MXE-5400 Series

Fanless Embedded Computer

User Manual



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Revision History

Revision	Release Date	Description of Change(s)
2.00	Dec.20, 2013	Initial Release
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Preface

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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.



Additional information, aids, and tips that help users perform tasks.



Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction



1.1 Overview

ADLINK's new Matrix MXE-5400 series of rugged quad-core fanless computers, featuring the latest 4th generation Intel® Core™ i7/i5/i3 processors (codename: Haswell), delivers outstanding performance with minimal power consumption. Intel's Quick Sync Technology and Core IPG equip the MXE-5400 with market leading performance in image/video related applications.

With the implementation of Intel® vPro™ (iAMT™ 9.0, TXT, TPM 1.2, Intel VT) technology and ADLINK's proprietary SEMA (Smart Embedded Management Agent) tool, the MXE-5400 maximizes manageability and security for a world of applications. Together they provide efficient remote monitoring of system activity and health in real time, system control over a robust secured channel, and complete fully manageable utilization of system resources.

The MXE-5400 series accommodates rich I/O interfaces in a compact system size, offering versatile connection to a wide range of applications. Dual mini PCIe slots and USIM socket empower the MXE-5400 to act as a communications hub for a variety of wireless connections, such as BT/WiFi and 3G. One slot is also configurable to a mini SATA interface, cooperating with internal SATA storage to deliver RAID 0/1 functionality.

Leveraging proprietary mechanical engineering, the MXE-5400 series continues to offer all the popular features of the Matrix E series, including cable-free construction, wide operating tempera-

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ture ranges, and 5 Grms vibration resistance. The entire ADLINK Matrix line undergoes rigorous testing for operational verification.

Combing superior processor performance, security and manageability, leading wireless capability, and rich I/O in a compact and robust package, the ADLINK MXE-5400 is an ideal choice for a wide range of applications supporting intelligent transportation, in-vehicle multimedia, and surveillance and factory automation.

1.2 Features

- 4th generation Intel® Core™ i7-4700EQ QC 2.4GHz (turbo up to 3.4GHz)/ i5-4400E DC 2.7GHz (turbo up to 3.3GHz)/ i3-4100E DC 2.4GHz
- Intel® Quick Sync Video technology supported with Media SDK+
- Intel® vPro™ technology for security and manageability (iAMT™ 9.0, TPM 1.2, TXT, Intel® VT™)
- Built-in ADLINK SEMA 2.2 (Smart Embedded Management Agent)
- Rich I/O:
  - DVI-I+2x DisplayPorts, 6x USB 3.0, 4x GbE ports, 8x isolated DI/O
  - 2x SATA-III (6.0 Gb/s) ports, 2x mPCIe (1x switchable to mSATA) slots

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1.3 Specifications

	MXE-5400
System	
Processor	Intel® Core™ i7-4700EQ/ i5-4400E/ i3-4100E
Chipset	Intel® Mobile Platform Controller Hub (QM87)
Video	3 independent displays: 1x VGA+ DVI by DVI-I connector 2x Dual Mode DisplayPort
Memory	4 GB DDR3L 1600 MHz SODIMM module (Up to 16 GB support)
I/O Interface	
Ethernet	4 GbE ports (3x Intel® I210IT + 1 Intel® I217LM PHY)
Serial Ports	2 BIOS configurable RS-232/422/485 (COM1 & COM2) 2 RS-232 (COM3 & COM4)
USB	6 USB 3.0 ports + 1 internal USB 2.0 port
DI/O	8 DI + 8DO w/ 1.5kV isolation
Audio	1 mic-in and 1 line-out
Mini PCIe	2 Mini PCIe sockets, 1 shared w/ mSATA
USIM	1 USIM socket for 3G/LTE communication (for 3G/LTE mini card)
WDT	Supports watchdog timer via SEMA
Power Supply	
DC Input	Built-in 9-32 VDC wide-range DC input 3P pluggable connectors with latch (GND, V-, V+)
AC Input	Optional 160 W external AC-DC adapter for AC input
Storage	
SATA HDD	2 internal SATA-III port for 2.5" HDD/SSD installation (supports RAID 0,1)
CompactFlash	1 CFast slot, supporting PIO and DMA modes

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	MXE-5400
eSATA	1 eSATA on rear panel for storage expansion
Mechanical	
Dimensions	230 mm (W) x 205 mm (D) x 75 mm (H) (9” x 8” x 2.5”)
Weight	3.8 kg (8.39 lb)
Mounting	Wall-mount kit
Environmental	
Operating Temperature	Standard: 0°C to 50°C Extended: -20 to 60°C for MXE-5401, up to 70°C for MXE-5402/5403 (w/ industrial SSD/CFast)
Storage Temperature	-40°C to 85°C (excl. HDD/SDD/CFAST)
Humidity	Approx. 95% @ 40°C (non-condensing)
Vibration	Operating, 0.5 Grms, 5-500 Hz, 3 axes (w/ HDD) Operating, 5 Grms, 5-500 Hz, 3 axes (w/ SSD, CFast)
ESD	Contact +/-4 KV and Air +/-8 KV
Shock	Operating, 50 G, half sine 11 ms duration (w/ CFAST or SSD)

Power Consumption		
Power off	2.16 W	In shutdown mode with DC input and only USB keyboard/mouse
System Idle	13.44 W	Under Windows Desktop with no application programs executed
Processor full load	47.04 W	Under Windows with 100% CPU utilization and 2D/3D graphics load
System full load	92.4 W	Under Windows with 100% CPU utilization and simultaneous access to all I/O devices.
Recommended power supply	160W	With consideration of voltage de-rating under high environmental temperature.

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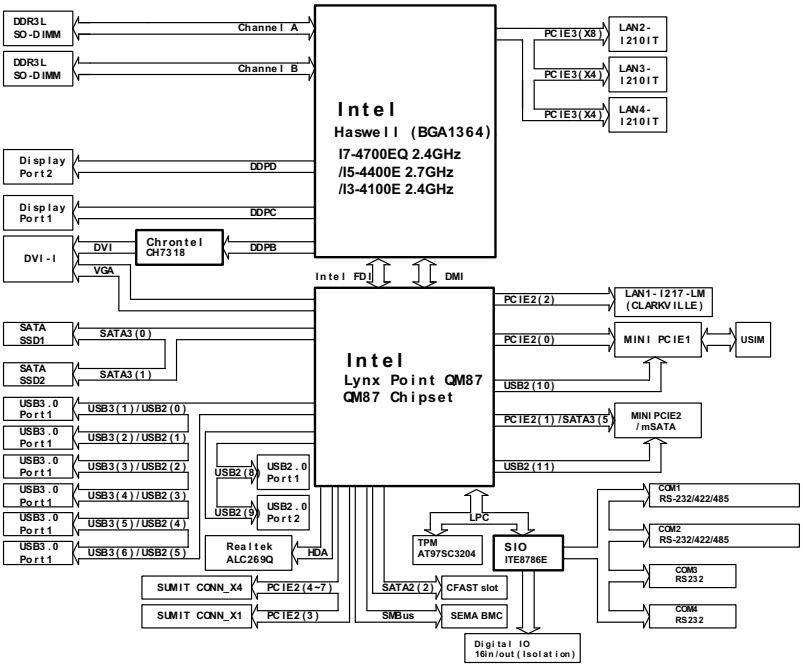


Figure 1-1: MXE-5400 Functional Block Diagram

1.4 Unpacking Checklist

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK. Ensure that the following items are included in the package.

- MXE-5400 unit
- Screw pack for wall-mounting and HDD installation
- DB62 to COM/DIO splitter cable
- Quick Start Guide
- ADLINK All-in-One DVD

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1.5 Mechanical Drawings

NOTE: All dimensions shown are in millimeters (mm) unless otherwise stated.

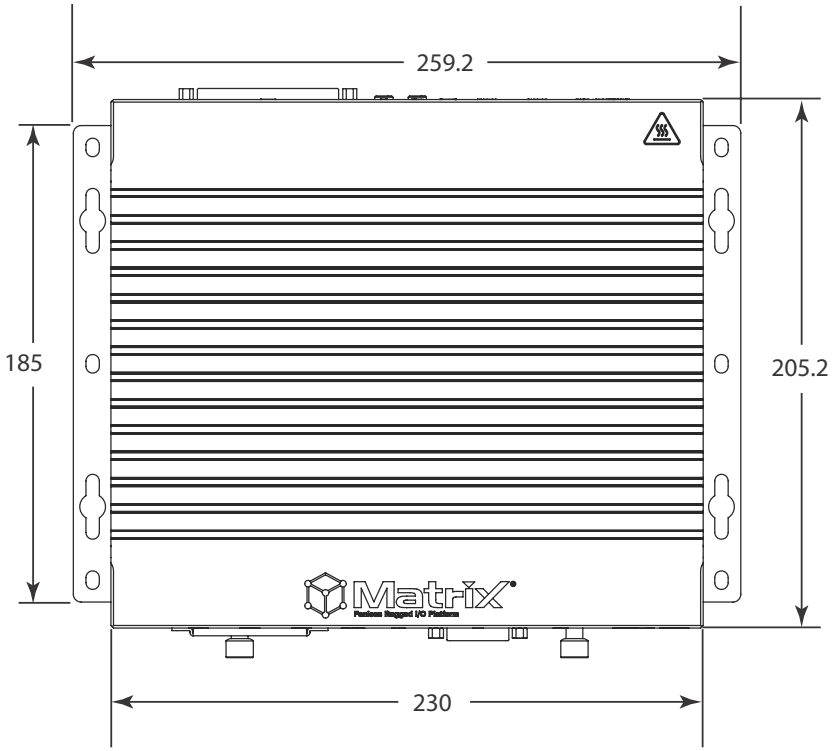


Figure 1-2: Top View

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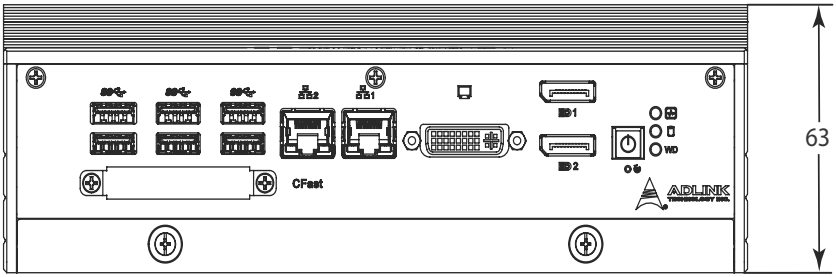


Figure 1-3: Front View

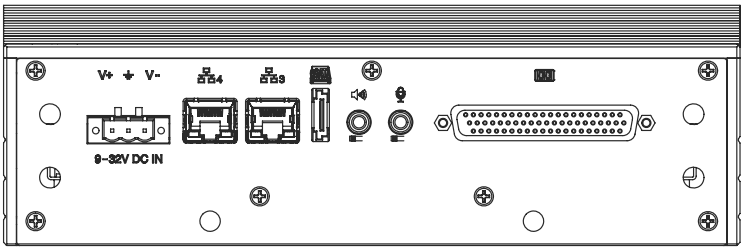


Figure 1-4: Rear View

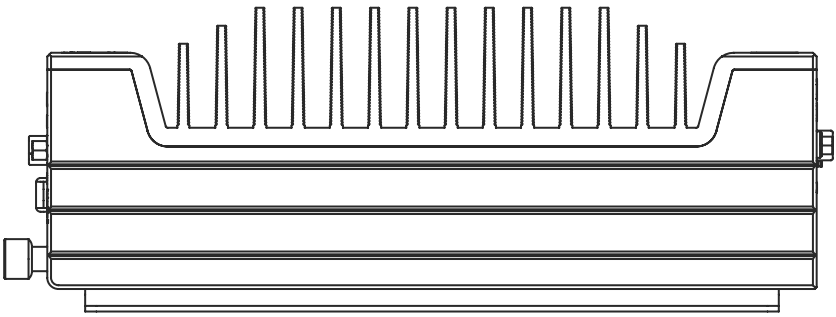


Figure 1-5: (Left) Side View

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1.6 Front Panel I/O Connectors

This section describes the I/O connectors located on the front panel of the MXE-5400.

