ARES-5423-TP

Programmable Embedded Controller with Intel® Atom™ D2550

User's Manual

Version 1.0

P/N: 4012542301100P 2013.10

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Revision History

Version	Date	Description
1.0	October 2013	Initial release

Contents

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Copyright Notice

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

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

Declaration of Conformity

CE

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

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

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

FCC Class A

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

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

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

RoHS

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

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

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

SVHC / REACH

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

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

Important Safety Instructions

Read these safety instructions carefully

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

Product Heat

The computer generates heat during operation. Contact the computer's chassis with your body could cause discomfort or even a skin burn.

Warning

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

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

Replacing Lithium Battery

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

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

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

Technical Support

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

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

http://www.arbor.com.tw

E-mail:info@arbor.com.tw

Warranty

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

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

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

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

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Chapter 1

Introduction

1.1. Product Highlights

- **Less Cable, Fanless Design**
- Rich I/O including 6 x COM, DIO, 4 x USB
- Outside viewable Status LED lights for Power/HDD/COM/DIO statues.
- Outside-accessible CFast socket
- Din-Rail mount support
- Rugged design for shock/vibration protection
- Easy installation/maintenance

1.2. About this Manual

This manual is meant for the experienced users and integrators with hardware knowledge of personal computers. If you are not sure about the description herein, consult your vendor before further handling.

We recommend that you keep one copy of this manual for the quick reference for any necessary maintenance in the future. Thank you for choosing ARBOR products.

1.3. Specifications

System Kernel	
Processor	Soldered onboard Intel® Atom™ D2550 1.86GHz processor
BIOS	AMI BIOS
Chipset	Intel® NM10
Graphics	Integrated Intel® GMA3650
System Memory	Onboard single-channel memory controller with 2GB DDR3-800/1066 DRAM
Ethernet Controller	2 x Realtek 8111 GbE controller
Watchdog Timer	1 ~ 255 levels reset

I/O Ports	
Serial Port	2 x RS-232 ports in a 2 x 10-pin terminal block
	4 x RS-232/485 configurable ports in a 2 x 10-pin terminal block
USB Port	4 x USB 2.0 ports
LAN Port	2 x RJ-45 ports
Video Port	1 x DB-15 female connector for analog RGB
DIO Port	1 x 8-bit digital I/O, 4-in and 4-out, in terminal block
Expansion Bus	1 x Mini-card slot interconnected with SIM card socket for optional WiFi or HSUPA module
Storage	
Type	1 x 2.5" drive bay for HDD/SSD
	1 x CFast socket which is outside accessible
	1 x mSATA (by OEM request)
Qualification	
Certification	CE, FCC Class A
Environment	
Operating Temp.	-10 ~ 60°C (14 ~ 140°F), ambient w/ air flow
Storage Temp.	-20 ~ 80°C (-4 ~ 176°F)
Relative Humidity	10 ~ 90% @ 60°C (non-condensing)
Vibration	5~500Hz, 3 Grms Random
	Operating 40G (11ms), Non-operating 80G with CF/SSD
Mechanical	
Construction	Whole aluminum chassis
Mounting	DIN-rail mount
Weight (Net / Gross)	1.4 kg (2.4 lb) (Barebone)
Dimensions (W x D x H)	170 x 127 x 74 mm (6.69" x 4.9" x 2.91")
Power Requirement	
Power Input	DC 9-36V by 2-pin terminal block
Power Consumption	17W (typical.)

1.4. Inside the Package

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

1 x ARES-5423 Programmable Embedded Controller

1 x Driver CD
1 x User's Manual
4 x 1x10 termianl block for COM/DIO
1 x 1x2 terminal block for Power

1.5. Ordering Information

ARES-5423-TP	Barebone system w/ Intel® Atom™ D2550 processor and 2GB DRAM

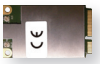
1.5.1. Optional Accessories

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

PAC-B065W-1 19V/3.4A 65W AC/DC adapter kit

1.5.2. Configure-to-Order Service

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

SSD-25032	Memoright 2.5” 32GB SATAII SSD Kit	
HSPA-SI1400	HSUPA 3.75G module kit & internal wiring	
WIFI-IN1300	Intel® Centrino® Advanced-N 6205 WiFi module w/ 20cm internal wiring	
ANT-H11	1 x 2dBi HSUPA antenna	
ANT-D11	1 x WiFi Dual-band 2.4G/5G antenna	

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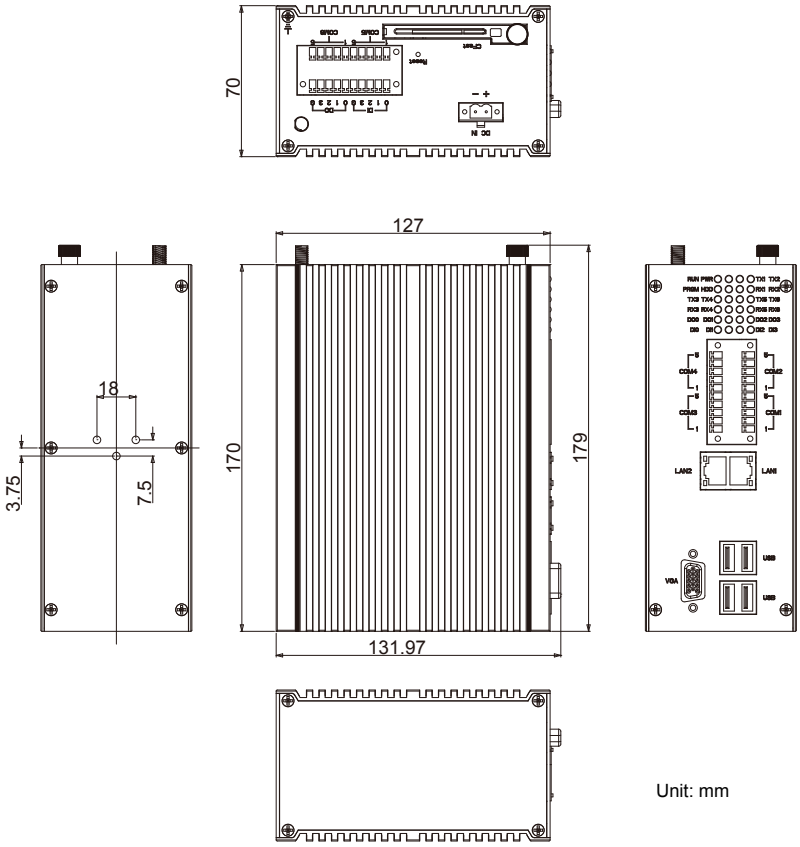
Chapter 2

Getting Started

2.1. Dimensions

The following illustration shows the dimensions of ARES-5423, with the measurements in width, depth, and height called out.

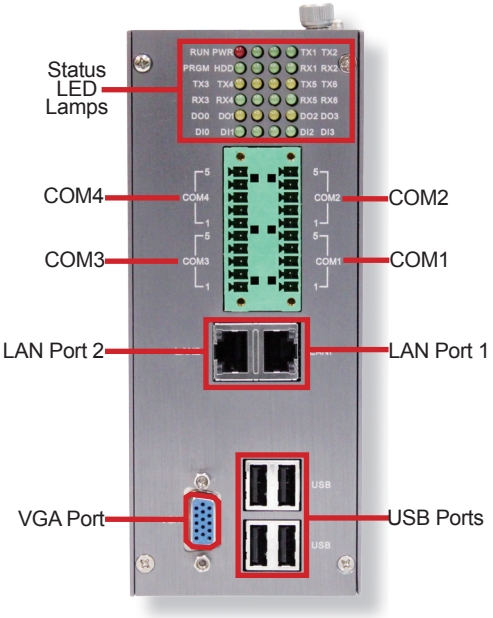


Unit: mm

2.2. Take A Tour

The computer has some I/O ports, status LED light and controls on the front and rear panels. The following illustrations show all the components called out for ARES-5423..

Front View



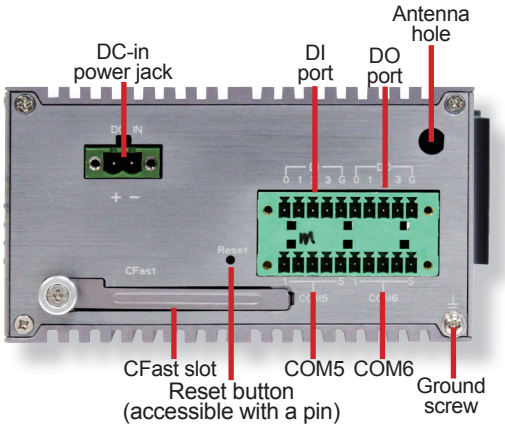
- **Status LED Lamps**

  24 status LED lamps are recessed on the front side of the computer to draw users' prompt awareness of the computer's contiguous events such as power on/off, data transmission and so on.

  These lamps and the notifications delivered are summarized as following:

LED Lamp	Color	State	Subject	Description
RUN (programmable)	Red	on	Power (by default)	Power is on.
	N/A	off		No power input.
PWR	Green	on	Power	Power is on.
	N/A	off		No power input.
PRGM (programmable)	Green	on	Power (by default)	Power is on.
	N/A	off		No power input or power error
HDD	Red	on	HDD status	(Alarm) No power input or power error
	N/A	off		Power is on.
TX1~TX6	Yellow	on	Ethernet data transmission	COM1~COM6 is transmitting data by Ethernet networking.
	N/A	off		No Ethernet data transmission is active at COM1~COM6.
RX1~RX6	Green	on	100M bit/s data receiving	COM1~COM6 is receiving 100M bit/s data.
	Yellow	on	1000M bit/s data receiving	COM1~COM6 is receiving 1000M bit/s data.
	N/A	off	10M bit/s data receiving	No data is being received or only 10 bit/s data is being received at COM1~COM6.

Side View



Rear View

2.3. Driver Installation Notes

The ARES-5423 supports the operating systems of Windows 7 and Windows XP. For these operating systems, find the necessary device drivers on the CD that comes with your purchase. For different operating systems, the installation of drivers/utilities may vary slightly, but generally they are similar. **DO** follow the sequence below to install the drivers to prevent errors:

Chipset→Graphics→Audio→LAN

Paths to find various drivers on the CD:

Windows 7

Device	Driver Path
Chipset	CHIPSET\WIN7\32
Graphics	GRAPHIC\WIN7\32
LAN	LAN\WIN7\32
Audio	AUDIO\WIN7\32

Windows XP

Device	Driver Path
Chipset	CHIPSET\XP
Graphics	GRAPHIC\XP
LAN	LAN\XP\REALTEK_8111E_XP_32
Audio	AUDIO\XP

Chapter 3

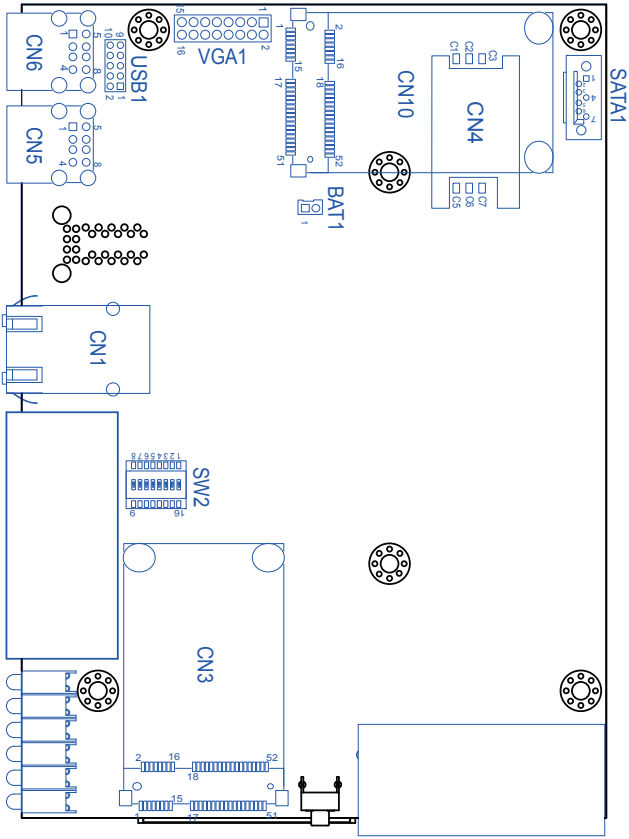
System Configuration

3.1. Board Layout

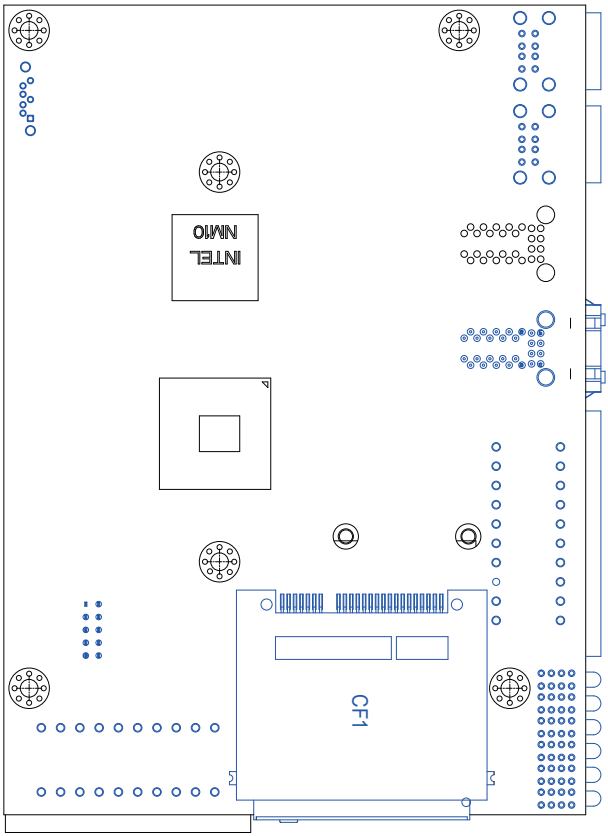
The engine of the computer is comprised of a main board and a power board. This section will provide an thorough view of these boards.

3.1.1. Main Board

Board Top

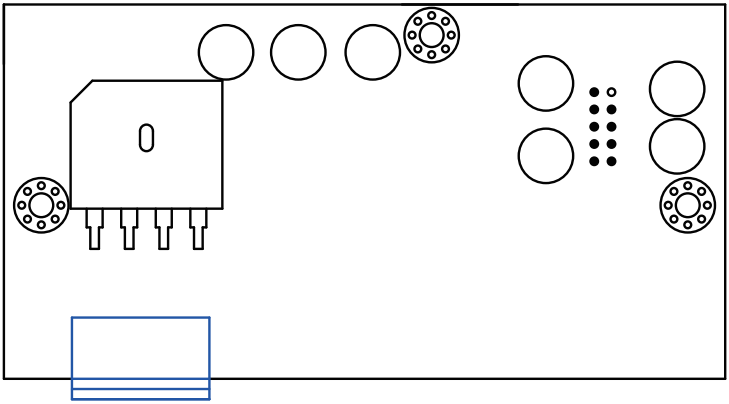


Board Bottom

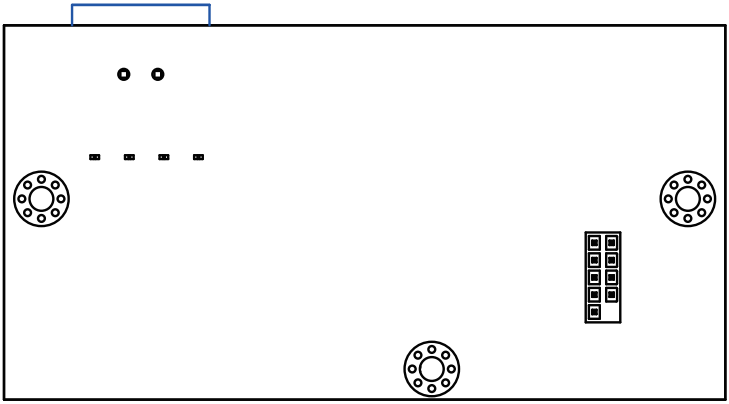


3.1.2. Power Board

Board Top



Board Bottom



3.2. Connectors and DIP Switches

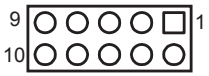
The main board comes with some connectors to join some devices and some jumpers to alter hardware configuration. The power board also comes with some connectors. The following in this chapter will explicate each of these components.

3.2.1. Main Board Connectors

This section will guide you through the connectors on the main board.

