WINSYSTEMS®

SYS-ITX-N-3900

Industrial NANO-ITX Embedded Computer with Intel® Atom™ E3900 Processor

Product Manual

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Revision History

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Table of Contents

1 Before You Begin 5
1.1 Warnings 5
2 Introduction 5
3 Functionality 5
4 Features 6
5 General Operation 8
5.1 System Block Diagram 8
6 Specifications 9
7 Setup 10
7.1 Installation and Connections 10
7.2 Power Up 10
7.3 Driver Installation 10
7.3.1 Chipset Component Driver 10
7.4 Watchdog Timer (WDT) 11
7.4.1 Example Code for WDT 11
7.5 Reset CMOS BIOS Configuration 12
8 Configuration 12
8.1 Component Layout 12
8.1.1 Rear Panel Connectors 12
8.1.2 Top View Connectors 13
8.2 Power 14
8.3 Connectors 14
8.3.1 DC Jack (J1) 14
8.3.2 Audio Jack (Line_out) (J2) 14
8.3.3 DisplayPort (J3) 14
8.3.4 RJ45 Connector (J4/J5) 14
8.3.5 USB 3.1 Gen 1 Connector (J6) 15
8.3.6 VGA Connector (J8) 16

8.3.7 RS232/422/485 Connector (J10) 16
8.3.8 M.2 key E Socket (J11) 16
8.3.9 Battery Connector (J15) 16
8.3.10 mSATA/Mini PCIe Socket (J16) 17
8.3.11 DDR3 SODIMM Socket (J17) 17
8.3.12 2.5-inch SATA HDD/SSD Connector (J21) 17
8.3.13 SATA Power Header (J22) 18
8.3.14 MicroSD Card Socket (J23) 18
8.4 Jumpers and Switches 18
8.4.1 CMOS Clear (JP3) 18
8.4.2 Power Button (SW1) 18

9 BIOS Settings 19
9.1 General Information 19
9.2 Entering Setup 19
9.3 Navigating the Menus 20
9.4 BIOS Screens 20

10 Troubleshooting 48
10.1 BIOS settings 48
10.1.1 Loading the Default Optimal Setting 48
10.1.2 Reset CMOS BIOS Configuration 48
10.1.3 Update BIOS 49

11 Cables and Software Drivers 49

A Best Practices 50

B Warranty Information 53

1. Before You Begin

Review the warnings in this section and the best practice recommendations (see “Best Practices” on page 50) when using and handling the WINSYSTEMS SYS-ITX-N-3900 embedded computer. Adherence to these recommendations provides an optimal user experience and prevents damage. Read through this document and become familiar with the SYS-ITX-N-3900 before proceeding.

FAILING TO COMPLY WITH THESE BEST PRACTICES MAY DAMAGE THE SYS-ITX-N-3900 AND VOID YOUR WARRANTY.

1.1 Warnings

Only qualified personnel should configure and install the SYS-ITX-N-3900. While observing best practices, pay particular attention to the following:.

Avoid Electrostatic Discharge (ESD)
Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

Warning
Do not reverse the positive and negative terminals when you connect power to the unit. This voids the warranty and damages the embedded computer.

2. Introduction

This manual provides configuration and usage information for the SYS-ITX-N-3900. If you still have questions, contact Technical Support at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

Refer to the WINSYSTEMS website at https://www.winsystems.com/ for other accessories (including cable drawings and pinouts) that can be used with your SYS-ITX-N-3900.

3. Functionality

The SYS-ITX-N-3900 is an industrial NANO-ITX embedded computer. Its compact design and low power dissipation board is ideal for digital signage, digital security surveillance (DSS), medical, and industrial IoT applications. The processor for the unit is an Intel® E3900 series Atom™,

integrated into the SYS-ITX-N-3900. The low-profile thermal solution provides a rugged platform base that protects the PCB assembly and offers convenient mounting. Information to configure and operate the SYS-ITX-N-3900 for most applications is included in this Product Manual or on our website at https://www.winsystems.com/.

NOTE WINSYSTEMS can provide custom configurations for original equipment manufacturer (OEM) clients. For details, please contact an Application Engineer through Technical Support (see “Introduction” on page 5 for contact information).

4. Features

This section describes the features of the SYS-ITX-N-3900 embedded computer.

Package Contents

- One SYS-ITX-N-3900 NANO-ITX embedded computer
- One external AC/DC power supply
- One SATA cable and SATA power cable
- SSD mounting hardware

Embedded Computer

- E3900 series Intel Atom processor

Feature	ITX-N-3940-1-0	ITX-N-3950-1-0
Processor	Intel Atom x5-E3940	Intel Atom x7-E3950
Core speed	Up to 1.60 GHz	Up to 1.6GHz
Number of cores	4	4
L2 cache	2 MB	2 MB

Operating Systems (compatibility)

The SYS-ITX-N-3900 uses the Intel Apollo Lake system on a chip (SOC). Older operating systems might not recognize this chip. For compatibility issues with older Windows OS such as Windows 8, install the Apollo Lake chipset component driver (INF) before any other driver. The INF driver can be found on our ITX-N-3900 product web page.

- Microsoft Windows 10 Enterprise (64-bit), IoT Core (32/64-bit)
- Linux Wind River 8 Linux distribution (64-bit), Yocto Project BSP tool-based embedded Linux distribution (64-bit)
- Android (64-bit)
- RTOS Wind River VxWorks

Please contact a WINSYSTEMS Sales Engineer for OS BSP availability.

Memory

- Up to 8 GB DDR3L (one socketed 1866/1600 MHz 204-pin SODIMM)

BIOS

- AMI uEFI BIOS

Video Interfaces

- x7-E3950: Intel HD Graphics 505 (controller)
- x5-E3940: Intel HD Graphics 500 (controller)
- Supports multiple displays
- DP
- VGA

Ethernet

- Supports Wake-on-LAN function
- Two Intel I210 Gigabit Ethernet (1 gigabit per second, GbE) controllers

Storage (Bootable)

- One SATA port for 2.5-inch SATA HDD/SSD
- One mSATA socket (Switch mSATA or Mini-PCIe by BIOS)

Serial Interface

- One serial port (RS232/422/485, BIOS configurable)

USB

- Two USB 3.1 Gen 1 ports

SD Interface

- One micro SD socket

Expansion Interface

- One M.2 E key socket for wireless application

Audio

- Line out audio Jack on rear I/O

Power

- DC 12 V input (rear I/O)
- Model specific power specifications:
  - ITX-N-3940: +12 V DC input (9 W typical)
  - ITX-N-3950: +12 V DC input (12 W typical)

Additional Features

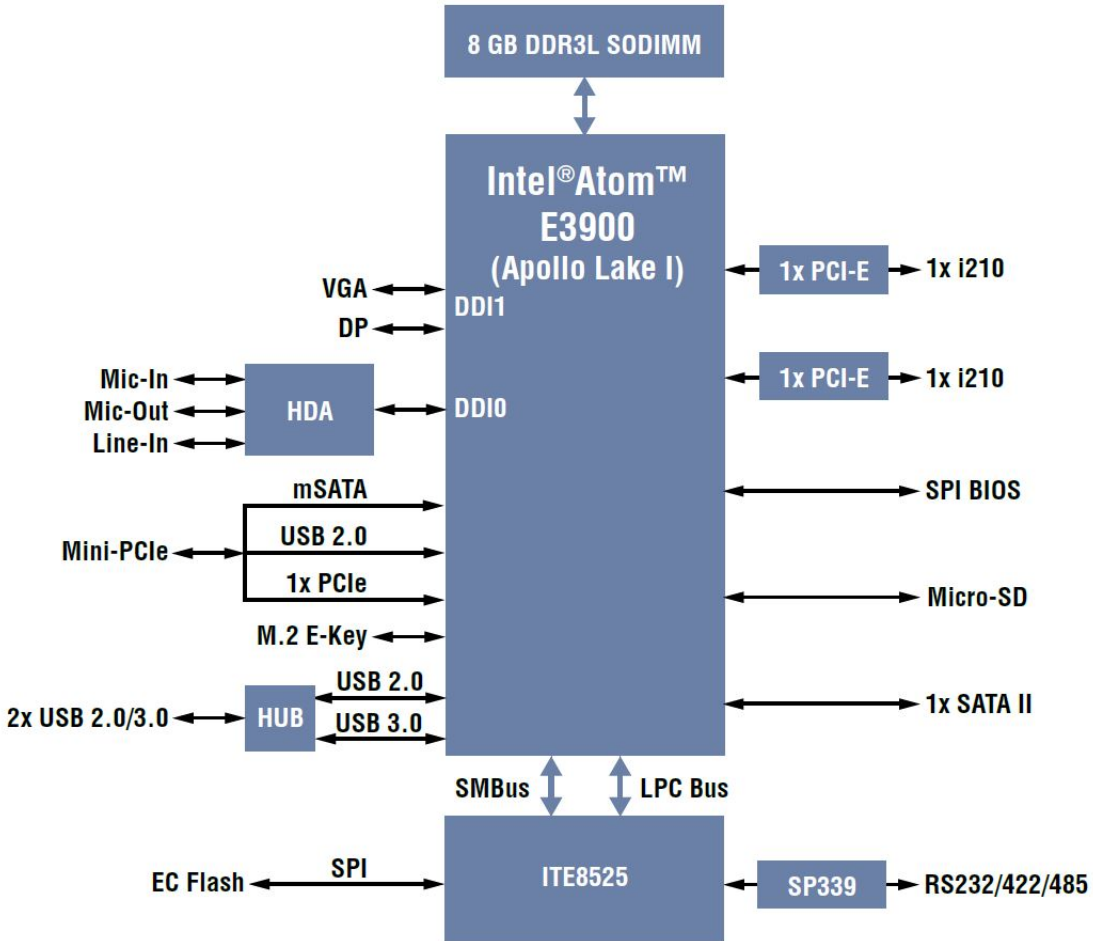
- Watchdog timer (WDT). Supports WDT function through software programming for enable/disable and interval setting, and a general system reset.

Temperature

- Operating temperature: -20°C to +60°C (-4°F to +140°F), requires airflow and high temperature grade DRAM; 10% to 90% relative humidity
- Storage temperature: -40°C to +85°C (-40°F to +185°F), 5% to 90% relative humidity

5. General Operation

5.1 System Block Diagram



6. Specifications

The SYS-ITX-N-3900 adheres to the following specifications and requirements.

Electrical	
V_{CC}	12 V DC ±5%, 15 watts (maximum)
MTBF	14.5 years
Battery: CR-2032	Chemical System: Li/MnO_2 Nominal Voltage: 3 V Rated Capacity: 225 mAh
Mechanical	
Mechanical Dimensions	5.9 x 5.9 x 2.1 in. (150 x 150 x 53 mm)
Weight	2.9 lb. (1.3 kg)
Environmental	
Temperature	Operating: -20°C to +60°C (-4°F to +140°F) Requires airflow and high temperature grade DRAM.
Humidity (RH)	Operating: 10% to 95% non-condensing
RoHS Compliant	Yes
Operating Systems	
Runs 64-bit Windows, Linux, and other x86-compatible operating systems. For a complete list, see Operating Systems (compatibility) in “Features” on page 6.	
Chipsets and Drivers	
CPU Type	**Intel Atom CPU** **E3950:** Up to 1.6 GHz L2 cache 2048 KB (2 MB) **E3940:** Up to 1.6 GHz L2 cache 2048 KB (2 MB)
BIOS	AMI BIOS ITX-N-3900
Memory	Up to 8 GB DDR3L (one socketed 1866/1600 MHz 204-pin SODIMM)
VGA Card	On-board Intel HD graphics
LAN Card	On-board Intel I210-IT gigabit network connection
LAN Card	On-board Intel I210-IT gigabit network connection #2
Audio Card	On-board Realtek high definition audio

7. Setup

Use the information in this section to install the SYS-ITX-N-3900. Refer to "Configuration" on page 12 to locate and identify the connectors outlined in this section.

7.1 Installation and Connections

1. Connect a compatible monitor to the VGA output (J9), or the DisplayPort output (J3).
2. Connect a USB keyboard to either of the two USB ports at J6.
3. Plug in the boot media of your preference. The options are:
   - SATA (J21)
   - mSATA (J16)
   - USB (J6)
4. If using a battery, connect the battery to J15.
5. Connect an Ethernet cable to a port at J4/J5 (as available).

7.2 Power Up

Plug in a compatible +12 V DC power source at J1. The first time power is applied, the SYS-ITX-N-3900 boots automatically, bypassing the power button (SW1). After initial startup, briefly press the power button to turn the SYS-ITX-N-3900 on and off or press and hold it to reset.

7.3 Driver Installation

The information in this section helps you to configure an operating system's driver for use with the on-board PCI devices of the SYS-ITX-N-3900. Drivers and documentation are available on the WINSYSTEMS website at https://www.winsystems.com/ or by contacting a Application Engineer at +1-817-274-7553.

7.3.1 Chipset Component Driver

The SYS-ITX-N-3900 uses the Intel Apollo Lake-I SOC. Older operating systems might not be able to recognize this chip. For compatibility issues with older Windows Operating Systems such as Windows 8, make sure to install the Apollo Lake-I SOC chipset component driver (INF) before any other driver.

7.4 Watchdog Timer (WDT)

The SYS-ITX-N-3900 features an advanced watchdog timer (WDT) that can be used to guard against software lockups. The timer is programmable from 1 second to 255 minutes (15,300 seconds).

NOTE Use a long timeout if the watchdog timer is enabled and booting to an operating system.

Use the following example as a guide to programming the WDT.

7.4.1 Example Code for WDT

The ITX-N-3900 features a programmable WDT. The following WDT code example is written in C. Use this example as a guide to program the WDT. Example C/C++ applications are available in the WDT System Management package.

NOTE The WDT System Management package is available upon request from WINSYSTEMS (see contact information in the Introduction section on page 1).

