AXIOMTEK

eBOX640-500-FL Series

Embedded System

User's Manual

RoHS

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Safety Precautions

Before getting started, please read the following important safety precautions.

1. The eBOX640-500-FL does not come with an operating system which must be loaded first before installation of any software into the computer.

2. Be sure to ground yourself to prevent static charge when installing any internal components. Use a wrist grounding strap and place all electronic components in any static-shielded devices. Most electronic components are sensitive to static electrical charge.

3. Disconnect the power cord from the eBOX640-500-FL prior to making any installation. Be sure both the system and all external devices are turned OFF. Sudden surge of power could ruin sensitive components. Make sure the eBOX640-500-FL is properly grounded.

4. Make sure the voltage of the power source is correct before connecting it to any power outlet.

5. Turn Off system power before cleaning. Clean the system using a cloth only. Do not spray any liquid cleaner directly onto the screen.

6. Do not leave equipment in an uncontrolled environment where the storage temperature is below -40℃ or above 80℃ as it may damage the equipment.

7. Do not open the system's back cover. If opening the cover for maintenance is a must, only a trained technician is allowed to do so. Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

   ● Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help discharge any static electricity on human body.

   ● When handling boards and components, wear a wrist grounding strap available from most electronic component stores.

Classification

1. Degree of production against electric shock: not classified
2. Degree of protection against ingress of water: IP40
3. Equipment not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.
4. Mode of operation: Continuous

General Cleaning Tips

Please keep the following precautions in mind while understanding the details fully before and during any cleaning of the computer and any components within.

A piece of dry cloth is ideal to clean the device.
1. Be cautious of any tiny removable components when using a vacuum cleaner to absorb dirt on the floor.
2. Turn the system off before clean up the computer or any components within.
3. Avoid dropping any components inside the computer or getting circuit board damp or wet.
4. For cleaning, be cautious of all kinds of cleaning solvents or chemicals which may cause allergy to certain individuals.
5. Keep foods, drinks or cigarettes away from the computer.

Cleaning Tools:

Although many companies have created products to help improve the process of cleaning computer and peripherals, users can also use house hold items accordingly for cleaning. Listed below are items available for cleaning computer or computer peripherals.

Pay special attention to components requiring designated products for cleaning as mentioned below.

- Cloth: A piece of cloth is the best tool to use when rubbing up a component. Although paper towels or tissues can be used on most hardware as well, it is recommended to use a piece of cloth.
- Water or rubbing alcohol: A piece of cloth may be somewhat moistened with water or rubbing alcohol before being rubbed on the computer. Unknown solvents may be harmful to plastic parts.
- Absorb dust, dirt, hair, cigarette and other particles outside of a computer can be one of the best methods of cleaning a computer. Over time these items may restrict the airflow in a computer and cause circuitry to corrode.
- Cotton swabs: Cotton swaps moistened with rubbing alcohol or water are applicable to reach areas in keyboard, mouse and other areas.
- Foam swabs: If possible, it is better to use lint free swabs such as foam swabs.
  .

【Note】：*It is strongly recommended that customer should shut down the system before start to clean any single components.*

Please follow the steps below:
1. Close all application programs;
2. Close operating software;
3. Turn off power switch;
4. Remove all devices;
5. Pull out power cable.

Scrap Computer Recycling

Please inform the nearest Axiomtek distributor as soon as possible for suitable solutions in case computers require maintenance or repair; or for recycling in case computers are out of order.

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SECTION 1
INTRODUCTION

This section contains general information and detailed specifications of the eBOX640-500-FL. The Section 1 includes the following sections:

- General Description
- System Specifications
- Dimensions
- I/O Outlets
- Packing List
- Model List

1.1   General Description

The eBOX640-500-FL is an embedded system that supports 6th/7th gen Intel® Core™ i7/ i5/ i3 & Celeron® processors to support Windows 10, and Linux, suitable for the most endurable operation.

It features fan less and compact size design with full feature I/O, two 288-pin unbuffered SODIMM socket for one channel DDR4-2133 MHz memory, and enhanced system dependability by built-in Watchdog Timer.

- **Features**
    1. LGA1151 socket 6th/7th gen Intel® Core® i7/ i5/ i3 & Celeron® processors (CPU TDP max. up to 35W)
    2. Fanless compact size design with desktop performance
    3. Front panel I/O connectivity design
    4. Supports 10~30 VDC wide range power input
    5. High performance 288-pin DDR4 Long-DIMM max. up to 32 GB
    6. Supports 4 COM and 4 USB 3.0
    7. Two 2.5" SATA drive bay, 1 Mini PCIe and 1 SIM slot

● **Reliable and Stable Design**
The embedded system supports 6th/7th gen Skylake/Kabylake Intel® Core™ i7/ i5/ i3 & Celeron® CPU (TDP up to 35W), high flexibility and multi-functional design is the best solution for any industrial field applications.

● **Embedded O.S. Supported**
The eBOX640-500-FL supports not only Windows 10, but also embedded OS, such as Windows 10 Embedded and Linux.

● **Various Storage devices supported**
For storage device, the eBOX640-500-FL supports two 2.5" SATA storage drive bay and one mSATA device.

1.2 System Specifications

1.2.1 CPU

● **CPU**
- LGA1151 socket 6th/7th gen Intel® Core™ i7/ i5/ i3 & Celeron® processors (CPU TDP max. up to 35W)

● **Chipset**
- Intel® H110

● **BIOS**
- American Megatrends Inc. UEFI (Unified Extensible Firmware Interface) BIOS.

● **System Memory**
- Two 288-pin unbuffered DDR4-2133 MHz Long-DIMM socket, max. up to 32 GB

1.2.2 I/O System

● One RS-232/422/485 9-pin D-Sub male connector (COM1) (select by jumper)

● Three RS-232 9-pin D-Sub male connector (COM2-4)

● One HDMI with resolution max. up to 3840 x 2160@30Hz or 2560 x 1600@60Hz.

● One DisplayPort (max. up to 4096 x 2304@60Hz)

● One VGA (Resolution max. up to 1920x1200)

● Two RJ-45 connectors for 10/100/1000 Base-T Ethernet ports
-LAN1: 1000/100/10Mbps Gigabit/Fast Ethernet support Wake-on-LAN, PXE with Intel® i219LM.
-LAN2: 1000/100/10Mbps Gigabit/Fast Ethernet PXE with Intel® i211AT

● Four USB 3.0 connectors

● Two USB 2.0 connectors

● One 10~30 VDC power input connector

● Two Indicators LED (System Power, HDD Active)

● One AT/ATX Quick switch

● One power switch

1.2.3   System Specification

- **Watchdog Timer**
  - 1~255 seconds or minutes; up to 255 levels.

- **Power Supply**
  - Input : 10~30 VDC

- **Operation Temperature**
  - -10℃~+55℃ (-14°F~+122°F), with W.T. SSD & Memory for Skylake
  - -10℃~+50℃ (-14°F~+122°F), with W.T. SSD & Memory for Kabylake

- **Humidity**
  - 10% ~ 90% (non-condensation)

- **Vibration Endurance**
  - 2Grm w/ SSD (5-500Hz, X, Y, Z directions)

- **Weight**
  - 3.22 kg (7.098lb) without package
  - 3.96 kg (8.355lb) with package

- **Dimensions**
  - 182 mm (7.17") (W) x 235.7 mm (9.27") (D) x 82 mm (3.22") (H)

1.2.4   Driver CD Content

- **Driver**
  - Chipset
  - Ethernet
  - Graphic
  - USB 3.0 hot fix for Windows 8.x
  - ME
  - HD Audio
  - Rapid Storage Technology (for AHCI and RAID)

- **Manual**
  - User Manual
  - Quick Manual

【**Note**】**:**   *All specifications and images are subject to change without notice.*

1.3   Dimensions

The following diagrams show dimensions and outlines of the eBOX640-500-FL.

1.3.1   System Dimensions
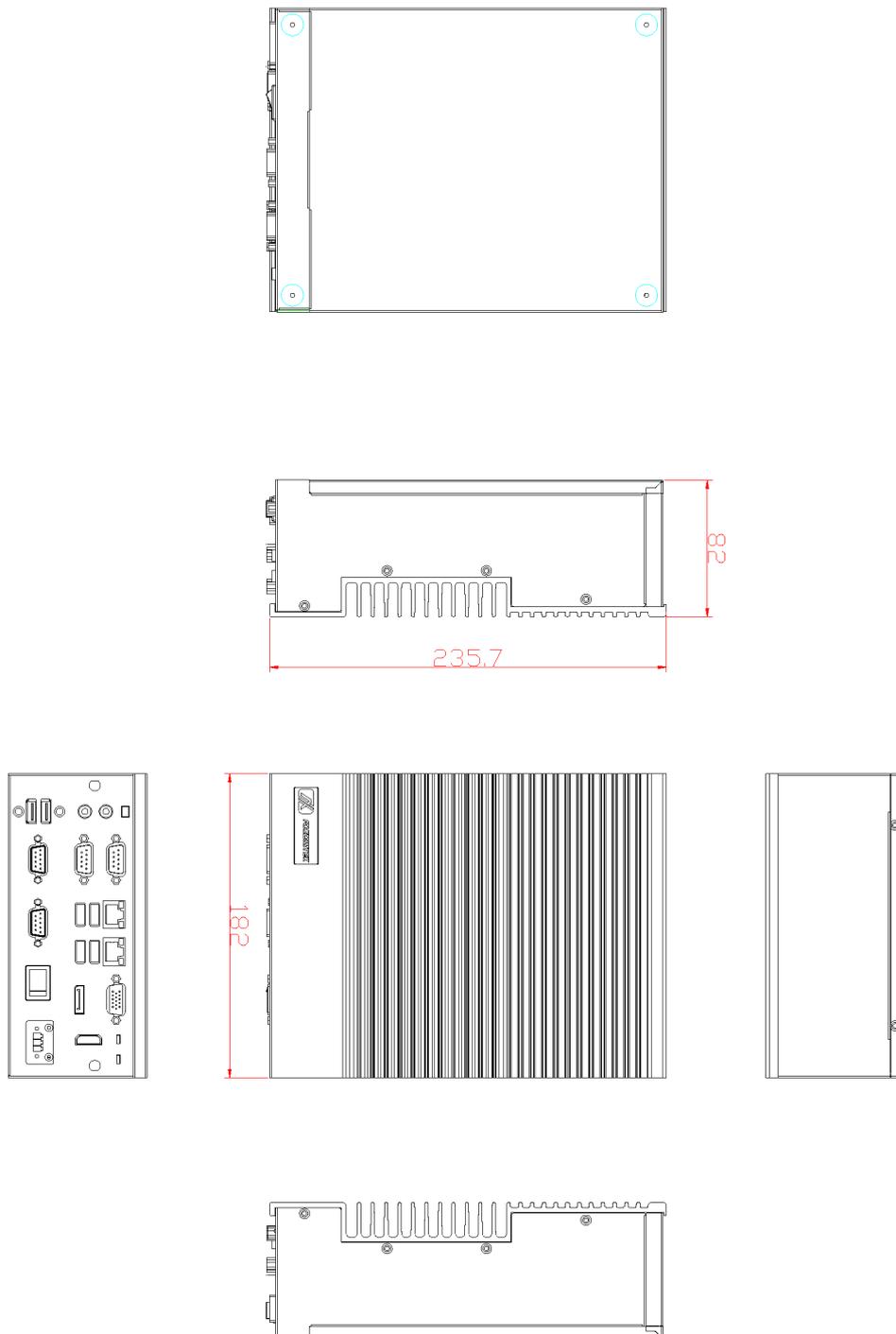
1.3.2   Wall mount Bracket Dimensions
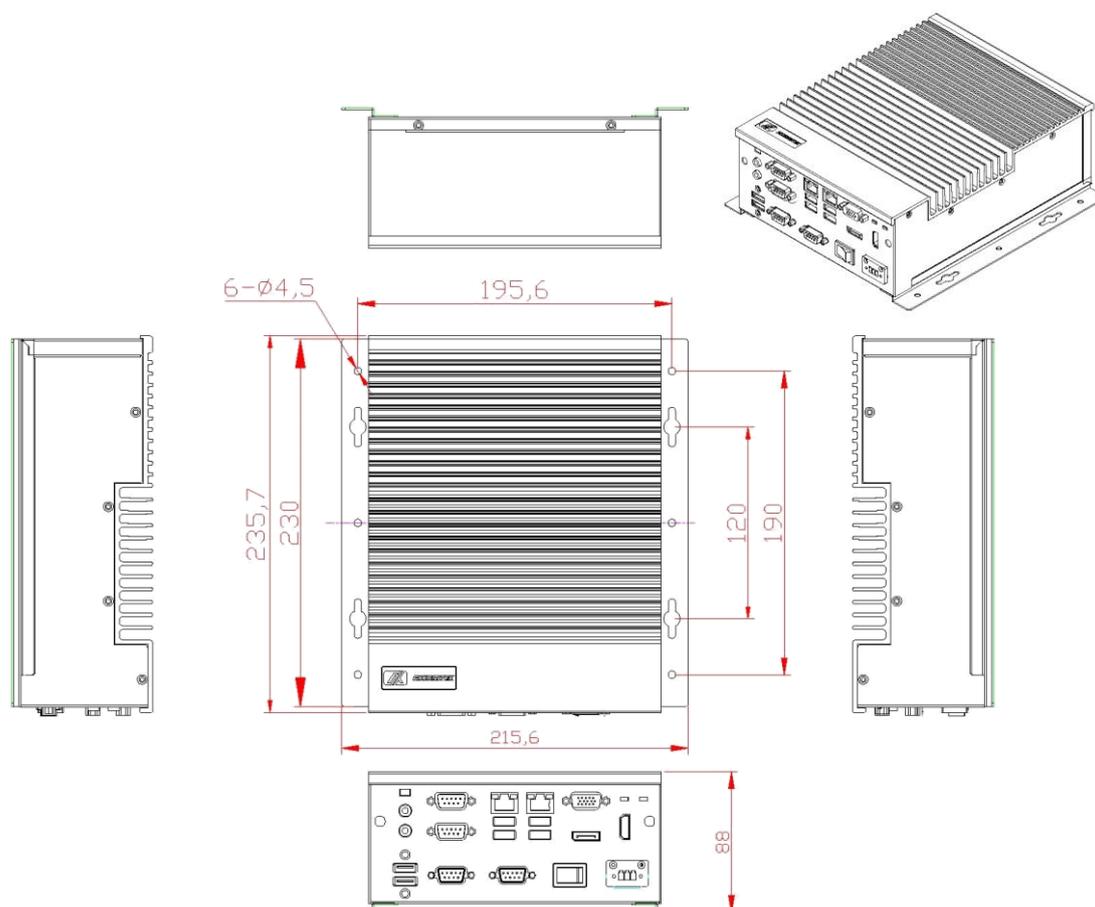
Instruction