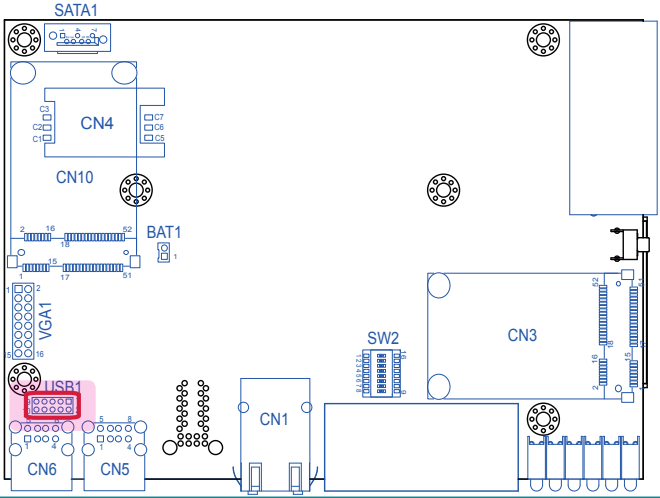
USB1

Description: Connector for internal USB ports
Connector Type: 2.00mm-pitch 2x5-pin header



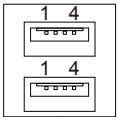
Pin	Desc.	Pin	Desc.
1	USB_VCC	2	USB_VCC
3	USB_0-	4	USB_1-
5	USB_0+	6	USB_1+
7	GND	8	GND
9	GND	10	N/C

Main Board Top

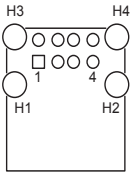


CN5 & CN6

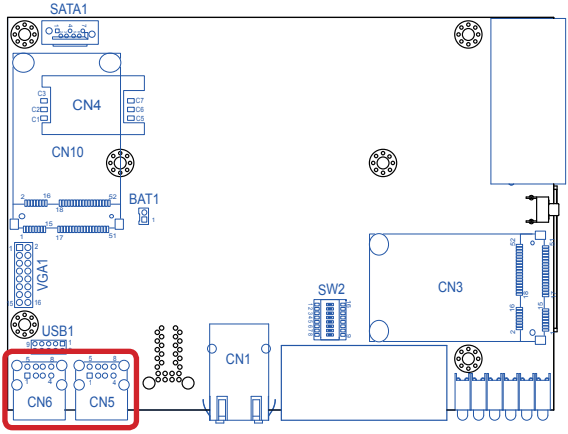
Description: External USB ports
Connector Type: Double-stacked type-A USB connectors



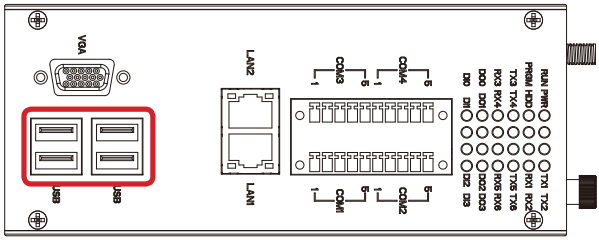
Pin	Description
1	+5V
2	USBD-
3	USBD-
4	GND



Main Board Top

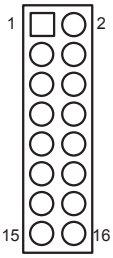


Front Panel



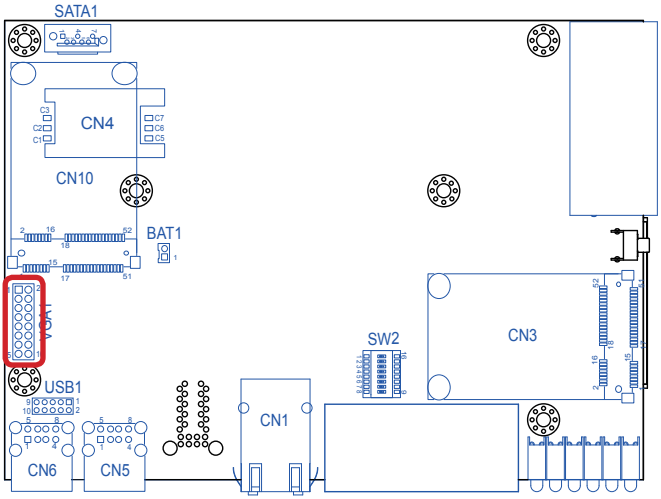
VGA1

Function: VGA connector
Connector Type: Onboard 2.00mm pitch 2x8-pin header



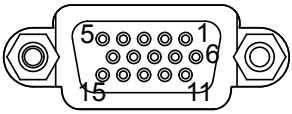
Pin	Description	Pin	Description
1	RED	2	GREEN
3	BLUE	4	N/C
5	GND	6	GND
7	GND	8	GND
9	CRT_VCC5	10	N/C
11	N/C	12	DCC_VDDAT
13	HSYNC	14	VSYNC
15	DDC_CLK	16	N/C

Main Board Top



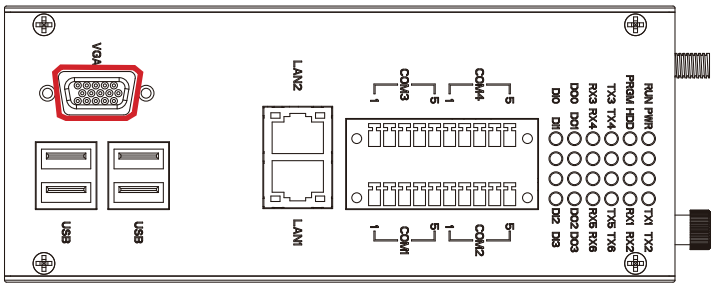
VGA

Function: External VGA port for CRT display
Connector Type: D-sub 15-pin female connector



Pin	Description	Pin	Description
1	CRT_R	2	CRT_G
3	CRT_B	4	N/C
5	GND	6	GND
7	GND	8	GND
9	VCC5	10	N/C
11	N/C	12	DCC_DATA
13	HSYNC	14	VSYNC
15	DDC_CLK	16	

Front Panel

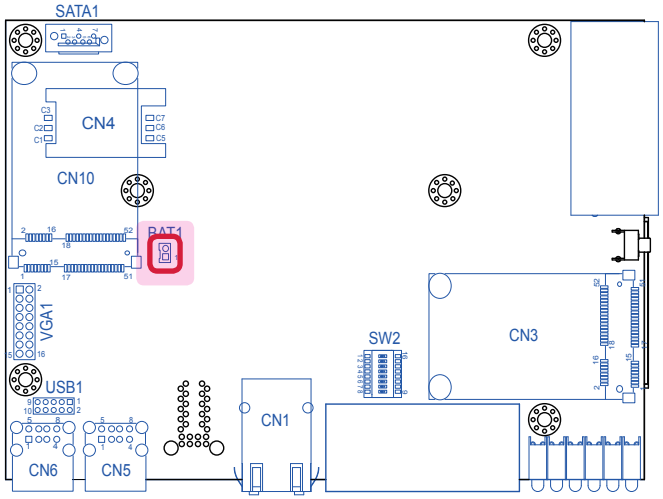


BAT1

Function: RTC power connector
Connector Type: Onboard 2.54mm pitch 1x2-pin header

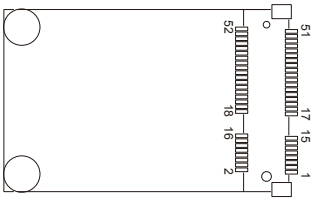
Pin	Description
1	VBAT
2	GND

Main Board Top



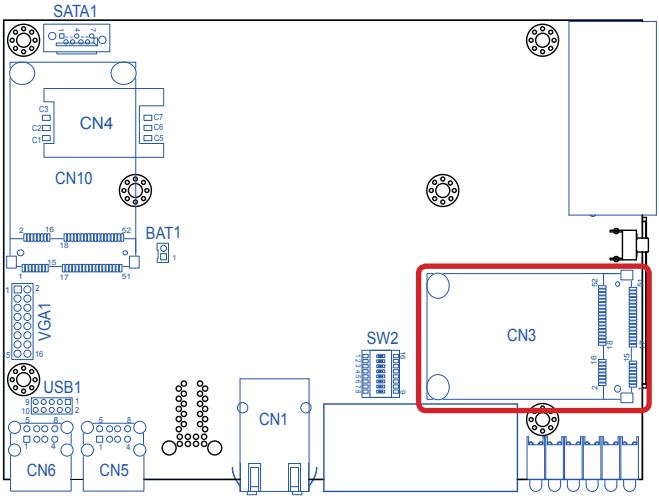
CN3

Description: PCI Express Mini-card socket
Connector Type: Onboard 0.8mm-pitch 52-pin edge card connector



Pin	Desc.	Pin	Desc.	Pin	Desc.	Pin	Desc.
1	WAKE#	16	N/C				
2	+3.3V	17	N/C				
3	N/C	18	GND				
4	GND	19	N/C				
5	N/C	20	W_DISABLE#	31	PE_CAD3_TX-	42	3G_LED_A
6	+1.5V	21	GND	32	SMB_DATA	43	GND
7	CLKREQ#	22	PCIE_ARST#	33	PE_CAD3_TX+	44	N/C
8	UIM_PWR_A	23	PE_CAD3_RX-	34	GND	45	N/C
9	GND	24	+3.3V	35	GND	46	N/C
10	UIM_DATA_A	25	PE_CAD3_RX+	36	USB_D-	47	N/C
11	REFCLK-	26	GND	37	GND	48	+1.5V
12	SIM_CLK_A	27	GND	38	USB_D+	49	N/C
13	REFCLK+	28	+1.5V	39	+3.3V	50	N/C
14	UIM_RST_A	29	GND	40	GND	51	N/C
15	GND	30	SMB_CLK	41	+3.3V	52	+3.3V

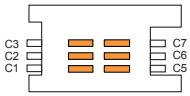
Board Top



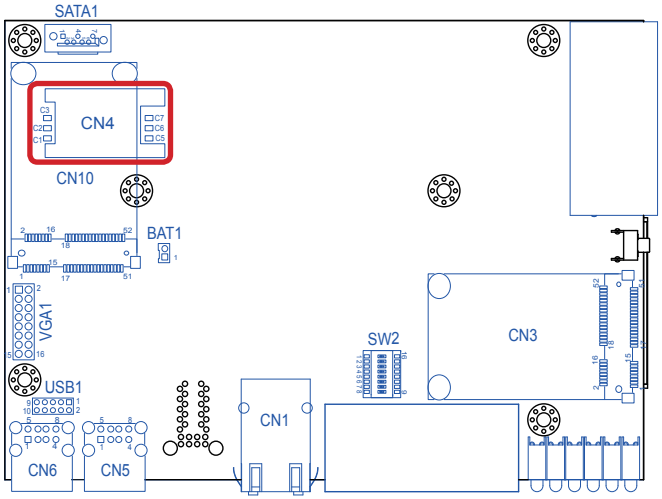
CN4

Description: SIM card connector
Connector Type: SMT-type 2.54mm-pitch 6-pin SIM card connector with a hinged cover

Pin	Description
C1	SIM_PWR_A
C2	UIM_RST_A
C3	SIM_CLK_A
C5	GND
C6	N/C
C7	UIM_DATA_A



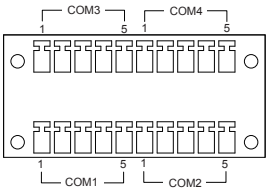
Board Top



CN7

Function: For serial ports COM1 and COM2, which are both RS232-interfaced, and for COM3 and COM4, which are configurable between RS232 and RS485.

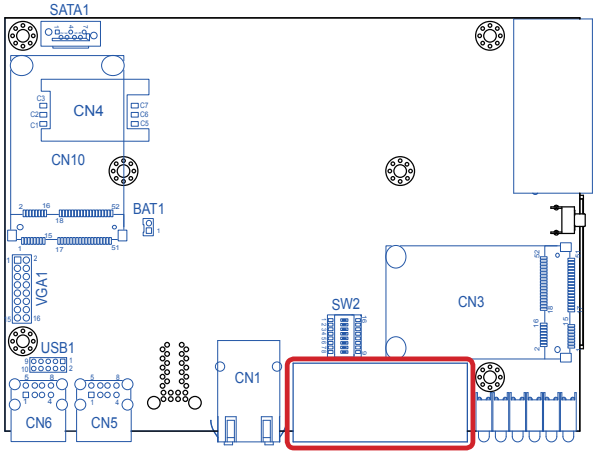
Connector Type: Double-stacked 10-pin Phoenix connector



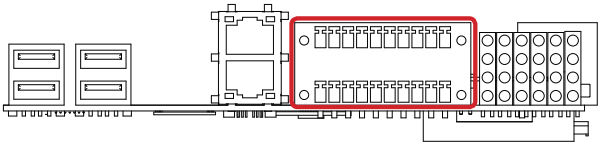
COM1 & COM2 (5-wire mode)	
Pin	**Description**
1	RTS
2	TXD
3	CTS
4	RXD
5	GND

COM3 & COM4 (3-wire mode)	
Pin	**Description**
1	TXD
2	RXD
3	RS485-
4	RS485+
5	GND

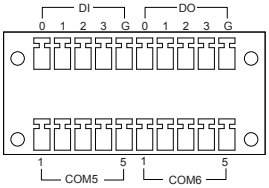
Main Board Top



Front Side



CN8



Function: For digital input / output ports and serial ports COM5 and COM6, which are configurable between RS232 and RS485.

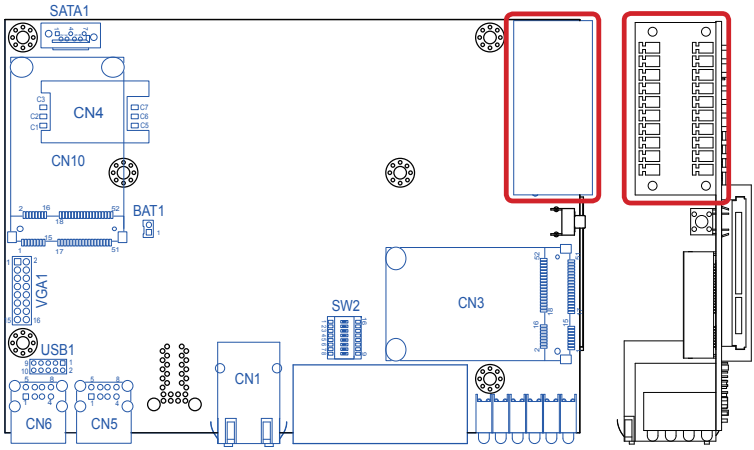
Connector Type: Double-stacked 10-pin Phoenix connector

Digital Input	
Pin	**Description**
0	DIO0
1	DIO1
2	DIO2
3	DIO3
G	GND

Digital Output	
Pin	**Description**
0	DIO4
1	DIO5
2	DIO6
3	DIO7
G	GND

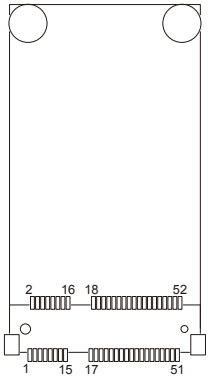
COM5 & COM6 (3-wire mode)	
Pin	**Description**
1	TXD
2	RXD
3	RS485-
4	RS485+
5	GND

Main Board Top **Side**



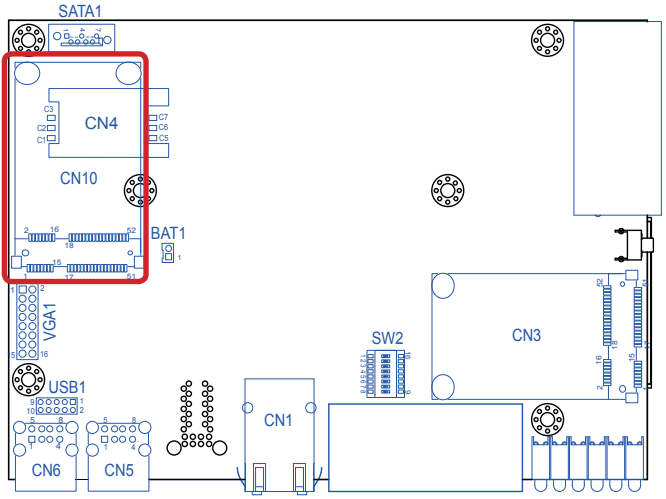
CN10

Description: mSATA socket
Connector Type: Onboard 0.8mm pitch 52-pin edge card connector



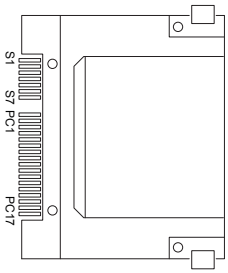
Pin	Desc.	Pin	Desc.	Pin	Desc.
1	NC	20	NC	36	NC
2	+3.3V	21	GND	37	GND
3	NC	22	NC	38	NC
4	GND	23	TX+	39	+3.3V
5	NC	24	+3.3V	40	GND
6	NC	25	TX-	41	+3.3V
7	NC	26	GND	42	NC
8	NC	27	GND	43	GND
9	GND	28	NC	44	NC
10	NC	29	GND	45	NC
11	NC	30	NC	46	NC
12	NC	31	RX-	47	NC
13	NC	32	NC	48	NC
14	NC	33	RX+	49	NC
15	GND	34	GND	50	GND
16	NC	35	GND	51	NC
17	NC			52	+3.3V
18	GND				
19	NC				

Main Board Top



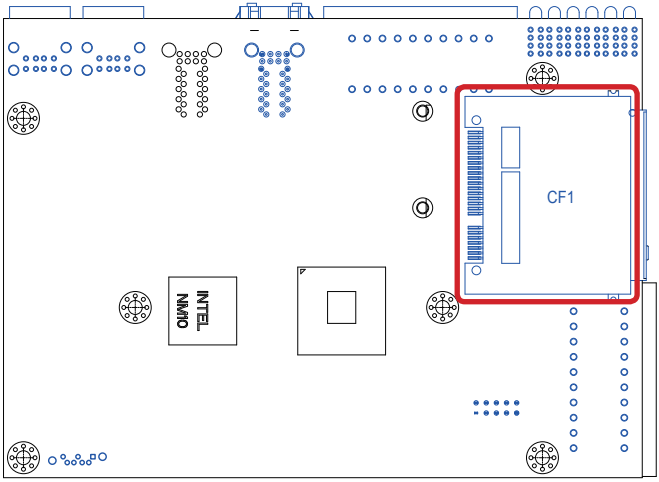
CF1

Function: CFast socket
Connector type: 24-pin push-push CFast connector, 8.35mm high.



