



Intel<sup>®</sup> Socket 1151 Core<sup>™</sup> i7/ i5/ i3 / Pentium<sup>®</sup>/ Celeron<sup>®</sup> Processors ATX Industrial Motherboard

**User's Manual** 



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### **ESD** Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please take care of the following jobs with precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. To discharge static electricity from your body.
- Wear a grounding wrist strap, available from most electronic component stores, when handling boards and components.

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# Chapter 1 Introduction



The IMB520 / 521 is an advanced ATX industrial motherboard based on the 8th Generation Intel® Core™ i7/ i5/ i3/ Pentium® and Celeron® processors (Coffeelake) in an LGA1151 socket and comes with an Intel® Q370 chipset. Specially designed for optimal computing and visual performance, the IMB520 / 521 motherboard is an ideal solution for major industry applications ranging from financial modeling to designing complex buildings and vehicles. With its built-in Intel® HD Graphics GFX, this industrial grade motherboard delivers superb 3D visual performance and supports triple display through DVI-D, HDMI and VGA ports to meet professional-grade CAD and media/entertainment needs.

In addition, the IMB520 / 521 supports Intel® Turbo Boost 2.0 technology, Intel® Hyper-Threading technology, Intel® HD Graphics with DX11, 64GB DDR4 2400/2666MHz memory, and a PCI-Express 3.0 x16 slot. It also features Intel® Active Management Technology 12 (iAMT), SATA RAID, as well as PCI Express expansion interfaces, making it specifically suited for applications with added security features.

#### 1.1 Features

- LGA1151 socket 8th Generation Intel<sup>®</sup> Core<sup>™</sup> i7/i5/i3, Pentium<sup>®</sup> and Celeron<sup>®</sup> processors (Coffeelake) up to 95W
- 4 x DDR4 2400/2666MHz DIMM with maximum memory capacity up to 64GB (max. 16GB per slot)
- DVI-D, HDMI, Displayport and VGA with triple view support
- 4 x SATA-600 RAID 0/1/5/10
- 2 x USB3.1 (Gen2), 4 x USB 3.1 (Gen1) and 7 x USB 2.0 ports

## 1.2 Specifications

- CPU
  - LGA1151 Socket 8<sup>th</sup> Generation Intel<sup>®</sup> Core<sup>™</sup> i7/ i5/ i3, Pentium<sup>®</sup> and Celeron<sup>®</sup> processor.
- Chipset
  - Intel<sup>®</sup> Q370. (IMB520)
  - Intel<sup>®</sup> C246. (IMB521)
- BIOS
  - AMI BIOS.
- System Memory
  - Q370:
    - ➤ 4 x 288-pin DIMM sockets.
    - Maximum 64GB DDR4 memory (max. 16GB per slot).
    - Supports 2400/2666MHz.
  - C246:
    - 4 x 288-pin DIMM sockets.
    - Maximum 64GB DDR4 memory (max. 16GB per slot).
    - Supports 2400/2666MHz.
    - Supports the memory with ECC function.
- Onboard Multi I/O
  - 1 x PS/2 keyboard and mouse.
  - Six serial ports:
    - 4 x RS-232 (internal box headers).
    - 2 x RS-232/422/485 (one in rear I/O, and the other in internal box header).

#### USB Interface

- 2 x USB3.1(Gen2) ports.
- 4 x USB 3.1(Gen1) ports.
- 7 x USB 2.0 ports.
- Ethernet
  - LAN1: 1000/100/10Mbps Gigabit/Fast Ethernet supports Wake-on-LAN, PXE Boot ROM, iAMT with Intel<sup>®</sup> i219LM.
  - LAN2: 1000/100/10Mbps Gigabit/Fast Ethernet supports Wake-on-LAN, PXE Boot ROM with Intel<sup>®</sup> i211AT.

- Serial ATA
  - 4 x SATAIII with RAID 0/1/5/10.
- Audio
  - Realtek ALC662 HDA Codec.
  - Supports MIC-in/line-in/line-out.
- Display
  - 1 x 15-pin D-Sub as VGA connector. Resolution max. up to 1920x1200 @60Hz.
  - 1 x HDMI 1.4b with max. resolution up to 4096x2160 @24Hz.
  - 1 x Displayport with max. resolution up to 4096 x 2304 @60Hz, Do not supports DP++.
  - 1 x DVI-D with resolution max. up to 1920×1200 @60Hz.

#### • Expansion Interface

- 1 x PCI-Express x16 slot.
- 4 x PCI-Express x4 slots.
- 1 x PCI-Express x1 slots.
- 1 x PCI slots.

#### • Power Input

- 1 x ATX power input connector.
- 1 x 12V ATX power input connector for CPU Power.
- Operating Temperature
  - 0°C ~ 60°C.
- Storage Temperature
  - -20°C ~ 75°C.
- Form Factor
  - 305 x 244mm.



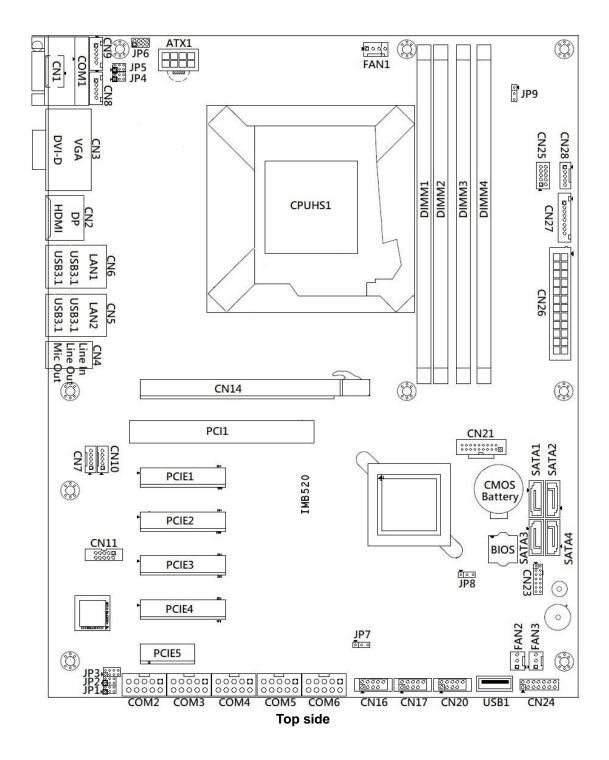
All specifications and images are subject to change without notice.

#### **Packing list** 1.3

- •
- Bulk packing 1 x Motherboard
  - 1 x I/O bracket
- Gift box •
  - 1 x Motherboard
  - 1 x I/O bracket
  - 1 x Driver DVD

# Chapter 2 Board and Pin Assignments

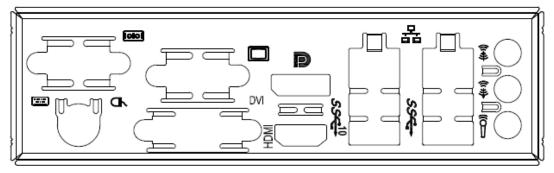
# 2.1 Board Layout



## 2.2 Rear I/O

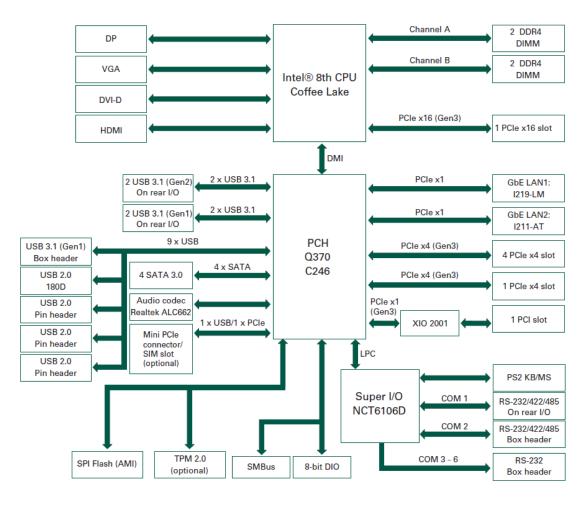


### I/O side



I/O bracket

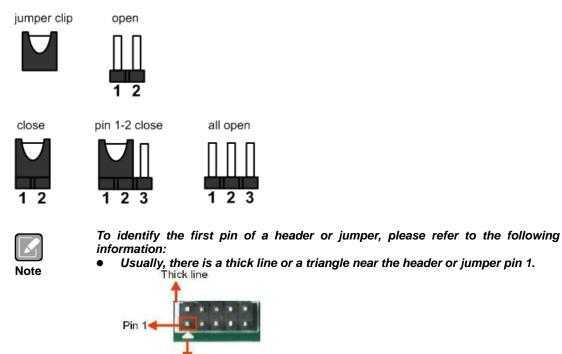
# 2.3 Block Diagram



# 2.4 Jumper Settings

#### Pin description

A jumper is a small component consisting of a jumper clip and jumper pins. Install a jumper clip on two jumper pins to close the jumper pins. Remove the jumper clip from two jumper pins to open the jumper pins. The following illustration shows how to set up a jumper.



The triangle

• A square pad, which you can find on the back of the motherboard, is usually used for pin 1.



Before applying power to the IMB520 / 521 series, make sure all of the jumpers are in factory default position. Below you can find a summary table of all jumpers and onboard default settings.



Turn off power before changing any default jumper settings.

| Jumper   | Description  | Setting        |
|----------|--|----------------|
| JP8      | Clear CMOS<br>Default: Normal Operation  | 1-2 Close      |
| JP9      | AT/ATX Power Mode Select<br>Default: ATX Mode  | 2-3 Close      |
| JP3, JP6 |  | 1-2 Close      |
| JP1, JP2 | COM1/2 RS-232/422/485 Mode Select<br>Default: RS-232   | 3-5, 4-6 Close |
| JP4, JP5 | Derault. NO-232  | 3-5, 4-6 Close |
| JP7      | System Temperature Sensor Source Select<br>Default: Internal Sensor<br>External Sensor can be installed on 2-3 | 1-2 Close      |

#### 2.4.1 Clear CMOS (JP8)

This jumper (3x1-pin p=2.54mm) allows you to clear the Real Time Clock (RTC) RAM in CMOS. You 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, 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.

| Function                   | Setting   | 1 |
|----------------------------|-----------|---|
| Normal operation (Default) | 1-2 close | 2 |
| Clear CMOS                 | 2-3 close | 3 |

#### 2.4.2 AT/ATX Mode Select (JP9)

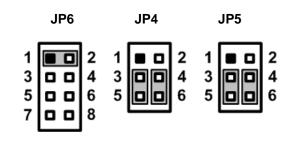
This 3x1-pin p=2.54mm jumper allows you to select AT or ATX power mode.

| Function           | Setting   |
|--------------------|-----------|
| AT mode            | 1-2 close |
| ATX mode (Default) | 2-3 close |

#### 2.4.3 COM1 Mode Select (JP4, JP5, JP6)

Use these jumpers (3x2-pin p=2.54mm) to set COM1 port to operate in RS-232, RS-422 or RS-485 communication mode.

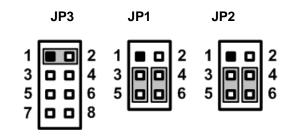
| Function                 | Setting  |
|--------------------------|--|
| RS-232 mode<br>(Default) | JP6 1-2 close<br>JP4 3-5, 4-6 close<br>JP5 3-5, 4-6 close      |
| RS-422 mode              | JP6 3-4, 7-8 close<br>JP4 1-3, 2-4 close<br>JP5 1-3, 2-4 close |
| RS-485 mode              | JP6 5-6, 7-8 close<br>JP4 1-3, 2-4 close<br>JP5 1-3, 2-4 close |



## 2.4.4 COM2 Mode Select (JP1, JP2, JP3)

Use these jumpers (3x2-pin p=2.54mm) to set COM1 port to operate in RS-232, RS-422 or RS-485 communication mode.

| Function                 | Setting  |
|--------------------------|--|
| RS-232 mode<br>(Default) | JP3 1-2 close<br>JP1 3-5, 4-6 close<br>JP2 3-5, 4-6 close      |
| RS-422 mode              | JP3 3-4, 7-8 close<br>JP1 1-3, 2-4 close<br>JP2 1-3, 2-4 close |
| RS-485 mode              | JP3 5-6, 7-8 close<br>JP1 1-3, 2-4 close<br>JP2 1-3, 2-4 close |



#### 2.4.5 Temperature Sensor Source Select (JP7)

Use these jumpers (3x1-pin p=2.54mm) to set temperature sensor source to operate form external or onboard mode.

| Function                | Setting   |
|-------------------------|-----------|
| Onboard Sensor(Default) | 1-2 close |
| External Sensor         | 2-3 close |

| 1 |  |
|---|--|
| 2 |  |
| 3 |  |
|   |  |

| ſ |      |
|---|------|
|   |      |
|   |      |
| N | lote |

An external sensor can be installed at 2-3.