The SYS-ITX-N-3900 features a programmable WDT. The following WDT code example is written in C++. Use this example as a guide to program the WDT.

```
##Define WDTCFG 0x06// WDT Timer Counter Register
#Define WDTMIN 0x07// WDT Timer Counter Register (Minute)
#Define WDTSEC 0x08// WDT Timer Counter Register (Second)
#Define EC_IOPort 0xE300// Default, reference to BIOS configuration

VOID Write_EC_SRAM(UINT8 Offset,UINT8 Value){

IoWrite8(EC_IOPort+Offset,Value);
}

Byte Read_EC_SRAM(UINT8 Offset){ IoRead8(EC_IOPort+offset,Value);
return Value;
}
void WDT()

{
// Enable WDT 30sec Write_EC_SRAM(WDTSEC,30);
Write_EC_SRAM(WDTCFG,0x01);//Bit0: WDT Enable, BIT1: 0:Second Mode

// Enable WDT 5min Write_EC_SRAM(WDTSEC,5);
Write_EC_SRAM(WDTCFG,0x03);//Bit0: WDT Enable, BIT1: 1:Minute Mode

// Enable WDT 10min, 20sec Write_EC_SRAM(WDTSEC,20);
Write_EC_SRAM(WDTSEC,10);
Write_EC_SRAM(WDTCFG,0x03);//Bit0: WDT Enable, BIT1: 1:Minute Mode
}
```

7.5 Reset CMOS BIOS Configuration

Jumpers can be used to reset the BIOS CMOS settings to the factory default. Enable or disable the Clear CMOS Function hardware circuit, by placing or removing the jumper from JP3 as needed. See “Reset CMOS BIOS Configuration” on page 48 for usage.

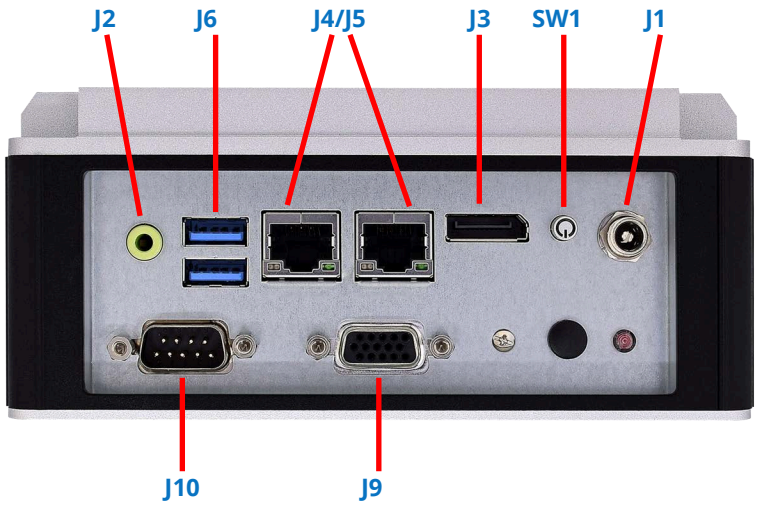
8. Configuration

This section describes the SYS-ITX-N-3900 components and configuration.

8.1 Component Layout

8.1.1 Rear Panel Connectors

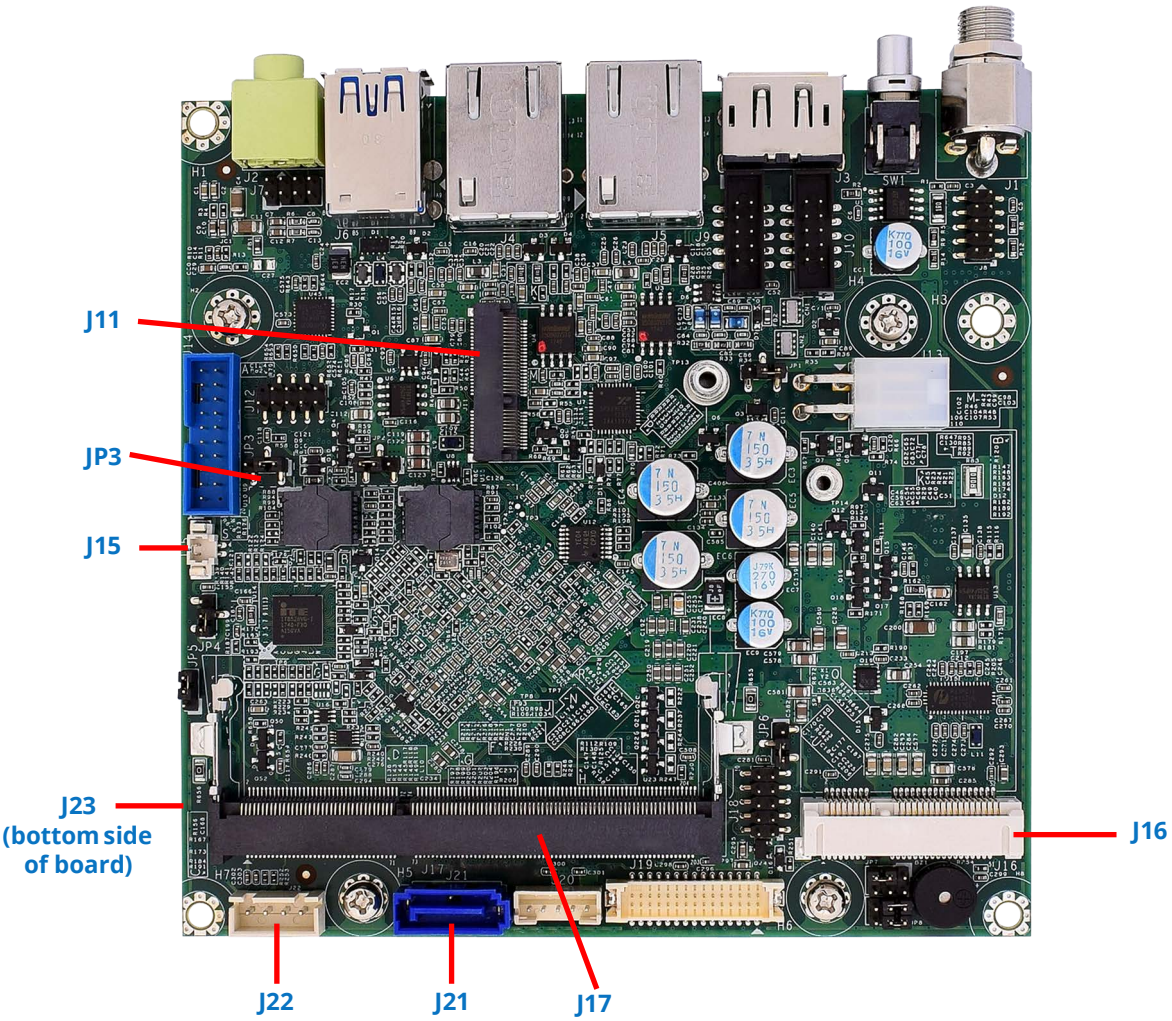
Rear panel connectors provide common external connections.



The following table provides connector descriptions and references for the rear panel, illustrated in the figure above.

Item	Type	Description	Reference
J1	Connector	DC Jack	page 14
J2	Connector	Audio Jack (Line_out)	page 14
J3	Connector	DisplayPort	page 14
J4/J5	Connector	RJ45 Connector	page 14
J6	Connector	USB 3.1 Gen 1 Connector	page 15
J9	Connector	VGA Connector	page 16
J10	Connector	RS232/422/485 Connector	page 16
SW1	Switch	Power Switch	page 18

8.1.2 Top View Connectors



The following table provides connector descriptions and references for the top of the board, illustrated in the figure above.

Item	Type	Description	Reference
J11	Connector	M.2 key E Socket	page 16
J15	Connector	Battery Connector	page 18
J16	Connector	mSATA/Mini PCIe Socket	page 17
J17	Connector	DDR3 SODIMM Socket	page 17
J21	Connector	2.5-inch SATA HDD/SSD Connector	page 17
J22	Connector	SATA Power Header	page 17
J23	Connector	Micro SD Card Socket	page 18
JP3	Jumper	CMOS Clear	page 18

8.2 Power

The main power supply to the embedded computer is +12 V DC. The SYS-ITX-N-3900 draws power through the J1 connector. See “DC Jack (J1)” on page 14.

8.3 Connectors

8.3.1 DC Jack (J1)

This connector provides for a +12 V DC input from a power adapter.

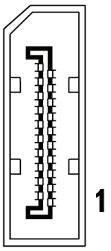
8.3.2 Audio Jack (Line_out) (J2)

This connector provides an audio line out (Line_out) signal.

8.3.3 DisplayPort (J3)

The DisplayPort™ 1.1 connector supplies both video and high-definition (HD) audio. See the “Audio Jack (Line_out) (J2)” on page 14 for other audio options.

Layout and Pin Reference



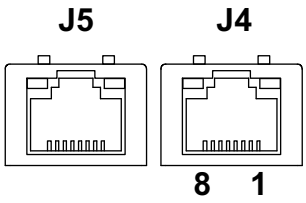
Pin	Name	Description	Pin	Name	Description
1	ML_Lane 0 (p)	Lane 0 (positive)	2	GND	Ground
3	ML_Lane 0 (n)	Lane 0 (negative)	4	ML_Lane 1 (p)	Lane 1 (positive)
5	GND	Ground	6	ML_Lane 1 (n)	Lane 1 (negative)
7	ML_Lane 2 (p)	Lane 2 (positive)	8	GND	Ground
9	ML_Lane 2 (p)	Lane 2 (negative)	10	ML_Lane 3 (p)	Lane 3 (positive)
11	GND	Ground	12	ML_Lane 3 (n)	Lane 3 (negative)
13	CONFIG1	CONFIG1	14	CONFIG2	CONFIG2
15	AUX_CH (p)	Auxiliary Channel (positive)	16	GND	Ground
17	AUX_CH (n)	Auxiliary Channel (negative)	18	Hot Plug	Hot Plug Detect
19	RETURN	Return for Power	20	DP_PWR	Power for connector (3.3 V 500 mA)

8.3.4 RJ45 Connector (J4/J5)

Two Intel I210-IT Gigabit Ethernet controllers provide standard IEEE 1588 and 802.1AS protocol time-stamping. Each Ethernet interface includes 10/100/1000 MP/s multispeed, full, and half-duplex operation.

The pinout below describes the standard RJ45 Ethernet connectors.

Layout and Pin Reference



Pin	Function	Description
1	TX_D1+	Transceive Data+
2	TX_D1-	Transceive Data-
3	RX_D2+	Receive Data+
4	BI_D3+	Bi-Directional Data+
5	BI_D3-	Bi-Directional Data-
6	RX_D2-	Receive Data-
7	BI_D4+	Bi-Directional Data+
8	BI_D4-	Bi-Directional Data-

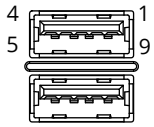
On-board Ethernet activity LEDs are built into the connectors at J4 and J5. There is one green LED (left) and one bi-color green/yellow LED (right).

LED	Activity	Ethernet Status
Left	Off	No Link
	Flashing (green)	Linked
Right	Off	No Link
	Off	Linked at 10 MB
	On (yellow)	Linked at 100 MB
	On (green)	Linked at 1 GB

8.3.5 USB 3.1 Gen 1 Connector (J6)

J6 provides two USB 3.1 Gen 1 Type A connectors.

Pin Reference



Pin	Description	Pin	Description
1	USBVCC	6	RX+
2	D-	7	GND
3	D+	8	TX-
4	GND	9	TX+
5	RX-		

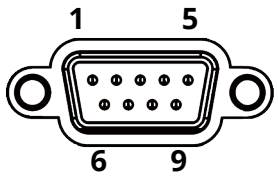
8.3.6 VGA Connector (J8)

Standard full size 15-pin VGA connector.

8.3.7 RS232/422/485 Connector (J10)

This DB9 connector provides access to the SYS-ITX-N-3900 serial port (RS232/422/485) at J10. This DB9 connector provides a serial port connection and is switched by BIOS.

Layout and Pin Reference



Pin	RS232	RS422	RS485
1	DCD#	T-	RX/TX-
2	RXD#	T+	RX/TX+
3	TXD#	R+	N/A
4	DTR#	R-	N/A
5	GND	GND	GND
6	DSR#	N/A	N/A
7	RTS#	N/A	N/A
8	CTS#	N/A	N/A
9	RI#	N/A	N/A
10	N/A	N/A	N/A

8.3.8 M.2 key E Socket (J11)

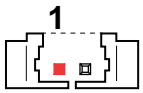
The SYS-ITX-N-3900 provides a 2230 M.2 key E Socket to support a variety of peripherals as available in this format.

8.3.9 Battery Connector (J15)

An optional external battery, connected to J15, supplies the SYS-ITX-N-3900 board with standby power for the real-time clock and CMOS setup RAM.

A power supervisory circuit contains the voltage sensing circuit and an internal power switch to route the battery or standby voltage to the circuits selected for backup. The battery automatically switches on when the V_{CC} of the systems drops below the battery voltage and off when V_{CC} returns to normal.

Layout and Pin Reference



Pin	Name
1	Battery Voltage
2	Ground

8.3.10 mSATA/Mini PCIe Socket (J16)

The SYS-ITX-N-3900 provides a Mini-PCIe socket to support a variety of peripherals as available in this format. The socket alternatively supports a mSATA device in this socket. Select mSATA, or Mini-PCIe in the BIOS to support your specific expansion device.

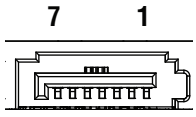
8.3.11 DDR3 SODIMM Socket (J17)

Connector J17 is a SODIMM 204-pin DDR3L compatible socket, accommodating a maximum of 8 GB RAM at 1333 MHz/1600 MHz/ 1866 MHz.

8.3.12 2.5-inch SATA HDD/SSD Connector (J21)

The bootable SATA III (SATA 6 Gb/s) interface is located at J21. WINSYSTEMS offers CBL-SATA-701-20 for this connector.

Layout and Pin Reference

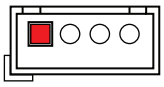


Pin	Name
1	GND
2	RX1+
3	RX1-
4	GND
5	TX1-
6	TX1+
7	GND

8.3.13 SATA Power Header (J22)

Power is supplied to the SATA device via the connector at J22.

Layout and Pin Reference



Pin	Name
1	+12 V
2	Ground
3	Ground
4	+5 V

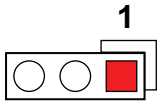
8.3.14 MicroSD Card Socket (J23)

The SYS-ITX-N-3900 provides a MicroSD card socket for storage only. The MicroSD cannot be used as a bootable device for Windows.

8.4 Jumpers and Switches

8.4.1 CMOS Clear (JP3)

Clear CMOS using this jumper (JP3).See “Reset CMOS BIOS Configuration” on page 48 for usage of this jumper.



JP7/JP8	Function
1-2 Short	Normal Operation (Default)
2-3 Short	Clear CMOS Contents

8.4.2 Power Button (SW1)

The power button (SW1), located next to J1, controls power to the SYS-ITX-N-3900. The first time you connect power to J1, the power button is bypassed and the embedded computer powers up automatically. See “Rear Panel Connectors” on page 12 for switch location.

After the initial power up, press **SW1** briefly to power the unit on or off, depending on the present state.

