

User Manual

FWA-2320

1U Entry-level Network
Appliance Based on Intel®
Atom™ C2000 System On Chip

ADVANTECH

Enabling an Intelligent Planet

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About This Manual

Thank you for purchasing and using the Advantech FWA-2320.

The target audience of this manual includes users, administrators and technicians. This publication is a useful reference when installing, configuring, operating and managing the FWA-2320.

This manual is organized as follows:

- Section 1: Getting Started helps you with the first steps with the FWA-2320.
- Section 2: Product Specification provides a detailed description of the FWA-2320 and its features.
- Section 3: Configuration and Service describes how to change the FWA-2320's configuration or how to install and service replaceable items.
- Section 4: Tips, Tricks and Troubleshooting provides best practices and other information that may be helpful for operation and troubleshooting of the FWA-2320.
- Appendices provide supplemental information referenced in the other sections of this document.

Useful Documents

If you cannot find the information you're looking for or need more detailed information on a specific topic, please refer to the list of additional documents and other sources of information below. Please contact your Advantech representative if you need help on obtaining these documents or still can't find what you're looking for.

- Advanced LAN Bypass User Manual
- Information on intel CPUs, Chipsets and NIC silicon can be found at www.intel.com
- FWA-2320 Reference Platform Software User's Guide (for samples only)

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*



Caution! *Cautions are included to help you avoid damaging hardware or losing data. e.g.*



There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Note! *Notes provide optional additional information.*



We Appreciate Your Input

Please let us know of any aspect of this product, including the manual, which could use improvement or correction. We appreciate your valuable input in helping make our products and documentation better.

Please send all such - in writing to: ncg@advantech.com

Glossary

ACPI	Advanced Configuration and Power Interface
AHCI	Advanced Host Controller Interface
APIC	Advanced Programmable Interrupt Controller
BIOS	Basic Input Output System
BMC	Baseboard Management Controller
CPU	Central Processing Unit
EHCI	Enhanced Host Controller Interface
FRU	Field Replaceable Unit
FW	Firmware
GbE	Gigabit Ethernet
HPM	Hardware Platform Management
HWM	Hardware Monitor (chip)
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
LOM	Lights Out Management
MAC	Media Access Control
MTBF	Mean Time Between Failures
NIC	Network Interface Controller
NMC	Network Mezzanine Card
NVRAM	Non-volatile Random Access Memory
OOS	Out Of Service
PCH	Platform Controllers Hub
PCIe	PCI Express
PECI	Platform Environment Control Interface
PCI SIG	PCI Special Interest Group
PICMG	PCI Industrial Computer Manufacturers Group
POST	Power On Self Test
PSU	Power Supply Unit
PXE	Pre-boot Execution Environment
QAT	QuickAssist Technology
QPI	QuickPath Interconnect
RASUM	Reliability, Availability, Serviceability, Usability, Maintainability
RDIMM	Registered DIMM
RMCP	Remote Management Control Protocol
RX	Receive
SAS	Serial Attached SCSI
SATA	Serial Advanced Technology Attachment

SCSI	Small Computer System Interface
SDR	Sensor Data Record
SerDes	Serializer/Deserializer
SOL	Serial Over LAN
SSD	Solid State Disk
SW	Software
TPM	Trusted Platform Module
TX	Transmit
UDIMM	Unbuffered DIMM
UHCI	Universal Host Controller Interface
USB	Universal Serial Bus

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Chapter 1

Getting Started

1.1 Safety Instructions

This section provides warnings that precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed during all phases of operation, service, and repair of this equipment. You should also employ all other safety precautions necessary for the operation of the equipment in your operating environment. If you are not sure about the precautions applicable to your operating environment, please contact your company's safety administrator. For basic information you may also refer to the safety precautions per IEC704-1 listed below although Advantech disclaims all responsibility for the accuracy of any statements contained therein and its applicability for your specific environment.

Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

Advantech intends to provide all necessary information to install and handle the FWA-2320 in this manual. Because of the complexity of this product and its various uses, we do not guarantee that the given information is complete. If you need additional information, contact your Advantech representative.

The product has been designed to meet the standard industrial safety requirements. It must not be used except in its specific area as specified in section 2.3.

Only personnel trained by Advantech or persons qualified in electronics or electrical engineering are authorized to install, service or maintain the product. The information given in this manual is meant to complete the knowledge of a specialist and must not be used as replacement for qualified personnel. Operating personnel must not remove equipment covers. Only factory authorized service personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment.

Do not install substitute parts or perform any unauthorized modification of the equipment or the warranty may be voided. Contact your local Advantech representative for service and repair to make sure that all safety features are maintained.

1.1.1 Safety Precautions per IEC704-1

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.

14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.
16. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

1.1.2 Safety Precautions - Static Electricity

Follow instructions below to protect yourself from harm and the products from damage:

1. Be sure you are at an ESD workstation, or grounded with an ESD strap before opening the top cover or installing/removing any unit accessible from the outside. Doing so will discharge any static electricity that might have built up in your body.
2. Don't touch any components inside the system while the system is on.
3. Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.
4. When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until you are ready to install the component in the unit.
5. When transporting any electrical component, first place it in an antistatic container or packaging.

1.2 Unpacking

Please check the delivery for completeness as you open the carton carefully. If any of the items listed in Table 1 is missing or damaged, please contact your Advantech representative.

When opening the box, you will find the FWA-2320 embedded in protective foam and the accessory box embedded to the foam. Remove the accessory box first and then pull out the unit including the protective foam using both hands. Now, remove the foam and the plastic sleeve on the unit.

After unpacking the unit, please check for any visible damage of the unit and contact your Advantech representative in case of any issue.

Table 1.1: Packing List

Item	Qty.	Image	Description
Network Appliance FWA-2320	1		1U Entry-Level Network Appliance based on Intel® Atom™ C2000 System On Chip
Console cable	1		Adapter cable RJ45 to DB9 2m for RS232.
HDD Carrier plate	1		Carrier Plate for 3.5" HDD
HDD Carrier Screw Set	1		Screws (4pcs) for mounting the HDD carrier plate inside the chassis
HDD screw set	1		Set of screws for 3.5" HDD mounting
mSATA Screw	1		Screw for mSATA SSD mounting
USB DOM screw	1		Screw for USB DOM mounting
SATA Cable	1		SATA Cable for HDD connection
Mounting Ears	2		Mounting Ears for Rack-mounting
Mounting Ear Screw Set	1		Screws (6pcs) for mounting the ears on the chassis

1.3 Installation and Configuration

The FWA-2320 comes as a pre-configured system with CPUs, memory and peripherals installed in the unit. In the rare case that you procured a barebone system or need to install components in the FWA-2320 for any other reason, please refer to section 3.

1.3.1 Rack Mounting

The FWA-2320 appliance is designed to be installed in a standard 19-inch rack. Please follow the basic guidelines below for rack mounting:

1. Mount the mounting ears on the each side of the unit using the screws included.
 - 1). Locate the threaded mount holes on the chassis on the side, close to the front panel.



Figure 1.1 Mounting ear thread holes

- 2). Place the mounting ear over the holes and insert the three screws. Do not tighten the screws immediately.



Figure 1.2 Mounting ear screws inserted but not fastened yet

- 3). After all screws have been inserted, hand tighten them using a PH2 screw driver to ensure secure installation.
2. Ensure the rack is adequate for the unit (weight) and the application.
3. Use the mounting hardware recommended by the rack manufacturer to mount the unit in the rack. Four mounting screws, compatible with the rack design, must be used and hand tightened to ensure secure installation
4. While Advantech does not supply support brackets, slide rails are available for separate order. Please refer to section 2.5 for options.
5. Choose a mounting location where all four mounting holes line up with those of the mounting bars of the 19-inch cabinet.
6. Choose a mounting location that does not block any air inlet and air outlet areas of the unit. It is also recommended to factor in heat generated by adjacent equipment and to avoid exposure to direct sunlight when mounting the unit. If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum recommended ambient temperature per section 2.3.

7. Route cables away from power lines, fluorescent lighting fixtures and sources of noise. Make sure that cables do not block air inlet and outlet areas.
8. Reliable grounding of rack-mounted equipment must be maintained.

1.3.2 Powering On

Before connecting the FWA-2320 to the power outlet, please make sure that the power rating of the outlet and the FWA-2320's PSU match. Please also make sure that the primary circuit and all power distribution is not overloaded. Inrush current and steady state power specifications for the FWA-2320 can be found in appendix C as well as the type label on the bottom of the unit.

Connect the power card to the PSU module and then to the power outlet. The PSU has a primary on off switch next to the power connector. Make sure that this switch is in the on position.

The unit will automatically power on after power is supplied. The green LED on the front panel should be lit as the unit is under power.

Please refer to section 2.4 for the location of front and rear panel elements.

1.3.3 Connecting to the Console

FWA-2320 does not provide an interface for an external monitor in the standard configuration. BIOS output as well as OS output are provided via a serial terminal connection by default.

The remainder of this section describes how to configure PuTTY on a Windows platform for connection with the FWA-2320 serial console as a reference. Other terminal programs may be used in a similar way as well.

Open up PuTTY and begin the configuration as shown below. Please use the actual COM port's number on the client machine instead of "COM1".

- Specify "COM1" under serial line and "115200" for speed, no parity, no flow control.
- Check Serial for connection type.
- Check "VT100+" for keypad in the keyboard submenu
- Check "Colour" or "Both" for "Indicate bolded text" in the colours submenu
- Click the "Open" button and a PuTTY terminal screen will appear.

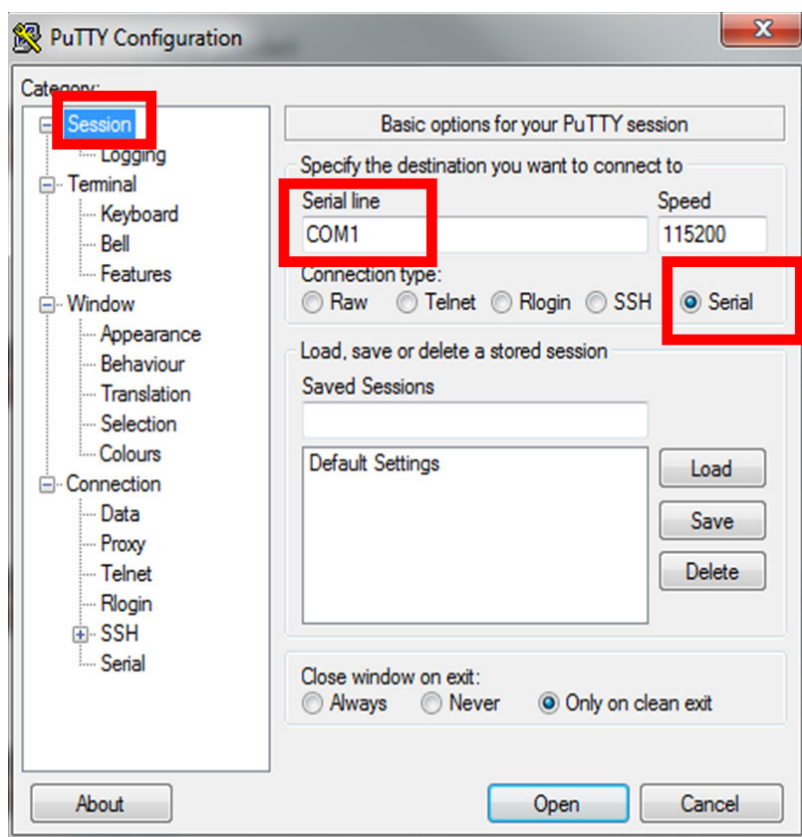


Figure 1.3 PuTTY Session Configuration

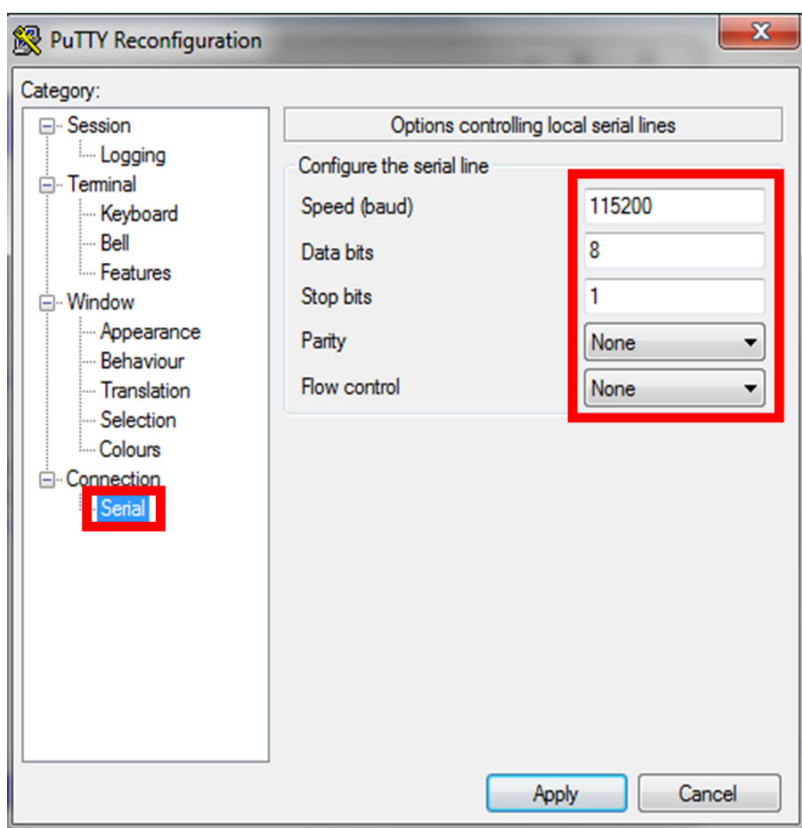


Figure 1.4 PuTTY Serial Configuration

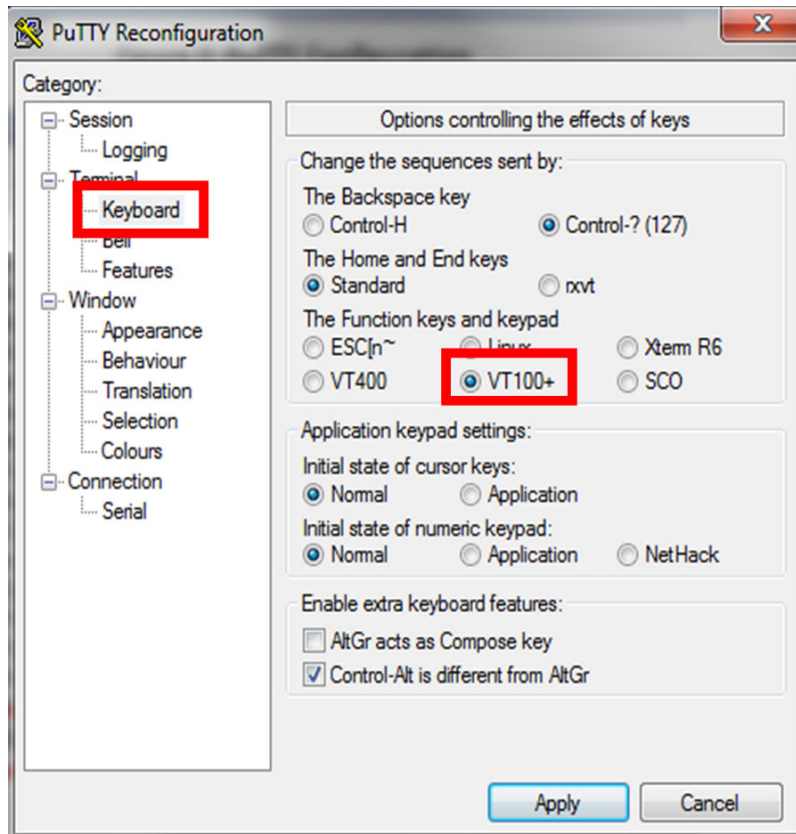


Figure 1.5 PuTTY Keyboard Settings

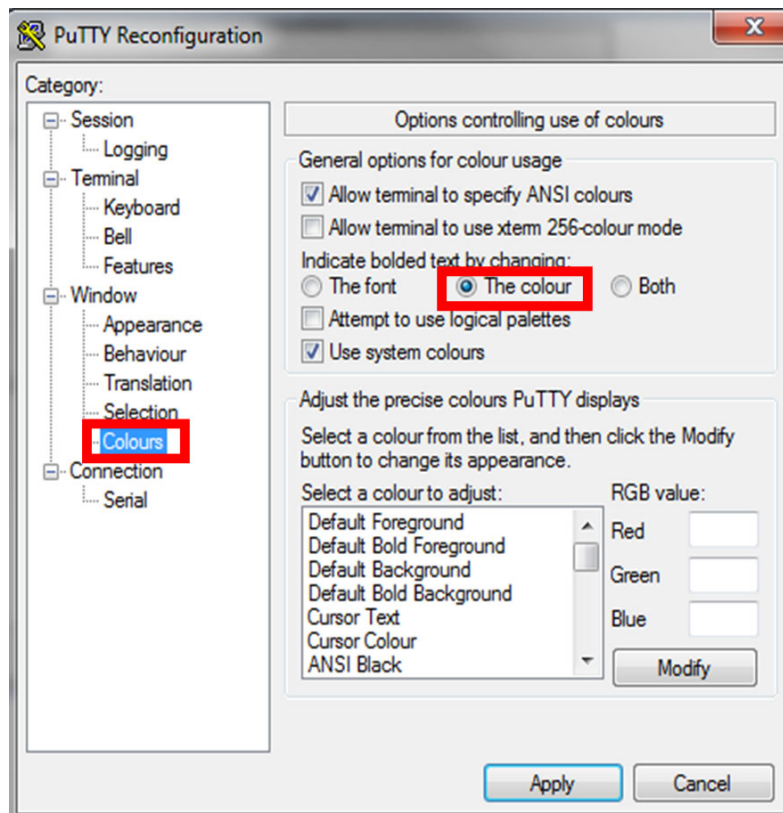


Figure 1.6 PuTTY Colour Settings

If the connection is successful you should be able to see the BIOS Power On (POST) screen after powering the unit:

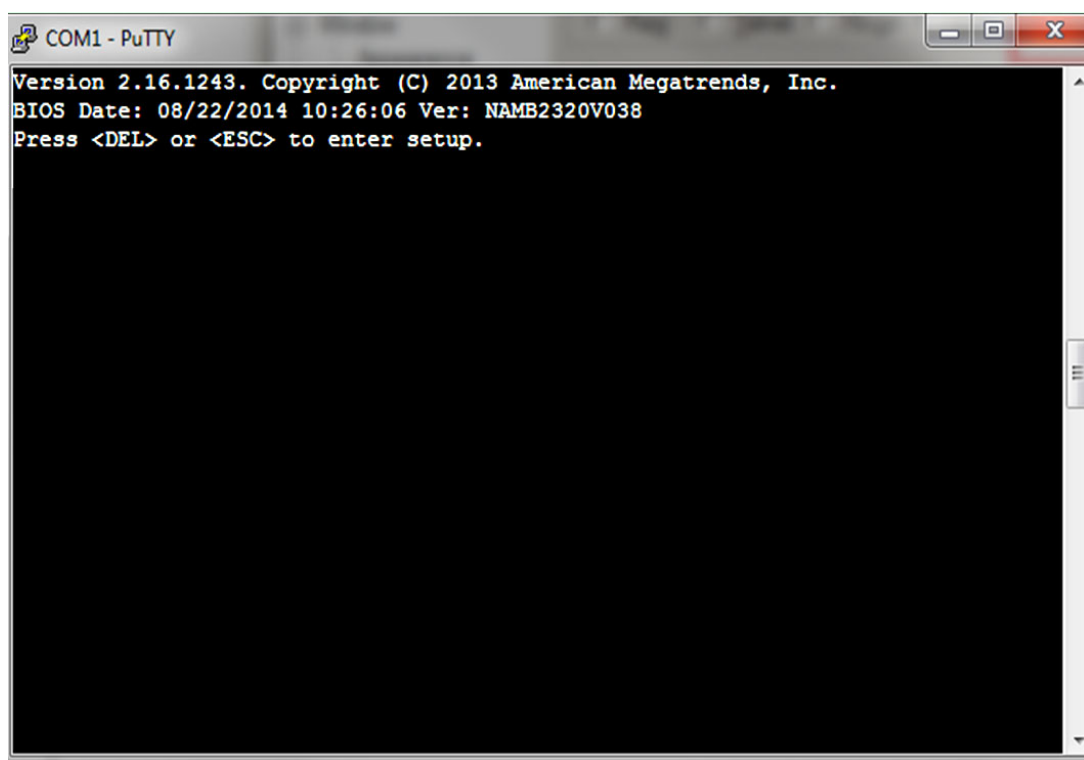


Figure 1.7 BIOS POST screen

Please note that the BIOS is doing some initial start up work while the console is still not active. It may take a while until the BIOS POST screen appears. On the other hand, the BIOS has been optimized for minimum boot time. The BIOS will move through POST quickly and immediately try to boot an OS according to the selected boot options in the BIOS:

In case you would extend the time the BIOS displays the POST screen and waits for a key press to enter the setup menu, you can do so via the BIOS setup menu. Please refer to section 3.2 for details.

1.3.4 Installing an OS

Several options are available for OS installation:

- System comes with a preinstalled OS
- Install an image from a USB key
- Install an OS via network boot.

If you use Advantech's services to pre-install an OS, you can skip the following section.

1.3.4.1 Pre-Installed reference OS

If you receive this manual along with a sample unit, the system will have a reference OS installed by default. The unit will be ready to boot the reference OS from the mass storage option selected.

1.3.4.2 Installing and/or boot an OS from a USB key

To install an OS via USB and/or boot the appliance from an USB stick, please make sure the following BIOS options are configured properly:

Advanced Setup: USB Configuration: Mass Storage Driver = Enabled

To boot from a USB stick:

1. Create a Live USB stick using LiLi (available via <http://www.linuxliveusb.com/>) or a similar tool. Please make sure to configure the Linux for the operation with a serial console (115200bd, 8N1, no handshake). Enabling serial support in the Linux bootloader (grub or similar) as well as kernel debug messages via serial console may be valuable for potential troubleshooting.
2. Install the USB stick in one of the front ports. Make sure you have a serial console connection established via tools such as PuTTY as described earlier.
3. Power on the appliance.
4. The boot priority in the FWA-2320's BIOS is giving SATA devices higher priority than USB devices. This is a safety measure to avoid that any end user can tamper the unit when installed in the field with a bootable USB stick. So, in order to boot from the USB stick, you need to enter BIOS setup.
In BIOS setup menu, move to the "Boot" menu. You can either give the USB stick higher boot priority over SATA devices. Alternatively, you can select the USB stick in the "Boot Override" Menu. Boot Override will modify the boot order for a single boot process only and will automatically revert back to the original boot priority. After making these changes leave the Setup Menu via "Save&Exit". This will restart the appliance and it will boot from the USB stick.

1.3.4.3 Installing an OS via network boot

To install an OS via network, basically works the same way as booting an OS via USB stick described above.

The main difference is that instead of a Linux live image you need to install a network installer / a network installable image on the USB key. Network Installers or network installable iso images are available for most Linux distributions such as RedHat, Debian, Ubuntu and CentOS. For detailed information, please refer to the documentation of the related network installer and / or Linux distribution.

Please make sure you configure the network installer image properly for the Ethernet port / device of the FWA-320 that you plan to use for the installation.

1.3.4.4 Booting an OS via network boot

The FWA-2320 supports booting over network via PXE.