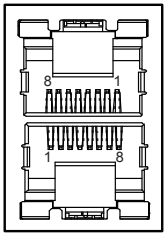
Pin	Desc.	Pin	Desc.	Pin	Desc.
S1	GND	**PC1**	+3.3V	**PC10**	N/C
S2	SATA_TX1+	**PC2**	GND	**PC11**	N/C
S3	SATA_TX1-	**PC3**	N/C	**PC12**	N/C
S4	GND	**PC4**	N/C	**PC13**	+3.3V
S5	SATA_RX1-	**PC5**	N/C	**PC14**	+3.3V
S6	SATA_RX1+	**PC6**	N/C	**PC15**	GND
S7	GND	**PC7**	GND	**PC16**	GND
		PC8	N/C	**PC17**	N/C
		PC9	N/C		

Main Board Bottom



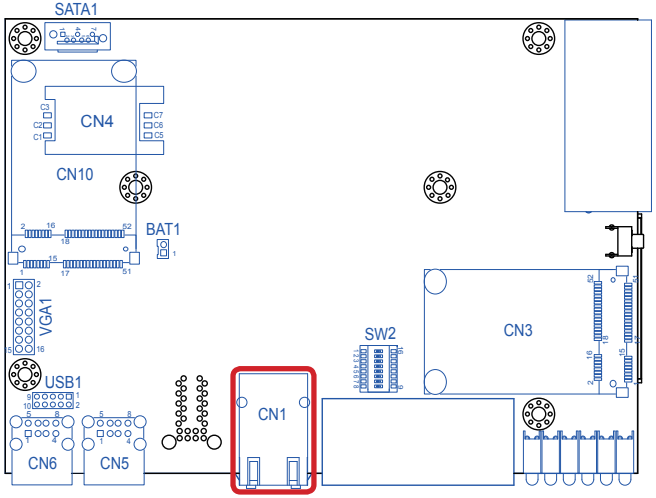
CN1

Description: LAN Ports
Connector Type: Two 8P8C RJ-45 connectors with LED and shield, supporting Ethernet 10/100/1000 Mbps.

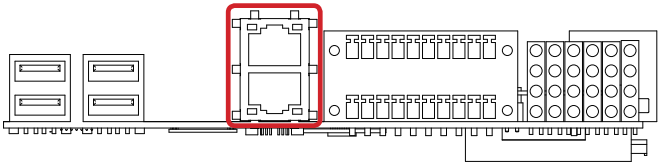


Pin	Description	Pin	Description
1	MDI0+	2	MDI0-
3	MDI1+	4	MDI1-
5	MDI2+	6	MDI2-
7	MDI3+	8	MDI3-

Main Board Top



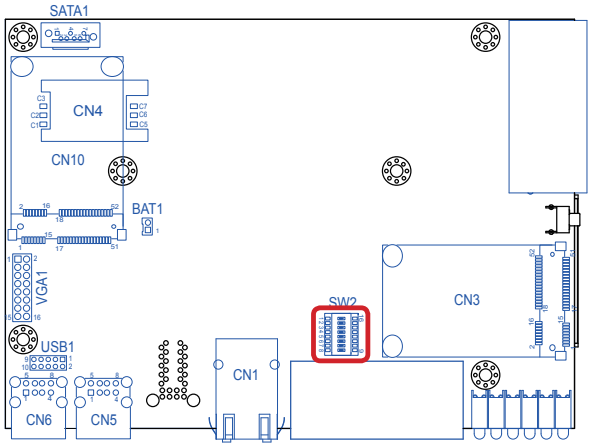
Front Side



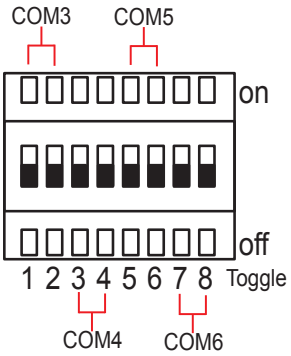
3.2.2. Main Board DIP Switch

The computer comes with six serial ports COM1 through COM6. They are all provided in terminal block. For data transmission, COM1 and COM2 are fixed to RS232 interface while COM3 through COM6 are configurable between RS432 and RS485. It relies on the 8-toggle (16-pin) DIP switch **SW2** on the top side of the main board tune these ports among the available protocols.

Main Board Top



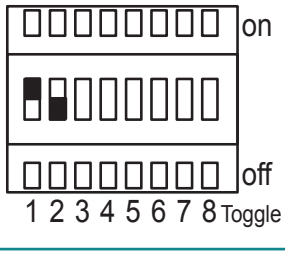
Among the toggles: Toggles 1 & 2 control COM3. Toggles 3 & 4 control COM4. Toggles 5 and 6 control COM5 while toggles 7 and 8 control COM6.



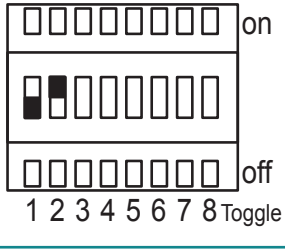
Follow the guide below to configure COM3 through COM6 for data transmission.

- **COM3 Settings**

COM3 RS232

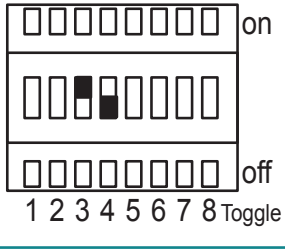
Toggle	Position	Setting
1	on	
2	off	
3	not applicable	
4	not applicable	
5	not applicable	
6	not applicable	
7	not applicable	
8	not applicable	

COM3 RS485

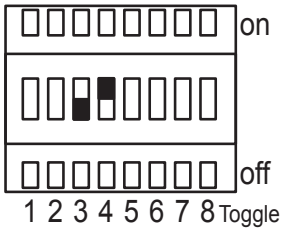
Toggle	Position	Setting
1	off	
2	on	
3	not applicable	
4	not applicable	
5	not applicable	
6	not applicable	
7	not applicable	
8	not applicable	

- **COM4 Settings**

COM4 RS232

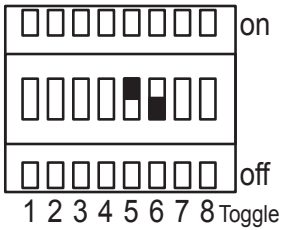
Toggle	Position	Setting
1	not applicable	
2	not applicable	
3	on	
4	off	
5	not applicable	
6	not applicable	
7	not applicable	
8	not applicable	

COM4 RS485

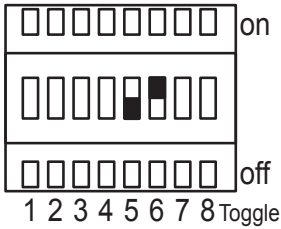
Toggle	Position	Setting
1	not applicable	
2	not applicable	
3	off	
4	on	
5	not applicable	
6	not applicable	
7	not applicable	
8	not applicable	

- **COM5 Settings**

COM5 RS232

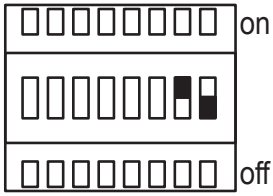
Toggle	Position	Setting
1	not applicable	
2	not applicable	
3	not applicable	
4	not applicable	
5	on	
6	off	
7	not applicable	
8	not applicable	

COM5 RS485

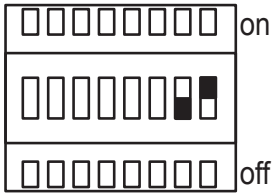
Toggle	Position	Setting
1	not applicable	
2	not applicable	
3	not applicable	
4	not applicable	
5	off	
6	on	
7	not applicable	
8	not applicable	

- **COM6 Settings**

COM6 RS232

Toggle	Position	Setting
1	not applicable	
2	not applicable	
3	not applicable	
4	not applicable	
5	not applicable	
6	not applicable	
7	on	
8	off	

COM6 RS485

Toggle	Position	Setting
1	not applicable	
2	not applicable	
3	not applicable	
4	not applicable	
5	not applicable	
6	not applicable	
7	off	
8	on	

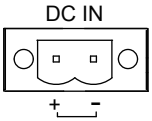
3.2.3. Power Board Connectors

This section will guide you through the connector s on the power board.

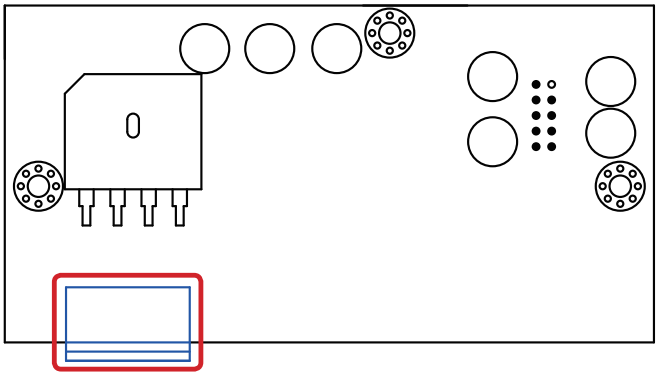
PWRIN1

Function: DC-IN power port
Connector Type: 2-pin terminal block

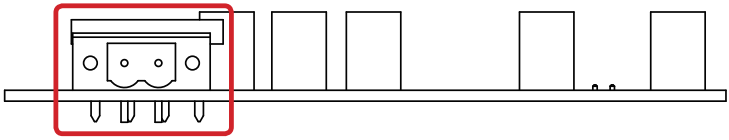
Pin	Description	Pin	Description
-	GND	+	+9~28V



Power Board Top



Side Panel



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Chapter 4

Installation and Maintenance

4.1. Install Hardware

The ARES-5423 is constructed based on modular design to make it easy for users to add hardware or to maintain the computer. The following sections will guide you to the simple hardware installations for the computer.

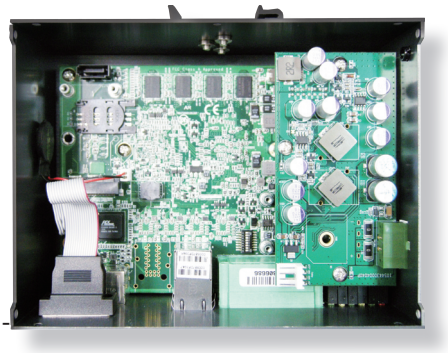
4.1.1. Open the Computer

Most of the connectors and DIP switch are built on the top side of the main board. To access these components, the computer's top cover has to go. Follow through the steps below to remove the top cover from the computer.

1. Place the computer on a flat surface. Loosen and remove the 9 screws from the computer's four edges as shown in the illustration below:

2. Remove the top cover completely from the computer.

The inside of the computer comes to view.



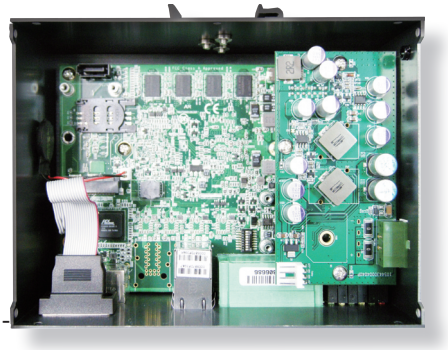
- To connect/disconnect devices to/from the main board and power board, see 3.2.1. Main Board Connectors, 3.2.2. Main Board DIP Switch and 3.2.3. Power Board Connectors.
- To install a 2.5" SATA HDD/SSD, see 4.1.2. Install 2.5" SATA HDD/SSD on page 38.
- To install a SIM card, see 4.1.3. Install SIM Card on page 43.
- To install an mSATA storage module, see 4.1.4. Install mSATA Storage on page 45.
- To install the wireless modules of **PCI Express Mini-card** form factor, see 4.1.5. Install Wireless Modules on page 47.

4.1.2. Install 2.5" SATA HDD/SSD

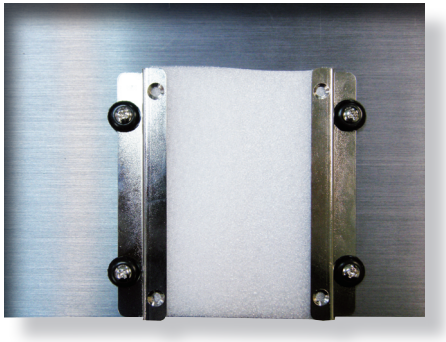
To install a 2.5" SATA HDD/SSD to the computer:

1. Remove the top cover from the computer as described in 4.1.1. Open the Computer on page 36.

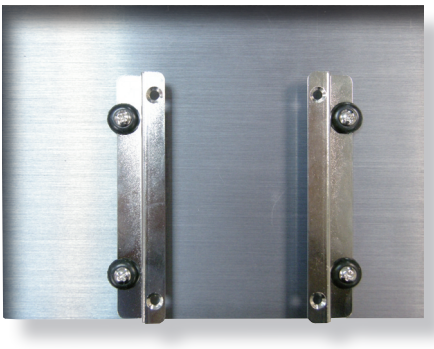
   The inside of the computer comes to view.



2. On the inner side of the top cover, find the bracket to install a 2.5" SATA HDD/SSD.



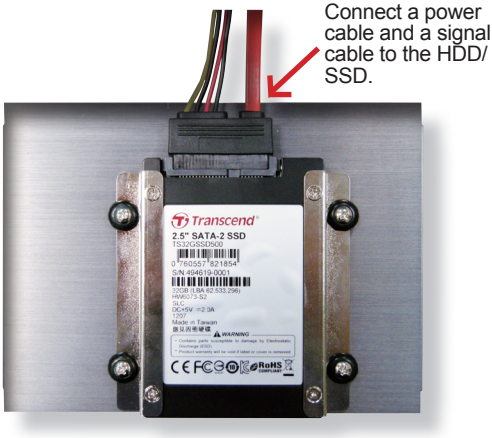
3. Remove the sponge.



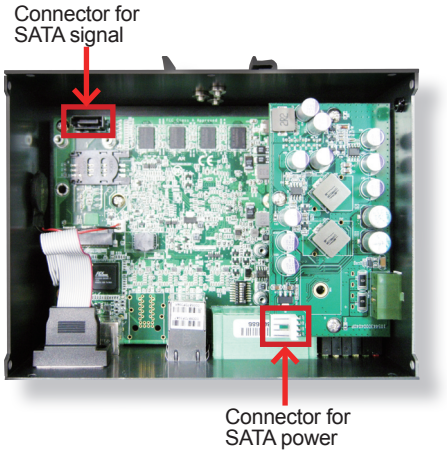
4. Slide a 2.5" SATA HDD or SSD into the bracket by the direction as shown below.

5. Fix the 2.5" SATA HDD/SSD to the bracket using four screws.

6. Connect a power cable and a signal cable to the HDD/SSD.

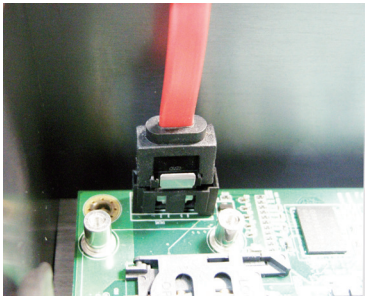


7. Find the SATA signal connector on the main board and the SATA power connector on the power board inside the computer.

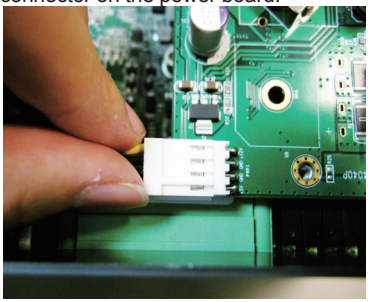


8. Connect the SATA signal cable and the SATA power cable to the aforesaid boards.

Connect the SATA signal cable to the connector on the main board.