If the unit accidentally locks up and is unresponsive, press and hold **SW1** for four (4) seconds to perform a hard restart.

9. BIOS Settings

9.1 General Information

The SYS-ITX-N-3900 includes a BIOS from AMI stored in Flash ROM. Access setup information through the BIOS setup utility to modify basic system configuration. The configuration is stored in CMOS RAM (it is retained during power-off). When power is applied to the system, the SYS-ITX-N-3900 communicates with peripheral devices and checks hardware resources against the configuration information stored in the CMOS memory. If during startup an error is detected or the CMOS parameters need to be initially defined, the diagnostic program prompts the user to enter the SETUP program. Some errors are significant enough to cause the startup to fail.

9.2 Entering Setup

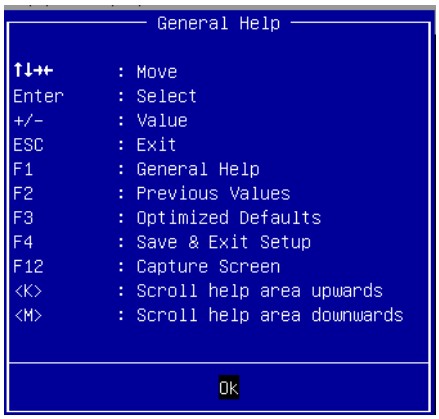
To enter setup, apply power to the computer and then press the **Delete** key or the **ESC** key. Either of these keys must be pressed when either the splash screen is displayed (during the system power-on self test, POST) or when the following prompt message is displayed. It may take a few seconds before the main setup menu screen is displayed.

Prompt Message: Press <Delete> or <ESC> to enter SETUP

If the above message disappears before you respond and you can still to enter Setup by pressing the **RESET** button to restart the system. Alternatively, you can restart the system by simultaneously pressing the **CTRL**, **ALT**, and **DELETE** keys on the keyboard.

Prompt message: Press <F1> to Run General Help or Resume

At the above prompt, the BIOS setup program can provide a General Help screen. The menu can be easily called up from any menu by pressing **F1**. The Help screen lists all the possible keys to use and the selections for the highlighted item. Press **ESC** to exit the Help screen.



9.3 Navigating the Menus

Use the up and down arrow keys to move among the selections and press **Enter** when a selection is highlighted to enter a sub-menu or to see a list of choices. See “BIOS Screens” on page 20 for available options.

9.4 BIOS Screens

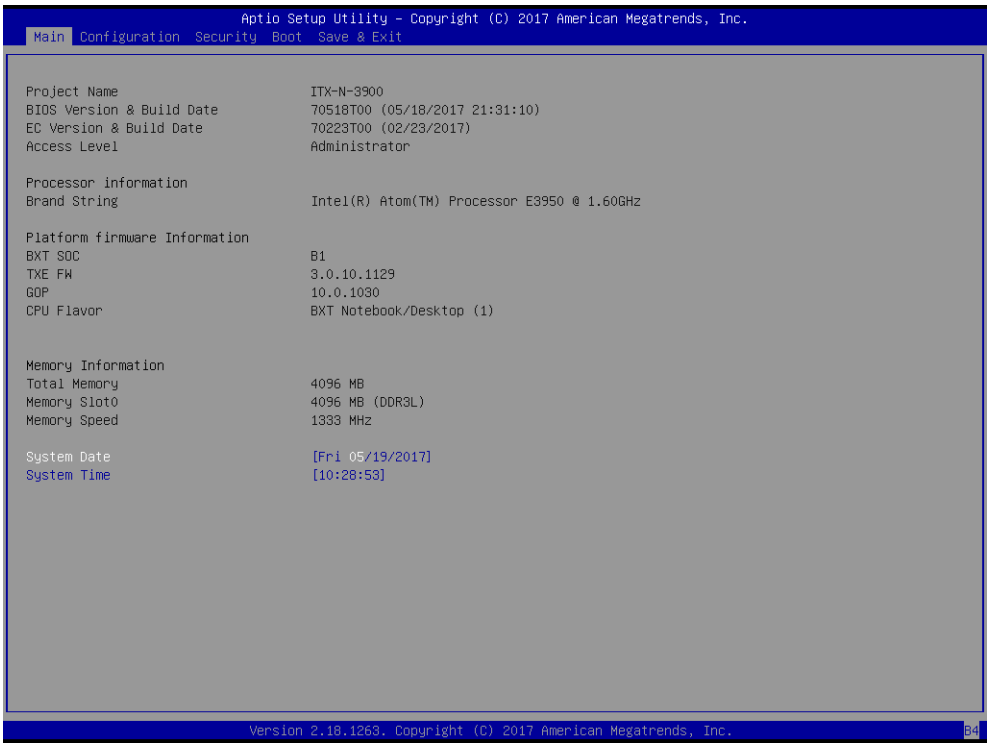
The following BIOS screens contain the options and sample settings for the SYS-ITX-N-3900. Your actual configuration may differ from the screens shown here.

Warning
Assigning incorrect values to items on the following screen menus may cause system malfunction.

NOTE Use care when modifying BIOS settings.

Main

Use this screen to review basic system information and adjust system date and time.

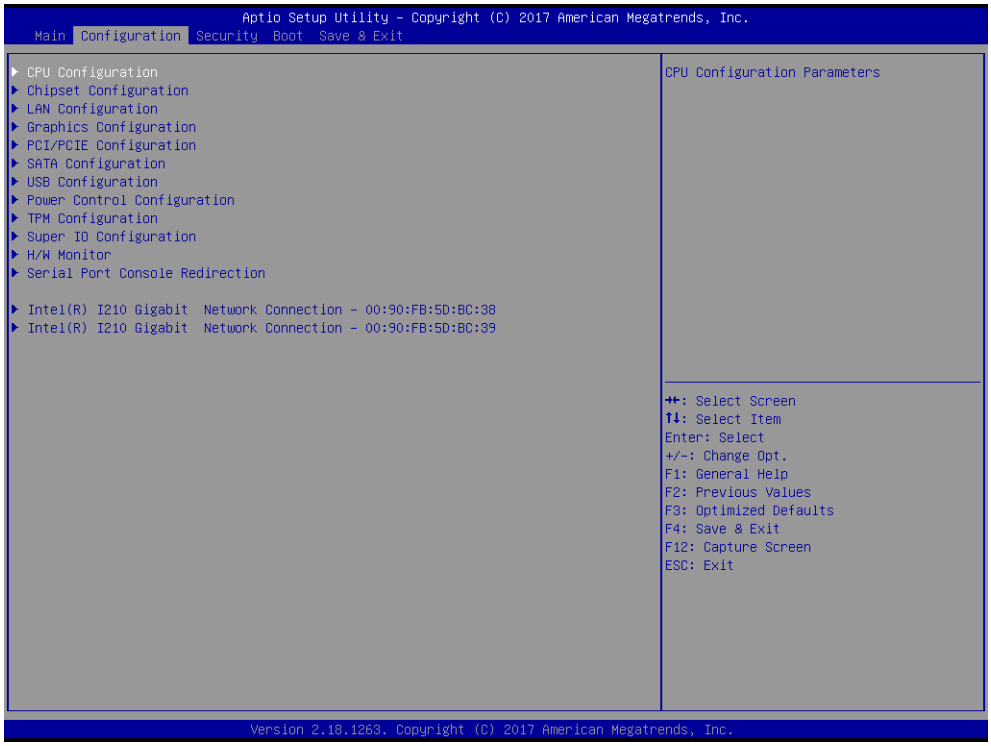


Menu item	Description
System Information	System information parameters provide information and vary with BIOS version and the specific modules used.
System Date	Displays the current date in MM/DD/YYYY format. To set or change the date, highlight the row using the up/down arrow keys, then highlight the month, day, or year by pressing **Enter** until the desired value is highlighted with a square block. Use the **+/-** keys to change the highlighted value, or enter the time using the number keys.
System Time	Displays the current time in HH/MM/SS format. To set or change the time, highlight the row using the up/down arrow keys, then highlight the hour, minute, or second by pressing **Enter** until the desired value is highlighted with a square block. Use the **+/-** keys to change the highlighted value.

Configuration

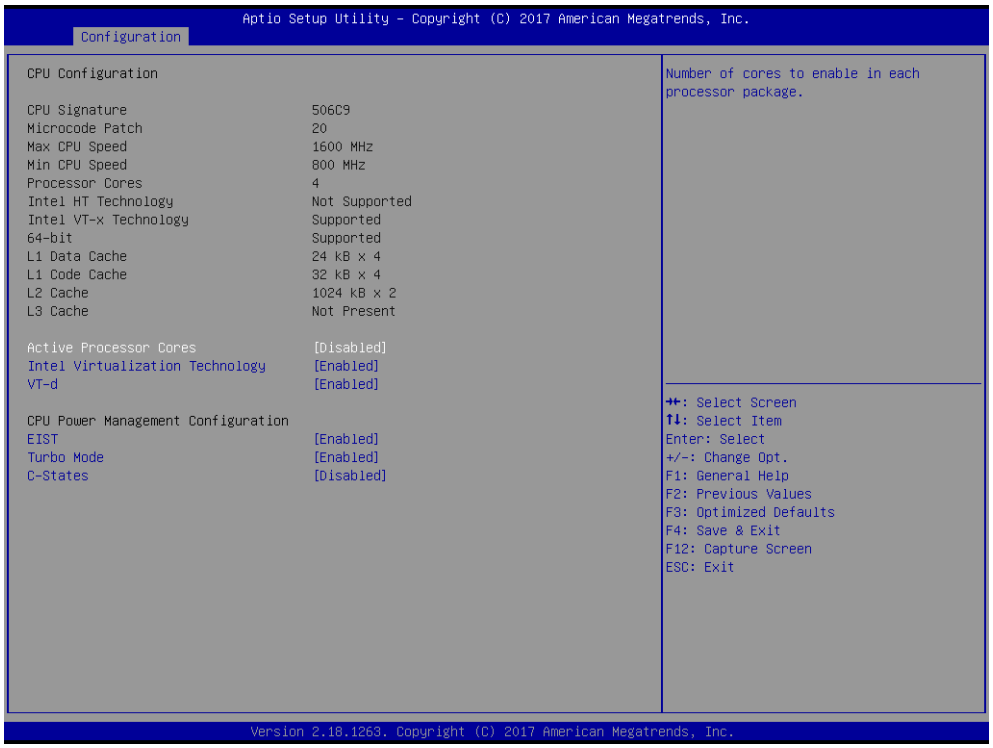
Use this screen to set enhanced configuration features (see the following sections for specifics):

- "CPU Configuration" on page 23
- "Chipset Configuration" on page 24
- "LAN Configuration" on page 25
- "Network Stack" on page 26
- "Graphics Configuration" on page 27
- "eDP-to-LVDS Configuration" on page 28
- "PCI/PCIE Configuration" on page 29
- "PCI Express Root Port 5" on page 30
- "PCI Express Root Port 6" on page 31
- "SATA Configuration" on page 32
- "USB Configuration" on page 33
- "Power Control Configuration" on page 35
- "TPM Configuration" on page 36
- "Super IO Configuration" on page 37
- "H/W Monitor Configuration" on page 38
- "Serial Port Console Redirection" on page 39
- "Console Redirection Settings (COM0)" on page 40
- "Intel I210-IT Gigabit Network Connections 1 and 2" on page 42
- "NIC Configuration" on page 43


Aptio Setup Utility – Copyright (C) 2017 American Megatrends, Inc.
Main Configuration Security Boot Save & Exit
CPU Configuration
Chipset Configuration
LAN Configuration
Graphics Configuration
PCI/PCIE Configuration
SATA Configuration
USB Configuration
Power Control Configuration
TPM Configuration
Super IO Configuration
H/W Monitor
Serial Port Console Redirection
Intel(R) I210 Gigabit Network Connection - 00:90:FB:5D:BC:38
Intel(R) I210 Gigabit Network Connection - 00:90:FB:5D:BC:39
CPU Configuration Parameters
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
F12: Capture Screen
ESC: Exit
Version 2.18.1263. Copyright (C) 2017 American Megatrends, Inc.

CPU Configuration

Use this screen to configure the specific active cores and advanced processor management technologies.



Active Processor Cores: The number of cores to enable in each processor package. Choices: Disabled (Default), Enabled

Active Processor Cores [Enabled]: Choices:

Core 0: Enabled (Default)
Core 1: Enabled (Default), Disabled
Core 2: Enabled (Default), Disabled
Core 3: Enabled (Default), Disabled

Intel Virtualization Technology: When enabled, a VMM can use the additional hardware capabilities provided by Vanderpool Technology. Choices: Enabled (Default), Disabled

VT-d: Enable/disable CPU VT-d. Choices: Enabled (Default), Disabled

EIST: Enable/disable Intel SpeedStep. Choices: Enabled (Default), Disabled

EIST [Enabled]

Turbo Mode: Enable/disable turbo mode. Choices: Enabled (Default), Disabled

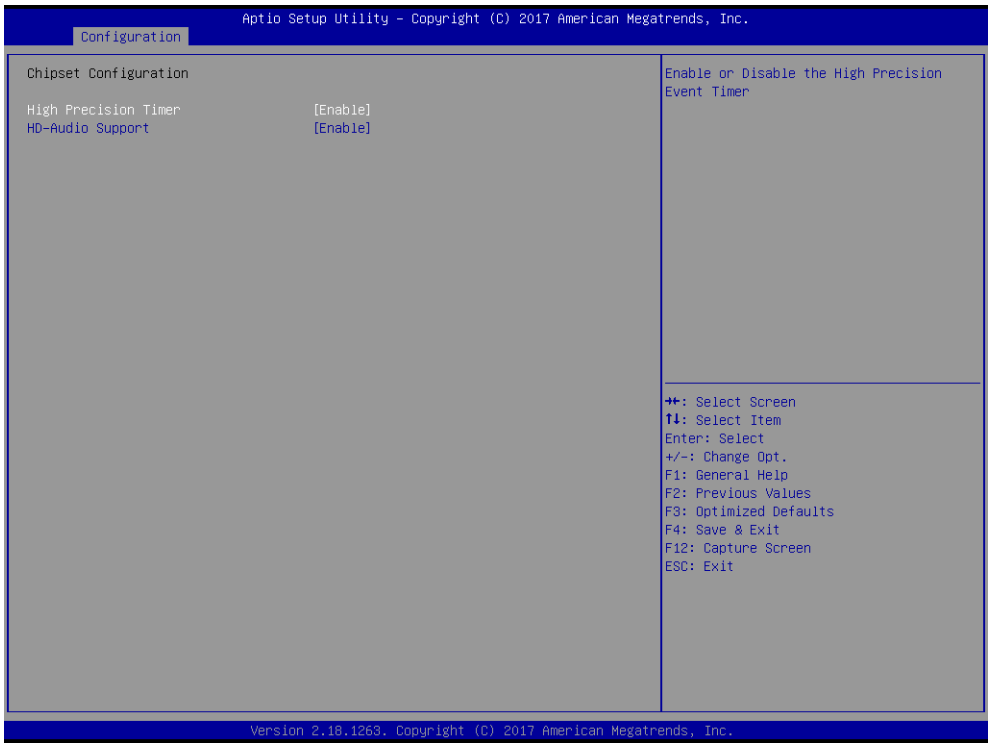
CPU C-states: Enable/disable CPU C states. Choices: Disabled (Default), Enabled

CPU C-states [Enabled]

Enhanced C-states: Enable/disable C1E. When enabled, CPU switches to minimum speed when all cores enter C-State. Choices: Enabled (Default), Disabled

Chipset Configuration

Use this screen to configure the timer and audio features.

