the computer.



After you screw the DIN-rail mounting clip to the computer:

1. Snap the DIN Rail clip to the upper edge of the DIN Rail.
2. Lift the computer firmly upward and then forward towards the DIN Rail until the DIN Rail clip tab engages and snaps to the upper edge of the DIN Rail.

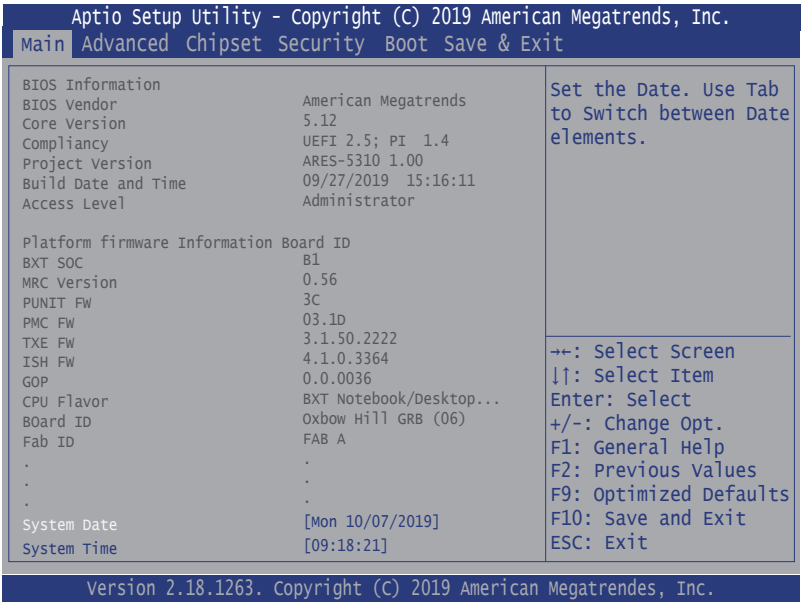


Chapter 5

BIOS

The BIOS Setup utility 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.



Note: Actual model name and board information varies according to your model.

Menu	Description
Main	See 5.1. Main on page 44
Advanced	See 5.2. Advanced on page 45
Chipset	See 5.3. Chipset on page 56
Security	See 5.4. Security on page 63
Boot	See 5.5. Boot on page 64
Save & Exit	See 5.6. Save & Exit on page 65

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.

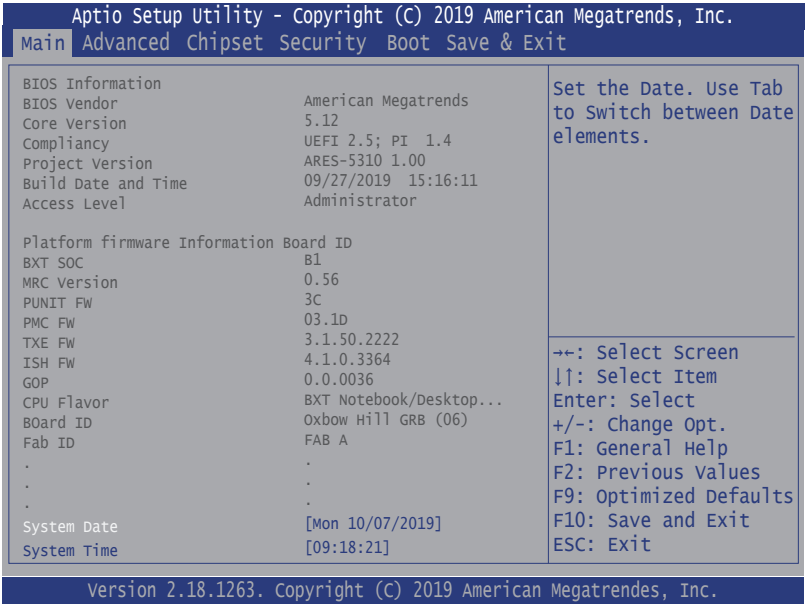
Keystroke	Function
← →	Moves left/right between the top menus.
↓ ↑	Moves up/down between highlight items.
Enter	Selects an highlighted item/field.
Esc	► On the top menus: Use **Esc** to quit the utility without saving changes to CMOS. (The screen will prompt a message asking you to select **OK** or **Cancel** 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	Restore previous values.
F9	Loads optimized default values.
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.

5.1. Main

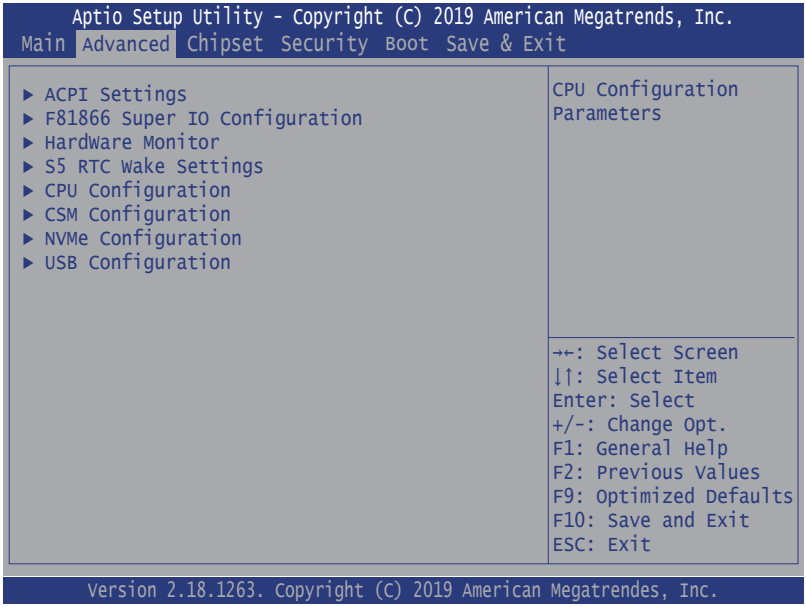
The **Main** menu features the settings of **System Date** and **System Time** and displays some BIOS info.