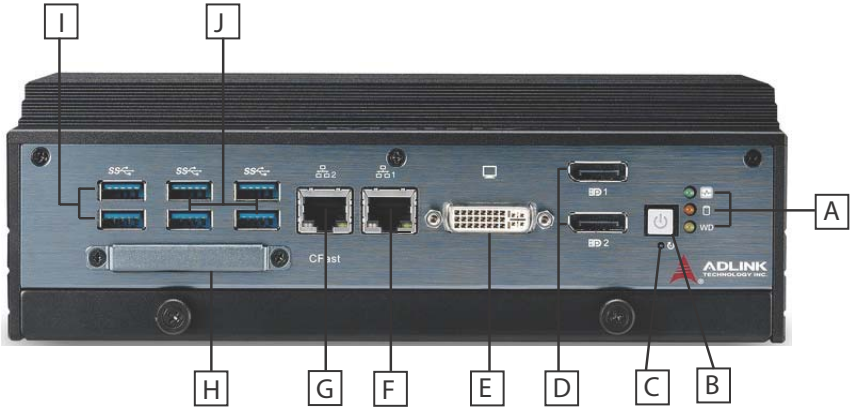


Figure 1-6: Front Panel I/O

A	LED indicators	**F**	I217 Gigabit Ethernet port
B	Power button	**G**	I210 Gigabit Ethernet port
C	Reset button	**H**	CFast connector (Push-Push, Type II)
D	Dual DisplayPort connector	**I**	Dual USB 3.0 port
E	DVI-I connector	**J**	Dual USB 3.0 ports (1600mA supported)

Table 1-1: MXE-5400 Front Panel I/O Connector Legend

1.6.1 Power Button

The power button is a non-latched push button with a blue LED indicator. System is turned on when button is pressed, and the power LED lit. If the system hangs, depressing the button for 5 seconds powers down the system.

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1.6.2 LED Indicators

In addition to the LED of the power button, three LEDs on the front panel indicate the following operations.

Indicator	Color	Description
Watchdog (WDT)	Yellow	Indicates watchdog timer status. Flashes when watchdog timer starts, and when timer is expired, system will auto-reboots.
Hard disk drive	Orange	When blinking, indicates the SATA hard driver is active
Diagnostic	Green	If lit continuously, indicates no physical storage is connected. If blinking, indicates no memory is installed on either SO-DIMM socket.

Table 1-2: LED Indicators

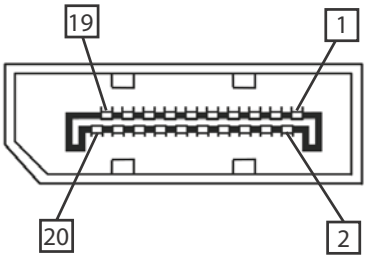
1.6.3 Reset Button

The reset button executes hard reset for the MXE-5400.

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1.6.4 Dual DisplayPort Connector

A dual DisplayPort connector on the front panel provides connection to VGA, DVI, HDMI monitor via DisplayPort to VGA adapter cable, to DVI adapter cable, and to HDMI adapter cable.



Pin	Signal	Pin	Signal
1	CN_DDPx0+	11	GND
2	GND	12	CN_DDPx3-
3	CN_DDPx0-	13	CN_DDPx_AUX_SEL
4	CN_DDPx1+	14	CN_DDPx_CONFIG2
5	GND	15	CN_DDPx_AUX+
6	CN_DDPx1-	16	GND
7	CN_DDPx2+	17	CN_DDPx_AUX-
8	GND	18	CN_DDPx_HPD
9	CN_DDPx2-	19	GND
10	CN_DDPx3+	20	+V3.3_DDPx_PWR

Table 1-3: DisplayPort Pin Assignment

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Multi-Display Option

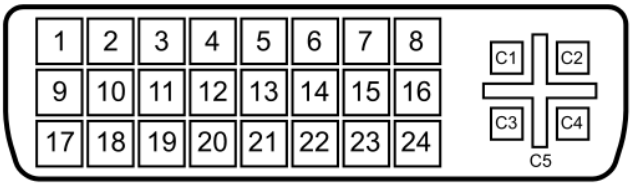
With the computing and graphic performance enhancements of 4th generation Intel processor, the MXE-5400 fully supports three independent displays, configured as follows.

Display 1	DP	DP	DVI
Display 2	DP	DP	VGA
Display 3	DVI	VGA	DP
Max. Res Display1	2560 x 1600 @60Hz	2560 x 1600 @60Hz	1920x1080 @60Hz
Max. Res Display2			2048 x 1280 @60Hz
Max. Res Display3	1920x1080 @60Hz	2048 x 1280 @60Hz	2560 x 1600@60Hz

Table 1-4: Multi-Display Configuration

1.6.5 DVI-I Connector

The MXE-5400 provides a DVI-I connector for connection to external monitor, which can separate to individual VGA and DVI-D (single link) interfaces.



Pin	Signal	Pin	Signal	Pin	Signal
1	DVI_Data2-	11	GND	21	N/C
2	DVI_Data2+	12	N/C	22	GND

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Pin	Signal	Pin	Signal	Pin	Signal
3	GND	13	N/C	23	DVI clock+
4	CRT DDC clock	14	+5V	24	DVI clock-
5	CRT DDC data	15	GND		
6	DVI DDC clock	16	Hot plug detect	C1	Analog Red
7	DVI DDC data	17	DVI_Data0-	C2	Analog Green
8	Analog vertical sync	18	DVI_Data0+	C3	Analog Blue
9	DVI_Data1-	19	GND	C4	Analog /horizontal sync
10	DVI_Data1+	20	N/C	C5	Analog GND

Table 1-5: DVI-I Connector Pin Assignment

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1.6.6 Dual Gigabit Ethernet Ports

The two Gigabit Ethernet ports consist of an Intel WGI210IT GbE controller and a WGI217LM Gigabit Ethernet PHY.

The WG210IT supports:

- IEEE 802.3az Energy Efficient Ethernet
- IEEE 1588/802.1AS precision time synchronization
- IEEE 802.3av traffic shaper
- Interrupt moderation, VLAN support, IP checksum offload
- PCIe OBFF (Optimized Buffer Flush/Fill) for improved system power management
- Four transmit and four receive queues
- RSS and MSI-X to lower CPU utilization in multi-core systems
- ECC - error correcting memory in packet buffers
- Wake-On-LAN
- NC-SI for greater bandwidth passthrough
- SMBus low-speed serial bus to pass network traffic
- Preboot eXecution Environment (PXE) flash interface support
- Jumbo frame support
- LAN Teaming

The WGI 217LM supports:

- IEEE 802.3u auto-negotiation conformance
- Energy Efficient Ethernet (EEE) IEEE 802.3az support [Low Power Idle (LPI) mode]
- Energy Efficient Ethernet(EEE)802.3az
- 10/100/1000 IEEE 802.3-compliant
- Automatic MDI/MDIX crossover at all speeds
- Wake-On-LAN
- Intel® AMT 9.0
- Reduced power consumption during normal operation and power down modes

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- Preboot eXecution environment (PXE) flash interface
- 9 KB jumbo frame support
- LAN Teaming

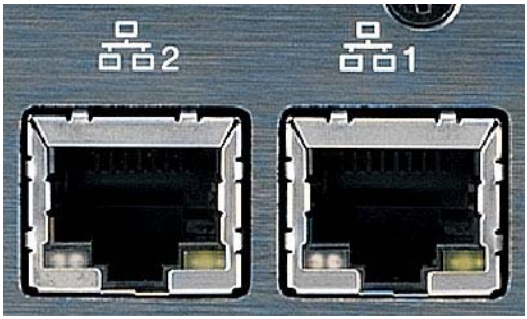


Figure 1-7: Gigabit Ethernet Ports

LED	LED Color	Status	Description
Active/Link	Yellow	OFF	Ethernet port is disconnected
		ON	Ethernet port is connected with no activity
		Flashing	Ethernet port is connected and active
Speed	Green/ Orange	OFF	10 Mbps
		Green	100 Mbps
		Orange	1000 Mbps

Table 1-6: Gigabit Ethernet Port LED Function

1.6.7 USB 3.0 Ports

The six USB 3.0 ports supporting Type A connection are all compatible with SuperSpeed, Hi-Speed, full-speed and low-speed USB devices, with support for multiple boot devices, including

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USB flash, USB external HDD, and USB CD-ROM drivers and boot priority and boot device configured in BIOS.

NOTE:

- When using USB CD-ROM via USB 3.0 port to re-install or repair the OS, cold boot should be utilized
- Four USB 3.0 ports support additional current up to 1600mA, positioned as shown in Table 1-1 on page 8

1.6.8 CFast Port

A type II push-push CFast host connector on the front panel connects to the host controller by SATA interface, with data transfer rates up to 3.0Gb/s(300MB/s)/1.5Gb/s(150MB/s) supported.

1.7 Rear Panel I/O Connectors

This section describes I/O connectors located on the rear panel of the MXE-5400.

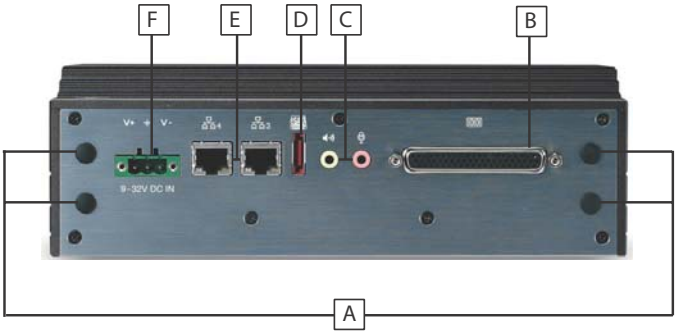


Figure 1-8: Rear Panel I/O

A	Antenna connection plugs (X4)	**D**	eSATA connector
B	DB-62P COM ports and digital I/O connector	**E**	I210 Gigabit Ethernet ports (X2)
C	Audio jacks	**F**	DC power supply connector

Table 1-7: MXE-5400 Rear Panel I/O Connector Legend

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1.7.1 DB-62P COM Port and Digital I/O Connector

4 COM ports and 8-channel isolated digital input and 8-channel isolated digital output are provided by the DB-62P connector with the included cable, terminating in four D-SUB 9-pin connectors and one 26-pin digital I/O connector. COM1 and COM2 ports selectively support RS-232/ RS-422/ RS-485 according to BIOS setting. Residual COM3 and COM4 ports support only RS-232 function.

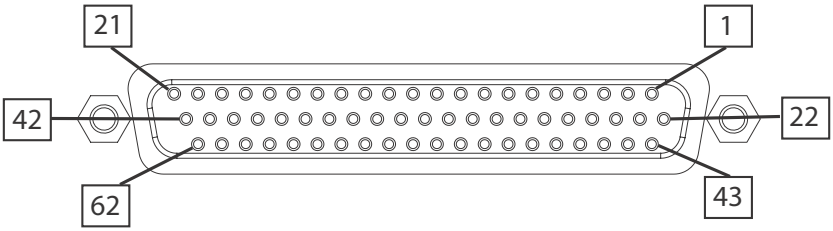


Figure 1-9: DB-62P COM Port

Pin	Signal	Pin	Signal	Pin	Signal
1	COM3_TXD	22	N/C	43	N/C
2	COM3_DTR#	23	COM3_DSR#	44	COM3_RTS#
3	COM3_RI#	24	COM3_DCD#	45	GND
4	COM4_TXD	25	COM4_RXD	46	COM4_CTS#
5	COM4_DTR#	26	COM4_DSR#	47	COM4_RTS#
6	COM4_RI#	27	COM4_DCD#	48	GND
7	COM1_TXD	28	COM1_RXD	49	COM1_CTS#
8	COM1_DTR#	29	COM1_DSR#	50	COM1_RTS#
9	COM1_RI#	30	COM1_DCD#	51	GND
10	COM2_TXD	31	COM2_RXD	52	COM2_CTS#

