

MS-9A66

Industrial Data Machine



Copyright Notice

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Trademarks

All trademarks are the properties of their respective owners.

Revision History

Revision	Date
V1.4	2016/12

Technical Support

If a problem arises with your system and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please try the following help resources for further guidance.

Visit the MSI website for technical guide, BIOS updates, driver updates and other information, or contact our technical staff via <http://www.msi.com/support/>

Safety Instructions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- Keep this equipment away from humidity.
- Lay this equipment on a reliable flat surface before setting it up.
- The openings on the enclosure are for air convection hence protects the equipment from overheating. **DO NOT COVER THE OPENINGS.**
- Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- Always Unplug the Power Cord before inserting any add-on card or module.
- All cautions and warnings on the equipment should be noted.
- Never pour any liquid into the opening that could damage or cause electrical shock.
- If any of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well or you can not get it work according to User's Manual.
 - The equipment has dropped and damaged.
 - The equipment has obvious sign of breakage.
- **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60°C (140°F), IT MAY DAMAGE THE EQUIPMENT.**

警告使用者:

這是甲類資訊產品，在居住的環境中使用時，可能會造成無線電干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:

http://www.msi.com/html/popup/csr/evmtprrt_pcm.html

Battery Information



European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.



廢電池請回收

Taiwan:

For better environmental protection, waste batteries should be collected separately for recycling or special disposal.



California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.

For further information please visit:

<http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

CE Conformity

Hereby, Micro-Star International CO., LTD declares that this device is in compliance with the essential safety requirements and other relevant provisions set out in the European Directive.



FCC-A Radio Frequency Interference Statement

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



Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.

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

- 1) this device may not cause harmful interference, and
- 2) this device must accept any interference received, including interference that may cause undesired operation.

WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, which takes effect on August 13, 2005, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life.



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1 Overview

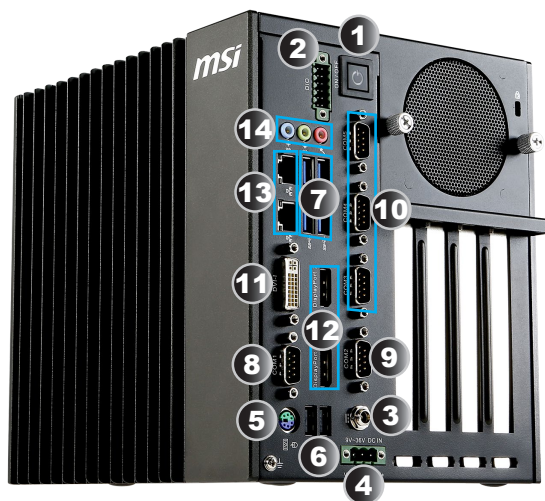


Thank you for choosing the MS-9A66, a high-performance automation computer from MSI.

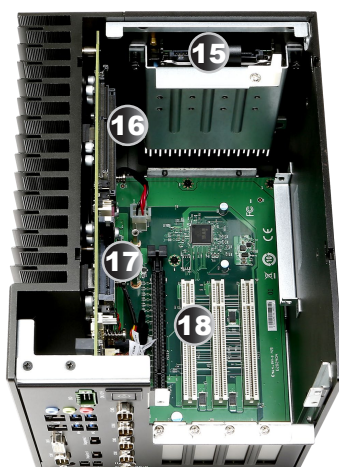
A highly integrated, rugged system that features versatile I/O capability and PCIe expansion slots, the MS-9A66 is perfect for a wide variety of industrial applications, including machine automation, video surveillance, facility environment monitoring, intelligent transportation, etc.

System Overview

► System I/O & Controls



► Internal View

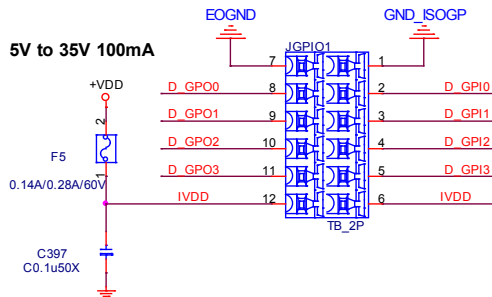


1 System Power Button

Press the system power button to turn the system on or off.

2 Digital I/O Connector

This Digital I/O connector can be used in various industrial applications like programmable logic devices and embedded, custom applications that make heavy use of GPIO for reading from various environmental sensors (IR, video, temperature, 3-axis orientation, and acceleration), and for writing output to DC motors (via PWM), audio, LCD displays, or LEDs for status. Its isolated Digital I/O pins provide electrical protection to the system, preventing high current devices and high voltages from damaging the system.



3 9~36V DC Power Jack

Power supplied through this jack supplies power to the system.

4 9~36V Phoenix DC Power Connector

The system is designed with a Phoenix connector that carries wide-range DC input and features reverse wiring protection.

5 Mouse/Keyboard Port

The standard PS/2 mouse/keyboard DIN connector is for a PS/2 mouse/keyboard.

6 USB 2.0 Port

The USB (Universal Serial Bus) port is for attaching USB devices such as keyboard, mouse, or other USB-compatible devices. It supports up to 480Mbit/s (Hi-Speed) data transfer rate.

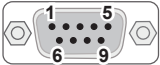
7 USB 3.0 Port

The USB 3.0 port is backward-compatible with USB 2.0 devices. It supports up to 5Gbit/s (SuperSpeed) data transfer rate.

8

RS-232/422/485 Serial Port: COM1 (0V/5V/12V)

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



RS-232

PIN	SIGNAL	DESCRIPTION
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	VCC	5V or 12V selected by jumper

RS-422

PIN	SIGNAL	DESCRIPTION
1	422 TXD-	Transmit Data, Negative
2	422 RXD+	Receive Data, Positive
3	422 TXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

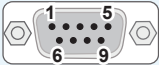
RS-485

PIN	SIGNAL	DESCRIPTION
1	485 TXD-	Transmit Data, Negative
2	NC	No Connection
3	485 TXD+	Transmit Data, Positive
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

9

RS-232/422/485 Serial Port: COM2 (0V)

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



RS-232

PIN	SIGNAL	DESCRIPTION
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	RI	Ring Indicator

RS-422

PIN	SIGNAL	DESCRIPTION
1	422 TXD-	Transmit Data, Negative
2	422 RXD+	Receive Data, Positive
3	422 TXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

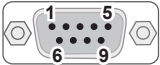
RS-485

PIN	SIGNAL	DESCRIPTION
1	485 TXD-	Transmit Data, Negative
2	NC	No Connection
3	485 TXD+	Transmit Data, Positive
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

10

RS-232 Serial Port: COM3, COM4, COM5 (0V)

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



RS-232

PIN	SIGNAL	DESCRIPTION
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	RI	Ring Indicator

11

DVI-I Port

The DVI-I (Digital Visual Interface-Integrated) connector allows you to connect an LCD monitor. It provides a high-speed digital interconnection between the computer and its display device. To connect an LCD monitor, simply plug your monitor cable into the DVI connector, and make sure that the other end of the cable is properly connected to your monitor (refer to your monitor manual for more information.)

12

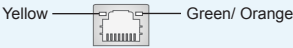
DisplayPort

DisplayPort is a digital display interface standard. This connector is used to connect a monitor with DisplayPort inputs.

13

RJ45 LAN Jack

The standard RJ-45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.



LED	Color	LED State	Condition
Left	Yellow	Off	LAN link is not established.
		On (steady state)	LAN link is established.
		On (blinking)	The computer is communicating with another computer on the LAN.
Right	Green	Off	10 Mbit/sec data rate is selected.
		On	100 Mbit/sec data rate is selected.
	Orange	On	1000 Mbit/sec data rate is selected.