Step 1: Screw the two pieces of wall-mount kits to the bottom plate of the device. Total four screws (metric 3 x6) are required.

Step 2: Use the device, with wall mount plate attached, as a guide to mark the correct locations of the four screws.

Step 3: Insert a tapping-screw (thread diameter less than 4mm) head through middle of the keyhole-shaped aperture on the plate, and then slide the device downwards. Tighten the screw head for added stability.

1.4   I/O Outlets

The following figures show I/O outlets on front of the eBOX640-500-FL.

● **Front View**
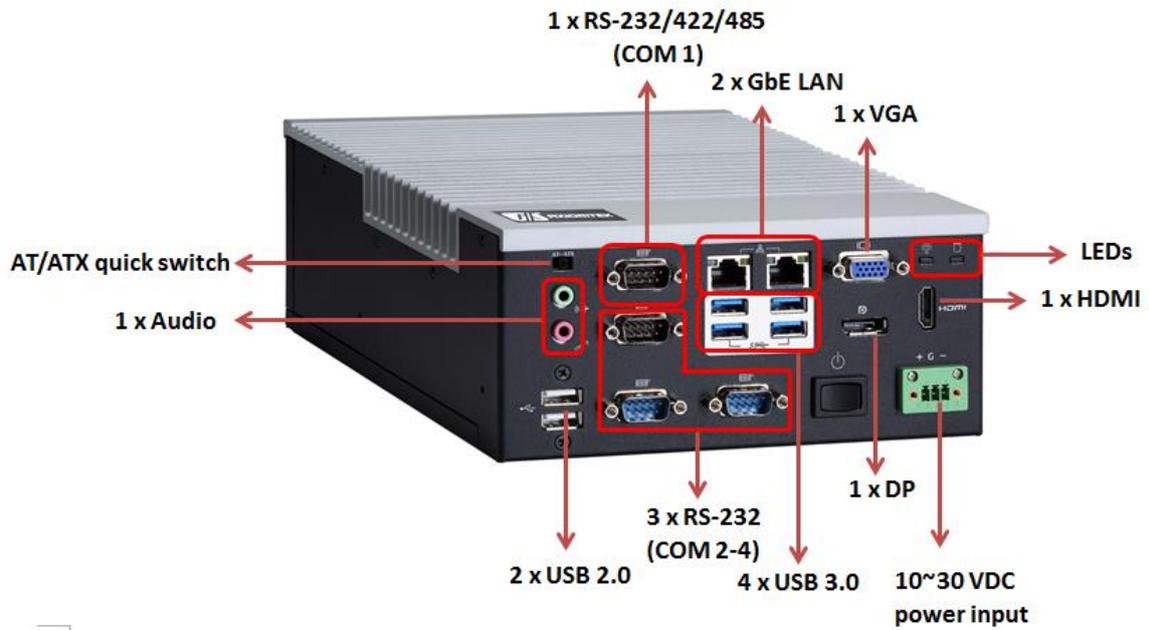
1.5   Packing List

The eBOX640-500-FL comes with the following bundle package:

- eBOX640-500-FL System Unit x 1
- eBOX640-500-FL Quick Installation Guide x 1
- DVD x 1 (For Driver and Manual)
- Screws Pack x 1
- Foot pad x 4
- Thermal grease x 1
- HDD bracket x 2
- 3-pin Terminal block connector x 1

1.6   Model List

eBOX640-500-FL-DC	Fanless embedded system with 6th/7th gen Intel$^®$ Core^{TM} i7/ i5/ i3 & Celeron$^®$ processors, 1 VGA/HDMI/DisplayPort, 2 GbE LANs, 4 USB 3.0, 2 USB 2.0,2 COM, PCIe Mini slot and 10~30 VDC PWR input

Please contact Axiomtek's distributors immediately in case any abovementioned items are missing.

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SECTION 2
HARDWARE INSTALLATION

The eBOX640-500-FL is convenient for your various hardware configurations, such as HDD (Hard Disk Drive), SSD (Solid State Drive), Long-DIMM or PCI Express Mini Card modules. The section 2 will show how to install the hardware.

2.1 Installation of CPU Processors

Step 1 Turn off the system, and unplug the power cord.
Step 2 There are eight screws on the top heatsink are used to fasten the heatsink to the chassis.
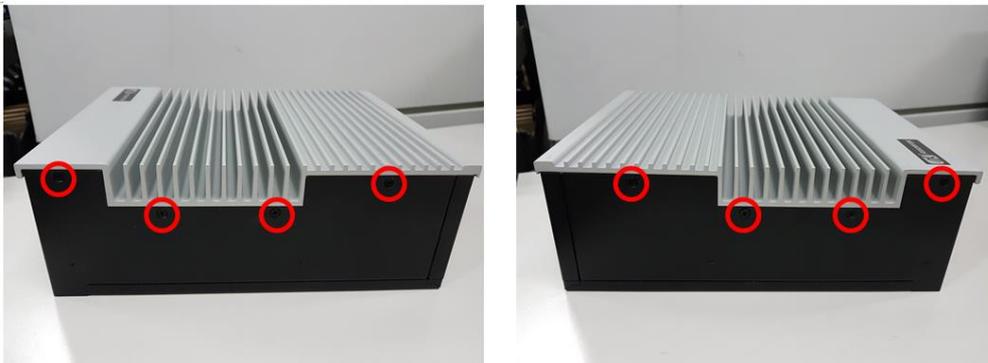
Step 3 Loosen these screws to remove the top heatsink.

Step 4 Disengage load lever.

● Disengage load lever by releasing down and out on the hook.

● Rotate load lever to open position at approximately 135°.

● Rotate load plate to open position at approximately 150°.

【Note】:

Apply pressure to corner with right-hand thumb when opening or closing load lever - otherwise lever will bounce back (as a mouse trap) causing bent contacts.
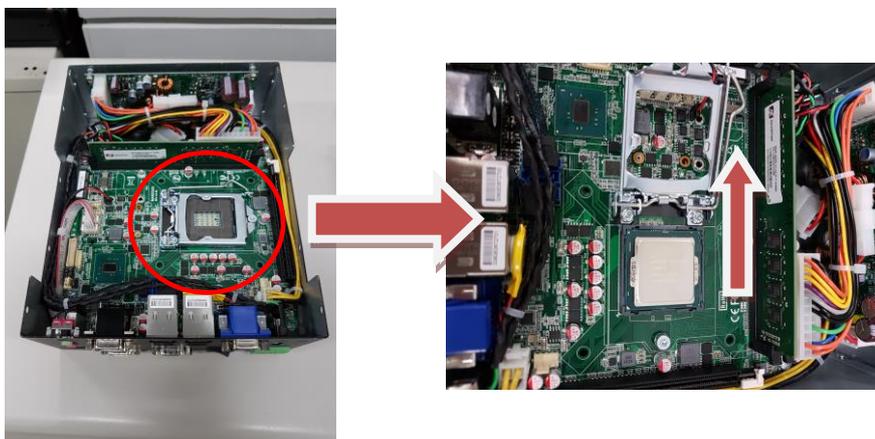
Step 5 Installation steps of CPU processors
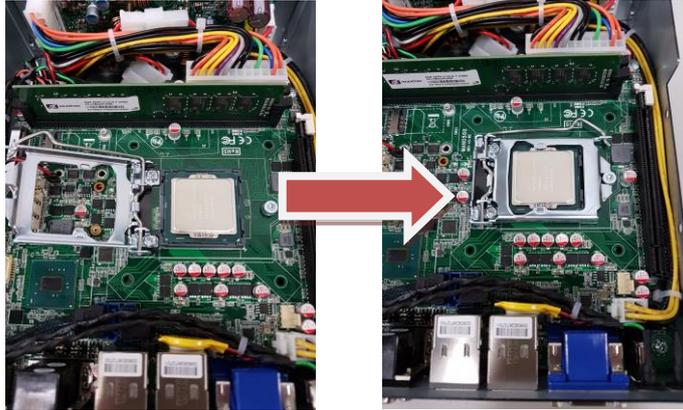
● Lift processor package from shipping media by grasping the substrate edges.