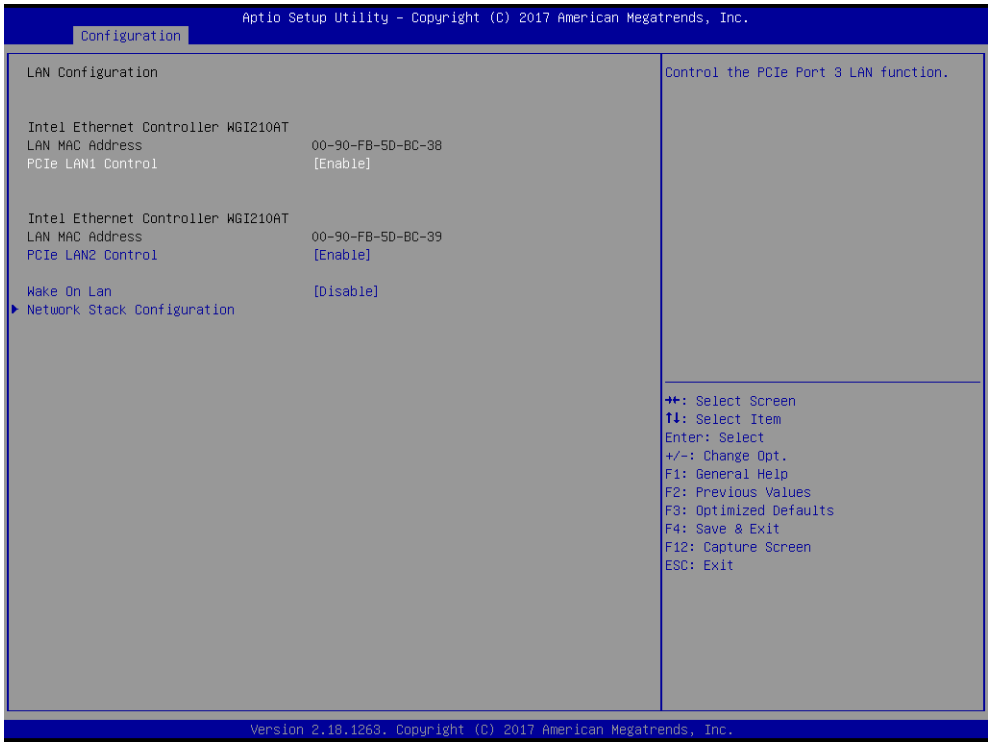


High Precision Timer: Enable/disable the high precision event timer. Choices: Enabled (Default), Disabled

HD-Audio Support: Enable/disable HD-Audio support. Choices: Enabled (Default), Disabled

LAN Configuration

Use this screen to configure the onboard LAN.



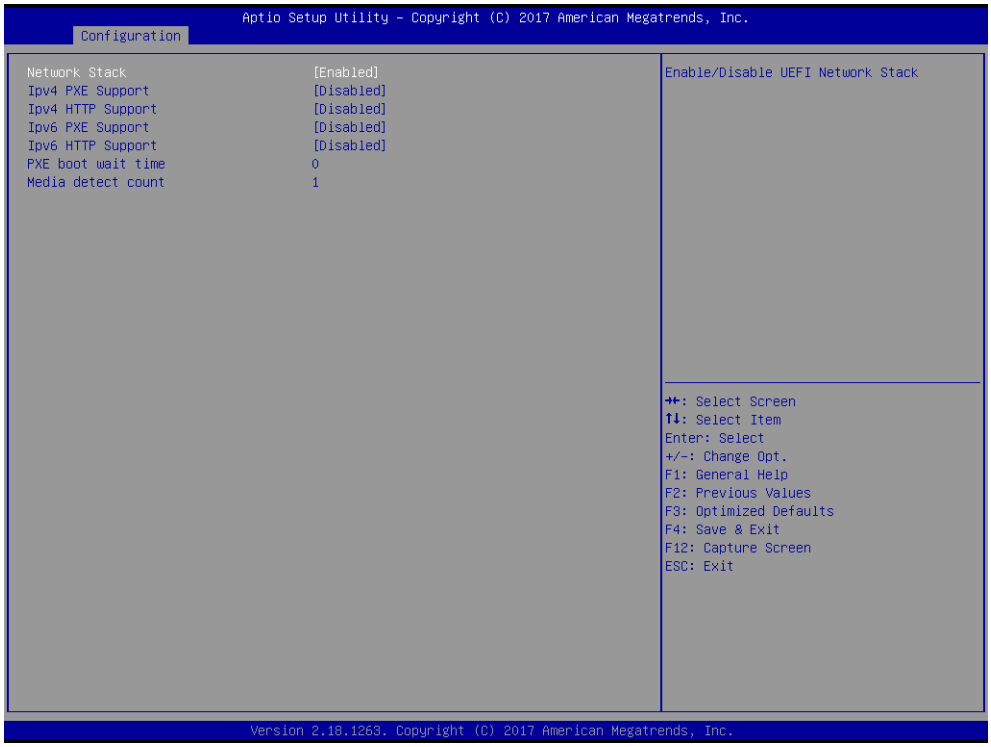
PCIe LAN1 Control: Control the PCIe Port 3 LAN function. Choices: Enabled (Default), Disabled

PCIe LAN2 Control: Control the PCIe Port 4 LAN function. Choices: Enabled (Default), Disabled

Wake on LAN: Enable/disable the Wake on LAN. Choices: Disabled (Default), Enable

Network Stack

Use this screen to configure the network stack.



Network Stack: Enable/disable UEFI network stack. Choices: Disabled (Default), Enable

Network Stack [Enable]

Ipv4 PXE Support: Enable Ipv4 PXE boot support. If disabled Ipv4 PXE boot option is not created. Choices: Disabled (Default), Enabled

Ipv4 HTTP Support: Enable Ipv4 HTTP boot support. If disabled Ipv4 HTTP boot option is not created. Choices: Disabled (Default), Enabled

Ipv6 PXE Support: Enable Ipv6 PXE boot support. If disabled Ipv6 PXE boot option is not created. Choices: Disabled (Default), Enabled

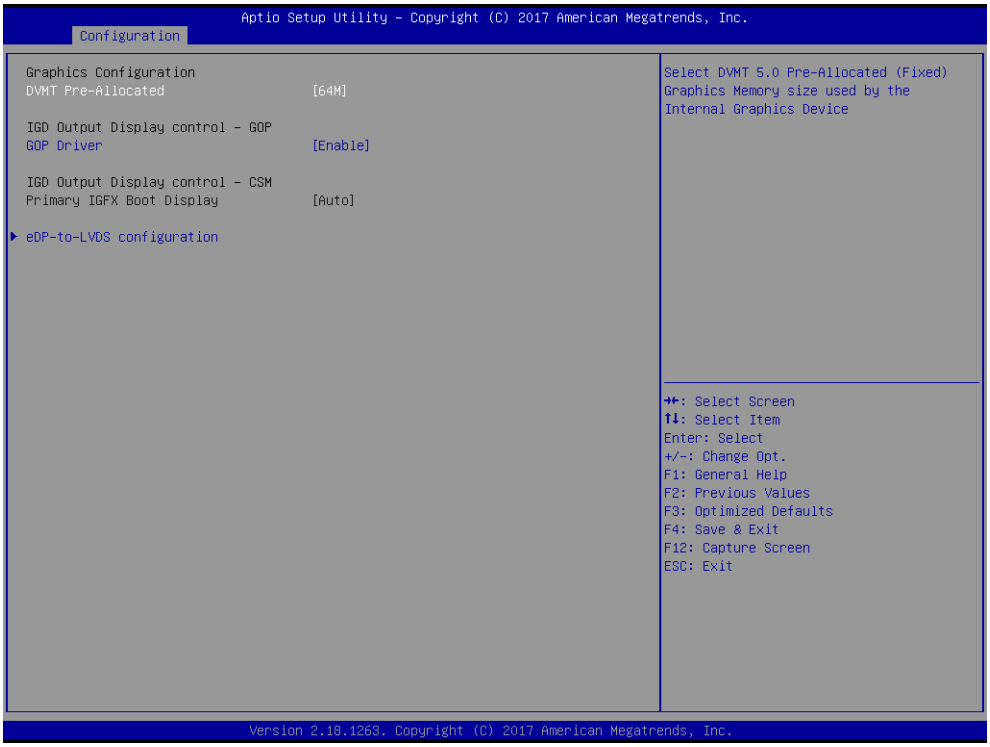
Ipv6 HTTP Support: Enable Ipv6 HTTP boot support. If disabled Ipv6 HTTP boot option is not created. Choices: Disabled (Default), Enabled

PXE boot wait time: Specify wait time to press ESC key to abort the PXE boot. Choices: 0 (Default), 1, 2, 3, 4, 5

Media detect count: Specify number of times presence of media is checked. Choices: 1 (Default), maximum 50

Graphics Configuration

Use this screen to configure the onboard graphics features.



DVMT Pre-Allocated

Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the internal graphics device. Choices: 64M (Default), 96M, 128M, 160M, 192M, 224M, 256M, 288M, 320M, 352M, 384M, 416M, 448M, 480M, 512M

IGD Output Display control – GOP (Boot item CSM Support [Disabled])

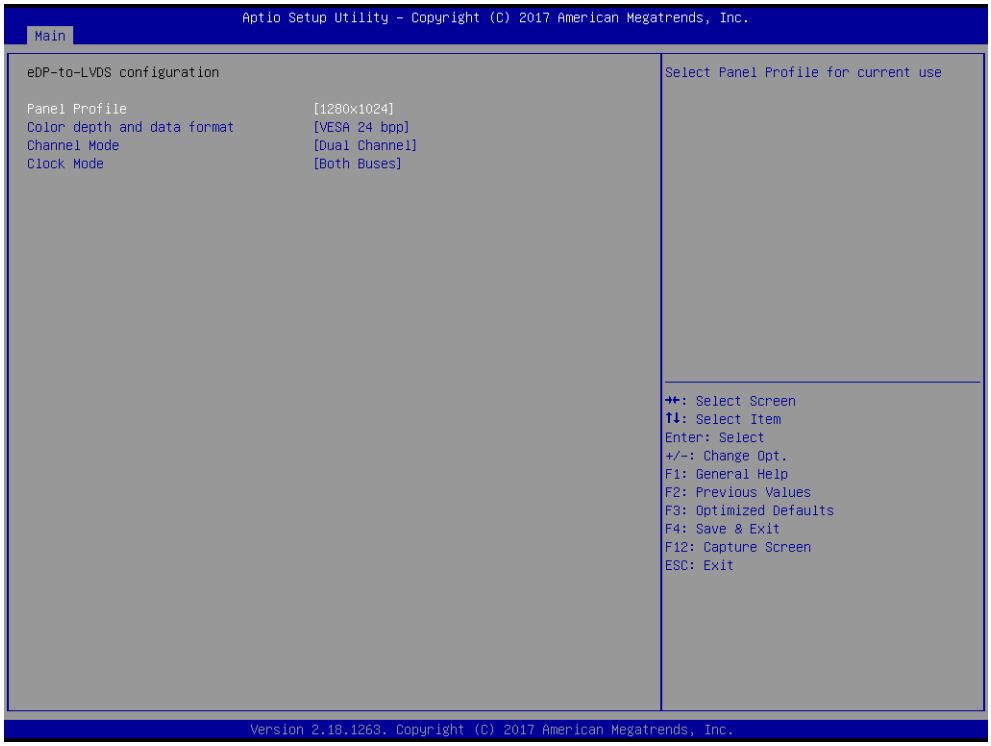
GOP Driver: Enable/disable GOP driver. Enable unloads VBIOS; disable loads VBIOS. Choices: Enabled (Default), Disabled

IGD Output Display control – CSM (Boot item CSM Support [Enabled])

Primary IGFX Boot Display: Select the video device that is activated during POST. This has no effect if external graphics present. Secondary boot display selection appears based on your selection. VGA mode is supported only on the primary display. Choices: Auto (Default), VGA, LVDS, DP

eDP-to-LVDS Configuration

Use this screen to configure the eDP-to-LVDS graphics.