# 2.5 Connectors

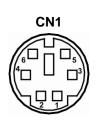
Signals go to other parts of the system through connectors. Loose or improper connection might cause problems, Make sure all connectors are properly and firmly connected. Here is a summary table showing the connectors on the hardware.

| Connector        | Description                        |
|------------------|------------------------------------|
| CN1              | PS/2 KB/MS Connector               |
| CN2              | DP/HDMI Connector                  |
| CN3              | DVI-D/ VGA Connector               |
| CN4              | Audio Jack                         |
| CN5              | RJ45 + USB3.1 GEN1 Connector       |
| CN6              | RJ45 (iAMT)+ USB3.1 GEN2 Connector |
| CN8, CN9         | Internal PS/2 KB/MS Connector      |
| CN11             | Front Audio Header                 |
| CN14             | PCI-Express x16 Slots              |
| PCIe1 ~ PCIe4    | PCI-Express x4 Slots               |
| PCI1             | PCI Slots                          |
| PCIe5            | PCI-Express x1 Slots               |
| CN15             | External Sensor Connector          |
| CN16, CN17, CN20 | Internal USB2.0 Headers            |
| CN21             | Internal USB3.1 GEN1 Connector     |
| CN23             | TPM 2.0 Connector (Optional)       |
| CN24             | Front Panel Header                 |
| CN25             | DIO Connector                      |
| CN26             | 24-pin Power Input Connector       |
| CN27             | Voltage Monitor Header             |
| CN28             | SMBus Header                       |
| ATX1             | CPU Power Input Connector          |
| COM1             | Comport Connector                  |
| COM2 ~ COM6      | Comport Box Header                 |
| FAN1             | CPU Fan Connector                  |
| FAN2, FAN3       | System Fan Connectors              |
| PCI1 ~ PCI4      | PCI Slots                          |
| SATA1 ~ SATA4    | SATA III Connector                 |

#### 2.5.1 Keyboard and PS/2 Mouse Connector (CN1)

The board supports a keyboard and mouse interface. Connector CN1 is a DIN connector for PS/2 keyboard connection via a Y-Cable.

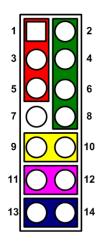
| Pin | Signal         |
|-----|----------------|
| 1   | Keyboard Data  |
| 2   | Mouse Data     |
| 3   | GND            |
| 4   | VCC            |
| 5   | Keyboard Clock |
| 6   | Mouse Clock    |



#### 2.5.2 Front Panel Header (CN24)

This is a front panel header (7x2-pin p=2.54mm).

| Pin | Signal              |
|-----|---------------------|
| 1   | Power LED+          |
| 2   | SPK- <sup>[*]</sup> |
| 3   | GND                 |
| 4   | BUZZER              |
| 5   | Power LED-          |
| 6   | N/C                 |
| 7   | N/C                 |
| 8   | SPK+ <sup>[*]</sup> |
| 9   | PWR-                |
| 10  | PWR+                |
| 11  | RESET-              |
| 12  | RESET+              |
| 13  | HD LED-             |
| 14  | HD LED+             |





<sup>[\*]</sup>: The buzzer on the motherboard will be active when pin 2 and pin 4 are connected; the external speaker on the chassis will be active when pin 2 and pin 4 are open.

#### 2.5.3 **GPIO Header (CN25)**

This header (5x2-pin p=2.00mm) is for digital I/O interface.

| Pin | Signal | Pin | Signal | 1 | 3 | 5 | 7 | 9  |
|-----|--------|-----|--------|---|---|---|---|----|
| 1   | DIO1   | 2   | DIO8   |   |   |   |   | 0  |
| 3   | DIO2   | 4   | DIO7   | 0 | 0 | 0 | 0 | 0  |
| 5   | DIO3   | 6   | DIO6   | 2 | 4 | 6 | 8 | 10 |
| 7   | DIO4   | 8   | DIO5   |   |   |   |   |    |
| 9   | NC     | 10  | GND    |   |   |   |   |    |



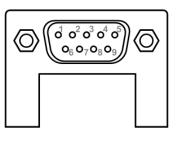
The default value of DIO1 to DIO8 is set as GPI with high level.

Note

#### **COM1 Connector (COM1)** 2.5.4

This is a high rise 9-pin D-Sub connector for COM1 serial port interface. The pin assignments of RS-232/422/485 are listed in the table below.

| Pin | RS-232 <sup>[*]</sup> | RS-422 <sup>[*]</sup> | RS-485 <sup>[*]</sup> |
|-----|-----------------------|-----------------------|-----------------------|
| 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   | RI#                   | N/C                   | N/C                   |



|   |    | 2 |
|---|----|---|
| l |    | 1 |
|   | No | - |

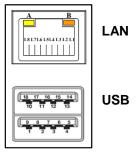
<sup>[']</sup>: Signals of COM1 can be RS-232/422/485 by selecting JP4, JP5 and JP6 (see section 2.4.3).

#### 2.5.5 LAN and USB 3.1 Connectors (CN5 and CN6)

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 1000/100/10 Base-T hub.

The Universal Serial Bus (compliant with USB 3.1 Gen2 (CN6) or USB3.1 Gen1 (CN5) connectors on the rear I/O are for installing USB peripherals such as a keyboard, mouse, scanner, etc.

| Pin | LAN Signal  | Pin | LAN Signal                       | <b></b>  |
|-----|---|-----|----------------------------------|--|
| L1  | Tx+ (Data<br>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<br>Base-T only)                    | L6  | Rx- (Data reception<br>negative) |  |
| L7  | RJ-1 (For 1000<br>Base-T only)                    | L8  | RJ-1 (For 1000 Base-T only)      | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
| A   | 100 LAN LED (Green)<br>/ 1000 LAN LED<br>(Orange) | В   | Active LED                       |  |





• Speed LED turns orange for 1000Mbps or green for 100Mbps. The light is off for 10Mbps.

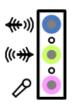
• CN6 supports AMT and USB3.1 GEN 2 when the chipset is customized into Intel® Q370 & C246. Both CN5 and CN6 support Wake-on-LAN.

| Pin | USB Signal  | Pin | USB Signal  |
|-----|-------------|-----|-------------|
| 1   | USB3_POWER  | 2   | USB1 -      |
| 3   | USB1 +      | 4   | GND         |
| 5   | USB3_SSRX1- | 6   | USB3_SSRX1+ |
| 7   | GND         | 8   | USB3_SSTX1- |
| 9   | USB3_SSTX1+ | 10  | USB3_POWER  |
| 11  | USB2 -      | 12  | USB2 +      |
| 13  | GND         | 14  | USB3_SSRX2- |
| 15  | USB3_SSRX2+ | 16  | GND         |
| 17  | USB3_SSTX2- | 18  | USB3_SSTX2+ |

#### 2.5.6 Audio Jack (CN4)

Install an audio driver, and then attach audio devices to CN4.

| Pin Color | Signal   |
|-----------|----------|
| Blue      | Line-in  |
| Green     | Line-out |
| Pink      | MIC-in   |

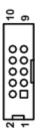


Note

### 2.5.7 Front Audio Header (CN11)

This is a front audio header (5x2-pin p=2.00mm) for convenient connection and control of audio devices.

| Pin | Signal    | Pin | Signal |
|-----|-----------|-----|--------|
| 1   | MIC_IN    | 2   | GND    |
| 3   | LINE_IN_L | 4   | GND    |
| 5   | LINE_IN_R | 6   | GND    |
| 7   | AUD_OUT_L | 8   | GND    |
| 9   | AUD_OUT_R | 10  | GND    |

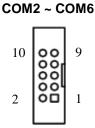


### 2.5.8 COM Headers (COM2 ~ COM6)

The motherboard comes with 5x2-pin p=2.54mm headers for COM2~COM6 serial port interfaces.

#### COM2~COM6:

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1   | DCD#   | 2   | DSR#   |
| 3   | RXD#   | 4   | RTS#   |
| 5   | TXD#   | 6   | CTS#   |
| 7   | DTR#   | 8   | RI#    |
| 9   | GND    | 10  | N/C    |



## 2.5.9 External Sensor Header (JP7)

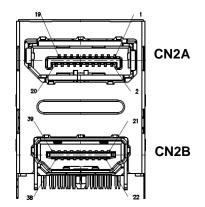
The external sensor header is an 1x3-pin p=2.54mm header. The function of JP7 is to connect an external sensor.

| Pin | Signal   | 1 |
|-----|----------|---|
| 1   | Sys_Temp | 2 |
| 2   | GND      | 3 |

#### 2.5.10 DisplayPort and HDMI Connector (CN2)

CN2 is a double-deck connector comprising an upper connector for DisplayPort (CN2A) and a lower connector for HDMI (CN2B).

| Pin | Signal          | Pin | Signal          |
|-----|-----------------|-----|-----------------|
| 1   | LANE 0          | 21  | DATA2           |
| 2   | GND             | 22  | GND             |
| 3   | LANE 0#         | 23  | DATA2#          |
| 4   | LANE 1          | 24  | DATA1           |
| 5   | GND             | 25  | GND             |
| 6   | LANE 1#         | 26  | DATA1#          |
| 7   | LANE 2          | 27  | DATA0           |
| 8   | GND             | 28  | GND             |
| 9   | LANE 2#         | 29  | DATA1#          |
| 10  | LANE 3          | 30  | Clock           |
| 11  | GND             | 31  | GND             |
| 12  | LANE 3#         | 32  | Clock#          |
| 13  | Detect Pin      | 33  | NC              |
| 14  | GND             | 34  | NC              |
| 15  | AUX CH          | 35  | SCL             |
| 16  | GND             | 36  | SDA             |
| 17  | AUX CH#         | 37  | GND             |
| 18  | Hot Plug Detect | 38  | +5V POWER       |
| 19  | GND             | 39  | Hot Plug Detect |
| 20  | DP_PWR(3.3V)    |     |                 |



#### 2.5.11 Internal USB Headers (CN16~CN17, CN20, USB1)

These are 5x2-pin p=2.54mm headers for USB 2.0 interface.

| Pin | Signal        | Pin | Signal        |
|-----|---------------|-----|---------------|
| 1   | +5 V_DUAL     | 2   | +5 V_DUAL     |
| 3   | USB 5, 7, 12- | 4   | USB 6, 8, 13- |
| 5   | USB 5, 7, 12+ | 6   | USB 6, 8, 13+ |
| 7   | GND           | 8   | GND           |
|     |               | 10  | GND           |

| 1 |    | 2  |
|---|----|----|
| 3 | 00 | 4  |
| 5 | 00 | 6  |
| 7 | 00 | 8  |
|   | 0  | 10 |

The USB1 is a Type-A 180D connector for USB2.0 signal.

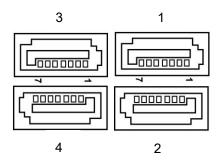
| Pin | Signal   |
|-----|----------|
| 1   | +5V_DUAL |
| 2   | USB-     |
| 3   | USB+     |
| 4   | GND      |



#### 2.5.12 SATA 3.0 Connectors (SATA1 ~ SATA4)

These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for SATA 3.0 interface allowing up to 6.0Gb/s data transfer rate. It is a computer bus interface for connecting to devices such as hard disk drive.

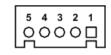
| Pin | Signal   |
|-----|----------|
| 1   | GND      |
| 2   | SATA_TX+ |
| 3   | SATA_TX- |
| 4   | GND      |
| 5   | SATA_RX- |
| 6   | SATA_RX+ |
| 7   | GND      |



#### 2.5.13 SMBus Header (CN28)

The CN28 (5x1-pin p=2.00mm) is for SMBus (System Management Bus) interface.

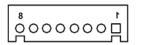
| Pin | Signal  | Pin | Signal  |
|-----|---------|-----|---------|
| 1   | SMB_SCL | 2   | N/C     |
| 3   | GND     | 4   | SMB_SDA |
| 5   | +5V     |     |         |



#### 2.5.14 Voltage Monitor Header (CN27)

The function of CN27 (8x1-pin p=2.54mm) is for voltage monitoring. It doesn't supply power.

| Pin | Signal  | Pin | Signal |
|-----|---------|-----|--------|
| 1   | GND     | 2   | GND    |
| 3   | VCC5_SB | 4   | +3.3V  |
| 5   | -5V     | 6   | +5V    |
| 7   | -12V    | 8   | +12V   |



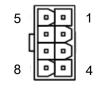
#### 2.5.15 Power Input Connectors (ATX1 and CN26)

Steady and sufficient power can be supplied to all components on the motherboard by connecting the power connector. Please make sure all components and devices are properly installed before connecting the power connector.