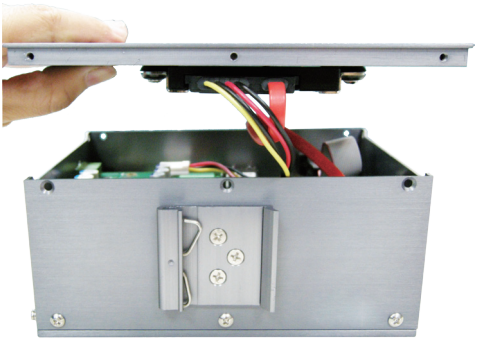


Connect the SATA power cable to the connector on the power board.



9. Place the top cover back onto the computer.

Restore the top cover to the computer.



Restore the top cover to the computer.
- A view from the other side

10. Refasten the 9 screws to fix the top cover.

4.1.3. Install SIM Card

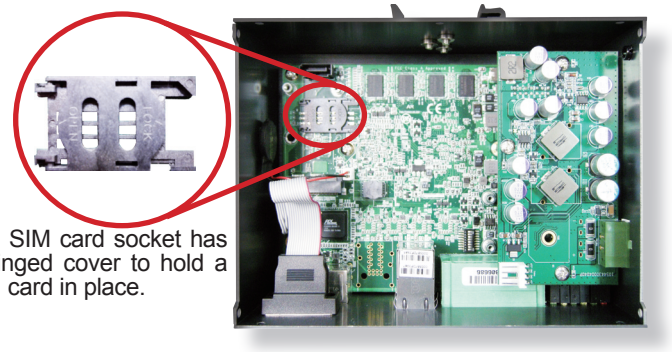
The computer comes with a SIM socket for 3G networking. Follow through the guide below to install a SIM card to the computer.

Note: Except for a SIM card, the computer also needs a 3G module for 3G networking, see Appendix C to install the 3G module **HSPA-SI1400**.

1. Remove the top cover from the computer as described in 4.1.1. Open the Computer on page 36.

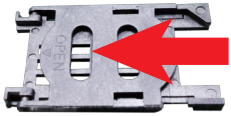
   The inside of the computer comes to view.

2. See the illustration below and find the **SIM Card** socket for 3G networking.

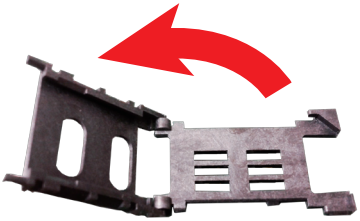


The SIM card socket has a hinged cover to hold a SIM card in place.

3. Push back the hinged cover to open the socket.

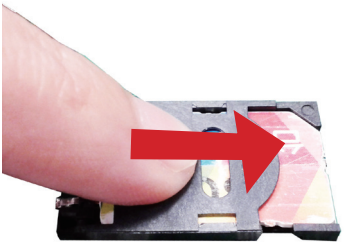


4. Swivel the hinged cover.



5. Slide a SIM card along the hinged cover. Note the notch on the SIM card should meet the notch on the socket.

6. Put down the hinged cover and push it forward to lock the SIM card in place.



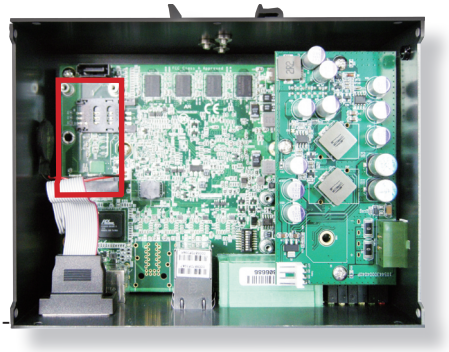
7. Restore the top cover to the computer.

4.1.4. Install mSATA Storage

To install an mSATA storage module to the computer:

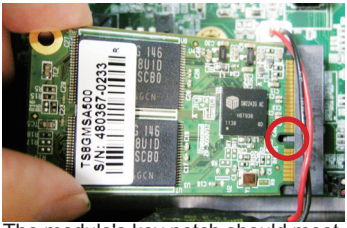
1. Remove the top cover from the computer as described in 4.1.1. Open the Computer on page 36.

   The inside of the computer comes to view.



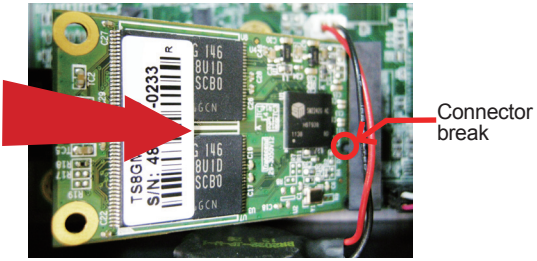
2. Find the socket for mSATA module as the picture above shows.

3. Confront the mSATA module's edge connector with the socket's connector. Align the module's key notch the connector's break.



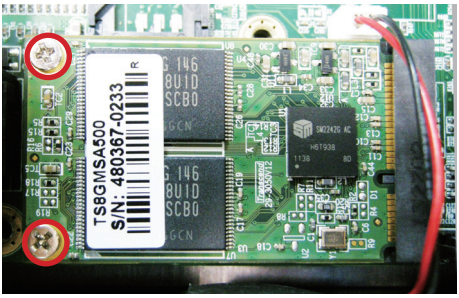
The module's key notch should meet the connector's break.

4. Fully plug the module until it cannot be plugged any more.



Fully plug the module.

5. Press the module down and fix the module in place using two screws.



6. Restore the top cover to the computer.

4.1.5. Install Wireless Modules

The computer comes with a **Mini-card** socket to load the computer with a wireless module of **PCI Express Mini-card** form factor. The configure-to-order wireless modules available with the computer are the 3G module **HSPA-SI1400** and the Wi-Fi moldue **WIFI-IN1300**:

HSPA-SI1400
HSUPA 3.75G module kit & internal wiring

WIFI-IN1300
Intel® Centrino® Advanced-N 6205 WiFi module w/ 20cm internal wiring

(See also 1.5.2. Configure-to-Order Service on page 5.)

- If you have ordered the 3G module **HSPA-SI1400**, see Appendix C to know how to install the hardware and software for the module.

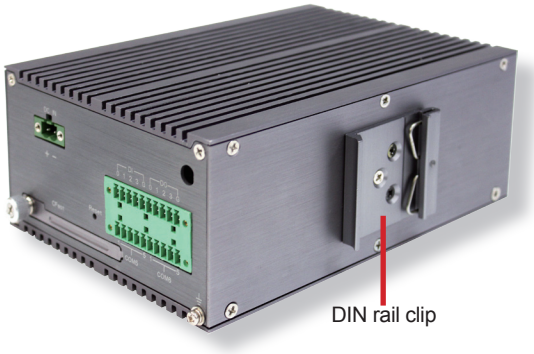
- If you have ordered the Wi-Fi module **WIFI-IN1300**, see Appendix D to know how to install the hardware and software for the module.

4.2. DIN-rail Mount

Integrate the computer to where it works by mounting it to a DIN-rail in the surroundings. Such integration relies on the DIN-rail clip on the rear side of the computer. Follow through the guide below to mount/dismount the computer to/ from a DIN-rail.

4.2.1. Mount the Computer

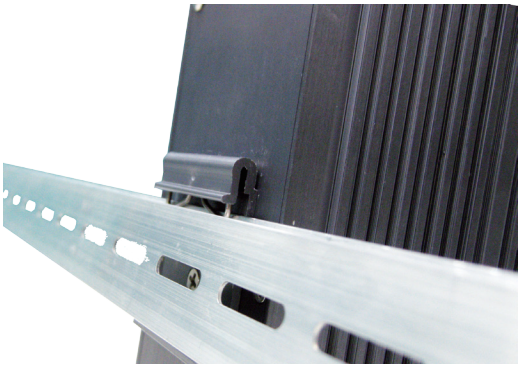
1. Find the DIN-rail clip on the rear side of the computer as illustrated below:



2. Hold the computer in a portrait orientation.

3. Confront the DIN-rail clip with the DIN-rail to mount. Hang the computer on

the DIN-rail by DIN-rail clip. Push the bottom of the computer and snap the computer onto the DIN-rail.



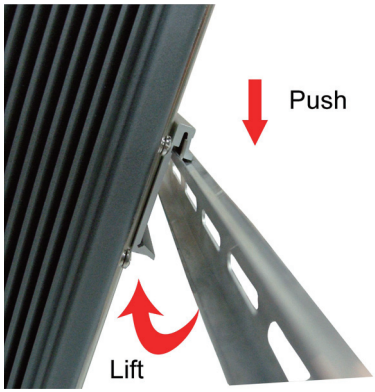
If the computer cannot be successfully fixed onto the DIN-rail, reverse the computer and clip the computer onto the DIN-rail by the bottom side.

Computer mounted on DIN-rail

4.2.2. Dismount the Computer

Power off the computer and disconnect all cables before proceeding to dismout the computer off the DIN-rail.

1. Push the top side of the computer down, with both hands. Try to release the clip from the DIN-rail.



2. Once the clip is released from the DIN-rail, completely dismount the computer off the DIN-rail by lifting the computer's bottom side.

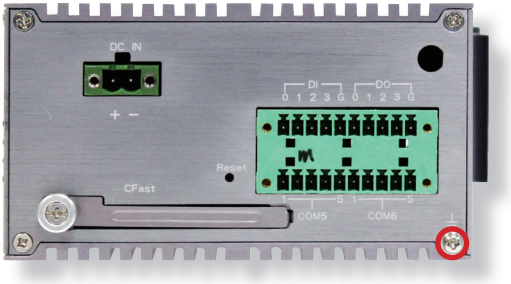
4.3. Ground the Computer

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

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

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

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

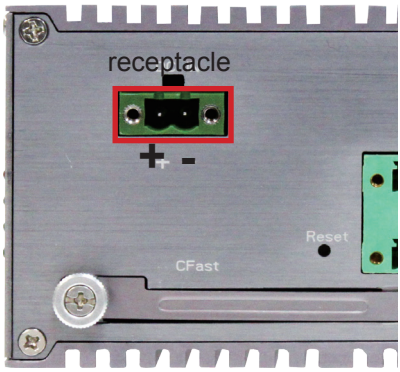


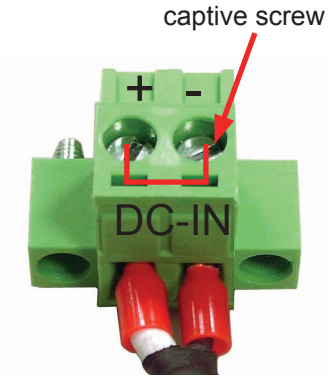
4.4. Wire DC-in Power Source

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

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

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





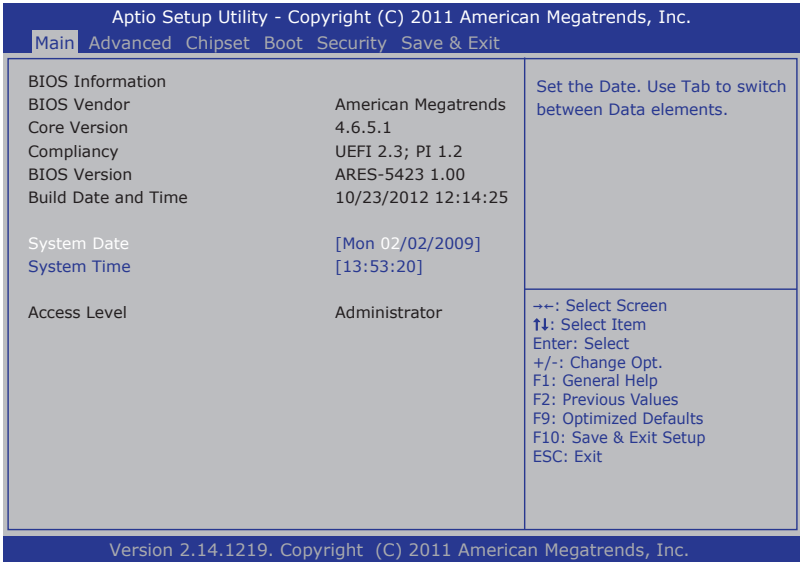
terminal block

Chapter 5

BIOS

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

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



The BIOS' featured menus are:

Menu	Description
Main	See 5.1. Main on page 56.
Advanced	See 5.2. Advanced on page 57.
Chipset	See 5.3. Chipset on page 68.
Boot	See 5.4. Boot on page 72.
Security	See 5.5. Security on page 74.
Save & Exit	See 5.6. Save & Exit on page 75.

Key Commands

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

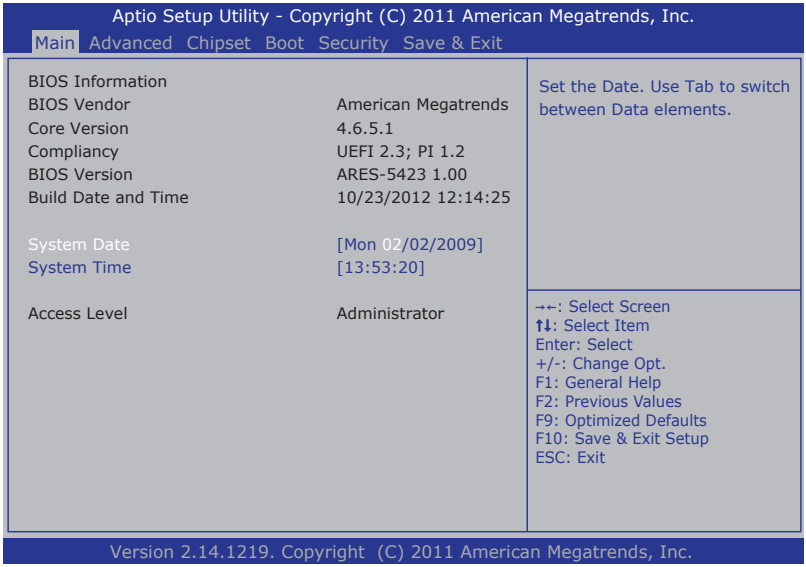
Keystroke	Function
← →	Moves left/right between the top menus.
↓ ↑	Moves up/down between highlight items.
Enter	Selects an highlighted item/field.
Esc	▸ On the top menus: Use **Esc** to quit the utility without saving changes to CMOS. (The screen will prompt a message asking you to select **OK** or **Cancel** to exit discarding changes. ▸ On the submenus: Use **Esc** to quit current screen and return to the top menu.
Page Up / +	Increases current value to the next higher value or switches between available options.
Page Down / -	Decreases current value to the next lower value or switches between available options.
F1	Opens the **Help** of the BIOS Setup utility.
F10	Exits the utility saving the changes that have been made. (The screen then prompts a message asking you to select **OK** or **Cancel** to exit saving changes.)

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

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

5.1. Main

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



The BIOS info displayed are:

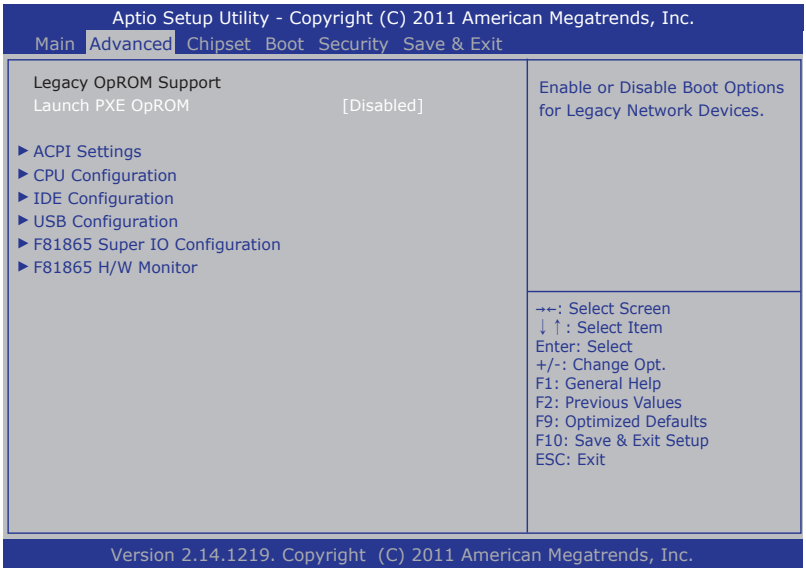
Info	Description
BIOS Vendor	Delivers the provider of the BIOS Setup utility.
Core Version	Delivers the version of the core.
Compliancy	Delivers UEFI support.
BIOS Version	Delivers the computer's BIOS version.
Build Date and Time	Delivers the date and time when the BIOS Setup utility was created/updated.
Access Level	Delivers the level that the BIOS is being accessed at the moment. (Only **Administrator Level** is available.)