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Pin	Signal	Pin	Signal	Pin	Signal
11	COM2_DTR#	32	COM2_DSR#	53	COM2_RTS#
12	COM2_RI#	33	COM2_DCD#	54	GND
13	IDI_67L	34	IDI_7H	55	IDI_0H
14	IDI_5H	35	IDI_6H	56	IDI_0L
15	IDI_4H	36	IDI_45L	57	IDI_1H
16	IDI_3H	37	IDI_3L	58	IDI_1L
17	EOGND	38	IDI_2L	59	IDI_2H
18	IDO_6	39	IDO_7	60	+V5DIO_ISO
19	IDO_4	40	IDO_5	61	+VDD
20	IDO_2	41	IDO_3	62	+VDD
21	IDO_0	42	IDO_1		N/C

Table 1-8: DB-62P COM Port Pin Assignment

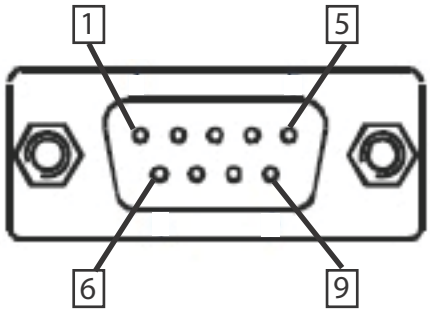


Figure 1-10: D-SUB 9P COM Connector

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Pin	Signal		
	RS-232	RS-422	RS-485
1	DCD#	TXD422-	485DATA-
2	RXD	TXD422+	485DATA+
3	TXD	RXD422+	N/C
4	DTR#	RXD422-	N/C
5	GND	N/C	N/C
6	DSR#	N/C	N/C
7	RTS#	N/C	N/C
8	CTS#	N/C	N/C
9	RI#	N/C	N/C

Table 1-9: D-SUB 9P COM Pin Assignment

8CH Isolated DI	8CH Isolated DO
Logic high: 5 to 24 V	Output: Open Drain N- Channel Power MOSFET driver
Logic low: 0 to 1.5 V	250 mA for all channels @ 60°C, 100% duty
Input resistance: 8.2 k @ 0.5 W	Supply voltage: 5 to 35 VDC
Interrupt source: DI	Isolation voltage: 1.5KV DC channel 0 to 7
Isolation voltage: 1.5KV DC channel 0 to 7	200 mA for +V5DIO_ISO (max)

Table 1-10: Digital I/O Specifications

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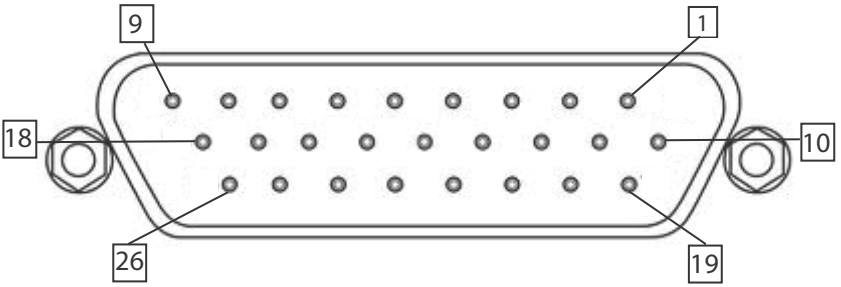


Figure 1-11: D-SUB 26P Connector on Digital I/O Port

Pin	Signal	Pin	Signal	Pin	Signal
1	EOGND	10	IDO_0	19	IDI_3H
2	+V5DIO_ISO	11	+VDD	20	IDI_2L
3	IDO_7	12	IDI_7H	21	IDI_2H
4	IDO_6	13	IDI_67L	22	IDI_1L
5	IDO_5	14	IDI_6H	23	IDI_1H
6	IDO_4	15	IDI_5H	24	IDI_0L
7	IDO_3	16	IDI_45L	25	IDI_0H
8	IDO_2	17	IDI_4H	26	+VDD
9	IDO_1	18	IDI_3L		

Table 1-11: D-SUB 26P Pin Assignment on Digital I/O Port

Isolated Digital Input Circuits

The input can accept voltages up to 24V, and input resistors are 8.2KΩ. Connections between outside signals are as follows.

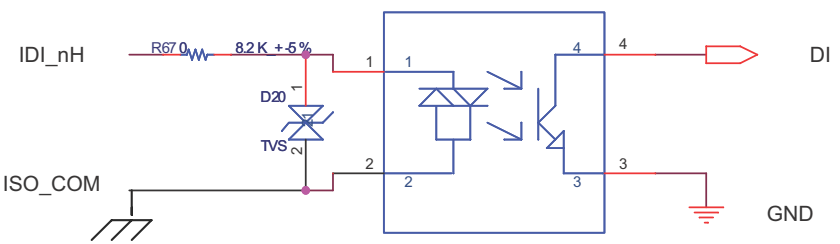


Figure 1-12: Isolated Digital Input Circuit

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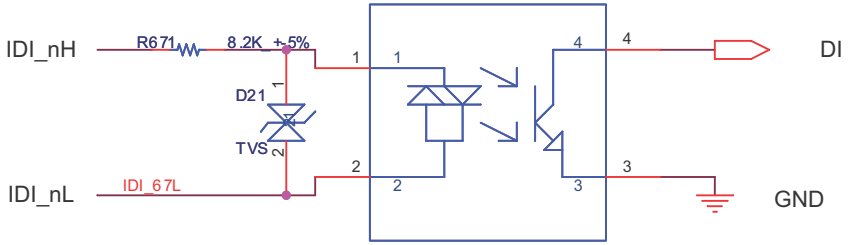


Figure 1-13: Isolated/Differential Digital Input Circuit

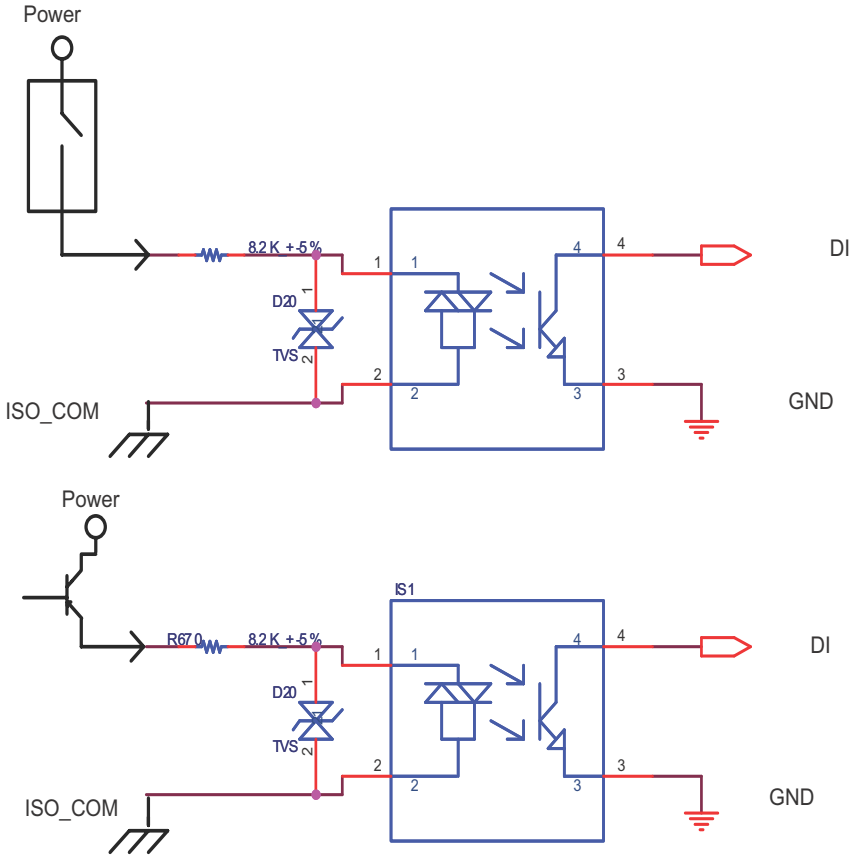


Figure 1-14: Isolated Digital Input Sample Application Circuit

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Isolated Digital Output Circuits

Each isolation digital output channel adopts a MOSFET transistor, capable of driving peak current up to 250mA (sustained current up to 100 mA) with voltage ranges from 5V to 35V.

The VDD pin is connected in serial with a fly-wheel diode to protect the driver during inductance loading, such as relay, motor, or solenoid. The VDD must connect to external power to form a fly-wheel current loop.

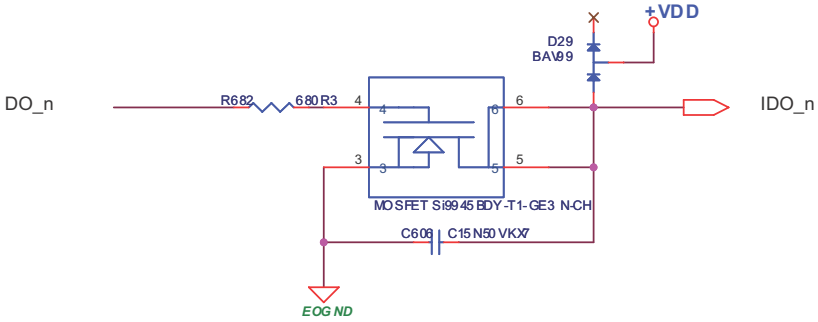


Figure 1-15: Isolated Digital Output Circuits

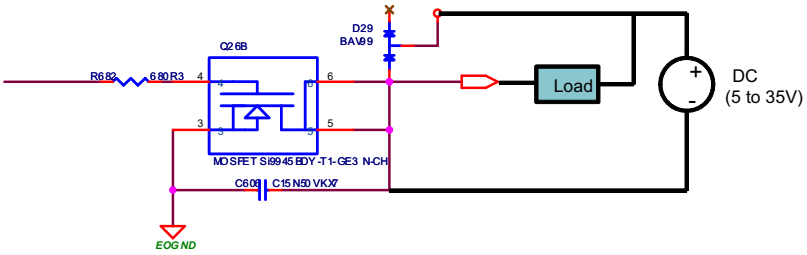


Figure 1-16: Isolated Digital Output Sample Application Circuit

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1.8 Internal I/O Connectors

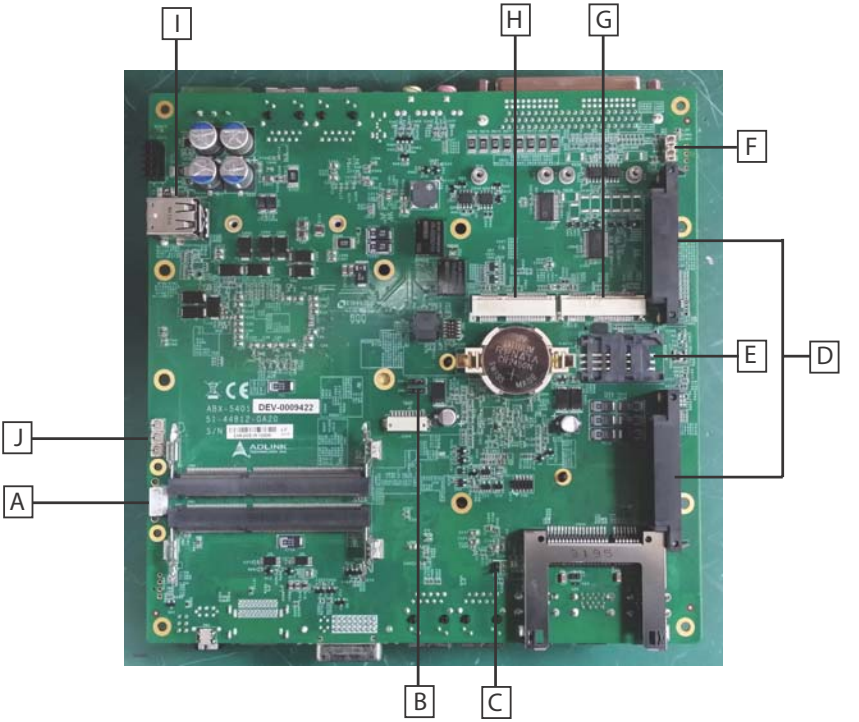


Figure 1-17: Internal I/O

A	Internal USB 2.0 wafer (reserved)
B	Controls CN23 function
C	Clear CMOS jumper
D	SATA slots (X2)
E	USIM slot
F	DC 5V and 3.3V connectors for GPS module
G	Mini PCIe slot
H	Mini PCIe/mSATA slot
I	USB 2.0 connector
J	Extended Power/Reset/LED wafer

Table 1-12: MXE-5400 Internal I/O Legend

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1.8.1 Clear CMOS Jumper

Under conditions in which the MXE-5400 fails to boot, clearing the BIOS content stored in CMOS and restoring the default settings may be effective. To clear CMOS, short Pin#1 and Pin#2 of CN3 and remove the jumper, after which the CMOS will be restored to factory default settings.