An external power supply plug fits into ATX1 and CN26 in only one orientation. Properly press down power supply plug until it completely and firmly fits into the connector. Loose connection may cause system instability.

| Pin | ATX1 Signal | Pin | ATX1 Signal |
|-----|-------------|-----|-------------|
| 1   | GND         | 5   | +12V        |
| 2   | GND         | 6   | +12V        |
| 3   | GND         | 7   | +12V        |
| 4   | GND         | 8   | +12V        |





CN26 24-pin power input connector:

| Pin | CN26 Signal | Pin | CN26 Signal |
|-----|-------------|-----|-------------|
| 1   | 3.3V        | 13  | 3.3V        |
| 2   | 3.3V        | 14  | -12V        |
| 3   | GND         | 15  | GND         |
| 4   | +5V         | 16  | PS_ON       |
| 5   | GND         | 17  | GND         |
| 6   | +5V         | 18  | GND         |
| 7   | GND         | 19  | GND         |
| 8   | PWR OK      | 20  | -5V         |
| 9   | 5VSB        | 21  | +5V         |
| 10  | +12V        | 22  | +5V         |
| 11  | +12V        | 23  | +5V         |
| 12  | 3.3V        | 24  | GND         |

| 24 |        |   |   | _ |          |         |   |   | 13       |
|----|--------|---|---|---|----------|---------|---|---|----------|
|    | •<br>• | • | • | • | <b>_</b> | <u></u> | • | • | <u>.</u> |
| 12 |        |   |   |   |          |         |   |   | 1        |

# 2.5.16 PCI-Express x4 Slots (PCIe1~PCIe4)

This motherboard has two PCI-Express x4 slots.

| Pin | Signal                | Pin | Signal              |
|-----|-----------------------|-----|---------------------|
| B1  | +12V_PS               | A1  | GND                 |
| B2  | +12V_PS               | A2  | +12V_PS             |
| B3  | +12V_PS               | A3  | +12V_PS             |
| B4  | GND                   | A4  | GND                 |
| B5  | SMB_CLK_RESUME        | A5  | N/C                 |
| B6  | SMB_DATA_RESUME       | A6  | N/C                 |
| B7  | GND                   | A7  | N/C                 |
| B8  | +3.3V_PS              | A8  | N/C                 |
| B9  | N/C                   | A9  | +3.3V_PS            |
| B10 | +3.3V_SB              | A10 | +3.3V_PS            |
| B11 | PCH_WAKE_N            | A11 | PWRGD               |
| B12 | N/C                   | A12 | GND                 |
| B13 | GND                   | A13 | CLKOUT_PCIE_P5      |
| B14 | PCIE1_SLOT1_TX_DP_C   | A14 | CLKOUT_PCIE_N5      |
| B15 | PCIE1_SLOT1_TX_DN_C   | A15 | GND                 |
| B16 | GND                   | A16 | PCIE1_SLOT1_RX_DP_C |
| B17 | PCIEX4_SLOT1_PRSNT2_N | A17 | PCIE1_SLOT1_RX_DN_C |
| B18 | GND                   | A18 | GND                 |
| B19 | PCIE2_TX_DP           | A19 | N/C                 |
| B20 | PCIE2_TX_DN           | A20 | GND                 |
| B21 | GND                   | A21 | PCIE2_RX_DP         |
| B22 | GND                   | A22 | PCIE2_RX_DN         |
| B23 | PCIE3_TX_DP           | A23 | GND                 |
| B24 | PCIE3_TX_DN           | A24 | GND                 |
| B25 | GND                   | A25 | PCIE3_RX_DP         |
| B26 | GND                   | A26 | PCIE3_RX_DN         |
| B27 | PCIE4_TX_DP           | A27 | GND                 |
| B28 | PCIE4_TX_DN           | A28 | GND                 |
| B29 | GND                   | A29 | PCIE4_RX_DP         |
| B30 | N/C                   | A30 | PCIE4_RX_DN         |
| B31 | N/C                   | A31 | GND                 |
| B32 | GND                   | A32 | N/C                 |

### 2.5.17 PCI-Express x1 Slots (PCIe5)

This motherboard has two PCI-Express x1 slots.

| Pin | Signal             | Pin | Signal             |
|-----|--------------------|-----|--------------------|
| B1  | +12V_PS            | A1  | GND                |
| B2  | +12V_PS            | A2  | +12V_PS            |
| B3  | +12V_PS            | A3  | +12V_PS            |
| B4  | GND                | A4  | GND                |
| B5  | SMB_CLK_RESUME     | A5  | N/C                |
| B6  | SMB_DATA_RESUME    | A6  | N/C                |
| B7  | GND                | A7  | N/C                |
| B8  | +3.3V_PS           | A8  | N/C                |
| B9  | N/C                | A9  | +3.3V_PS           |
| B10 | +3.3V_SB           | A10 | +3.3V_PS           |
| B11 | PCH_WAKE_N         | A11 | PWRGD              |
| B12 | N/C                | A12 | GND                |
| B13 | GND                | A13 | CLKOUT_PCIE_P8     |
| B14 | PCIE5_SLOT_TX_DP_C | A14 | CLKOUT_PCIE_N8     |
| B15 | PCIE5_SLOT_TX_DN_C | A15 | GND                |
| B16 | GND                | A16 | PCIE5_SLOT_RX_DP_C |
| B17 | N/C                | A17 | PCIE5_SLOT_RX_DN_C |
| B18 | GND                | A18 | GND                |

#### 2.5.18 Fan Connectors (FAN1~FAN3)

This motherboard has three fan connectors. Find fan speed option(s) at BIOS Setup Utility: Advanced\HW Monitor\PC Health Status.

The FAN1 (4x1-pin p=2.54mm) is for the the CPU fan connector.

| Pin | Signal              |
|-----|---------------------|
| 1   | GND                 |
| 2   | +12V                |
| 3   | FAN Speed Detection |
| 4   | FAN Speed Control   |

| 1 |       |  |
|---|-------|--|
|   | l o l |  |
| 4 |       |  |
| 4 | Ů,    |  |

າດ

The FAN2 and FAN3 (4x1-pin p=2.54mm) are for system fan connectors.

| Pin | Signal              |
|-----|---------------------|
| 1   | GND                 |
| 2   | +12V                |
| 3   | FAN Speed Detection |

20

#### Internal USB 3.1 Gen1 Connector (CN21) 2.5.19

The CN21 is a 19-pin internal connector for installing versatile USB 3.1 compliant peripherals.

| Pin | Signal | Pin | Signal | 1000  |   |   |
|-----|--------|-----|--------|-------|---|---|
| 1   | VBUS0  |     |        | 16    |   |   |
| 2   | SSRX5- | 19  | VBUS1  |       |   |   |
| 3   | SSRX5+ | 18  | SSRX6- |       |   | ٠ |
| 4   | GND    | 17  | SSRX6+ |       | • | • |
| 5   | SSTX5- | 16  | GND    | E     |   | : |
| 6   | SSTX5+ | 15  | SSTX6- |       |   |   |
| 7   | GND    | 14  | SSTX6+ |       | • | • |
| 8   | USB10- | 13  | GND    |       | ٠ | ٠ |
| 9   | USB10+ | 12  | USB11- | →[[   | • | _ |
| 10  | ID     | 11  | USB11+ | 0.2-2 |   |   |

#### 2.5.20 VGA and DVI-D Connector (CN3)

CN3 is a double-deck connector comprising an lower connector for DVI-D port and a upper connector for VGA port.

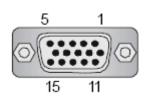
The high rise DVI-D connector provides transmission of fast and high quality video signals between a source device (graphic card) and a display device (monitor).

| Pin | Signal       | Pin | Signal      |
|-----|--------------|-----|-------------|
| 1   | TX2-         | 2   | TX2+        |
| 3   | Ground       | 4   | NC          |
| 5   | NC           | 6   | DVI_SPD_CLK |
| 7   | DVI_SPD DATA | 8   | NC          |
| 9   | TX1-         | 10  | TX1+        |
| 11  | Ground       | 12  | NC          |
| 13  | NC           | 14  | VGAVCC      |
| 15  | Ground       | 16  | HPDETECT    |
| 17  | TX0-         | 18  | TX0+        |
| 19  | Ground       | 20  | NC          |
| 21  | NC           | 22  | Ground      |
| 23  | TXC+         | 24  | TXC-        |

|     | _  |    |    |    |    |    |    |    |                     |
|-----|----|----|----|----|----|----|----|----|---------------------|
|     | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |                     |
| KO) | 9  | 10 |    | 12 | 13 | 14 | 15 | 10 | $\langle O \rangle$ |
|     | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | ${\bf \Box}$        |

The 15-pin D-Sub connector is commonly used for VGA display.

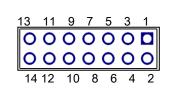
| Pin | Signal          | Pin | Signal        |
|-----|-----------------|-----|---------------|
| 1   | Red             | 2   | Green         |
| 3   | Blue            | 4   | NC            |
| 5   | GND             | 6   | GND           |
| 7   | GND             | 8   | GND           |
| 9   | VCC             | 10  | GND           |
| 11  | NC              | 12  | DDC DATA      |
| 13  | Horizontal Sync | 14  | Vertical Sync |
| 15  | DDC CLK         |     |               |



#### 2.5.21 TPM Pin Header (CN23)

These are 7x2-pin p=2.0mm headers for SPI interface with an AX93515 TPM module.

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1   | VCC3P3 | 2   | GND    |
| 3   | MOSI   | 4   | MISO   |
| 5   | CLK    | 6   | CS2    |
| 7   | RST    | 8   | PIRQ   |
| 9   | PP     | 10  | NC     |
| 11  | NC     | 12  | NC     |
| 13  | NC     | 14  | MC     |





The screw type is M2\*0.4.

#### 2.5.22 Internal Mouse Connector (CN9)

The internal mouse (PS/2 type) interface is available through a 5-pin connector.

| Pin | Signal      |
|-----|-------------|
| 1   | Mouse Clock |
| 2   | Mouse Data  |
| 3   | NC          |
| 4   | GND         |
| 5   | +5V level   |

| сh | 4 | ω | N | -        |
|----|---|---|---|----------|
| 2  | 0 | 0 | 0 | <u>,</u> |

#### 2.5.23 Internal Keyboard Connector (CN8)

The internal keyboard (PS/2 type) interface is available through a 5-pin connector.

| Pin | Signal         |
|-----|----------------|
| 1   | Keyboard Clock |
| 2   | Keyboard Data  |
| 3   | NC             |
| 4   | GND            |
| 5   | +5V level      |

| сл | 4 | ω | N | - |
|----|---|---|---|---|
| Q  | 0 | 0 | 0 | 밁 |

# Chapter 3 Hardware Description

# 3.1 Microprocessors

The IMB520 / 521 series supports Intel<sup>®</sup> Core<sup>™</sup> i7/ i5/ i3, Pentium<sup>®</sup> and Celeron<sup>®</sup> processors, which enable your system to operate under Windows<sup>®</sup> 10 and Linux environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for your installed microprocessor to prevent the CPU from damages.



Caution: Make sure turnoff power supply, before you install the processor into the CPU socket.

# 3.2 BIOS

The IMB520 / 521 series uses AMI Plug and Play BIOS.

# 3.3 System Memory

The IMB520 / 521 supports four 288-pin DDR4 DIMM sockets for maximum memory capacity up to 64GB DDR4 SDRAMs. The memory module comes in sizes of 2GB, 4GB, 8GB and 16GB.

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# Chapter 4 AMI BIOS Setup Utility

The AMI UEFI BIOS provides users with a built-in setup program to modify basic system configuration. All configured parameters are stored in a flash chip to save the setup information whenever the power is turned off. This chapter provides users with detailed description about how to set up basic system configuration through the AMI BIOS setup utility.