14**Audio Jack**

- Line-In (Blue) - for external CD player or other audio devices
- Line-Out (Green) - for speakers or headphones
- Mic-In (Pink) - for microphones

15**HDD Bracket**

This bracket is provided for hard disk drives.

16**Memory Slot**

These slots are intended for memory modules.

17**CFast 2.0 Socket**

This socket is provided for CFast cards.

18**PCI/PCIe Expansion Slot**

These slots are provided for PCI/PCIe expansion cards.

System Specifications

Processor

- Intel 4th generation Core i7/ i5/ i3/ Celeron/ Pentium processor (LGA1150)

Chipset

- Intel Q87/C226 chipset

Memory

- 2 * Non-ECC, unbuffered DDR3 1066/1333/1600 MHz SO-DIMM slots
- Support Dual-Channel mode
- Up to 16 GB

LAN

- Intel I217 Gigabit Fast Ethernet controller with iAMT 9.0 support (LAN1)
- Intel I210-AT Gigabit Fast Ethernet controller (LAN2)

Storage

- Onboard SATA III for 2 * 2.5" HDD/SSD installation
 - Support AHCI and RAID 0, 1
- 1 * CFast 2.0 socket

Audio

- Realtek ALC887 High Definition Audio codec
- 3 * audio jacks (Line-In, Line-Out, Mic-In)

Graphics

- 1 * DVI-I port
- 2 * DisplayPorts

Security

- 1 * internal USB 2.0 port for Security Key

System I/O & Controls

- 1 * System Power Button
- 1 * Digital I/O Connector
- 1 * 9~36V DC Power Jack
- 1 * 9~36V Phoenix DC Power Connector
- 1 * Mouse/Keyboard Port
- 2 * USB 2.0 Ports
- 4 * USB 3.0 Ports
- 1 * RS-232/422/485 Serial Port (COM1: 0V/5V/12V)
- 1 * RS-232/422/485 Serial Port (COM2: 0V)
- 3 * RS-232 Serial Ports (COM3, COM4, COM5: 0V)
- 1 * DVI-I Port
- 2 * DisplayPorts
- 2 * RJ45 LAN Jacks
- 3 * Audio Jacks

Expansion Slot

- 1 * PCIe x16 slot / 2 * PCIe x8 slots
 - Maximum card length: 197mm
 - Maximum card height (with optional bracket): 118mm
 - Minimum card height (with optional bracket): 90mm
- 3 * PCI slots / 2 * PCI slots
 - With 1 HDD installed:
 - » Maximum card length: 197mm
 - » Maximum card height (with optional bracket): 114mm
 - » Minimum card height (with optional bracket): 86mm
 - With 2 HDDs installed:
 - » Maximum card length: 197mm
 - » Maximum card height (without optional bracket): 46mm
 - » Minimum card height (without optional bracket): under 46mm

Power Supply

- Input: 9-36Vdc, 20-5A

Power Consumption

CPU 35W (Haswell DT)	Power off (*3)	System Idle Mode (*1)	System Full Load (*2)	PCI-E Card PCI Card (*4)	Recommended Power Supply
Integrated Embedded Computer					
Core-i7	0.2601W	14.813W	64.506W	95W	160W
Core-i5	0.2580W	14.858W	57.469W	102W	160W
Celeron	0.2485W	15.363W	46.014W	114W	160W

*1-Screen saver disabled

*2-Burn-In test v7.1: CPU, Memory, HDD, 2D, 3D, Video, Network, USB2.0, USB3.0, PS2, COM port: 100%

*3-Meet Eu ErP

*4-Additional power supply is necessary if PCIe/PCI Cards are installed and in use

Environmental

- Operation Temperature:
 - » -10 ~ 50°C for Industrial DC power
 - » 0 ~ 40°C for DC adaptor
- Storage Temperature: -20 ~ 80°C
- Relative Humidity: 0 ~ 90%, non-condensing

Dimension

- 175 (W) x 225 (D) x 218 (H) mm

Weight

- 4.68 kg

Regulatory Compliance

- CE, FCC Class A, VCCI, C-Tick, BSMI, RoHS, TUV

OS Support

- Windows XP 32/64 Bit
 - Intel I210-AT LAN is not supported in WinXP 64 bit
 - USB 3.0, AHCI and RAID are not supported in WinXP
 - DisplayPort Audio is not supported in WinXP
- Windows 7 32/64 Bit
- Windows 8.1 64 Bit
- Windows 10 64 Bit

Hardware Options

- Optional fan module covers available to enhance heat dissipation from installed PCI/PCIe cards

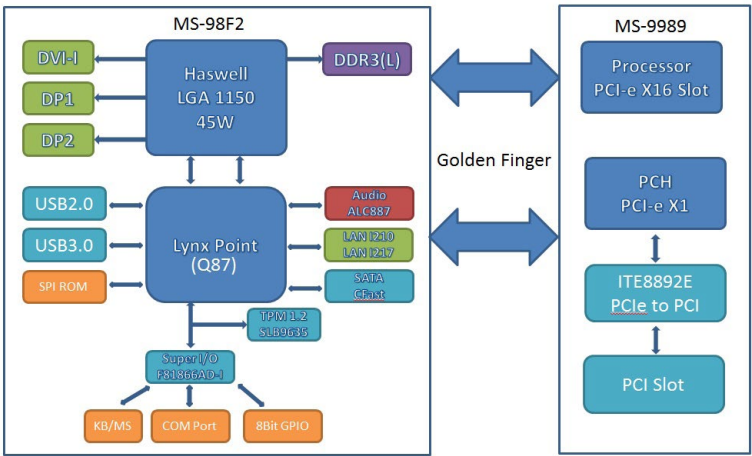
SKU Comparison

Features \ SKUs	MS-9A66 (Q87)	MS-9A66 (C226)
	MS-98F2 (Q87)	MS-98F2 (C226)
Motherboard	MS-9989 (1*PCIe x16, 3*PCI)	MS-99B9 (2*PCIe x8, 2*PCI)
Daughterboard		

Block Diagram

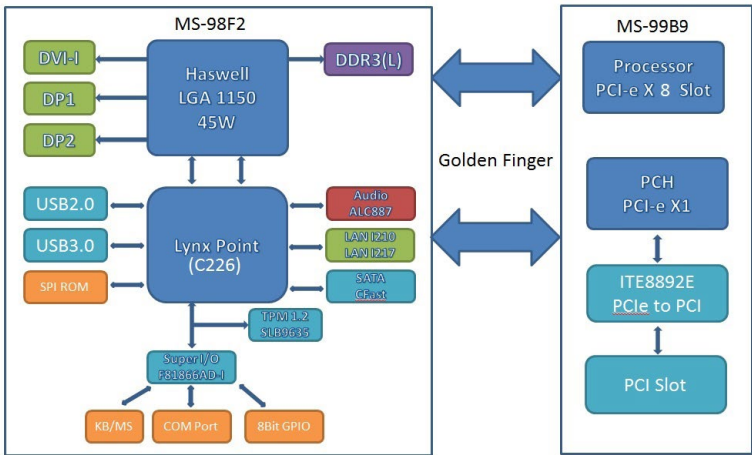
MS-9A66 (Q87)