The featured settings are:

Setting	Description
System Time	Sets system time.
System Date	Sets system date.

5.2. Advanced

Access the **Advanced** menu to manage the computer's system configuration including the Super IO chip.

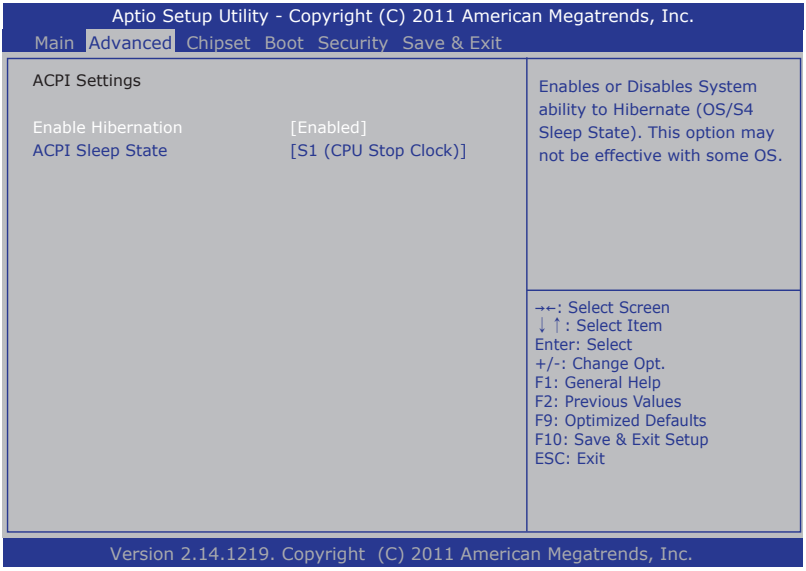


The featured settings and submenus are:

Setting	Description
Launch PXE OpROM	Enables/disables the boot option for legacy network devices. ▸ **Disabled** is the default. ▸ "PXE" means "Preboot Execution Environment", a series of methods to get a typical Windows-based computer to boot up without a hard drive or boot diskette.
ACPI Settings	See 5.2.1. ACPI Settings on page 58.
CPU Configuration	See 5.2.2. CPU Configuration on page 59.
IDE Configuration	See 5.2.3. IDE Configuration on page 61.
USB Configuration	See 5.2.4. USB Configuration on page 62.
F81865 Super IO Configuration	See 5.2.5. F81865 Super IO Configuration on page 63.
F81865 H/W Monitor	See 5.2.6. F81865 H/W Monitor on page 67.

5.2.1. ACPI Settings

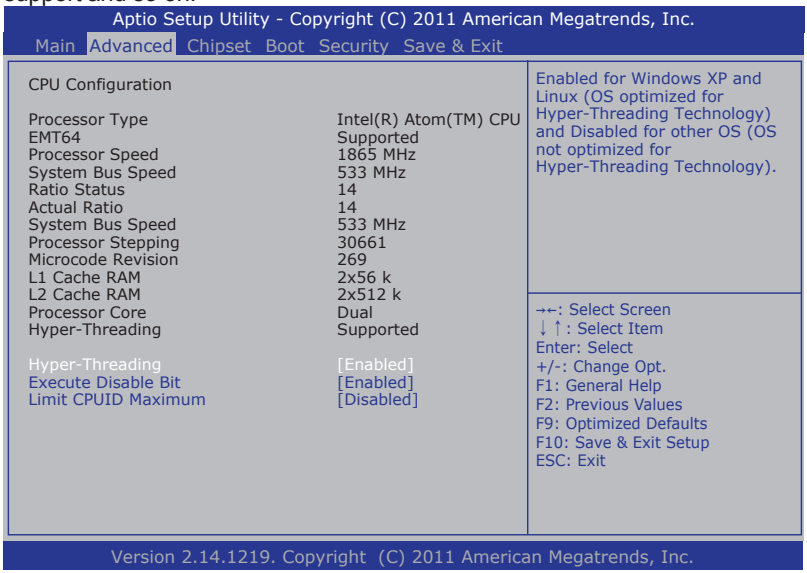
The submenu **ACPI Settings** allow users to configure the system's ACPI (Advanced Configuration and Power Interface) by the following settings:



Setting	Description
Enable Hibernation	Enables/disables the system to/from hibernation (OS/S4 Sleep State). ▸ This option may not be effective with some OS. ▸ **Enabled** is the default.
ACPI Sleep State	Sets the highest ACPI sleep state for the system to enter when the suspend button is hit. ▸ Options available are: **Suspend Disabled** **S1 only (CPU Stop Clock)** (default)

5.2.2. CPU Configuration

Access this submenu to identify the CPU and its capabilities by running a report listing the CPU's model name, processor speed, microcode revision, max./ min. processor speeds, processor cores, Intel® Hyper-Threading Technology support and so on.



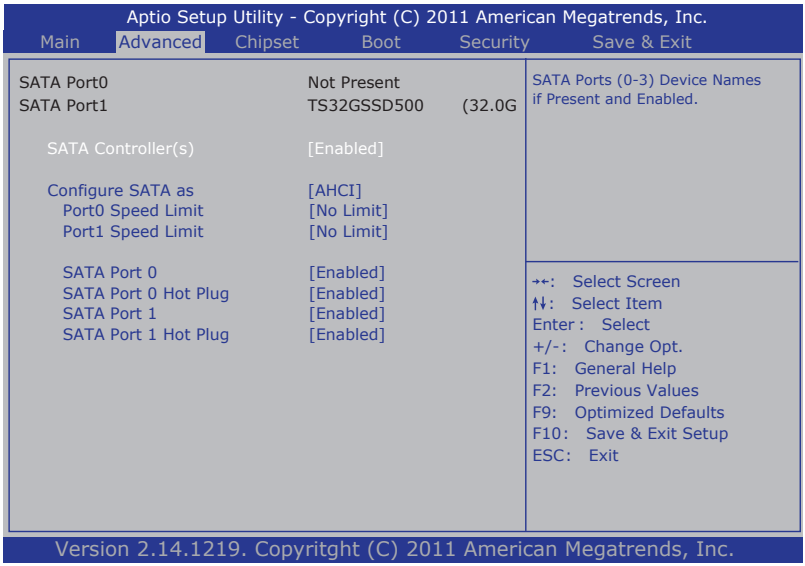
This submenu also features the following settings to configure the CPU:

Setting	Description
Hyper Threading Technology	Enables/disables the processor's Hyper-threading feature. ▸ Select **Enabled** for Windows XP and Linux4. (These are the OS optimized for Hyper-threading Technology) ▸ Select **Disabled** for the other OS (, which are not optimized for Hyper-threading Technology). ▸ **Enabled** is the default. ▸ When disabled, only one thread per enabled core is enabled.
Execute Disable Bit	Enables/disables the processor's capability to mark the memory as executable or non-executable, when the operating system supports. ▸ This feature can prevent some classes of viruses or worms that exploit buffer over run vulerabilities and can thus help improve the overall security of the system. ▸ **Enabled** is the default.

Limit CPUID Maximum	Sets whether the processor should limit the maximum CPUID input value to 03h when the operating system queries it upon startup. ▸ Select **Enabled** to allow a processor with Intel® Hyper-Threading technology to work with an operating system that doesn't support it. ▸ **Disabled** is the default.

5.2.3. IDE Configuration

Select **IDE Configuration** to view the information about the mSATA storage present in the system.

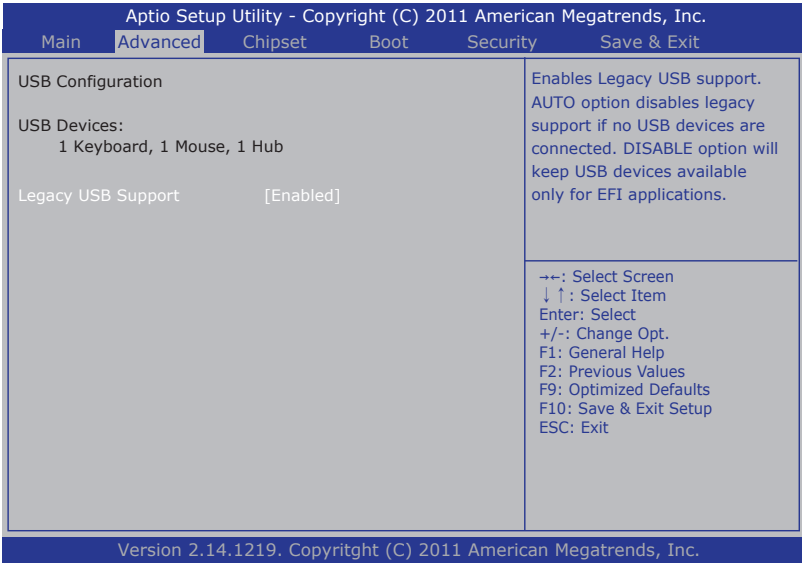


The featured settings are:

Setting	Description
SATA Controller(s)	Enables/disables the present SATA ports (0-3). ▸ **Enabled** is the default.
Configures SATA as	Configures how to sun the SATA drives. ▸ Options available are **AHCI** (default) and **IDE**.
Port0 Speed Limit **Port1 Speed Limit**	Sets the speed limit for the port's AHCI. ▸ Options available are **No Limit** (default), **GEN 1 Rate** and **GEN2 Rate**.
SATA Port0 **SATA Port1**	Enables/disables the SATA port. ▸ **Enabled** is the default.
SATA Port0 Hot Plug **SATA Port1 Hot Plug**	Enables/disables hot-pluggable feature for the SATA port. ▸ **Enabled** is the default.

5.2.4. USB Configuration

Select this submenu to view the status of the USB ports and configure USB features.

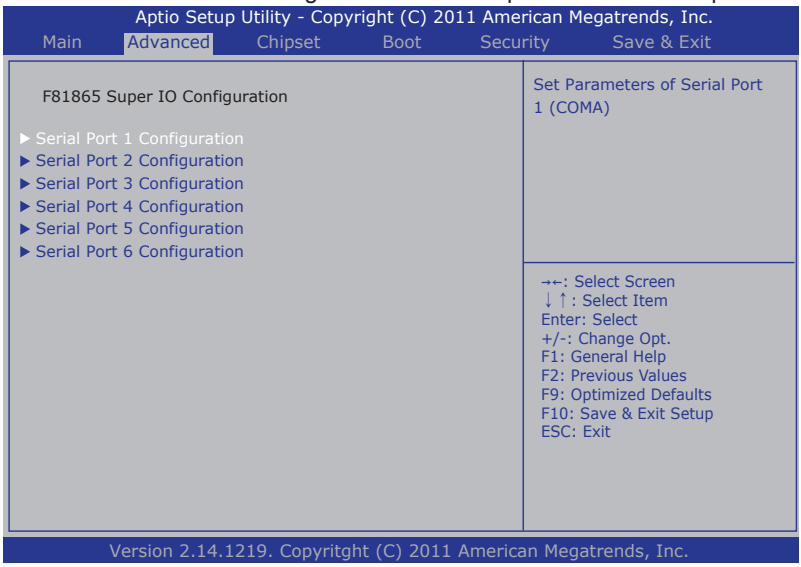


The featured setting is:

Setting	Description
Legacy USB Support	Enables/disables legacy USB support. ▸ Options available are **Enabled** (default), **Disabled** and **Auto**. ▸ Select **Auto** to disable legacy support if no USB device are connected. ▸ Select **Disabled** to keep USB devices available only for EFI applications.

5.2.5. F81865 Super IO Configuration

Access this submenu to configure the board's Super IO for the serial ports.



The featured submenus are:

Submenu	Description
Serial Port 1 Configuration	Configures the computer's COM1, which is fixed to RS232 interface and cannot be changed. The featured settings are:

Setting	Description
Serial Port	Enables/disables the serial port. ▸ **Enabled** is the default.
Change Settings	Sets the optimal IO address and IRQ info for the serial port. ▸ Options available are: **IO=3F8h; IRQ=4;** (default) **IO=3F8h; IRQ=3,4,5,6,7,10,11,12;** **IO=2F8h; IRQ=3,4,5,6,7,10,11,12;** **IO=3E8h; IRQ=3,4,5,6,7,10,11,12;** **IO=2E8h; IRQ=3,4,5,6,7,10,11,12;** **IO=2F0h; IRQ=3,4,5,6,7,10,11,12;** **IO=2E0h; IRQ=3,4,5,6,7,10,11,12;** ▸ This setting is only available when the serial port is enabled.

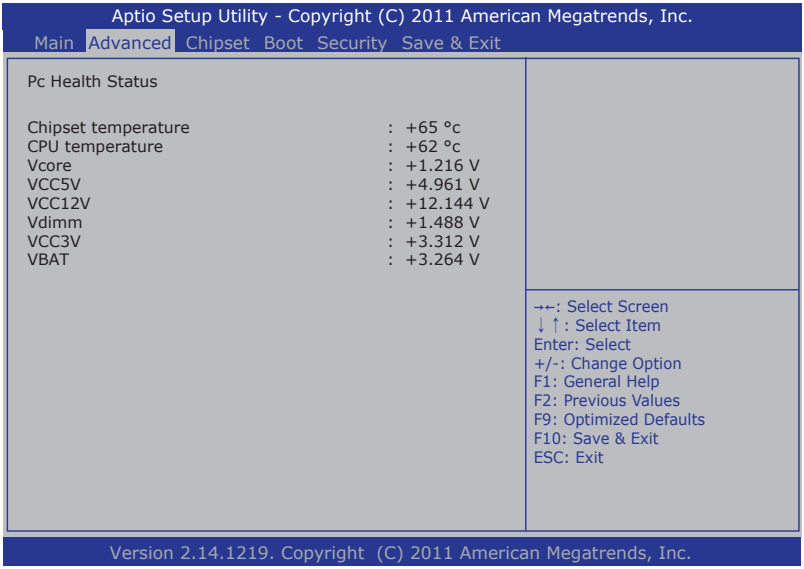
<table>
<tr><td>Serial Port 2 Configuration</td><td>Configures the computer's COM2, which is fixed to RS232 interface and cannot be changed. The featured settings are:<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Serial Port</td><td>Enables/disables the serial port.
▸ Enabled is the default.</td></tr>
<tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port, or leaves it on BIOS auto-detection.
▸ Options available are:
IO=2F8h; IRQ=3; (default)
IO=3F8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F8h; IRQ=3,4,5,6,7,10,11,12;
IO=3E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F0h; IRQ=3,4,5,6,7,10,11,12;
IO=2E0h; IRQ=3,4,5,6,7,10,11,12;
▸ This setting is only available when the serial port is enabled.</td></tr>
</table></td></tr>
<tr><td>Serial Port 3 Configuration</td><td>Configures the computer's COM3, which is configurable between RS232 and RS485. The featured settings are:<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Serial Port</td><td>Enables/disables the serial port.
▸ Enabled is the default.</td></tr>
<tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port, or leaves it on BIOS auto-detection.
▸ Options available are:
IO=3E8h; IRQ=10; (default)
IO=3F8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F8h; IRQ=3,4,5,6,7,10,11,12;
IO=3E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F0h; IRQ=3,4,5,6,7,10,11,12;
IO=2E0h; IRQ=3,4,5,6,7,10,11,12;
▸ This setting is only available when the serial port is enabled.</td></tr>
<tr><td>COM3 RS485 AutoFlow</td><td>Enables/disables RS485 mode.
▸ Disabled is the default.
▸ Note this setting needs to be consistent with the DIP switch on the main board to prevent possible conflict. See also COM3 Settings on page 30.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>Serial Port 4 Configuration</td><td>Configures the computer's COM4, which is configurable between RS232 and RS485. The featured settings are:
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Serial Port</td><td>Enables/disables the serial port.
▸ Enabled is the default.</td></tr>
<tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port, or leaves it on BIOS auto-detection.
▸ Options available are:
IO=2E8h; IRQ=11; (default)
IO=3F8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F8h; IRQ=3,4,5,6,7,10,11,12;
IO=3E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F0h; IRQ=3,4,5,6,7,10,11,12;
IO=2E0h; IRQ=3,4,5,6,7,10,11,12;
▸ This setting is only available when the serial port is enabled.</td></tr>
<tr><td>COM4 RS485 AutoFlow</td><td>Enables/disables RS485 mode.
▸ Disabled is the default.
▸ Note this setting needs to be consistent with the DIP switch on the main board to prevent possible conflict. See also COM4 Settings on page 30.</td></tr>
</table></td></tr>
<tr><td>Serial Port 5 Configuration</td><td>Configures the computer's COM5, which is configurable between RS232 and RS485. The featured settings are:
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Serial Port</td><td>Enables/disables the serial port.
▸ Enabled is the default.</td></tr>
<tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port, or leaves it on BIOS auto-detection.
▸ Options available are:
IO=2F0h; IRQ=5; (default)
IO=3F8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F8h; IRQ=3,4,5,6,7,10,11,12;
IO=3E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F0h; IRQ=3,4,5,6,7,10,11,12;
IO=2E0h; IRQ=3,4,5,6,7,10,11,12;
▸ This setting is only available when the serial port is enabled.</td></tr>
<tr><td>COM5 RS485 AutoFlow</td><td>Enables/disables RS485 mode.
▸ Disabled is the default.
▸ Note this setting needs to be consistent with the DIP switch on the main board to prevent possible conflict. See also COM5 Settings on page 31.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>Serial Port 6 Configuration</td><td>Configures the computer's COM6, which is configurable between RS232 and RS485. The featured settings are:
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Serial Port</td><td>Enables/disables the serial port.
▸ Enabled is the default.</td></tr>
<tr><td>Change Settings</td><td>Sets the optimal IO address and IRQ info for the serial port, or leaves it on BIOS auto-detection.
▸ Options available are:
IO=2E0h; IRQ=7; (default)
IO=3F8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F8h; IRQ=3,4,5,6,7,10,11,12;
IO=3E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2E8h; IRQ=3,4,5,6,7,10,11,12;
IO=2F0h; IRQ=3,4,5,6,7,10,11,12;
IO=2E0h; IRQ=3,4,5,6,7,10,11,12;
▸ This setting is only available when the serial port is enabled.</td></tr>
<tr><td>COM6 RS485 AutoFlow</td><td>Enables/disables RS485 mode.
▸ Disabled is the default.
▸ Note this setting needs to be consistent with the DIP switch on the main board to prevent possible conflict. See also COM6 Settings on page 32.</td></tr>
</table></td></tr>
</table>