● Scan the processor package gold pads for any presence of foreign material.

● Locate connection 1 indicator on the processor which aligns with connection 1 indicator chamfer on the socket, and notice processor keying features that line up with posts along socket walls.

● Grasp the processor with thumb and index finger along the top and bottom edges. The socket will have cutouts for your fingers to fit into.

● Carefully place the processor into the socket body vertically.
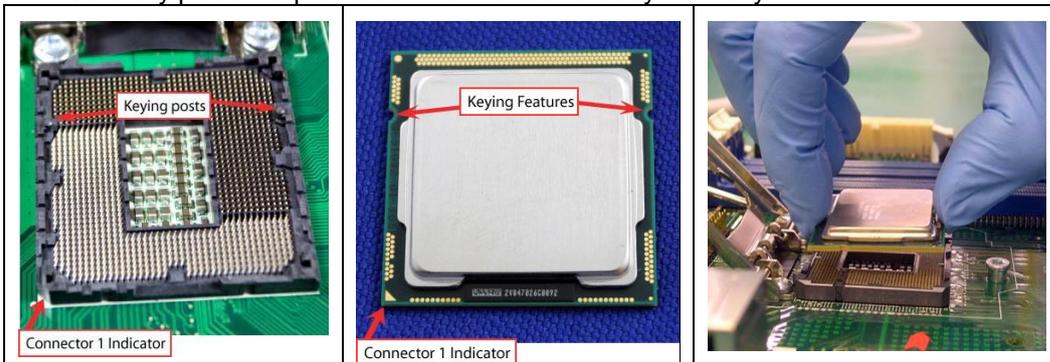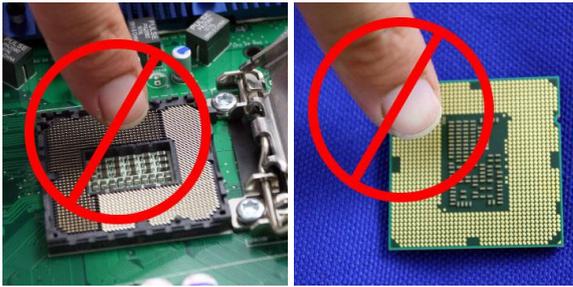
	Never touch fragile socket contacts to avoid damage and do not touch processor sensitive contacts at any time during installation.
Caution	

2.2 Installation of Long-DIMM Memory

Step 1 **Turn off the system, and unplug the power cord.**
Step 2 **There are eight screws on the top heatsink are used to fasten the heatsink to the chassis.**
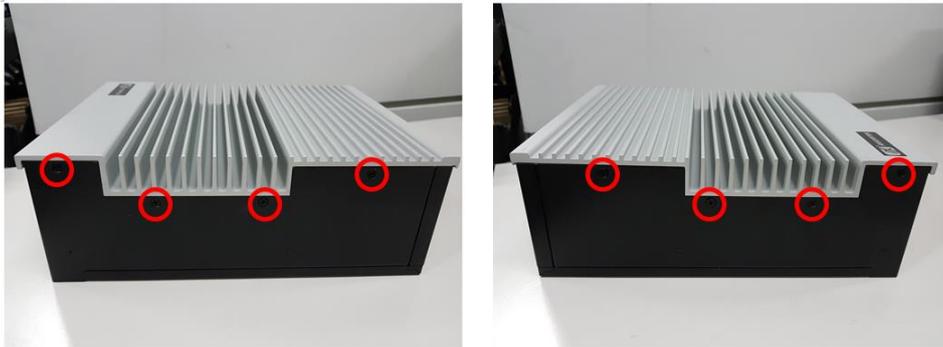
Step 3 **Loosen the screws to remove top heat sink then two Long-DIMM sockets on main board are visible.**
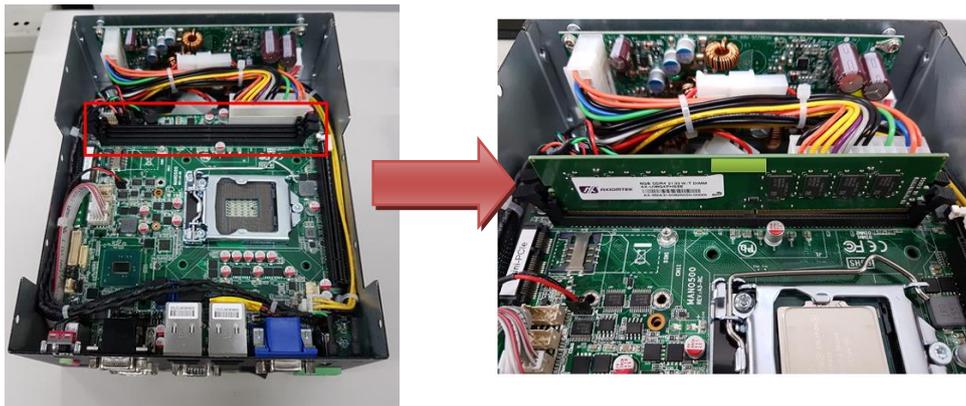
Step 4 **Locate the memory module, insert a gold colored contact into the socket and push the module two end latches till locked.**

Step 5 **Put the bottom cover and fasten four screws back onto the system.**

2.3   Installation of Express Mini Card

Step 1   Turn off the system, and unplug the power cord.
Step 2   There are eight screws on the top heatsink are used to fasten the heatsink to the chassis.
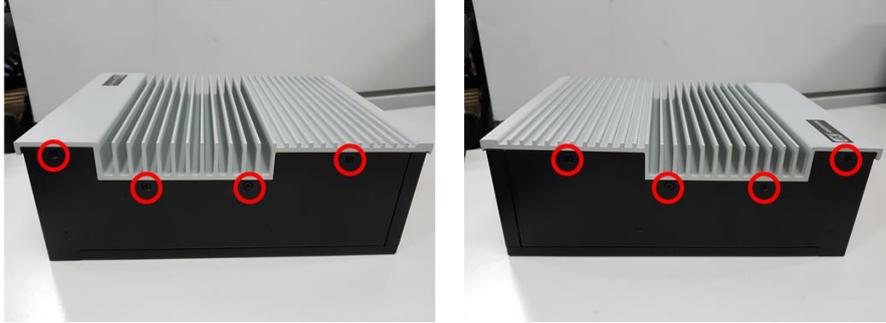
Step 3   Remove the top cover.

Step 4   Locate Express Mini card slot within the red line marked.

Step 5   Slide Mini Card into Mini Card slot with caution, and fasten screw of Express Mini Card.
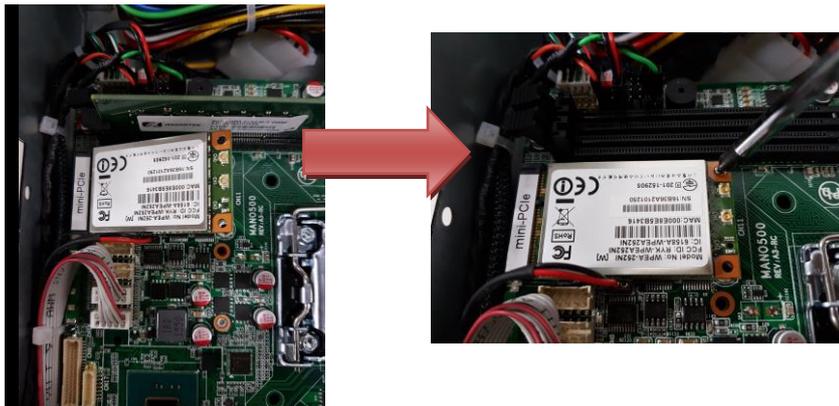
Step 6   Assembly the top cover back and fasten all screws.

2.4   Installation of 2.5" SAT Device

Step 1   **Turn off the system, and unplug the power adaptor.**

Step 2   **Turn the system upside down to locate screws at the rear side, and then loosen two screws.**

Step 3   **Remove the bottom cover and locate SSD/HDD within the red line marked.**
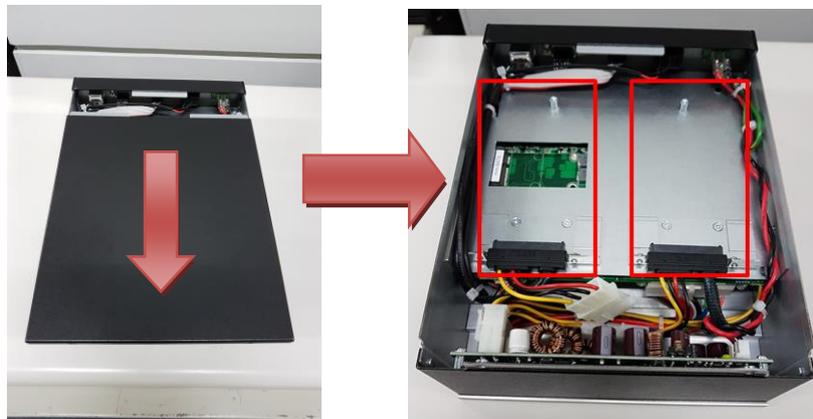
Step 4   **Please prepare the following items to assemble SSD/HDD.**

Step 5   Fasten two screws to fix SSD/HDD.

Step 6   Connected the SSD/HDD directly and make sure the insertion is complete.

2.5　Installation of　mSATA slot

Step 1 **Turn off the system, and unplug the power cord.**

Step 2 **Turn the system upside down to locate screws at the rear side, and then loosen two screws.**

Step 3 **Remove the bottom cover.**

Step 4 **Identify the mSATA slot, insert an mSATA module into the socket and then fasten a screw.**
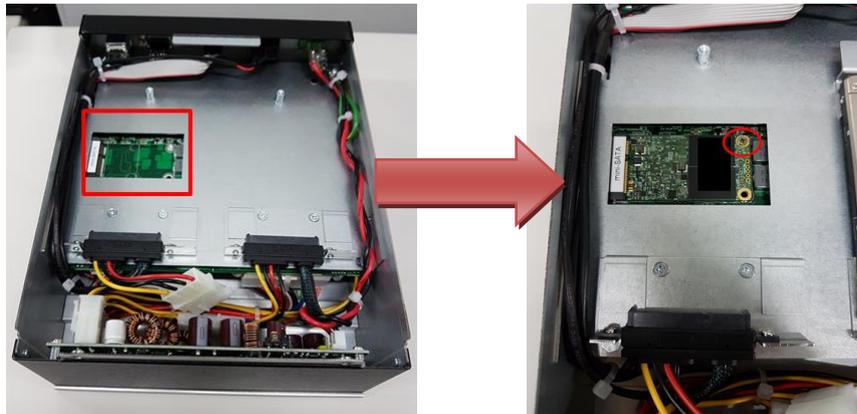
Step 5 **Put the bottom cover and fasten two screws back onto the system.**

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SECTION 3
JUMPER & CONNECTOR SETTINGS

Proper jumper settings configure the eBOX640-500-FL to meet various application needs. Hereby all jumpers settings along with their default settings are listed for devices onboard.