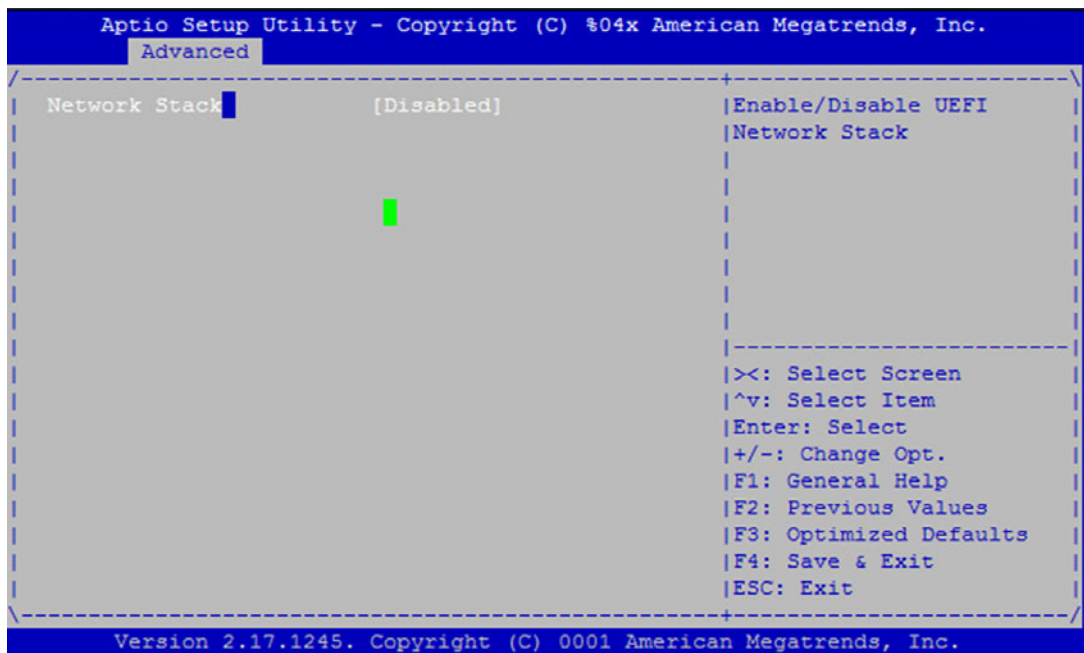
To boot an OS via network, please make sure the following BIOS options In the Advanced: Network Stack Configuration Menu are configured properly:

Table 1.2: PXE BIOS Options

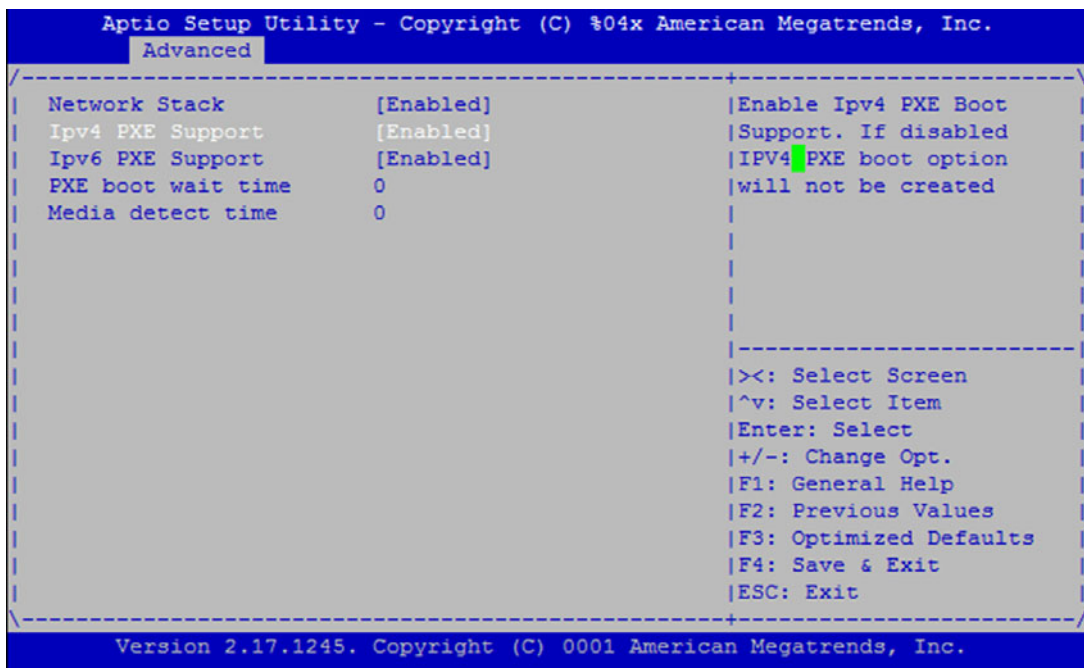
Network Stack	Enabled	Enables the UEFI Network Stack.
IPv4 PXE Support	Enabled Disabled	Enabled if PXE booting in an IPv4 network; disabled otherwise
IPv6 PXE Support	Enabled Disabled	Enabled if PXE booting in an IPv6 network; disabled otherwise

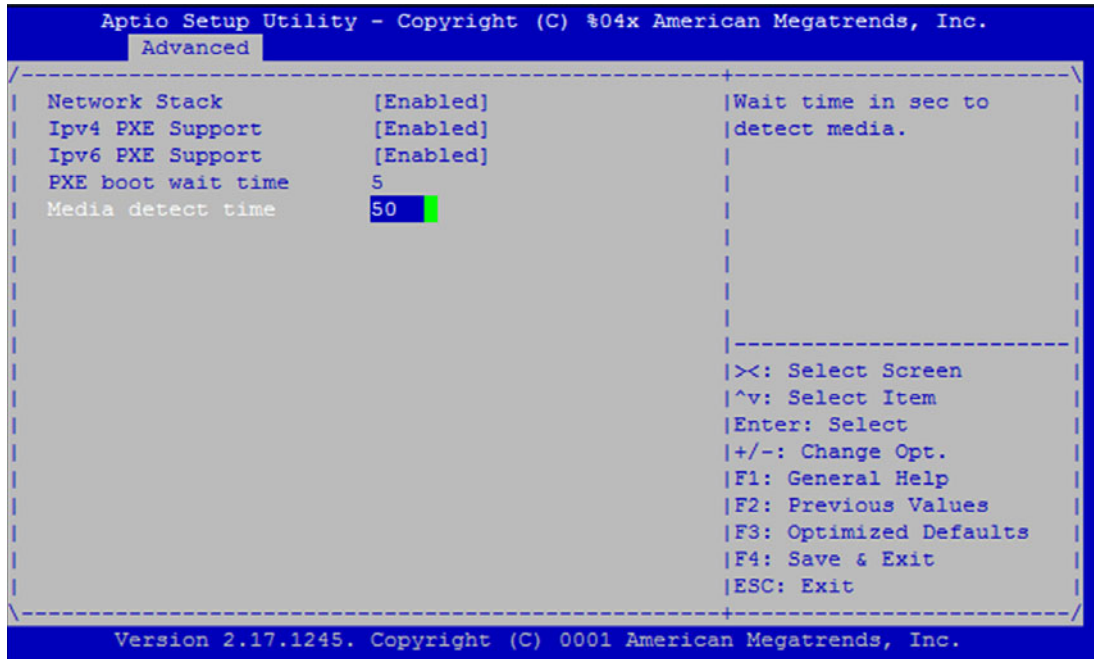
Below are the steps to enable PXE boot.

1. It needs to set BIOS/ Advanced-> Network Stack Configuration-> Network Stack as enabled (default setting is disabled)

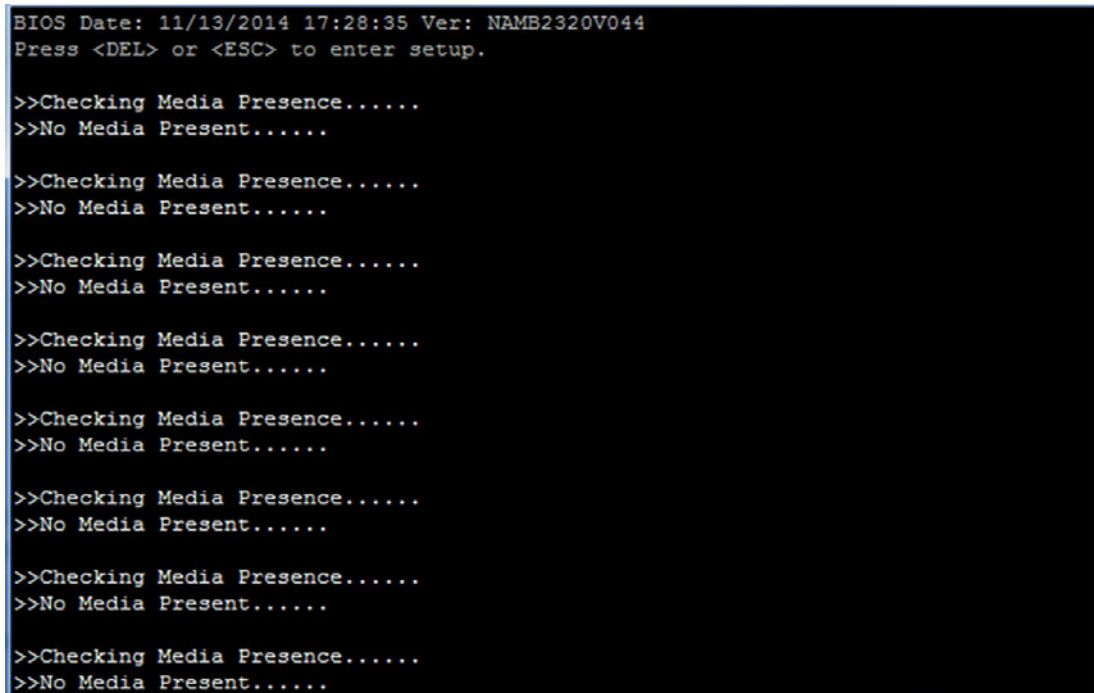


2. When set Network Stack is enabled, it may set IPV4 PXE & IPV6 PXE function as enabled/disabled, and set PXE boot wait time (range 0~5) & Media detect time(range 0~50).

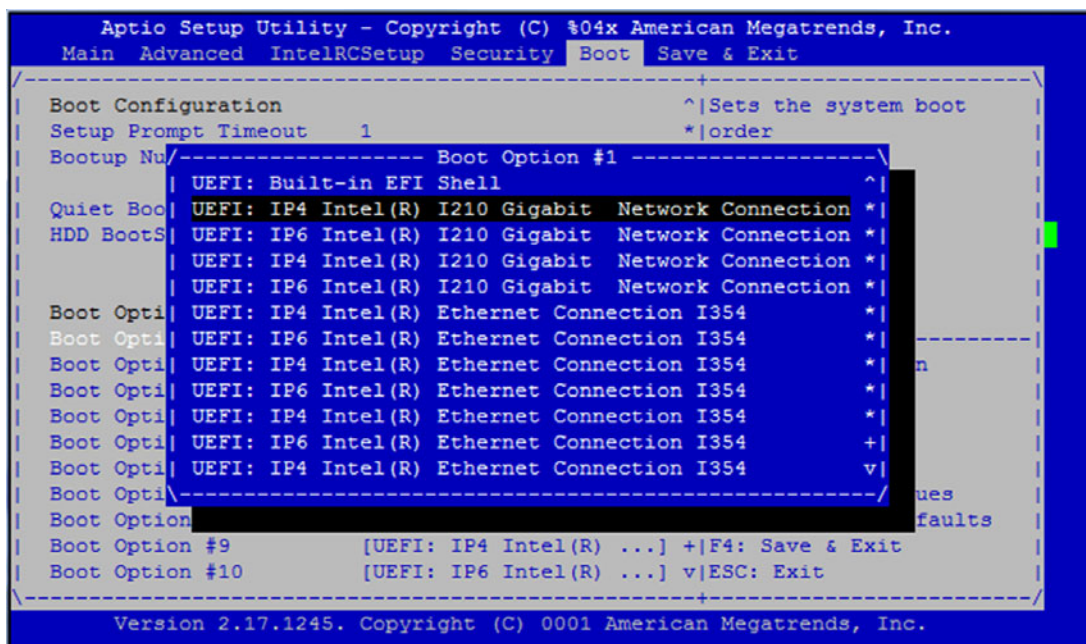




3. Save BIOS and reboot system. The BIOS will show “Checking Media Presence.....”, if system is not connected PXE server, it will show “No Media Present.....”



4. User may re-login in BIOS, choose BIOS/ boot item, and set UEFI PXE LAN boot sequence,



PXE boot usually does not allow for OS installation over network as the PXE client will only load a single file from the boot server. Similarly, booting Linux over network is usually a two stage process. In the first step, a boot loader such a grub or mini OS such as SysLinux are loaded via PXE from the boot server. The boot loader or miniOS then load the actual target OS which usually consists of multiple files which decompressed and installed into a RAM disk. The detailed process and required configuration of such network install will heavily depend on the target OS and boot loader / miniOS used. Please refer to the related documentation available.

PXE boot requires a DHCP server and a TFTP server in the network to complete. DHCP Server and TFTP server are commonly run on the same machine and collectively referred to as “boot server”. Setting up such a boot server implies a couple of steps. How-to guides for setting up Linux as PXE boot server are available on the internet, e.g. https://www.debian-administration.org/article/478/Setting_up_a_server_for_PXE_network_booting.

Please note that it is recommended to setup a separate network / subnet for network booting as the DHCP required for PXE booting may conflict with existing DHCP servers in your network.

The PXE client in the FWA-2320 sends the system’s GUID as part of the DHCP Request. Some boot servers have mechanisms to automatically configure the target OS image based on the client system’s GUID. Using this mechanism allows to use the same boot server for network booting of different devices / appliances.

1.4 Getting Help: Technical Support and Assistance

In case the unit you received is a sample for evaluation, please contact your Advantech representative. For production units, please follow the process below:

1. Visit the Advantech web site at www.advantech.com/support to find the latest information about the FWA-2320 and related products.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Worldwide contact information can be found on www.advantech.com.
3. Please have the following information ready before you call / be sure to include this information in your email:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of firmware and software versions installed on the product
 - A complete description of the problem
 - The exact wording of any error messages
4. In case the unit needs to be send back for repair, please refer to appendix E for instructions.

Chapter 2

Product Specification

2.1 Overview

The FWA-2320 is the latest addition to Advantech's portfolio of networking platforms based on the Intel® Atom® processor C2000 family extending the scalability of the Intel® platform for communications infrastructure from high end ATCA based systems all the way down to this entry level 1U rackmount appliance. The FWA-2320 can support 2-core, 4-core and 8-core processor SKUs with or without QuickAssist hardware acceleration providing additional flexibility to Network Equipment Providers to choose a platform which meets their performance / price targets. In addition to supporting up to eight Atom™ cores based on the Silvermont architecture in 22nm technology yielding higher clock frequencies and significantly increased performance gains, the new System On Chip processor features tighter I/O integration and improved IO bandwidth.

On-chip functions include four server class GbE ports and crypto acceleration for symmetric keys, bulk security encryption/decryption and public key functions. The four Ethernet data ports support optional LAN bypass and are complemented by two PCIe based Gigabit Ethernet management ports.

System features include an LCM, one RJ45 console and two USB ports as well as one internally mounted 3.5" HDD/SDD with SATA Gen3 support. An mSATA slot and a USB DOM socket provide options for adding SSDs. A PCIe x4 slot provides further expansion capabilities.

Figure 2 shows the various elements in the FWA-2320.

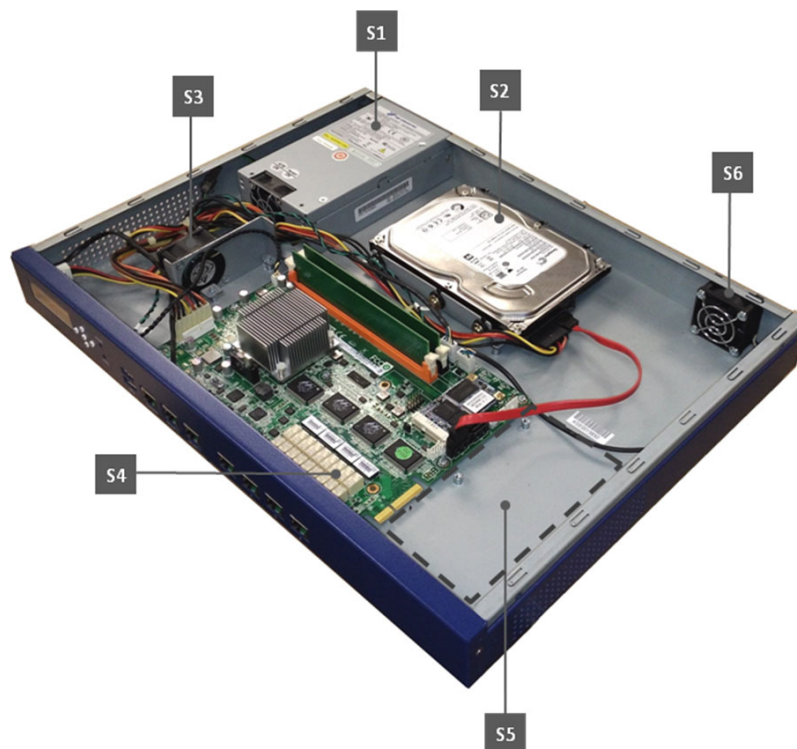


Figure 2.1 System Overview

Table 2.1: System Components

Component	Qty.	Description
S1	1	PSU module
S2	1	3.5" HDD
S3	1	Front fan
S4	1	NAMB-2320 Motherboard

Table 2.1: System Components

S5	1	PCIe expansion card mounting area
S6	1	Rear fan

2.2 Product Versions

The FWA-2320 is available in the following standard configurations. Contact your Advantech representative for availability of other configuration options.

Table 2.2: Available Product Versions

Model Name	Configurations
FWA-2320-00E	C2358 (2C/ 1.7GHz) with 2Gbps QuickAssist 2 DIMM sockets, up to 1333 MHz 6 LAN ports W/ bypass 1x Fixed 100W PSU
FWA-2320-01E	C2558 (4C/ 2.4GHz) with 5Gbps QuickAssist 2 DIMM sockets, up to 1600 MHz 6 LAN ports w/ bypass 1x Fixed 100W PSU
FWA-2320-02E	C2758 (8C/ 2.4GHz) with 10Gbps QuickAssist 2 DIMM sockets, up to 1600 MHz 6 LAN ports w/ bypass 1x Fixed 100W PSU

2.3 Technical Specifications

Table 2.3: Specifications

Processor System	CPU	Intel® Atom™ C2000 processor	
	L2 Cache	1 MB /4 MB depending on CPU SKU	
Memory	Technology	One DDR3 channel, two DDR3 UDIMMs up to 1600 MT/s depending on CPU SKU	
	Capacity	Up to 16 GB	
PCI-Express	Expansion Slots	Internal PCIe x4 gold finger expansion (optional)	
Ethernet	LAN on Board	4 x GbE LAN ports (integrated in Atom? C2000) with 2 segment advanced bypass support (optional) 2 x GbE management ports (Intel I210-AT based) (no bypass capability)	
Mass Storage	SATA	1 x 2.5"/3.5" SATA HDD or SSD	
	Others	Internal mSATA (1x) and USB DOM slot (1x)	
Management interfaces	USB	2 x USB ports	
	Serial	1 x RJ45 console port (RS232)	
	LCD Module	1 x graphic LCM module, 5 buttons (optional)	
Power Supply	Wattage	100 W	
	Input	100 V ~ 240 V @ 50 ~ 60 Hz, full range	
Environment		Operating	Non-Operating
	Temperature	0 ~ 40° C (32 ~ 104° F)	-20 ~ 75° C (-4 ~ 167° F)
	Humidity	5 ~ 85% @ 40° C (104° F)	5 ~ 95%

Table 2.3: Specifications

Physical Characteristics	Dimensions (W x H x D)	426 x 44.4 x 319 mm
	Weight (N.W)	4.5 kg (9.9 lb)

2.3.1 System dimensions

The system dimensions (in mm) are shown below:

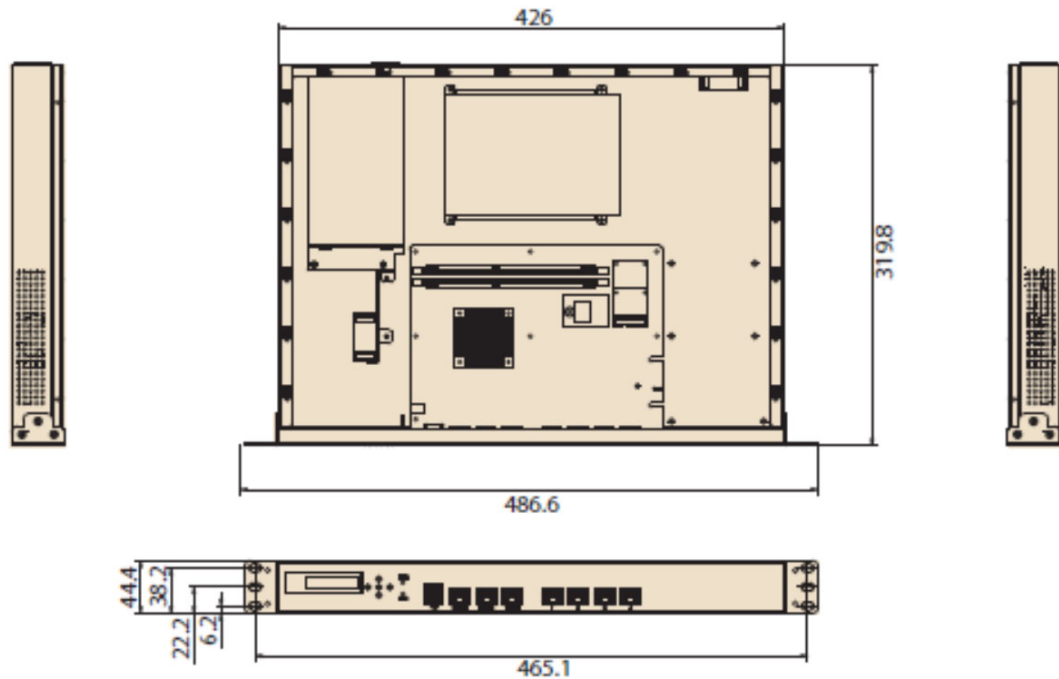


Figure 2.2 System Dimensions

2.3.2 Regulatory Compliance

The Advantech FWA-2320 meets the specifications and regulations for safety and EMC defined in this chapter. Please contact your Advantech representative for a copy of the declaration of conformity or detailed test reports.

2.3.2.1 Safety

Table 2.4: Applicable Safety Regulations

USA/Canada	UL 60950-1 2nd Edition//CSA C22.2 No. 60950-1-07 2nd Edition
Europe	EN 60950-1:2006/A11:2009/A1:2010/A12:2011
International	CB Certificate and Report to IEC60950-1, 2nd Edition and all international deviations

2.3.2.2 Electromagnetic Compatibility

Table 2.5: Applicable EMC Regulations	
USA	FCC 47 CFR Parts 15, Verified Class A Limit
Canada	ICES-003 Class A Limit
Europe	EMC Directive, 2004/108/EC EN55022, Class A Limit, Radiated & Conducted Emissions EN55024 Immunity Characteristics for ITE EN61000-4-2 ESD Immunity EN61000-4-3 Radiated Immunity EN61000-4-4 Electrical Fast Transient EN61000-4-5 Surge EN61000-4-6 Conducted RF EN61000-4-8 Power Frequency Magnetic Fields EN61000-4-11 Voltage Fluctuations and Short Interrupts EN61000-3-2 Harmonic Currents EN61000-3-3 Voltage Flicker
Taiwan	BSMI Approval, CNS 13438, Class A and CNS13436 Safety
International	CISPR 22, Class A Limit, CISPR 24 Immunity

2.3.2.3 CE Mark

The CE marking on this product indicates that it is in compliance with the European Union EMC Directive 2004/108/EC, Safety Directive 2001/95/EC, Low Voltage Directive 2006/95/EC, and RoHS (recast) Directive 2011/65/EU.

2.4 Detailed Description

2.4.1 Front Elements

Please refer to Appendix A for a description of connector pin definitions.