MS-9A66 Block Diagram

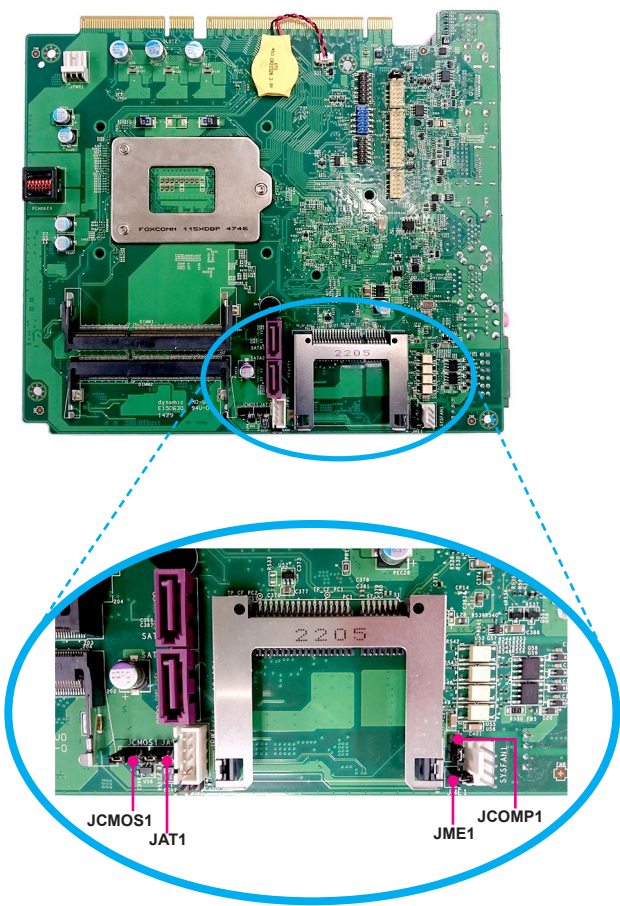


MS-9A66 (C226)

MS-9A66 Block Diagram



Motherboard Jumpers



Clear CMOS Jumper: JCMOS1

Normal
(Default)



Clear CMOS

AT/ATX Select Jumper: JAT1

ATX (Default)



AT

ME Jumper: JME1

Normal
(Default)



ME disable

Serial Port Power Jumper: JCOMP1

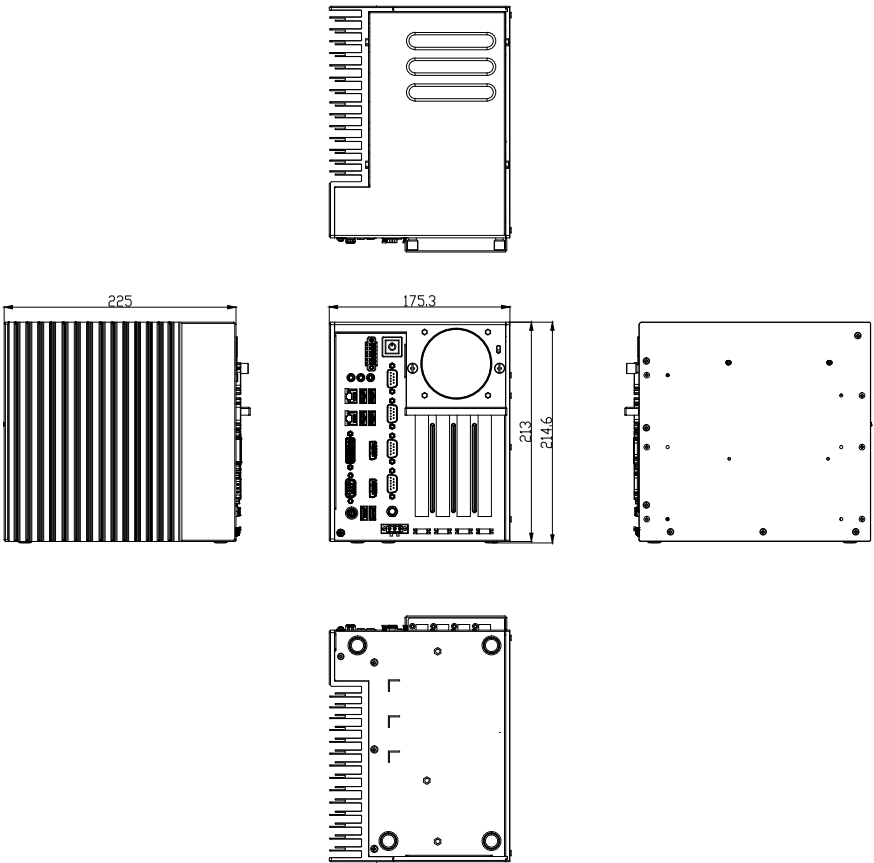
+5V (Default)