# 4.1 Starting

To enter the setup screens, follow the steps below:

- 1. Turn on the computer and press <Del> during the Power On Self Test (POST) to enter BIOS setup, otherwise, POST will continue with its test routines.
- Once you enter the BIOS, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as the Advanced and Chipset menus.

| ٢ | 1  | 2  |
|---|----|----|
| I | Ľ  | 1  |
| U |    | -  |
| N | lo | te |

*If your computer cannot boot after making and saving system changes with BIOS setup, you can restore BIOS optimal defaults by setting JP8 (see section 2.4.1).* 

It is strongly recommended that you should avoid changing the chipset's defaults. Both AMI and your 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.

| 1 |
|---|
|   |
| 1 |
|   |

Some of the navigation keys differ from one screen to another.

| Hot Keys      | Description   |
|---------------|---|
| →← Left/Right | The Left and Right < Arrow> keys allow you to select a setup screen.  |
| ↑↓ Up/Down    | The Up and Down <arrow> keys allow you to select a setup screen or sub screen.</arrow>  |
| Enter         | The <enter> key allows you to display or change the setup option listed for a particular setup item. The <enter> key can also allow you to display the setup sub screens.</enter></enter> |
| +– Plus/Minus | The Plus and Minus <arrow> keys allow you to change the field value of a particular setup item.</arrow>   |
| F1            | The <f1> key allows you to display the General Help screen.</f1>  |
| F2            | The <f2> key allows you to Load Previous Values.</f2>   |
| F3            | The <f3> key allows you to Load Optimized Defaults.</f3>  |
| F4            | The <f4> key allows you to save any changes you have made and exit Setup.<br/>Press the <f4> key to save your changes.</f4></f4>  |
| Esc           | The <esc> key allows you to discard any changes you have made and exit the Setup. Press the <esc> key to exit the setup without saving your changes.</esc></esc>                          |

## 4.3 Main Menu

When you first enter the setup utility, you will enter the Main setup screen. You 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 shown below.

| Main Advanced Chipset Secur:   | :y − Copyright (C) 2018 Ameriα<br>ty Boot Save & Exit                                       | can Megatrends, Inc.   |
|--|---|--|
| BIDS Information<br>Project Version<br>Build Date and Time<br>System Date<br>System Time<br>Access Level | IMB520 V1.00 Q370<br>12/22/2018 14:23:06<br>[Sun 12/23/2018]<br>[O0:58:55]<br>Administrator | Set the Date. Use Tab to<br>switch between Date elements.<br>Default Ranges:<br>Year: 2005–2099<br>Months: 1–12<br>Days: dependent on month                                    |
|  |   | ++: Select Screen<br>f4: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |

#### **BIOS Information**

Display the BIOS 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:

- ACPI Settings
- Trusted Computing
- ► Platform Misc Configuration
- CPU Configuration
- SATA and RST Configuration
- NCT6106D Super IO Configuration
- NCT6106D Hardware Monitor
- PCH-FW configuration
- ► AMT configuration
- USB Configuration
- PCI Subsystem Settings
- CSM Configuration
- Serial Port Console Redirection

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

| Aptio Setup Utility – Copyright (C) 2018 American<br>Main Advanced Chipset Security Boot Save & Exit   | Megatrends,   | Inc.  |
|--|---|---|
| <ul> <li>ACPI Settings</li> <li>Trusted Computing</li> <li>Platform Misc Configuration</li> <li>CPU Configuration</li> <li>SATA And RST Configuration</li> <li>NCT6106D Super ID Configuration</li> <li>NCT6106D HW Monitor</li> <li>PCH-FW Configuration</li> <li>AMT Configuration</li> <li>USB Configuration</li> <li>PCI Subsystem Settings</li> <li>CSM Configuration</li> <li>Serial Port Console Redirection</li> </ul> | System ACPI<br>++: Select S<br>11: Select S<br>Enter: Select<br>+/-: Change<br>F1: General<br>F2: Previous<br>F3: Optimize<br>F4: Save & f<br>ESC: Exit | Screen<br>Item<br>ct<br>Opt.<br>Help<br>s Values<br>ed Defaults |
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#### • ACPI Settings

This screen shows ACPI Settings.

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|--------------------------------|--------------------|----------------|---|
| ACPI Settings                  |                    |                | Select the highest ACPI sleep<br>state the system will enter  |
| ACPI Sleep State               | [S3 (Suspend       | to RAM)]       | when the SUSPEND button is pressed.   |
|                                |                    |                | <pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| Version 2.20.1271              | . Copyright (C) 20 | 18 American Me | egatrends, Inc.   |

#### ACPI Sleep State

Select the ACPI (Advanced Configuration and Power Interface) sleep state. Configuration options are Suspend Disabled and S3 (Suspend to RAM). The default is S3 (Suspend to RAM). This option selects the ACPI sleep state the system will enter when the suspend button is pressed.

#### **AMT BIOS Features**

Enable or disable Active Management Technology BIOS features. The default is Enabled.

| Aptio Setup<br>Advanced | ) Utility – Copyright (C) 2018 America | n Megatrends, Inc.   |
|-------------------------|--|--|
| AMT BIOS Features       | [Enabled]                              | When disabled AMT BIOS<br>Features are no longer<br>supported and user is no<br>longer able to access MEBx<br>Setup.<br>Note:<br>This option does not disable<br>Manageability Features in FW. |
|                         |  | <pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>                          |
| Version 2.              | 20.1271. Copyright (C) 2018 American   | Megatrends, Inc.   |

#### • Trusted Computing

Enable or disable security device support.

| Aptio Setup Utility<br>Advanced                                      | – Copyright (C) 2018 Am | merican Megatrends, Inc.  |
|--|-------------------------|---|
| Configuration<br>Security Device Support<br>NO Security Device Found | [Disable]               | Enables or Disables BIOS<br>support for security device.<br>O.S. will not show Security<br>Device. TCG EFI protocol and<br>INT1A interface will not be<br>available.  |
|  |                         | <pre>++: Select Screen fl: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
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#### CPU Configuration

This screen shows CPU information, and you can change the value of the selected option.

| Aptio Setup Utility<br>Advanced  | – Copyright (C) 2018 America  | an Megatrends, Inc.  |
|--|---|--|
| CPU Configuration  |   | To turn on/off the MLC streamer prefetcher.  |
| Type<br>ID<br>Speed<br>L1 Data Cache<br>L1 Instruction Cache<br>L2 Cache<br>L3 Cache<br>L4 Cache                   | Intel(R) Core(TM)<br>i7-8700 CPU @ 3.20GHz<br>0x906EA<br>3200 MHz<br>32 KB × 6<br>32 KB × 6<br>256 KB × 6<br>12 MB<br>N/A | streamer prefetcher.   |
| VMX<br>SMX/TXT   | Supported<br>Supported  |  |
| Hardware Prefetcher<br>Adjacent Cache Line Prefetch<br>Hyper-Threading<br>Intel (VMX) Virtualization<br>Technology | [Enabled]<br>[Enabled]<br>[Enabled]<br>[Enabled]  | <pre>f4. Select Screen f4: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values</pre> |
| Active Processor Cores<br>AES  | [All]<br>[Enabled]  | F3: Optimized Defaults<br>F4: Save & Exit  |
| Boot performance mode  | [Max Non-Turbo<br>Performance]  | ESC: Exit  |
| Intel(R) SpeedStep(tm)<br>Turbo Mode   | [Enabled]<br>[Disabled]   |  |
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#### Hardware Prefetcher

Turn on/off the MLC streamer prefetcher.

#### **Adjacent Cache Line Prefetch**

Turn on/off prefetching of adjacent cache lines.

#### Hyper-Threading

Enable or disable Hyper-threading Technology, which allows a single physical processor to multitask as multiple logical processors. When disabled, only one thread per enabled core is enabled.

#### 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.

#### **Active Processor Cores**

Number of cores to enable in each processor package.

#### AES

Enable / Disable AES (Advanced Encryption Standard)

#### Boot performance mode

Select the performance state that the BIOS will set starting from reset vector.

#### Intel (R) SpeedStep(tm)

Allows more than two frequency ranges to be supported.

#### Turbo Mode

Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled, unless max turbo ratio is bigger than 16 - SKL A0 W/A.

#### C states

Enable/Disable CPU Power Management, which allows CPU to go to power saving C-states when it's not 100% utilized.

#### • Compatibility Support Module (CSM) Configuration

This screen displays CSM information.

| Aptio Setup Utility<br>Advanced  | – Copyright (C) 2018 Americar                             | n Megatrends, Inc.  |
|--|---|---|
| Compatibility Support Module Conf.   | iguration   | Enable/Disable CSM Support.   |
| CSM Support  | [Enabled]   |   |
| CSM16 Module Version   | 07.82   |   |
| GateA2O Active<br>Option ROM Messages<br>INT19 Trap Response<br>HDD Connection Order | [Upon Request]<br>[Force BIOS]<br>[Immediate]<br>[Adjust] |   |
| Boot option filter   | [UEFI and Legacy]   |   |
| Option ROM execution<br>Storage<br>Video<br>Other PCI devices                        | [Legacy]<br>[Legacy]<br>[Legacy]                          | <pre>++: Select Screen f↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
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#### **CSM Support**

Enabled / Disable CSM Support.

#### GateA20 Active

UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20. This option is useful when any RT code is executed above 1MB.

#### **Option ROM Messages**

Set display mode for Option ROM.

#### **INT19 Trap Response**

BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.

#### **Boot option filter**

This option controls Legacy/UEFI ROMs priority.

#### Storage

Controls the execution of UEFI and Legacy Storage OpROM.

#### Video

Controls the execution of UEFI and Legacy Video OpROM.

#### **Other PCI devices**

Determines OpROM execution policy for devices other than Network, Storage, or Video.

#### • NCT6106D Hardware Monitor

| iiity – copyright (c) 2018 F   | American Megatrends, Inc.   |
|--|---|
|  | Enable or Disable Smart Fan   |
| [Disabled]<br>: +37.0 %<br>: +41 %<br>: 5252 RPM<br>: N/A<br>: N/A<br>: +1.016 V<br>: +5.088 V<br>: +2.928 V<br>: +5.056 V |   |
| : +3.296 V   | <pre>++: Select Screen f↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
|  | [Disabled]<br>: +37.0 %<br>: +41 %<br>: 5252 RPM<br>: N/A<br>: N/A<br>: +1.016 V<br>: +5.088 V<br>: +2.928 V  |

This screen displays the temperature of system and CPU, cooling fans speed in RPM and system voltages (VCC\_CPU, DDR, +12V, +5V and +3.3V).

#### **NCT6106D Super IO Configuration**

You 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 <Enter> for more options.

| Aptio Setup Utility -<br>Advanced  | - Copyright (C) 2018 American | n Megatrends, Inc.  |
|--|-------------------------------|---|
| NCT6106D Super IO Configuration  |                               | Set Parameters of Serial Port<br>1 (COMA)   |
| <pre>Super IO Chip • Serial Port 1 Configuration • Serial Port 2 Configuration • Serial Port 3 Configuration • Serial Port 4 Configuration • Serial Port 5 Configuration • Serial Port 6 Configuration</pre> | NCT6106D                      | <pre>++: Select Screen ++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| Version 2.20.1271. (   | Copyright (C) 2018 American ⊧ | Megatrends, Inc.  |

Serial Port 1~6 Configuration Use these items to set parameters related to serial port 1~6

| Aptio Setup Uti<br>Advanced   | ility – Copyright (C) 2018 Ame   |  |
|---|--|--|
| Serial Port 1 Configuration<br>Serial Port<br>Device Settings         | [Enabled]<br>IO=3F8h; IRQ=4;   | Enable or Disable Serial Port<br>(COM)<br>++: Select Screen<br>fl: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|   |  |  |
| CH-FW Configuration<br>his screen displays ME Firm                    | 1271. Copyright (C) 2018 Ameri<br>nware information.<br>lity – Copyright (C) 2018 Amer |  |
| CH-FW Configuration<br>his screen displays ME Firm<br>Aptio Setup Uti | nware information.   |  |

•

#### • PCI Subsystem Settings

This screen allows you to set PCI Subsystem mode.

| Aptio Setup Utility – (<br>Advanced  | Copyright (C) 2018 American       | Megatrends, Inc.  |
|--|-----------------------------------|---|
| PCI Subsystem Settings   |                                   | Value to be programmed into   |
| PCI Settings Common for all Devices:<br>PCI Latency Timer<br>VGA Palette Snoop | [32 PCI Bus Clocks]<br>[Disabled] | PCI Latency Timer Register.   |
|  |                                   | <pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| Version 2.20.1271. Cop   | oyright (C) 2018 American M       | egatrends, Inc.   |

#### **PCI Latency Timer**

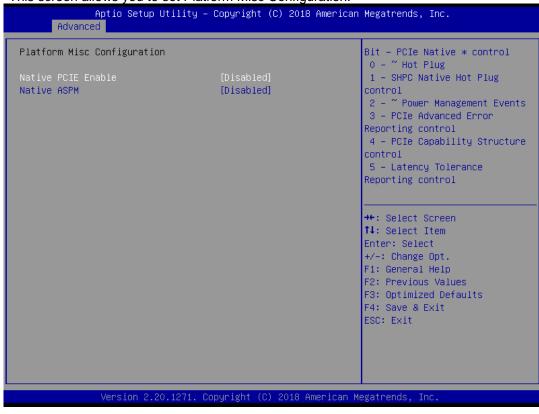
Set the value to be programmed into PCI Latency Timer Register.