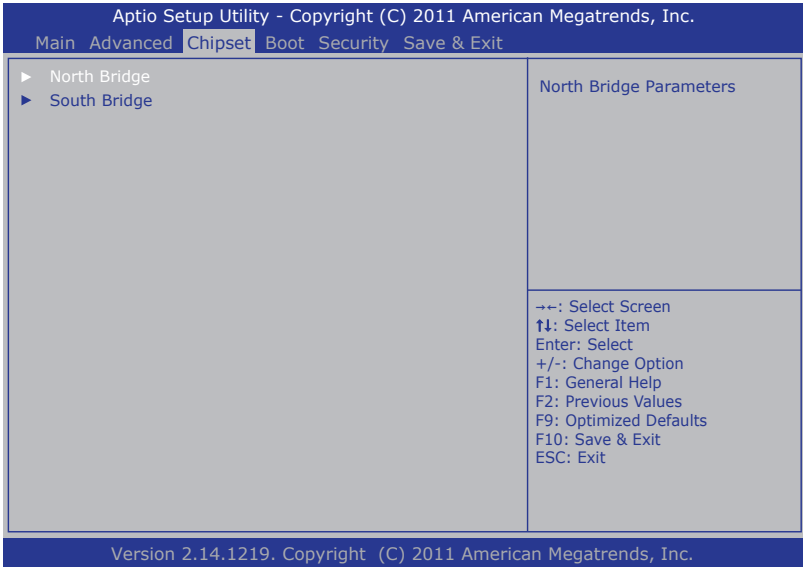
5.2.6. F81865 H/W Monitor

Select this submenu to view the main board's hardware status. Select it to run a report of various info as depicted below:



5.3. Chipset

The **Chipset** menu controls the system's chipset, including the north bridge and the south bridge.



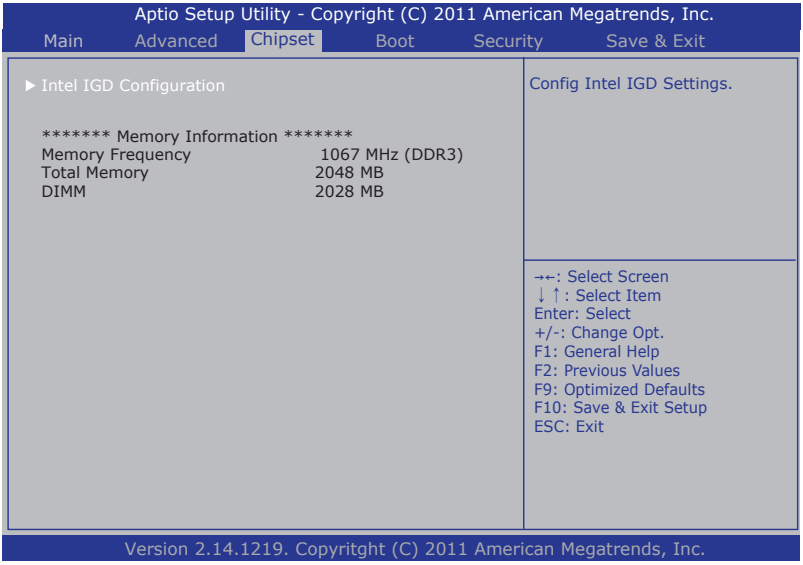
The featured submenus are **Host Bridge** and **South Bridge**, which are detailed in the following of this section.

Submenu overview:

Submenu	Description
Host Bridge	Configures the host bridge, i.e. the northbridge. See 5.3.1. Host Bridge on page 69 for more details.
South Bridge	Configures the southbridge. See 5.3.2. South Bridge on page 71 for more details.

5.3.1. Host Bridge

This submenu opens and shows the memory information such as memory frequency, total memory and the memory module(s) connected. This submenu also features one submenu - **Intel IGD Configuration**, to configure Intel IGD (Internal Graphics Device):

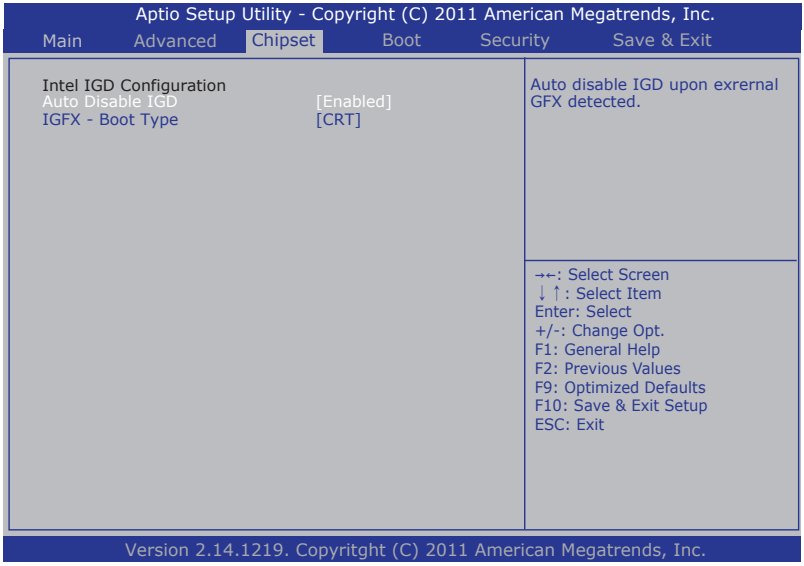


The featured submenu is:

Submenu	Description
Intel IGD Configuration	Configures the internal graphics device. See 5.3.1.1. Intel IGD Configuration on page 70 for details.

5.3.1.1. Intel IGD Configuration

Access this submenu to configure the internal graphics device featured by Intel®.

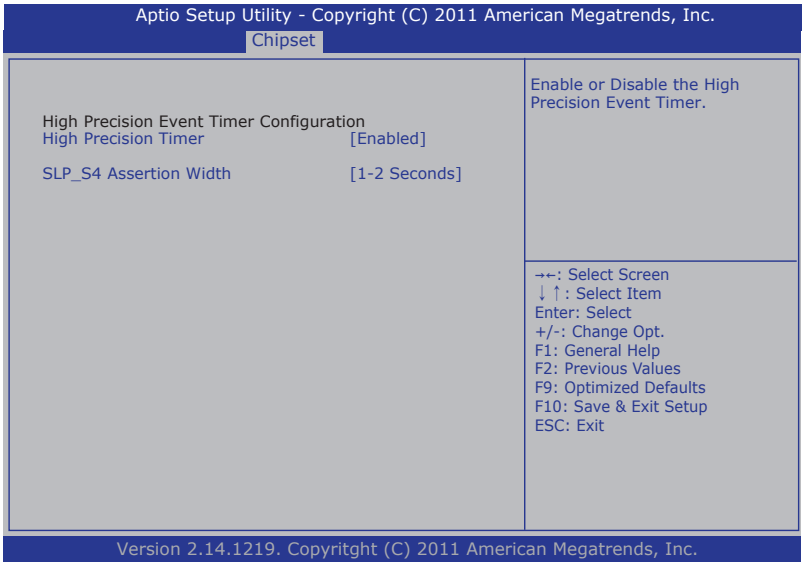


The featured settings are:

Setting	Description
Auto Disable IGD	Sets whether to auto-disable the integrated graphics device if an external graphics is detected. ▸ **Enabled** is the default.
IGFX - Boot Type	Sets which video device to activate during POST. ▸ The only option available is **CRT**. (default) ▸ This setting has no effect if an external graphics is present.

5.3.2. South Bridge

Access this submenu to configure the system's south bridge:

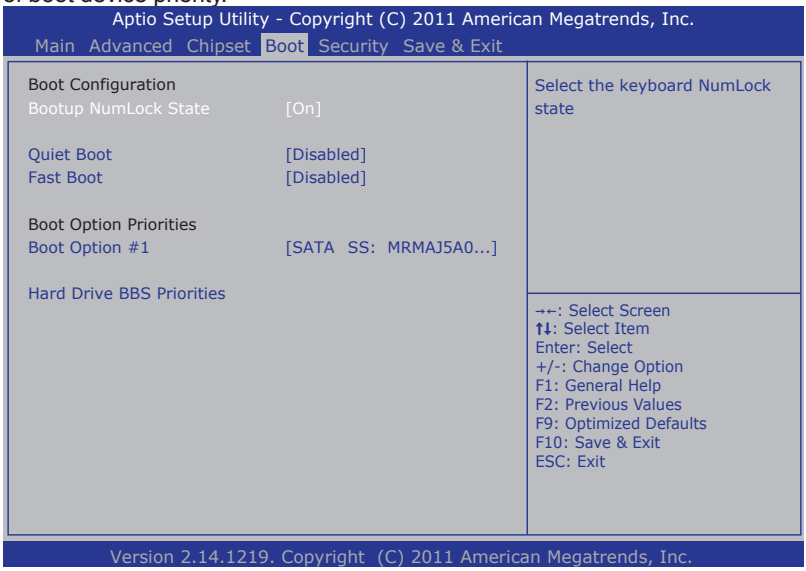


The featured settings are:

Setting	Description
High Precision Timer	Enables/disables the "High Precision Timer", which delivers more accurate controls for multimedia events. ▸ **Enabled** is the default.
SLP_S4 Assertion Width	Sets the minimum assertion width of the SLP_S4# signal. ▸ Options available are: **1-2 Seconds** (default) **2-3 Seconds** **3-4 Seconds** **4-5 Seconds**

5.4. Boot

The **Boot** menu configures how to boot up the system such as the configuration of boot device priority.



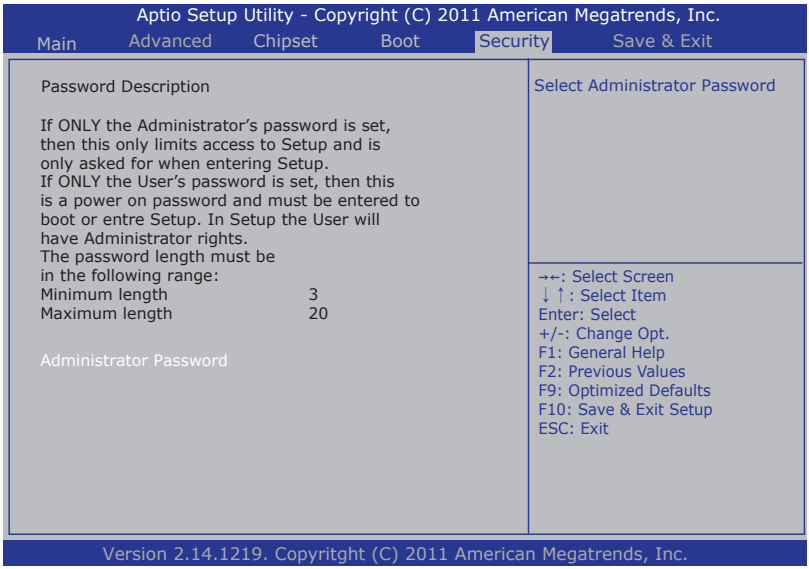
The featured settings are:

Setting		Description
Boot Configuration	**Boot NumLock State**	Sets the keyboard's NumLock state when the system boots up. ▸ Options available are **On** (default) and **Off**.
	Quiet Boot	Sets whether to display the POST (power on self tests) messages or the board manufacturer's full screen logo during booting. ▸ Leave it as **Disabled** (default) to display the normal POST messages.
	Fast Boot	Enables/disables initializing only a minimal set of devices required to launch the active boot options when booting up the system. ▸ **Disabled** is the default. ▸ This setting has no effect on BBS (BIOS Boot Specification) options. ▸ When enabled, the following settings become available:

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Skip VGA</td><td>This setting isn't available.</td></tr>
<tr><td>Skip USB</td><td>Enables/disables skipping USB devices when booting up the system.
▸ When enabled, the USB devices won't be available until OS startup.
▸ When disabled, the USB devices are available before OS startup. This is the default.</td></tr>
<tr><td>Skip PS2</td><td>Enables/disables skipping PS2 (keyboard and mouse) devices when booting up the system.
▸ Disabled is the default.</td></tr>
</table>
</td></tr>
<tr><td>Boot Option Priorities</td><td>Boot Option #1</td><td>Sets the very 1st boot device among the available device types.
▸ Option(s) available are the available device type(s).</td></tr>
<tr><td colspan="2">Hard Drive BBS Priorities</td><td>Sets hard drive boot sequence.
▸ Options available are the available hard-drive (default) and Disabled.</td></tr>
</table>

5.5. Security

The **Security** menu sets up the password for the system's administrator account. Once the administrator password is set up, this BIOS Setup utility is limited to access and will ask for the password each time any access is attempted.

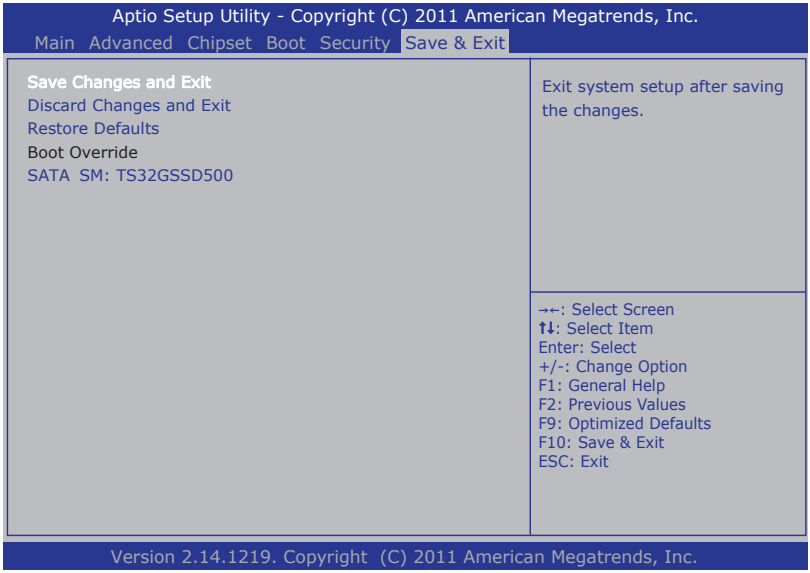


The featured setting is:

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

5.6. Save & Exit

The **Save & Exit** menu features a handful of commands to launch actions from the BIOS Setup utility regarding saving changes, quitting the utility and recovering defaults.



The features settings are:

Setting	Description
Save Changes and Exit	Saves the changes and quits the BIOS Setup utility.
Discard Changes and Exit	Quits the BIOS Setup utility without saving the change(s).
Restore Defaults	Restores all settings to defaults. ▸ This is a command to launch an action from the BIOS Setup utility rather than a setting.
Boot Override	**Boot Override** presents a list in context with the boot devices in the system. Select the device to boot up the system regardless of the currently configured boot priority. ▸ This is a command to launch an action from the BIOS Setup utility rather than a setting.