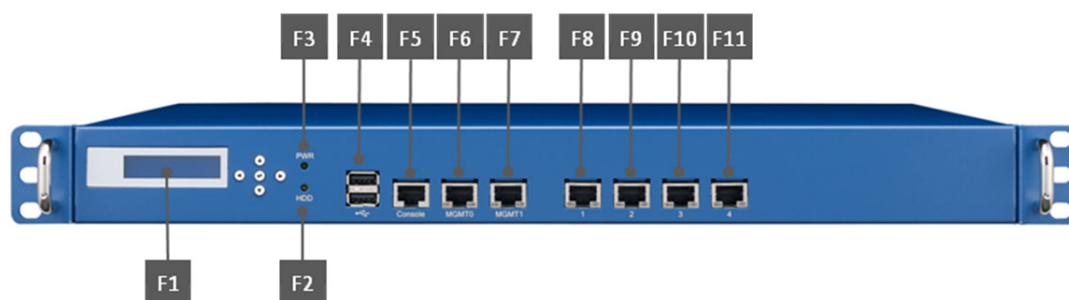


Figure 2.3 System Front View

Table 2.6: Front Elements		
Item	Element	Description
F1	LCM	Graphical LCD Module with 5 buttons
F2	HDD LED	Hard disk activity LED (all SATA devices)
F3	PWR LED	Power LED
F4	USB Connector	Stacked Type A USB connector providing 2 USB2.0 ports
F5	Console Connector	RS232 Console Connector
F6	Management Port 0	Management LAN Port 0
F7	Management Port 1	Management LAN Port 1
F8	Traffic Port 1	Traffic LAN Port 1

Table 2.6: Front Elements

F9	Traffic Port 2	Traffic LAN Port 2
F10	Traffic Port 3	Traffic LAN Port 3
F11	Traffic Port 4	Traffic LAN Port 4

2.4.1.1 LED Details

Two LEDs are provided at the front for signalling important system status at the location F2 and F3.



Figure 2.4 Front LEDs

The PWR LED is a green indicator which is lit when the unit is powered. The HDD activity LED is amber and indicates hard disk and mSATA activity.

2.4.2 Rear Elements



Figure 2.5 System Rear View

Table 2.7: Rear elements

Item	Element	Description
R1	System fan	Rear system fan exhaust
R2	Power inlet	Power connector
RF3	Power Supply fan	Exhaust of PSU fan
R4	On/Off Switch	Power Switch

2.4.3 System Block Diagram

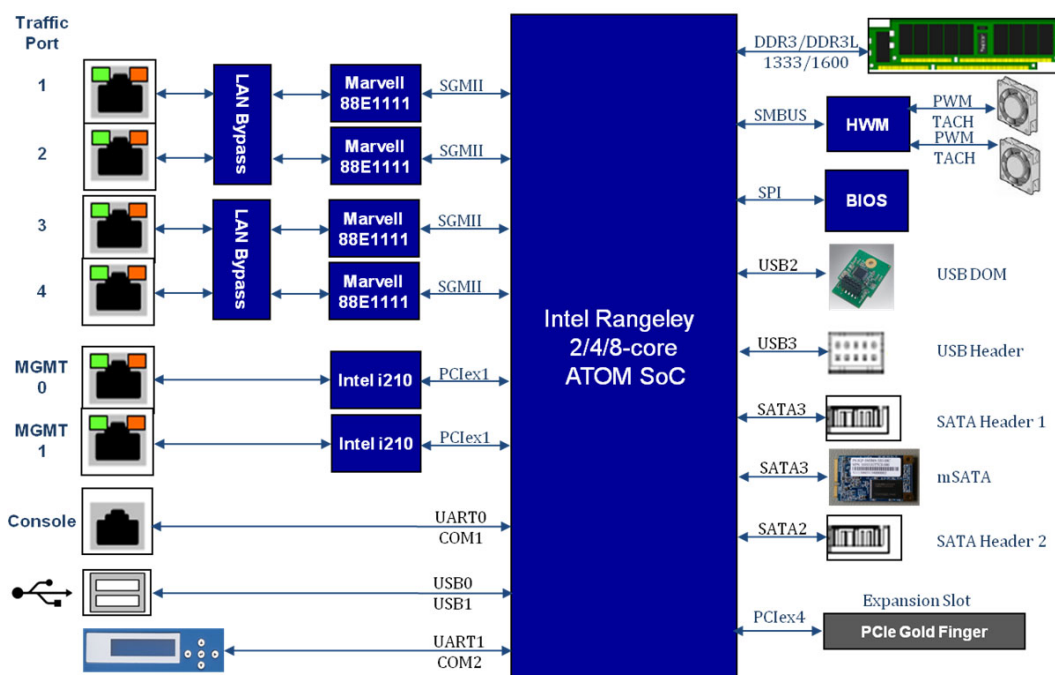


Figure 2.6 Block diagram

2.4.3.1 Processor(s)

The FWA-2320 supports one ATOM C2000 processor. The table below gives an overview of the processor SKUs for communication infrastructure which can be supported on the FWA-2320:

Features	8 Core	8 Core	8 Core	4 Core	4 Core	4 Core	2 Core	2 Core
SKU - Intel® Atom™ Processor	C2758	C2738	C2718	C2558	C2538	C2518	C2358	C2338
Target TDP	~20 W	~20 W	~18 W	~15 W	~15 W	~13 W	~7 W ⁺⁺	~7 W ⁺⁺
CPU Cores	8	8	8	4	4	4	2	2
Core Freq Base (Turbo)	2.4 GHz None	2.4 GHz None	2.0 GHz None	2.4 GHz None	2.4 GHz None	1.7 GHz None	1.7 GHz (2.0 GHz)	1.7 GHz (2.0 GHz)
Memory Channels	2	2	2	2	2	2	1	1
DIMMs/Channel	2	2	2	2	2	2	2	2
Memory Type	DDR3L	DDR3L	DDR3L	DDR3L	DDR3L	DDR3L	DDR3L	DDR3L
Memory Frequency	1600	1600	1333	1600	1600	1333	1333	1333
PCIe Lanes - Max	16	16	16	16	16	16	8 ⁺⁺	8 ⁺⁺
PCIe Controllers	4	4	4	4	4	4	4	4
GbE ports	4	4	4	4	4	4	4	4
SATA 3 Ports	2	2	2	2	2	2	2	2
SATA 2 Ports	4	4	4	4	4	4	2	4
USB 2 Ports	4	4	4	4	4	4	4	4
Intel® VT-x2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intel® QuickAssist Technology								
	10 Gbps*	NONE	10 Gbps*	5 Gbps**	NONE	5 Gbps**	4 Gbps**	NONE

Figure 2.7 ATOM C2000 SKUs for Communications Infrastructure

Please note that the ATOM C2000 is soldered on the motherboard and cannot be installed later. The standard product configurations available including CPU options are listed in section 2.2. If you're interested in the support of other CPU SKUs, please contact your Advantech representative.

For details on the features of the Atom C2000 processor, please refer to documentation available from intel.

2.4.4 Memory

Two DDR3L or DDR3 DIMMs are supported on the FWA-2320. Both DIMMs reside on the CPU's memory channel A and can support operation up to 1600MT/s (CPU SKU dependent).

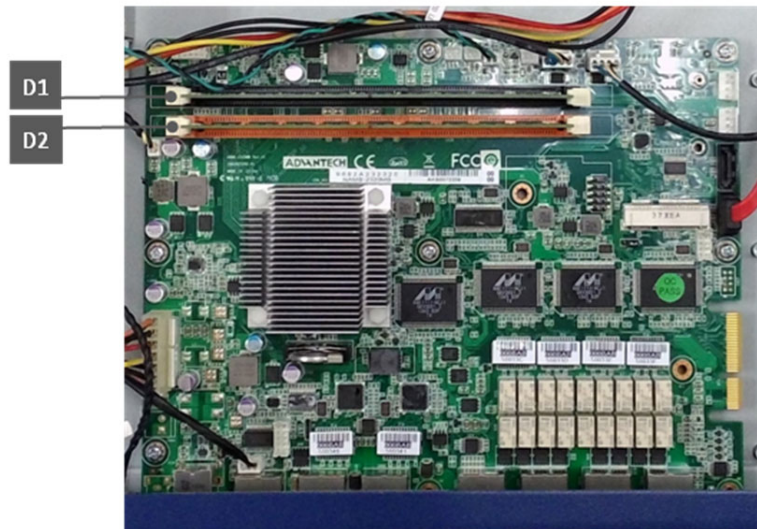


Figure 2.8 DIMM Location

Table 2.8: DIMM Mapping

Location	DIMM	Channel	Color	SMBus Adr.
D1	1	A	Black	0xA0
D2	2	A	Amber	0xA2

DIMM modules can be populated in any order. DDR3 and DDR3L modules differ in some operating voltages and will be recognized automatically. No manual adjustment is required. However, mixing DDR3 and DDR3L DIMMs is not supported and can lead to system damage.

It is recommended to use identical DIMMs on both sockets for best performance and reliability.

The following list summarizes the modules validated on the FWA-2320:

Table 2.9: Validated DIMMs

Vendor	Frequency	Capacity	Advantech PN
Apacer	DDR3-1333	2G	96D3-2G1333NN-AP1
	DDR3-1600		96D3-2G1600NN-APL
	DDR3-1333	4G	96D3-4G1333NN-AP
	DDR3-1333		96D3-4G1333E-AP
	DDR3-1600	8G	96D3-8G1600NN-APL
	DDR3-1333		96D3-8G1333NN-APL
Transcend	DDR3-1600	2G	96D3-2G1600NN-TRL
	DDR3-1600	4G	96D3-4G1600NN-TR
	DDR3L-1600		AQD-D3L4GN16-SQ

Table 2.9: Validated DIMMs

	DDR3L-1600	2G	AQD-D3L2GN16-SQ
	DDR3L-1600		AQD-D3L4GN16-MG
Advantech	DDR3L-1600	4G	AQD-D3L4GN16-SG
	DDR3L-1600		AQD-D3L4GN16-MQ
	DDR3L-1600	8G	AQD-D3L8GN16-SG

Please contact your Advantech representative for the most recent list of validated peripherals or if you would like to use modules not listed.

2.4.5 Chipset

The chipset / PCH functionality is integrated into the Atom C2000 SoC.

2.4.5.1 USB

The FWA-2320 supports six two external USB2.0 ports which can be used to connect low, full and high speed devices. The 5V supply rail supplied to external devices is current limited by a self resetting, electronic fuse to 500 mA.

Table 2.10: USB Ports

USB Port	Implementation
0	Type A front panel connector
1	Type A front panel connector
2	USB DOM socket (location M6)
3	USB header (reserved)

A third USB port is connected to an onboard USB DOM socket supporting “Type A” disks on module with PCB dimensions of 26.5 mm x 37.8 mm as shown below

**Figure 2.9 USB DOM**

The following list summarizes the modules validated on the FWA-2320:

Table 2.11: Validated USB DOMs

Vendor	Capacity	Advantech PN
Phison Electronics Corp	4G	UUD004GTSC0-670
ATP	4G	AF4GSSGH-AABXP

An additional USB2.0 port is connected to an onboard header. This port is reserved for custom use. Please contact your Advantech representative if you are interested to use this port.

The USB Host Controller is integrated into the Atom C2000 SoC and implements a Enhanced Host Controller Interface compliant to the EHCI 1.0 Specification. The EHCI supports up to four USB 2.0 root ports. The controller integrates a Rate-Matching Hub to support USB 1.1 devices. Universal Host Controller and Open Host Controller Interfaces are not supported by the Atom C2000 device.

Please note that the BIOS of the FWA-2320 supports disabling the USB Controller as well as specific USB device classes. Please refer to chapter BIOS / BIOS Setup Menu for details.

2.4.5.2 SATA

The SoC has two independent integrated SATA host controllers. One controller supports DMA operation on up to four ports and supports data transfer rates of 3.0 Gb/s (300 MB/s) and 1.5 Gb/s (150 MB/s) referred to as SATA2 controller.

The other controller, the SATA3 controller, in addition to legacy data rates supports data rates of up to 6 Gb/s (600 MB/s). The SATA3 controller is the legacy IDE controller and has two ports.

Both SATA controllers contains two modes of operation - a native mode and an AHCI mode using memory space.

The SATA ports are implemented per below table on the FWA-2320. Other SATA ports provided by the Atom C2000 are not used on the FWA-2320.

Table 2.12: SATA Ports

System	SATA Port Implementation	Controller	Controller Port
1	SATA header 1 (location M1)	SATA3	Port 0
2	mSATA socket (location M3)	SATA3	Port 1
3	SATA header 2 (reserved; location M2)	SATA2	Port 0



Figure 2.10 mSATA SSD

The following list summarizes the drives validated on the FWA-2320:

Table 2.13: Validated SATA Drives		
Vendor	Vendor PN (Capacity)	Advantech PN
HDD Drive		
WD	WD5000AAKX 500GB 3.5" SATA HDD	96HD500G-ST-WD7K2
Seagate	ST3000DM001 3.5"3TB SATA HDD	96HD3T-ST-SG7K
Seagate	ST3000VX000 3.5" 3TB SATA HDD	96HD3T-ST-SG7KE
WD	WD10EZEX 3.5" 1TB SATA HDD	96HD1000G-ST-WD7K2
WD	WD2000FYYZ 3.5"2TB SATA HDD	96HD2T-ST-WD7KE
WD	WD5003ABYZ 3.5" 500GB SATA HDD	96HD500G-ST-WD7KE
WD	WD1002F9YZ-09H1JL0 3.5" 1TB SATA HDD	96HD1TB-ST-WD7KE
Seagate	ST9500620NS 2.5" 500GB SATA HDD	96ND500G-ST-SG7K2
TOSHIBA	MK6476GSX SL01 2.5" 640GB SATA HDD	96ND640G-ST-TO5K
Seagate	ST91000640NS 2.5" 1TB SATA HDD	96ND1T-ST-SG7KE
Seagate	ST1000LM014 2.5" 1TB SATA HDD	96ND1TB-ST-SG5K
WD	WD5000LPVX 2.5" 500GB SATA HDD	96ND500G-ST-WD5K4
WD	WD7500BPVX-22JC3T0 2.5" 750GB SATA HDD	96ND750G-ST-WD5K1
WD	WD20NPVX 2.5" 2TB SATA HDD	96ND2T-ST-WD5K
Seagate	ST500LT012 2.5" 500GB SATA HDD	96ND500G-ST-SG5K4
WD	WD5000LUCT-63C26Y0 2.5" 500GB SATA HDD	96ND500G-ST-WD5KE
WD	WD7500BPKX 2.5" 750GB SATA HDD	96ND750G-ST-WD7K1
WD	WD10JUCT-63CYN0 2.5" 1TB SATA HDD	96ND1T-ST-WD5KE
ADVANTECH	SQF-S25M8-32G-S8E 2.5" 32GB SATA SSD	SQF-S25M8-32G-S8E
ADVANTECH	SQF-S25U5-320G-S8C 2.5" 320GB SATA SSD	SQF-S25U5-320G-S8C
Plextor	96FD25-S32-PM 2.5" 32GB SATA SSD	PX-32G5Me
Plextor	96FD25-S256-PM 2.5" 256GB SATA SSD	PX-256G5Me
ADVANTECH	SQF-S25S8-32G-S8C 2.5" 32GB SATA SSD	SQF-S25S8-32G-S8C
ADVANTECH	SQF-S25S4-16G-S8E 2.5" 16GB SATA SSD	SQF-S25S4-16G-S8E
ADVANTECH	SQF-S25S8-512G-S8C 2.5" 512GB SATA SSD	SQF-S25S8-512G-S8C
ADVANTECH	SQF-S25S8-128G-S5C 2.5" 128GB SATA SSD	SQF-S25S8-128G-S5C
ADVANTECH	SQF-S25S4-64G-S7C 2.5" 64GB SATA SSD	SQF-S25S4-64G-S7C
ADVANTECH	SQF-S25M8-1T-S8C 2.5" 1TB SATA SSD	SQF-S25M8-1T-S8C
ADVANTECH	SQF-S25M8-128G-S8C 2.5" 128GB SATA SSD	SQF-S25M8-128G-S8C
ADVANTECH	SQF-SLMM4-256G-S9C 256G Slim SATA	SQF-SLMM4-256G-S9C
ADVANTECH	SQF-SLMS4-64G-S9C 64GB Slim SATA	SQF-SLMS4-64G-S9C
mSATA		
Plextor	96FD-M32-PM 32GB	PX-32G5Me
Plextor	96FD-M256-PM 256GB	PX-256G5Me
ADVANTECH	SQF-SMSM8-256G-S8E	SQF-SMSM8-256G-S8E
ADVANTECH	SQF-SMSS4-128G-S8E	SQF-SMSS4-128G-S8E
ADVANTECH	SQF-SMSS4-64G-S9E	SQF-SMSS4-64G-S9E
ADVANTECH	SQF-SMSS8-32G-S5C	SQF-SMSS8-32G-S5C
ADVANTECH	SQF-SMSM4-16G-S8E	SQF-SMSM4-16G-S8E
ADVANTECH	SQF-SHMS2-32G-S9C	SQF-SHMS2-32G-S9C
ADVANTECH	SQF-SHMM2-64G-S9C	SQF-SHMM2-64G-S9C
ADVANTECH	SQF-SHMM1-32G-S7C	SQF-SHMM1-32G-S7C
ADVANTECH	SQF-SHMS1-16G-S7C	SQF-SHMS1-16G-S7C

2.4.5.3 Legacy Functions and IO

1. RTC

The SoC contains an MC146818B-compatible Real-Time Clock (RTC) with 256 bytes of battery-backed RAM (CMOS RAM) which is reserved for legacy use. The real-time clock keeps track of the system time. The RTC operates on a 32.768 KHz crystal and is buffered by a 3.3 V coin battery (B1).

The typical current draw in the system off state equals 6uA which yields a maximum system off time of 17520 hours based on the capacity of the battery used. Please note that environmental conditions, especially temperature, can lead to a change of current draw and that effects like battery self discharge current and other leakage need to be factored in.

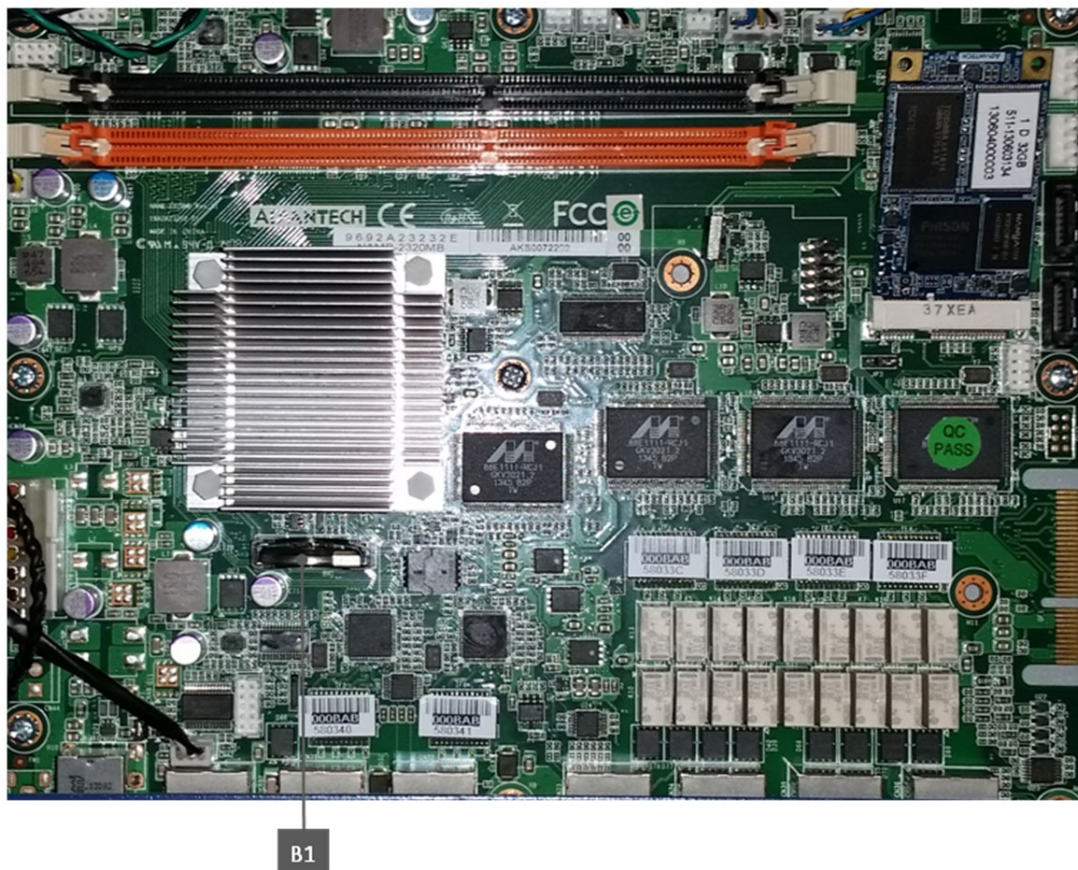


Figure 2.11 RTC battery

Please refer to section 3.5.2 reg. replacing the coin battery.

2. Serial Ports

The SoC integrates two 16C550 compliant UARTs which are mapped to the default resources:

Table 2.14: COM Ports

UART	Port	Resources	Implementation
0	COM1	IO Range 0x3f8 -0x3ff, IRQ4	Console port
1	COM2	IO Range 0x2f7 – 0x2ff, IRQ3	Interface to LCM

Please note that the UARTs in the SoC do not support any UART handshake and status/control signals but RXD, TXD, only.

3. HPET

The High Precision Event Timer (HPET) provides a set of timers that are used by the operating system for timing events. One timer block is implemented, containing one counter and three timers. It complies with the IA-PC HPET (High Precision Event Timers) Specification, Revision 1.0 available from intel.

4. SMBus

The PCH integrates two SMBus controllers. The first one is used as interface to external devices such as EEPROMs, the hardware monitor; the second controller is not used on the FWA-2320.

Table 2.15: SMBus Devices

SMBus	Adr,	Device	Function
0	0x5C/5D	NCT7904D	Hardware monitor chip
0	0xA0/A1	DIMM A0 SPD	SPD EEPROM
0	0xA2/A3	DIMM A1 SPD	SPD EEPROM
0	0xAC/AD	24C02	System FRU EEPROM
0	0xAE/AF	24C02 (reserved)	Reserved for FRU EEPROM on PCIe expansion card
0	0xD2/D3	CK420BQ	Clock generator

Most of the SMBus devices are only accessed by BIOS at system start up to determine and set system configuration. Tampering with these devices may lead to system instability and malfunction.

Information on the hardware monitor and how to access it is provided in section 2.4.9.

Information reg. the FRU EEPROM can be found in section 2.4.9.1.

5. Interrupt Controllers

The PCH contains two cascaded, legacy 8259 interrupt controllers as well as an IO Advanced APIC. Legacy Interrupts can also be generated via the LPC Bus using the Serial IRQ mechanism.

The PCH interrupt controllers forward the interrupt requests to the local APIC integrated with the CPU either as out of band INT# requests or MSI/MSI-X in band messages. For more details on the iA interrupt architecture, please refer to documentation available from intel.

2.4.5.4 QuickAssist Accelerator

QuickAssist is used by applications running on the IA cores to accelerate and offload processing. The integrated QuickAssist accelerator appears to software as a PCIe endpoint and is used as a look-aside coprocessor. It supports the features below:

- Symmetric Cryptographic Functions
 - Cipher Operations
 - Hash/Authenticate Operation
 - Cipher-Hash Combined Operation
 - Key Derivation Operation
- Public Key Functions
 - RSA Operation
 - Diffie-Helman Operation
 - Digital Signature Standard Operation

- Key Derivation Operation
- Elliptic Curve Cryptography: ECDSA* and ECDH*

For more information, please refer to documentation available from intel.

2.4.5.5 Random Number Generator

The ATOM C2000 processor introduces a software visible digital random number generation mechanism supported by a high-quality entropy source. This capability is available to programmers through the new RDRAND instruction. The resulting random number generation capability complies with existing industry standards (ANSI X9.82 and NIST SP 800-90). The instruction is described as RDRAND - Read Random Number in Volume 2 of the Intel® 64 and IA-32 Architectures Software Developer's Manual available from Intel.

2.4.6 Network Interfaces (Onboard)

The FWA-2320 supports a total of 6 onboard network ports.

4 ports are dedicated as "traffic" ports (locations F8 to F11) and support Advanced LAN bypass. The Ethernet Controller for the traffic ports is integrated into the Atom C2000 SoC and referenced as "i354", a derivative of the popular i350 standalone controller.

Marvell 88E1111 PHYs are provided on the FWA-2320 to support 10/100/1000 Base-T. These PHYs will be detected and configured automatically by the standard Ethernet drivers available from Intel.

The two management ports are implemented using intel i210 Ethernet Controllers with PCIe1 connectivity to the CPU.

2.4.7 PCIe Expansion

A custom form factor expansion module can be installed at location S5. The expansion slot supports PCIe4 gen.2 connectivity. The custom PCIe expansion slot is reserved for future use.