#### VGA Palette Snoop

Enables or Disables VGA Palette Registers Snooping.

#### • Platform Misc Configuration

This screen allows you to set Platform Misc Configuration.



#### Native PCIE Enable

Bit - PCIe Native \* control\n 0 - ~ Hot Plug\n 1 - SHPC Native Hot Plug control\n 2 - ~ Power Management Events\n 3 - PCIe Advanced Error Reporting control\n 4 - PCIe Capability Structure control\n 5 - Latency Tolerance Reporting control.

#### Native ASPM

Enabled - OS Controlled ASPM, Disabled - BIOS Controlled ASPM.

#### **SATA Configuration**

During system boot up, the BIOS automatically detects the presence of SATA devices. In the SATA Configuration menu, you can see the hardware currently installed in the SATA ports.

| Aptio Setup Util<br>Advanced  | ity – Copyright (C) 2018 Ame  | erican Megatrends, Inc.   |
|---|---|---|
| SATA And RST Configuration  |   | Enable/Disable SATA Device.   |
| SATA Controller(s)<br>SATA Mode Selection<br>Serial ATA Port 0<br>Port 0<br>Hot Plug<br>Spin Up Device<br>SATA Device Type<br>Serial ATA Port 1<br>Port 1<br>Hot Plug<br>Spin Up Device<br>SATA Device Type<br>Serial ATA Port 2<br>Port 2<br>Hot Plug<br>Spin Up Device<br>SATA Device Type<br>Serial ATA Port 3<br>Port 3<br>Hot Plug<br>Spin Up Device | [Enabled]<br>[AHCI]<br>Empty<br>[Enabled]<br>[Disabled]<br>[Disabled]<br>[Hard Disk Drive]<br>Empty<br>[Enabled]<br>[Disabled]<br>[Hard Disk Drive]<br>Empty<br>[Enabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled] | <pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| SATA Device Type  | [Hard Disk Drive]   | v   |
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#### SATA Controller(s)

Enable or disable the SATA Controller feature. The default is Enabled.

#### **SATA Mode Selection**

Determine how SATA controller(s) operate. Operation mode options are RAID and AHCI (Advanced Host Controller Interface). The default is the AHCI mode.

#### **SATA Controller Speed**

Indicates the maximum speed the SATA controller can support.

#### Hot Plug

Designates this port as Hot Pluggable.

#### **Spin Up Device**

If enabled for any of ports, Staggerred Spin Up will be performed and only the drives that have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

#### SATA Device Type

Identify the SATA port is connected to a solid-state drive (SSD) or hard disk drive (HDD).

#### • Serial Port Console Redirection

This screen allows you to set serial port console redirection.

| COMO<br>Console Redirection [Disabled]  | Console Redirection Enable or<br>Disable.  |
|---|--|
| <ul> <li>Console Redirection Settings</li> <li>Legacy Console Redirection</li> <li>Legacy Console Redirection Settings</li> <li>Serial Port for Out-of-Band Management/<br/>Windows Emergency Management Services (EMS)<br/>Console Redirection [Disabled]</li> </ul> | DISAUTE.   |
| ▶ Console Redirection Settings  | ++: Select Screen<br>14: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |

#### • USB Configuration

This screen shows USB configuration.

| Aptio Setup Utility -<br>Advanced   | Copyright (C) 2018 American    | Megatrends, Inc.  |
|---|--------------------------------|---|
| USB Configuration   |                                | Enables Legacy USB support.<br>AUTO option disables legacy                                    |
| USB Module Version  | 20                             | support if no USB devices are connected.  |
| USB Controllers:<br>1 XHCI  |                                |   |
| USB Devices:<br>1 Drive, 1 Keyboard   |                                |   |
| Legacy USB Support<br>XHCI Hand-off   | [Enabled]<br>[Enabled]         |   |
| USB Mass Storage Driver Support   | [Enabled]                      |   |
| USB hardware delays and time-outs:<br>USB transfer time-out<br>Device reset time-out<br>Device power-up delay | [20 sec]<br>[20 sec]<br>[Auto] | <pre>++: Select Screen  ↓↓: Select Item Enter: Select +/-: Change Opt. F1: General Help</pre> |
| Mass Storage Devices:<br>Generic Flash Disk 8.07  | [Auto]                         | F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit                 |
|   |                                |   |
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#### **USB** Devices

Displays all detected USB devices.

#### Legacy USB Support

Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected.

#### **XHCI Hand-off**

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

#### **USB Mass Storage Driver Support**

Enable/Disable USB Mass Storage Driver Support.

#### USB transfer time-out

The time-out value for Control, Bulk, and Interrupt transfers.

#### Device reset time-out

USB mass storage device Start Unit command time-out.

#### **Device power-up delay**

Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

# 4.5 Chipset Menu

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

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

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

| <ul> <li>System Agent (SA) Configuration</li> <li>PCH-IO Configuration</li> <li>System Agent (SA) Paramete</li> <li>**: Select Screen</li> <li>11: Select Item</li> <li>Enter: Select</li> <li>*/-: Change Opt.</li> <li>F1: General Help</li> <li>F2: Previous Values</li> <li>F3: Optimized Defaults</li> <li>F4: Save &amp; Exit</li> <li>ESC: Exit</li> </ul> | Aptio Setup Utility – Copyright (C) 2018 American<br>Main Advanced <mark>Chipset</mark> Security Boot Save & Exit | Megatrends, Inc.  |
|---|---|---|
| +/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit  | ▶ PCH-IO Configuration  | ↑↓: Select Item   |
| Version 2.20.1271. Copyright (C) 2018 American Megatrends, Inc.   |   | +/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |

#### • System Agent (SA) Configuration

This screen allows users to configure System Agent (SA) parameters. For items marked with "▶", please press <Enter> for more options.

| Aptio Setup Utility -<br>Chipset   | Copyright (C) 2018 American | Megatrends, Inc.  |
|--|-----------------------------|---|
| System Agent (SA) Configuration  |                             | VT-d capability   |
| SA PCIe Code Version<br>VT-d   | 7.0.46.80<br>Supported      |   |
| VT-d<br>Above 4GB MMIO BIOS assignment   | [Enabled]<br>[Disabled]     |   |
| <ul> <li>Graphics Configuration</li> <li>Memory Configuration</li> <li>PEG Port Configuration</li> </ul> |                             |   |
|  |                             | <pre>++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
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#### **Graphics Configuration**

Open the sub menu for parameters related to graphics configuration.

#### **Memory Configuration**

Open the sub menu for information related to system memory.

#### **PEG Port Configuration**

Open the sub menu for parameters related to PEG port configuration.

#### VT-d

VT-d capability.

#### Above 4GB MMIO BIOS assignment

Enable/Disable above 4GB Memory MappedIO BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.

#### • Graphics Configuration

This screen shows graphics configuration.

| Aptio Setup Utili<br>Chipset   | ty – Copyright (C) 2018  | American Megatrends, Inc.   |
|--|--------------------------|---|
| IGFX VBIOS Version<br>Primary IGFX Boot Display<br>Internal Graphics | 1014<br>[Auto]<br>[Auto] | Select the Video Device which<br>will be activated during POST.<br>This has no effect if external<br>graphics present.<br>Secondary boot display<br>selection will appear based on<br>your selection.<br>VGA modes will be supported<br>only on primary display |
|  |                          | <pre>++: Select Screen  f↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>  |
| Version 2-20-127   | 1 Convright (C) 2018 A   | merican Megatrends, Inc.  |

#### Primary IGFX Boot Display

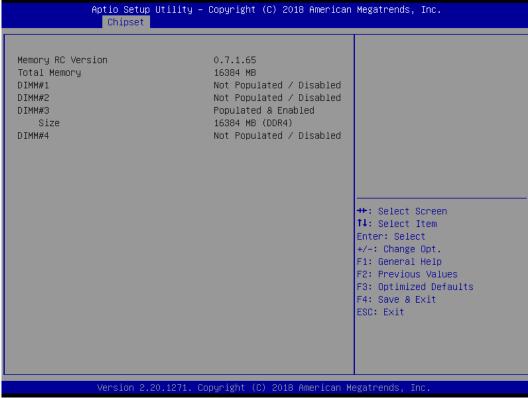
Select the video device which will be activated during POST (Power-On Self Test). The default is Auto.

#### Internal Graphics

Keep IGFX enabled based on the setup options.

#### • Memory Configuration

This screen shows system memory information.



#### • PEG Port Configuration

This screen shows PEG Port/POE Port feature information.

| Aptio Setup Utility -<br>Chipset                | Copyright (C) 2018 American        | Megatrends, Inc.  |
|---|------------------------------------|---|
| PEG Port Configuration                          |                                    | Enable or Disable the Root Port   |
| PEG 0:1:0<br>Enable Root Port<br>Max Link Speed | Not Present<br>[Enabled]<br>[Auto] |   |
| ▶ PEG Port Feature Configuration                |                                    |   |
|   |                                    |   |
|   |                                    | <pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
|   |                                    |   |
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#### Max Link Speed

Configure PEG 0:1:0 Max Speed.

### PEG Port Feature Configuration

This screen shows PEG port feature configuration.

| Aptio Setup Utility – Copyright (C) 2018 American<br><mark>Chipset</mark> | Megatrends, Inc.   |
|---|--|
| PEG Port Feature Configuration  | Detect Non-Compliance PCI<br>Express Device in PEG   |
| Detect Non-Compliance Device [Enabled]                                    |  |
|   | <pre> ++: Select Screen f↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| Version 2.20.1271. Copyright (C) 2018 American M                          | egatrends, Inc.  |

### **Detect Non-Compliance Device**

Detect Non-Compliance PCI Express Device in PEG.

#### • PCH-IO Configuration

This screen allows you to set PCH parameters.

| Aptio Setup L<br>Chipset   | Jtility – Copyright (C) 2018∣ | American Megatrends, Inc.   |
|--|-------------------------------|---|
| PCH-IO Configuration<br>> PCI Express Configuration<br>> USB Configuration<br>> HD Audio Configuration |                               | PCI Express Configuration<br>settings   |
| PCH LAN Controller<br>Wake on LAN Enable   | [Enabled]<br>[Enabled]        |   |
|  |                               | <pre>++: Select Screen fl: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| Version 2.20   | ).1271. Copyright (C) 2018 Am |   |

#### **PCH LAN Controller**

Enable or disable onboard PCH LAN controller.

#### Wake on LAN Enable

Enable or disable integrated LAN to wake the system.

#### • USB Configuration

This screen shows USB configuration.

| Aptio Setup Utility<br>Chipset | y – Copyright (C) 2018 Ame | rican Megatrends, Inc.   |
|--------------------------------|----------------------------|--|
| USB Configuration              |                            | Option to enable Compliance  |
| XHCI Compliance Mode           | [Disabled]                 | Mode. Default is to disable<br>Compliance Mode. Change to<br>enabled for Compliance Mode<br>testing.<br>++: Select Screen<br>fl: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|                                |                            |  |
| L                              | . Copyright (C) 2018 Ameri | .can Megatrends, Inc.  |

#### XHCI Disable Compliance Mode

Provides options to disable Compliance Mode. Default is FALSE to not disable Compliance Mode. Set TRUE to disable Compliance Mode.

• PCI Express Configuration This screen shows PCI Express configuration.

| Aptio Setup Utility -<br>Chipset  | – Copyright (C) 2018 America                    | n Megatrends, Inc.  |
|---|---|---|
| PCI Express Configuration   |   | PCI Express Root Port Settings.   |
| ▶ PCI Express Root Port 1<br>▶ PCI Express Root Port 21                       |   |   |
|   |   | <pre>++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |
| Version 2.20.1271. (  | Copyright (C) 2018American                      | Megatrends, Inc.  |
| Aptio Setup Utility -<br>Chipset  | – Copyright (C) 2018 America                    | n Megatrends, Inc.  |
| PCI Express Root Port 1<br>PCIe Speed<br>ASPM<br>Detect Non-Compliance Device | [Enabled]<br>[Auto]<br>[Disabled]<br>[Disabled] | Control the PCI Express Root<br>Port.   |
|   |   | ++: Select Screen<br>†4: Select Item  |
|   |   | ↑↓: Select Item   |
|   |   | Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit                                |

#### PCIe Speed

Configure PCIe Speed.

#### ASPM

Set the ASPM Level: \nForce L0s - Force all links to L0s State \nAUTO - BIOS auto configure \nDISABLE - Disables ASPM.

#### **Detect Non-Compliance Device**

Detect Non-Compliance PCI Express Device. If enabled, it will take more time at POST time.