Note: Actual model name and board information varies according to your model.

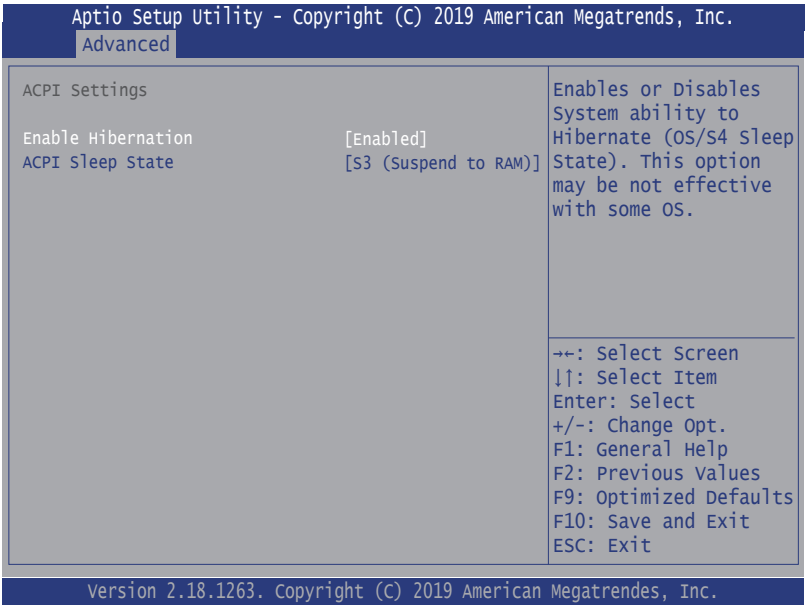
Setting	Description
Project Name	Delivers the model name of the computer.
BIOS Version	Delivers the computer's BIOS version.
Build Date and Time	Delivers the date and time when the BIOS Setup utility was made/ updated.
Access Level	Delivers the level that the BIOS is being accessed at the moment.
System Date	Sets system date.
System Time	Sets system time.

5.2. Advanced



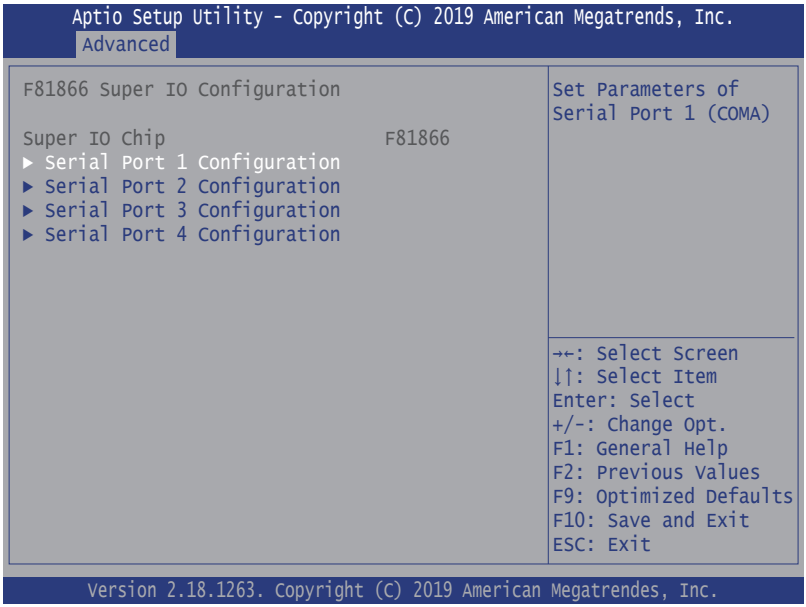
Setting	Description
ACPI Settings	See 5.2.1. ACPI Settings on page 46
F81866 Super IO Configuration	See 5.2.2. F81866 Super IO Configuration on page 47.
Hardware Monitor	See 5.2.3. Hardware Monitor on page 48
S5 RTC Wake Settings	See 5.2.4. S5 RTC Wake Settings on page 49
CPU Configuration	See 5.2.5. CPU Configuration on page 50
CSM Configuration	See 5.2.6. CSM Configuration on page 52
NVMe Configuration	See 5.2.7. NVME Configuration on page 53.
USB Configuration	See 5.2.8. USB Configuration on page 54

5.2.1. ACPI Settings



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

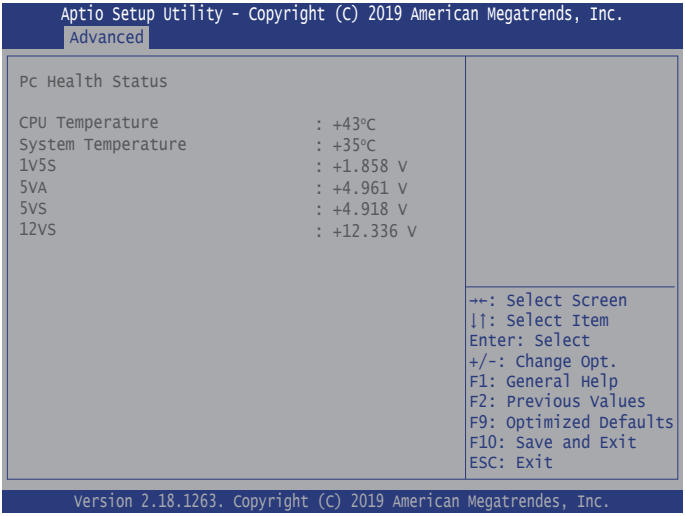
5.2.2. F81866 Super IO Configuration



Note: The quantity of serial ports varies according to your model.