3.1   Locations of Jumpers & Connectors

MANO500 Top Side
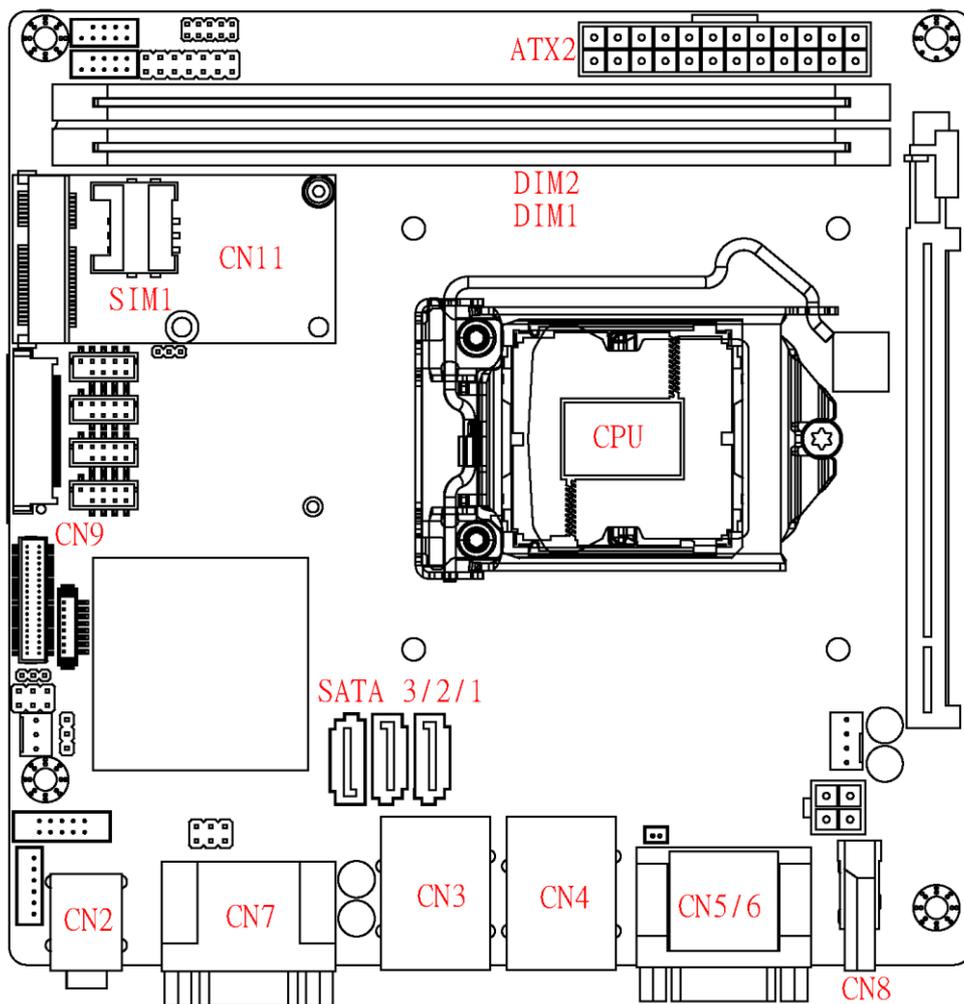
MANO500 Bottom Side

CN12
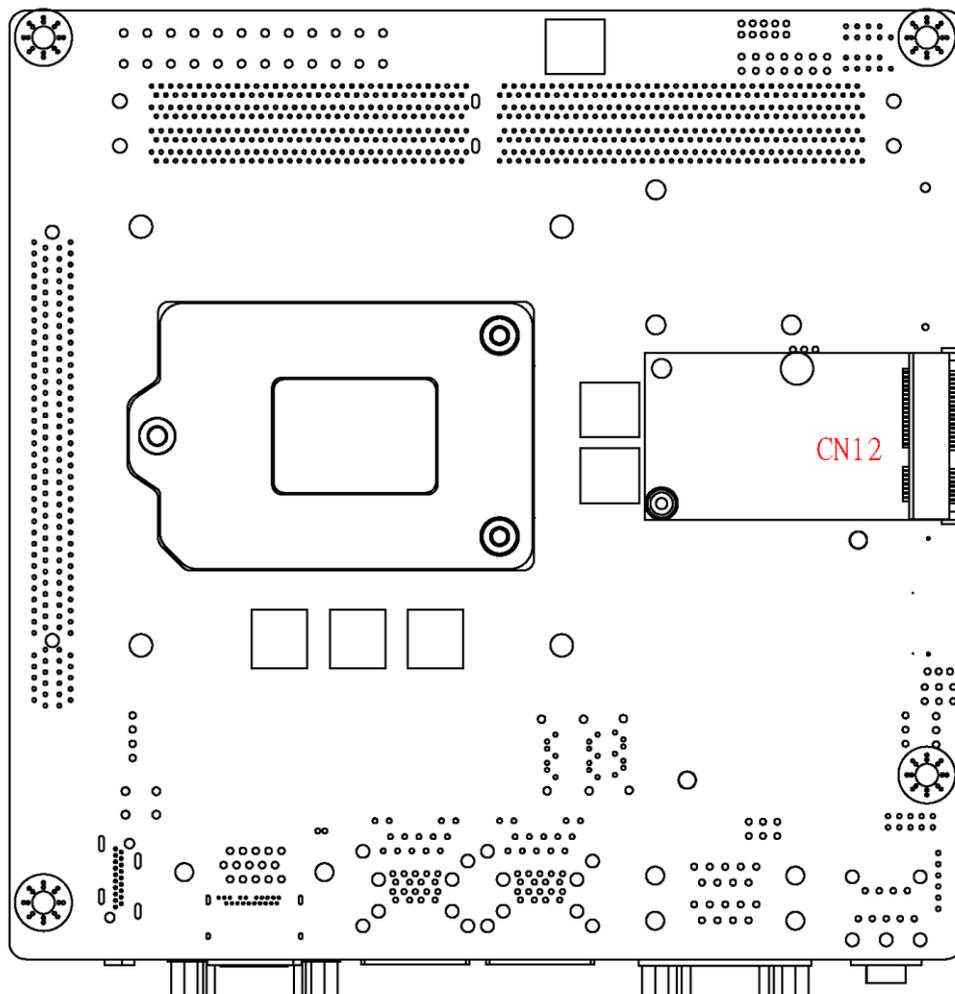
【Note】: *It is strongly recommended that any unmentioned jumper settings should not be modified without instructions by Axiomtek FAEs.*

Any modifications without instructions might cause system failure.

3.2   Summary of Jumper Settings

Proper jumper settings configure the eBOX640-500-FL to meet various application purposes. A table of all jumpers and their default settings is listed below.

MANO500

Jumper	Function/Default Setting		Jumper Setting
JP1	Clear CMOS Default: Normal Operation		1-2 Close
JP3	COM1 RS-232/422/485 Mode Select Default: RS-232		1-2 Close
JP4			3-5, 4-6 Close
JP5			3-5, 4-6 Close
JP6	COM1 Data/Power Select Default: RS-232 Data	CN7 Pin 1: DCD	3-5 Close
		CN7 Pin 9: RI	4-6 Close

【**Note**】**:** *How to setup Jumpers*

That a cap on a jumper is to "close" the jumper, whereas that offs a jumper is to "open" the jumper.

[Open]   [Closed]   [Pin1-2 Closed]

3.2.1 Clear CMos (JP1)

This jumper allows users to clear the Real Time Clock (RTC) RAM in CMOS. Users can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which includes system setup information such as system passwords.

To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.

2. Remove the onboard battery.

3. Move the jumper clip from pins 1-2 (default) to pins 2-3. Keep the clip-on pins 2-3 for about 5~10 seconds, and then move the clip back to pins 1-2.

4. Re-install the battery.

5. Plug the power cord and turn ON the computer.

6. Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.

Functions	Settings
Normal (Default)	1-2 close
Clear CMOS	2-3 close

3.2.2 AT/ATX Quick Switch

Functions	Settings
ATX mode (Default)	1-2 close
AT mode	2-3 close

3.2.3 COM1 RS-232/422/485 Mode Select (JP3, JP4, JP5)

Use these jumpers (3x2-pin p=2.0mm) to set COM1 port to operate in RS-232, RS-422 or RS-485 communication mode.

Functions	Settings
RS-232 mode (Default)	JP3 1-2 close JP4 3-5, 4-6 close JP5 3-5, 4-6 close
RS-422 mode	JP3 3-4 close JP4 1-3, 2-4 close JP5 1-3, 2-4 close
RS-485 mode	JP3 5-6 close JP4 1-3, 2-4 close

3.2.4 COM1 Data/Power Select (JP6)

The COM1 port has +5V power capability on DCD and +12V on RI by setting this jumper (3x2-pin p=2.54mm).

Functions	Settings
Power: Set COM1 pin 1 to +5V	1-3 close
Data: Set COM1 pin 1 to DCD (Default)	3-5 close
Power: Set COM1 pin 9 to +12V	2-4 close
Data: Set COM1 pin 9 to RI (Default)	4-6 close
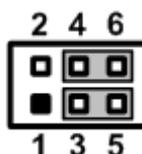
3.3   Connectors

Connectors connect the board with other parts of the system. Loose or improper connection might cause problems. Make sure all connectors are properly and firmly connected. Here is a summary table shows all connectors on the **eBOX640-500-FL** series.

External Connectors	Section
Audio Jack (CN2)	**3.3.1**
LAN and USB 3.0 Connectors (CN3, CN4)	**3.3.2**
DisplayPort Connector (CN5)	**3.3.3**
VGA Connector (CN6)	**3.3.4**
COM 1 and COM 2 Connector (CN7)	**3.3.5**
HDMI Connector (CN8)	**3.3.6**
System Power switch	**3.3.7**
PCI-Express Mini Card Connector (CN11)	**3.3.8**
mSATA Slot (CN12)	**3.3.9**
SIM Card Slot (SIM1)	**3.3.10**
Power/HDD LED	**3.3.11**
DC Power input connector	**3.3.12**

3.3.1 Audio Jack (CN2)

The motherboard provides HD audio jack on the rear I/O. Install audio driver, and then attach audio devices to CN2.

Pin Colors	Signals
Green	Line-out
Pink	MIC-in
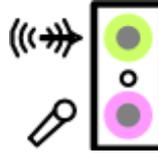
3.3.2 LAN and USB Connector (CN3/CN4)

The motherboard comes with two high performance plug and play Ethernet interfaces (RJ-45) which are fully compliant with the IEEE 802.3 standard. Connection can be established by plugging one end of the Ethernet cable into this RJ-45 connector and the other end to a 1000/100/10Base-T hub.

The Universal Serial Bus (compliant with USB 3.0) connectors on the rear I/O are for installing USB peripherals such as keyboard, mouse, scanner, etc.

Pins	Signals	Pins	Signals
L1	Tx+ (Data transmission positive)	L2	Tx- (Data transmission negative)
L3	Rx+ (Data reception positive)	L4	RJ-1 (For 1000 Base-T only)
L5	RJ-1 (For 1000 Base-T only)	L6	Rx- (Data reception negative)
L7	RJ-1 (For 1000 Base-T only)	L8	RJ-1 (For 1000 Base-T only)
A	Active LED	B	Speed LED
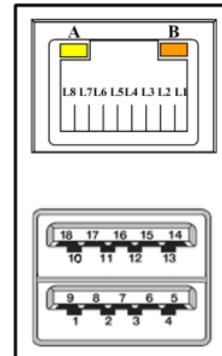
【**Note**】：*Speed LED turns orange for 1000Mbps or green for 100Mbps.*
CN3 supports AMT when chipset is customized into Intel® Q170 and Wake-on-LAN.

Pins	Signals	Pins	Signals
1	USB3_POWER	2	USB -
3	USB +	4	GND
5	USB3_SSRX	6	USB3_SSRX+
7	GND	8	USB3_SSTX
9	USB3_SSTX+		

3.3.3   DisplayPort Connector (CN5)

The DisplayPort interface is available through CN5.