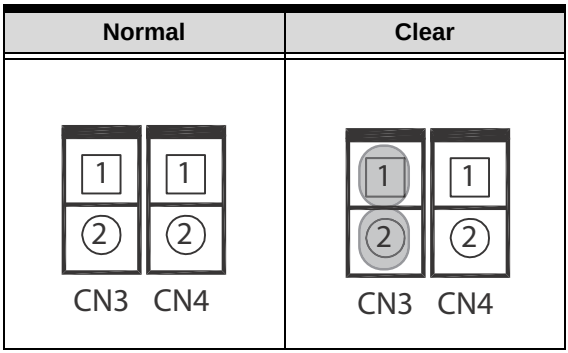


Figure 1-18: Clear CMOS Jumper Pin Settings

Pin	Description
1	RTCRST#
2	Gnd

Table 1-13: Clear CMOS Jumper Pin Assignment

1.8.2 DC 5V and 3.3V Connectors for GPS Module

The two power connectors, for GPS module use, carry a maximum current rating of 1A each.

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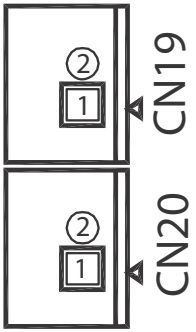


Figure 1-19: DC 5V and 3.3V Connectors Configuration

Pin	Description
CN19	
1	+5V
2	Gnd
CN20	
1	+3.3V
2	Gnd

Table 1-14: DC 5V and 3.3V Connectors Pin Assignments

1.8.3 USIM Port

Use of 3.5G mini-PCIe module requires a SIM card for communication with a telecom operator. The MXE-5400 provides a USIM port connected to the mini-PCIe connector, with which a SIM card and 3.5G mini-PCIe module can be installed to facilitate 3.5G communication.

1.8.4 SATA Connectors (X2)

The SATA connectors support data transfer up to 6.0Gb/s(600MB/s), with a SATA host controller supporting legacy mode using I/O space and AHCI mode using memory space. The SATA connector is compatible with a 2.5in. hard disk drive (HDD) or solid state disk

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(SSD), requiring installation into the SATA connector with a HDD bracket.

1.8.5 Mini-PCIe Connectors

The MXE-5400 features two mini-PCIe connectors, following the revision 1.2 standard. While both CN16 and CN 23 support versatile mini-PCIe modules, the USIM slot is set to interact with CN16, accepting WWAN modules. In addition to mini PCIe support, CN23 provides mini SATA access via jumper CN24 selection, as shown.

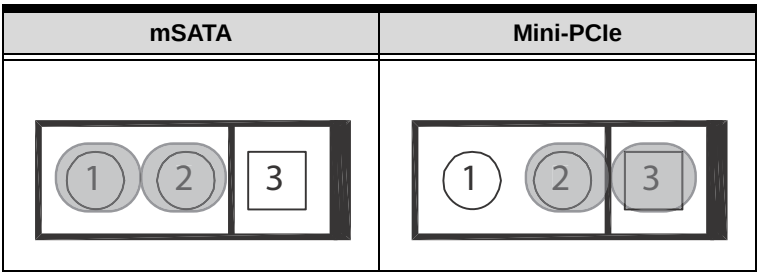


Figure 1-20: Mini-PCIe Connector Jumper Settings

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1.8.6 Extendable Power/Reset/LED

The MXE-5400 provides internal LED connectors powering indicators for the Power button (from CN40), Reset button (CN39), and Power for external controllable devices (CN41), assigned as shown.

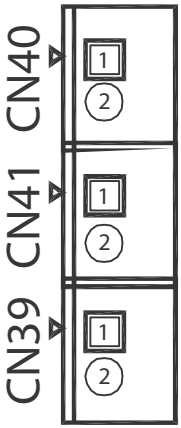


Figure 1-21: Extendable Power/Reset/LED Configuration

Pin	Description
CN40	
1	Power Button
2	Gnd
CN41	
1	+V3.3SB
2	Power LED
CN39	
1	Reset Button
2	Gnd

Table 1-15: Extendable Power/Reset/LED Connectors Pin Assignments

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2 Getting Started

This chapter discusses installation of hard disk drive, mini-PCIe module, mSATA, and CFast card. In addition to connection and use of DIO and COM ports, wall-mount installation is also described.

2.1 Installing Hard Disk Drives

The MXE-5400 provides two SATA connectors for installation of one hard disk drive each.

1. Remove the thumbscrews on the front panel by hand or screwdriver.



2. Withdraw the thumbscrews and remove the bottom cover by pulling and lifting.

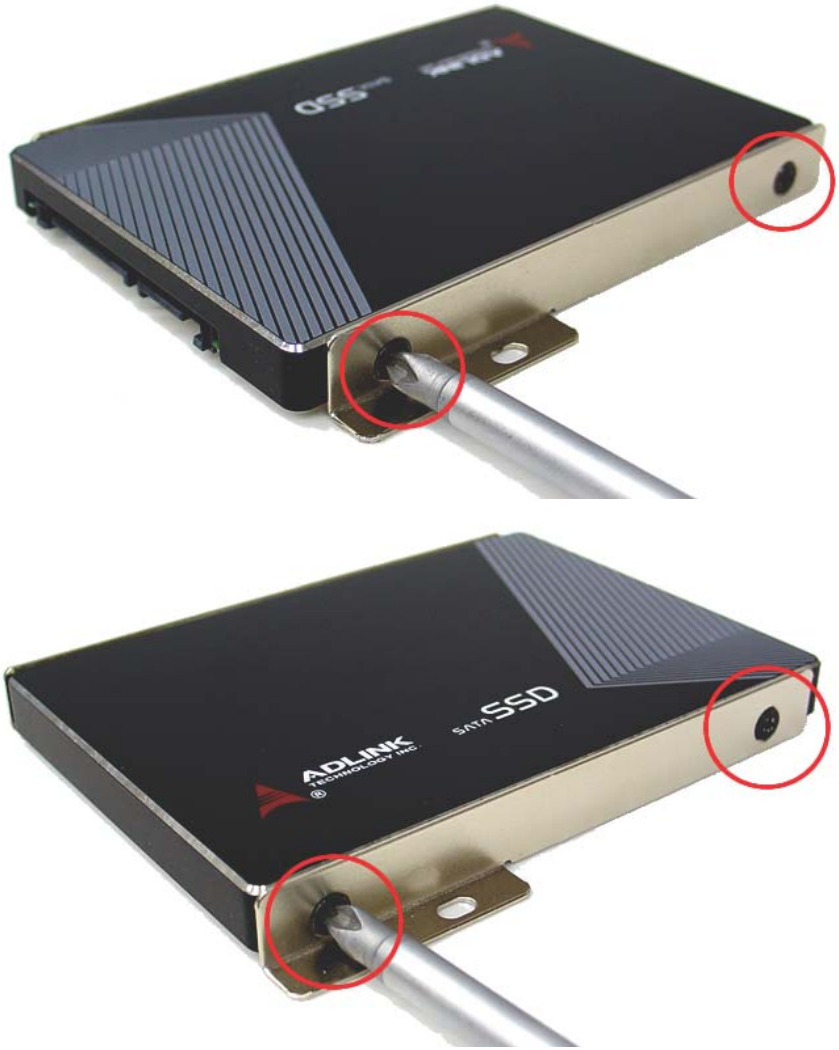
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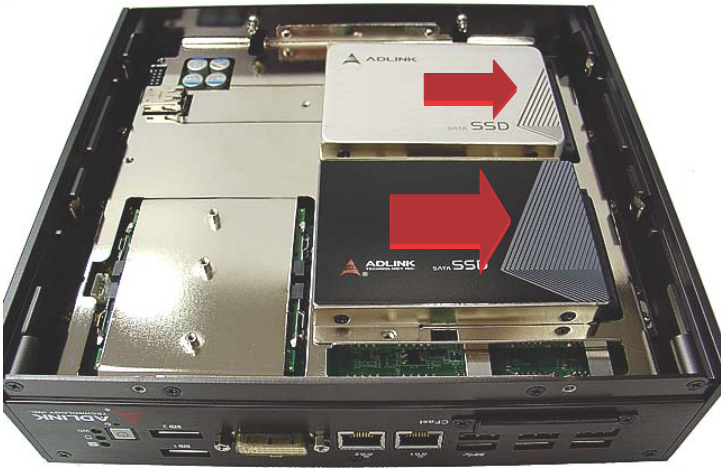
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3. Place the two HDD brackets on left and right sides of a 2.5'' HDD or SSD and use the 4 M3-F-head-L4 screws to fix the brackets.



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4. Install the hard disk drive and fasten the 2 M3-head-L4 screws on the top of the HDD brackets. Two hard disk drives are supported.





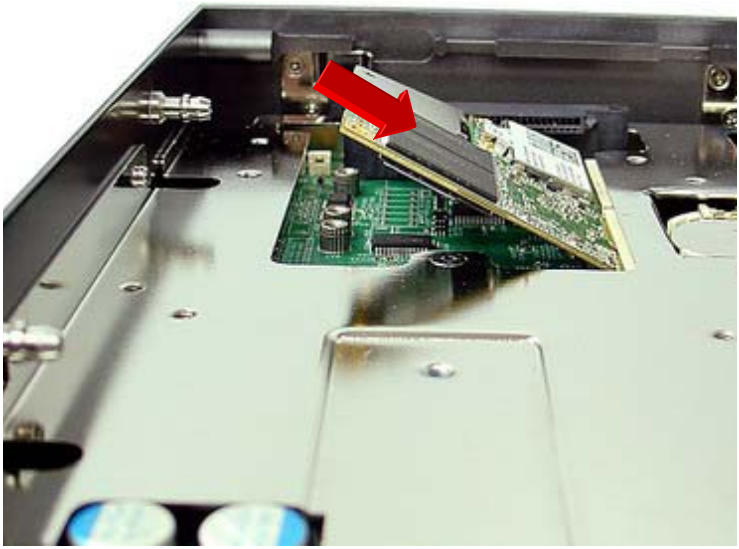
5. Re-assemble the bottom cover and fasten the thumb-screws on the front panel by hand or screwdriver.

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2.2 Installing a Mini-PCIe Device

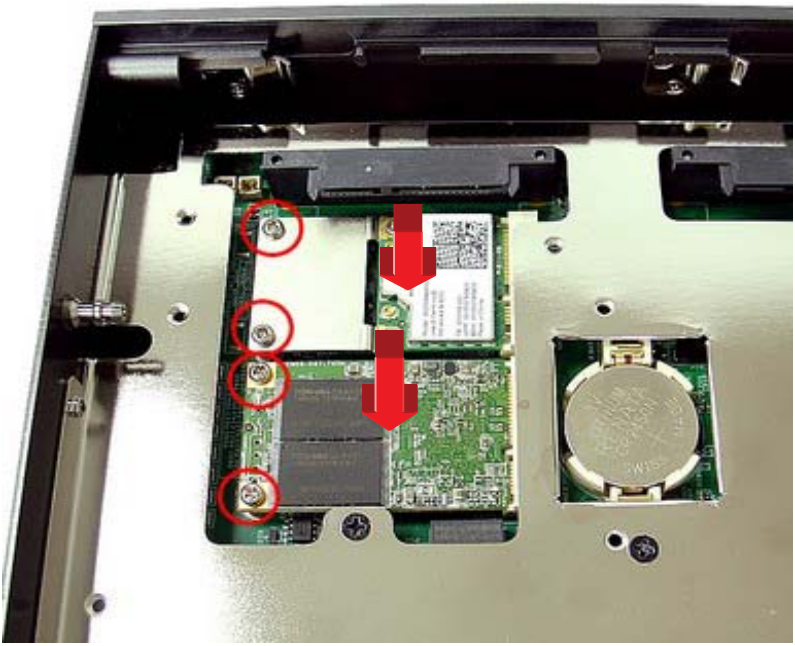
The MXE-5400 provides two mini-PCIe slots supporting mini-PCIe wireless modules and mSATA devices.