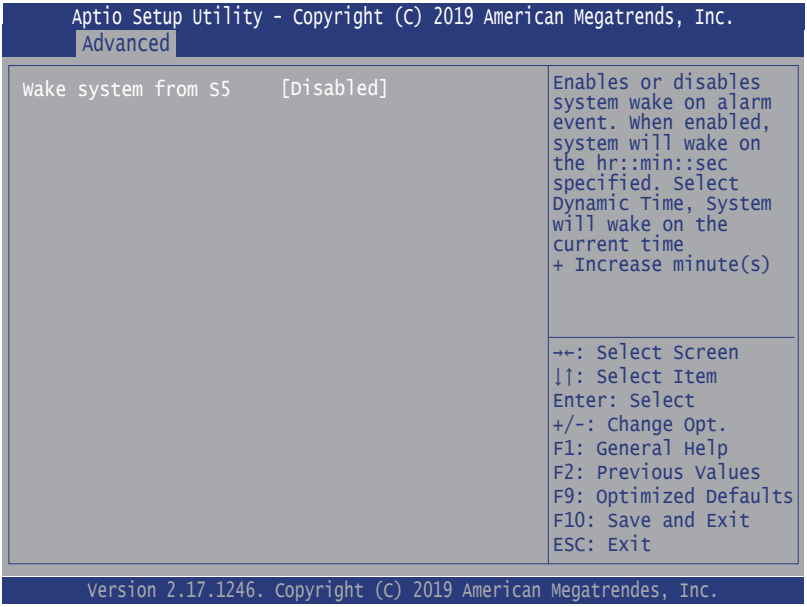
Setting	Description
Serial Port 1/2/3/4 Configuration	To configure each COM port settings. Note: The quantity of serial ports varies according to your model.
Serial Port	**Enable** (default) or **Disable** the Serial Port (COM).
Change Settings	Select5 an optimal settings for the serial port. Serial Port 1 default: IO=3F8h, IRQ=4 Serial Port 2 default: IO=2F8h, IRQ=3 Serial Port 3 default: IO=3E8h, IRQ=11 Serial Port 4 default: IO=2E8h, IRQ=10
Mode Select	Select **RS-232** (default), **RS-485, RS-485** or **RS-485 Termination Registor**.

5.2.3. Hardware Monitor



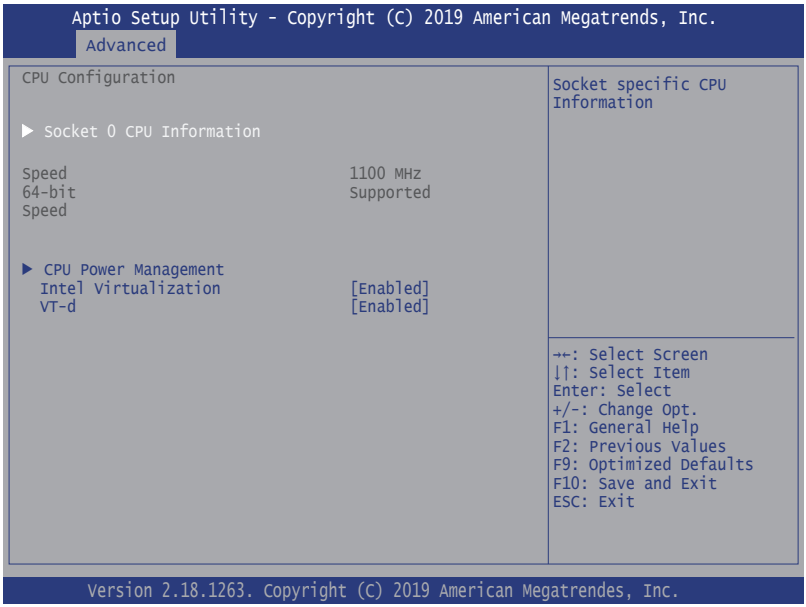
The page shows the PC health status.

5.2.4. S5 RTC Wake Settings



Setting	Description
Wake System from S5	**Enable** or **Disable** (default) system wake on alarm event. ► Options available are: **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).