Pins	Signals	Pins	Signals
1	DP_TX0_P	2	GND
3	DP_TX0_N	4	DP_TX1_P
5	GND	6	DP_TX1_N
7	DP_TX2_P	8	GND
9	DP_TX2_N	10	DP_TX3_P
11	GND	12	DP_TX3_N
13	GND	14	GND
15	DP_AUXP	16	GND
17	DP_AUXN	18	DP_HPD
19	GND	20	+3.3V
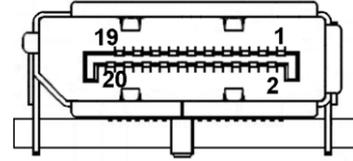
3.3.4   VGA Connector (CN6)

The CN6 is a high rise 15-pinD-Subconnector which is commonly used for VGA display. This VGA interface configuration can be configured via software utility.

Pins	Signals	Pins	Signals
1	RED	2	Green
3	Blue	4	NC
5	GND	6	DETECT
7	GND	8	GND
9	VCC	10	GND
11	NC	12	DDC DATA
13	Horizontal Sync	14	Vertical Sync
15	DDC CLK		
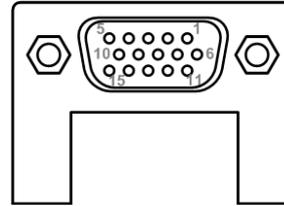
3.3.5   COM Connector (CN7)

The CN7is adouble-deckDB-9connectorfor COM1 and COM2 serial port interfaces where only COM1 is selectable for RS-232/422/485 mode by jumper settings (see section 3.2.3). The pin assignments of RS-232/422/485 are listed in table below.

COM 1

Pins	RS-232	RS-422	RS-485
1	DCD# [*]	TX-	485-
2	RXD	TX+	485+
3	TXD	RX+	N/C
4	DTR#	RX-	N/C
5	GND	GND	GND
6	DSR#	N/C	N/C
7	RTS#	N/C	N/C
8	CTS#	N/C	N/C
9	RTS#	N/C	N/C

COM1
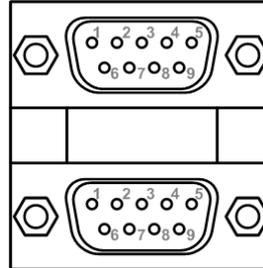
COM2

【Note】: *Pin 1 of COM1 can be DCD/+5V and pin 9 of COM1 can be RI/+12V by selecting JP6 (see section 3.2.4).*

COM 2

Pins	Signals	Pins	Signals
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI		

COM 3/4

Pins	Signals	Pins	Signals
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI		
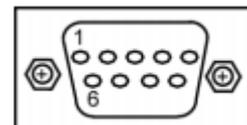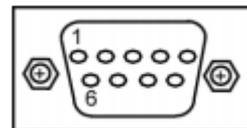
3.3.6   HDMI (CN8)

The HDMI (High-Definition Multimedia Interface) is a compact digital interface which is capable of transmitting high-definition video and high-resolution audio over a single cable.

Pins	Signals	Pins	Signals
1	HDMI OUT_DATA2+	2	GND
3	HDMI OUT_DATA2-	4	HDMI OUT_DATA1+
5	GND	6	HDMI OUT_DATA1-
7	HDMI OUT_DATA0+	8	GND
9	HDMI OUT_DATA0-	10	HDMI OUT_Clock+
11	GND	12	HDMI OUT_Clock-
13	N/C	14	GND
15	HDMI OUT_SCL	16	HDMI OUT_SDA
17	GND	18	+5V
19	HDMI_HTPLG		
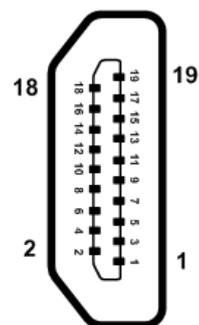
3.3.7 System Power Switch

This button is for turning on/off the system power.

Function	Description
On	Turn on/off system
Off	Keep system status

3.3.8 Express Mini Card Slot

The CN11 complies with PCI-Express Mini Card Spec. V1.2.

Pins	Signals	Pins	Signals
1	WAKE#	2	+3.3VAUX
3	N/C	4	GND
5	N/C	6	+1.5V
7	+3.3VAUX	8	UIM_PWR
9	GND	10	UIM_DAT
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_REST
15	GND	16	UIM_VPP
17	N/C	18	GND
19	N/C	20	W_DISABLE#
21	GND	22	PERST#
23	PERN0	24	+3.3VAUX
25	PERP0	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PETN0	32	SMB_DATA
33	PETP0	34	GND
35	GND	36	USB_10-
37	GND	38	USB_10+
39	+3.3VAUX	40	GND
41	+3.3VAUX	42	N/C
43	GND	44	N/C
45	CL_CLK	46	N/C
47	CL_DATA	48	+1.5V
49	CL_RST_N	50	GND
51	N/C	52	+3.3VAUX
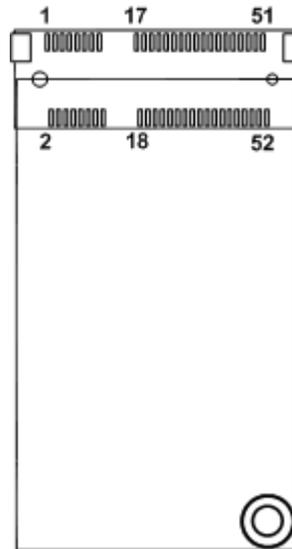
3.3.9 mSATA (CN12)

The CN11 complies with PCI-Express Mini Card Spec. V1.2.

Pins	Signals	Pins	Signals
1	N/C	2	+3.3VAUX
3	N/C	4	GND
5	N/C	6	+1.5V
7	N/C	8	N/C
9	GND	10	N/C
11	N/C	12	N/C
13	N/C	14	N/C
15	GND	16	N/C
17	N/C	18	GND
19	N/C	20	N/C
21	GND	22	PERST#
23	SATA0_RX_DP	24	+3.3VAUX
25	SATA0_RX_DN	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	SATA0_TX_DN	32	SMB_DATA
33	SATA0_TX_DP	34	GND
35	GND	36	USB_9-
37	GND	38	USB_9+
39	+3.3VAUX	40	GND
41	+3.3VAUX	42	N/C
43	GND	44	N/C
45	N/C	46	N/C
47	N/C	48	+1.5V
49	N/C	50	GND
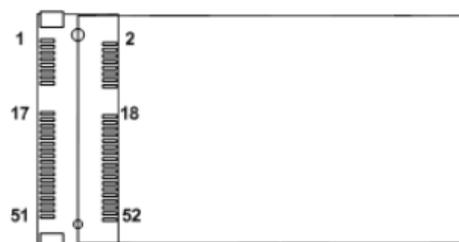
3.3.10 SIM Slot (SIM1)

The SIM1 is for inserting SIM Card. It is mainly used in 3G wireless network application. In order to work properly, the SIM Card must be used together with 3G module which is inserted to CN11.

Pins	Signals	Pins	Signals
1	UIM_PWR	7	UIM_VPP
2	UIM_REST	8	GND
3	UIM_CLK	9	GND
4	N/C	10	GND
5	N/C	11	GND
6	UIM_DAT	12	GND
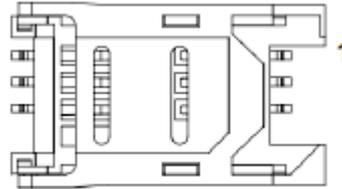
3.3.11 Power and HDD LED Indicator

The Orange LED is linked to Hard Disk Drive (HDD) activity signal. LED flashes every time HDD is accessed. The power LED (green) lights up and will remain steady while the system is powered on.

LED Color	Description
Green	Power on/off
Orange	Hard disk drive activity
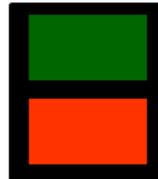
3.3.12 DC power input connector

The system supports a wide range Phoenix DC-in connector for system power 10~30 VDC power input.

Pin	Signal
1	+
2	GND
3	-

SECTION 4
BIOS SETUP UTILITY

This section provides users with detailed description how to set up basic system configuration through the BIOS setup utility.

4.1   Starting

To enter the setup screens, follow the steps below:

1.   Turn on the computer and press the <Del> key immediately.
2.   After press the <Del> key, the main BIOS setup menu displays. Users can access to other setup screens, such as the Advanced and Chipset menus, from the main BIOS setup menu.

It is strongly recommended that users should avoid changing the chipset's defaults. Both AMI and system manufacturer have carefully set up these defaults that provide the best performance and reliability.

4.2   Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.

【Note】: *Some of the navigation keys differ from one screen to another.*

Hot Keys	Description
→← Left/Right	The Left and Right <Arrow> keys allow users to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow users to select a setup screen or sub-screen.
+– Plus/Minus	The Plus and Minus <Arrow> keys allow users to change the field value of a particular setup item.
Tab	The <Tab> key allows users to select setup fields.
F1	The <F1> key allows users to display the General Help screen.
F2	The <F2> key allows users to Load Previous Values.
F3	The <F3> key allows users to Load Optimized Defaults.
F4	The <F4> key allows users to save any changes they made and exit the Setup. Press the <F4> key to save any changes.
Esc	The <Esc> key allows users to discard any changes they made and exit the Setup. Press the <Esc> key to exit the setup without saving any changes.
Enter	The <Enter> key allows users to display or change the setup option listed for a particular setup item. The <Enter> key can also allow users to display the setup sub- screens.