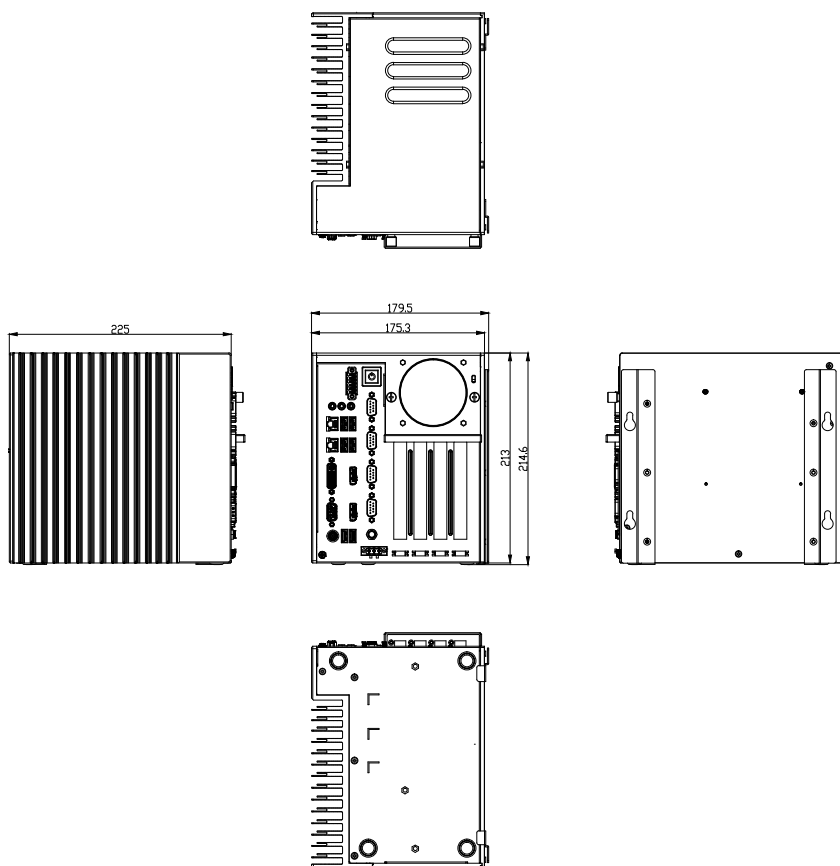
+12V

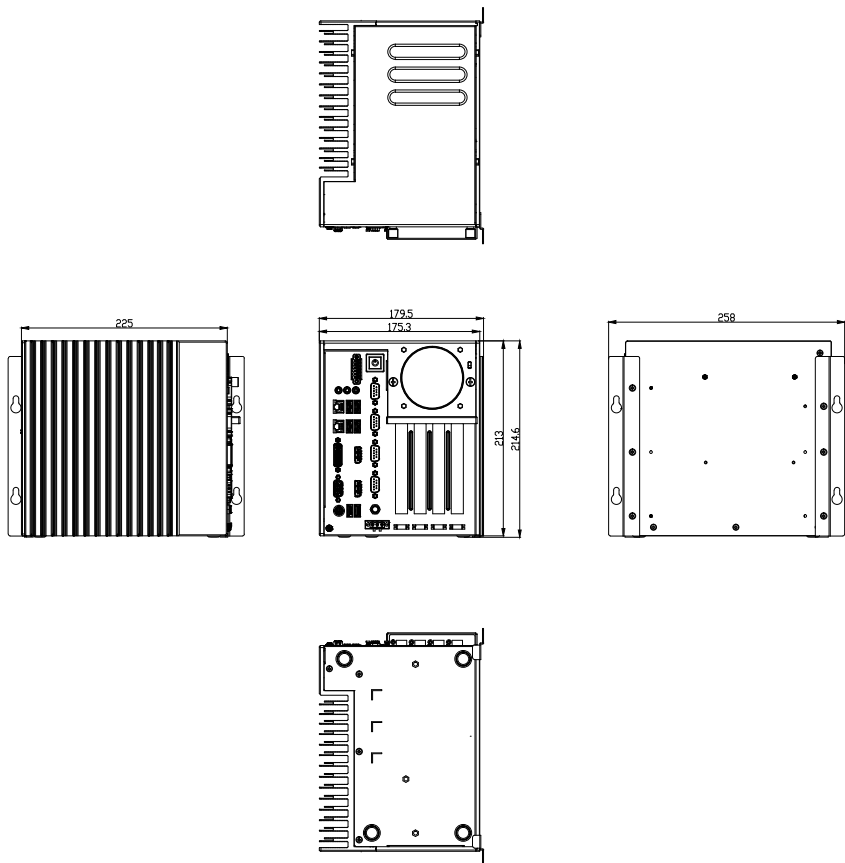
ME Overview

➤ **System Dimensions without Wall Mount**



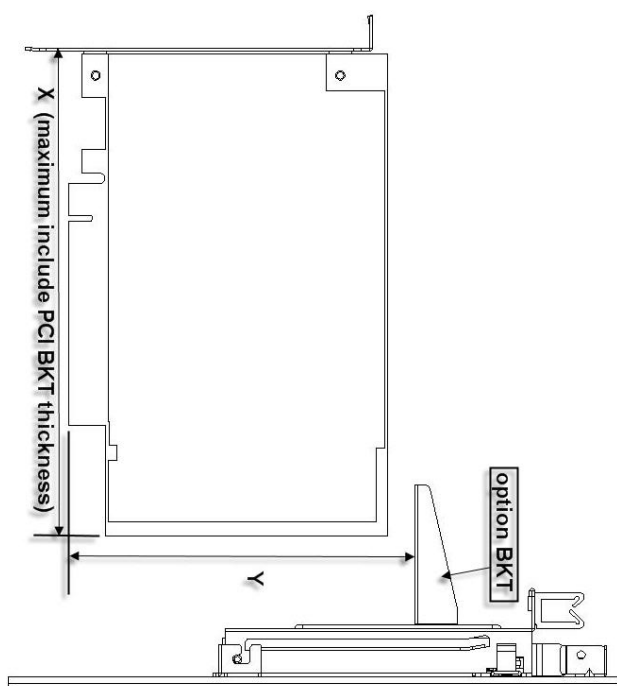
► System Dimensions with Wall Mount





PCI Express Card Dimension Limitation

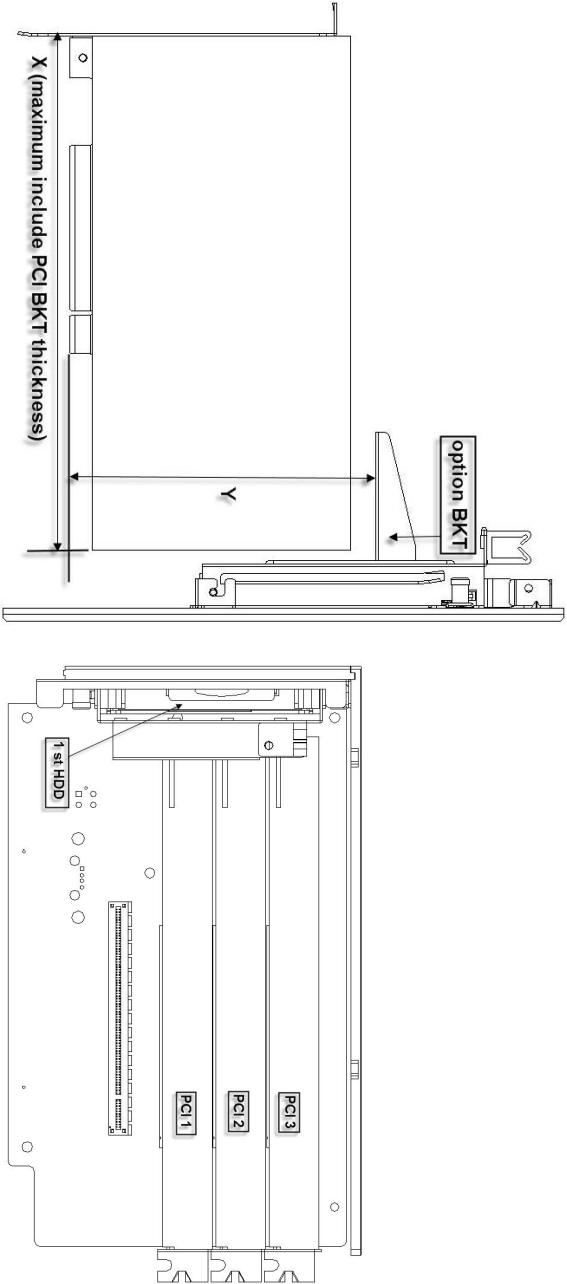
PCIe Card	Maximum X	Maximum Y (with optional bracket)	Minimum Y (with optional bracket)
Dimension	197 mm	118 mm	90 mm

**➤ MS-9A66 (Q87) PCIe Card Dimensions**

➤ MS-9A66 (Q87) PCI Card Dimensions

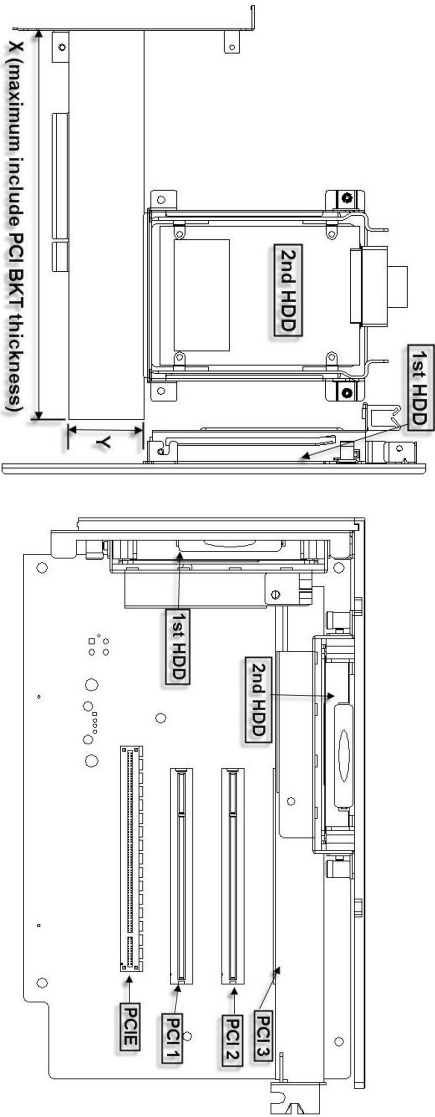
PCI1 ~ PCI3 Card Dimension Limitation (with 1 HDD installed)