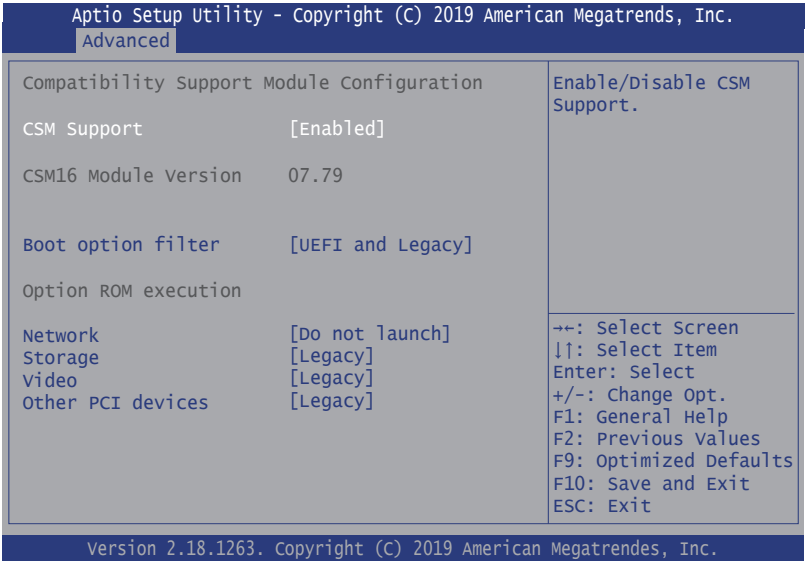
5.2.5. CPU Configuration



Setting	Description	
Socket 0 CPU Information	Shows Socket 0 CPU information.	
CPU Power Managment Configuration	**EIST**	**Enable** (default)/**Disable** Intel SpeedStep
	Turbo Mode	Only available when EIST (Intel Speed Step) is **Enabled**. **Enable** (default)/**Disable** Turbo Mode
	Boot performance Mode	Set the performance state that the BIOS will set before the OS handoff. Options: **Max Battery, Max Non-Turbo Performance** (default) and **Turbo Performance**.
	CPU C States	**Enable** /**Disable** (default) CPU C States
	Power Limit 1 Enable	**Enable** (default)/**Disable** Power Limit 1

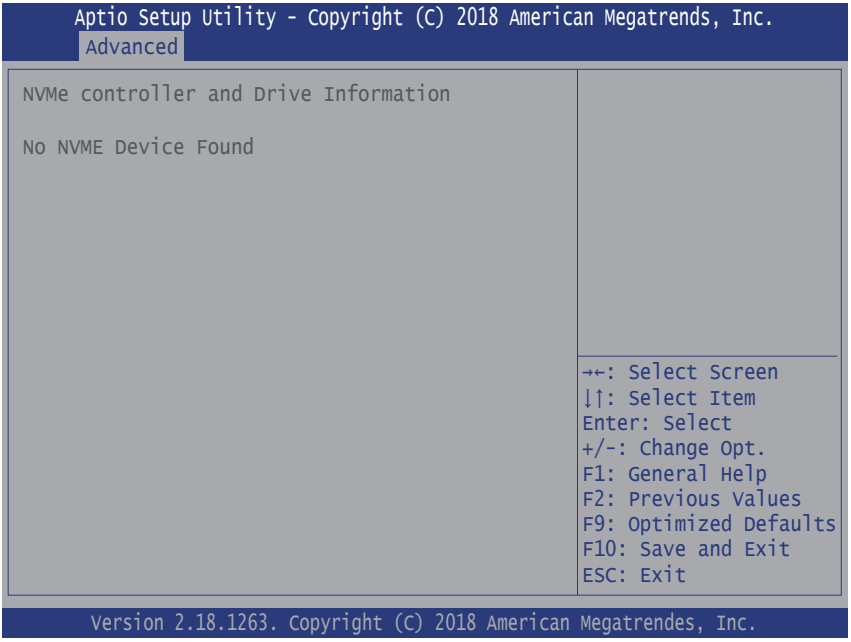
Intel Virtualization Technology	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology ► Options: **Enabled** (default) or **Disabled**
VT-d	**Enable** (default) or **Disable** VT-d function

5.2.6. CSM Configuration



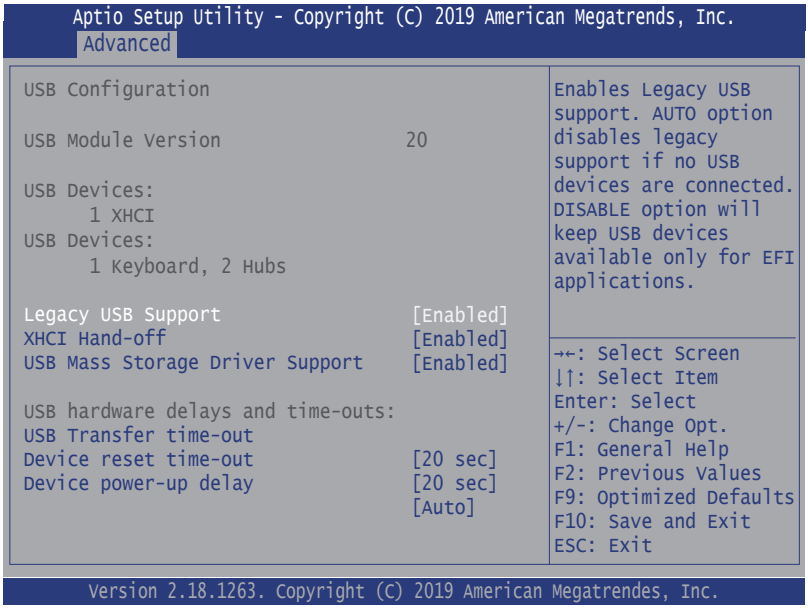
Setting	Description
CSM Support	**Enable** (default) or **Disable** CSM Support.
Boot option filter	Control the Legacy/UEFI ROMs priority. ► Options: **UEFI and Legacy** (default), **Legacy only** and **UEFI only**.
Network	Control the execution of UEFI and Legacy PXE OpROM ► Options: **Do not launch** (default) , **UEFI** and **Legacy**.
Storage	Control the execution of UEFI and Legacy Storage OpROM ► Options: Do not launch and Legacy (default)
Video	Control the execution of UEFI and Legacy Video OpROM ► Options: Do not launch, UEFI and Legacy (default).
Other PCI devies	Control the Legacy/UEFI ROMs priority. ► Options: Do not launch and Legacy (default).