1. Remove bottom cover as detailed previously.
2. Insert the mini-PCIE wireless module into the slot at an angle.



3. Depress the mini-PCIe wireless module into place and use the 2 M2.5-P-head-L5 screws to fix the module.

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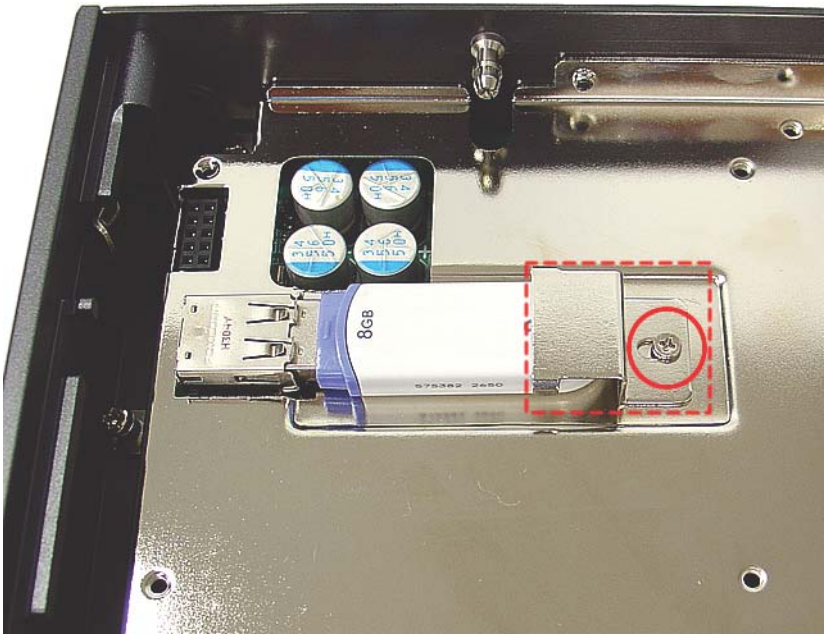
For details of Mini SATA connection, please see “Mini-PCIe Connectors” on page 25.

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2.3 Internal USB Connector

The MXE-5400 provides an internal USB2.0 connector to accommodate one USB dongle.

Use the M2.5-I-head-L4 screw and USB bracket included in the accessory package to fix the USB dongle.



2.4 Installing CFast Card

The MXE-5400 provides an external CFast socket to accommodate one CFast card for additional storage.

1. Remove the 2 screws and the CFast cover from the front panel.



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2. Gently insert the CFast card into the CFast socket.



3. Re-assemble the CFast cover and fasten the 2 screws on the front panel.

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2.5 COM Ports and DIO Device

4 COM ports, 8 digital input and 8 digital output ports are available on the included breakout cable, for connecting COM ports and DIO devices.

Connect the cable to the connector on the rear panel.



The 4 COM port cables are numbered 1 to 4, with 1 and 2 (COM1 & COM2) BIOS configurable and connecting to RS-232/422/485 devices and 3 and 4 (COM3 & 4) to RS-232 interface devices.

Cable	#	BIOS configurable	Device Compatibility
COM1	1	Yes	RS-232/422/485
COM2	2	Yes	

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Cable	#	BIOS configurable	Device Compatibility
COM3	3	No	RS-232
COM4	4	No	

The DIO cable connects to a terminal board for digital input and digital output.



NOTE:

ADLINK provides the following optional accessories:

- DB26-to-DIN37 cable (Part Number 30-01143-0000)
- DIN37 terminal board (Part Number 91-14025-1020)

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2.6 Connecting DC power

WARNING:

Before introducing DC power to the MXE-5400, ensure the voltage and polarity provided are compatible with the DC input. Improper input voltage and/or polarity can be responsible for system damage.

The DC power input connector of the MXE-5400 utilizes V+, V- , and chassis ground pins, and accepts input voltage as shown previously.

1. Connect DC power.
2. Fix the DC connector using the 2 screws.



2.7 Wall-mounting the MXE-5400

The MXE-5400 is shipped with wall-mount brackets and accessory screws, with mounting procedures as follows.

1. Prepare the two wall-mount brackets and 4 M4-P head screws included in the package.

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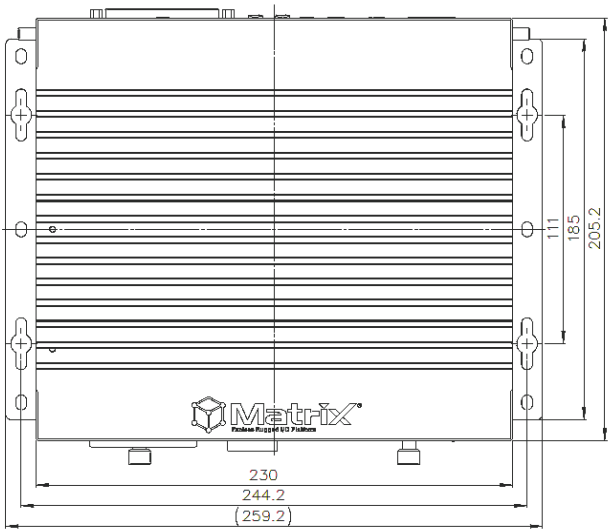
2. Remove the 4 plastic pads from the corners of the chassis underside.



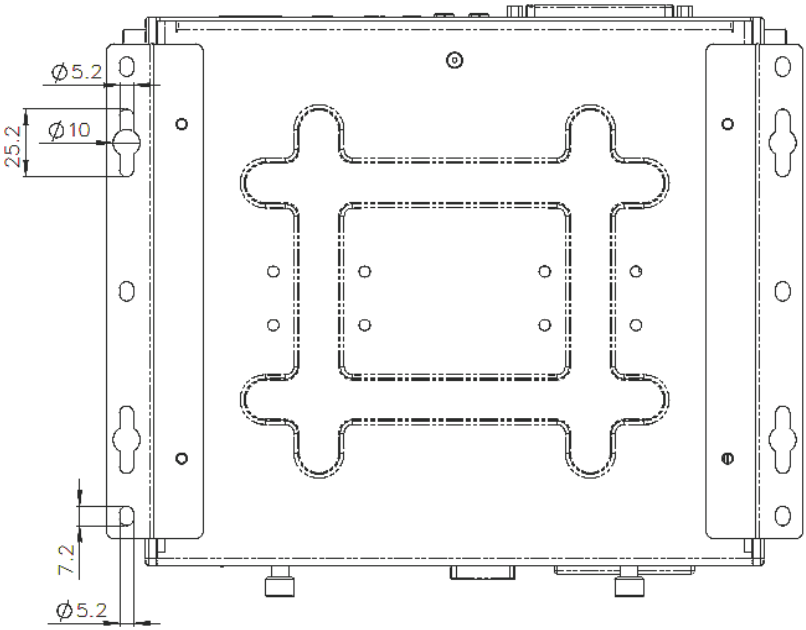
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3. Fix the 2 wall-mount brackets, also included, to the chassis with the 4 included M4-P head screws, according to the spacing dimensions of the screw holes and brackets, as shown. (All units are in millimeters (mm)





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4. Once final assembly as shown is complete, mount the MXE-5400 series controller on the wall via the screw holes.

2.8 Cooling Considerations

Heat-generating components of the MXE-5400 (such as CPU and PCH) are all situated on the left side of the system. These components directly contact the heat sink via thermal pads and dissipate heat generated by the components. To maximize efficiency of heat dissipation, maintain a minimum of 2 inches (5 cm) clearance on the top of the MXE-5400.

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3 Driver Installation

After installing the operating system, all related drivers must be installed for the system to function properly. This section describes the drivers needed for Windows operating systems and the procedures to install them. For other OS support, please contact ADLINK for further information.

Install drivers as follows.

1. Fully install Microsoft Windows OS before installing any drivers. Most standard I/O device drivers have been included in Microsoft Windows OS. For Windows 7 users, please note that you need Administrator privilege to install the drivers properly.
2. Install the chipset driver.
3. Install the graphics driver.
4. Install the Ethernet driver.
5. Install the audio driver.
6. Install the SEMA utility, WDT and DI/O drivers.

3.1 Installing the Chipset Driver

This section describes installation of the chipset driver for the MXE-5400. The chipset driver directs the operating system to configure the Intel® QM87 chipset components in order to ensure that the following features function properly:

- SATA Storage Support
- USB Support
- Identification of Intel® Chipset Components in the Device Manager

Microsoft Windows 7 must be fully installed and running on the system before installing this software:

The following steps install the chipset driver for the MXE-5400

1. Close any running applications.
2. Insert the ADLINK All-in-One DVD. The chipset driver is located in the directory

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x:\Driver Installation\Matrix\MXE-5400\Chipset
where x: denotes the DVD-ROM drive.

3. Execute Setup.exe and follow onscreen instructions to complete the setup.
4. After installation is complete, reboot the system.

3.2 Installing the Graphics Driver

This section describes installation of the graphics driver for the MXE-5400. The MXE-5400 is equipped with the Intel® Graphics Media Accelerator Driver package, which supports Windows 7.

To install the graphics driver:

1. Close any running applications.
2. Insert the ADLINK All-in-One DVD. The graphics driver is located in the directory
x:\Driver Installation\Matrix\MXE-5400\Graphics
where x: denotes the DVD-ROM drive.
3. Execute Setup.exe and follow onscreen instructions to complete the setup.
4. After installation is complete, reboot the system.

3.3 Installing the Ethernet Driver

This section describes installation of the Ethernet driver for the MXE-5400. To install the driver for the Intel 1210/1217 Gigabit Ethernet controller:

1. Close any running applications.
2. Insert the ADLINK All-in-One DVD. The Ethernet driver is located in the directory
x:\Driver Installation\Matrix\MXE-5400\LAN-Intel\
where x: denotes the DVD-ROM drive.
3. Execute setup.exe and follow onscreen instructions to complete the setup.
4. After installation is complete, reboot the system.

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3.4 Installing the Audio Driver

This section describes installation of the audio driver for the MXE-5400. The MXE-5400 supports High Definition audio using the Realtek ALC269 audio codec. To install the audio driver:

1. Close any running applications.
2. Insert the ADLINK All-in-One DVD. The audio driver is located in the directory
   x:\Driver Installation\Matrix\MXE-5400\Audio\
   where x: denotes the DVD-ROM drive.
3. Execute Setup.exe and follow onscreen instructions to complete the setup.
4. After installation is complete, reboot the system.

3.5 Installing the SEMA utility, WDT and DI/O Drivers

This section describes installation of the SEMA utility, WDT and DI/O drivers for the MXE-5400.

The MXE-5400 supports ADLINK Smart Embedded Management Utility with features as follows.

- System Health for real time CPU, system temperature, total/current uptime
- User-defined 1KB Flash
- Watchdog Timer
- Hardware Monitoring for input voltage levels and current power consumption
- Digital Input/Output control utility (sample)
- S.M.A.R.T. Information for storage

A WDT (watchdog timer) is a hardware mechanism resetting the system when the operating system or application is halted. A typical usage of WDT is to start the timers and periodically reset the timer, and when timer is expired, the system resets. SEMA utility installation is required to access the WDT function.

MXE-5400 also provides 8 channel DI and 8 channel DO, and SEMA provides a reference for the DIO control along with its API.

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To install the SEMA utility, WDT and DI/O drivers:

1. Close any running applications.
2. Insert the ADLINK All-in-One DVD. The utility is located in the directory:

   x:\Driver Installation\Matrix\MXE-5400\WDT_SEMA_DIO\

   where x: denotes the DVD-ROM drive.
3. Execute Setup.exe and follow onscreen instructions to complete the setup.

After installation is complete, reboot the system.


NOTE:

Administrator privilege is required to use the API in Windows 7.

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Appendix A: Watchdog Timer (WDT) & DI/O Function Libraries

This appendix describes use of the watchdog timer (WDT) function library for the MXE-5400.

The watchdog timer is a hardware mechanism provided to reset the system if the operating system or an application stalls. After starting, the watchdog timer in the application must be periodically reset before the timer expires. Once the watchdog timer expires, a hardware-generated signal is sent to reset the system.