4.3 Main Menu

The Main Menu screen is the first screen users see when entering the setup utility. Users can always return to the Main setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is also shown below.

```
Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

  Main   Advanced  Chipset   Boot   Security   Save & Exit

BIOS Information                                      Set the Date. Use Tab to
Project Version            MANO500 B1.00              switch between Date elements.
Build Date and Time        12/20/2016  14:46:28

System Date                [wed 12/21/2016]
System Time                [16:35:32]

Access Level               Administrator

                                                    → ← : Select Screen
                                                    ↑ ↓   : Select Item
                                                    Enter: Select
                                                    +/- :  Change Opt.
                                                    F1 :   General Help
                                                    F2 :   Previous Values
                                                    F3 :   Optimized Defaults
                                                    F4 :   Save & Exit
                                                    ESC :  Exit

       Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```

BIOS Information
Display the auto-detected BIOS detail information.

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

Access Level
Display the access level of current user.

4.4   Advanced Menu

The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

> ► IT8786 Super IO Configurations
> ► Hardware monitor
> ► Smart Fan Functions
> ► Utility Configurations
> ► CPU Configurations
> ► SATA Configurations
> ► PCH-FW Configurations
> ► USB Configurations
> ► Axiom DXE Configurations

For items marked with "►", please press <Enter> for more options.
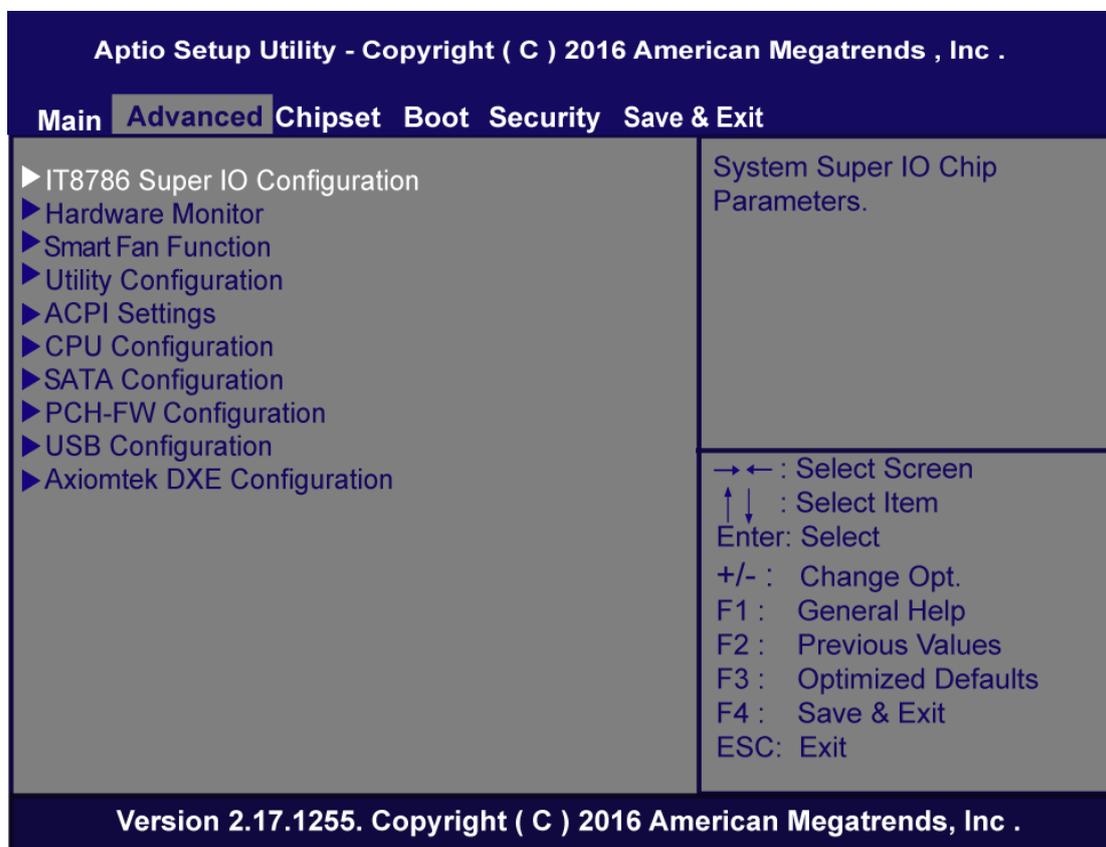
● **IT8786 Super IO Configuration**

Users can use this screen to select options for the Super IO Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with " ", please press for more options.

Serial Port 1~4 Configuration
Use these items to set parameters related to serial port 1~4.

● **Hardware Monitor**

This screen monitors hardware health status.

```
         Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

    Advanced

  PC Health Status

  CPU temperature              : +39°C
  System temperature           : +46°C
  Fan1 Speed                   : N/A
  Fan2 Speed                   : N/A
  VCC_CPU                      : +0.984 V
  VCC_DDR                      : +1.200 V
  +12                          : +11.952 V
  +5                           : +5.010 V                →←: Select Screen
  3.3                          : +3.280 V                ↑↓  : Select Item
  VBAT                         : +3.000 V              Enter : Select

                                                       +/- :  Change Opt.
                                                       F1 :   General Help
                                                       F2 :   Previous Values
                                                       F3 :   Optimized Defaults
                                                       F4 :   Save & Exit
                                                       ESC : Exit

         Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```

● **Smart Fan functions**
This screen allows users to select CPU fan mode.

● **Utility Configurations**

```
Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

  Advanced

 Utility Configuration                        BIOS Flash Utility

▶BIOS Flash Utility



                                              →←: Select Screen
                                              ↑↓  : Select Item
                                              Enter: Select
                                              +/- :   Change Opt.
                                              F1 :    General Help
                                              F2 :    Previous Values
                                              F3 :    Optimized Defaults
                                              F4 :    Save & Exit
                                              ESC:  Exit

     Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```
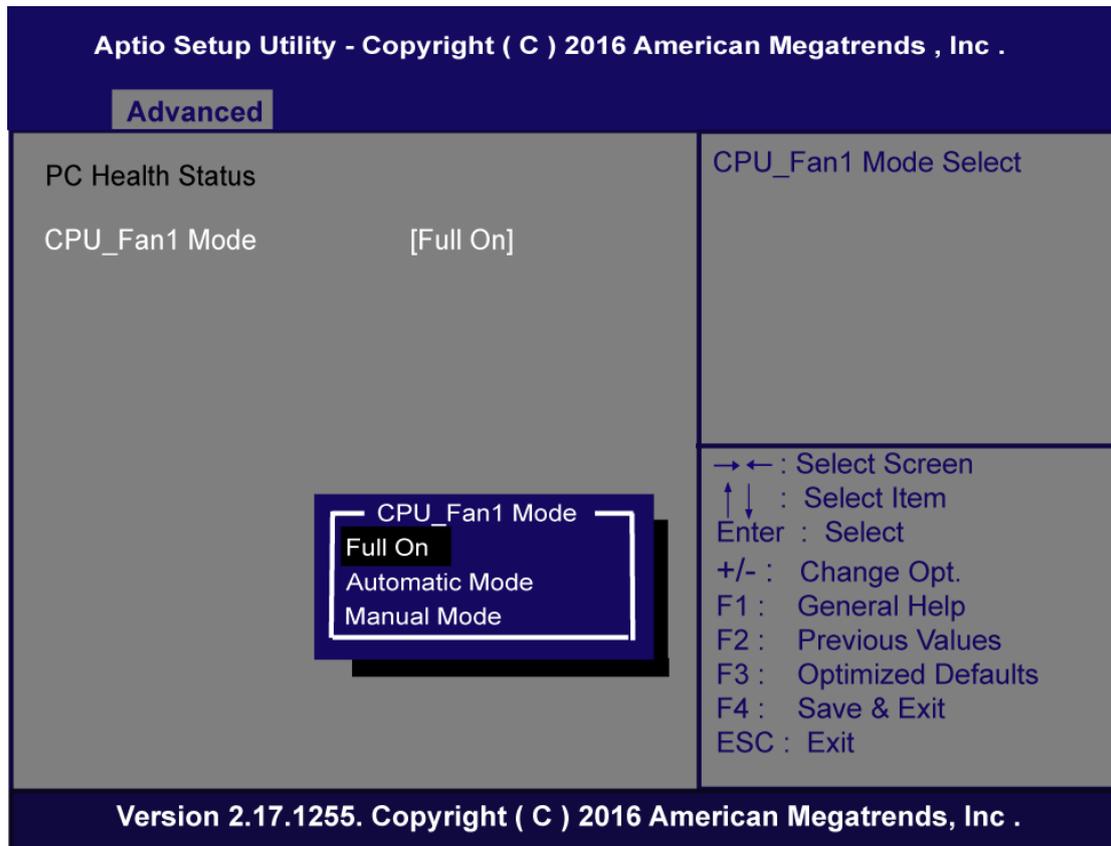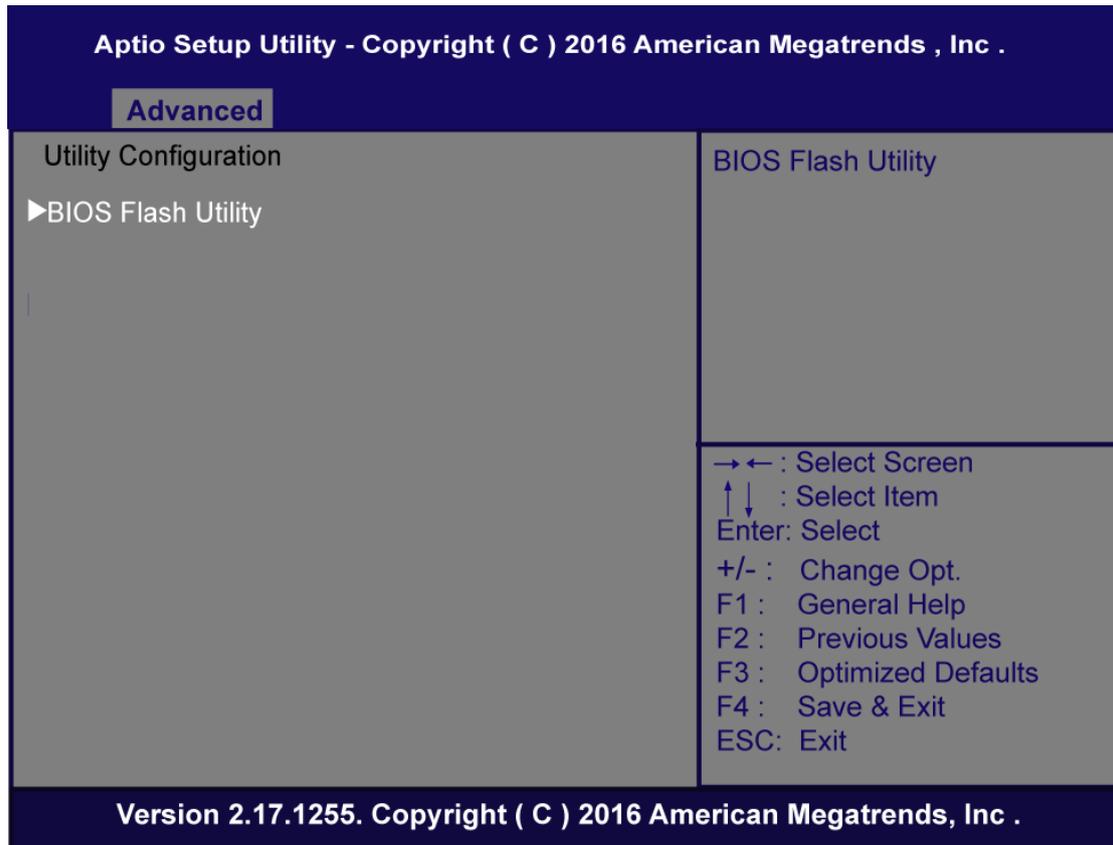
BIOS Flash Utility

BIOS flash utility configuration. For more detailed information.

● **ACPI Settings**

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Advanced

ACPI Setting

ACPI Sleep State   [S3 (Suspend to RAM)]

→←: Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1 : General Help
F2 : Previous Values
F3 : Optimized Defaults
F4 : Save & Exit
ESC: Exit

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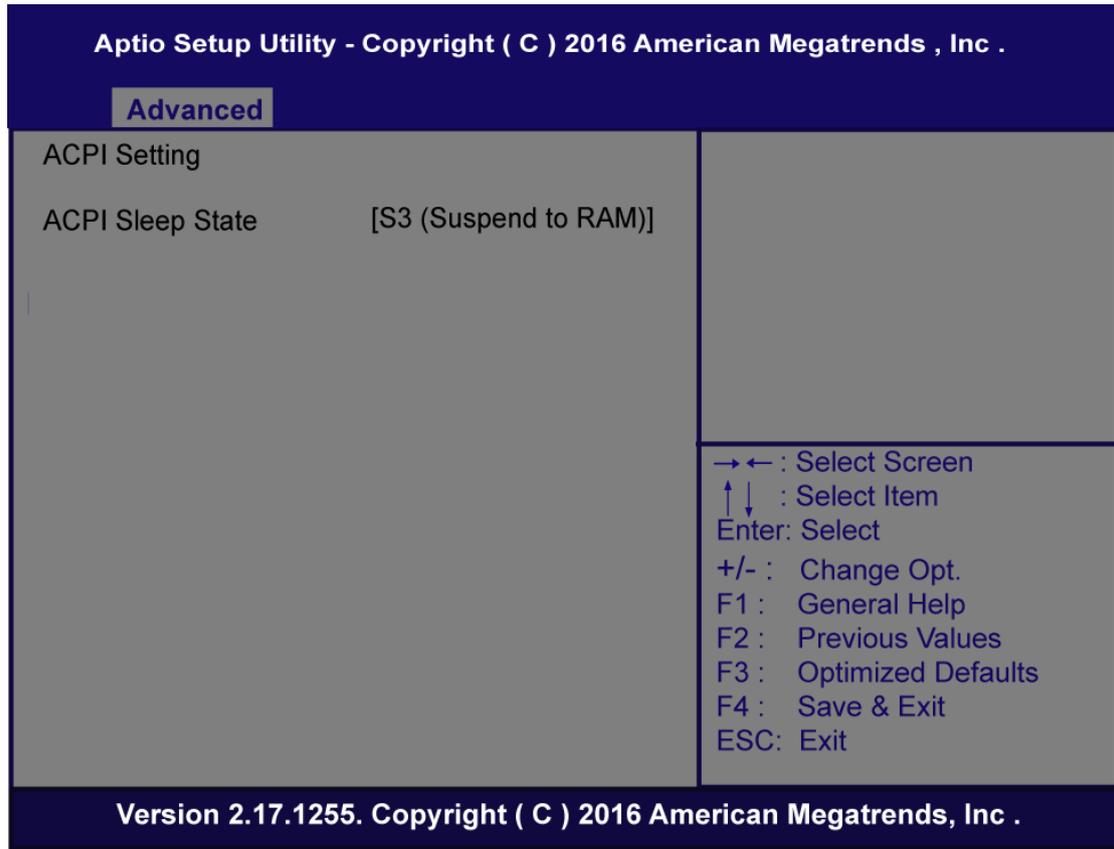
ACPI Sleep State

When the suspend button is pressed, the ACPI (Advanced Configuration and Power Interface) sleep state is S3 (Suspend to RAM).

● **CPU Configurations**

This screen shows the CPU version and its detailed information.

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Advanced	

CPU Configuration		When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology
Intel(R) Celeron(R) CPU G3900TE @ 2.30GHz		
CPU Signature	506E3	
Microcode Patch	55	
Max CPU Speed	300 MHz	
Min CPU Speed	800 MHz	
CPU Speed	2300 MHz	
Processor Cores	2	
Hyper Threading Technology	Not Supported	
Intel VT-x Technology	Supported	
Intel SMX Technology	Not Supported	
64-bit	Supported	
EIST Technology	Supported	→←: Select Screen
CPU C3 state	Supported	↑↓ : Select Item
CPU C6 state	Supported	Enter: Select
CPU C7 state	Supported	+/- : Change Opt.
		F1 : General Help
L1 Date Cache	32 KB x 2	F2 : Previous Values
L1 Code Cache	32 KB x 2	F3 : Optimized Defaults
L2 Cache	256 KB x 2	F4 : Save & Exit
L3 Cache	MB	ESC: Exit
Intel Virtualization Technology	[Enabled]	

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Intel Virtualization Technology

Enable or disable Intel Virtualization Technology. When enabled, a VMM (Virtual Machine Mode) can utilize the additional hardware capabilities. It allows a platform to run multiple operating systems and applications independently, hence enabling a single computer system to work as several virtual systems.

● **SATA Configurations**

In this Configuration menu, users can see the currently installed hardware in the SATA ports. During system boot up, the BIOS automatically detects the presence of SATA devices.
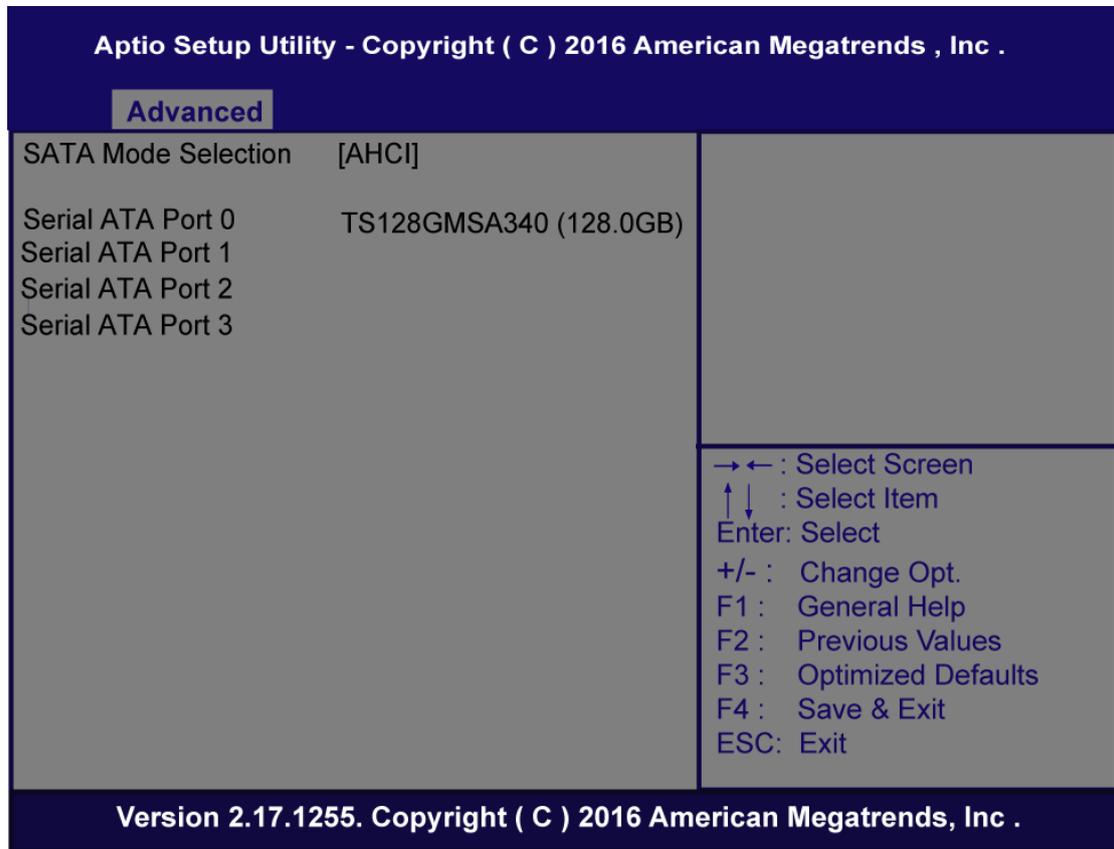
SATA Mode Selection
AHCI (Advanced Host Controller Interface) mode is how SATA controller(s) operate.

Serial ATA Port 0
It shows the device installed in connector SATA0.

Serial ATA Port 1
It shows the device installed in connector SATA1.

Serial ATA Port 2
It shows the device installed in connector SATA2.

Serial ATA Port 3
It shows the device installed in connector SATA3.

● **PCH-HW**

This screen shows ME Firmware information.

● **USB Configurations**