5.2.7. NVME Configuration



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

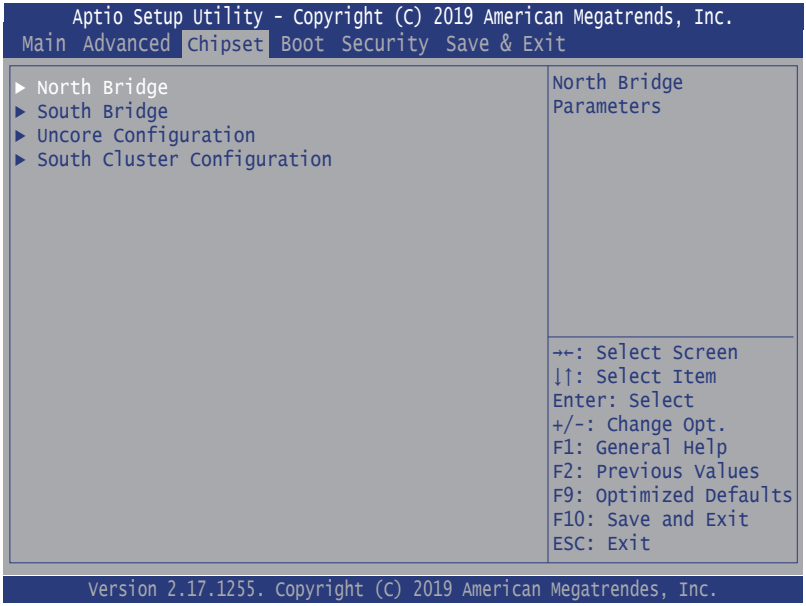
5.2.8. USB Configuration



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 Mass Storage Driver Support	Enables/disables USB Mass Storage Driver Support. ► The optional settings are: **Enabled** (default) **/ Disabled**.
USB hardware delay and time-out	
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)

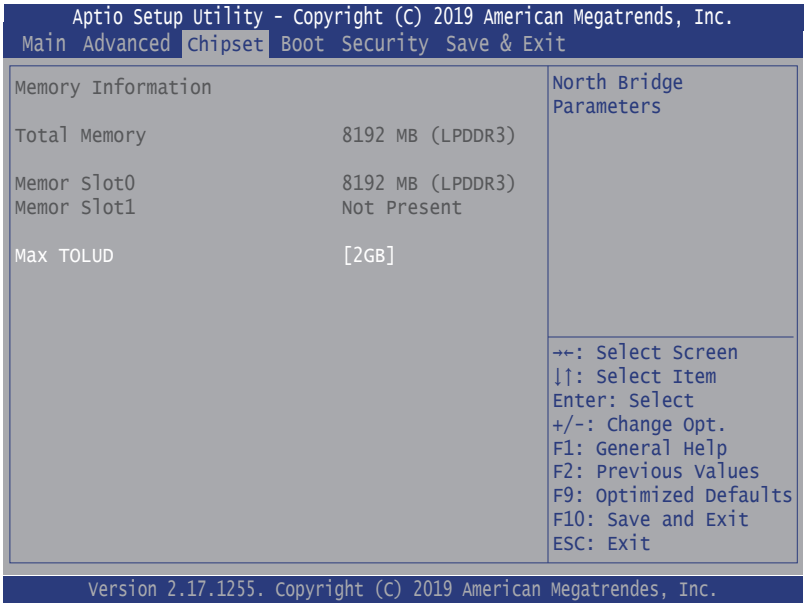
Device reset time-out	Use this item to set USB mass storage device start unit command time-out. ► Options available are: **10 sec, 20 sec** (default)., **30 sec, 40 sec**
Device power-up delay	Use this item to set maximum time the device will take before it properly reports itself to the host controller. '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.

5.3. Chipset



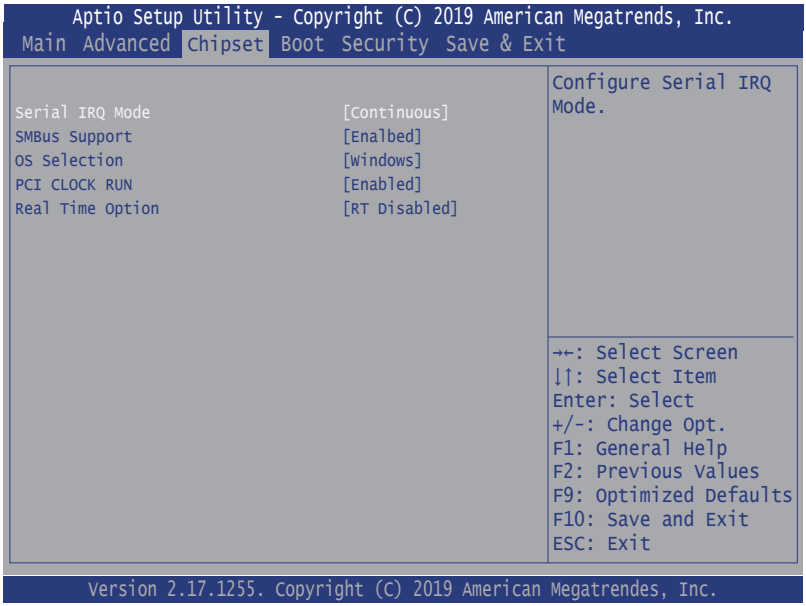
Submenu	Description
North Bridge	See 5.3.1. North Bridge on page 57
South Bridge	See 5.3.2. South Bridge on page 58
Uncore Configuration	See 5.3.3. Uncore Configuration on page 59
South Cluster Configuration	See 5.3.4. South Cluster Configuration on page 60