2.4.8 TPM

An Infineon SLB 9635TT 1.2 Trusted Platform Module is supported on the FWA-2320.

This module is TCG-compliant and has passed Common Criteria EAL4+ certification. The Firmware Version in use is 3.17.

2.4.9 LCD Module

Features

- 21 columns x 4 lines text display
- 128 x 32 dots graphic display
- Text wrap, scroll and inverse capability
- Built in characters plus 16 user defined characters
- Communicate over RS232 interface
- Baud rate speed selection between 9600 and 19200 bps
- Programmable on/off and brightness of the LED backlight
- Horizontal and vertical bar charts
- 32 bytes reserved non-volatile memory spaces for user settings
- 5 buttons keypad
- Fit in a standard 3.5" floppy

2.4.10 Mass Storage

Up to three SATA devices and a USB DOM are supported by the FWA-2320. In the default configuration, two SATA devices are supported: an onboard mSATA socket (location M3) and a 3.5" HDD site (M7). The USB DOM socket can be found at M6. The HDD power cable (M5) and SATA cable (M4) are supplied with the unit.

For a SATA-III connection of the HDD, connect the SATA cable to the SATA3 connector (M1) as shown below. A connection to the SATA2 connector (M2) will limit interface speeds to SATA-II.

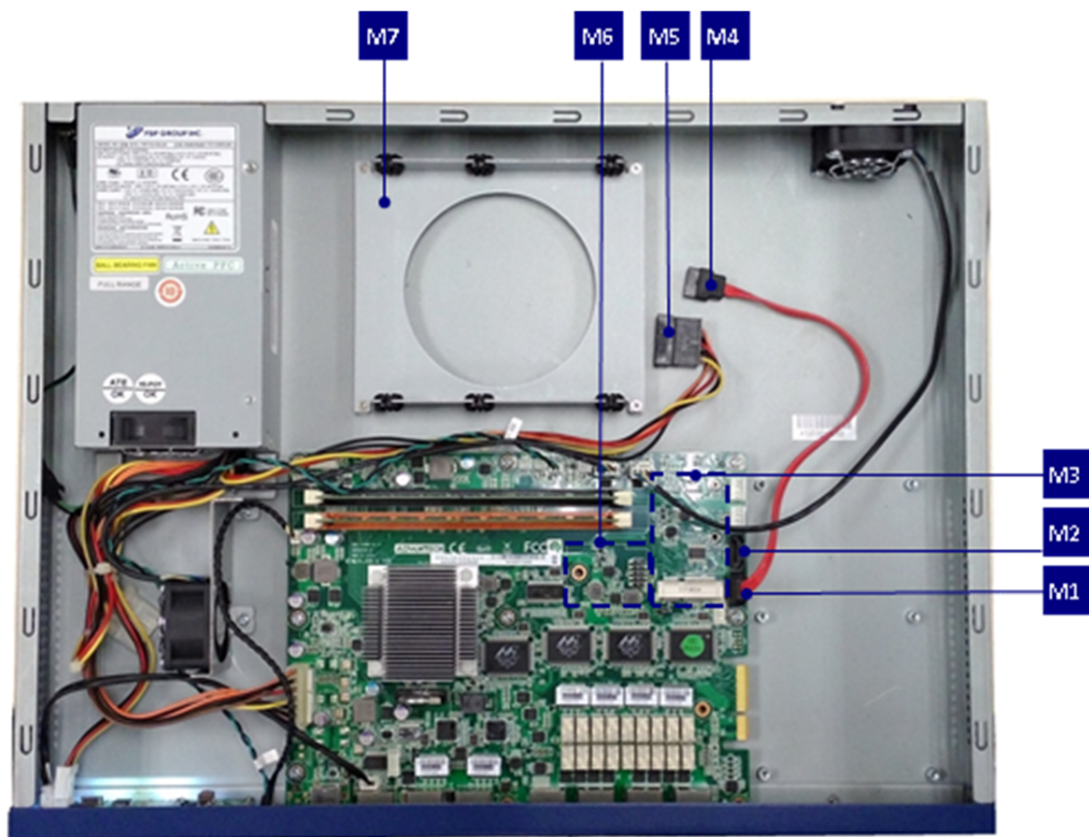


Figure 2.12 Mass storage components

2.4.11 BIOS

The FWA-2320's BIOS is based on AMI's APTIO BIOS and compliant to the UEFI, SMBIOS and ACPI specifications.

The BIOS performs probing, initialization and configuration of the FWA-2320 and initializes the OS boot process at the end of POST (Power On Self Test).

Regular BIOS output as well as the setup menu are displayed via the console port. Please refer to section 1.3.3 regarding the console connection process.

The BIOS Setup Menu is described in detail in section 3.2. BIOS Error Codes used during POST are described in Appendix B.

Please note that the FWA-2320 does not have any onboard POST Code LEDs onboard. A special POST code adapter is required to retrieve BIOS error codes.

All BIOS configuration parameters are stored in NVRAM, a dedicated section of the BIOS flash chip. Parameters are no longer stored in legacy CMOS RAM by the platform BIOS. I.e. BIOS configuration parameters will not be lost due to an empty battery.

2.4.11.1 Password Protection

The BIOS supports and administrator password to restrict access to the BIOS setup menu to qualified and trusted personal, only.

2.4.11.2 BIOS Defaults

The BIOS comes with a set of configuration parameters when shipped by Advantech referred to as “Optimized Defaults” or “factory defaults”. The user can change BIOS settings via the setup menu either temporarily or permanently by saving the changes as “User defaults”.

The BIOS loads Optimized Defaults by the option “Restore Defaults; and loads User defaults by the option “Restore User Defaults”. If no User defaults have been defined, the BIOS will do nothing.

2.4.11.3 PCIe Tree

The BIOS also performs an enumeration of all PCIe resources, builds a bus/device map and assigns resources to the PCIe devices. Most OSes perform a reallocation of resources during start up. However, the PCIe bus/device map will not be changed by the OS. The table below gives an overview of the PCIe devices and their corresponding system function:

Table 2.16: PCIe Devices

PCIe bus: dev:fun	PCIe VenID: DevID	Device	Description
00:00:00	8086:1f0b	Host bridge	Intel Atom C2000 SoC Transaction Router
00:01:00	8086:1f10	PCI bridge	Intel Atom C2000 PCIe Root Port 1
00:02:00	8086:1f11	PCI bridge	Intel Atom C2000 PCIe Root Port 2
00:02:00	8086:1f12	PCI bridge	Intel Atom C2000 PCIe Root Port 3
00:0b:00	8086:1f18	Co-processor	Intel Atom C2000 nCPM for QuickAssist Technology
00:0e:00	8086:1f14	Host bridge	Intel Atom C2000 RAS
00:0f:00	8086:1f16	IOMMU	Intel Atom processor RCEC
00:13:00	8086:1f15	System peripheral	Intel Atom C2000 SMBus 2.0 Controller
00:14:00	8086:1f41	Ethernet controller	Intel I354 connected to traffic port labelled “1”
00:14:01	8086:1f41	Ethernet controller	Intel I354 connected to traffic port labelled “2”
00:14:02	8086:1f41	Ethernet controller	Intel I354 connected to traffic port labelled “3”
00:14:03	8086:1f41	Ethernet controller	Intel I354 connected to traffic port labelled “4”
00:16:00	8086:1f2c	USB controller	Intel Atom C2000 USB Enhanced Host Controller
00:17:00	8086:1f22	SATA controller	Intel Atom C2000 AHCI SATA2 Controller
00:18:00	8086:1f32	SATA controller	Intel Atom C2000 AHCI SATA3 Controller
00:1f:00	8086:1f38	ISA bridge	Intel Atom C2000 PCU Legacy Bus Bridge (LPC, legacy devices)
00:1f:03	8086:1f3c	SMBus	Intel Atom C2000 PCU SMBus (SMBus Controller 0)

Table 2.16: PCIe Devices

02:00:00	8086:1533	Ethernet controller	Intel I210 connected to management port labelled "MGT0"
03:00:00	8086:1533	Ethernet controller	Intel I210 connected to management port labelled "MGT1"

2.4.12 Platform Management

A Nuvoton NCT7904 Hardware Monitor Chip (HWM) provides hardware monitoring capabilities on the FWA-2320. The HWM chip is connector to the PCH's SMBus. Standard software packages such as "Imsensors" can be used on the host to provide sensor information under Linux. Advantech provides the required patch that adds support for the HWM chip and a system specific configuration file.

Please contact your Advantech representative if you wish to receive the Imsensors patch or, in case you want to implement your own hardware monitoring solution, to obtain more details regarding the hardware implementation.

The HWM monitors all critical voltages on the FWA-2320:

Pin No.	Pin Name	Function
6	VSEN6	Monitor VNN 1V Core Power
7	VSEN7	Monitor V1P0 1V Core Power
8	VSEN8	Monitor VSB5V Power
9	VSEN9	Monitor V1P1 1.07V Core Power
10	VSEN10	Monitor VDDQ_MEM 1.5V Power
11	VSEN11	Monitor VCCP 1V Core Power
13	VSEN13	Monitor 5V Power
14	VSEN14	Monitor 12V Power
15	3VDD/VSEN15	Monitor 3.3V Power
16	3VSB	Monitor 3.3V AUX Power
48	VBAT	Monitor coin-battery Power

Moreover, the following temperatures are supervised:

Pin No.	Pin Name	Function
2,3	TR1	Monitor inlet air temperature

The HWM also monitors the front and rear fans:

Pin No.	Pin Name	Function
29	FANIN_1	Monitor FAN1 Speed.
30	FANPWM1	Control fan1 Speed.
31	FANIN_2	Monitor FAN2 Speed.
32	FANPWM2	Control fan1 Speed.

In addition to the HWM, the ATOM C2000 CPU features integrated temperature sensors (1 per core) that are supported by the "coretemp" module of Imsensors:

```
[root@localhost Advantech_FWA-1320_2320_HWM_driver_00_02]# sensors
coretemp-isa-0000
Adapter: ISA adapter
Core 0:      +24.0°C (high = +98.0°C, crit = +98.0°C)
Core 1:      +23.0°C (high = +98.0°C, crit = +98.0°C)
Core 2:      +23.0°C (high = +98.0°C, crit = +98.0°C)
Core 3:      +23.0°C (high = +98.0°C, crit = +98.0°C)
```

Figure 2.13 Display of CPU temperature

The diagram below shows the location of the various temperature sensors:

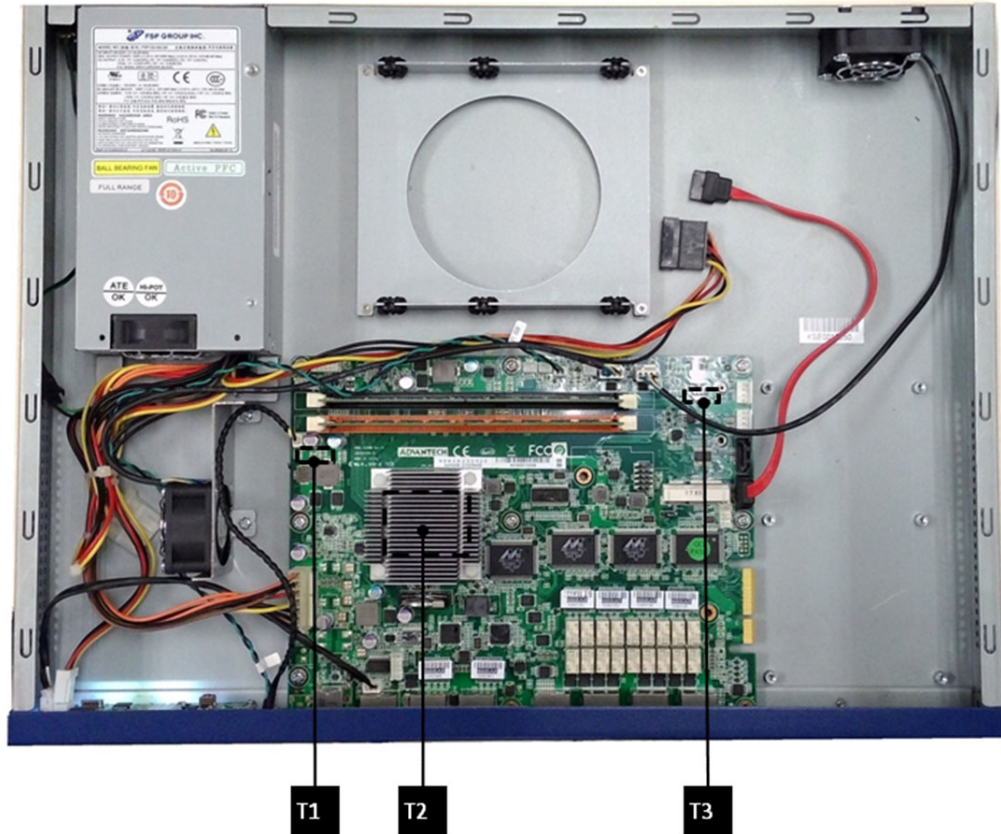


Figure 2.14 Thermal Sensor Locations

Table 2.17: Thermal Sensors	
Sensor	Description
T1	Air Inlet Sensor
T2	CPU Temperature Sensors (integrated into SoC)
T3	Air Outlet Sensor

2.4.13 Thermal Management

The main air inlet is in the front area of the left chassis sidewall (location C2). The front fan C1 soaks air into the unit and the main airflow is across the motherboard to the right back corner where the rear fan C4 pushes the air out of the main rear outlet opening C5. The PSU has an integrated fan which also pulls air into the PSU via the openings at C2 and exhausts air at the rear opening of the PSU module (C6). For cooling PCIe expansion cards, there are additional vent holes in area C3.

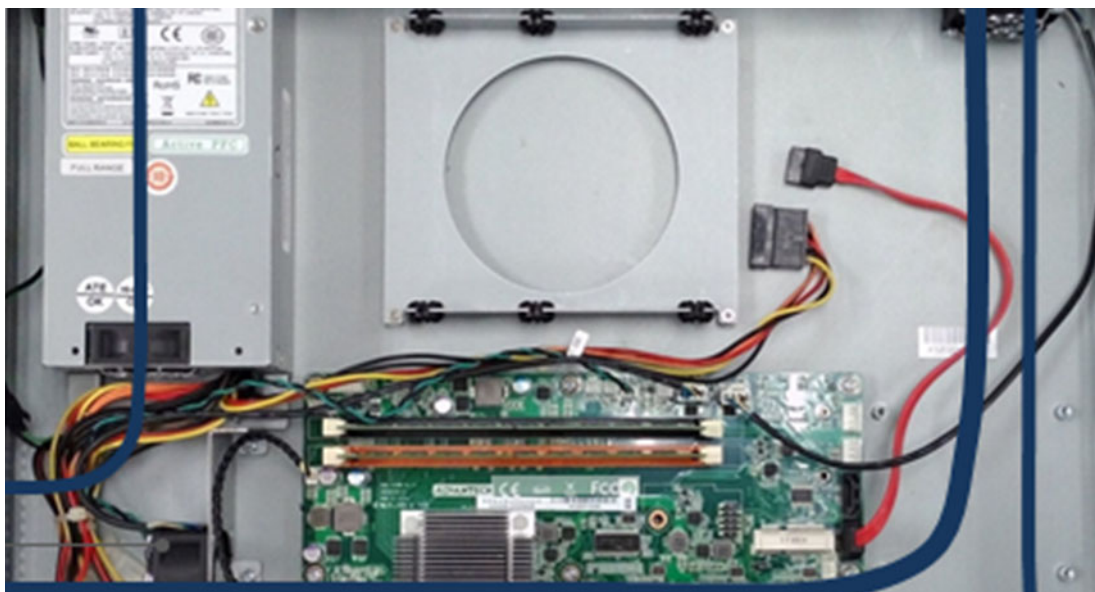


Figure 2.15 System airflow and fans

2.4.14 Power Supplies

The FWA-2320 supports a single AC wide range PSU located at position Rx. Technical specification for the power supply can be found in Appendix C.

2.4.14.1 Product Labelling

The FWA-2320 contains a number of labels that help to identify the product as well as the MAC addresses used by the system. The type label is placed on the bottom side of the unit and other labels can be found inside the unit.



Figure 2.16 Type Label (bottom)

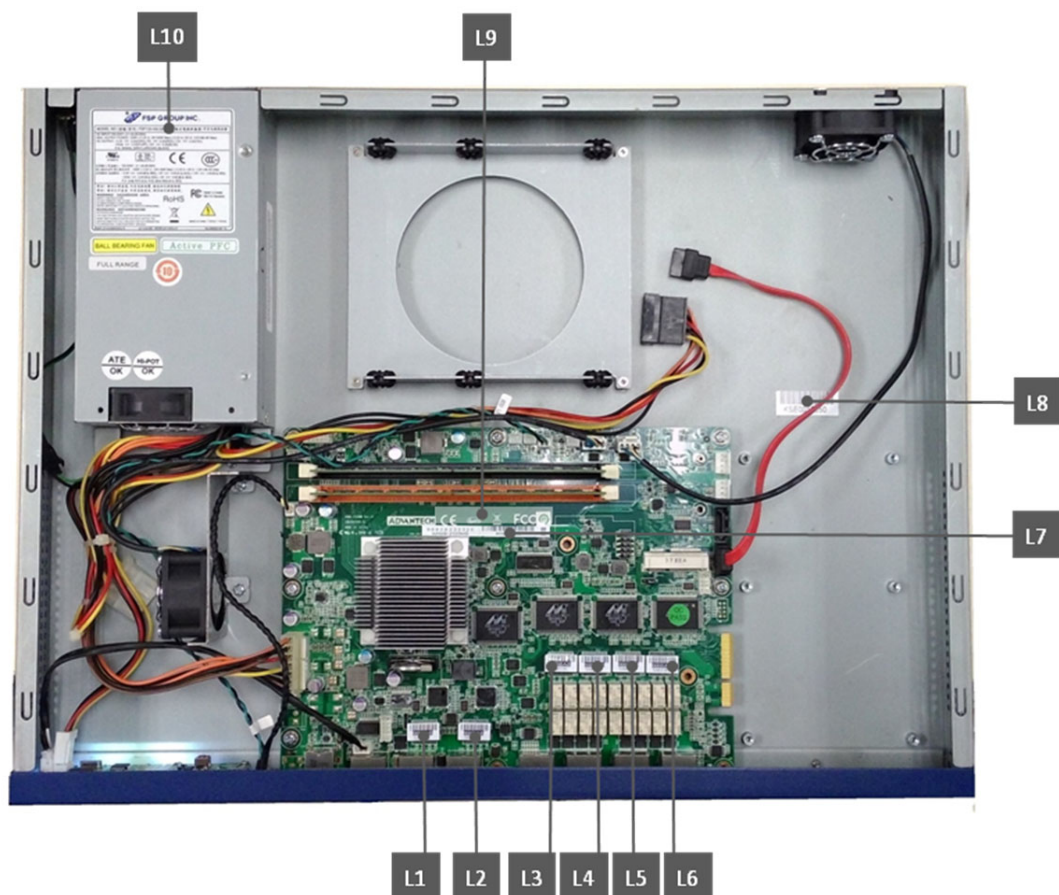


Figure 2.17 Product Labels (internal)

Table 2.18: Product Labels

Label	Description
L1	MAC Address for Management Port 0
L2	MAC Address for Management Port 1
L3	MAC Address for Traffic Port 1
L4	MAC Address for Traffic Port 2
L5	MAC Address for Traffic Port 3
L6	MAC Address for Traffic Port 4
L7	Motherboard Serial Number
L8	System Serial Number
L9	CE/FCC/RoHS/WEEE labels (on PCB)
L10	PSU labels (PSU specific)
L11	Type Label

2.4.14.2 Electronic Label: FRU EEPROM

The FWA-2320 supports an onboard FRU EEPROM which can be accessed via SMBus 0 using `afwu`. The table below shows the FRU EEPROM format:

< add here >

Alternatively, FRU information is also embedded in DMI Tables 1/2/3 and can be displayed with DMI parsing tools like `dmidecode`.

2.5 Advanced Platform Features

2.5.1 Intrusion Detection

The FWA-2320 does not support intrusion detection by default. This feature has been reserved in the motherboard design, though, and can be enabled at system level via customization. Please contact your Advantech representative should you be interested in this option.

2.5.2 Watchdog

The FWA-2320 provides a programmable watchdog that may be used to reset the system in case it bites due to malfunctioning application software to restore the unit to a known good state. The watchdog is based on intel's TCO timer and is integrated in the Atom C2000 device. The TCO watchdog timer is supported under Linux via a kernel driver (iTCO_wdt.ko). Please refer to Linux as well as ATOM C2000 documentation should you need more details.

2.5.3 LAN Bypass

For a detailed description of the LAN Bypass functionality and the related software API, please refer to the Advanced LAN Bypass User's Manual.

LAN bypass allows automated or manual control of the connectivity between two LAN ports grouped into a bypass segment and the host:

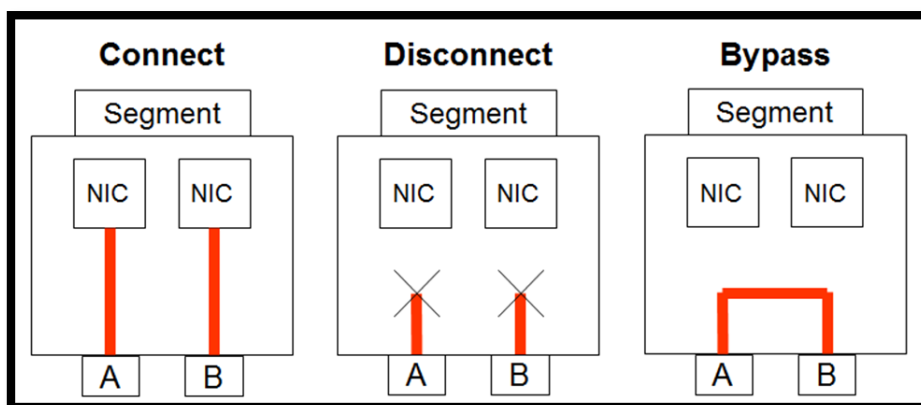


Figure 2.18 Connectivity options of LAN ports in a bypass segment

In “connect” mode, the ports on a segment are connected to the host via NICs. Traffic will enter and leave the ports just like on a regular NIC.

In “disconnect” mode, the ports are disconnected from the host and from each other. No traffic can flow through the ports

In “bypass” mode, the two ports are disconnected from the host, but connected to each other. Traffic entering the system on one port will be sent out on the other port and vice versa.

“Bypass mode” is used to allow traffic to flow through the system when the system is in a non operational state such as loss of power or in case the application is unresponsive. Application health is monitored by a configurable watchdog.

“Disconnect” mode is typically used to block any traffic until the system has fully started up and the application SW is in a well defined state allowing to handle traffic properly.

Connectivity can be auto controlled by a number of system events:

- **Power Up**
Host system is turned on / powers up (DC on)
- **Power Down**
Host system is turned off / powers down (DC off)
- **Power Reset**
Host system is reset or rebooted
- **Watchdog Start**
LAN bypass watchdog is started or strobed for the first time
- **Watchdog Timeout**
LAN bypass watchdog timed out
- **External Trigger**
Global Watchdog Trigger input (dedicated GPIO pin)

In addition to the event driven model, it is also possible to set the connectivity for a bypass segment via the SW API.

2.5.3.1 LAN Bypass Segments

The FWA-2320 supports four onboard traffic ports which are grouped into 2 bypass segments as shown below:

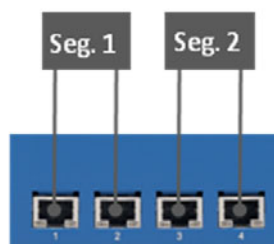


Figure 2.19 Onboard LAN ports and bypass segments

2.5.3.2 Bypass Watchdog Support

Each bypass segment is supported by an independent watchdog timer. The timer basis is set to 100ms. Watchdog timeout periods can be set between 100ms and 6553.5 seconds (about 109 minutes).

The FWA-2320 also supports a global watchdog trigger which allows multiple bypass segments to be controlled at the same time. The global watchdog signal is connected between the two onboard bypass segments and also to the PCIe extension connector (for future use).