DI/O provides input/output to support inter-device communications. Simple programming guides allow easy transmission of digital signals between the system and attached peripherals.

A.1 WDT with API/Windows

Matrix WDT API library files and a demo program (incl. source code) can be found on the included driver CD or downloaded from http://www.adlinktech.com.

To use the WDT function library for MXE-5400 series, include the header file matrix_wdt.h and linkage library matrix_wdt.lib in the C++ project.

InitWDT

Initializes watchdog timer function of MXE-5400. InitWDT must be called before the invocation of any other WDT function.

@ Syntax

C/C++

```
BOOL InitWDT()
```

@ Parameters

None

@ Return code

TRUE if watchdog timer is successfully initialized.

FALSE if watchdog timer fails to initialize.

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SetWDT

Sets the timeout value of the watchdog timer. There are two parameters for this function to indicate the timeout ticks and unit. ResetWDT or StopWDT should be called before the expiration of watchdog timer, or the system will reset.

@ Syntax

C/C++

```
BOOL SetWDT(BYTE tick, BYTE unit)
```

@ Parameters

`tick`

Specify the number of ticks for watchdog timer. A valid value is 1 - 255.

`unit`

Specify the timeout ticks of the watchdog timer.

Value	Description
0	The unit for one tick is one second. For example, when one tick is specified as 100 and the unit as 0, the timeout value is 100 seconds.
1	The unit for one tick is one minute. For example, whenone tick is specified as 100 and the unit as 1, the timeout value is 100 minutes.

@ Return codes

TRUE if timeout value of watchdog timer is successfully set.

FALSE if timeout value of watchdog timer is failed to set.

StartWDT

Starts watchdog timer function. Once the StartWDT is invoked, the watchdog timer starts. ResetWDT or StopWDT should be called before the expiration of watchdog timer, or the system will reset.

@ Syntax

C/C++

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```
BOOL StartWDT()
```

@ **Parameters**

None

@ **Return codes**

TRUE if watchdog timer is successfully started.

FALSE if watchdog timer is failed to start.

ResetWDT

Resets the watchdog timer. The invocation of ResetWDT allows restoration of the watchdog timer to the initial timeout value specified in SetWDT function. ResetWDT or StopWDT should be called before the expiration of the watchdog timer, or the system will reset.

@ **Syntax**

C/C++

```
BOOL ResetWDT()
```

@ **Parameters**

None

@ **Return codes**

TRUE if watchdog timer is successfully reset.

FALSE if watchdog timer fails to reset.

StopWDT

Stops the watchdog timer.

@ **Syntax**

C/C++

```
BOOL StopWDT()
```

@ **Parameters**

None

@ **Return codes**

TRUE if watchdog timer is successfully stopped.

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FALSE if watchdog timer fails to stop.

A.2 DI/O with API/Windows

Matrix DI/O API library files and a demo program (incl. source code) are located on the included driver CD or downloaded from http://www.adlinktech.com.

To use the DI/O function library for MXE-5400 series, include the header file matrix_dio.h and linkage library matrix_dio.lib in the C++ project.

DI/O functions are as follows.

GPIO_Init

Reserves system resources for digital input/output API service.It is necessary to call this function before using other MXE-5400 DI/O functions.

@ **Syntax**

C/C++

```
I16 GPIO_Init(void)
```

@ **Parameters**

None

@ **Return code**

```
NoError
ErrorOpenDriverFailed
ErrorDeviceIoctl
```

GPI_Read()

Reads the digital logic state of the digital input line..

@ **Syntax**

C/C++

```
I16 GPI_Read(U16 *pwState)
```

@ **Parameters**

pwState

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Returns the digital logic state of MXE-5400 digital input channels 1 to 8 (bit 0 to 7)

@ **Return code**

```
NoError
ErrorOpenDriverFailed
ErrorDeviceIoctl
```

GPO_Write()

Sets the digital logic state of the digital output line.

@ **Syntax**

C/C++

```
I16 GPO_Write(U16 wState)
```

@ **Parameters**

State

Sets the digital logic state of MXE-5400 digital output channels 1 to 8 (bit 0 to 7) to 0 or 1.

@ **Return code**

```
NoError
ErrorOpenDriverFailed
ErrorDeviceIoctl
```

GPO_Read()

Reads the digital logic state of the digital output line.

@ **Syntax**

C/C++

```
I16 GPO_Read(U16 *pwState)
```

@ **Parameters**

pwState

Returns the digital logic state of MXE-5400 digital output channels 1 to 8 (bit 0 to 7).

@ **Return code**

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```
NoError
ErrorOpenDriverFailed
ErrorDeviceIoctl
```

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Appendix B BIOS Setup



BIOS options in the manual are for reference only, and are subject to configuration. Users are welcome to download the latest BIOS version from the ADLINK website.

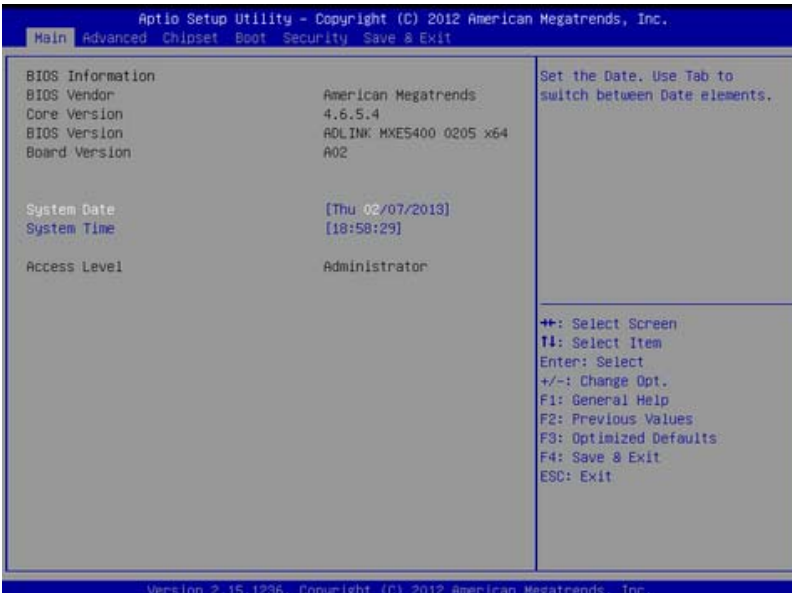
The Basic Input/Output System (BIOS) is a program that provides a basic level of communication between the processor and peripherals. In addition, the BIOS also contains codes for various advanced features applied to the MXE-5400. The BIOS setup program includes menus for configuring settings and enabling features of the MXE-5400 series. Most users do not need to use the BIOS setup program, as the MXE-5400 ships with default settings that work well for most configurations.



Changing BIOS settings may lead to incorrect controller behavior and possible inability to boot. In such a case, Section 1.8.1 on page 23 provides instruction on clearing the CMOS and restoring default settings

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B.1 Main



B.1.1 BIOS Information

Shows current system BIOS core version, BIOS version and Board version.

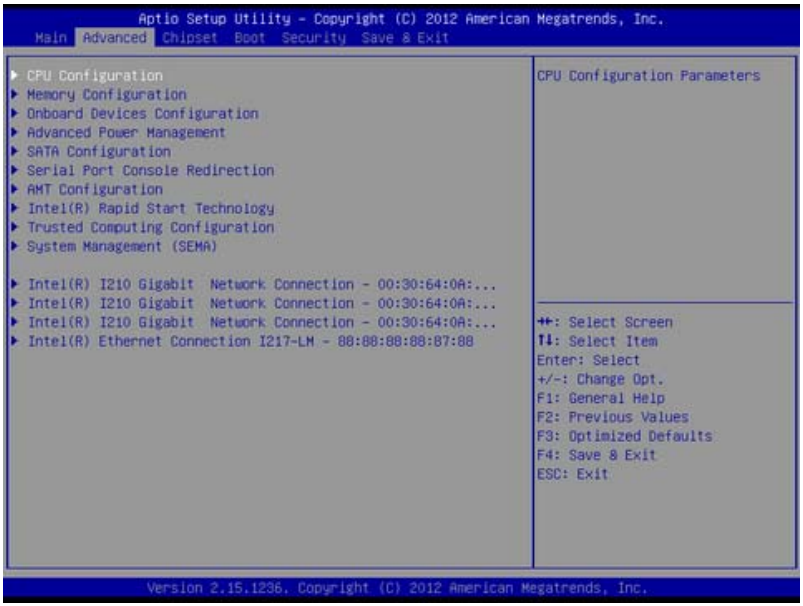
B.1.2 System Time/System Date

Changes system time and date. Highlight System Time or System Date using the up or down <Arrow> keys. Enter new values using the keyboard then <Enter>. Use < Tab > to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

NOTE: The time is in 24-hour format, for example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.

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B.2 Advanced

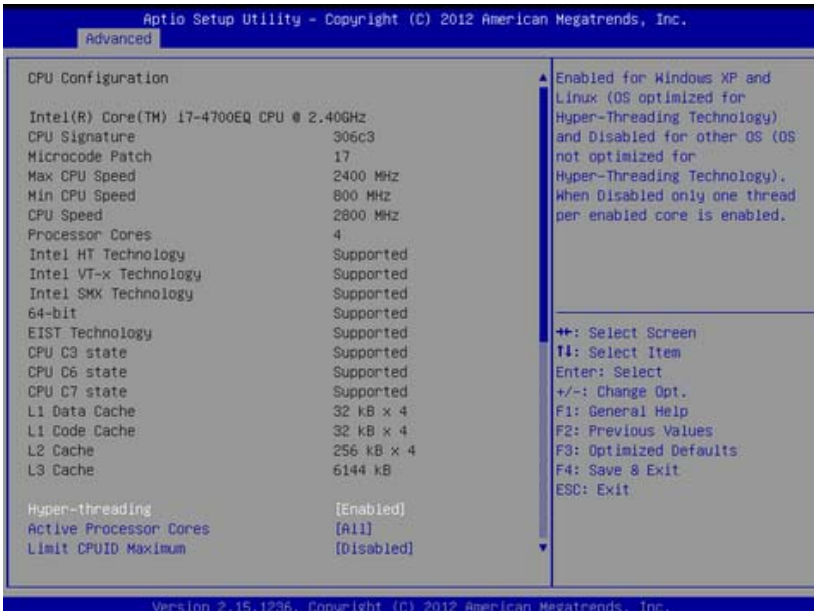


CAUTION:

Setting incorrect or conflicting values in Advanced BIOS Setup may cause system malfunction.

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CPU Configuration



Hyper-Threading

Enabled for OS optimized for Hyper-Threading Technology and disabled for those not optimized. When disabled only one thread per enabled core is enabled

Active Processor Cores

Number of cores to enable in each processor package.

Limit CPUID Maximum

Limits the CPUID return value, should be disabled in older OS to avoid system error.

Execute Disable Bit

Can prevent certain classes of malicious buffer overflow.

Intel Virtualization Technology

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology

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Hardware Prefetcher

Enables/disables the Mid Level Cache (L2) streamer prefetcher

Adjacent Cache Line Prefetch

Enables/disables prefetching of adjacent cache lines.

CPU AES

Enables/Disables CPU Advanced Encryption Standard instructions.

EIST

Enables/disables Intel SpeedStep Technology.

Turbo Mode

Enables/disables Intel TurboBoost Technology.

Energy Performance

Optimizes performance/power saving ratio.

CPU C state

Enables/disables CPU C states

Package C State limit

CPU Package C State limit.

ACPI CTDP BIOS

Enables/Disables ACPI CTDP BIOS support.

Configurable TDP Level

Allows reconfiguration of TDP levels based on current power and thermal delivery capabilities of the system.

Config TDP Lock

Locks the Config TDP Control register.