Panel Profile: Select panel profile for current use. Choices: 1280x1024 (Default), 640x480, 800x480, 800x600, 1024x768, 1280x800, 1280x1024,1366x768, 1440x900,1920x1080, OEM Profile

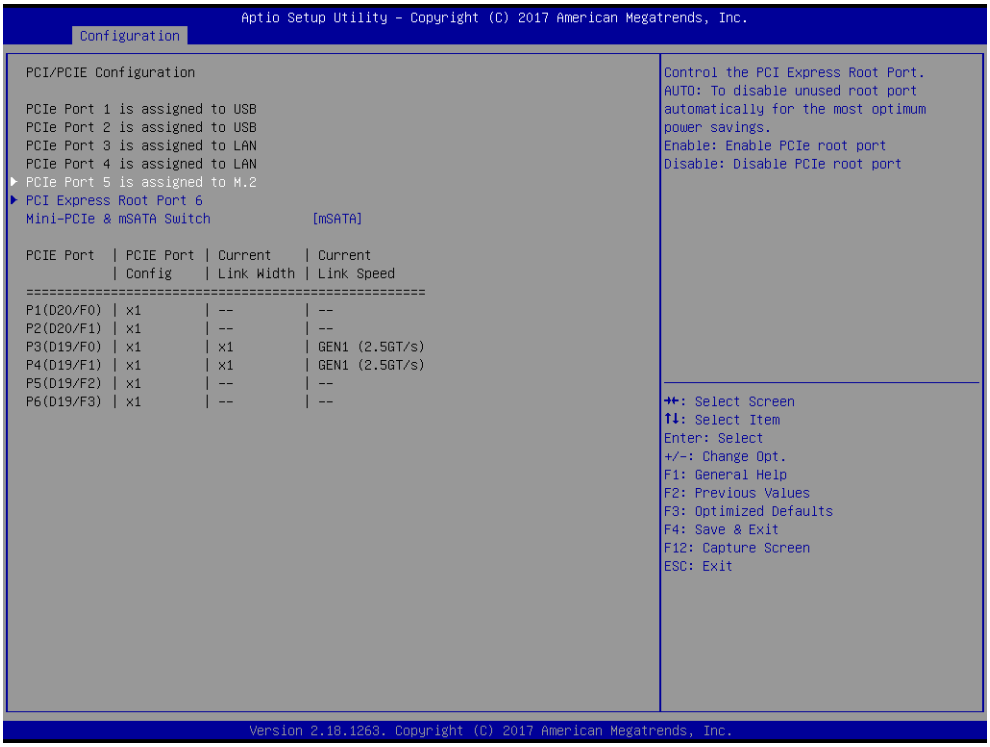
Color depth and data format: Select color depth and data format: Choices: VESA 24 bpp (Default), JEIDA 24 bpp, VESA and JEIDA 18 bpp,

Channel Mode: Select LVDS channel mode. Choices: Dual channel (Default), Single channel

Clock Mode: Select clock output for LVDS. Choices: Both Bus (Default), Even Bus, Odd Bus

PCI/PCIE Configuration

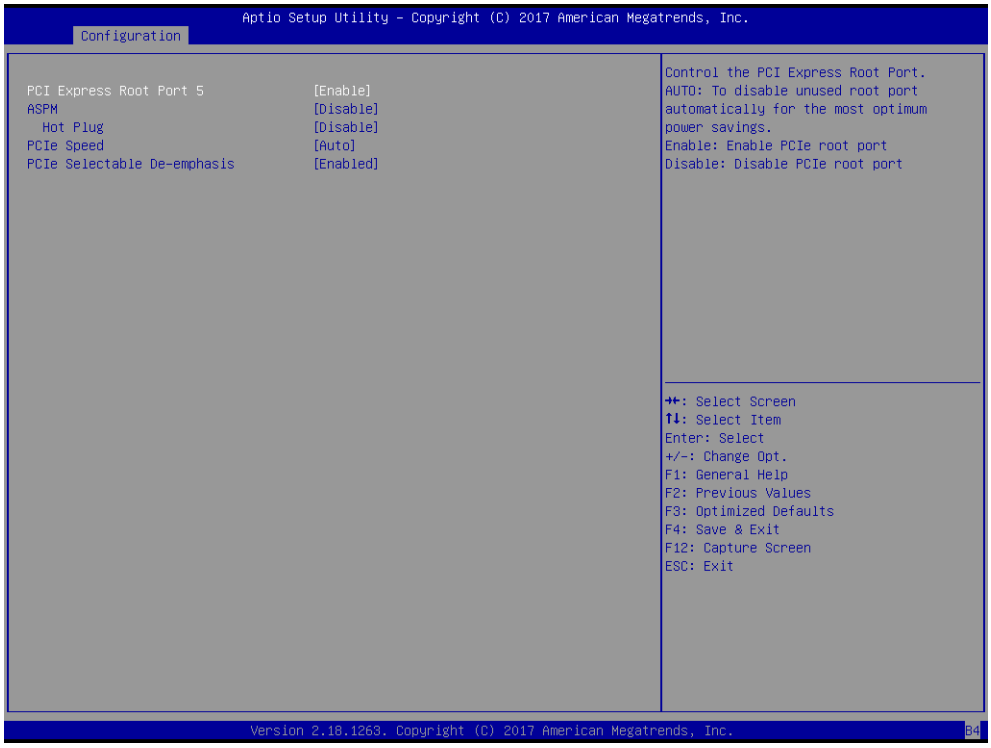
Use this screen to select mSATA or Mini-PCIe.



Mini-PCIe & mSATA Switch: Choices: mSATA (Default), Mini-PCIe

PCI Express Root Port 5

Use this screen to enable and configure the PCIe Port 5 assigned to M.2 parameters.



PCI Express Root Port 5: Controls the PCI express root port. AUTO: To disable unused root port automatically for the most optimum power savings. Choices: Enable (Default, Enable PCIe Root port), Disable (Disable PCIe root port)

ASPM: PCI express active state power management settings. Choices: Disable (Default), L0s, L1, L0sL1, Auto

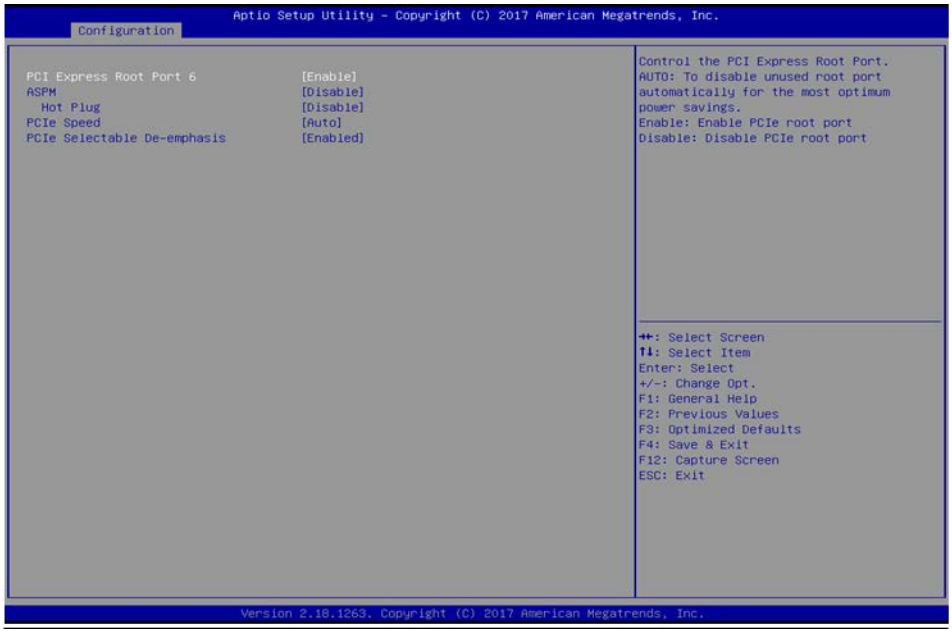
Hot Plug: Enable/disable PCI express hot plug. Choices: Disable (Default), Enable

PCIe Speed: Configure PCIe speed. Choices: Auto (Default), Gen1, Gen2

PCIe Selectable De-emphasis: When the link is operating at 5.0 GT/s, this bit selects the level of de-emphasis for an upstream component. 1b - 3.5 dB, 0b – 6 dB. Choices: Enabled (Default), Disabled

PCI Express Root Port 6

Use this screen to configure PCI express root port 6.



PCI Express Root Port 6: Control the PCI express root port. AUTO: To disable unused root port automatically for the most optimum power savings. Choices: Enable (Default, Enable PCIe Root port), Disable (Disable PCIe root port)

ASPM: PCI express active state power management settings. Choices: Disable (Default), L0s, L1, L0sL1, Auto

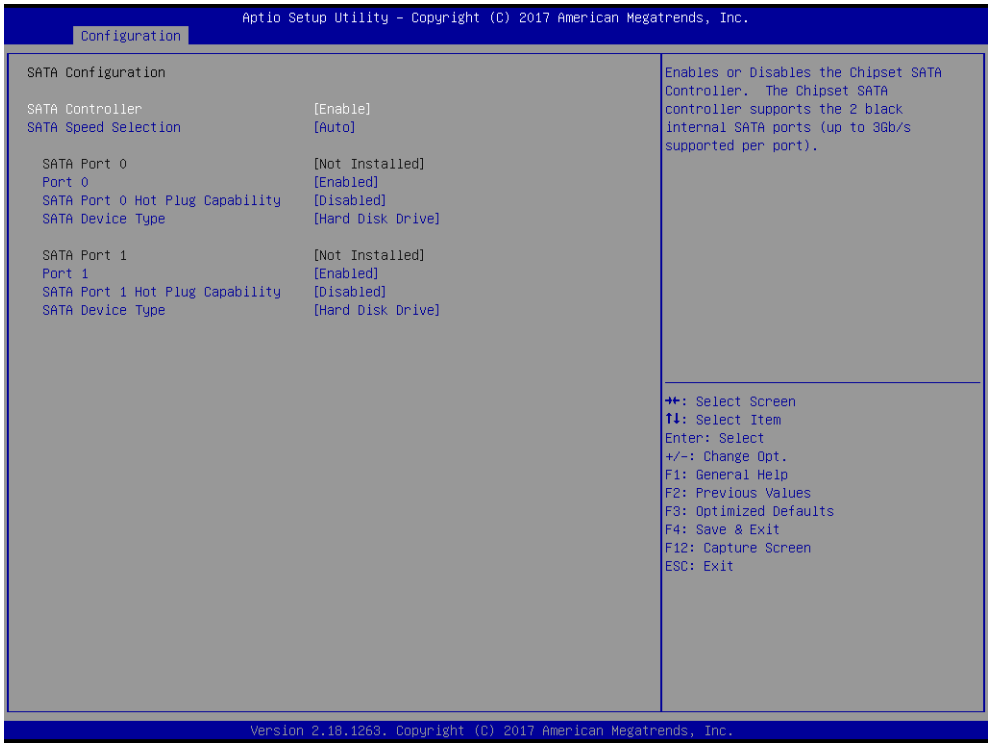
Hot Plug: Enable/disable the PCI express hot plug. Choices: Disable (Default), Enable

PCIe Speed: Configure PCIe speed. Choices: Auto (Default), Gen1, Gen2

PCIe Selectable De-emphasis: When the link is operating at 5.0 GT/s speed, this bit selects the level of de-emphasis for an upstream component. 1b -3.5 dB, 0b – 6 dB. Choices: Enabled (Default), Disabled

SATA Configuration

Use this screen to configure the SATA device options settings.



SATA Controller: Enable/disable the chipset SATA controller. The chipset controller supports the two black internal SATA ports (up to 3 Gb/s supported per port). Choices: Enable (Default), Disable

SATA Speed Selection: Select SATA interface speed. Choices: Auto (Default), Gen1, Gen2, Gen3

SATA Port 0

Port 0: Enable/disable SATA port. Choices: Enabled (Default), Disabled

SATA Port 0 Hot Plug Capability: Enable/disable SATA port 0 hot plug capability. If enabled, SATA port is reported as hot plug capable. Choices: Disabled (Default), Enabled

SATA Device Type: Identify whether the SATA port is connected to a solid state drive. Choices: Hard Disk Drive (Default), Solid State Drive

SATA Port 1

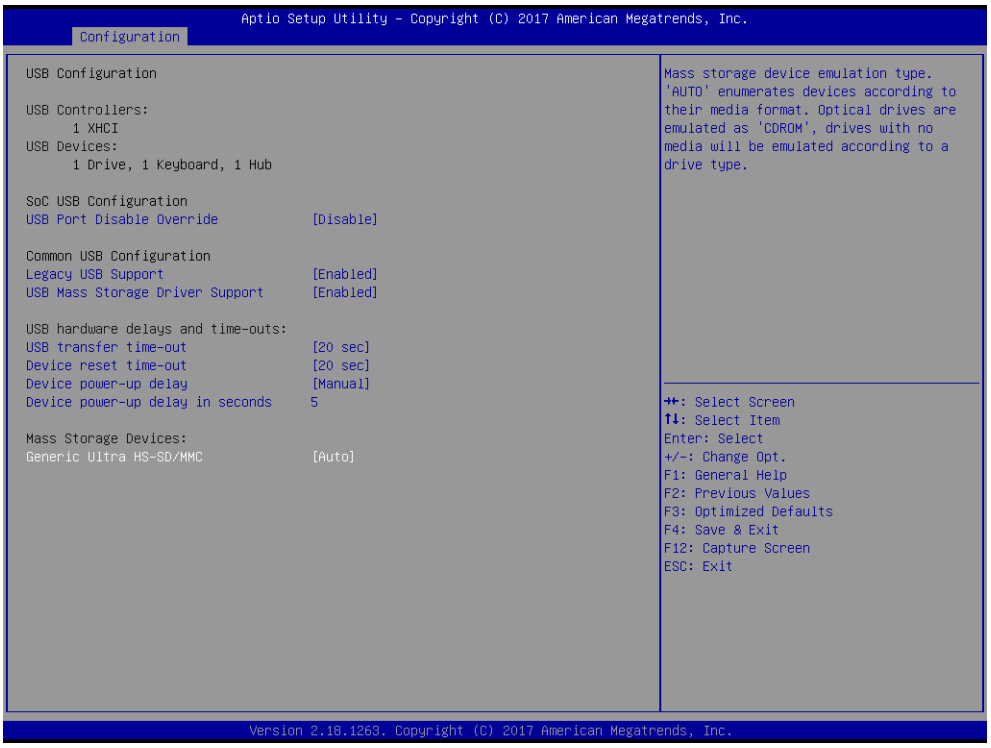
Port 1: Enable/disable SATA port. Choices: Enabled (Default), Disabled

SATA Port 1 Hot Plug Capability: If enabled, SATA port is reported as hot plug capable. Choices: Disabled (Default), Enabled

SATA Device Type: Identify whether the SATA port is connected to a hard disk drive or a solid state drive. Choices: Hard Disk Drive (Default), Solid State Drive

USB Configuration

Use this screen to set the USB configuration parameters.