#### • HD Audio Configuration

#### This screen shows HD Audio information

|                    | o Setup Utility – Copyright (C) 2018 An<br><mark>hipset</mark> | merican Megatrends, Inc.  |
|--------------------|--|---|
| HD Audio Subsystem | Configuration Settings   | Control Detection of the  |
| HD Audio           | [Enabled]  | HD-Audio device.<br>Disabled = HDA will be<br>unconditionally disabled<br>Enabled = HDA will be<br>unconditionally enabled.<br>++: Select Screen<br>14: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|                    |  |   |
| Ver                | sion 2.20.1271. Copyright (C) 2018 Amer                        | rican Megatrends, Inc.  |

# 4.6 Security Menu

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

| Password Description<br>If ONLY the Administrator's password is set,<br>then this only limits access to Setup and is<br>only asked for when entering Setup.   | Set Administrator Password  |
|---|---|
| If ONLY the User's password is set, then this<br>is a power on password and must be entered to<br>boot or enter Setup. In Setup the User will<br>have Administrator rights.<br>The password length must be<br>in the following range: |   |
| Minimum length 3  |   |
| Maximum length 20<br>Administrator Password<br>User Password  | <pre>++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre> |

#### • 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

Aptio Setup Utility – Copyright (C) 2018 American Megatrends, Inc. Main Advanced Chipset Security Boot Save & Exi Boot Configuration Number of seconds to wait for setup activation key. Bootup NumLock State 65535(0xFFFF) means indefinite [On] waiting. Quiet Boot [Disabled] Launch PXE OpROM policy [Do not launch] Boot Option Priorities Boot Option #1 [Generic Flash Disk 8.07] [UEFI: Generic Flash Boot Option #2 Disk 8.07, Partition 1] USB Device BBS Priorities ↔+: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit Version 2.20.1271. Copyright (C) 2018 American Megatrends,

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

- Setup Prompt Timeout Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
- **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.
- Launch PXE OpROM policy 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 your system configuration with optimal or fail-safe default values.

| Aptio Setup Utility – Copyright (C) 2018 American<br>Main Advanced Chipset Security Boot Save & Exit   | Megatrends, Inc.  |
|--|---|
| Save Options<br>Save Changes and Exit<br>Discard Changes and Exit<br>Save Changes and Reset<br>Discard Changes and Reset<br>Save Changes<br>Discard Changes<br>Discard Changes |   |
| Restore Defaults<br>Save as User Defaults<br>Restore User Defaults   |   |
| Boot Override<br>Generic Flash Disk 8.07<br>UEFI: Generic Flash Disk 8.07, Partition 1   | t↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
| Version 2.20.1271. Copyright (C) 2018 American M   | egatrends, Inc.   |

#### • Save Changes and Exit

When you 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 configuration 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 you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can 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 you have 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 you 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 a major issue in most applications. Some embedded systems are not watched by humans 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 that 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 the 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

| Start                       |           |  |
|-----------------------------|-----------|--|
| $\downarrow$                |           |  |
| Un-Lock WDT:                |           |  |
|                             | O 2E 87   | ; Un-lock super I/O                                      |
|                             |           | ; Un-lock super I/O                                      |
| $\downarrow$                |           | , <b>,</b>   |
| Select Logic device:        |           |  |
| C C                         | O 2E 07   |  |
|                             | O 2F 08   |  |
| $\downarrow$                |           |  |
| Set Second or Minute:       |           |  |
|                             | O 2E F0   |  |
|                             | O 2F N    | ; N=00 or 08 (See 🗐 <u>Note</u> below)                   |
| T                           | -         | ,, <u></u> ,   |
| •<br>Set base timer:        |           |  |
|                             | O 2E F1   |  |
|                             | 0 2F M    | ; M=00,01,02,FF(Hex) ,Value=0 to 255                     |
| .1.                         |           | , M=00,01,02,11 (Hex) , value=0 to 200                   |
| ✓WDT counting re-set timer: |           |  |
| WD1 counting re-set timer.  | O 2E F1   |  |
|                             | • · ·     |  |
|                             | 0 2F M    | ; M=00,01,02,…FF (See <sup>S</sup> X) <u>Note</u> below) |
| $\checkmark$                |           |  |
| IF No re-set timer:         |           |  |
|                             | ; WDT tin | ne-out, generate RESET                                   |
|                             |           |  |
| ;IF to disable WDT:         | 0 05 00   |  |
|                             | O 2E 30   | · Oan ha diaabhad at ann tinna                           |
|                             | 0 2F 00   | ; Can be disabled at any time                            |
|                             |           |  |
|                             |           |  |

- Timeout Value Range
  - 1 to 255
    - Minute / Second

#### Se <u>Note</u>:

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

00h: Time-out Disable 01h: Time-out occurs after 1 second 02h: Time-out occurs after 2 seconds 03h: 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

00h: Time-out Disable

01h: Time-out occurs after 1 minute

02h: Time-out occurs after 2 minutes 03h: Time-out occurs after 3 minutes

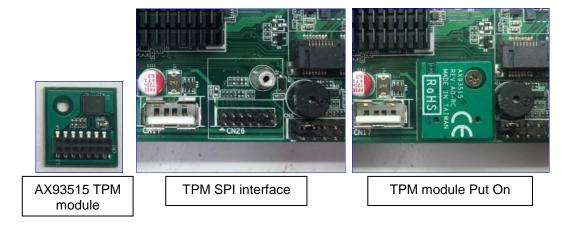
USH. TIME-OUL OCCURS aller S

FFh: Time-out occurs after 255 minutes

# Appendix B TPM Module Installation

The TPM 2.0 (Trusted Platform Module 2.0) module is a modularized design applying to the IMB520 / 521 and provides enhanced hardware security for the computer. In this appendix you will learn how to install the TPM 2.0 module into the IMB520 / 521. Please read and follow the instructions below carefully.

1. Insert TPM module into the SPI interface of motherboard, as illustrated below.



- 2. There are two ways to confirm whether the TPM Module is installed successfully or not:
  - a. Enter the BIOS setup menu and go to Trusted Computing. On the first line will show "TPM2.0 Device Found".

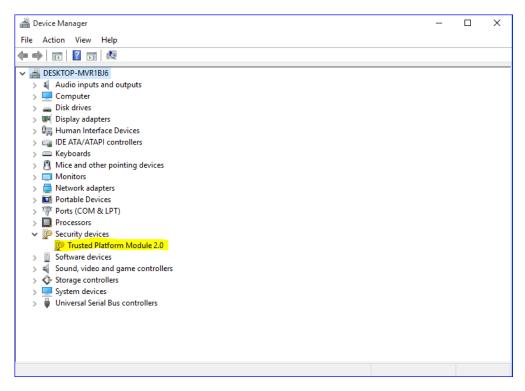
| Aptio Setup Utility – Copyright (C) 2018 American<br>Main Advanced Chipset Security Boot Save & Exit   | Megatrends, Inc.  |
|--|---|
| <ul> <li>Trusted Computing</li> <li>Platform Misc Configuration</li> <li>CPU Configuration</li> <li>SATA And RST Configuration</li> <li>NCT6106D Super IO Configuration</li> <li>NCT6106D HW Monitor</li> <li>PCH-FW Configuration</li> <li>AMT Configuration</li> <li>USB Configuration</li> <li>USB Configuration</li> <li>PCI Subsystem Settings</li> <li>CSM Configuration</li> <li>Serial Port Console Redirection</li> </ul> | System ACPI Parameters.<br>++: Select Screen<br>14: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
| Version 2.20.1271. Copyright (C) 2018 American Me<br>(In the Advance menu, go to Trusted C   |   |

TPM Module Installation

| Aptio Setup Utility -<br>Advanced   | - Copyright (C) 2018 Americar   | ) Megatrends, Inc.   |
|---|---|--|
| TPM20 Device Found<br>Firmware Version:<br>Vendor:<br>Security Device Support<br>Active PCR banks<br>Available PCR banks<br>SHA-1 PCR Bank<br>SHA256 PCR Bank               | 73.4<br>STM<br>[Enable]<br>SHA-1,SHA256<br>SHA-1,SHA256<br>[Enabled]<br>[Enabled] | Enables or Disables BIOS<br>support for security device.<br>O.S. will not show Security<br>Device. TCG EFI protocol and<br>INT1A interface will not be<br>available.           |
| Pending operation<br>Platform Hierarchy<br>Storage Hierarchy<br>Endorsement Hierarchy<br>TPM2.0 UEFI Spec Version<br>Physical Presence Spec Version<br>TPM 20 InterfaceType | [None]<br>[Enabled]<br>[Enabled]<br>[TCG_2]<br>[1.3]<br>[TIS]                     | ++: Select Screen<br>11: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
| Version 2.20.1271. 0  | Copyright (C) 2018 American M   |  |

(In the Trusted Computing section, on the first of line will show "TPM2.0 Device Found", if installation is successful.)

b. In the Windows 10 OS environment, enter Device Manager, and select the item of Security devices. The screen will show "Trusted Platform Module 2.0" if installation is successful.



c. In the Windows 10 OS environment, enter Control Panel, select the item of BitLocker Drive Encryption, and enter TPM Administration. The screen will show the information below if installation is successful.

| 🖀 Trusted Platform Module (TPM) Management on Local Computer   | – 🗆 X                    |
|--|--------------------------|
| 🖀 File Action View Window Help   | _ 8 ×                    |
|  |                          |
| See TPM Management on Local Comp TPM Management on Local Computer  | Actions                  |
| TPM Management on Local Computer   | TPM Management on Loca 🔺 |
| Configures the TPM and its support by the Windows platform   | Prepare the TPM          |
|  | Change Owner Passwo      |
| Overview   | Clear TPM                |
| Windows computers containing the Trusted Platform Module (TPM) security hardware provide enhanced security features<br>for applications. This snap-in displays information about the computer's TPM and allows administrators to configure the | Reset TPM Lockout        |
| device. It also allows administrators to view and manage commands understood by the device.  | View 🕨                   |
|  | New Window from Here     |
| Status   | Q Refresh                |
| The TPM is ready for use, with reduced functionality.  | 🛛 Help                   |
| TPM Management   |                          |
|  |                          |
| Change TPM owner password. and   |                          |
| Clear the TPM to remove ownership and reset the TPM to factory defaults.   |                          |
| WARNING: Clearing the TPM causes you to lose all TPM keys and data protected by those keys.  |                          |
| TPM Manufacturer Information   |                          |
| Manufacturer Name: STM Manufacturer Version: 71.4 Specification Version: 2.0   |                          |
|  |                          |
|  |                          |
|  |                          |
|  |                          |
|  |                          |
|  |                          |
|  |                          |
|  |                          |

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# Appendix C iAMT Settings

The Intel<sup>®</sup> Active Management Technology (Intel<sup>®</sup> AMT) utilizes built-in platform capabilities and popular third-party management and security applications to let IT administrators remotely discover, repair and better protect their networked computing assets, thus significantly improving IT management efficiency.

In order to use Intel<sup>®</sup> AMT you must enter the ME BIOS (<Ctrl + P> during system startup), change the ME BIOS password, and then select "Intel<sup>®</sup> iAMT" as the manageability feature.

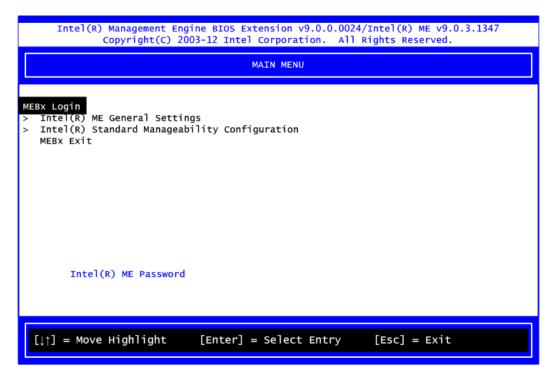
# **Entering Management Engine BIOS Extension (MEBx)**

- 1. Go to BIOS to enable the iAMT function.
- 2. Exit from BIOS after starting iAMT, and press <Ctrl + P> to enter MEBx Setting.