TCC Activation Offset

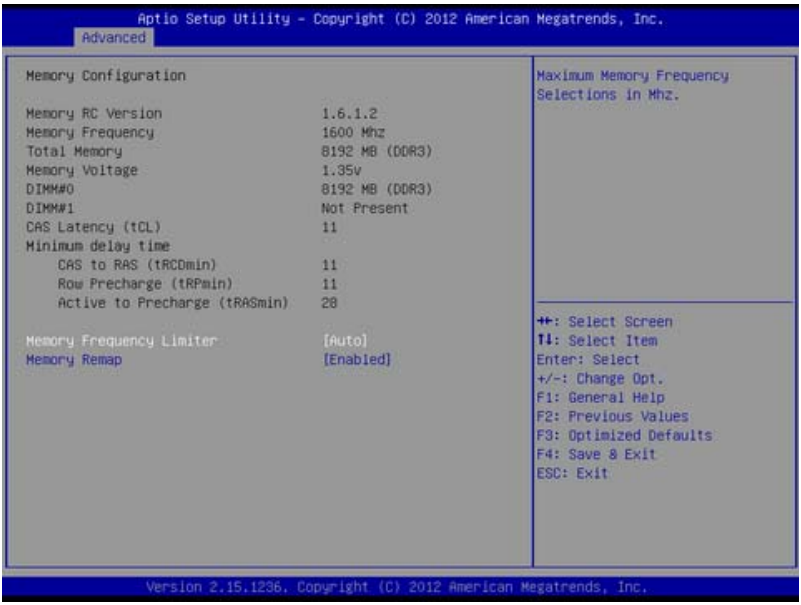
Offset from the factory TCC activation temperature

Intel TXT (LT) Support

Enables/Disables Intel® TXT(LT) support.

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Memory Configuration



Memory Frequency Limiter

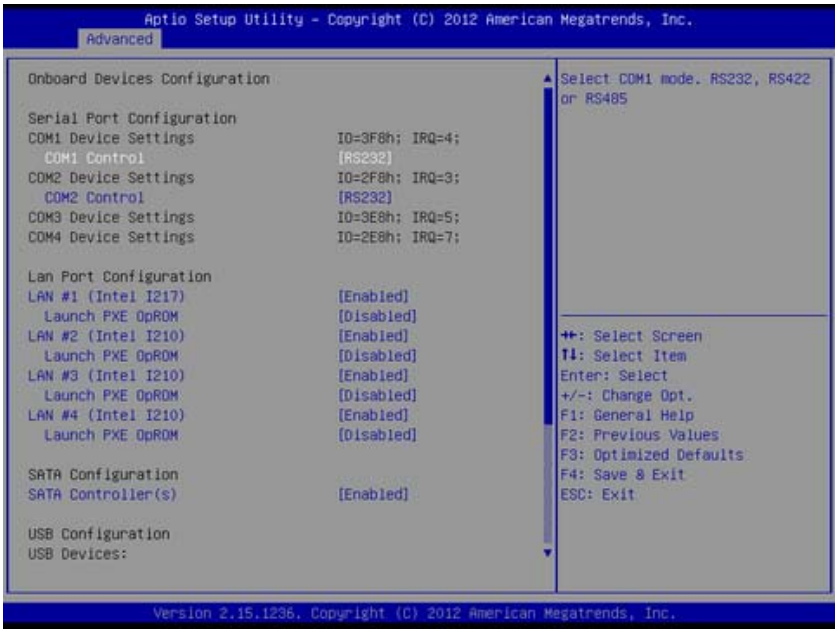
Maximum memory frequency, set in MHz.

Memory Remap

Enables/Disables memory remap over 4G.

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Onboard Device Configuration



COM1 Control

Select COM1 mode from among RS232, RS422 or RS485.

COM2 Control

Select COM2 mode from among RS232, RS422 or RS485.

LAN #1 (Intel I217)

Enables/disables onboard Intel I217 LAN controller.

Launch PXE OpROM

Enables/Disables execution of LAN boot-rom to add boot option for legacy network devices.

LAN #2 (Intel 210)

Enables/Disables onboard Intel 210 LAN controller.

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Launch PXE OpROM

Enables/Disables execution of LAN boot-rom to add boot option for legacy network devices.

LAN #3 (Intel 210)

Enables/disables onboard Intel 210 LAN controller.

Launch PXE OpROM

Enables/disables execution of LAN boot-rom to add boot option for legacy network devices.

LAN #4 (Intel 210)

Enables/disables onboard Intel 210 LAN controller.

Launch PXE OpROM

Enables/disables execution of LAN boot-rom to add boot option for legacy network devices.

SATA Controller(s)

Enables/disables SATA Device.

Legacy USB Support

AUTO option disables legacy support if no USB devices are connected, DISABLE option keeps USB devices available only for EFI applications.

USB 3.0 Support

Enables/Disables USB 3.0 (XHCI) controller support, allowing

USB 3.0 devices to be used in DOS environment.

XHCI Hand-Off

Enables BIOS support of XHCI Hand-Off feature. Default option is Enabled.

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Advanced Power Management



Restore On AC Power Loss

Determines the state entered when power is restored after a power loss, from among Last State, Power On, and Power Off.

Power Off	When set, powers the system down when power is restored.
Power On	When set, powers the system on when power is restored.
Last State	When set, powers the system down or on depending on the last system power state when power is restored.

Table B-1: Restore On Power Loss Settings

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Wake System With Fixed Time

Enables/Disables System Wake on Alarm event. When enabled, system will wake at the hr::min::sec specified.

Wake On Ring

Disables/Enables RI ping for Wake On Ring function.

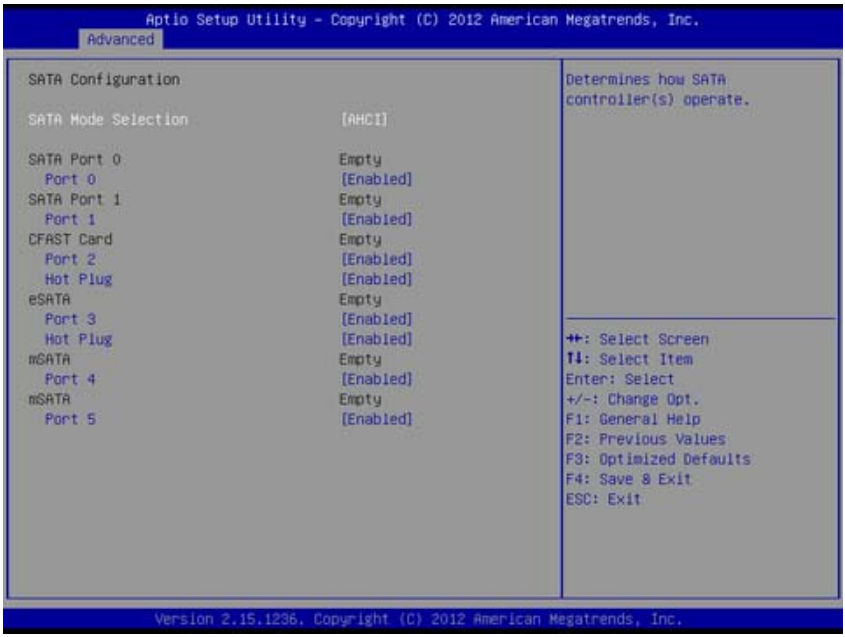
OS Watchdog

Enables/Disables OS Watchdog.

BIOS POST Watchdog

Sets watchdog timer for BIOS POST process.

SATA Configuration



SATA Mode Selection

Allows selection of the SATA channel configuration from among (1) IDE Mode, (2) AHCI Mode, or (3) RAID Mode.

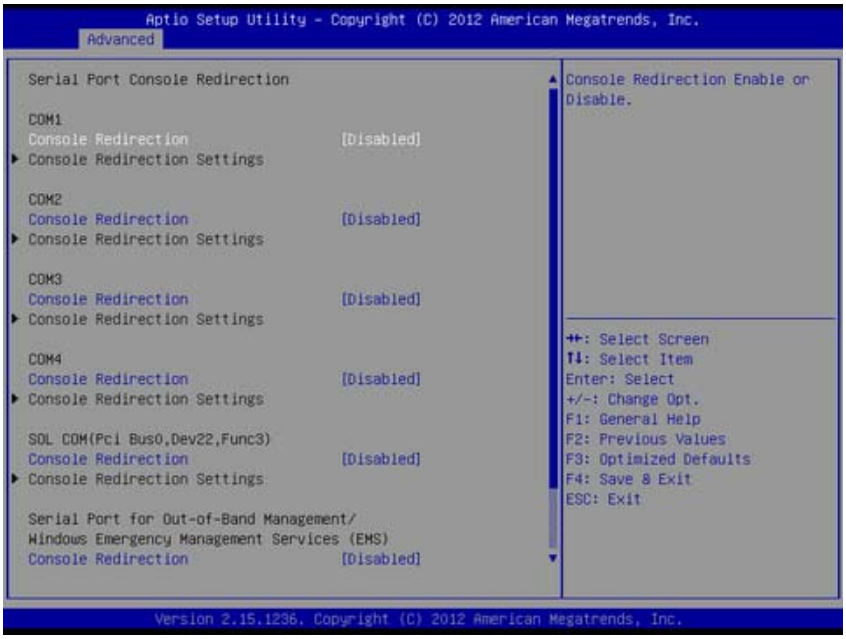
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SATA Port 0 / SATA Port 1 / CFAST Card / eSATA / mSATA / mSATA

Port X: Enables or disables SATA Port X

Hot Plug: Sets the port as hot pluggable.

Serial Port Console Redirection



COM 1 to 4, SOL (Serial Over LAN) COM Console Redirection

Enables console redirection of COM 1 to 4, SOL COM.

Console Redirection Setting

Miscellaneous parameters for COM Port 1 to 4, SOL COM.

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Serial Port for Out-of-Band Management/Windows Emergency Management Services (EMS)

Enables console redirection for remote management of a Windows Server OS through the designated Out-of-Band Mgmt Port.

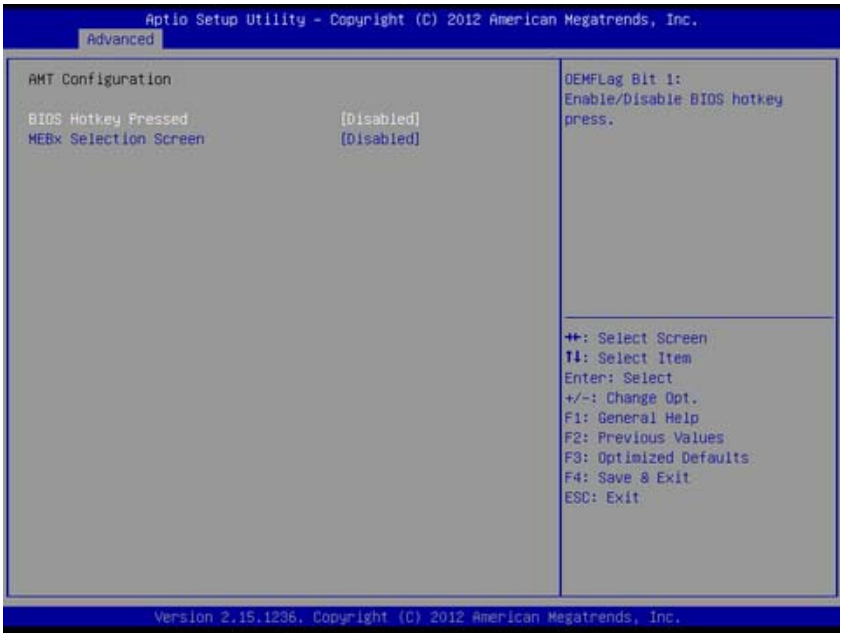
Out-of-Band Mgmt Port

Selects the COM Port for remote management of a Windows OS.

Terminal Type

Selects the transmission protocol for the remote terminal console.

AMT Configuration



BIOS Hotkey Pressed / MEBx Selection Screen

Miscellaneous settings for iAMT function.

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Intel® Rapid Start Technology



Intel® Rapid Start Technology

Enables/Disables Intel® Rapid Start Technology.

Entry on S3 RTC Wake

Invokes RapidStart upon S3 RTC Wake.

Entry After

Enables RTC wake timer at S3 entry, ranging from 0 (Immediately) to 120 minutes.

Active Page Threshold Support

Supports RST with small partition.