```
     Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

       Advanced

 USB Configuration

 USB Module Version           13

 USB Devices:
         1 Keyboard, 1 Mouse




                                              → ← : Select Screen
                                              ↑ ↓  : Select Item
                                              Enter: Select
                                              +/- :   Change Opt.
                                              F1 :    General Help
                                              F2 :    Previous Values
                                              F3 :    Optimized Defaults
                                              F4 :    Save & Exit
                                              ESC:  Exit


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```

USB Devices
Display all detected USB devices.

● **Axiom DXE Configurations**

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Advanced

Axiom DXE Configuration

LAN WAKE AFTER G3   [Disabled]

LAN WAKE AFTER G3

LAN WAKE AFTER G3
Enabled
Disabled

→ ← : Select Screen
↑ ↓ : Select Item
Enter: Select
+/- :   Change Opt.
F1 :   General Help
F2 :   Previous Values
F3 :   Optimized Defaults
F4 :   Save & Exit
ESC : Exit

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4.5   Chipset Menu

The Chipset menu allows users to change the advanced chipset settings. Users can select any of the items in the left frame of the screen to go to the sub menus:

> ►   PCH-IO Configuration
> ►   System Agent (SA) Configuration

For items marked with "►", please press <Enter> for more options.

```
              Aptio Setup Utility - Copyright (C) 2016 American Megatrends, Inc.
      Main    Advanced    Chipset    Security    Boot    Save & Exit

 ▶ PCH-IO Configuration                                     System Agent (SA) Parameters
 ▶ System Agent (SA) Configuration




                                                            →←: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F3: Optimized Defaults
                                                            F4: Save & Exit
                                                            ESC: Exit



              Version 2.17.1254. Copyright (C) 2016 American Megatrends, Inc.
```
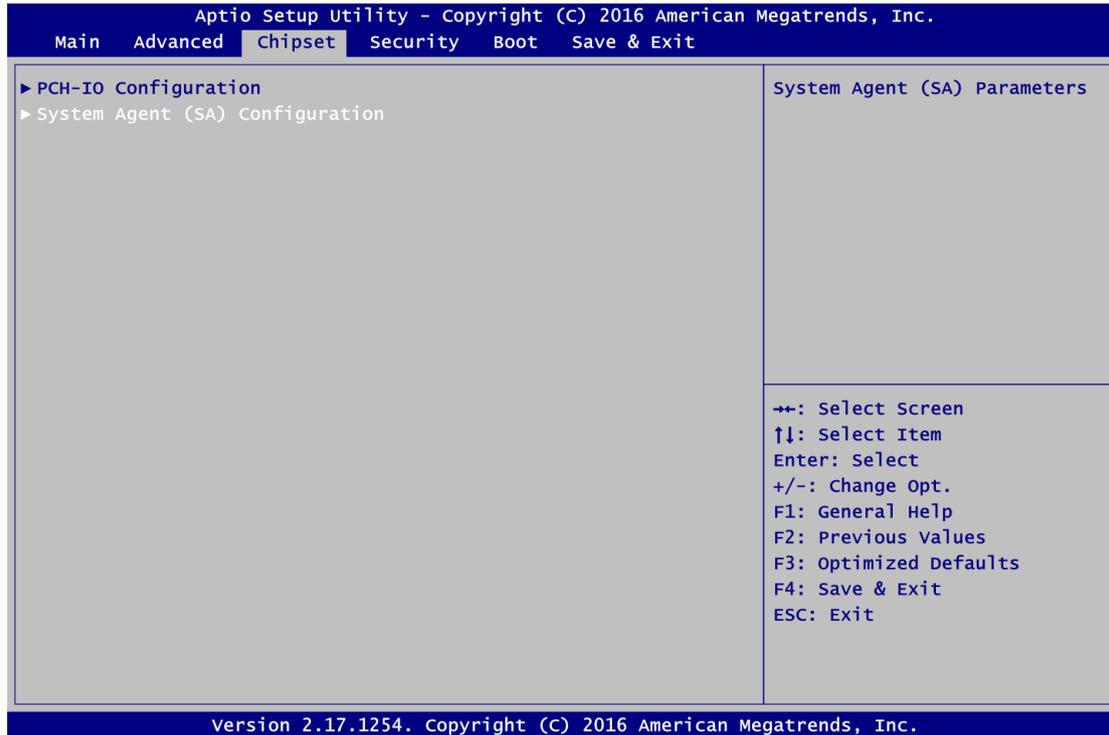
● **PCH-IO Configuration**

This screen allows users to set PCH parameters.