# Set and Change Password

1. You will be asked to set a password at first login. The default password is "admin".



2. You will be asked to change the password before setting ME.

| Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347<br>Copyright(C) 2003-12 Intel Corporation. All Rights Reserved. |  |  |  |
|---|--|--|--|
| MAIN MENU   |  |  |  |
| <pre>MEBX Login &gt; Intel(R) ME General Settings &gt; Intel(R) Standard Manageability Configuration    MEBx Exit</pre>                       |  |  |  |
| Intel(R) ME Password  |  |  |  |
| $[\downarrow\uparrow]$ = Move Highlight [Enter] = Select Entry [Esc] = Exit   |  |  |  |

- 3. Confirm your new password while revising. The new password must consist of eight characters, including at least:
  - One upper case letter
  - One lower case letter
  - One number
  - One special symbol, such as '!', '\$', ';' (except: ':', ',', '"')

The default value demonstrates an example of a valid password: **!!11qqQQ** 

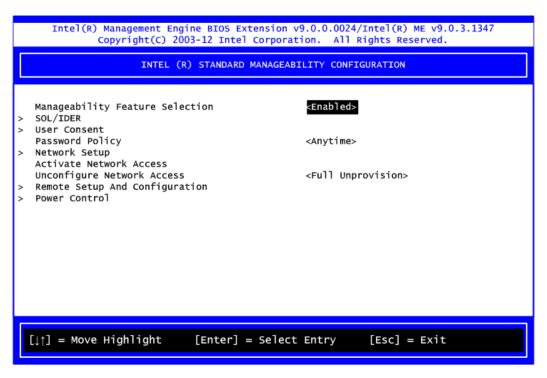
Underline (  $\_$  ) and space are valid characters for the password, but they won't make higher complexity.

# **iAMT Settings**

1. Select Intel® AMT configuration and press <Enter>.

| Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347<br>Copyright(C) 2003-12 Intel Corporation. All Rights Reserved. |              |  |  |
|---|--------------|--|--|
| MAIN MENU   |              |  |  |
| <pre>MEBX Login &gt; Intel(R) ME General Settings &gt; Intel(R) Standard Manageability Configuration    MEBx Exit</pre>                       |              |  |  |
| Intel(R) ME Password  |              |  |  |
| [↓↑] = Move Highlight [Enter] = Select Entry  | [Esc] = Exit |  |  |

2. Select Network Setup to configure iAMT.



3. Select TCP/IP to go into Network interface and set it to Enabled. Go into DHCP Mode and set it to Disabled.

| Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347<br>Copyright(C) 2003-12 Intel Corporation. All Rights Reserved. |  |  |  |
|---|--|--|--|
| INTEL (R) ME NETWORK SETUP  |  |  |  |
| <pre>Intel(R) ME Network Name Settings &gt; TCP/IP Settings</pre>   |  |  |  |
| [↓↑] = Move Highlight [Enter] = Select Entry [Esc] = Exit   |  |  |  |

| Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347<br>Copyright(C) 2003-12 Intel Corporation. All Rights Reserved. |                                     |  |  |  |
|---|-------------------------------------|--|--|--|
| WIRED LAN IPV4 CONFIGURATION  |                                     |  |  |  |
| DHCP Mode   | <enabled></enabled>                 |  |  |  |
|   |                                     |  |  |  |
|   |                                     |  |  |  |
|   |                                     |  |  |  |
|   |                                     |  |  |  |
|   |                                     |  |  |  |
| Enable/Disable IPV4 DHCP Mode   |                                     |  |  |  |
|   |                                     |  |  |  |
| [↓↑] = Move Highlight   | [Enter] = Select Entry [Esc] = Exit |  |  |  |

- 4. If DHCP Mode is disabled, complete the following settings:
  - IP address
  - Subnet mask

| Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347<br>Copyright(C) 2003-12 Intel Corporation. All Rights Reserved. |                      |                         |  |  |
|---|----------------------|-------------------------|--|--|
| WIRED LAN IPV4 CONFIGURATION  |                      |                         |  |  |
| DHCP Mode<br>IPV4 Address<br>Subnet Mask Address<br>Default Gateway Address<br>Preferred DNS Address<br>Alternate DNS Address                 | 10.1.                | 0.0                     |  |  |
| <ente< td=""><td>er&gt; = Complete Entry</td><td>[Esc] = Discard Changes</td></ente<>   | er> = Complete Entry | [Esc] = Discard Changes |  |  |

5. Go back to Intel<sup>®</sup> AMT Configuration, then select Activate Network Access and press <Enter>.

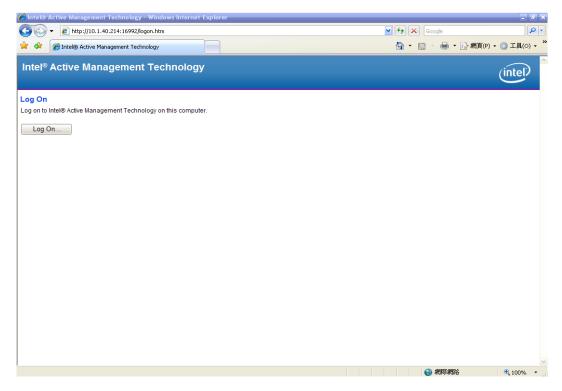
| Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347<br>Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.   |  |  |  |  |
|---|--|--|--|--|
| INTEL (R) STANDARD MANAGEABILITY CONFIGURATION  |  |  |  |  |
| Manageability Feature Selection <enabled><br/>&gt; SOL/IDER</enabled>   |  |  |  |  |
| <pre>&gt; User Consent Password Policy <anytime> &gt; Network Setup </anytime></pre>  |  |  |  |  |
| Activate Network Access<br>Unconfigure Network Access<br>> Remote Setup And Configurati<br>> Power Control<br>Activates the current network settings<br>and opens the ME network interface<br>Continue: (Y/N) |  |  |  |  |
| $[\downarrow\uparrow] = Move Highlight [Enter] = Select Entry [Esc] = Exit$   |  |  |  |  |

6. Exit from MEBx after completing the iAMT settings.

# iAMT Web Console

1. On a web browser, type http://(IP ADDRESS):16992, which connects to iAMT Web.

Example: <u>http://10.1.40.214:16992</u>



2. To log on, you will be required to type in your username and password for access to the Web.

USER: admin (default value) PASS: (MEBx password) 3. Enter the iAMT Web.

| ) 🗢 🗢 🔊 http://10.1.4               |                       | 由下列提供: Yahool奇摩  |                               | _ 0               |
|-------------------------------------|-----------------------|--|-------------------------------|-------------------|
|                                     | 0.214:16992/index htm |  | 💌 🗟 😚 🗶 📴 Yahoo!              | 9                 |
|                                     |                       | (明田)   |                               |                   |
| 💽! • 🔍 Yahoofiji                    | 申提章 推                 | 🛤 🖕 🖗 🗴 🖄 😋 🖸 r 🚍 r 😥 r 🚮 r 🛃 r                            | 👂 • 🚍 • 🚘 • 🎬 🔟 • 🌒 🖂 🕮 • 💱 • | + +               |
| 我的最爱 👍 🛞 INTE                       | L SOFTWARE LICEN 😅 In | tel Login (2) ē PICO822 Project ē TXC 台湾晶技 📟 Intel 嵌入式軟體、驅 | 翻程                            | Intel Login       |
| Intel® Standard Manageabili         | ity                   |  | 🏠 ・ 🗟 🔹 🚔 ・ 網頁 🕑 ・ 安全性(       | 5) - 工具(0) - 10 - |
|                                     |                       |  |                               |                   |
| ntel <sup>®</sup> Standard I        | Manageability         |  |                               | (intel)           |
| omputer:                            |                       |  |                               | 9                 |
| stem Status                         | System Status         |  |                               |                   |
| rdware Information<br>System        | 6                     | On   |                               |                   |
| Processor                           | Power<br>IP address   | 10.1.40.214  |                               |                   |
| Memory<br>Disk                      | IPv6 address          | Disabled   |                               |                   |
| nt Log<br>note Control              | System ID             | 03000200-0400-0500-0006-000700080009                       |                               |                   |
| ver Policies                        | Date                  | 7/17/2013  |                               |                   |
| work Settings<br>6 Network Settings | Time                  | 9:59 am  |                               |                   |
| tem Name Settings<br>r Accounts     | Refresh               |  |                               |                   |
|                                     |                       |  |                               |                   |
|                                     |                       |  |                               |                   |
|                                     |                       |  |                               |                   |

4. Click Remote Control, and select commands on the right side.

|   | ty - Wandows Internet Explorer 是由下列提供: Yehool奇摩   |                         | _ 6 >          |
|---|---|-------------------------|----------------|
|   | 40.214:16992/remote.htm   | 🔹 😔 🔶 🗙 🞯 Yabool        | - 0            |
|   | (我的最愛(4) 工具(1) 説明(11)   |                         |                |
| C 💽! - Q. Vahoo R                                     |   |                         | + 🌣            |
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| 🍎 Intel® Standard Manageabil                          | lity  | ▲ · □ · □ ▲ · 網頁① · 安全性 | ŧ◎ • 工具◎ • 🚱 • |
| Intel <sup>®</sup> Standard  <br><sup>Computer:</sup> | Manageability   |                         | (intel)        |
| ystem Status<br>lardware Information                  | Remote Control  |                         |                |
| System<br>Processor                                   | Power state: On   |                         |                |
| Memory<br>Disk  | Send a command to this computer.  |                         |                |
| vent Log<br>emote Control                             | Turn power off     Select a boot option:     Normal boot  |                         |                |
| ower Policies<br>etwork Settings                      | C cycle power off and on*<br>Boot from local CD/DVD drive<br>Reset*<br>Boot from local hard drive |                         |                |
| v6 Network Settings                                   | C Graceful Shutdown*  |                         |                |
| ystem Name Settings<br>ser Accounts                   | *Caution: These commands may cause user application data loss                                     |                         |                |
|   | cuttors, meas commanda may cause user appreaden data tosa.  |                         |                |
|   | Send Command  |                         |                |
|   |   |                         |                |
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|   |   |                         |                |
|   |   |                         | 1+[            |

5. When you have finished using the iAMT Web console, close the Web browser.

# Appendix D Configuring SATA for RAID

# Configuring SATA Hard Drive(s) for RAID Function

Before you begin the SATA configuration, please prepare:

• Two SATA hard drives (to ensure optimal performance, it is recommended that you use two hard drives with identical model and capacity). If you do not want to create RAID with the SATA controller, you may prepare only one hard drive.

## Please follow up the steps below to configure SATA hard drive(s):

- 1. Install SATA hard drive(s) in your system.
- 2. Enter the BIOS Setup to configure SATA controller mode and boot sequence.
- 3. Configure RAID by the RAID BIOS.

## 1. Installing SATA hard drive(s) in your system.

Connect one end of the SATA signal cable to the rear of the SATA hard drive, and the other end to available SATA port(s) on the board. Then, connect the power connector of power supply to the hard drive.

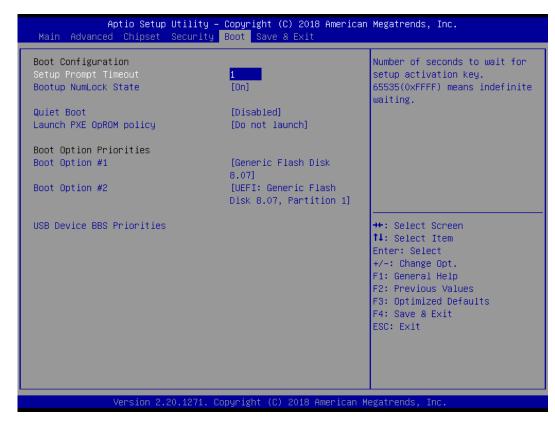
## 2. Configuring SATA controller mode and boot sequence by the BIOS Setup.

You have to make sure whether the SATA controller is configured correctly by system BIOS Setup and set up BIOS boot sequence for the SATA hard drive(s).

2.1. Turn on your system, and then press the <Del> button to enter BIOS Setup during running POST (Power-On Self Test). If you want to create RAID, just go to the Advanced Settings menu/SATA Configuration, select the "SATA Mode Selection", and press <Enter> for more options.