PCI Card (PCI 1 ~ PCI 3)	Maximum X	Maximum Y (with optional bracket)	Minimum Y (with optional bracket)
Dimension	197 mm	114mm	86mm



PCI3 Card Dimension Limitation (with 2 HDDs installed)

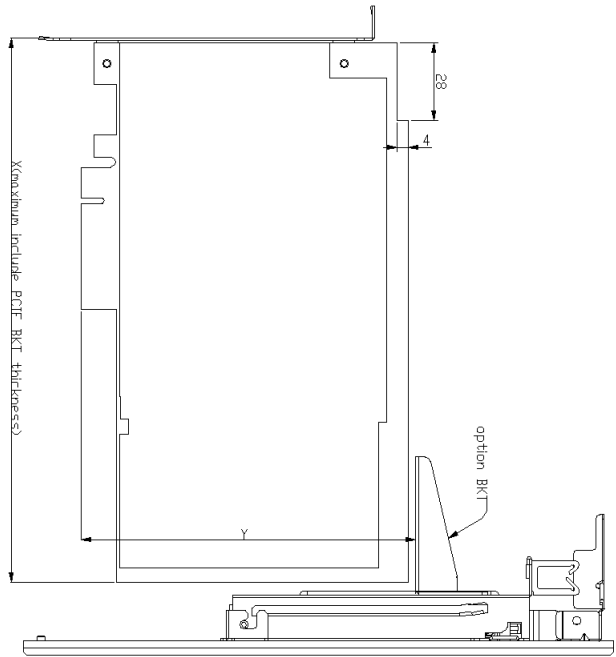
PCI Card (PCI 3)	Maximum X	Maximum Y (without optional bracket)	Minimum Y (without optional bracket)
Dimension	197mm	46mm	Under 46mm



➤ MS-9A66 (C226) PCIe Card Dimensions

PCI Express Card Dimension Limitation

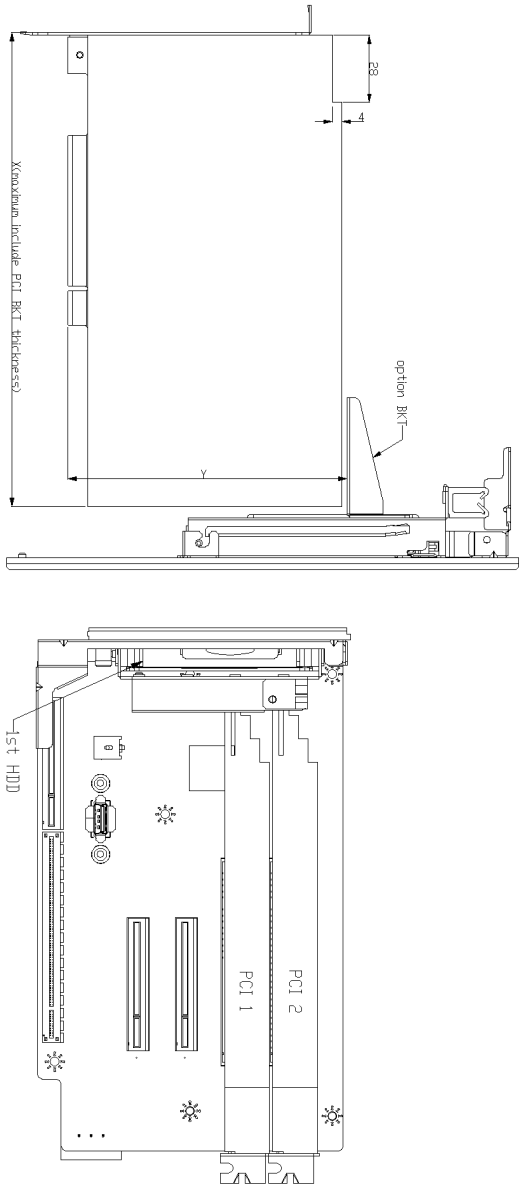
PCIe Card	Maximum X	Maximum Y (with optional bracket)	Minimum Y (with optional bracket)
Dimension	197 mm	118 mm	90 mm



➤ MS-9A66 (C226) PCI Card Dimensions

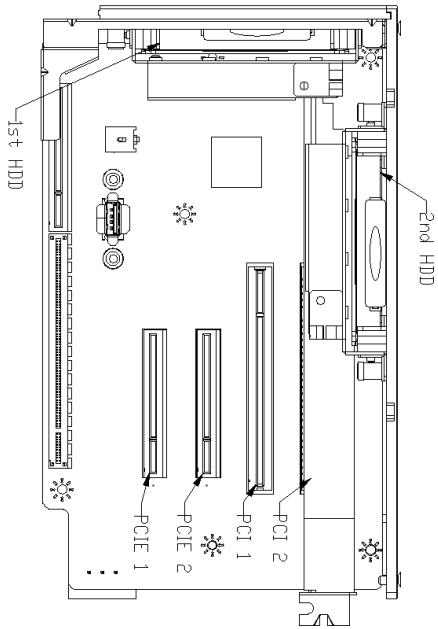
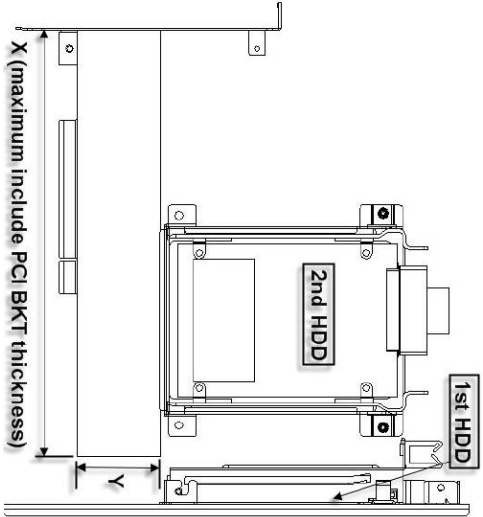
PCI1 ~ PCI2 Card Dimension Limitation (with 1 HDD installed)

PCI Card (PCI 1 ~ PCI 2)	Maximum X	Maximum Y (with optional bracket)	Minimum Y (with optional bracket)
Dimension	197 mm	114mm	86mm

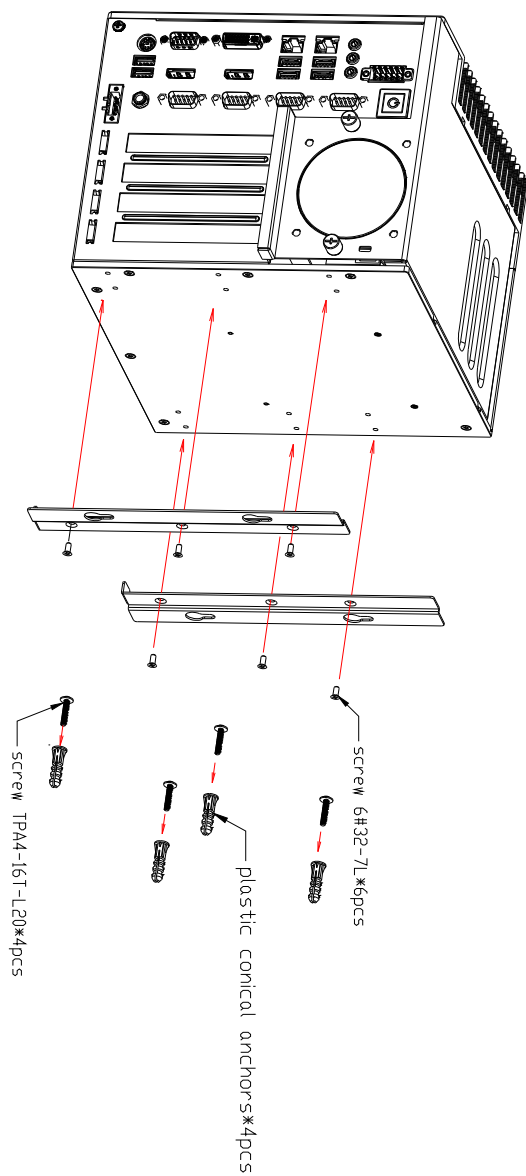


PCI2 Card Dimension Limitation (with 2 HDDs installed)