5.3.1. North Bridge



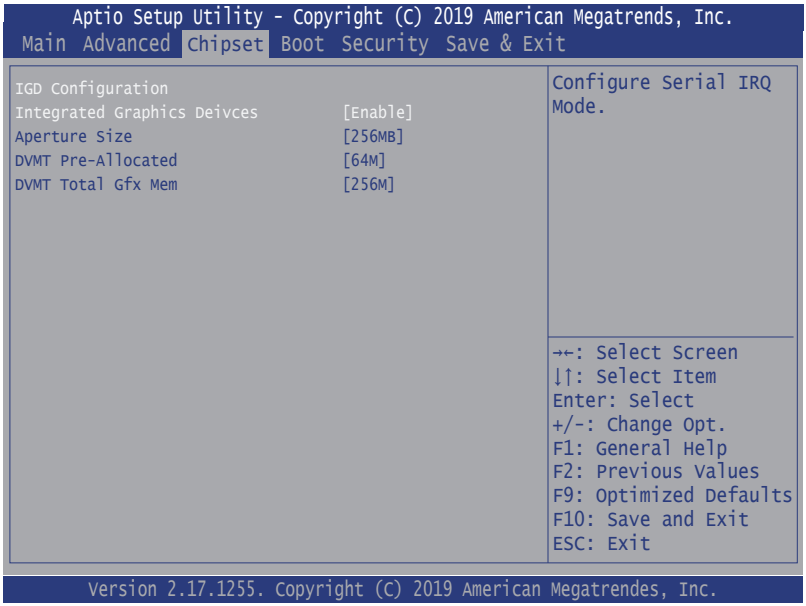
Submenu	Description
Max TOLUD	Set the maximum value of TOLUD. ► Options: **2 GB** (default), **2.25 GB**, **2.5 GB**, **2.75 GB** and **3 GB**

5.3.2. South Bridge



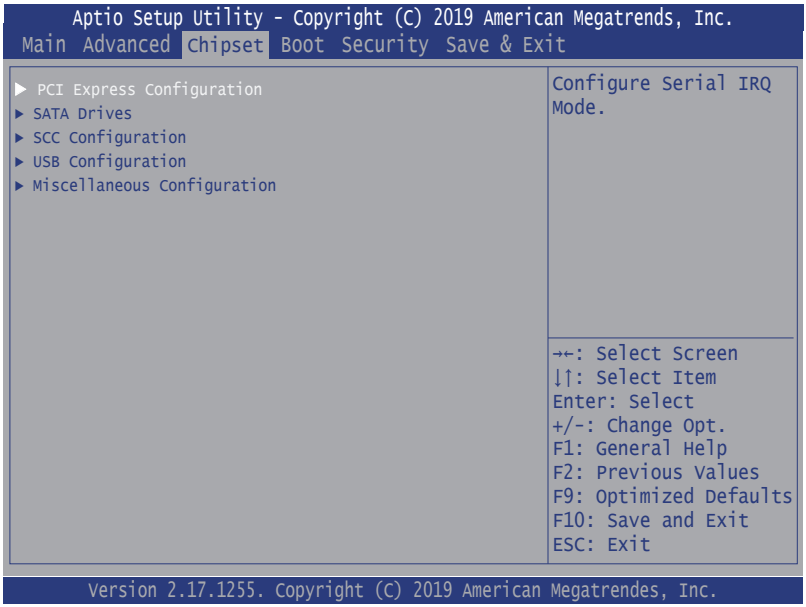
Submenu	Description
Serial IRQ Mode	Configure Serial IRQ Mode ► Options: **Quiet** and **Continuous** (default)**.**
SMBUS Support	**Enable** (default) or **Disable** SMBus Support.
OS Selection	Select the target OS. ► Options: **Windows** (default), **Android**, **Win7** and **Intel Linux**
PCI CLOCK RUN	**Enable** (default) or **Disable** CLKRUN# logic to stop PCI clocks.
Real Time Option	Disable or enable real time mode. If select Real-time Enabled, set IDI Agent Real-Time Traffic MaskBits. ► Options: **RT Disabled** (default), **RT Enabled, Agent IDI1** and **RT Enabled, Agent Disabled**

5.3.3. Uncore Configuration



Submenu	Description
Integrated Graphics Device	Enable or disable integrated graphics device. ► **Enable**: Enable Integraged Graphics Device (IGD) when selected as the primary video adapter. ► **Disable**: Always disable IGD.
Apeture Size	Select the Apeture 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) and **512MB**.
DVMT Pre-Allocated	Select the DVMT 5.0 Pre-allocated (Fixed) Graphic Memory size used by the Internal Graphic Device. ► Options: **64M** is the default.
DVMT total Gfx Mem	Select the DVMT 5.0 Total Graphic Memory size used by the Internal Graphic Device. ► Options: **128MB, 256MB** (default) and **Max.**