SoC USB Configuration

USB Port Disable Override: Selectively enable/disable the corresponding USB port from reporting a device connection to the controller. Choices: Disable (Default), Enable

USB Port Disable Override [Enable]

USB Port #0-3: Enable/disable the USB port. When disabled, any USB devices plugged into the connector is not detected by BIOS or OS. Choices: Enable (Default), Disabled

USB 3 Port #0-3: Enable/disable the USB port. When disabled, any USB devices plugged into the connector is not detected by BIOS or OS. Choices: Enable (Default), Disabled

Common USB Configuration

Legacy USB Support: Enables legacy USB support. Auto: Disable legacy support if no USB devices are connected. Disable: Keep USB device

available only for EFI applications. Choices: Enabled (Default), Disabled, Auto

USB Mass Storage Driver: Enable/disable USB mass storage driver support. Choices: Enabled (Default), Disabled

USB Hardware delays and time-outs

USB transfer time-out: The time-out value for control, bulk, and Interrupt transfers. Choices: 20 sec (Default), 1 sec, 5 sec, 10 sec

Device reset time-out: USB mass storage device start unit command time-out. Choices: 20 sec (Default), 10 sec, 30 sec, 40 sec

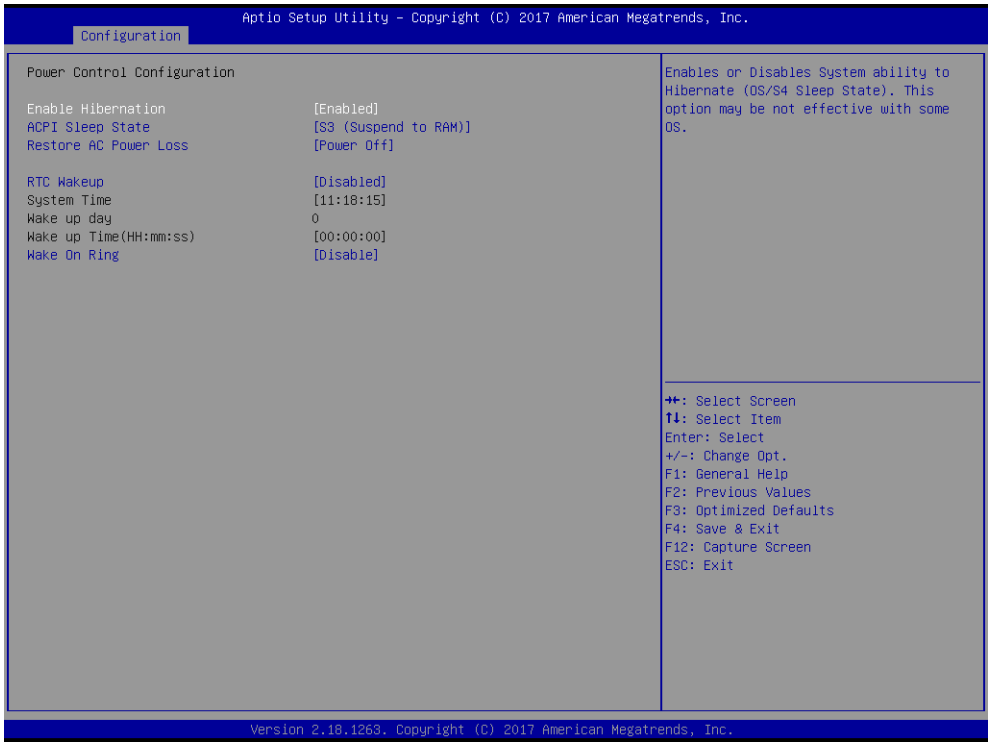
Device power-up delay: Maximum time the device takes before it properly reports itself to the host controller. Auto uses the default value: 100 ms for a root port; for a hub port the delay is taken from hub descriptor. Choices: Auto (Default), Manual

Mass Storage Devices

Generic Ultra HS-SD/MMC: Mass storage device emulation type. AUTO enumerates devices according to their media format. Optical drives are emulated as CDROM, drives with no media are emulated according to a drive type. Choices: Auto (Default), Floppy, Forced FDD, Hard Disk, CD-ROM

Power Control Configuration

Use this screen to set the system power control configuration parameters.



Enable Hibernation: Enable/disable the system's ability to hibernate (OS/S4 sleep state). This option may be not effective with some OSes. Choices: Enabled (Default), Disabled

ACPI Sleep State: Select the highest ACPI sleep state the system enters when the SUSPEND button is pressed. Choices: S3 (Suspend to RAM, Default), Suspend Disabled

Restore AC Power Loss: Specify what state to go to when power is re-applied after a power failure (G3 state). Power On: System boots as soon as power is applied. Power Off: System remains in power-off state until power button is pressed. Choices: Power Off (Default), Power On, Last State

RTC Wake up: Enable/disable system wake on alarm event. Enabled: System waked up at the Hour: Min: Sec specified. Disabled: Turn off RTC Wakeup. Choices: Disabled (Default), Enabled

RTC Wake up [Enabled]

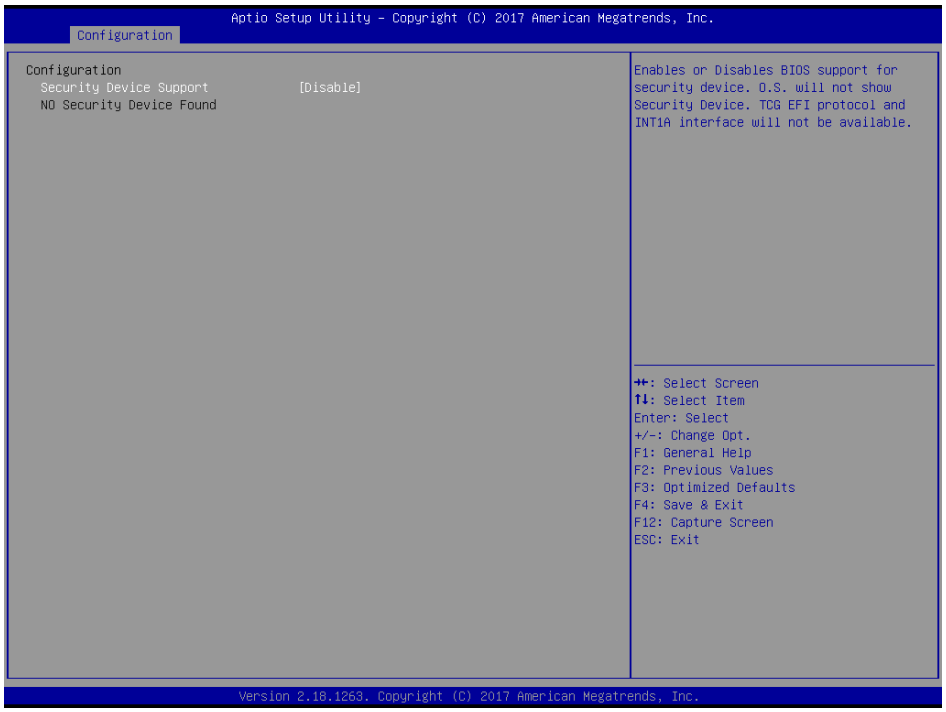
Wake up day: Select 0 for daily system wake up 1-31 for which day of the month that you want the system to wake up. Choices: 0 (Default), 0-31

Wake up Time(HH: mm: ss): Use [Enter], [TAB] to select field, HH: 0-23, mm: 0-59, ss: 0-59. Choices: HH: 0-23, mm: 0-59, ss: 0-59

Wake On Ring: Enable/disable wake on ring. Choices: Disable (Default), Enable

TPM Configuration

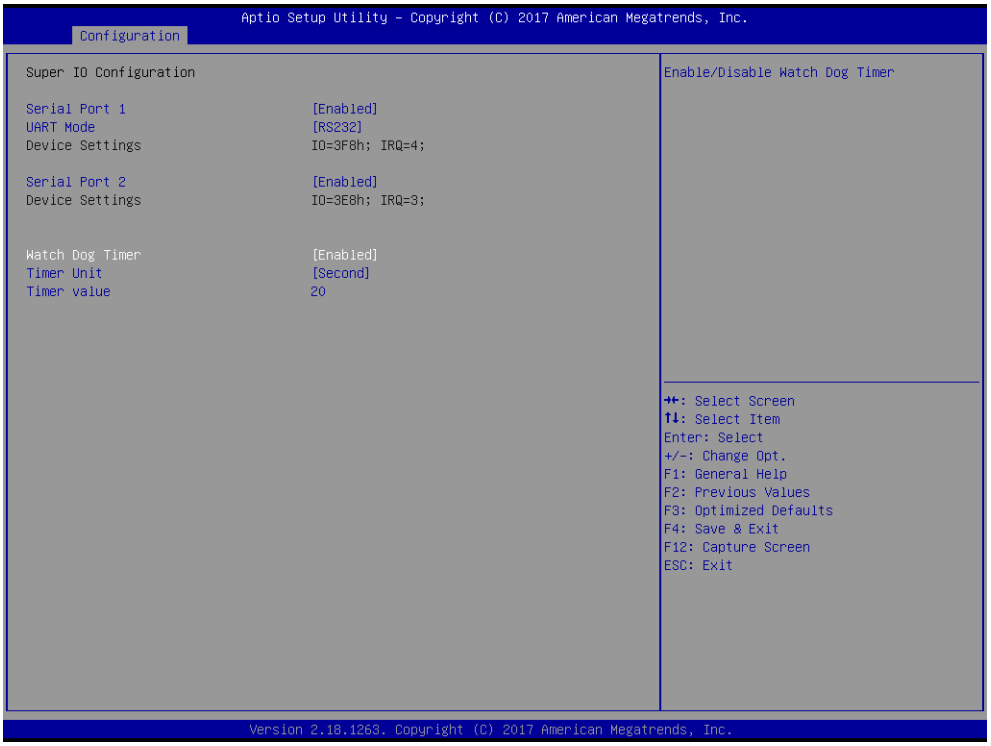
Use this screen to set the trusted computing setting parameter.



Security Device Support: Enable/disable BIOS support for security device. The OS does not show the security device. TCG EFI protocol and INT1A Interface is not available. Choices: Disabled (Default), Enabled

Super IO Configuration

Use this screen to set the system super I/O chip parameters.



Serial Port 1: Enable/disable serial port (COM). Choices: Enabled (Default), Disabled

UART Mode: Set current UART mode: RS232, RS485, RS485/422. Choices: RS-232 (Default), RS-485 HALF DUPLEX, RS-485/422 FULL DUPLEX

Serial Port 2: Enable/disable serial port (COM). Choices: Enabled (Default), Disabled

Watch Dog Timer: Enable/disable WDT. Choices: Disabled (Default), Enabled

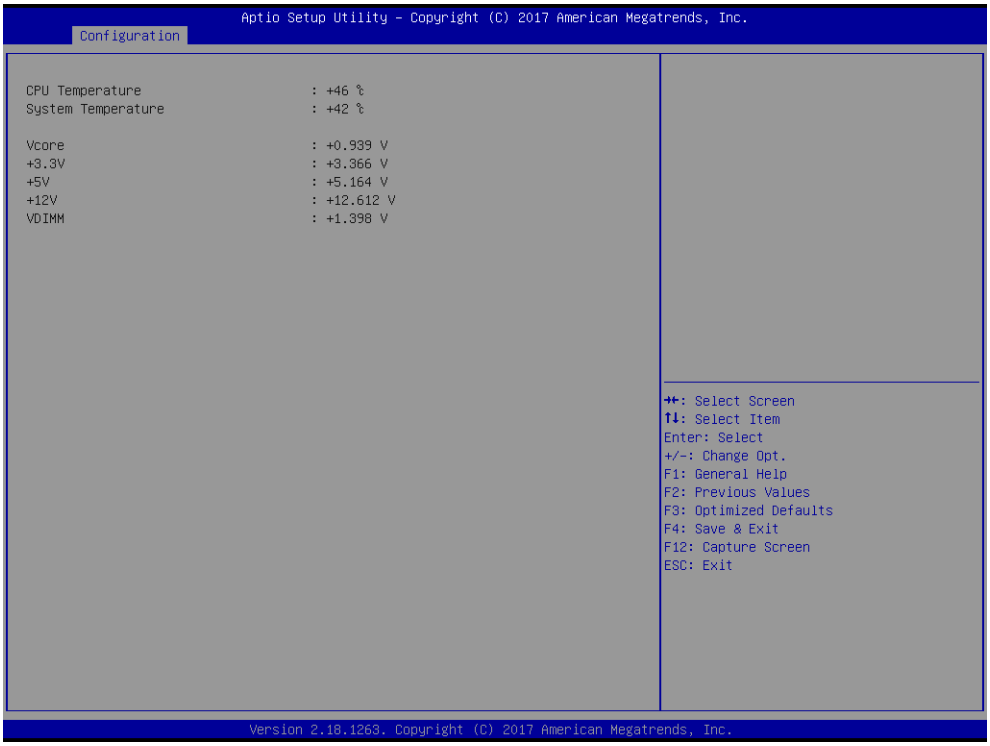
Watch Dog Timer [Enabled]

Timer Unit: Select timer count unit of WDT. Choices: Second (Default), Minute

Timer value: Set WDT timer value seconds/minutes. Choices: 20 (Default), 1-255 (Minute), 10-255 (Second)

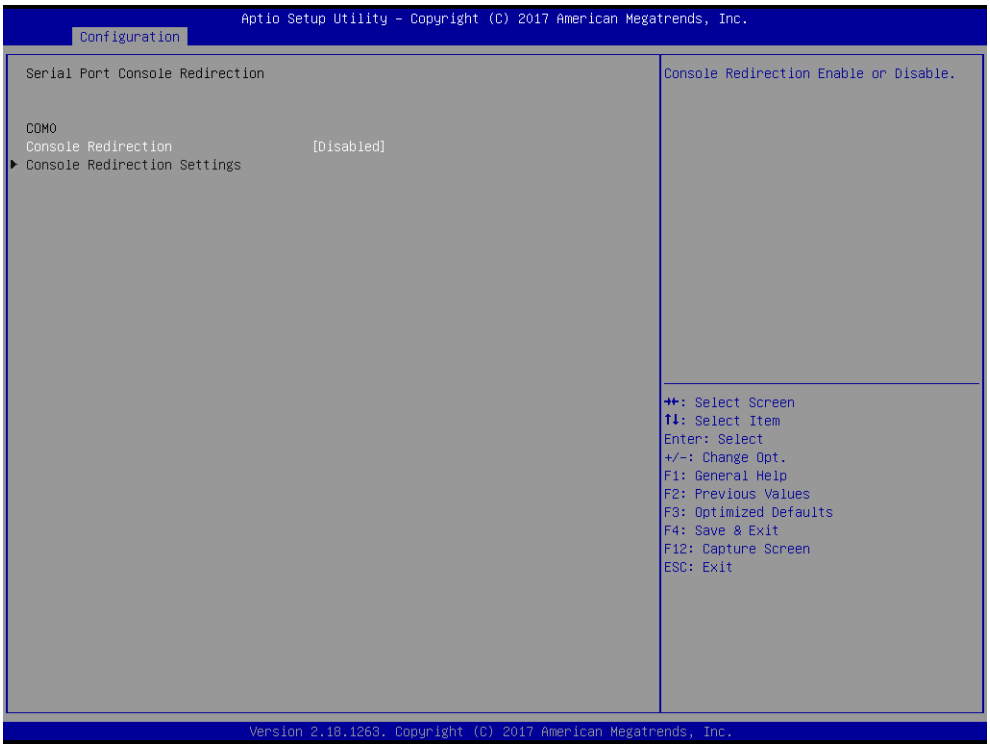
H/W Monitor Configuration

Use this screen to display the hardware status. There are no editable settings on this screen.