PCI Card (PCI 2)	Maximum X	Maximum Y (without optional bracket)	Minimum Y (without optional bracket)
Dimension	197mm	46mm	Under 46mm

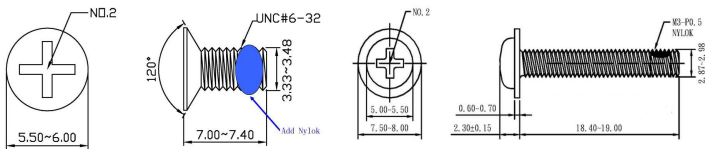


► Mounting Brackets



The mounting hole: 6.35mm(1/4") and deepness is less than 30mm.

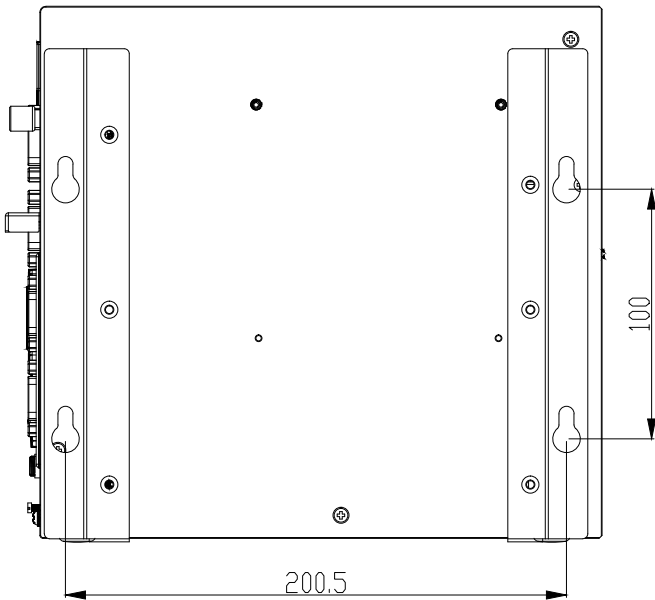
■ **Mounting Bracket Screws**



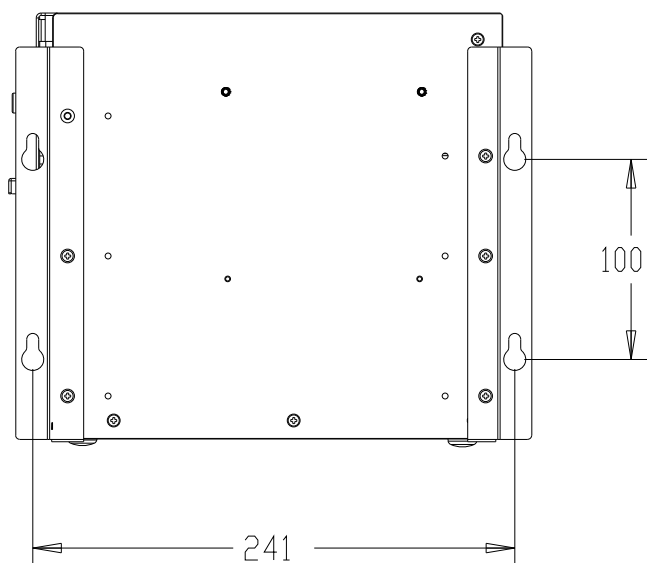
6#32-7L

TPA4-16T-L20

■ **Installation 1**



■ Installation 2



wall mount BKT fix B



2 Getting Started



This chapter provides you with the information on hardware setup procedures. While connecting peripheral devices, be careful in holding the devices and use a grounded wrist strap to avoid static electricity.

Installing System Components

Important

Turn off the system and unplug the power cord before installing or replacing system components.

► **Top Cover**

1. Locate the thumbscrews on the front panel of the system.



2. Loosen the thumbscrews to release the top cover.



-
3. Push the top cover gently forward.



-
4. Remove the top cover from the system.



➤ Memory

1. Locate the memory slot.



2. Align the notch on the memory with the key on the slot and insert the memory into the slot at a 45-degree angle.



3. Push the memory gently downwards until the slot clips click and lock the memory in place.

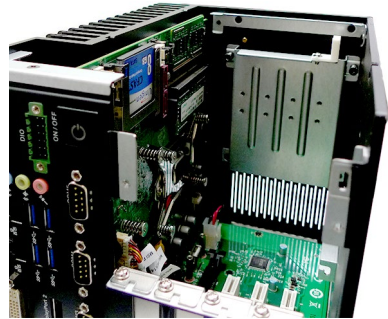


4. Install the second memory if necessary.

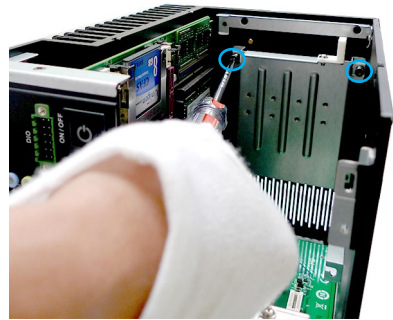


► 1st Hard Disk Drive

1. Locate the HDD mounting kit.



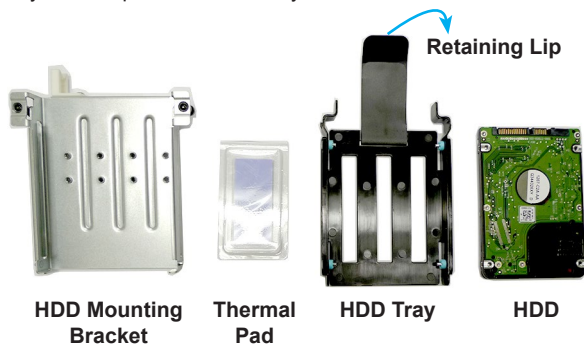
2. Unscrew the HDD mounting kit to free it up for removal.



3. Gently remove the mounting kit from the system.



-
4. Identify the components necessary for HDD installation.



-
5. Fit the HDD into the tray. Be sure to put the HDD in the correct orientation.



-
6. Peel off the transparent protective film of the thermal pad.



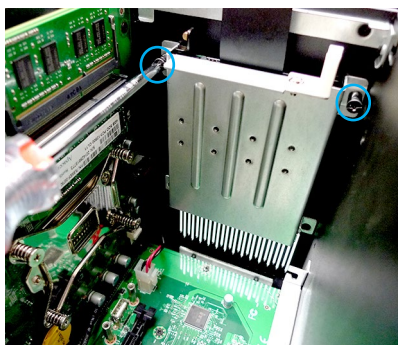
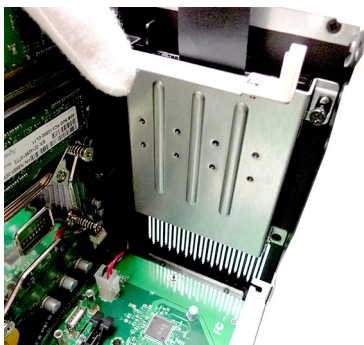
7. Place the thermal pad onto the HDD. Check the following picture for the exact location of the thermal pad. Once the thermal pad is secured, peel off the yellow protective film.