5.3.4. South Cluster Configuration



Submenu	Description
PCI Express Configuration	See 5.3.4.1. PCI Express Configuration on page 61
SATA Drives	See 5.3.4.2. SATA Drives on page 61
SCC Configuration	See 5.3.4.3. SCC Configuration on page 61
USB Configuration	See 5.3.4.4. USB Configuration on page 61
Miscellaneous Configuration	See 5.3.4.5. Miscellaneous Configuration on page 62

5.3.4.1. PCI Express Configuration

Setting	Description
PCI Express Root Port 1~5	**Enable** or **Disable** the PCIe Express Root Port or set to **Auto** (default) .
ASPM Support	Disable or set the ASPM level. Force L0s will force all inks to L0s state. "Auto" will allow BIOS to auto configure."Disable" will disable ASPM. ► Options: **Disabled** (default), **L0s**, **L1**, **L0sL1** and **Auto**.
PCIe Speed	Select PCI Express port speed. ► Options: **Auto** (default), **Gen1** and **Gen2**.

5.3.4.2. SATA Drives

Setting	Description
Chipset SATA	**Enables** (default) / **disables** chipset SATA controller.
Port 0	**Enables** (default) / **disables** the SATA port.

5.3.4.3. SCC Configuration

Setting	Description
SCC eMMC Support	**Enables** (default) / **disables** SCC eMMC support.
eMMC Max Speed	Select the eMMC max speed allowed. ► Options: **HS400** (default), **HS200** and **DDR50o**.

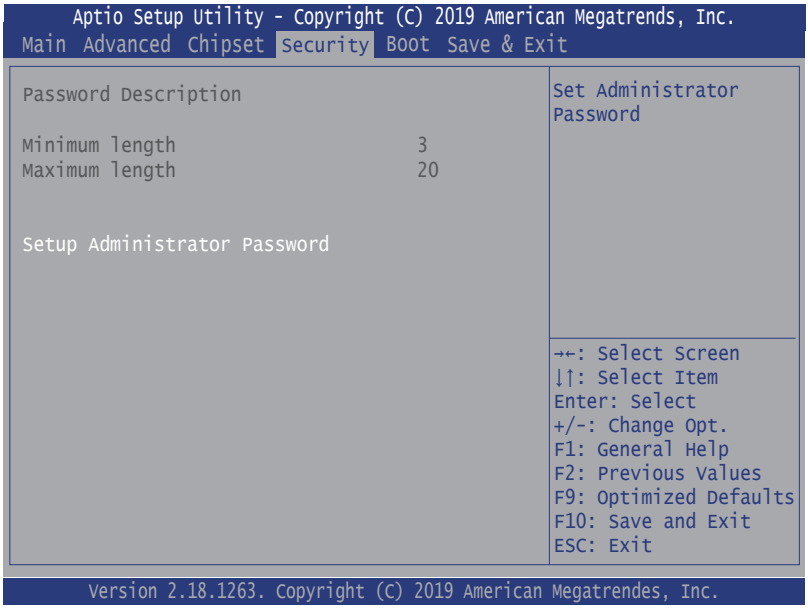
5.3.4.4. USB Configuration

XHCI Pre-Boot Driver	**Enables** / **disables** (default) XHCI Pre-Boot Driver support.
xHCI Mode	**Enables** (default) / **disables** xHCI mode. When disabled, XHCI controller would be function disabled, none of the USB devices are detectable and usable during boot and in OS. Do not disable it unless for debug purpose .

5.3.4.5. Miscellaneous Configuration

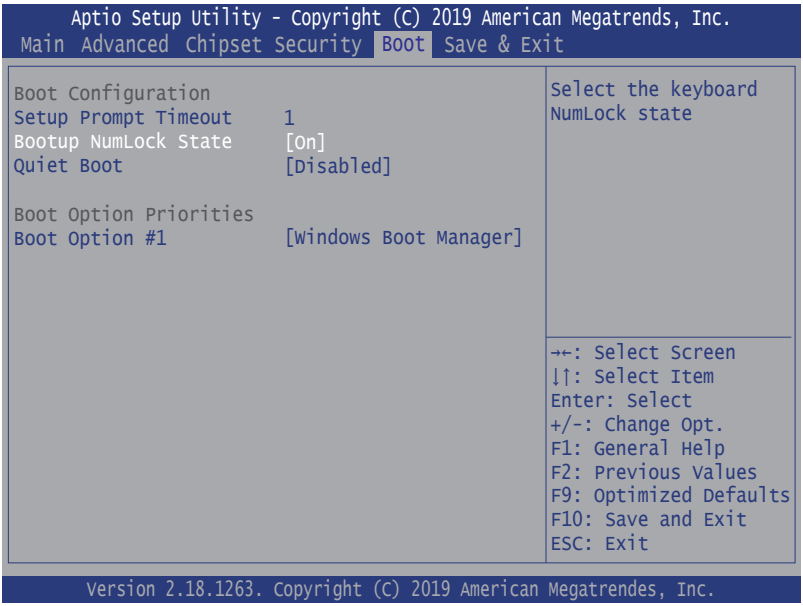
Power on after power fail	Specify what state to go to when power is re-applied after a power failure (G3 state). ► Options available are **Power On** (default), **Power Off** and **Last State**.
Wake On Lan	**Enables** (default) / **disables** Wake-on-LAN feature.