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Appendices

Appendix A: Digital I/O Setting

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

Sample Codes:

```
/*-----  Include Header Area -----*/
#include "math.h"
#include "stdio.h"
#include "dos.h"

#define   sioIndex                  0x2E              /* or 0x4E */
#define   sioData                   0x2F              /* or 0x4F */

/*-----  routing, sub-routing -----*/
void main()
{
    unsigned char DataIn;

    Digital_Output(0x50);
    delay(2000);

    DataIn = Digital_Input();
    printf(" Input : %2x \n",DataIn);
    delay(2000);

    Digital_Output(0xA0);
    delay(2000);

    DataIn = Digital_Input();
    printf(" Input : %2x \n",DataIn);
    delay(2000);
}

unsigned char Digital_Input(void)
{
         unsigned char tData;
         unsigned char iData;

         outportb(sioIndex, 0x87);                  /* SIO - Enable */
         outportb(sioIndex, 0x87);

    outportb(sioIndex, 0x07);              /* LDN - GPIO */
    outportb(sioData,  0x06);

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

```
    outportb(sioIndex, 0xF0);               /* GPIO0 0~3 - Inutput */
    outportb(sioData,  0xF0);

    outportb(sioIndex, 0xF2);               /* GPIO0 0~3 - Status */
    iData = inportb(sioData) & 0x0F;

         outportb(sioIndex, 0xAA);          /* SIO - Disable */

         return iData;
}

void Digital_Output(unsigned char oData)
{
         unsigned char tData;
         unsigned char iData;

         outportb(sioIndex, 0x87);                  /* SIO - Enable */
         outportb(sioIndex, 0x87);

    outportb(sioIndex, 0x07);               /* LDN - GPIO */
    outportb(sioData,  0x06);

    outportb(sioIndex, 0x2B);               /* GPIO1 - Enable */
    outportb(sioData,  0x01);

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

    outportb(sioIndex, 0xF0);               /* GPIO0 4~6 - Output Enable
*/
    outportb(sioData,  0xF0);
    outportb(sioIndex, 0xE0);               /* GPIO1 0 - Output Enable */
    tData = inportb(sioData);
    outportb(sioData,  tData | 0x01);

    outportb(sioIndex, 0xF1);               /* GPIO0 4~6 - Data */
    outportb(sioData,  oData);
    outportb(sioIndex, 0xE1);               /* GPIO1 1 - Data */
    tData = inportb(sioData);
    if( ( oData & 0x80 ) == 0x00 )
         tData = tData & 0xFE;
    else
         tData = tData | 0x01;
    outportb(sioData,  tData);

         outportb(sioIndex, 0xAA);          /* SIO - Disable */

}
```

Appendix B: Watchdog Timer (WDT) Setting

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

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

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

Sample Codes:

```
/*-----  Include Header Area -----*/
#include "math.h"
#include "stdio.h"
#include "dos.h"

#define SIO_INDEX       0x2E                /* or index = 0x4E */
#define SIO_DATA        0x2F                /* or data  = 0x4F */

/*-----  routing, sub-routing -----*/
void main()
{
        outportb(sioIndex, 0x87);           /* SIO - Enable */
        outportb(sioIndex, 0x87);

        outportb(sioIndex, 0x07);           /* LDN - WDT */
        outportb(sioData,  0x07);

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

        outportb(sioIndex, 0xFA);           /* WDOUT_EN */
        outportb(sioData,  0x01);

        outportb(sioIndex, 0xF6);           /* WDT - Timeout Value */
        outportb(sioData,  0x05);

        outportb(sioIndex, 0xF5);           /* WDT - Configuration */
        outportb(sioData,  0x32);