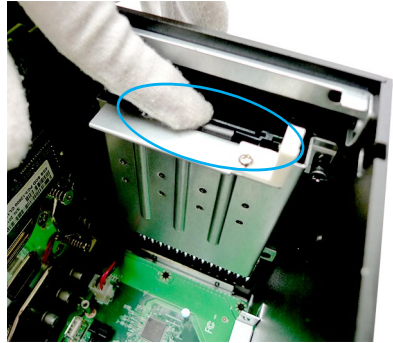
8. Fit the HDD into the mounting bracket.



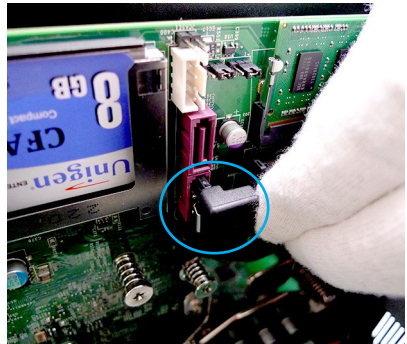
9. Once the HDD has been securely installed, place the HDD set back to the system. Make sure the HDD set is correctly oriented. Fasten the HDD set to the system with screws.



-
10. To avoid clutter, tidy up the retaining lip behind the HDD.



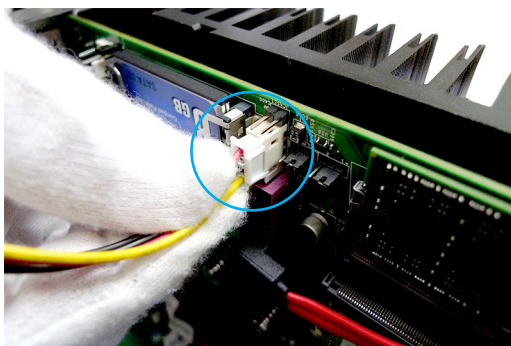
-
11. Connect the SATA data cable to the onboard SATA connector.



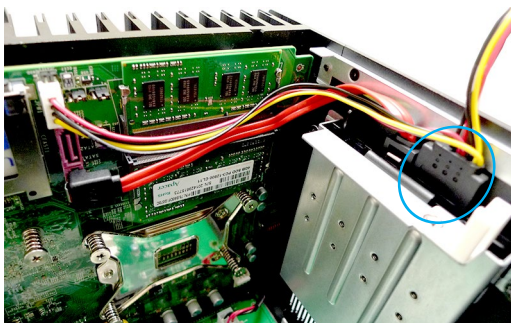
-
12. Connect the SATA data cable to the HDD.



-
13. Connect the SATA power cable to the onboard SATA power connector.



-
14. Connect the SATA power cable to the HDD.

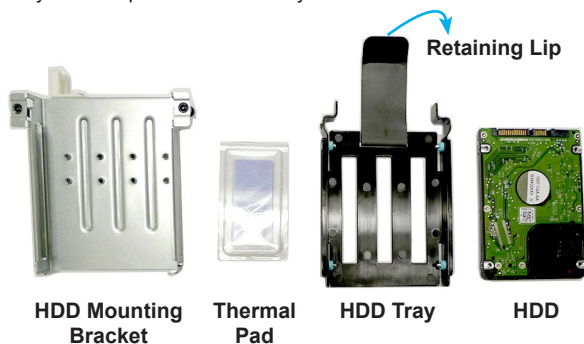


-
15. Route the cables through the cable routing clip.



► 2nd Hard Disk Drive (Optional)

1. Identify the components necessary for HDD installation.



2. Fit the HDD into the tray. Be sure to put the HDD in the correct orientation.



3. Peel off the transparent protective film of the thermal pad.



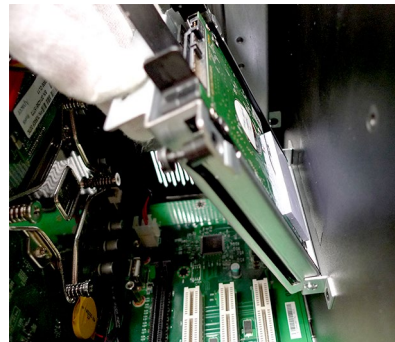
-
4. Place the thermal pad onto the HDD. Check the following picture for the exact location of the thermal pad. Once the thermal pad is secured, peel off the yellow protective film.



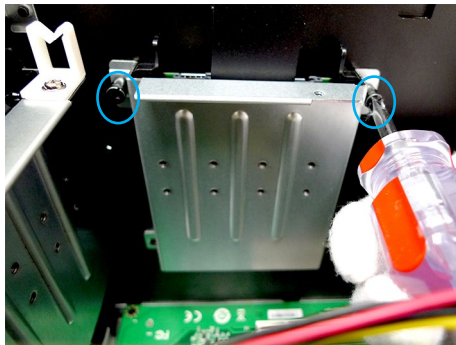
-
5. Fit the HDD into the mounting bracket.



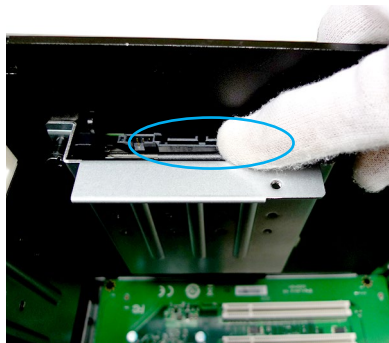
-
6. Once the HDD has been securely installed, place the HDD set back to the system. Make sure the HDD set is correctly oriented.



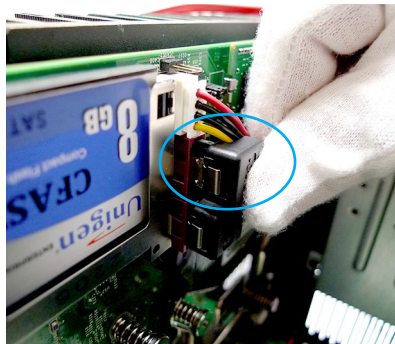
-
7. Fasten the HDD set to the system with screws.



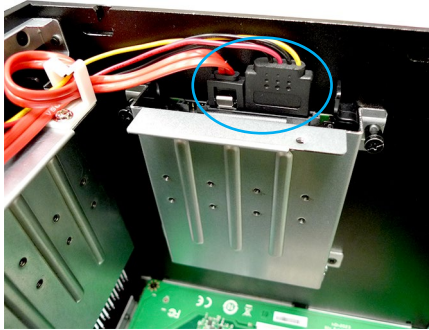
-
8. To avoid clutter, tidy up the retaining lip behind the HDD.



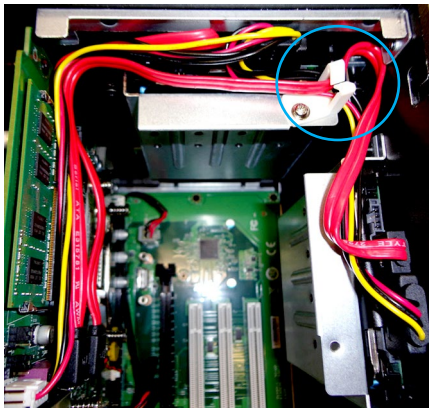
-
9. Connect the SATA data cable to the onboard SATA connector.



-
10. Connect the SATA data and power cables to the HDD.