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Chipset

Intel PCH RC Version	1.8.0.0
Intel PCH SKU Name	PCH-H Desktop H110 SKU
Intel PCH Rev ID	31/D1
▶HD Audio Configuration	

HD Audio Subsystem
Configuration Settings

→←: Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1 : General Help
F2 : Previous Values
F3 : Optimized Defaults
F4 : Save & Exit
ESC: Exit

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● **HD Audio Configuration**

Control detection of the HD Audio device. Configuration options are Disabled and Enabled.

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Chipset

HD Audio Configuration

HD Audio   [Enabled]

Control Detection of the HD-Audio device.
Disabled = HDA will be unconditionally disabled
Enabled = HDA will be unconditionally enabled
Auto = HDA will be enabled if present, disabled otherwise.

HD Audio
Disabled
Enabled
Auto

→ ← : Select Screen
↑ ↓ : Select Item
Enter : Select
+/- : Change Opt.
F1 : General Help
F2 : Previous Values
F3 : Optimized Defaults
F4 : Save & Exit
ESC : Exit

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HD Audio Configuration
Use this item for HD Audio configuration settings.

● **System Agent (SA) Configuration**

This screen shows System Agent version information and provides function for specifying related parameters.

```
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                    Chipset

System Agent Bridge Name     Skylake          Graphics Configuration
Vt-d                         Supported

▶Graphics Configuration
▶Memory Configuration


                                              → ← : Select Screen
                                              ↑ ↓  : Select Item
                                              Enter: Select
                                              +/- :   Change Opt.
                                              F1 :    General Help
                                              F2 :    Previous Values
                                              F3 :    Optimized Defaults
                                              F4 :    Save & Exit
                                              ESC:  Exit

         Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```

Graphics Configuration
Use this item to configure internal graphics controller.

Memory Configuration
Use this item to refer to the information related to system memory.

● **Graphics Configuration**

LVDS Panel Type

Select LVDS panel resolution.

Backlight Control

Select LVDS Backlight PWM/CCFL.

Primary IGFX Boot Display

Select the video device which will be activated during POST (Power-On Self-Test). The default is VBIOS Default.

Secondary IGFX Boot Display

Select secondary display device. The default is Disabled.

● **Memory Information**

This screen shows the system memory information.

```
Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

                           Chipset

 Memory Configuration

 Memory RC Version           1.8.0.1
 Memory Frequency            2133 MHz
 Total Memory                8192 MB
 DIMM#0                      8192 MB
 DIMM#1                      Not Present


                                            → ← : Select Screen
                                            ↑ ↓  : Select Item
                                            Enter: Select
                                            +/- :   Change Opt.
                                            F1 :    General Help
                                            F2 :    Previous Values
                                            F3 :    Optimized Defaults
                                            F4 :    Save & Exit
                                            ESC:  Exit

        Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```

4.6   Security Menu

The Security menu allows users to change the security settings for the system.

```
            Aptio Setup Utility - Copyright (C) 2016 American Megatrends, Inc.
     Main    Advanced    Chipset    Security    Boot    Save & Exit

  Password Description                                    Set Administrator Password

  If ONLY the Administrator's password is set,
  then this only limits access to Setup and is
  only asked for when entering Setup.
  If ONLY the User's password is set, then this
  is a power on password and must be entered to
  boot or enter Setup. In Setup the User will
  have Administrator rights.
  The password length must be
  in the following range:
  Minimum length               3
  Maximum length               20                      →←: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
  Administrator Password                                +/-: Change Opt.
  User Password                                         F1: General Help
                                                        F2: Previous Values
                                                        F3: Optimized Defaults
                                                        F4: Save & Exit
                                                        ESC: Exit


            Version 2.17.1254. Copyright (C) 2016 American Megatrends, Inc.
```

Administrator Password

This item indicates whether an administrator password has been set (installed or uninstalled).

User Password

This item indicates whether a user password has been set (installed or uninstalled).

4.7   Boot Menu

The Boot menu allows users to change boot options of the system.

```
          Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

  Main  Advanced  Chipset   Boot  Security  Save & Exit

  Boot Configuration                                 Set the order of the legacy
                                                     devices in this group
  Setup Prompt Timeout       1
  Bootup NumLock State       [On]

  Quiet Boot                 [Disabled]
  Legacy PXE OpROM           [Disable]

  Boot Option Priorities
  Boot Option #1             [Windows Boot Manager]
                             (po: TS128GMSA340)]     →←  : Select Screen
                                                     ↑↓  :  Select Item
  Boot Option #2             [po: TS128GMSA340       Enter  :  Select
                                         ]
                                                     +/- :   Change Opt.
  Hard Drive BBS Priorities                          F1 :    General Help
                                                     F2 :    Previous Values
                                                     F3 :    Optimized Defaults
                                                     F4 :    Save & Exit
                                                     ESC :   Exit

          Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```

Setup Prompt Timeout
This item sets number of seconds to wait for setup activation key.
Options:1 (Default)

Bootup NumLock State
Use this item to select the power-on state for the keyboard NumLock.

Quiet Boot
Select to display either POST output messages or a splash screen during boot-up.

Legacy PXE OpROM
Use this item to enable or disable the boot ROM function of the onboard LAN chip when the system boots up.

Boot Option Priorities
These are settings for boot priority. Specify the boot device priority sequence from the available devices.

4.8   Save & Exit Menu

The Save & Exit menu allows users to load system configuration with optimal or fail-safe default values.

```
Aptio Setup Utility - Copyright ( C ) 2016 American Megatrends , Inc .

  Main   Advanced  Chipset   Boot   Security   Save & Exit

Save Options                                  Exit system setup after saving
Save Changes and Exit                         the changes.
Discard Changes and Exit

Save Changes and Reset
Discard Changes and Reset

Save Changes
Discard Changes

Default Options                               → ← : Select Screen
Restore Defaults                              ↑ ↓  :  Select Item
Save as User Defaults                         Enter :  Select
Restore User Defaults                         +/- :   Change Opt.
                                              F1 :    General Help
Boot Override                                 F2 :    Previous Values
PO: TS128GMSA340                              F3 :    Optimized Defaults
Windows Boot Manager  (PO: TS128GMSA340)      F4 :    Save & Exit
                                              ESC :   Exit

           Version 2.17.1255. Copyright ( C ) 2016 American Megatrends, Inc .
```

Save Changes and Exit
When users have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.

Discard Changes and Exit
Select this option to quit Setup without making any permanent changes to the system configurations and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.

Save Changes and Reset
When completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configurations take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.

Discard Changes and Reset
Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

Save Changes
When completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

Discard Changes
Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.

Restore Defaults
It automatically sets all Setup options to a complete set of default settings when users select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.

Save as User Defaults
Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.

Restore User Defaults
It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.

Boot Override
Select a drive to immediately boot that device regardless of the current boot order.

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APPENDIX A
# WATCHDOG TIMER

About Watchdog Timer

Software stability is major issue in most application. Some embedded systems are not watched by human for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us solution.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

How to Use Watchdog Timer

The I/O port base addresses of watchdog timer are 2E (hex) and 2F (hex). The 2E (hex) and 2F (hex) are address and data port respectively.

Assume that program A is put in a loop that must execute at least once every 10ms. Initialize watchdog timer with a value bigger than 10ms. If the software has no problems; watchdog timer will never expire because software will always restart the counter before it reaches zero.

```
   ┌─────────┐                        ┌─────────┐
   │  Begin  │                        │  Begin  │
   └────┬────┘                        └────┬────┘
        │ Next                             │ Next
        ▼                                  ▼
┌──────────────────┐              ┌──────────────────┐
│ Enable and       │◄──┐          │ Enable and       │
│ Initialize       │   │          │ Initialize       │
│ Watchdog Timer   │   │          │ Watchdog Timer   │
└────────┬─────────┘   │          └────────┬─────────┘
         │ Next        │                   │ Next
         ▼             │                   ▼
┌──────────────────┐   │          ┌──────────────────┐
│                  │   │          │                  │◄──┐
│  Program "A"     │   │          │  Program "A"     │   │
│                  │   │          │                  │   │
└────────┬─────────┘   │          └────────┬─────────┘   │
         │ Next        │                   │ Next        │
         ▼             │                   ▼             │
┌──────────────────┐   │          ┌──────────────────┐   │
│ Disable Watchdog │   │          │ Reset Watchdog   │   │
│ Timer            │   │          │ Timer            │   │
└────────┬─────────┘   │          └────────┬─────────┘   │
         │ Next        │                   │ Next        │
         └─────────────┘                   └─────────────┘
```
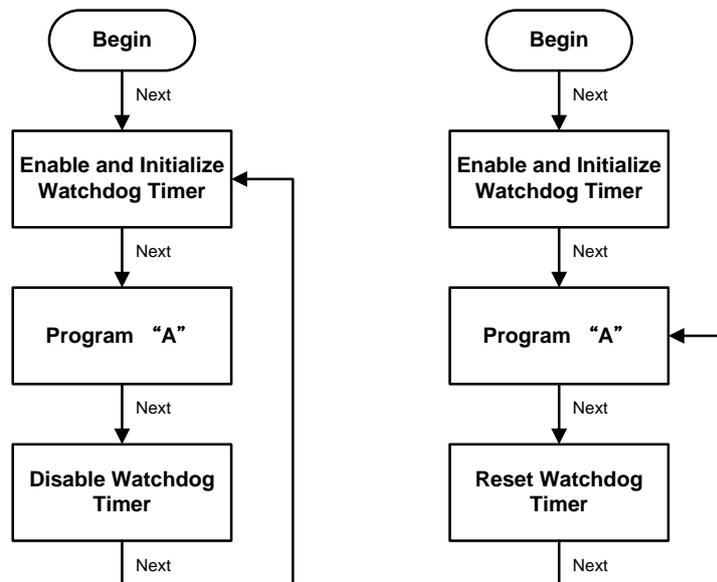
Sample Program

Assembly sample code:

```
;Enable WDT:
mov    dx,2Eh
mov    al,87          ;Un-lock super I/O
out    dx,al
out    dx,al


;Select Logic device:
mov    dx,2Eh
mov    al,07h
out    dx,al
mov    dx,2Fh
mov    al,08h
out    dx,al


;Activate WDT:
mov    dx,2Eh
mov    al,30h
out    dx,al
mov    dx,2Fh
mov    al,01h
out    dx,al


;Set Second or Minute :
mov    dx,2Eh
mov    al,0F5h
out    dx,al
mov    dx,2Fh
mov    al,Nh          ;N=00h or 08h(see below 【Note】)
out    dx,al


;Set base timer :
mov    dx,2Eh
```

```
mov    al,0F6h
out    dx,al
mov    dx,2Fh
mov    al,Mh          ;M=00h,01h,...FFh (hex),Value=0 to 255
out    dx,al          ;(see below 🔖 Note)


;Disable WDT:
mov    dx,2Eh
mov    al,30h
out    dx,al
mov    dx,2Fh
mov    al,00h         ;Can be disabled at any time
out    dx,al
```

🔖 【**Note**】:

If **N**=*00h, the time base is set to second.*

M = *time value*

00: Time-out Disable

01: Time-out occurs after 1 second

02: Time-out occurs after 2 seconds

03: Time-out occurs after 3 seconds

.

.

FFh: Time-out occurs after 255 seconds

If **N**=*08h, the time base is set to minute.*

M = *time value*

00: Time-out Disable

01: Time-out occurs after 1 minute

02: Time-out occurs after 2 minutes

03: Time-out occurs after 3 minutes

.

.

FFh: Time-out occurs after 255 minutes

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