        outportb(sioIndex, 0xAA);           /* SIO - Disable */
}
```

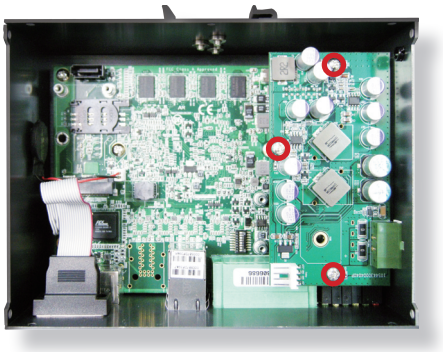
Appendix C: 3G Module HSPA-SI1400 Hardware/Software Installation

To be able to network with 3G, hardware-wise the computer needs a 3G module installed and a SIM card inserted (as described in 4.1.3. Install SIM Card on page 43) and software-wise the computer needs the device driver and an application program. This appendix will guide you to install the 3G module **HSPA-SI1400** and the device driver. (To have a copy of the device driver, please contact ARBOR customer service as described in Technical Support on page viii.)

C.1. Install HSPA-SI1400

1. Remove the computer's top cover as described in 4.1.1. Open the Computer on page 36.

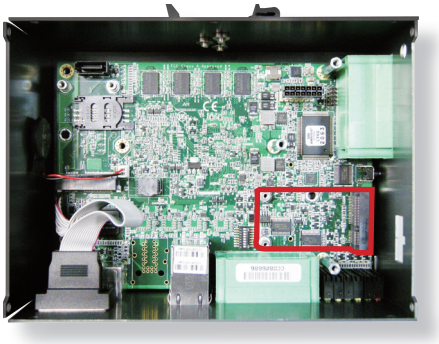
   The inside of the computer comes to view.



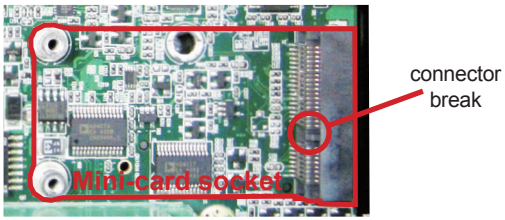
2. Loosen and remove the 3 screws from the power board as the picture above shows.

3. Dismantle the power board from the main board.

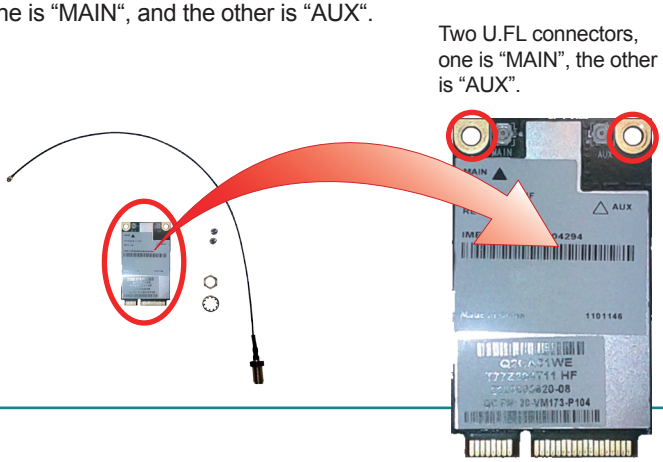
   The **PCI Express Mini-card** socket for wireless modules comes to view.



   Note the socket has a break among the connector .



4. Have the **HSPA-SI1400** 3G module kit. The 3G module is a full-size module of **PCI Express Mini-card** form factor, with two U.FL connectors, one is “MAIN“, and the other is “AUX“.

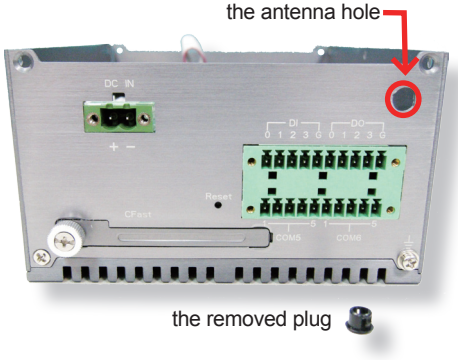


5. Plug the 3G module to the socket's connector by a slanted angle. Fully plug the module, and note the notch on the wireless module should meet the break of the connector.

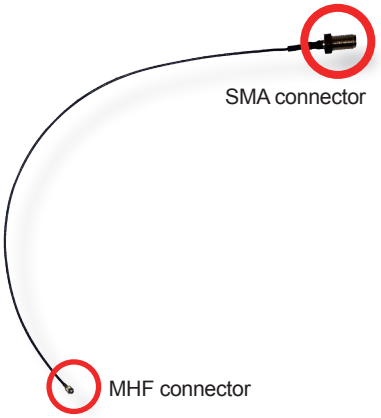
Fully plug the module.

6. Press down the module and fix the module in place using two screws.

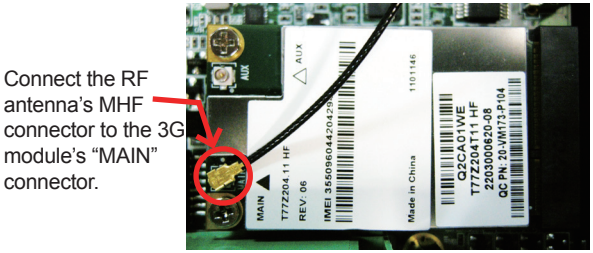
7. Remove a plastic plug from the computer's rear (or front) panel to make an antenna hole. Keep the plastic plug for any possible restoration in the future.



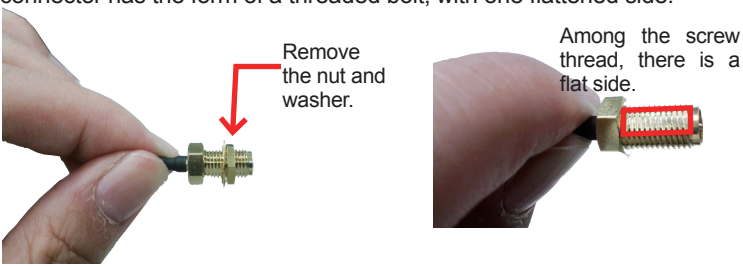
8. Have the RF antenna. The antenna has an SMA connector on one end and an MHF connector on the other.



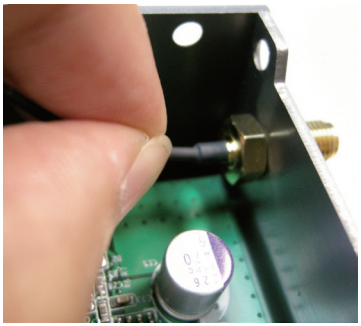
9. Connect the RF antenna's MHF connector to the 3G module's "MAIN" connector.

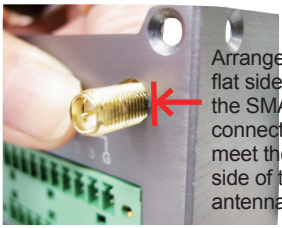


10. From the other end of the RF antenna, which is an SMA connector, remove the washer and the nut. Save the washer and nut for later use. Note the SMA connector has the form of a threaded bolt, with one flattened side.



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

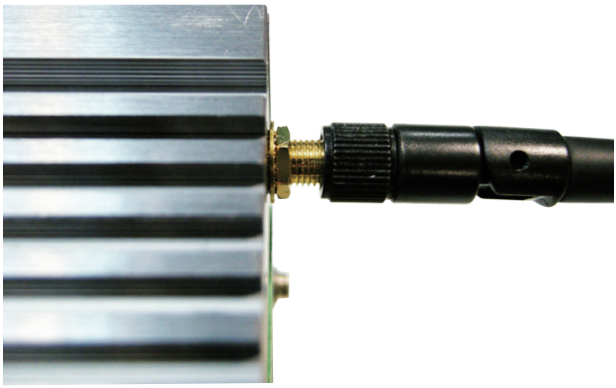




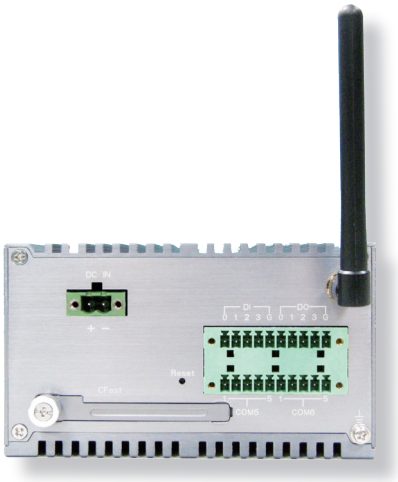
12. Mount the washer first and then the nut to the SMA connector. Make sure the nut is tightened.

13. Restore the computer's top cover.

14. Have an external antenna. Screw and tightly fasten the antenna to the SMA connector.



15. Swivel the antenna to an angle of best signals.



C.2. Install Device Driver

As described in 2.3. Driver Installation Notes on page 12, after the drivers for the chipset, .NET Framework, audio and Ethernet are installed, you can proceed to install the driver for the wireless modules such as 3G module or Wi-Fi module.

To install the driver for the 3G module **HSPA-SI1400**:

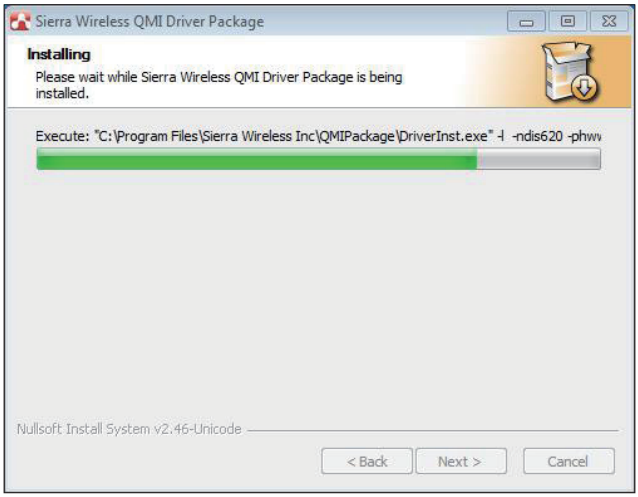
1. Request a copy of the device driver from ARBOR customer service by the contact info as described in Technical Support on page viii.

2. Run the executable file **SWIQMISetup.exe**.

   The installer then opens.

3. Click the **Next** button to proceed.

   The driver installation then starts, progresses and finishes.



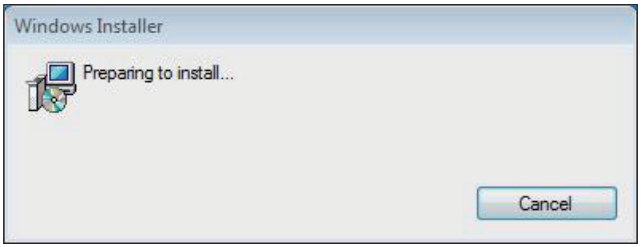
4. Click the **Finish** button to quit the driver installation.

B.3. Install Application Program

1. Request a copy of the application program from ARBOR customer service by the contact info as described in Technical Support on page viii.

2. Run the Windows Installer file **Watcher_Generic.msi**.

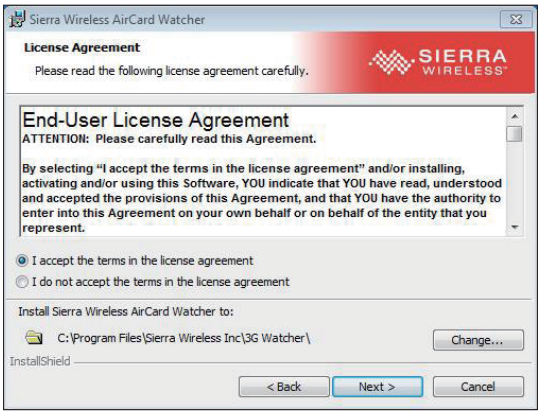
   The installer opens and prepares to install.



   Once the preparation finishes, the installer prompts to install **Sierra Wireless AirCard Watcher** on the computer.

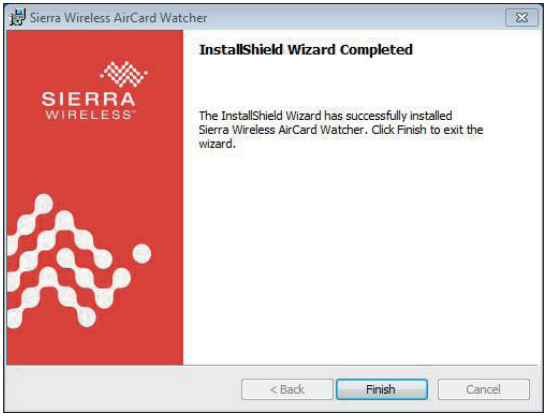
3. Click the **Next** button to proceed.

   The installer then prompts the license agreement.



4. Select **I accept the terms in the license agreement**. Click the **Change...** button to browse for an alternate folder to install the application program to, or simply click the **Next** button to install the application program to the suggested folder.

   The installation then starts, progresses and finishes.



5. Click the **Finish** button to quit the installation.

   An **AirCard Watcher** icon then shows up on the desktop.

6. Double-click the **AirCard Watcher** icon to launch the application program.

   The **AirCard Watcher** opens.

7. See the document of the **AirCard Watcher** to know how to use the application program.

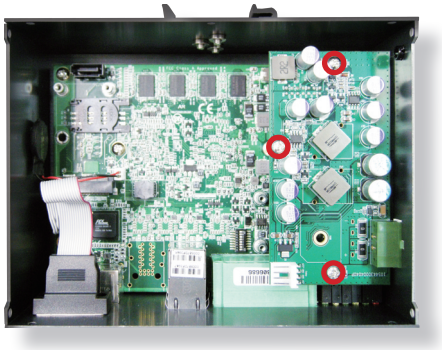
Appendix D: Wi-Fi Module WIFI-IN1300 Hardware/Software Installation

To use Wi-Fi, hardware-wise the computer needs a Wi-Fi module installed, and software-wise the computer needs the device driver and an application program. This appendix will guide you to install the Wi-Fi module **WIFI-IN1300** and the device driver. (To have a copy of the device driver, please contact ARBOR customer service by the contact info described in Technical Support on page viii.)

D.1. Install WIFI-IN1300

1. Remove the computer's top cover as described in 4.1.1. Open the Computer on page 36.

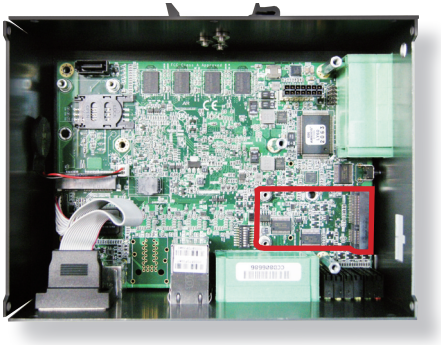
   The inside of the computer comes to view.



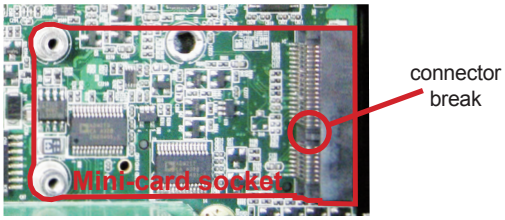
2. Loosen and remove the 3 screws from the power board as the picture above shows.

3. Dismantle the power board from the main board.

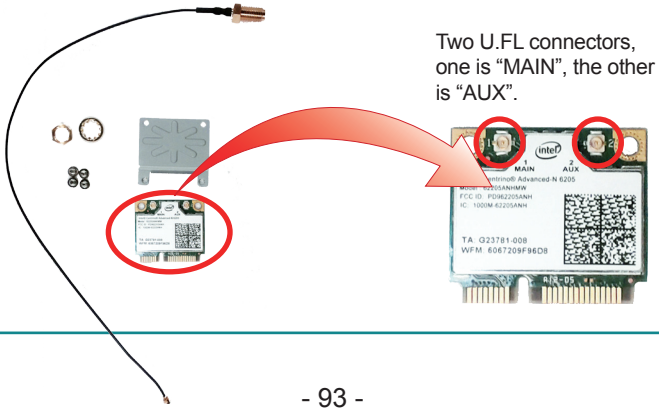
   The **PCI Express Mini-card** socket for wireless modules comes to view.



   Note the socket has a break among the connector .



4. Prepare the **WIFI-IN1300** Wi-Fi module kit. The module is a half-size module of **PCI Express Mini-card** form factor, with two U.FL connectors, one is “MAIN“, and the other is “AUX“.

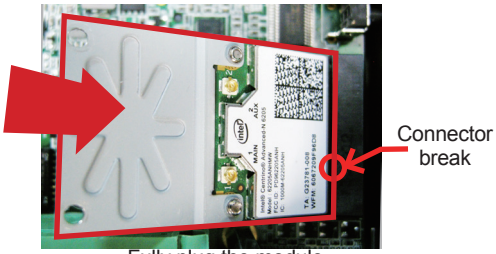


5. In order to make the half-size Wi-Fi module compatible with the **Mini-card** socket, extend the WiFi module with a “mini half bracket”. Join them together by using two screws.

Position the WiFi module and the “mini half bracket” exactly as shown.

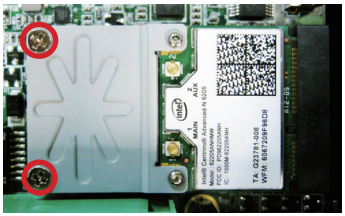
Join the WiFi module and the “mini half bracket” by using two screws.

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

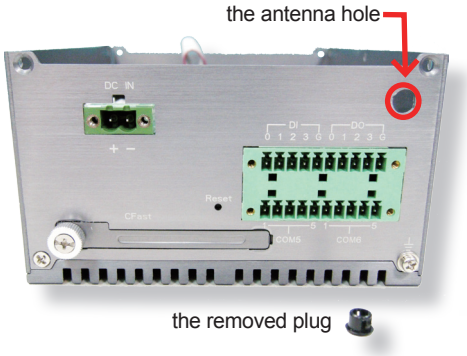


Fully plug the module.

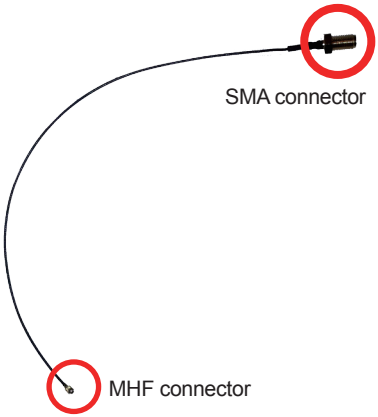
7. Press the module down and fix the module in place using two screws.



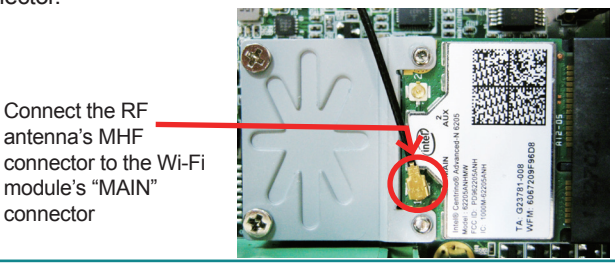
8. Remove a plastic plug from the computer's rear (or front) panel to make an antenna hole. Keep the plastic plug for any possible restoration in the future.



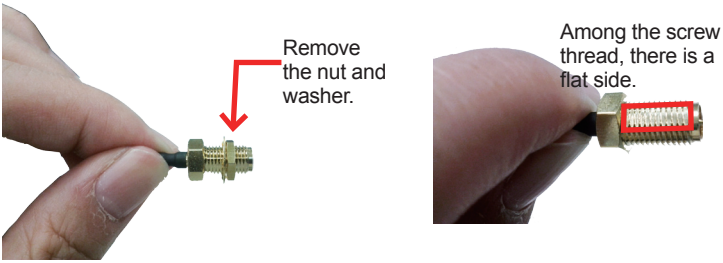
9. Have the RF antenna. The antenna has an SMA connector on one end and an MHF connector on the other.



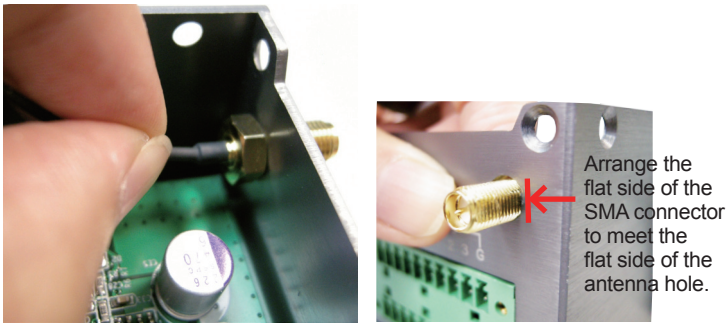
10. Connect the RF antenna's MHF connector to the Wi-Fi module's "MAIN" connector.



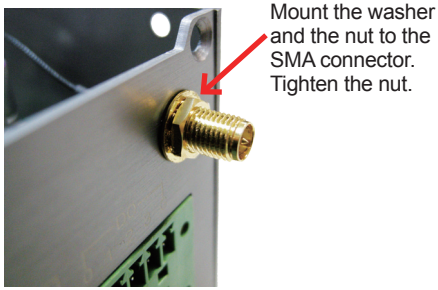
11. From the other end of the RF antenna, which is an SMA connector, remove the washer and the nut. Save the washer and nut for later use. Note the SMA connector has the form of a threaded bolt, with one flat side.



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

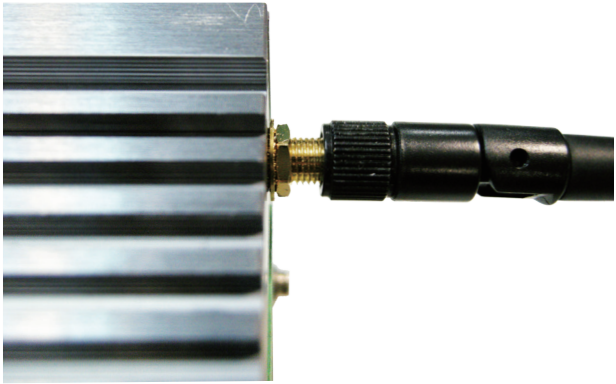


13. Mount the washer first and then the nut to the SMA connector. Make sure the nut is tightened.

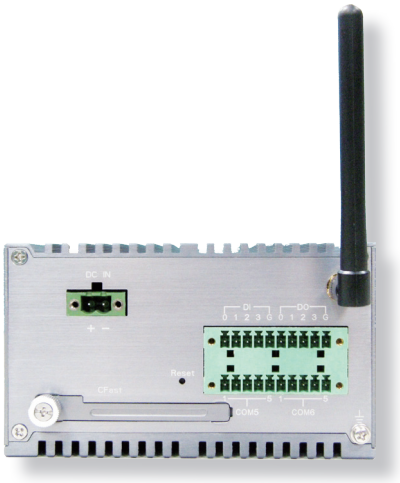


14. Restore the computer's top cover.

15. Have an external antenna. Screw and tightly fasten the antenna to the SMA connector.



16. Swivel the antenna to an angle of best signals.



D.2. Install Device Driver & Application Program

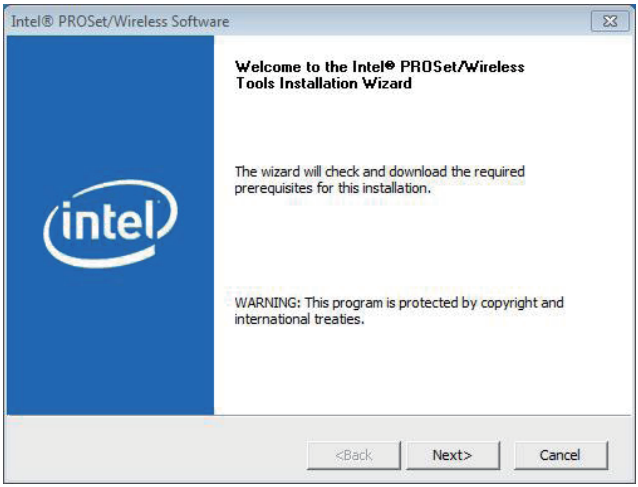
As described in 2.3. Driver Installation Notes on page 12, after the drivers for the chipset, .NET Framwork, audio and Ethernet are installed, you can proceed to install the driver for the wireless modules such as 3G module or Wi-Fi module.

The device driver of **WIFI-IN1300** will install the application program (the utility) as well. Follow the guide below to install **WIFI-IN1300** driver (and the application program):

1. Request a copy of the device driver from ARBOR customer service by the contact info as described in Technical Support on page viii.

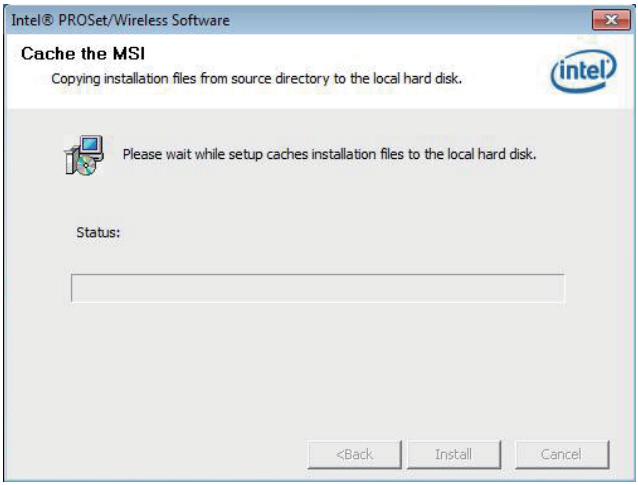
2. Run the executable file of the device driver, for example **Advanced-N 6205 WinXP_14.2.0.10_x32.exe**.

   The installer then opens.



3. Click the **Next** butoon to proceed.

   The installer then starts to prepare for the setup.



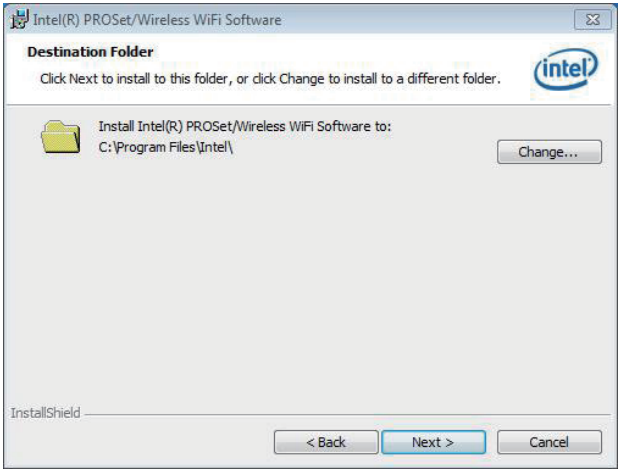
   When the preparation finishes, the installer prompts to install **Intel(R) PROSet/Wireless WiFi Softwar**e on the computer.

4. Click the **Next** button to proceed.

   The installer then prompts the license agreement.

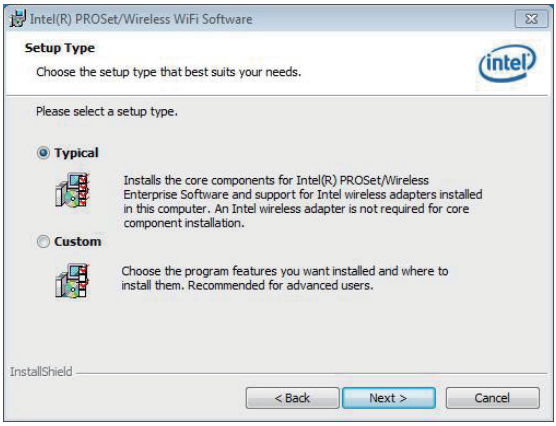
5. Select **I accept the terms in the license agreement** and click the **Next** button to proceed.

   The installer then asks where to install the software.



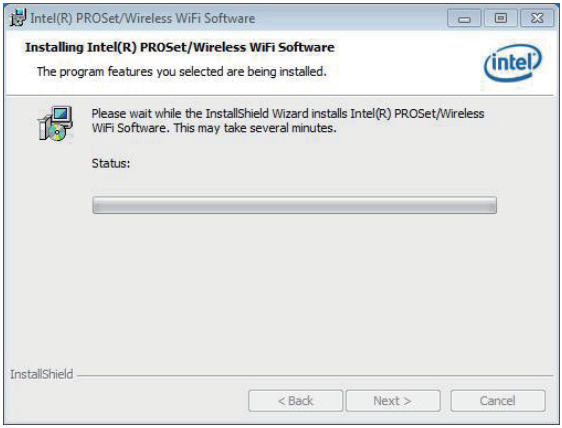
6. Click the **Change...** button to browse for an alternate folder to install the software to, or simply click the **Next** button to install the software to the suggested folder.

   The installer then opens a **Setup Type** selection.

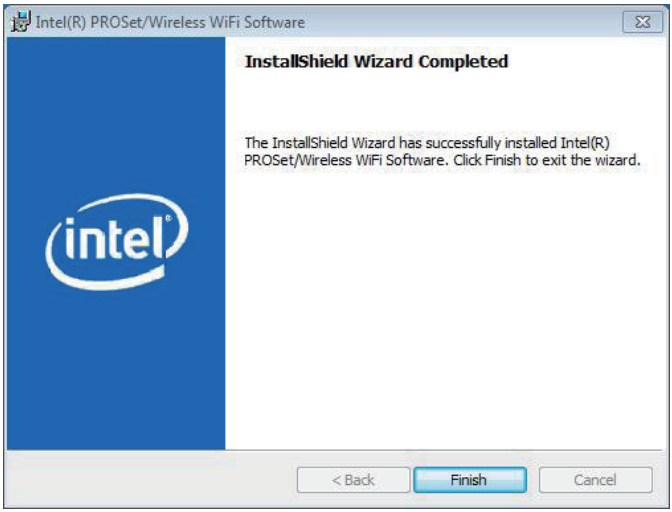


7. Select **Typical** to install both the driver and the application program (recommended) or select **Custom** to choose the features to install. Then click the **Next** button to proceed.

   The software installation then starts, progresses and finishes.



8. Click the **Finish** button to quit the software installation.



9. The computer's Wi-Fi feature is ready-to-use, see the document of the application program to know how to connect the computer to a Wi-Fi hotspot.