2.5.3.3 LED Behaviour

Advantech Advanced LAN bypass uses a LED to show the state of a bypass segment. Usually the bypass LED is implemented as a dual colour LED combined with a regular LAN port LED. The table below shows the status of the bypass LED, only. For a complete description of port LEDs please refer to Appendix A.3.2).

Table 2.19: Bypass States and LED Behavior

State	LED Status
CONNECT	Off
BYPASS	Solid Amber
DISCONNECT	Blinking Amber (1 Hz)

2.6 Available Accessories and Related Products

2.6.1 Accessories

The following accessories are available for ordering. Please contact your Advantech representative for a list of available and supported peripherals such as memory modules, hard disks and solid state drives.

Table 2.20: Accessories

Model Name	Configurations
1702002600	Power cable 3P 180 cm, USA
1702002605	Power cable 3P 180 cm, Europe
1702031801	Power cable 3P 180 cm, UK
1700000237	Power cable 3P 180 cm, JP

Chapter 3

Configuration and
Service

3.1 Jumper Settings

There are no jumpers on the FWA-2320 intended for customer use.

3.2 BIOS Setup Menu

This section describes the FWA-2320's UEFI BIOS based on AMI's APTIO BIOS.

Users can modify BIOS settings and control the special features of the FWA-2320 using the BIOS setup menu.

Please note that Advantech supports shipping the FWA-2320 with custom BIOS defaults to simplify the deployment and integration for our customers. Please contact your Advantech representative if you want to receive more information regarding this service.

The BIOS Setup Menu can be entered via the BIOS POST screen displayed on the console interface:

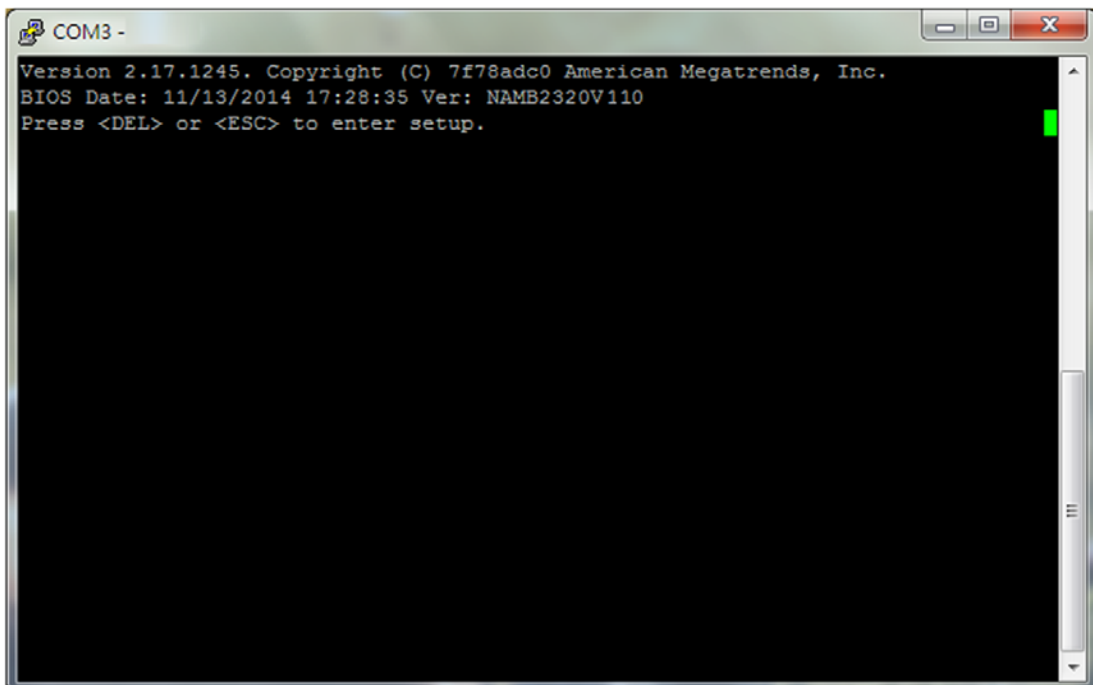


Figure 3.1 BIOS POST screen

BIOS Setup can be entered by hitting or <F2> keys during POST.

The BIOS setup menu screens have a few main elements as shown below. The menu bar displays the selectable menu pages as tabs. The parameter window displays and allows configuration of the settings available in a given menu page or a submenu thereof. Auxiliary text providing information about the selected setup item is displayed in the top right corner.

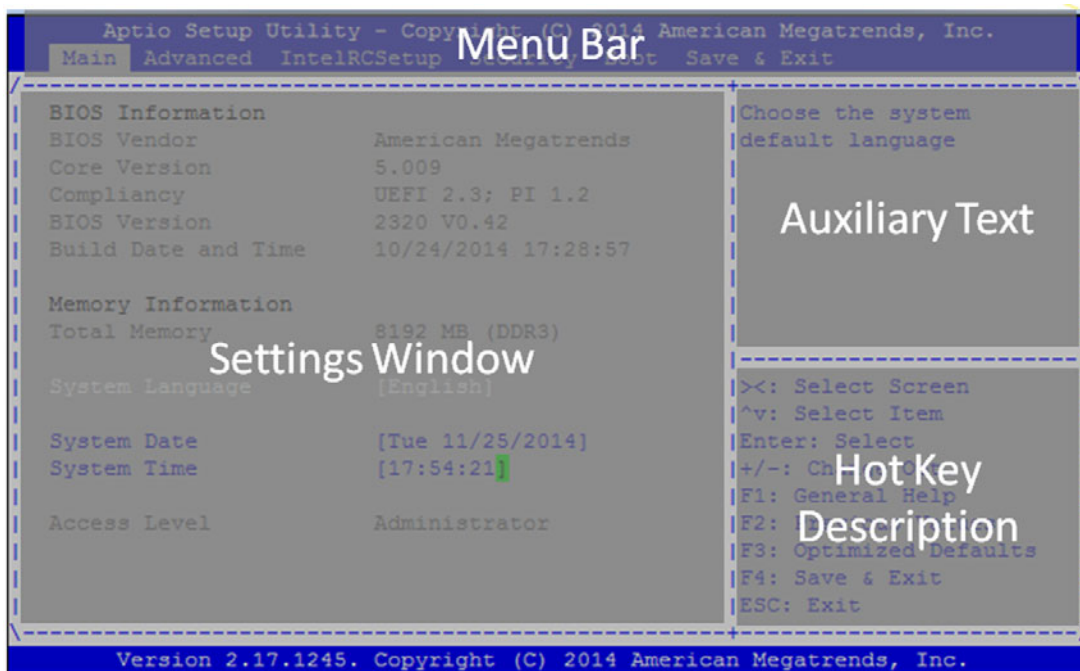


Figure 3.2 BIOS Setup Screen Organization

3.2.1 Main Setup Menu

If security protection has been enabled previously (see chapter 3.2.4), you will be prompted for the BIOS password upon entering the BIOS Setup. After a successful check or if password protection has not been enabled, users will see the Main Setup screen shown below. Users can always return to the Main setup screen by selecting the Main tab.

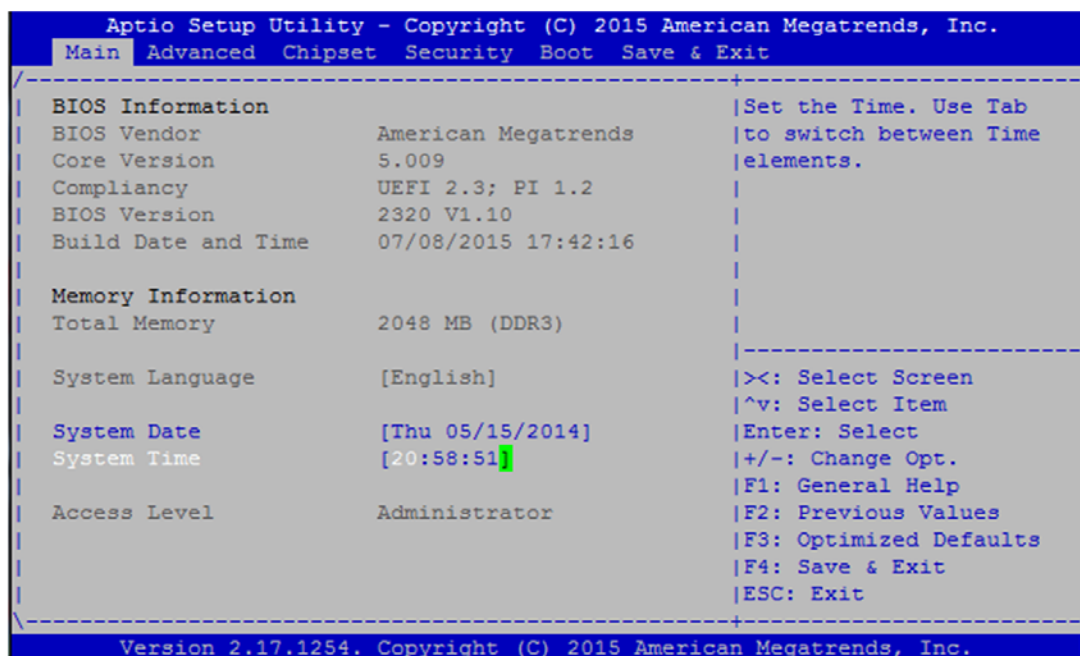


Figure 3.3 BIOS Setup Main screen

The main setup page displays a summary of system and BIOS configuration and status information. The fields on this page are read-only except for the System Date and Time setting.

Table 3.1: BIOS Setup: Main Menu

Group	Setup item	Access / Options	Description
BIOS Information	BIOS Vendor	Display only	American Megatrends
	Core Version	Display only	Current AMI BIOS core version in use
	Compliance	Display only	UEFI Spec revision that the BIOS complies to
	BIOS Version	Display only	Advantech BIOS Version info EX: mmmm Vx.yz mmmm: model name X: major version Yz: minor version
	Build Date & Time	Display only	Shows BIOS build date and time
Memory Information	Total Memory	Display only	Shows total memory detected
System Language		Display only	Selects the Setup Menu Language. Only English is supported on the FWA-2320.
System Date		MM/DD/YY	Displays and sets the system date as used by the BIOS
System Time		HH:MM:SS	Displays and sets the system time as used by the BIOS
Access Level		Display only	Shows the user privilege level according to the security settings. If password protection has not been enabled, this will default to "Administrator"

3.2.1.1 Setting System Time and Date

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

Please note that system time and date are set during manufacturing process according to factory's local time zone. You may need to update system time to reflect the desired time zone when you receive the unit.

3.2.2 Advanced Setup Menu

Select the Advanced tab from the FWA-2320 setup screen to enter the Advanced BIOS Setup screen. Users can select any of the items in the left frame of the screen, such as the Trusted Computing Configuration, to go to the sub menu for that item. Users can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys.

The Advanced BIOS Setup screen is shown below. The sub menus are described on the following pages.

```

Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
Main  Advanced  Chipset  Security  Boot  Save & Exit
-----
|> System Health                               |Monitor hardware status|
|> Serial Port Console Redirection              |                       |
|> PCI Subsystem Settings                      |                       |
|> Network Stack Configuration                 |                       |
|> CSM Configuration                           |                       |
|> Trusted Computing                           |                       |
|> USB Configuration                           |                       |
|                                               |                       |
|                                               |                       |
|                                               |                       |
|                                               |                       |
|><: Select Screen                             |                       |
|^v: Select Item                               |                       |
|Enter: Select                                 |                       |
|+/-: Change Opt.                             |                       |
|F1: General Help                             |                       |
|F2: Previous Values                          |                       |
|F3: Optimized Defaults                       |                       |
|F4: Save & Exit                               |                       |
|ESC: Exit                                     |                       |
-----
Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.

```

Figure 3.4 Advanced Setup Main screen

3.2.2.1 Serial Port Console Redirection

This sub menu allows you to change the settings used for the serial console.

Note that the serial console is always using COM1 which is connected to the front panel.

```

Aptio Setup Utility - Copyright (C) 2015 American Megatrends, Inc.
  Advanced
-----
| COM1                                         |Console Redirection   |
| Console Redirection [Enabled]                |Enable or Disable.   |
|> Console Redirection Settings                |                       |
|                                               |                       |
|                                               |                       |
|                                               |                       |
|><: Select Screen                             |                       |
|^v: Select Item                               |                       |
|Enter: Select                                 |                       |
|+/-: Change Opt.                             |                       |
|F1: General Help                             |                       |
|F2: Previous Values                          |                       |
|F3: Optimized Defaults                       |                       |
|F4: Save & Exit                               |                       |
|ESC: Exit                                     |                       |
-----
Version 2.17.1254. Copyright (C) 2015 American Megatrends, Inc.

```

Figure 3.5 Advanced Setup: Console Redirection Menu

3.2.2.2 COM1 Console Redirection Settings

The settings for COM1 console can be accessed in this menu.

is sub menu allows you to change the settings used for the serial console. For example, users can define the terminal type, bits per second, data bits, parity, stop bits and others.

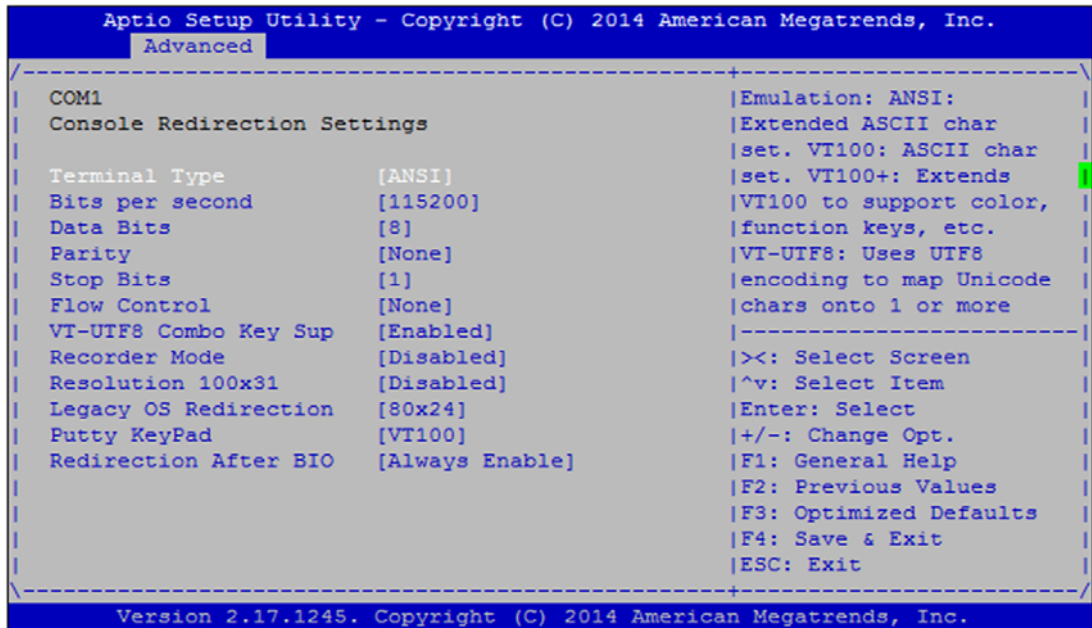


Figure 3.6 Advanced Setup: COM1 Console Redirection Submenu

Table 3.2: Advanced Setup: COM1 Console Redirection Menu Items

Setup item	Access / Options	Description
Terminal Type	ANSI / VT100 / VT100+ / VT-UTF8	Select the target terminal emulation type: <ul style="list-style-type: none"> ■ ANSI to use the Extended ASCII Character Set. ■ VT100 to use the ASCII Character set. ■ VT100+ to add color and function key support. ■ VT-UTF8 to use UTF8 encoding to map Unicode characters into one or more bytes.
Bits per second	9600 / 19200 / 38400 / 57600 / 115200	Defines the baud rate.
Data Bits	7 / 8	Defines number of data bits in a character.
Parity	None / Even / Odd / Mark / Space	Defines the parity scheme used.
Stop Bits	1 / 2	Defines number of stop bits in a character.
Flow Control	None / Xon/Xoff	Defines the flow control scheme.
VT-UTF8 Combo Key	Disabled / Enabled	Enables VT-UTF8 Combination Key Support for ANSI / VT100 terminals
Recorder Mode	Disabled / Enabled	When Enabled the data displayed on a terminal will be captured and sent as text messages to a remote server.
Resolution 100x31	Disabled / Enabled	Enables or disables extended terminal resolution
Legacy OS redirection	80x24 / 80x 25	When using Legacy OS, this item specifies the Number of Rows and Columns supported
PuTTY Keypad	VT100 / . LINUX / XTERMR6 / SCO / ESCN / VT400	Select Function Key and Key Pad Emulation on PuTTY.

Table 3.2: Advanced Setup: COM1 Console Redirection Menu Items

Redirection after BIOS	Always Enable / BootLoader	This defines how long console redirection will be active: “BootLoader” means that legacy console redirection is disabled before booting into a Legacy OS. “Always Enable” means Legacy console Redirection is enabled permanently.
------------------------	----------------------------	---

3.2.2.3 PCI Subsystem Settings

This menu contains settings for the PCIe subsystem. Some menu items are referred to as “PCI” settings. Although the FWA-2320 does not implement a PCI bus, these settings still apply to the platform as PCIe is using the same configuration mechanism as PCI.

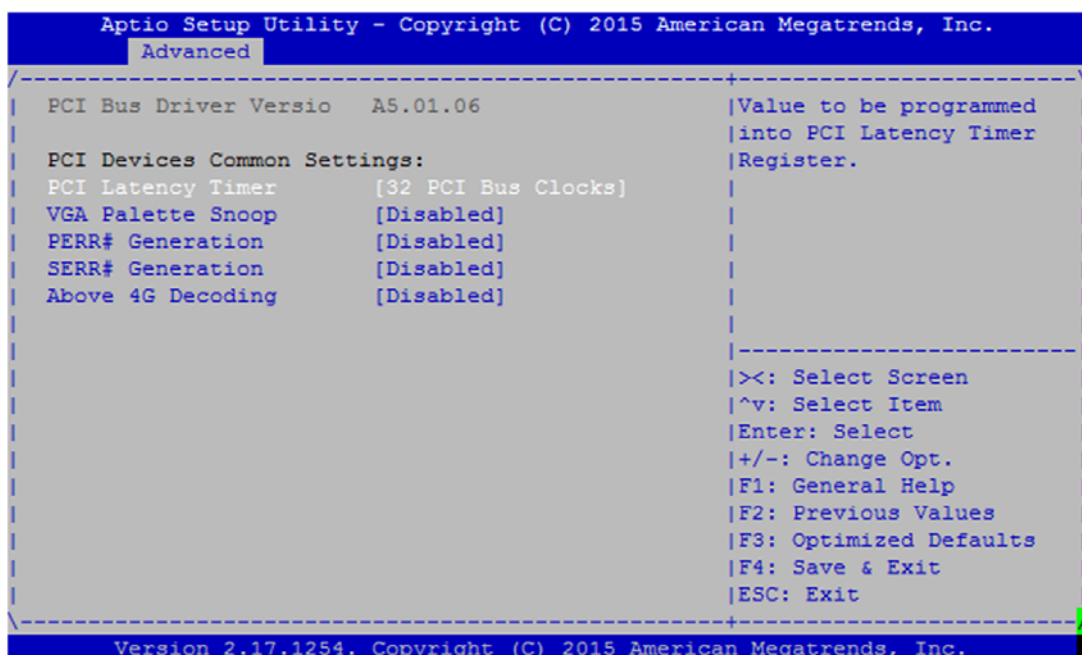
**Figure 3.7 Advanced Setup: PCI Subsystem**

Table 3.3: Advanced Setup: PCI Subsystem Menu Items

Group	Setup item	Access / Options	Description
none	PCI Bus Driver Version	Display only	Shows the current PCI SW module version which is used by the BIOS.
PCI Devices Common Settings	PCI Latency Timer	32 / 64 / 96 / 128 / 160 / 192 / 224 / 248	Value to be programmed into PCI Latency Timer Register of PCI devices. Determines how long slow devices may occupy the PCI bus
	PCI-X Latency Timer	32 / 64 / 96 / 128 / 160 / 192 / 224 / 248	Value to be programmed into PCI Latency Timer Register of PCI-X capable devices.
	VGA Palette Snoop	Enabled / Disabled	Enables snooping of VGA compatible accesses.
	PERR# Generation	Enabled / Disabled	Enables or Disables PCI Devices to Generate PERR#.
	SERR# Generation	Enabled / Disabled	Enables or Disables PCI Devices to Generate SERR#.
	Above 4G Decoding	Enabled / Disabled	Enables or Disables 64bit capable Devices to be Mapped above 4GB in the Address Space.
none	PCI Express Settings	Submenu	Change PCI Express Devices Settings.

3.2.2.4 Network Stack Configuration

This menu configures the built in network stack of the BIOS.

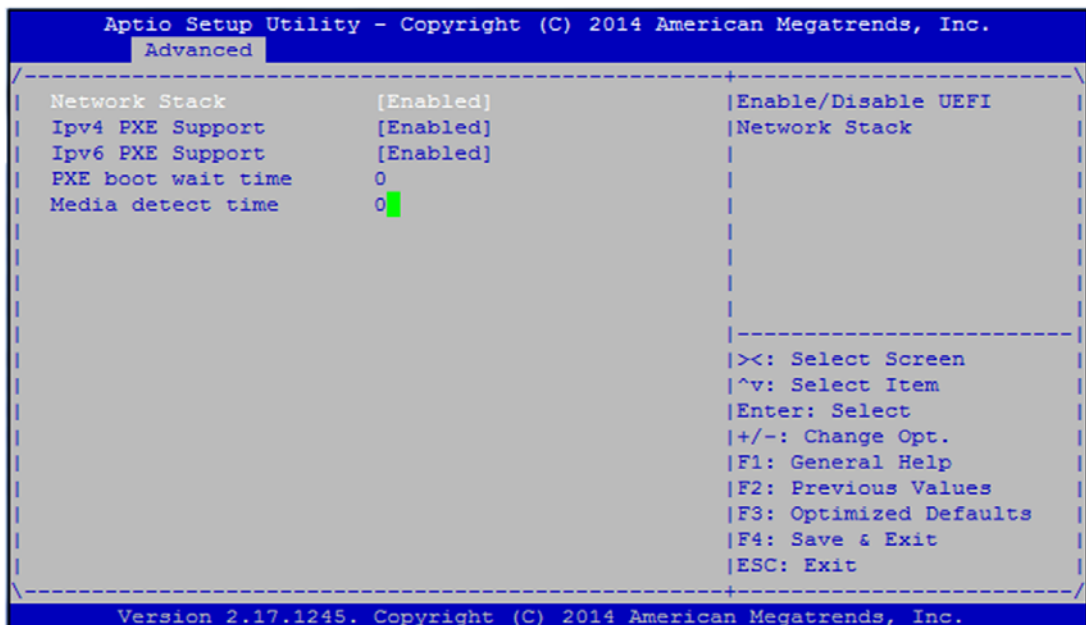


Figure 3.8 Advanced Setup: Network Stack Configuration Menu

Table 3.4: Network Stack Configuration Menu

Group	Setup item	Access / Options	Description
none	Network Stack	Enabled Disabled	Enables or disables the UEFI Network Stack.
	IPv4 PXE Support	Enabled Disabled	Enables or disables IPv4 support for PXE
	IPv6 PXE Support	Enabled Disabled	Enables or disables IPv4 support for PXE
	PXE Boot Wait Time	0-5	Timeout in seconds used by BIOS wait for the ESC key to abort the PXE boot
	Media Detect Time	0-50	Timeout in seconds to detect network media

3.2.2.5 Compatibility Support Module (CSM) Configuration

This submenu allows users to configure the support for legacy BIOS mechanisms and option ROMs.