Hybrid Hard Disk Support

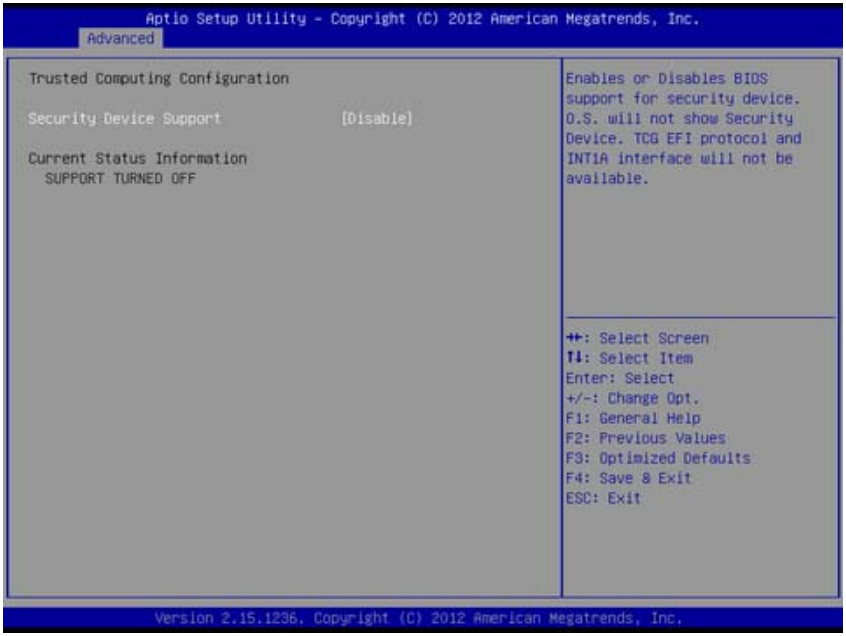
Hybrid Hard Disk Support.

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RapidStart Display Save/Restore

RapidStart Display Save/Restore.

Trusted Computing Configuration



Security Device Support

Enables/Disables BIOS support for security device. OS does not show Security Device. TCG EFI protocol and INT1A interface are not available.

TPM State

Enables/Disables Security Device. The computer reboots during restart to change status of the device.

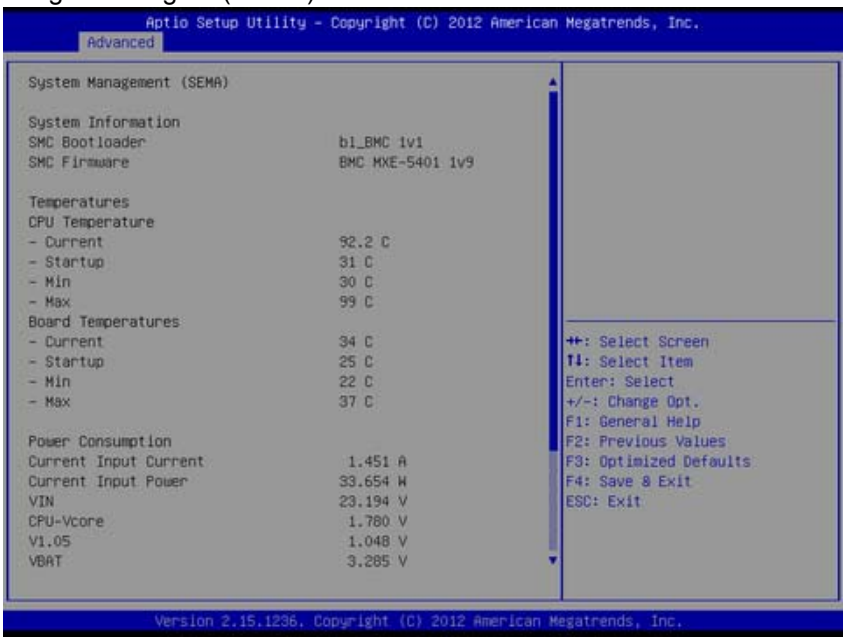
Pending Operation

Schedules an operation for the Security Device. The computer reboots during restart to change status of the security device.

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System Management (SEMA)

HW monitoring information from ADLINK Smart Embedded Management Agent (SEMA)



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B.3 Chipset



Intel VT-d Technology

Enables Intel® Virtualization Technology for Directed I/O function.

Aperture Size

Allows selection of aperture size.

DVMT Pre-Allocated

Selects DVMT 5.0 pre-allocated (fixed) graphics memory size used by the internal graphics device.

DVMT Total Gfx Mem

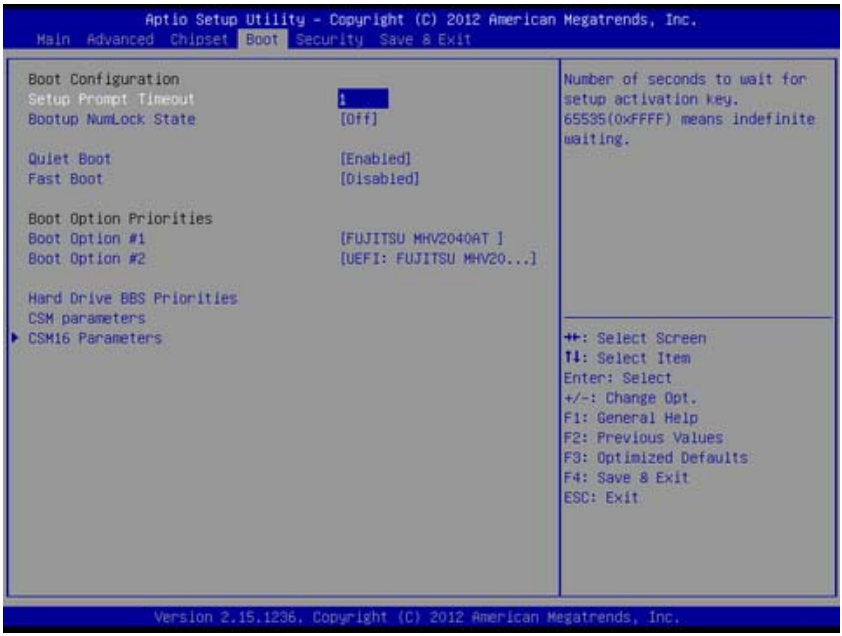
Selects total DVMT5.0 graphic memory size used by the internal graphics device.

Gfx Low Power Mode

This option is applicable for SFF only.

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B.4 Boot



Boot Configuration

Setup Prompt Timeout

Number of seconds to wait for setup activation key (DEL).

Bootup Num-Lock State

Allows Number Lock setting to be modified during boot.

Quiet Boot

When Disabled, directs BIOS to display POST messages. When Enabled, directs BIOS to display the OEM logo.

Fast Boot

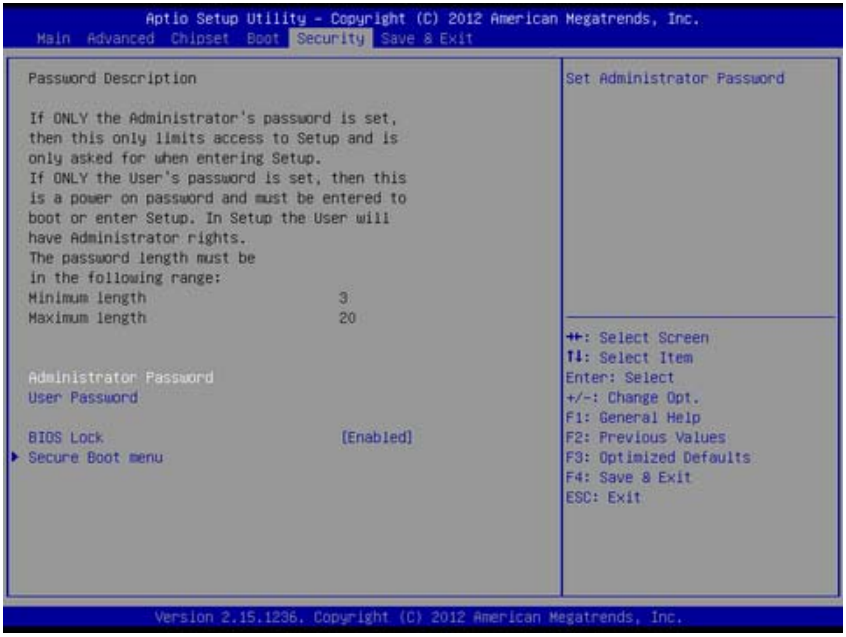
Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect on BBS boot options.

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Boot Option Priorities

Specifies the priority of boot devices, with all installed boot devices detected during POST displayed. Boot Option # specifies the desired boot device.

B.5 Security



If only the Administrator's password is set, only access to Setup is limited and the password only requested when entering Setup. If only the user's password is set, power on requires a password which must be accepted to boot or enter setup. In Setup the user has Administrator rights.

Administrator Password

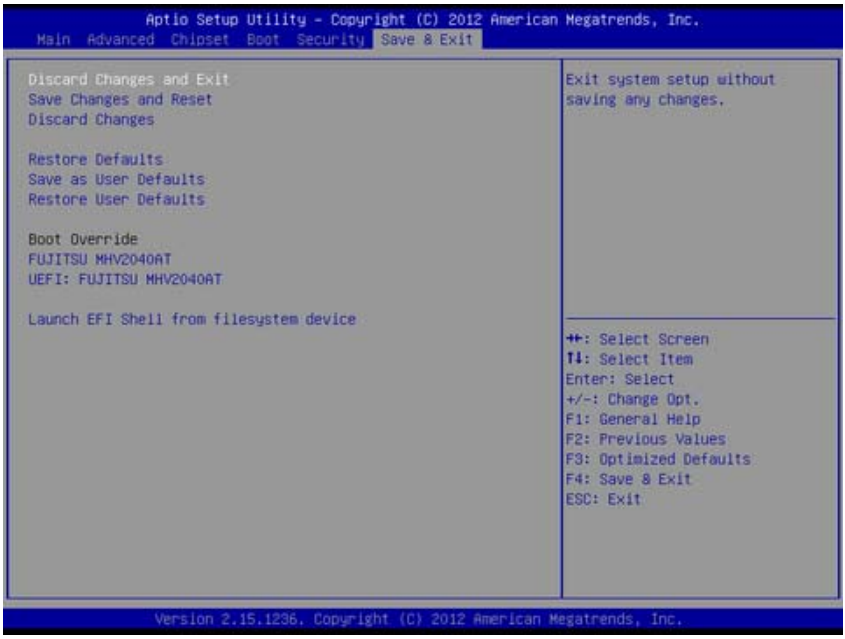
Sets Administrator password

User Password

Sets boot/setup User password

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B.6 Exit



Discard Changes and Exit

Exits system setup without saving any changes

Save Changes and Reset

Resets the system after saving the changes

Discard Changes

Discards changes made to any of the Setup options.

Restore Defaults

Returns all BIOS options to default settings, designed for maximum system stability, but not performance. Applicable in the event of system configuration problems.

Save as User Defaults

Saves changes made as User Defaults

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Restore User Defaults

Restores User Default settings to all Setup options

Launch EFI Shell from filesystem device

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Important Safety Instructions

For user safety, please read and follow all **instructions**, **WARNINGS**, **CAUTIONS,** and **NOTES** marked in this manual and on the associated equipment before handling/operating the equipment.

- Read these safety instructions carefully.
- Keep this user's manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment:
  - Turn off power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources;
  - Keep equipment away from high heat or high humidity;
  - Keep equipment properly ventilated (do not block or cover ventilation openings);
  - Make sure to use recommended voltage and power source settings;
  - Always install and operate equipment near an easily accessible electrical socket-outlet;
  - Secure the power cord (do not place any object on/over the power cord);
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.

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- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.
- A Lithium-type battery may be provided for uninterrupted, backup or emergency power.

WARNING:

Risk of explosion if battery is replaced with an incorrect type; please dispose of used batteries appropriately.

- Equipment must be serviced by authorized technicians when:
  - The power cord or plug is damaged;
  - Liquid has penetrated the equipment;
  - It has been exposed to high humidity/moisture;
  - It is not functioning or does not function according to the user's manual;
  - It has been dropped and/or damaged; and/or,
  - It has an obvious sign of breakage.

Please pay strict attention to all warnings and advisories appearing on the device, to avoid injury or damage.



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Getting Service

Contact us should you require any service or assistance.

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2F, C Block, Bldg. A1, Cyber-Tech Zone, Gao Xin Ave. Sec. 7,
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Tel: +82-2-2057-0565
Fax: +82-2-2057-0563
Email: korea@adlinktech.com

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Email: israel@adlinktech.com

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