Serial Port Console Redirection

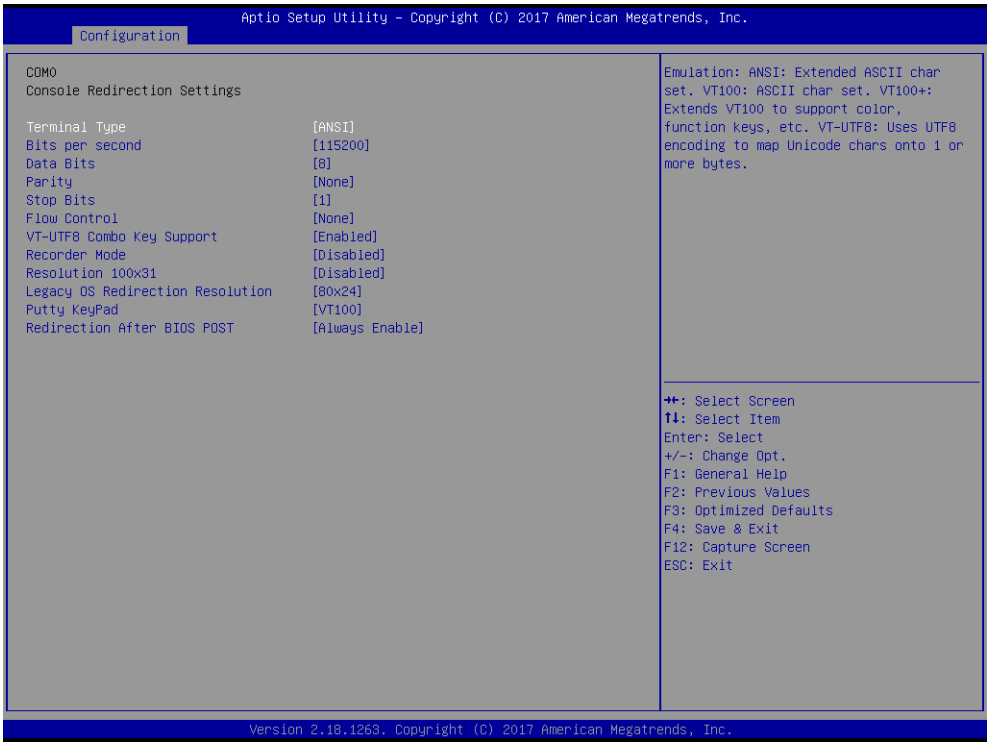
Use this screen to access and to enable/disable serial port console redirection settings.



Console Redirection: Enable/disable console redirection. Choices: Disabled (Default), Enabled

Console Redirection Settings (COM0)

Use this screen to specify how the host computer and the remote computer (which the user is using) exchange data. Both computers should have the same or compatible settings.



Terminal Type Emulation: *ANSI:* Extended ASCII char set. *VT100:* ASCII char set. *VT100+:* Extends VT100 to support color, function keys, etc. VT-*UTF8:* Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. Choices: ANSI (Default), VT100, VT100+, VT-UTF8

Bits per second: Select serial port transmission speed. The speed must be matched on other side. Long or noisy lines may require lower speeds. Choices: 115200 (Default), 9600, 19200, 38400, 57600

Data bits: Set data bits. Choices: 8 (Default), 7

Parity: A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the number of 1's in the data bits is even. Odd: parity bit is 0 if the number of 1's in the data bits is odd. Mark: parity bit is always 1. Space: parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit. Choices: None (Default), Even, Odd, Mark, Space

Stop Bits: Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning.) The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit. Choices: 1 (Default), 2

Flow Control: Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals. Choices: None (Default), Hardware RTS/CTS

VT-UTF8 Combo Key Support: Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals. Choices: Enabled (Default), Disabled

Recorder Mode: Enable/disable recorder mode. With this mode enabled only text is sent. This is to capture terminal data. Choices: Disabled (Default), Enabled

Resolution 100x31: Enable/disable extended terminal resolution. Choices: Disabled (Default), Enabled

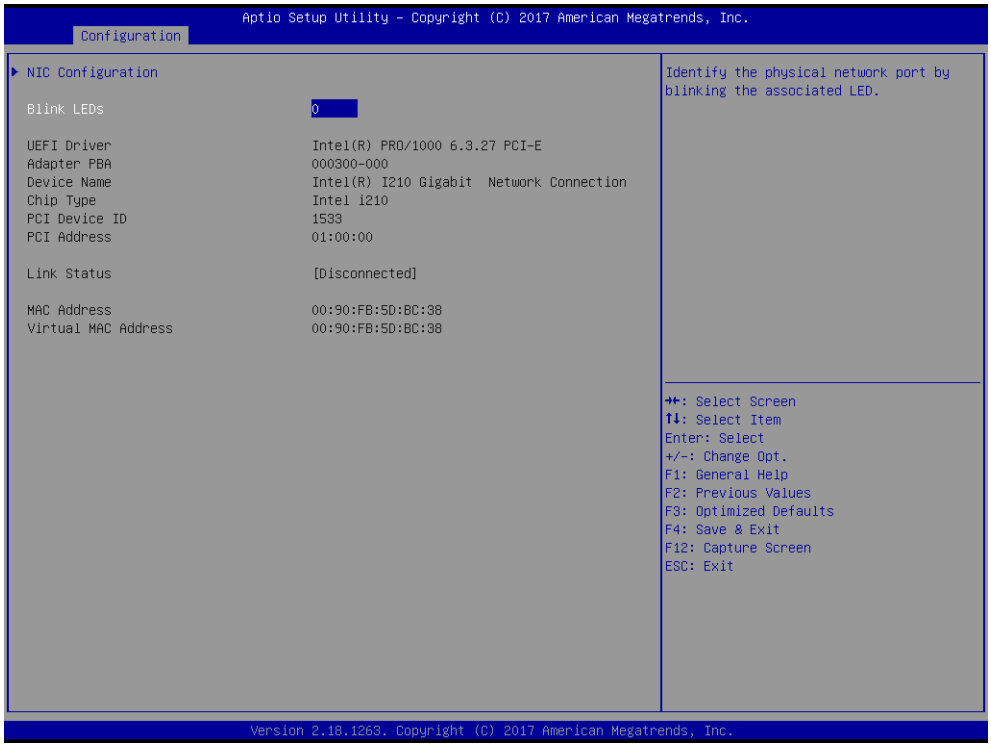
Legacy OS Redirection Resolution: On Legacy OS, the number of rows and columns that support redirection. Choices: 80x24 (Default), 80x25

Putty KeyPad: Select the function key and key pad on Putty. Choices: VT100 (Default), LINUX, XTERMR6, SCO,ESCN,VT400

Redirection After BIOS POST: When BootLoader is selected, then Legacy console redirection is disabled before booting to legacy OS. When Always Enable is selected, then Legacy Console Redirection is enabled for legacy OS. Default setting for this option is set to Always Enable. Choices: Always Enable (Default), BootLoader

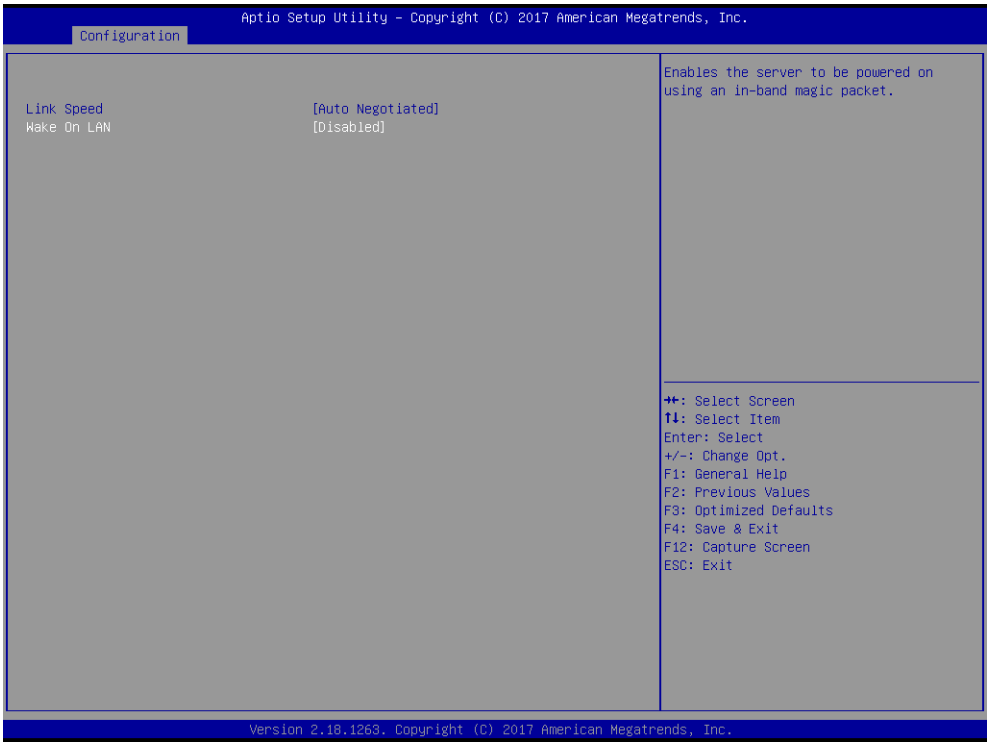
Intel I210-IT Gigabit Network Connections 1 and 2

Use this screen to access the I210-IT Gigabit Network connection device parameters.



NIC Configuration

Use this screen to specify the port speed used for the selected boot protocol.



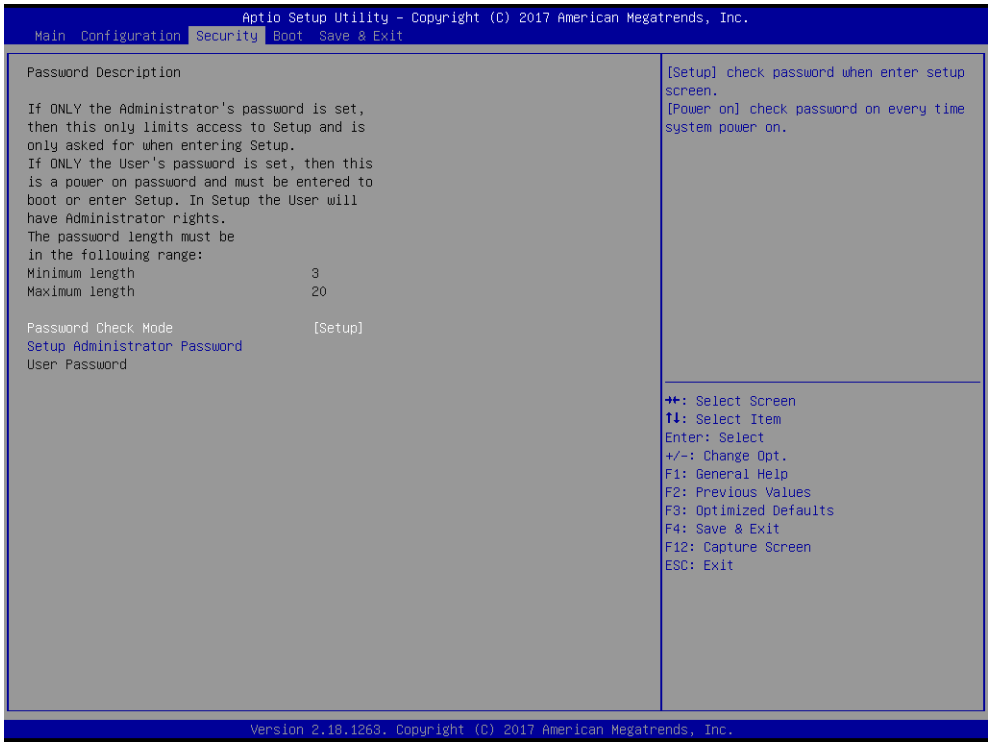
Link Speed: Specify the port speed used for the selected boot protocol. Choices: Auto Negotiated (Default), 10 Mbps Half, 10 Mbps Full, 100 Mbps Half, 100 Mbps Full

Wake On LAN: Enable/disable the server to be powered on using an in-band magic packet. Choices: Disabled (Default), Enabled

Blink LEDs: Identify the physical network port by blinking the associated LED for n amount of seconds set. Choices: 0 - 10 (seconds), 0 (Default)

Security

Use this screen to set security passwords to control system access at boot time or when entering the BIOS setup program.

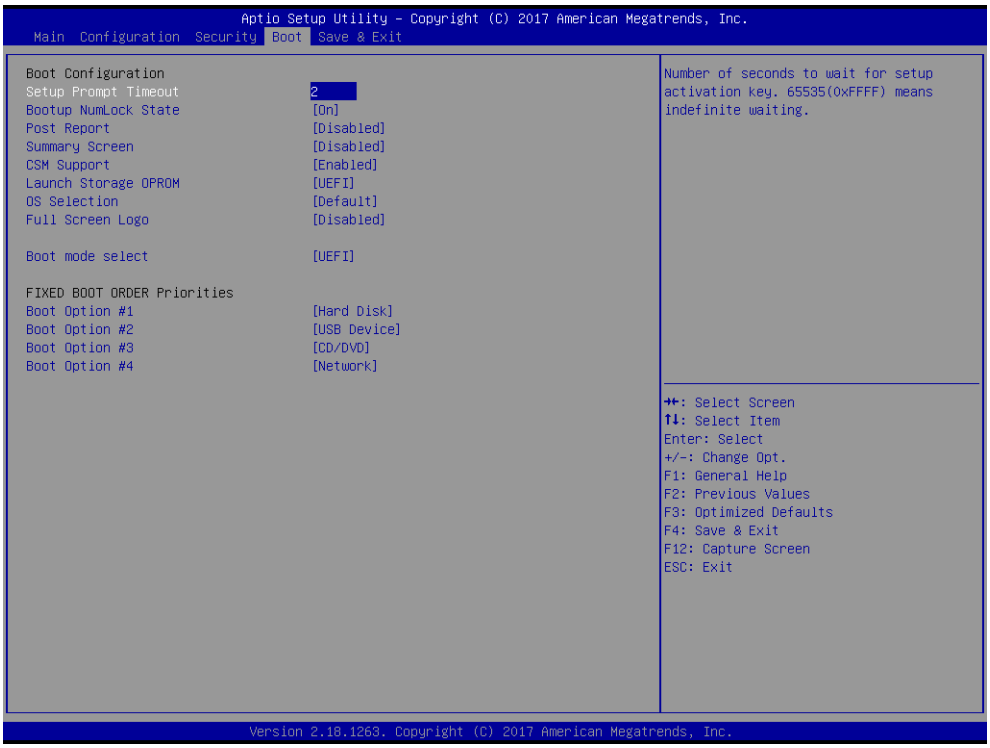


Password Check Mode: *Setup:* Check password when entering setup screen. *Power on:* Check password on every time system is powered on. Choices: Setup (Default), Power on

Setup Administrator Password: Set administrator password. No default setting.