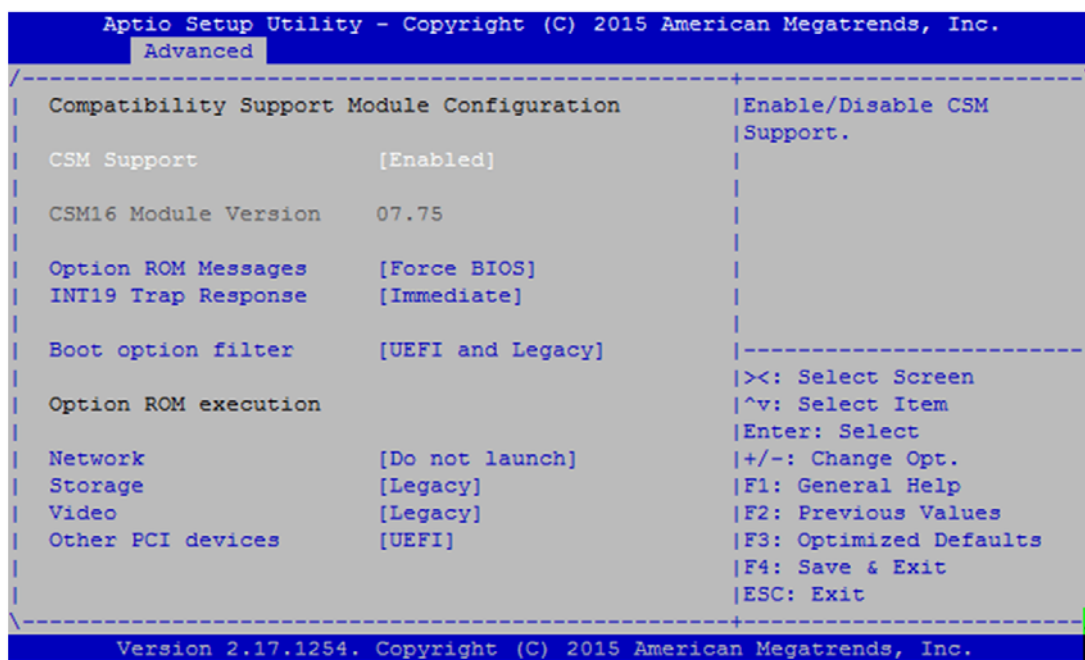
**Figure 3.9 Advanced Setup: CSM Configuration Menu**

Table 3.5: CSM Configuration Menu

Group	Setup item	Access / Options	Description
	CSM Support	Enabled Disabled	Enables or disables the Compatibility Support Module.
	CSM Module Version	Display only	Shows the version of the CSM used in the BIOS (for reference, only)
	Option ROM Messages	Force BIOS Keep Current	Sets the display mode for Option ROM. "Keep Current" will allow the Option ROM to use its current, own display setting. "Force BIOS" will force the Option ROM to use the display mode set by the system BIOS.
	INT19 Trap Response	Immediate Postponed	Interrupt 19 is the software interrupt that handles the boot disk function. If set to Immediate, the Option ROM will immediately capture Interrupt 1. If this item is set to Postponed, the option ROM will only capture Interrupt 19 during boot from a legacy device.
	Boot option filter	UEFI and Legacy Legacy Only UEFI Only	This item allows to control the execution of legacy and UEFI compliant Option ROMs
Option ROM execution	Network	Do not launch UEFI Legacy	This item allows a more granular control of OptionROM execution depending of the type of extension device.
	Storage		
	Video		
	Other PCI device ROM		

3.2.2.6 Trusted Computing

Please note that Trusted Computing support is disabled by default in the factory defaults to save system boot time. If disabled, the Trusted Computing Menu will not display any status information.

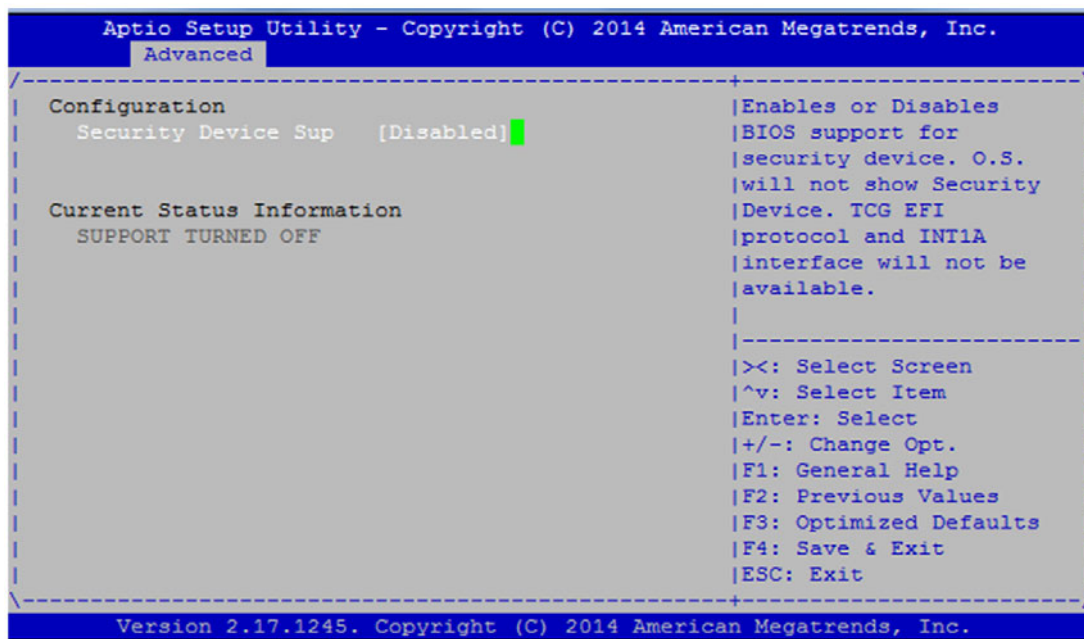


Figure 3.10 Advanced Setup: Security Menu

Table 3.6: Trusted Computing Menu

Group	Setup item	Access / Options	Description
Configuration	Security Device Sup	Enabled Disabled	Enables or disables the support for the TPM.
Current Status information	Support Turned Off	Display Only	Is displayed when TPM support is disabled
	TPM State	Display Only	Shows TPM Enablement Status
	TPM Active State	Display Only	Shows TPM Activation Status
	TPM Owner	Display Only	Shows Current TPM Owner

3.2.2.7 USB Configuration

This sub menu allows you to change the settings used for USB and to get an overview of the USB devices detected by the BIOS.

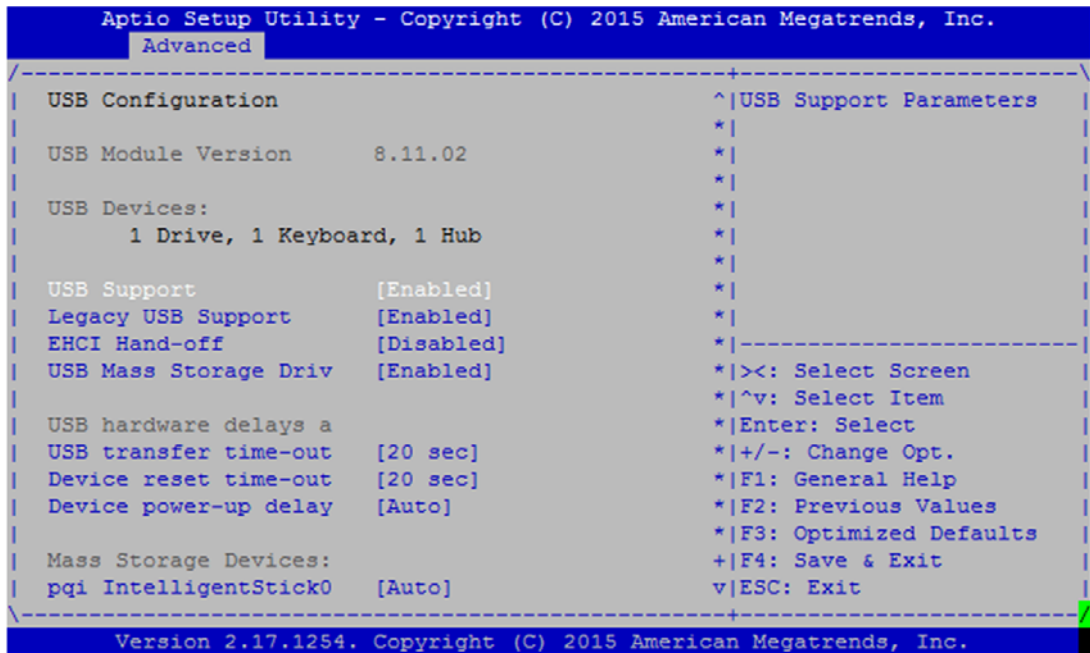


Figure 3.11 Advanced Setup: USB Configuration Menu

Table 3.7: USB Configuration Menu

Group	Setup item	Access / Options	Description
	USB Module Version	Display only	Shows the version of the USB SW module used in the BIOS (for reference, only)
	USB Devices	Display only	Shows the list of USB devices detected by the BIOS
none	USB Support	Enabled Disabled	Enables or disables the support for USB. If disabled, the USB EHCI controller will not be initialized by the BIOS.
	Legacy USB Support	Auto Enabled Disabled	Enables legacy support over USB to support Keyboard and Mouse
	EHCI Hand-Off	Enabled Disabled	Controls the hand off of EHCI ownership from BIOS to OS at boot time.
	Mass Storage Driver	Enabled Disabled	Enables support for USB mass storage devices in the BIOS like a USB DOM or a USB stick. This option needs to be enabled in case a USB device shall be part of the boot options.
	USB Timing	USB transfer time-out	1sec / 5sec / 10sec / 20sec
	Device Reset time-out	10sec / 20sec / 30sec / 40sec	Time Out for a device to Reset
	Device power-up delay	Auto Manual	Maximum time the device will take before it properly reports itself to the Host Controller.

Table 3.7: USB Configuration Menu

This section displays the Mass Storage Devices detected by the BIOS, if any It also allows to define how these devices will be presented		
Mass Storage Devices	<ID of Device 1>	Auto / Floppy / Forced FDD / Hard Disk / CD-ROM
		Shows the ID of the first Mass Storage device found and allows defining how this device is presented by the USB Storage driver in the BIOS. For maximum interoperability leave this setting as "Auto".
	...	dito

3.2.3 Chipset

This sub menu allows you to change the settings of the intel chipset. Please note that "chipset" is a legacy term and the related functionality is split over the CPU and PCH portions of the SoC. Similarly, the terms "South Bridge" and "North Bridge" are legacy terms and do not represent the silicon implementation any more. However, those terms are kept consistent with previous products to allow users to navigate more easily.

The sub menus are described on the following pages.

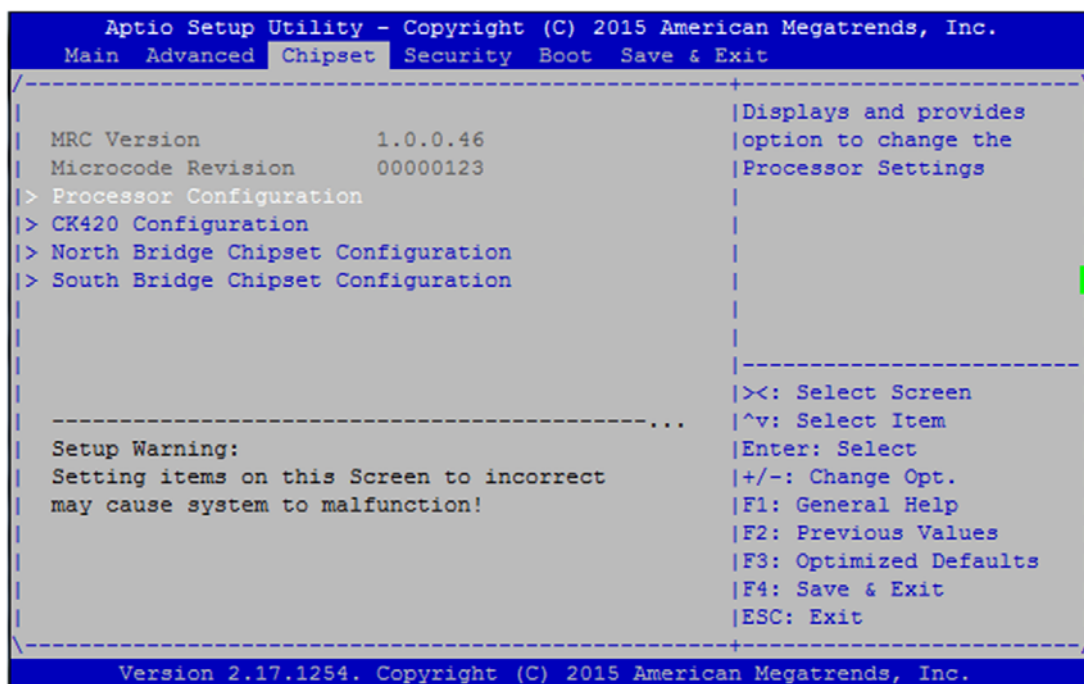


Figure 3.12 Chipset Configuration Menu

3.2.3.1 Chipset Setup: Processor Configuration

This menu supports configuration of the ATOM C2000 CPU.

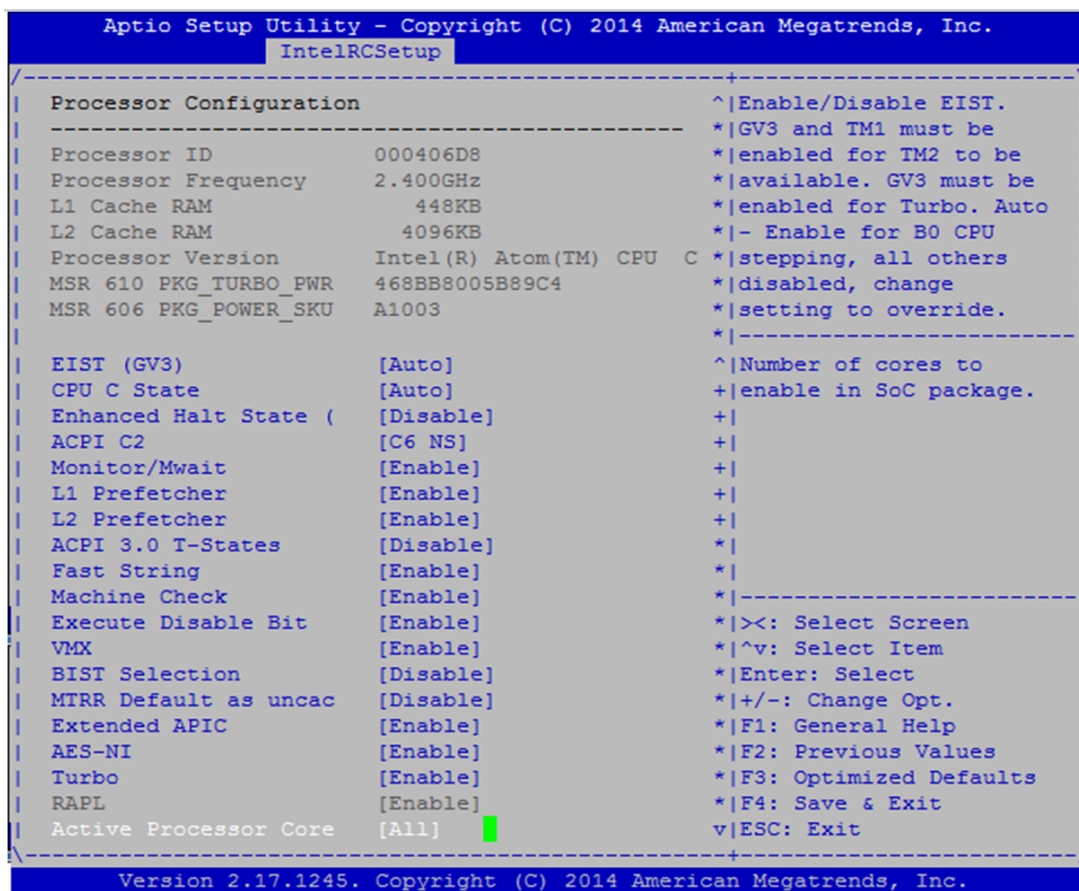


Figure 3.13 Chipset: Processor Configuration Menu

Table 3.8: Processor Configuration Menu

Group	Setup item	Access / Options	Description
Processor Configuration	Processor ID	Display only	Displays information on the processor installed
	Processor Frequency		
	L1 Cache RAM		
	L2 Cache RAM		
	Processor Version		

Table 3.8: Processor Configuration Menu

none	EIST(GV3)	Auto Enable Disable	EIST (Enhanced Intel SpeedStep Technology) allows the system to automatically adjust processor voltage and core frequency in an effort to reduce power consumption and heat dissipation.
	CPU C State	Disable Enable Auto	CPU C-State is a feature to reduce power consumption by blocking clock cycles to the CPU during C1 State (Halt State).
	Enhanced Halt State	Disable Enable	Enables / disables the Enhanced C1E state of the CPU
	ACPI C2	Disable C6 NS C6 FS	Configure the CPU state (ACPI C2) reported to OS, Options are: disable C2 reporting, C6 No Shrink or C6 Full Shrink.
	Monitor/Mwait	Disable Enable	Enable or Disable the Monitor / Mwait instruction
	L1 Prefetcher	Disable Enable	Enable / Disable L1 Prefetcher
	L2 Prefetcher	Disable Enable	Enable / Disable L2 Prefetcher
	Machine Check	Disable Enable	
	Execute Disable Bit	Disable Enable	Execute Disable Bit is a mechanism which allows Oses and software to become less vulnerable to viruses and malware.
	VMX	Enable	Enables Virtualization Support (Virtual Mode Extensions also referred to as intel Vanderpool Technology),
	AES-NI	Enable	Enable / Disable AES-NI instructions
	Turbo	Disable Enable	Enable or Disable CPU Turbo capability.. (This item may only be enabled on dual core processor SKUs)
	RAPL	Disable Enable	Enables or Disables the CPU's Running Average Power Limit Capability (RAPL).
	Active Processor Core	All 4 2	Number of cores enabled in the CPU (This item is hidden on 2 core SKUs)

3.2.3.2 Intel RC Setup: CK420 Configuration

This menu supports configuration of the platform clock generator.

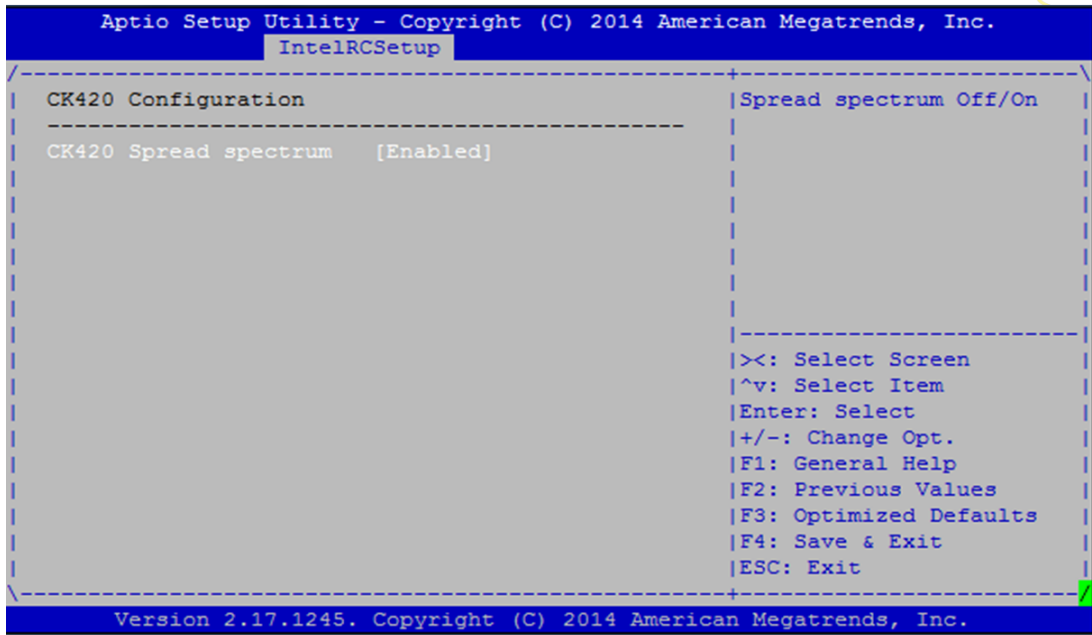


Figure 3.14 CK420 Configuration Menu

Table 3.9: CK420 Configuration Menu

Group	Setup item	Access / Options	Description
	CK420 Spread Spectrum	Enabled Disabled	Enables Spread Spectrum Operation for lower EMI.

3.2.3.3 Chipset Setup: North Bridge Configuration

This menu allows the configuration of the memory controller and related features of the SoC.

```

Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
  IntelRCSetup
-----
North Bridge Chipset Configuration
-----
Memory Information
Total Memory          8192 MB
Memory Frequency      DDR3 - 1600 MHz

Fast Boot              [Disabled]
Memory Frequency      [Auto]
ECC Support            [Enabled]
Faulty Part Tracking  [Disabled]
On Correctable Faulty [Halt]
Patrol Scrub Enable   [Enabled]
Patrol Scrub Period   [24 hours]
Demand Scrub Enable   [Enabled]
Scrambler              [Enabled]

| Enables/Disables fast
| boot which skips memory
| training and attempts
| to boot using last
| known good
| configuration.
-----
|>: Select Screen
|^v: Select Item
|Enter: Select
|+/-: Change Opt.
|F1: General Help
|F2: Previous Values
|F3: Optimized Defaults
|F4: Save & Exit
|ESC: Exit
-----
Version 2.17.1245. Copyright (C) 2014 American Megatrends, Inc.

```

Figure 3.15 NorthBridge Configuration Menu

Table 3.10: Northbridge Configuration Menu

Group	Setup item	Access / Options	Description
Memory Information	Total Memory	Display only	Displays information on the processor installed
	Memory Frequency		
none	Fast Boot	Enabled Disabled	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. This item has no effect on BBS boot options.
	Memory Frequency	Auto DDR3-1866 DDR3-1600	Memory frequency control. (The option "DDR3-1600 is hidden when populated memory speed is under 1600)
	ECC Support	Enabled Disabled	Selected to enable / disable ECC Support
	Faulty Part Tracking	Enabled Disabled	Select to enabled / disable faulty part tracking which allows identification and isolation of defective DRAM chips.
	On Correctable Faulty Part	Halt Continue	On correctable faults halt or continue
	Patrol Scrub Enable	Enabled	Select to enable / disable Patrol Scrub Support For more information on patrol scrub, please refer to section
	Patrol Scrub Period	24 hours 10 hours 4 hours 1 hour	Select the patrol scrub Period
	Demand Scrub Enable	Enabled	Select to enable / disable Demand Scrub Support For more information on demand scrub, please refer to section
	Scrambler	Enabled	Select to enable / disable the Scrambler

3.2.3.4 Chipset Setup: South Bridge Configuration

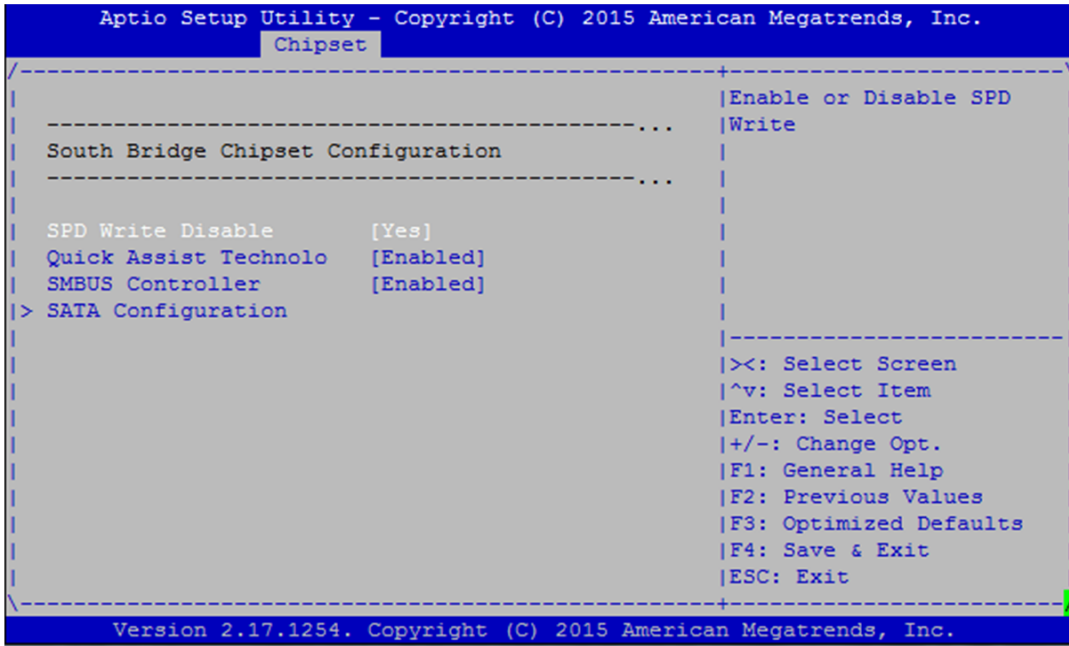


Figure 3.16 South Bridge Configuration

Table 3.11: South Bridge Configuration

Feature	Default	Description
SMBus Controller	Enabled	Enabled/Disabled SMBus Controller.