Aptio Setup Utility – Copyright (C) 2018 American Megatrends, Inc. Advanced SATA And RST Configuration Enable/Disable SATA Device. SATA Mode Selection [AHCI] Serial ATA Port O Empty [Enabled] Port 0 Hot Plug [Disabled] Spin Up Device [Disabled] [Hard Disk Drive] SATA Device Type Serial ATA Port 1 Empty Port 1 [Enabled] Hot Plug [Disabled] Spin Up Device [Disabled] ++: Select Screen SATA Device Type [Hard Disk Drive] ↑↓: Select Item Serial ATA Port 2 Empty Enter: Select Port 2 [Enabled] +/-: Change Opt. Hot Plug [Disabled] F1: General Help [Disabled] Spin Up Device F2: Previous Values SATA Device Type [Hard Disk Drive] F3: Optimized Defaults Serial ATA Port 3 Empty F4: Save & Exit [Enabled] Port 3 ESC: Exit Hot Plug [Disabled] Spin Up Device [Disabled] [Hard Disk Drive] SATA Device Type Version 2.20.1271. Copyright (C) 2018 American Megatrends, Inc A list of options appears, please select "RAID". Aptio Setup Utility – Copyright (C) 2018 American Megatrends, Inc. Advanced SATA And RST Configuration Enable/Disable SATA Device. SATA Mode Selection Serial ATA Port O Empty [Enabled] Port 0 Hot Plug [Disabled] Spin Up Device [Disabled] SATA Device Type [Hard Disk Drive] Serial ATA Port 1 Empty [Enabled] Port 1 Hot Plug [Disabled] Spin Up Device [Disabled] ++: Select Screen [Hard Disk Drive] t↓: Select Item SATA Device Type Serial ATA Port 2 Empty Enter: Select Port 2 [Enabled] +/-: Change Opt. Hot Plug [Disabled] F1: General Help Spin Up Device [Disabled] F2: Previous Values SATA Device Type [Hard Disk Drive] F3: Optimized Defaults Serial ATA Port 3 Empty F4: Save & Exit [Enabled] ESC: Exit Port 3 Hot Plug [Disabled] Spin Up Device [Disabled] SATA Device Type [Hard Disk Drive] Version 2.20.1271. Copyright (C) 2018 American Megatrends,

2.2. Under the Boot Settings menu, set DVD-ROM for First Boot Option to boot DVD-ROM after system restarts.



2.3. Save and exit the BIOS Setup.

#### 3. Configuring RAID by the RAID BIOS.

Enter the RAID BIOS setup utility to configure a RAID array. Skip this step and proceed if you do not want to create a RAID.

3.1. After the POST memory testing and before the operating system booting, a message "Press <Ctrl - I> to enter Configuration Utility" shows up. Accordingly, press <Ctrl - I> to enter the RAID BIOS setup utility.

| Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved. |                     |                   |       |         |        |             |
|--|---------------------|-------------------|-------|---------|--------|-------------|
| RAID VO  | umes:               |                   |       |         |        |             |
| ID   | Name                | Level             | Strip | Size    | Status | Bootable    |
| 0  | Volume1             | RAIDO(Stripe)     | 128KB | 149.1GB | Normal | Yes         |
| · · ·  | Devices:            |                   |       | -1      |        |             |
| ID   | Device Model        |                   |       | Size    |        | tus(Vol ID) |
| 4  | ST320LT012-9WS14    | WOV20YPA          |       | 298.0GB |        | isk(0)      |
| 5  | ST380817AS          | 5MR1BSS7          |       | 74.5GB  |        | isk(O)      |
| Press <ctr< td=""><td>L-I&gt; to enter Confi</td><td>iguration Utility</td><td></td><td></td><td></td><td></td></ctr<>       | L-I> to enter Confi | iguration Utility |       |         |        |             |

3.2. After you press <Ctrl - I>, the "Create RAID Volume" screen will appear. If you want to create a RAID array, select the "Create RAID Volume" option in the Main Menu and press <Enter>.

| Intel(R) Rapio<br>Copyright(C) 2 | Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved. |   |  |
|----------------------------------|--|---|--|
| 1. Create RAI<br>2. Delete RAI   | [ MAIN MENU<br>D Volume<br>s to Non-RAID<br>[ DISK/VOLUME INFO<br>Serial #   | ]<br>4. Recovery Volume Options<br>5. Acceleration Options<br>6. Exit |  |
| [†1]-Select                      | [ESC]-Exit   | [Enter]-Select Menu   |  |

3.3. After entering the "Create Volume Menu" screen, you can type the disk array name with 1~16 letters (letters cannot be special characters) in the item "Name".

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|---|--|--|--|--|
| [ CREATE VOLUME MENU ]         Name:       Volume1         RAID Level:       RAID0(Stripe)         Disks:       Select Disks         Strip Size:       16KB         Capacity:       149.1         Sync:       N/A         Create Volume |  |  |  |  |
| [ HELP ]<br>Enter a unique volume name that has no special characters and is<br>16 characters or less.  |  |  |  |  |
| [  ]Change [TAB]-Next [ESC]-Previous Menu [ENTER]-Select  |  |  |  |  |

3.4. When finished, press <Enter> to select a RAID level. There are four RAID levels: RAID0, RAID1, RAID5 and RAID10. Select a RAID level and press <Enter>.

| Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved.  |               |                   |                |  |
|---|---------------|-------------------|----------------|--|
| [ CREATE VOLUME MENU ]<br>Name: Volume1<br>RAID Level: RAID0(Stripe)<br>Disks: Select Disks<br>Strip Size: 16KB<br>Capacity: 149.1 GB<br>Sync: N/A<br>Create Volume |               |                   |                |  |
| [ HELP ]  |               |                   |                |  |
| [ †]Change  | [TAB]-Next [E | SC]-Previous Menu | [ENTER]-Select |  |

3.5. Set the stripe block size. The KB is the standard unit of stripe block size. The stripe block size can be 4KB to 128KB. After the setting, press <Enter> for the array capacity.

| Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved.   |                             |   |                |  |
|--|-----------------------------|---|----------------|--|
| [ CREATE VOLUME MENU ]<br>Name: Volume1<br>RAID Level: RAIDO(Stripe)<br>Disks: Select Disks<br>Strip Size: 128KB<br>Capacity: 149.1 GB<br>Sync: N/A<br>Create Volume |                             |   |                |  |
|  | The following<br>RA:<br>RA: | HELP ]<br>g are typical values:<br>tDO - 128KB<br>tD10 - 64KB<br>tD5 - 64KB |                |  |
| [ †]Change   | [TAB]-Next                  | [ESC]-Previous Menu   | [ENTER]-Select |  |

3.6. After setting all the items on the menu, select "Create Volume" and press <Enter> to start creating the RAID array.

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|---|--|--|--|--|
| [ CREATE VOLUME MENU ]<br>Name: Volume1<br>RAID Level: RAIDO(Stripe)<br>Disks: Select Disks<br>Strip Size: 128KB<br>Capacity: 149.1 GB<br>Sync: N/A<br>Create Volume        |  |  |  |  |
| [ HELP ]<br>The default value indicates the maximum capacity using the selected<br>disks. Entering a lower capacity allows you to create a second<br>volume on these disks. |  |  |  |  |
| [[]Change [TAB]-Next [ESC]-Previous Menu [ENTER]-Select   |  |  |  |  |

3.7. When prompting for confirmation, press <Y> to create this volume, or <N> to cancel the creation.

| Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved.                        |  |  |  |
|---|--|--|--|
| [ CREATE VOLUME MENU ]<br>Name: Volume1<br>RAID Level: RAIDO(Stripe)<br>Disks: Select Disks<br>Strip Size: 128KB<br>Capacity: 149.1 GB<br>Sync: N/A |  |  |  |
| WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.<br>Are you sure you want to create this volume? (Y/N):  |  |  |  |
| Press ENTER to create the specified volume.   |  |  |  |
| [ 1]Change [TAB]-Next [ESC]-Previous Menu [ENTER]-Select  |  |  |  |

After the creation is completed, you will see detailed information about the RAID Array in the Disk/Volume Information section, including RAID mode, disk block size, disk name, and disk capacity, etc.

|   | Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved. |   |  |  |
|---|--|---|--|--|
| [ MAIN MENU ]         1. Create RAID Volume       4. Recovery Volume Options         2. Delete RAID Volume       5. Acceleration Options         3. Reset Disks to Non-RAID       6. Exit         [ DISK/VOLUME INFORMATION ] |  |   |  |  |
| RAID Volumes:<br>ID Name<br>O Volume1<br>Physical Devices:<br>ID Device Model<br>4 ST320LT012-9WS14<br>5 ST380817AS   | RAIDO(Stripe) 12<br>Serial #   | rip Size Status Bootable<br>8KB 149.1GB Normal Yes<br>Size Type/Status(Vol ID)<br>298.0GB Member Disk(O)<br>74.5GB Member Disk(O) |  |  |
| [†↓]-Select   | [ESC]-Exit   | [Enter]-Select Menu   |  |  |

### Delete RAID volume

If you want to delete a RAID volume, select the "Delete RAID Volume" option in the Main Menu. Press <Enter> and follow on-screen instructions.

|  | Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815<br>Copyright(C) 2003-13 Intel Corporation. All Rights Reserved.<br>[ MAIN MENU ] |                                 |  |                 |
|--|---|---------------------------------|--|-----------------|
| 2. Delete  | 1. Create RAID Volume4. Recovery Volume Options2. Delete RAID Volume5. Acceleration Options3. Reset Disks to Non-RAID6. Exit                  |                                 | ons  |                 |
| RAID Volumes:<br>ID Name<br>O Volume1                                      | Level<br>RAIDO(Stripe)  | IE INFORMATIO<br>Strip<br>128KB | N]<br>Size Status<br>149.1GB Normal                  | Bootable<br>Yes |
| Physical Devices:<br>ID Device Model<br>4 ST320LT012-9WS14<br>5 ST380817AS | Serial #<br>WOV2OYPA<br>5MR1BSS7  |                                 | Size Type/Sta<br>298.0GB Member C<br>74.5GB Member C |                 |
|  |   |                                 |  |                 |
| [†↓]-Select  | [ESC]-  | Exit                            | [Enter]-Select                                       | Menu            |

Press <Esc> to exit the RAID BIOS utility. Now, you can proceed to install a SATA driver controller and the operating system.

# Appendix E Digital I/O

# **Digital I/O Software Programming**

- I2C to GPIO PCA9554PW GPIO[3:0] is Output, GPIO[7:4] is Input.
- I2C address: 0b0100100x.
- IOBASE: 0xF040
- Registers:

## Command byte

| Command | Protocol        | Function                    |
|---------|-----------------|-----------------------------|
| 0       | Read byte       | Input port register         |
| 1       | Read/write byte | Output port register        |
| 2       | Read/write byte | Polarity inversion register |
| 3       | Read/write byte | Configuration register      |

The command byte is the first byte to follow the address byte during a write transmission. It is used as a pointer to determine which of the following registers will be written or read.

## Register 0: Input port register.

This register is a read-only port. It reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by Register 3. Writes to this register have no effect.

The default 'X' is determined by the externally applied logic level, normally '1' when no external signal is externally applied because of the internal pull-up resistors.

| Bit | Symbol | Access    | Value | Description                      |
|-----|--------|-----------|-------|----------------------------------|
| 7   | 17     | Read only | Х     |                                  |
| 6   | 16     | Read only | Х     |                                  |
| 5   | 15     | Read only | Х     |                                  |
| 4   | 14     | Read only | Х     | Determined by externally applied |
| 3   | 13     | Read only | Х     | logic level.                     |
| 2   | 12     | Read only | Х     |                                  |
| 1   | 11     | Read only | Х     |                                  |
| 0   | 10     | Read only | Х     |                                  |

### Register 1: Output port register.

This register reflects the outgoing logic levels of the pins defined as outputs by Register 3. Bit values in this register have no effect on pins defined as inputs. Reads from this register return the value that is in the flip-flop controlling the output selection, not the actual pin value.

| Symbol | Access                                 | Value  | Description   |
|--------|--|--|---|
| 07     | R                                      | 1*   |   |
| O6     | R                                      | 1*   |   |
| O5     | R                                      | 1*   |   |
| O4     | R                                      | 1*   | Reflects outgoing logic levels of pins defined as   |
| O3     | R                                      | 1*   | outputs by Register 3.  |
| O2     | R                                      | 1*   |   |
| O1     | R                                      | 1*   |   |
| O0     | R                                      | 1*   |   |
|        | 07<br>06<br>05<br>04<br>03<br>02<br>01 | O7         R           O6         R           O5         R           O4         R           O3         R           O2         R           O1         R | O7         R         1*           O6         R         1*           O5         R         1*           O4         R         1*           O3         R         1*           O2         R         1*           O1         R         1* |

\* : Default value

### Register 3: Configuration register.

This register configures the directions of the I/O pins. If a bit in this register is set, the corresponding port pin is enabled as an input with high-impedance output driver. If a bit in this register is cleared, the corresponding port pin is enabled as an output. At reset, the I/Os are configured as inputs with a weak pull-up to VDD.

| Bit | Symbol | Access | Value | Description  |
|-----|--------|--------|-------|--|
| 7   | C7     | R/W    | 1*    |  |
| 6   | C6     | R/W    | 1*    |  |
| 5   | C5     | R/W    | 1*    | Configure the directions of the I/O pins.  |
| 4   | C4     | R/W    | 1*    | 0 = Corresponding port pin enabled as an output.<br>1 = Corresponding port pin configured as input<br>(default value). |
| 3   | C3     | R/W    | 1*    |  |
| 2   | C2     | R/W    | 1*    |  |
| 1   | C1     | R/W    | 1*    |  |
| 0   | C0     | R/W    | 1*    |  |

\* : Default value