Boot

Use this screen to specify the priority of boot devices and to set other boot options.



Setup Prompt Timeout: Set the number of seconds to wait for setup activation key. 65535 (0Xffff) means indefinite waiting. Choices: 2 (Default), 1-65535

Bootup NumLock State: Select the keyboard NumLock state. Choices: On (Default), Off

Post Report: Enable/disable post report support. Choices: Disabled (Default), Enabled

Summary Screen: Enable/disable Summary Screen support. Choices: Disabled (Default), Enabled

CSM Support: Enable/disable CSM support. Choices: Disabled (Default), Enabled

CSM Support [Enabled]

Launch Storage OPROM: Control the execution of UEFI and legacy storage OpROM. Choices: UEFI (Default), Do not launch, Legacy

Warning
The operating system (OS) may not boot if this setting is changed after the OS is installed.

OS Selection: [Default] To Win8/8.1/10; [Other] Android/Linux; [Legacy System] Win7/DOS; This item setting affects LPSS and XHCI hand-off item setting. Choices: Default (Win8/8.1/10), Others, Legacy System, Intel Linux

Full Screen Logo: Enable/disable Quiet Boot option and full-screen Logo. Choices: Disabled (Default), Enabled

Boot mode select: Select boot mode LEGACY/UEFI. Choices: UEFI (Default), Legacy

FIXED BOOT ORDER Priorities

Boot Option #1: Set the system boot order. Choices: Hard Disk (Default), USB Device, CD/DVD, Network, Disabled

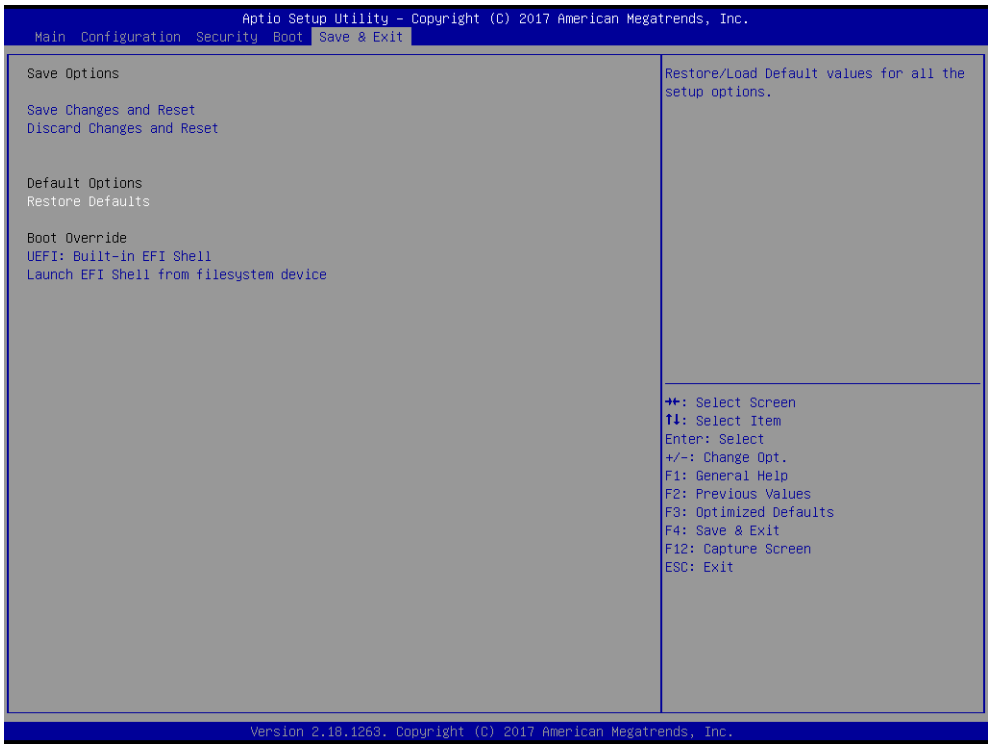
Boot Option #2: Set the system boot order. Choices: USB Device (Default), Hard Disk, CD/DVD, Network, Disabled

Boot Option #3: Set the system boot order. Choices: CD/DVD (Default), USB Device, Hard Disk, Network, Disabled

Boot Option #4: Set the system boot order. Choices: Network (Default), CD/DVD, USB Device, Hard Disk, Disabled

Save & Exit

Use this screen to save or discard changes made to BIOS settings, or to restore the system to the default BIOS settings.



Save Changes and Reset: Reset the system after saving the changes.

Discard Changes and Reset: Reset system setup without saving any changes.

Restore Defaults: Restore/load default values for all setup options.

UEFI: Built-in EFI Shell: Boot option filter (UEFI only). Resets the system after saving the changes.

Launch EFI Shell from filesystem device: Attempt to launch EFI shell application (Shell.efi) from one of the available filesystem devices.

10. Troubleshooting

This section provides useful tips to get the SYS-ITX-N-3900 operating. For basic hardware installation and configuration, refer to "Installation and Connections" on page 10. This section addresses system integration issues in terms of BIOS setting and OS diagnostics.

10.1 BIOS settings

This section assumes that you have correctly selected and connected all devices with the required cables before applying power. If this is in question, inspect the connection and application of each of the following components: 204-pin DDR3 memory, keyboard, mouse, SATA hard disk, VGA connector, power cable of the device, and all ATX accessories. Failure of any of these components can cause a system failure.

It is recommended that you press the **DELETE** or **ESC** key and enter the BIOS setup menu during the initial boot-up sequence to configure a stable BIOS configuration that can be woken.

10.1.1 Loading the Default Optimal Setting

NOTE If the system appears to be unstable during startup, you can try loading the default BIOS configuration to see if this solves the issue.

When prompted in the main setup menu, load setup defaults:

1. Apply power to an installed SYS-ITX-N-3900 and press **DELETE** or **ESC** to enter the BIOS setup menu.
2. Select the **Save & Exit** menu and then scroll to **Restore Defaults**.
3. Press **Enter**.
4. To load the default optimal BIOS setup, select **Yes**. This forces the BIOS settings back to the initial factory configuration.

10.1.2 Reset CMOS BIOS Configuration

You can use jumpers to reset the BIOS CMOS settings to the factory default. Enable or disable the Clear CMOS Function hardware circuit by placing or removing the jumper from JP3 as needed. See "CMOS Clear (JP3)" on page 18.

To reset the BIOS CMOS configuration to the factory default settings:

1. Remove power from the SYS-ITX-N-3900.
2. Find JP3.
3. Remove jumpers from pins 1-2.
4. Install jumpers on pins 2-3 and wait five seconds.

5. Replace jumpers on pins 1-2.

10.1.3 Update BIOS

1. Obtain the ROM file and flash utility. See “Cables and Software Drivers” on page 49.
2. Extract the files from the zip archive to the root directory of a bootable USB flash drive. The three required files are Shell Flash 32.efi, temp.bin, and Update.nsh.
3. Insert the USB flash drive in a USB port on the SYS-ITX-N-3900 and apply power to the embedded computer.
4. Boot to EFI-Shell mode.
5. At the prompt, enter the command `fs0:` to change to the root directory of the USB drive.
6. At the root directory of the USB drive, enter the command `update` to start the updating the BIOS.
7. When the update has completed, there is a 5-second pause and then the computer automatically restarts.
8. Press **DELETE** or **ESC** to open the BIOS setup menu and select **Restore Defaults**.
9. To finish the update, select **Save & Exit**.

11. Cables and Software Drivers

Go to https://www.winsystems.com/ for cable information and software drivers.

Appendix A. Best Practices

This section outlines the best practices for operating the SYS-ITX-N-3900 in a safe and effective manner that does not damage the board. Please read this section carefully.

Avoid Electrostatic Discharge (ESD)
Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

Power Supply

Power Supply Budget

Evaluate your power supply budget. It is good practice to budget twice the typical power requirement for all of your devices.

Zero-Load Power Supply

Use a zero-load power supply whenever possible. A zero-load power supply does not require a minimum power load to regulate. If a zero-load power supply is not appropriate for your application, then verify that the embedded computer's typical load is not lower than the power supply's minimum load. If the embedded computer does not draw enough power to meet the power supply's minimum load, then the power supply does not regulate properly and can cause damage to the SYS-ITX-N-3900.

Use Proper Power Connections (Voltage)
When verifying the voltage, measure it at the power connector on the SYS-ITX-N-3900. Measuring it at the power supply does not account for voltage drop through the wire and connectors.

Power the SYS-ITX-N-3900 using J1 (+12 V DC). Verify the power connections. Incorrect voltages can cause catastrophic damage.

Power Harness

Minimize the length of the power harness. This reduces the amount of voltage drop between the power supply and the SYS-ITX-N-3900.

Gauge Wire

Use the largest gauge wire available for your application and connector. Most connector manufacturers have a maximum gauge wire they recommend for their pins.

Contact Points

For maximum reliability, WINSYSTEMS boards typically use connectors with gold finish contacts. It is critical that the contact material in the mating connectors is matched properly (gold to gold and tin to tin). Contact areas made with dissimilar metals can cause oxidation/corrosion, resulting in unreliable connections.

Pin Contacts

The pin contacts used in cabling are not given enough attention. The ideal choice for a pin contact uses a design similar to Molex's or Trifurcon's design that provides three distinct points to maximize the contact area and improve connection integrity in high shock and vibration applications.

Power Down

Make sure that power has been removed from the system before making or breaking any connections.

Power Supply OFF—The power supply should always be off before it is connected to the I/O module. Do not hot-plug the SYS-ITX-N-3900 on a host platform that is already powered.

I/O Connections OFF—I/O connections should also be off before connecting them to the embedded computer modules or any I/O cards. Connecting hot signals can cause damage whether the embedded system is powered or not.

Conformal Coating

Applying conformal coating to a WINSYSTEMS product does not in itself void the product warranty, if it is properly removed prior to return. Coating may change thermal characteristics and impedes our ability to test, diagnose, and repair products. Any coated product sent to WINSYSTEMS for repair will be returned at customer expense and no service will be performed.

Operations/Product Manuals

Every embedded computer has an Operations manual or Product manual.

Periodic Updates—Operations/Product manuals are updated often. Periodically check the WINSYSTEMS website (https://www.winsystems.com/) for revisions.

Check Pinouts—Always check the pinout and connector locations in the manual before plugging in a cable. Many I/O modules have identical

headers for different functions and plugging a cable into the wrong header can have disastrous results.

Contact an Applications Engineer—If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact a WINSYSTEMS Applications Engineer at: +1-817-274-7553.

Appendix B. Warranty Information

WINSYSTEMS warrants that for a period of two (2) years from the date of shipment, any Products and Software purchased or licensed hereunder which have been developed or manufactured by WINSYSTEMS shall be free of any defects and shall perform substantially in accordance with WINSYSTEMS' specifications therefor. With respect to any Products or Software purchased or licensed hereunder which have been developed or manufactured by others, WINSYSTEMS shall transfer and assign to Customer any warranty of such manufacturer or developer held by WINSYSTEMS, provided that the warranty, if any, may be assigned. The sole obligation of WINSYSTEMS for any breach of warranty contained herein shall be, at its option, either (i) to repair or replace at its expense any materially defective Products or Software, or (ii) to take back such Products and Software and refund the Customer the purchase price and any license fees paid for the same. Customer shall pay all freight, duty, broker's fees, insurance, charges and other fees and charges for the return of any Products or Software to WINSYSTEMS under this warranty. WINSYSTEMS shall pay freight and insurance charges for any repaired or replaced Products or Software thereafter delivered to Customer within the United States. All fees and costs for shipment outside of the United States shall be paid by Customer. The foregoing warranty shall not apply to any Products or Software which have been subject to abuse, misuse, vandalism, accident, alteration, neglect, unauthorized repair or improper installation.

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Title to the Products shall remain vested in WINSYSTEMS until complete payment is made by Customer. Title to any Software shall remain vested in WINSYSTEMS, or WINSYSTEMS' licensor from whom WINSYSTEMS has obtained marketing rights, both before, during and after the term of the License. Nonpayment when due of the purchase price for any Products or the License fees for any Software, or, if applicable, taxes and/or the cost of any freight and insurance for any Products and/or Software, shall entitle WINSYSTEMS to take possession of the Products and/or Software without notice to Customer or prejudice to WINSYSTEMS' rights under contract or any other legal remedy.

Until title to the Products pass in accordance with the provision set out above, except with the prior written approval of WINSYSTEMS, no Products shall be modified, altered, moved or in any way assigned, sublet, mortgaged or charged nor may Customer part with possession of all or part of the same.

There are no understandings, agreements or representations, express or implied, other than those set forth herein. This Order embodies the entire agreement between the parties and may be waived, amended or supplemented only by a written instrument executed jointly by WINSYSTEMS and Customer as evidenced only by the signature of duly authorized officers of each party. The foregoing terms and conditions of any order which may be issued by Customer for the purchase of Products or licensing of Software hereunder.

In the event this Order is placed in the hands of an attorney or collection agency by WINSYSTEMS to collect any sums due hereunder to WINSYSTEMS, Customer shall pay all reasonable attorney's fees, expenses, collection and court costs incurred by WINSYSTEMS.

THIS AGREEMENT SHALL BE GOVERNED AND CONSTRUED UNDER THE TEXAS UNIFORM COMMERCIAL CODE AND THE APPLICABLE LAWS OF THE STATE OF TEXAS. THE PARTIES ACKNOWLEDGE THAT ANY ACTION BROUGHT HEREUNDER SHALL ONLY BE BROUGHT IN A COURT OF COMPETENT JURISDICTION IN TARRANT COUNTY, TEXAS.

Warranty Service

1. To obtain service under this warranty, obtain a return authorization number. In the United States, contact the WINSYSTEMS Service Center for a return authorization number. Outside the United States, contact your local sales agent for a return authorization number.
2. You must send the product postage prepaid and insured. You must enclose the products in an anti-static bag to protect from damage by static electricity. WINSYSTEMS is not responsible for damage to the product due to static electricity.