South Bridge Configuration: SATA Configuration

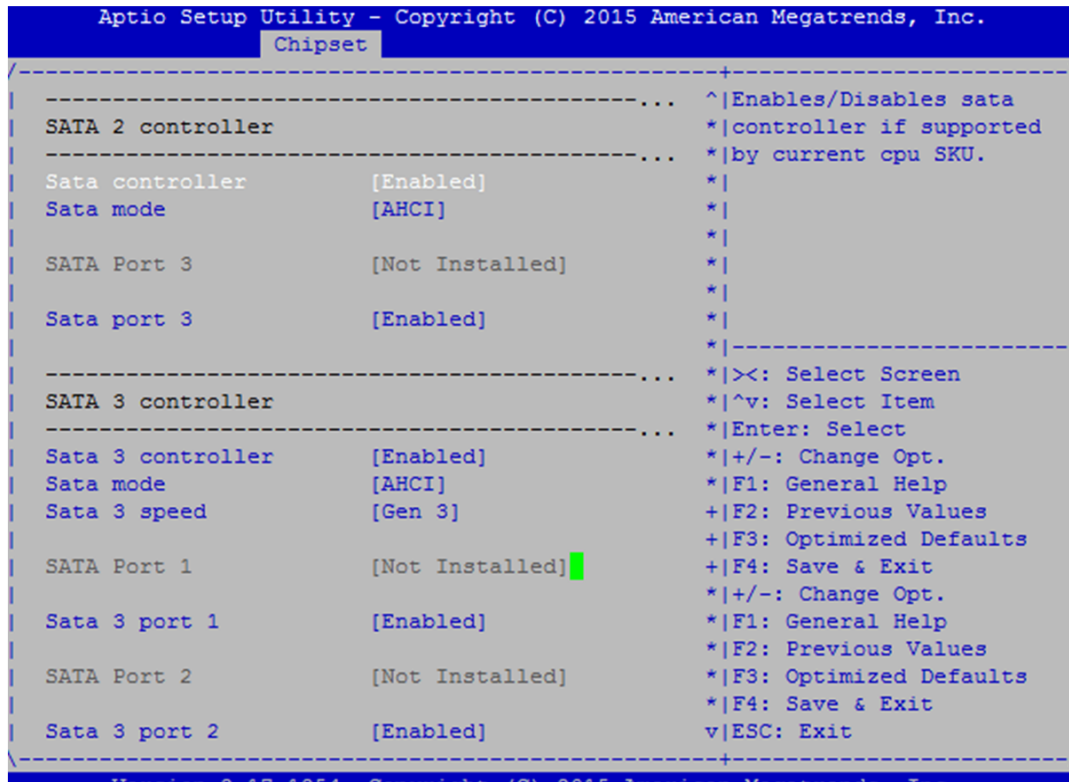


Figure 3.17 SATA Configuration

Table 3.12: SATA Configuration

Feature	Default	Description
SATA Port0	Display only	
SATA Port1	Display only	
SATA Port2	Display only	Show current SATA devices in use on the MIC-5332
SATA Port3	Display only	
SATA Port4	Display only	
SATA Port5	Display only	
SATA Mode	AHCI Mode	(1) IDE Mode. (2) AHCI Mode. (3) RAID Mode.
Aggressive Link Power	Enabled	Aggressive Link Power Management Support. For Cougar Point B0 stepping onwards.

3.2.4 Security Setup

“Administrator Password” allows users to configure the system so that a password after being installed is required each time the system boots, and/or an attempt is made to enter the Setup program.

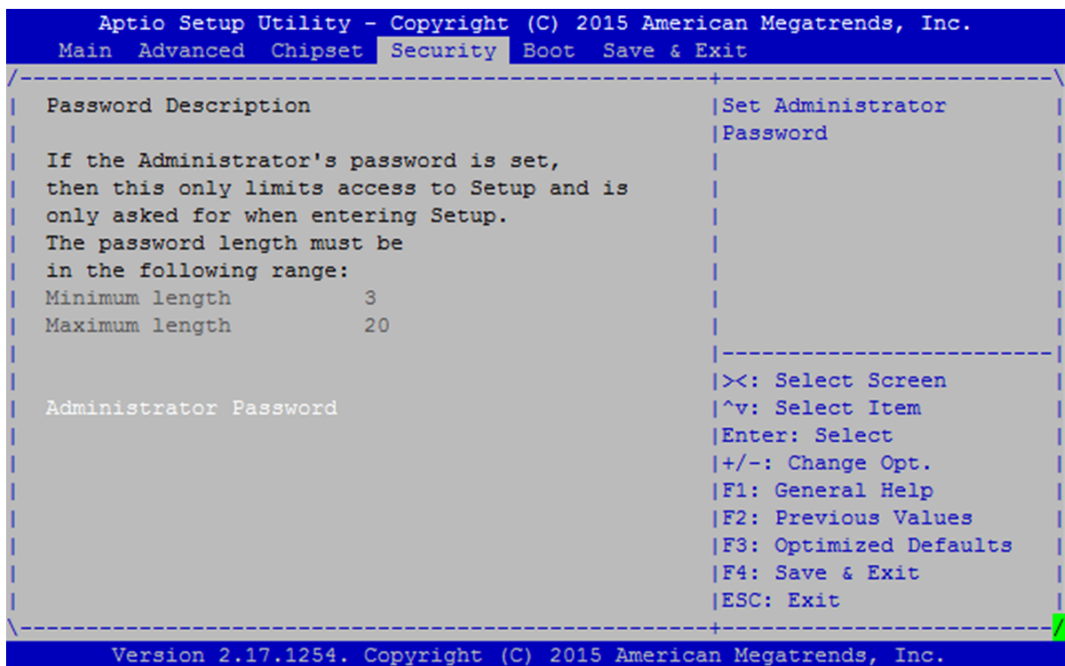


Figure 3.18 Security Setup

- Note!**
- If ONLY the Administrator's password is set, then this only limits access to Setup and is only asked for when entering Setup.
 - If ONLY the User's password is set, then this is a power on password and must be entered to boot or enter Setup. In Setup the User will have Administrator rights.
 - The password length must be in the following range:
 - Minimum length: 3
 - Maximum length: 20

3.2.5 Boot Menu

Users can configure the system boot priority settings via the boot page. The default setting of boot priority of boot option #1 is “Disabled in BBS Order”; option #2 is “UEFI: Built-in EFI Shell”; and option #3 is “Windows Boot Manager.” Users can define the boot priorities based on the application.

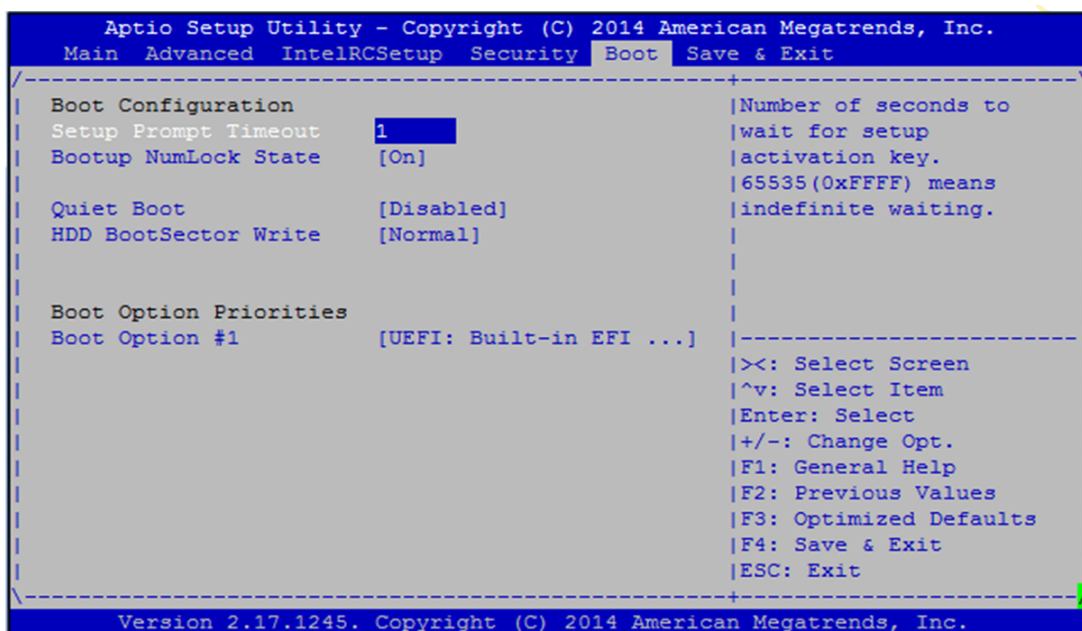


Figure 3.19 Boot Configuration

Table 3.13: Boot Configuration

Feature	Default	Description
Setup Prompt Timeout	1	Number of seconds to wait for setup activation key.
Bootup NumLock State	On	Select the keyboard NumLock state.
Quiet Boot	Disabled	Enables or disables Quiet Boot option.
Fast Boot	Disabled	Enables or disables boot with an initialization of a minimal set of devices required to launch active boot option.
Boot Option	User Defined	Sets the system boot order.
Hard Drive BBS Priorities	Submenu	Set the order of the legacy devices in this group.

3.2.6 Save & Exit Menu

The FWA-2320 BIOS allows users to store BIOS configuration results as “User Defaults.” Users can select “Save as User Defaults” to record all changes which had been made in previous pages as the default setting for further use.

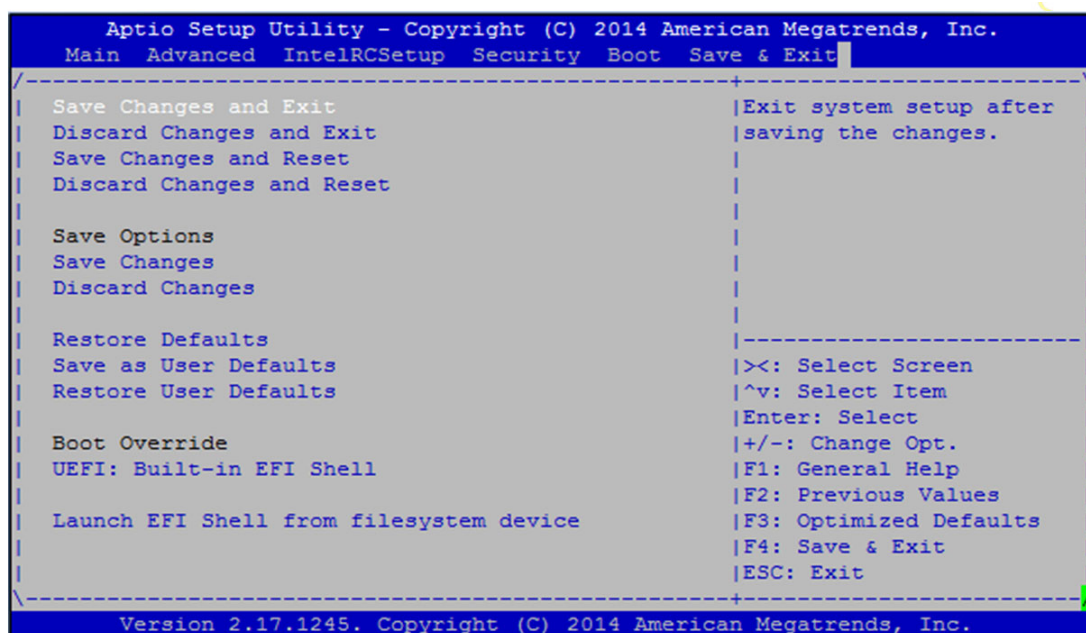


Figure 3.20 Save & Exit Menu

Table 3.14: Save & Exit Menu Options

Group	Setup item	Description
none	Save Changes and Exit	Exit setup after saving the changes. Does not update User defaults.
	Discard Changes and Exit	Exit setup without saving any changes.
	Save Changes and Reset	Reset system after saving the changes. Does not update User Defaults.
	Discard Changes and Reset	Reset system without saving the changes.
Save Options	Save Changes	Save Changes made so far to any of the setup options.
	Discard Changes	Discard Changes made so far to any of the setup options.
	Restore Defaults	Restores the BIOS factory defaults to all the setup options.
	Save as User Defaults	Saves the Current BIOS Settings as User Defaults.
	Restore User Defaults	Restores the User defaults to all the setup options.
Boot Override	UEFI: < boot device>	This option allows you to override the specified boot order and use a different boot device for the next boot.
	Launch EFI Shell from file system device	This option allows you to launch the EFI shell.

3.3 Installing Components

Please make sure you follow the safety guidelines presented in section 1.1 when making changes to the hardware.

3.3.1 Removing the Top Cover

You need:

- a PH2 screw driver

The top cover is secured by a total of 6 screws, 2 each on the left, rear and right side:



Figure 3.21 Top cover screw locations (left/rear/right)

To remove the top cover, remove these screws using a PH1 screw driver. Be sure to keep the screws in a safe place for top cover re-installation.

After that, slide the top cover backwards until the front flange of the top cover disengages with the unit's face plate:

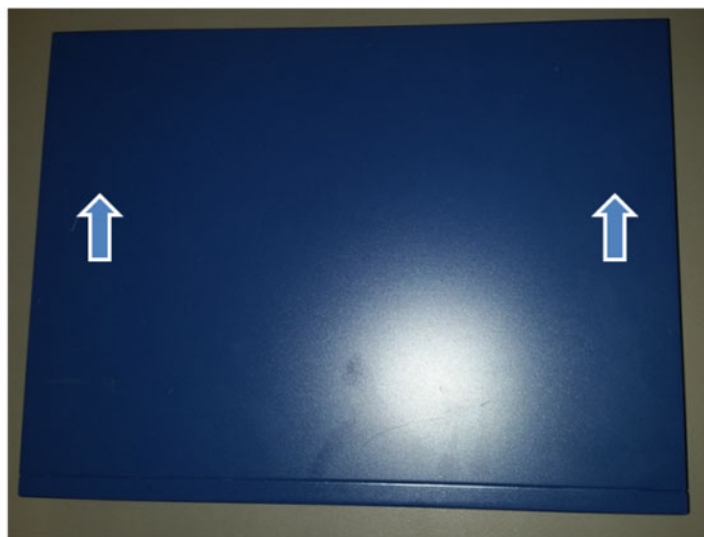


Figure 3.22 SlideTop Cover back

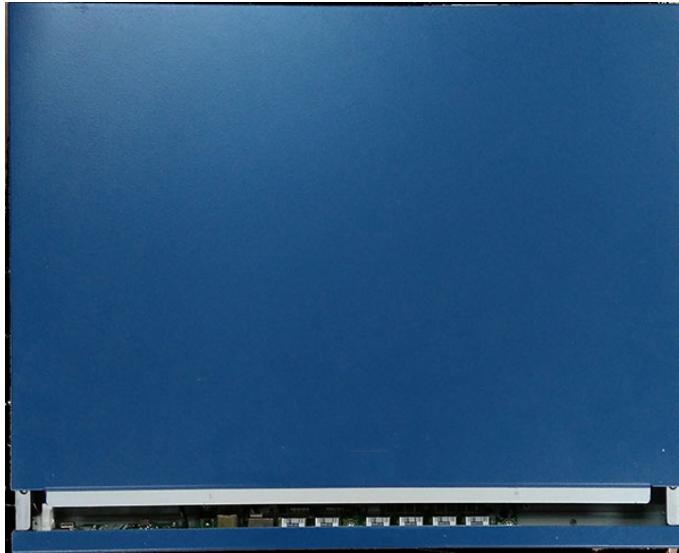


Figure 3.23 Top Cover Flange Disengagement

Now lift off and remove the top cover.

3.3.2 Reinstalling the Top Cover

You need:

- a PH2 screw driver

To re-install the top cover slide it onto the unit from the top with the top cover flange facing the unit's face plate. Keep a gap of about an inch between the front plate and the flange.

After that, slide the top cover forward until the flange is fully seated underneath the face plate.

Now insert the screws in the 6 locations shown above. Tighten each screw only lightly then move on to the next screw. After all screws have been inserted, tighten them.

3.3.3 Disk Installation

3.3.3.1 2.5" HDD Drive

You need:

- a PH2 screw driver
- a standard 2.5" SATA HDD
- the HDD screw kit (included in the unit)
- the HDD carrier plate
- the SATA cable



Figure 3.24 Screws for HDD mounting

After removing the top cover, follow the instructions below for 2.5" disk installation:

1. Remove the plastic bag that protects the HDD carrier plate.
2. The HDD carrier plate has 2 holes on each side to accommodate different HDD vendor's mounting hole locations. Each of the holes provides a dampening rubber to reduce disk vibration.

Do not remove the rubbers as this may lead to performance degradation or even malfunction.

Insert the HDD drive from the top into the carrier plate. Align the HDD's mounting threads with 2 holes on each side of the carrier plate. The holes to use may vary from disk vendor to disk vendor. For some vendors, all 4 holes may align.

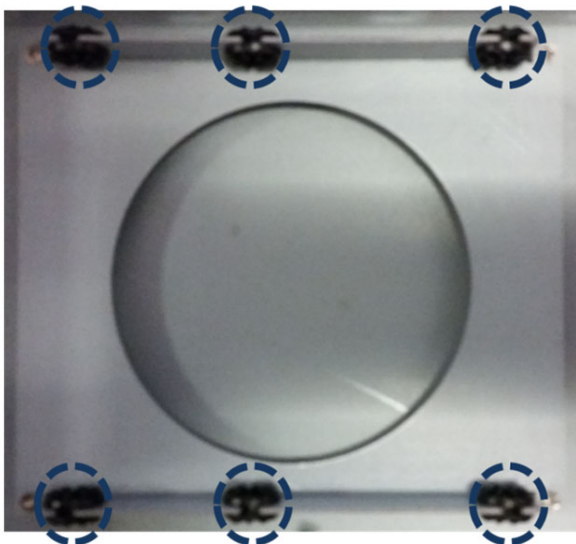


Figure 3.25 HDD Carrier plate dampeners



Figure 3.26 Carrier plate and HDD alignment

3. Insert the screws supplied as part of the HDD kit into the holes and HDD threads. Make a few turns on each screw only using a PH2 screw driver until the threads start to engage. Then move on to the next screw. When all four screws have been inserted, fasten the screws tightly.



Figure 3.27 Screw insertion and fastening

4. Move the carrier plate into the system location M7 and align the carrier plate's mounting holes with the standoffs in the chassis.

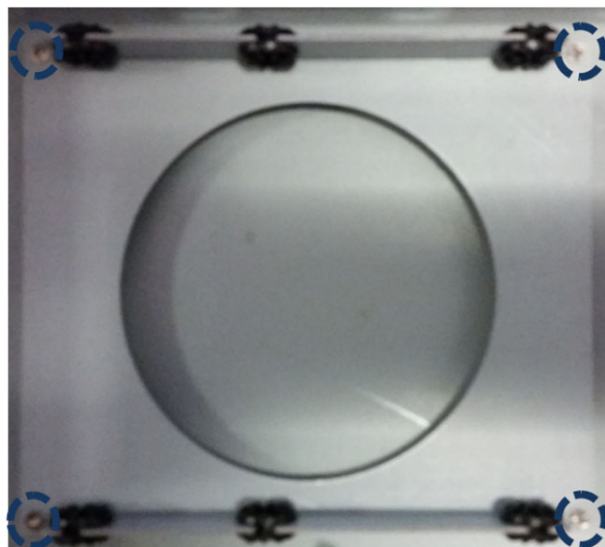


Figure 3.28 HDD Carrier plate screw locations

5. Insert the carrier plate mounting screws and start to fix them from the front side (i.e. the side facing the FWA-2320 motherboard). Securely tighten the screws using a PH2 screw driver after having inserted all four screws.



Figure 3.29 Insertion of the carrier into the chassis

6. Connect the SATA cable delivered with the unit to the disk as well as the motherboard connector. Please make yourself aware of the keying mechanism in the SATA connector before inserting the cable.



Figure 3.30 SATA cabling



Figure 3.31 SATA Connector keying

7. Connect the HDD power cable to the disk. Please make yourself aware of the keying mechanism in the power connector before inserting the cable.



Figure 3.32 HDD Power cable

3.3.3.2 USB DOM

You need:

- a PH2 screw driver
- a standard USB DOM
- the USB DOM mounting screw (included in the unit)



Figure 3.33 USB DOM mounting screw

An USB DOM compliant module can be installed at location M6:

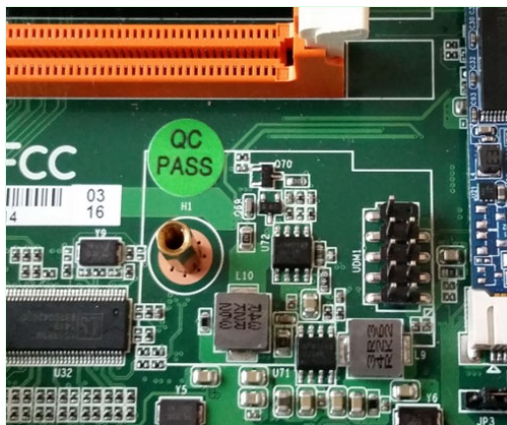


Figure 3.34 USB DOM site with header & standoff

1. Make sure the USB DOM is compliant with the socket.
2. Insert the DOM onto the header from the top. Make sure the header and receptacle align properly as shown below

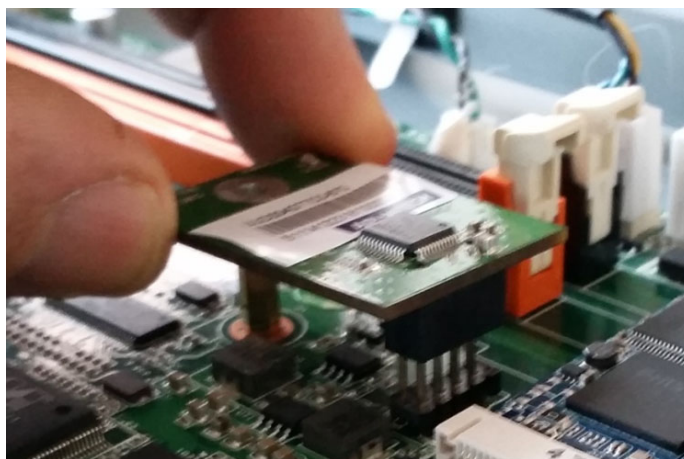


Figure 3.35 USB DOM alignment

3. If properly inserted. The mount hole in the DOM and the threaded insert will be aligned. Insert the DOM mounting screw and tighten it.



Figure 3.36 USB DOM mounting

3.3.3.3 mSATA SSD

You need:

- a PH1 screw driver
- a standard mSATA SSD
- the mSATA mounting screw (included in the unit)



Figure 3.37 mSATA mounting screw

An mSATA compliant SSD can be installed at location M3:

1. Make sure the mSATA disk is compliant with the socket and that the mechanical keys match

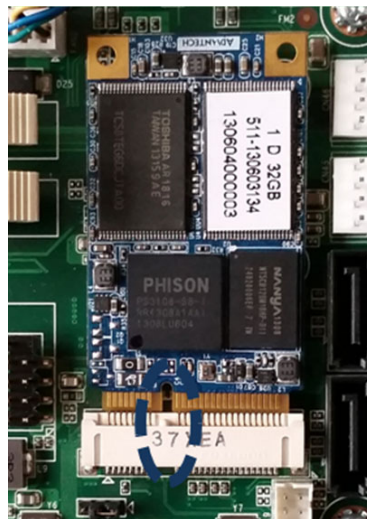


Figure 3.38 mSATA key alignment

2. Insert the mSATA module in the connector under an angle of around 45°. The gold contacts of the module will almost disappear in the connector when the module is fully seated.