5.4. Security



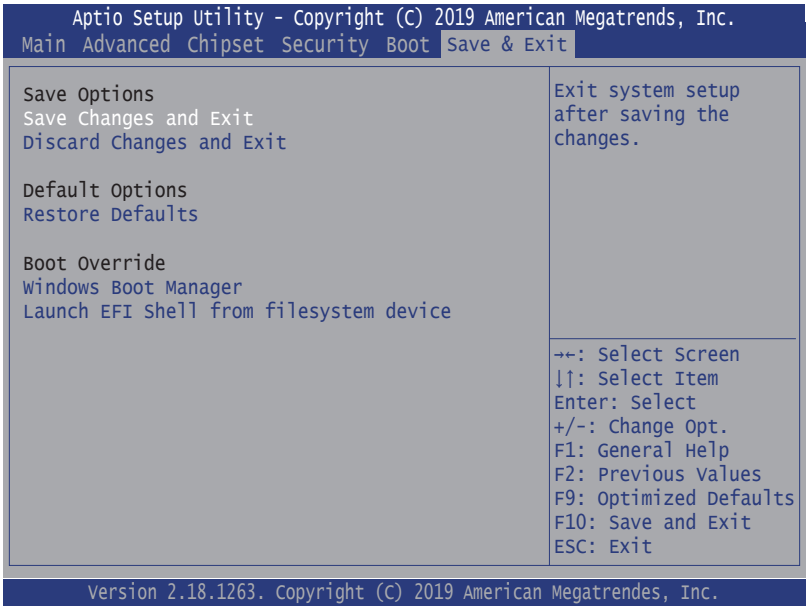
Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. 2. An **Create New Password** dialog then pops up onscreen. 3. Enter your desired password that is no less than 3 characters and no more than 20 characters. 4. Hit [Enter] key to submit.

5.5. Boot



Setting	Description
Setup Prompt Timeout	Set how long to wait for the prompt to show for entering BIOS Setup. ► The default setting is **2** (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. ► 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. ► Select **Disabled** to display the normal POST message, which is the default.
Boot Option Priority	Set the system boot priorities.
Hard Drive BBS Priorities	Sets the order of the legacy devices in this group. BBS means "BIOS Boot Specification".

5.6. Save & Exit



Setting	Description
Save Changes and Reset	Saves the changes and quits the BIOS Setup utility.
Discard Changes and Exit	Quits the BIOS Setup utility without saving the change(s).
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. ► **Windows Boot Manager:** ?? ► **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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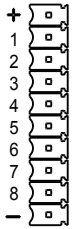
Appendix

Appendix A. DIO Signal Connections

A.1. 8-Bit DIO Signal Connections (for -E3950A/S and -N3350A)

The 4 x DI, 4 x DO connector offers 8-bit DIO, power (+5V) and ground pin. Each bit of DIO can be set as digital input or output.

Please see the DC characteristics for detail.

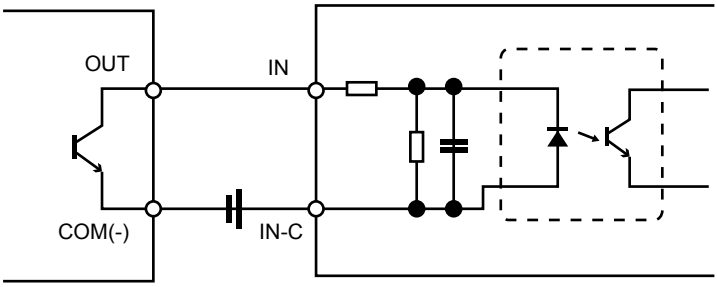


Parameter	SYM.	MIN.	TYP.	MAX.	UNIT	Conditions
I/OD TTL Level bi-directional pin with schmitt trigger, open drain output with 12mA source-sink capability, 5V tolerance						
Input Low Threshold Voltage	VI-			0.8	V	
Input High Threshold Voltage	VI+	2.0			V	
Output Low Current	IOL		+12		mA	VOL=0.4V

A.2. 32-Bit DIO Signal Connections (for -E3950P and -N3350P)

A.2.1. Isolated Digital Input Connections

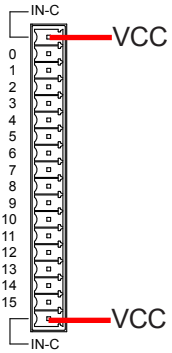
The input (IN-C) will accept supply voltages of up to 24 V. Make sure the Von (IN-C to IN) is more than 12V and Voff (IN-C to IN) is less than 5V. The following diagram shows the connection between outside signal and the system.



PLC (NPN Output)

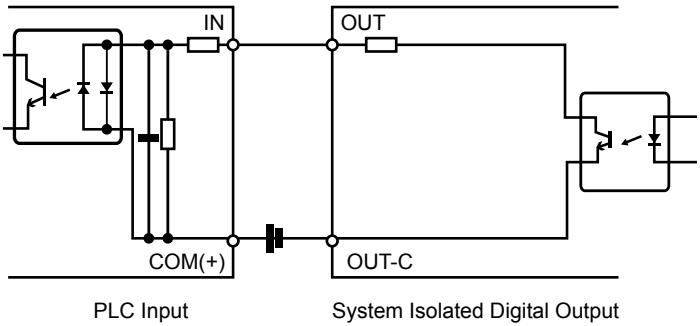
System Isolated Digital Input

Note that the input's (IN-C) first and last pins are for VCC.



A.2.2. Isolated Digital Output Connections

When an isolated output channel is being used as an output channel, if an external voltage (maximum 24V) is applied, the current will flow from the external voltage source to the system. Make sure that the current through each out pin does not exceed 200 mA.



Note that the output's (OUT-C) first and last pins are for GND.