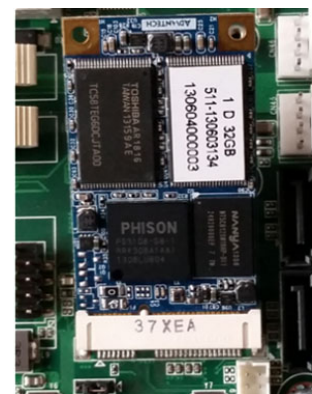
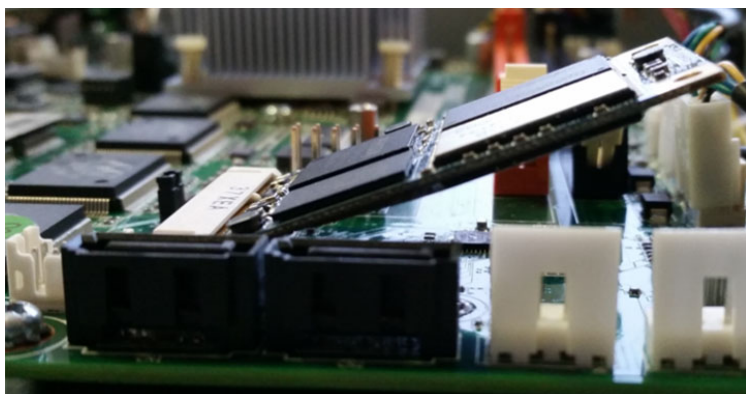


Figure 3.39 mSATA angled insertion

3. Push down the module softly until it is in horizontal position. If the module is correctly seated, the module's right hand mount hole will align with the threaded standoff in the FWA-2320 motherboard. Insert the mSATA mounting screw and tighten it.

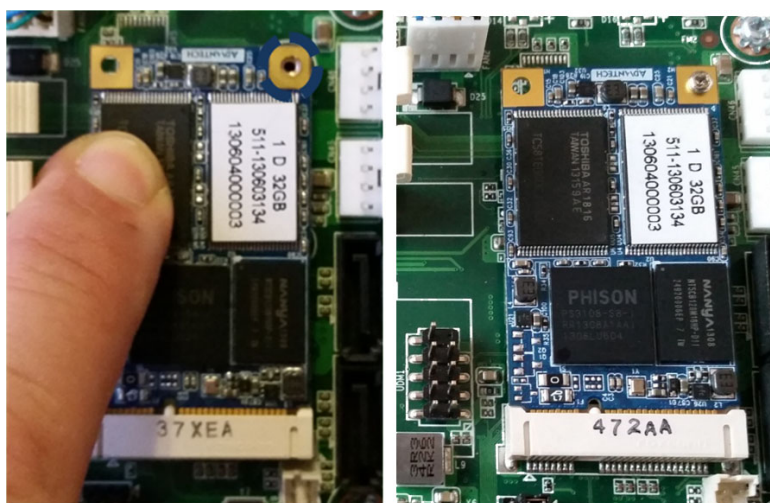


Figure 3.40 mSATA mounting

3.3.4 Memory Installation

After removing the top cover, follow the instructions below for DIMM installation:

1. Double check that the DIMMs to be installed match the requirements of section 2.4.5.
2. Open the white latches on the left and right sides of the DIMMs by turning it outwards as indicated by the arrows below.

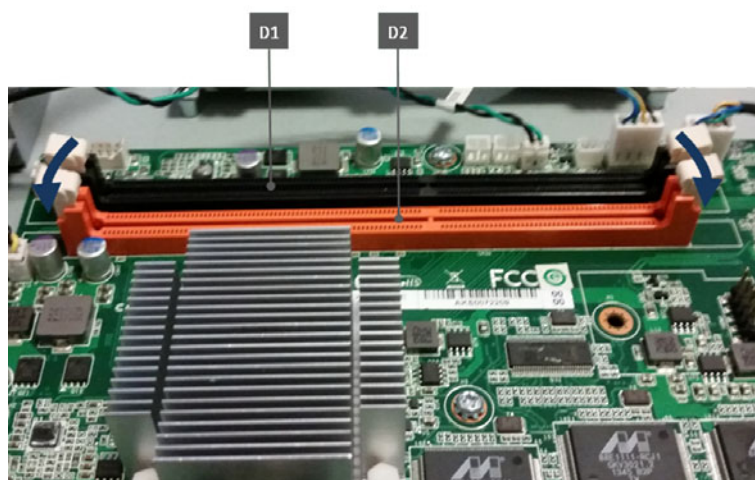




Figure 3.41 Opening DIMM latches

3. Select DIMM orientation so that the keys in the DIMM module and socket match.



Figure 3.42 DIMM key alignment

4. Insert the DIMM from the top using the guide rails on the left and right of the DIMM sockets.



Figure 3.43 DIMM insertion into slide rails

5. Put your thumbs near the right and left end of the DIMM and press down the DIMM evenly until the white latches fully close with a click.

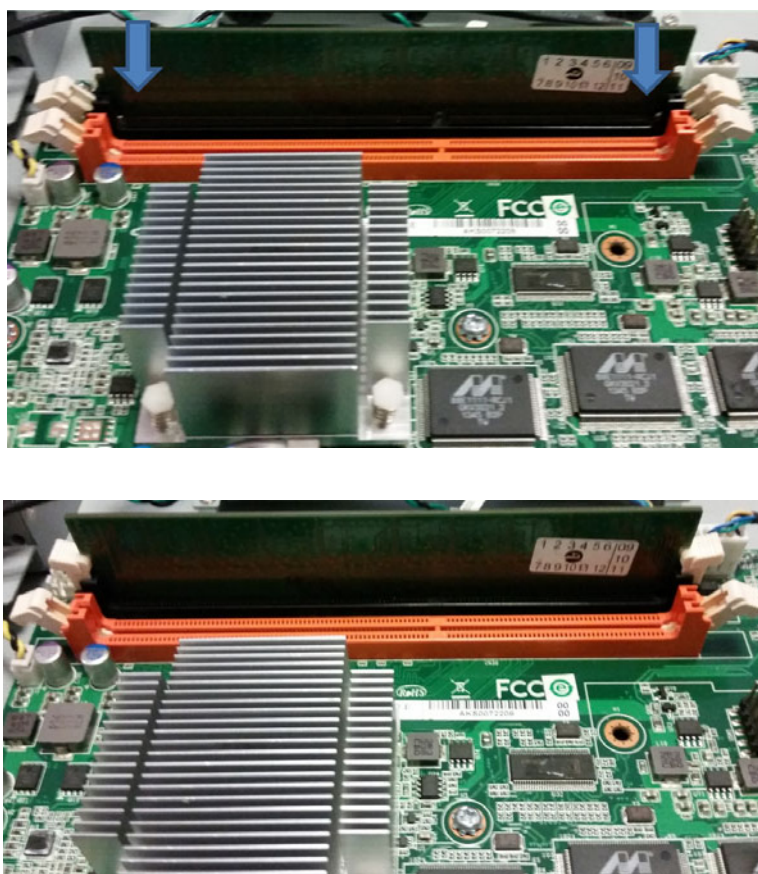


Figure 3.44 Seating the DIMM in the socket

6. In case you want to install another DIMM, repeat steps 1) to 5) accordingly.

3.4 Firmware Upgrades

3.4.1 BIOS

The BIOS can be upgraded using “flashrom” under Linux. flashrom Version 0.9.7-r1855 or newer is required.

flashrom is available via www.flashrom.org or as part of all major Linux distributions. Documentation on flashrom can also be found there.

Start flashrom with the following parameters to update the BIOS on the FWA-2320:

```
-w (BIOS Name) -p internal: laptop=this _is _not_laptop
```

```
[root@FWA-3231 home]# flashrom -w 2320V044.bin -p internal:laptop=this_is_not_laptop
flashrom v0.9.8-r1888 on Linux 2.6.32-431.el6.x86_64 (x86_64)
flashrom is free software, get the source code at http://www.flashrom.org

Calibrating delay loop... OK.
Found chipset "Intel Avoton/Rangeley".
This chipset is marked as untested. If you are using an up-to-date version
of flashrom *and* were (not) able to successfully update your firmware with it,
then please email a report to flashrom@flashrom.org including a verbose (-V) log.
Thank you!
Enabling flash write... Warning: SPI Configuration Lockdown activated.
OK.
Found Winbond flash chip "W25Q64.V" (8192 kB, SPI) mapped at physical address 0
x00000000ff800000.
Reading old flash chip contents... done.
Erasing and writing flash chip... Erase/write done.
Verifying flash... VERIFIED.
[root@FWA-3231 home]#
```

3.4.2 LAN Bypass

LAN Bypass Firmware can be upgraded via the LAN Bypass Software. Please refer to the Advanced LAN Bypass User's Manual for details.

3.5 Replacing FRUs

Please make sure you follow the safety guidelines presented in section 1.1 when making changes to the hardware.

For instruction on how to remove and install the top cover of the unit please refer to section 3.3.

3.5.1 Disk Drives

3.5.1.1 2.5" HDD

You need:

- a PH2 screw driver

A standard 2.5" SATA HDD To remove the HDD, proceed in the reverse of the installation procedure in section 3.3.1.1:

1. Detach the HDD power and SATA cables
2. Remove the four screws on the corners of the HDD carrier plate and remove the HDD carrier plate from the system
3. Remove the HDD mounting screws and extract the HDD from the carrier plate.
4. Install a new HDD by following the instructions in section 3.3.1.1.

3.5.1.2 USB DOM

You need:

- a PH2 screw driver
- a standard USB DOM

To remove a USB DOM proceed in the reverse of the installation procedure in section 3.3.1.2:

1. Remove the USB DOM mounting screw..
2. Extract the USB DOM by pulling the DOM upwards evenly. Be sure not to bend any USB DOM connector pins.
3. Install a new SSD following the mounting instructions of the same section.

3.5.1.3 mSATA SSD

You need:

- a PH1 screw driver
- a standard mSATA SSD

To remove a mSATA SSD proceed in the reverse of the installation procedure in section 3.3.1.3:

1. Remove the mSATA mounting screw. Please be sure to hold the screw as the spring mechanism in the mSATA connector will flip the mSATA module upwards once the screw is loose.
2. Extract the mSATA module

Install a new SSD following the mounting instructions of the same section.

3.5.2 CMOS Battery

You need:

- A BR2032 battery

Warning! *There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type specified above.*



Dispose of used batteries according to the manufacturer's instructions.

To replace the RTC's battery located at B1, pull the spring clip securing the battery forward with your finger tip. Please handle with care and do not bend the spring clip. Then extract the battery vertically.



Figure 3.45 Unlocking the battery

Keeping the spring clip pulled towards you, insert the replacement battery.

Please make sure you insert the battery in correct polarity with the positive pole facing the front panel and the negative pole facing the CPU heatsink. Trying to insert the battery with incorrect orientation/polarity will damage the battery holder. Additional security risks apply as stated above.

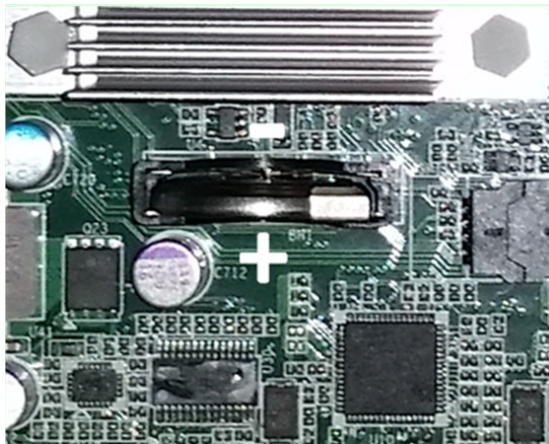


Figure 3.46 Battery Polarity

When the coin cell is seated release the spring clip and control that it moves back into its original position and that it secures the battery correctly.

3.5.3 DIMMs

To replace a DIMM module, basically extract the DIMM module by pushing the DIMM socket latches outward. As the latches flip completely open, the DIMM module will be automatically extracted from the socket. Pull the DIMM module out vertically.

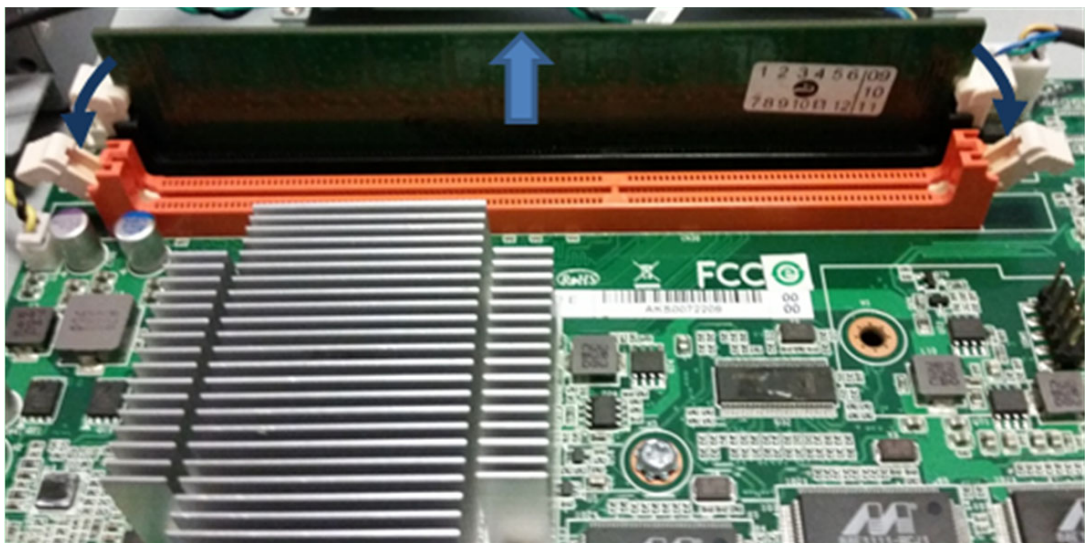


Figure 3.47 Unlocking and removing a DIMM

To insert a new DIMM please follow the process described in section 3.3.3.

Appendix **A**

Connector Pinout and
LED Information

A.1 Console Port (RS232)

This connector can be found at position F5.

Please note that this RJ45 connector for the console, in contrast to RJ45 connectors for network ports, does not feature any integrated LEDs.

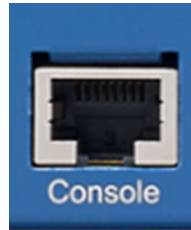


Figure A.1 RJ45 Console connector

Table A.1: Console Connector Pin Assignment

Pin No.	Signal Name	Description
1	n.c.	Not connected
2	n.c.	Not connected
3	TX	Transmit Data (Output from FWA-2320)
4	GND	Digital Circuit Ground
5	GND	Digital Circuit Ground
6	RX	Receive Data (input to FWA-2320)
7	n.c.	Not connected
8	n.c.	Not connected

A.2 USB Type A Connectors

These connectors can be found at position F4



Figure A.2 Stacked USB Type A connector

Table A.2: Stacked USB Type A Connector Pin Assignment

Pin No.	Signal Name	Description
1	VCC_USB0	USB Supply Voltage Port 0 (5 V @ 500 mA, fused)
2	USB0N	USB Port 0 Differential Pair
3	USB0P	
4	GND	Digital Circuit Ground
5	VCC_USB1	USB Supply Voltage Port 1 (5V@500mA, fused)

Table A.2: Stacked USB Type A Connector Pin Assignment

6	USB1N	USB Port 1 Differential Pair
7	USB1P	
8	GND	Digital Circuit Ground

A.3 RJ45 10/100/1000 BASE-T Ports

These connectors can be found at positions F6 through F11.



Figure A.3 RJ45 10/100/1000 Base-T connector

A.3.1 Connector Pinout

Table A.3: RJ45 10/100/1000 Base-T Connector Pin Assignment

Pin No.	Signal Name	Description
1	MDI[0]+	Media Dependent Interface[0]+
2	MDI[0]-	Media Dependent Interface[0]-
3	MDI[1]+	Media Dependent Interface[1]+
4	MDI[2]+	Media Dependent Interface[2]+
5	MDI[2]-	Media Dependent Interface[2]-
6	MDI[1]-	Media Dependent Interface[1]-
7	MDI[3]+	Media Dependent Interface[3]+
8	MDI[3]-	Media Dependent Interface[3]-

A.3.2 LED Definition

Table A.4: RJ45 Connector LED Indication

Speed LED	Left (Green / Amber Color)	Link/Active LED	Right (Green / Amber Color)
10 Mbps	Off	Link	Turn on Green
100 Mbps	Static Amber	Active	Blinking Green
1000 Mbps	Static Green	Bypass Status: Disconnect	Blinking Amber
		Bypass Status: Bypass	Static Amber

Note! *Bypass States are only signalled on the traffic LAN ports. Management LAN ports do not have this extra LED colour & signalling.*



Appendix **B**

BIOS Post Codes

B.1 BIOS Post Codes

POST Codes are diagnostic codes sent by the BIOS to IO address 0x80. A POST adapter needs to be installed in the system to view these POST Codes. Codes not listed are reserved by AMI.

POST Code	Description
0x01	Power on. Reset type detection (soft/hard).
0x02	AP initialization before microcode loading
0x03	North Bridge initialization before microcode loading
0x04	South Bridge initialization before microcode loading
0x05	unused
0x06	Microcode loading
0x07	AP initialization after microcode loading
0x08	North Bridge initialization after microcode loading
0x09	South Bridge initialization after microcode loading
0x0A	unused
0x0B	Cache initialization
0x0E	Microcode not found
0x0F	Microcode not loaded
0x10	PEI Core is started
0x11	Pre-memory CPU initialization is started
0x12	Pre-memory CPU initialization (CPU module specific)
0x13	Pre-memory CPU initialization (CPU module specific)
0x14	Pre-memory CPU initialization (CPU module specific)
0x15	Pre-memory North Bridge initialization is started
0x16	Pre-Memory North Bridge initialization (North Bridge module specific)
0x17	Pre-Memory North Bridge initialization (North Bridge module specific)
0x18	Pre-Memory North Bridge initialization (North Bridge module specific)
0x19	Pre-memory South Bridge initialization is started
0x1A	Pre-memory South Bridge initialization (South Bridge module specific)
0x1B	Pre-memory South Bridge initialization (South Bridge module specific)
0x1C	Pre-memory South Bridge initialization (South Bridge module specific)
0x1D – 0x2A	unused
0x2B	Memory initialization. Serial Presence Detect (SPD) data reading
0x2C	Memory initialization. Memory presence detection
0x2D	Memory initialization. Programming memory timing information
0x2E	Memory initialization. Configuring memory
0x2F	Memory initialization (other).
0x30	Reserved for ASL
0x31	Memory Installed
0x32	CPU post-memory initialization is started
0x33	CPU post-memory initialization. Cache initialization
0x34	CPU post-memory initialization. Application Processor(s) (AP) initialization
0x35	CPU post-memory initialization. Boot Strap Processor (BSP) selection
0x36	CPU post-memory initialization. System Management Mode (SMM) initialization

0x37	Post-Memory North Bridge initialization is started
0x38	Post-Memory North Bridge initialization (North Bridge module specific)
0x39	Post-Memory North Bridge initialization (North Bridge module specific)
0x3A	Post-Memory North Bridge initialization (North Bridge module specific)
0x3B	Post-Memory South Bridge initialization is started
0x3C	Post-Memory South Bridge initialization (South Bridge module specific)
0x3D	Post-Memory South Bridge initialization (South Bridge module specific)
0x3E	Post-Memory South Bridge initialization (South Bridge module specific)
0x3F -0x4E	unused
0x4F	DXE IPL is started
0x50	Memory initialization error. Invalid memory type or incompatible memory speed
0x51	Memory initialization error. SPD reading has failed
0x52	Memory initialization error. Invalid memory size or memory modules do not match.
0x53	Memory initialization error. No usable memory detected
0x54	Unspecified memory initialization error.
0x55	Memory not installed
0x56	Invalid CPU type or Speed
0x57	CPU mismatch
0x58	CPU self test failed or possible CPU cache error
0x59	CPU micro-code is not found or micro-code update is failed
0x5A	Internal CPU error
0x5B	reset PPI is not available
0x60	DXE Core is started
0x61	NVRAM initialization
0x62	Installation of the South Bridge Runtime Services
0x63	CPU DXE initialization is started
0x64	CPU DXE initialization (CPU module specific)
0x65	CPU DXE initialization (CPU module specific)
0x66	CPU DXE initialization (CPU module specific)
0x67	CPU DXE initialization (CPU module specific)
0x68	PCI host bridge initialization
0x69	North Bridge DXE initialization is started
0x6A	North Bridge DXE SMM initialization is started
0x6B	North Bridge DXE initialization (North Bridge module specific)
0x6C	North Bridge DXE initialization (North Bridge module specific)
0x6D	North Bridge DXE initialization (North Bridge module specific)
0x6E	North Bridge DXE initialization (North Bridge module specific)
0x6F	North Bridge DXE initialization (North Bridge module specific)
0x70	South Bridge DXE initialization is started
0x71	South Bridge DXE SMM initialization is started
0x72	South Bridge devices initialization
0x72	South Bridge DXE Initialization (South Bridge module specific)
0x73	South Bridge DXE Initialization (South Bridge module specific)
0x74	South Bridge DXE Initialization (South Bridge module specific)
0x75	South Bridge DXE Initialization (South Bridge module specific)
0x76	South Bridge DXE Initialization (South Bridge module specific)

0x77	South Bridge DXE Initialization (South Bridge module specific)
0x78	ACPI module initialization
0x79	CSM initialization
0x80 – 0x8F	unused
0x90	Boot Device Selection (BDS) phase is started
0x91	Driver connecting is started
0x92	PCI Bus initialization is started
0x93	PCI Bus Hot Plug Controller Initialization
0x94	PCI Bus Enumeration
0x95	PCI Bus Request Resources
0x96	PCI Bus Assign Resources
0x97	Console Output devices connect
0x98	Console input devices connect
0x99	Super IO Initialization
0x9A	USB initialization is started
0x9B	USB Reset
0x9C	USB Detect
0x9D	USB Enable
0xA0	IDE initialization is started
0xA1	IDE Reset
0xA2	IDE Detect
0xA3	IDE Enable
0xA4	SCSI initialization is started
0xA5	SCSI Reset
0xA6	SCSI Detect
0xA7	SCSI Enable
0xA8	Setup Verifying Password
0xA9	Start of Setup
0xAA	Reserved for ASL
0xAB	Setup Input Wait
0xAC	Reserved for ASL
0xAD	Ready To Boot event
0xAE	Legacy Boot event
0xAF	Exit Boot Services event
0xB0	Runtime Set Virtual Address MAP Begin
0xB1	Runtime Set Virtual Address MAP End
0xB2	Legacy Option ROM Initialization
0xB3	System Reset
0xB4	USB hot plug
0xB5	PCI bus hot plug
0xB6	Clean-up of NVRAM
0xB7	Configuration Reset (reset of NVRAM settings)
0xC0 – 0xCF	unused
0xD0	CPU initialization error
0xD1	North Bridge initialization error
0xD2	South Bridge initialization error
0xD3	Some of the Architectural Protocols are not available
0xD4	PCI resource allocation error. Out of Resources

0xD5	No Space for Legacy Option ROM
0xD6	No Console Output Devices are found
0xD7	No Console Input Devices are found
0xD8	Invalid password
0xD9	Error loading Boot Option (LoadImage returned error)
0xDA	Boot Option is failed (StartImage returned error)
0xDB	Flash update is failed
0xDC	Reset protocol is not available
0XE0	S3 Resume is started (S3 Resume PPI is called by the DXE IPL)
0xE1	S3 Boot Script execution
0xE2	Video repost
0xE3	OS S3 wake vector call
0xE8	S3 Resume Failed
0xE9	S3 Resume PPI not Found
0xEA	S3 Resume Boot Script Error
0xEB	S3 OS Wake Error
0xF0 – 0xF4	unused
0xf8 – 0xFA	unused

Appendix **C**

Declaration of
Conformity

C.1 Declaration of Conformity

The FWA-2320 has been successfully tested for compliance to the regulations below. Should you need a signed copy of the declaration of conformity or the related test reports, please contact your Advantech representative.

C.1.1 CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring.

C.1.2 FCC Class A

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

Appendix **D**

Warranty and RMA

D.1 Warranty and RMA

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered, for example, Advantech products used, other hardware and software used, etc. Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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