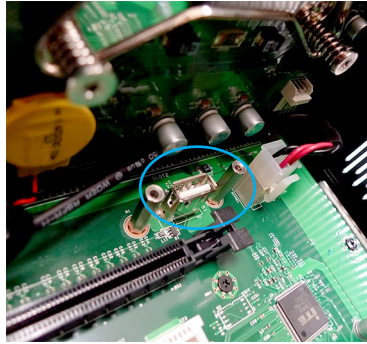


-
11. Tidy up the cables by routing them through the cable routing clip.

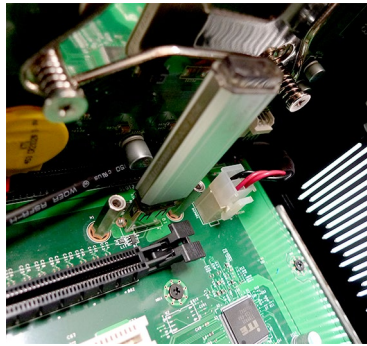


► USB DOM

1. Locate the onboard USB port.

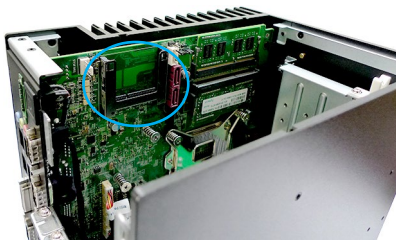


2. Connect the USB DOM directly to the port.



► CFast Card

1. Locate the onboard CFast socket.



2. Insert the CFast card into the socket.

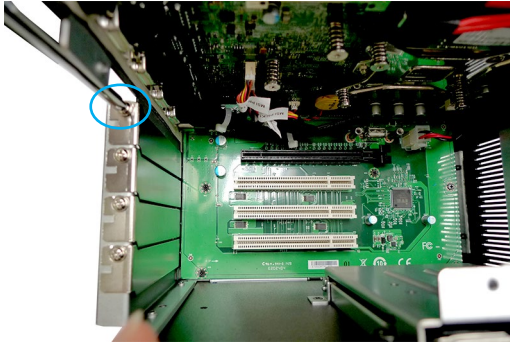


3. Push the card gently downwards to secure it in place.

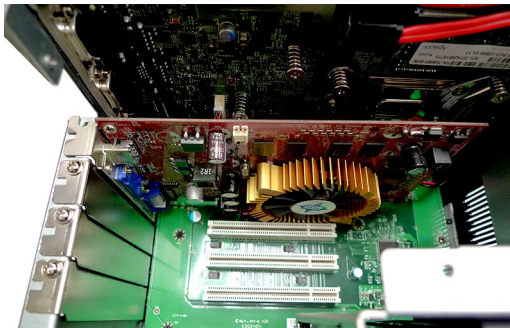


► PCIe Expansion Card

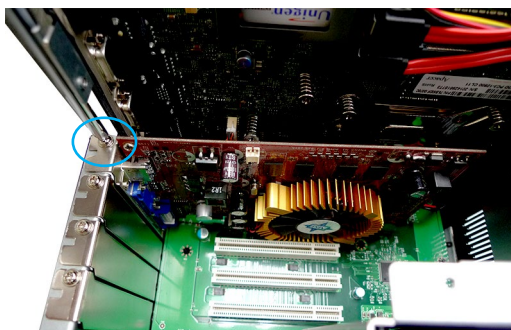
1. Locate the PCIe slot and remove the card bracket from the chassis.



2. Check the card's keyed components for correct alignment with the slot and lower the card into the slot. Push the card gently downwards to secure it in place.



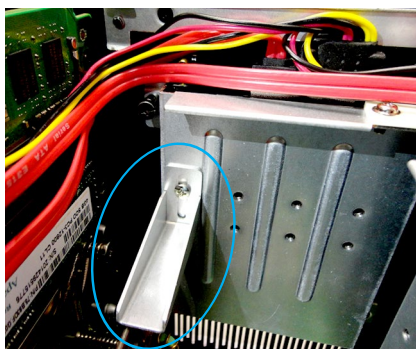
-
3. Screw the card to the chassis to fix it in place.



-
4. (Optional) A protective bracket is provided to cut down on system vibrations that may damage the card. First fix the sponge to the bracket.



-
5. Then place the bracket above the card and screw it to the HDD set as indicated by the picture.



► Fan Module (Optional)

1. Identify the components necessary for fan module installation.



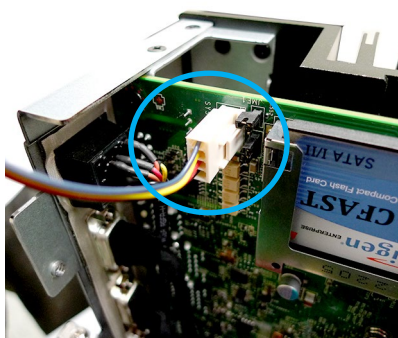
2. Mount the fan module over the air ventilation holes on the system top cover.



3. Put the fan bracket atop the fan and screw it to the fan in diagonal sequence.



4. Connect the fan power connector to the motherboard.



► Mounting Brackets (Optional)

1. Identify the components necessary for mounting bracket installation.



2. Screw the brackets to the system. Two types of installation are available. Pick the one that best suits your need.



► Connecting Power (Optional)

With a redundant power supply solution, users may feed the power through the DC power jack and/or through the 9V~36V Phoenix DC connector.

1. Locate the DC power connector on the system panel.



2. Connect a DC receptacle connector to it.



► Connecting DIO (Optional)

1. Locate the DIO connector on the system panel.



2. Connect a DIO switch connector to it.



3 BIOS Setup

This chapter provides information on the BIOS Setup program and allows users to configure the system for optimal use.

Users may need to run the Setup program when:

- An error message appears on the screen at system startup and requests users to run SETUP.
- Users want to change the default settings for customized features.

Important

- *Please note that BIOS update assumes technician-level experience.*
- *As the system BIOS is under continuous update for better system performance, the illustrations in this chapter should be held for reference only.*

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press or <F2> key to enter Setup.

Press or <F2> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

Important

The items under each BIOS category described in this chapter are under continuous update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be held for reference only.

Control Keys

← →	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Option
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Exit
Esc	Exit

Getting Help

After entering the Setup menu, the first menu you will see is the Main Menu.

Main Menu

The main menu lists the setup functions you can make changes to. You can use the arrow keys (↑ ↓) to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

Sub-Menu

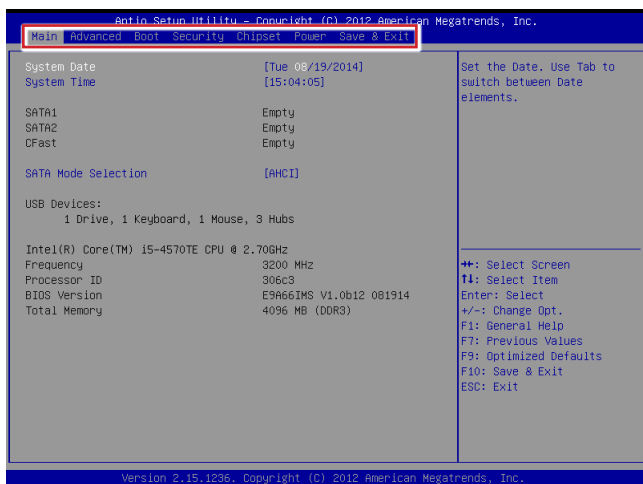
If you find a right pointer symbol appears to the left of certain fields that means a sub-menu can be launched from this field. A sub-menu contains additional options for a field parameter. You can use arrow keys (↑ ↓) to highlight the field and press <Enter> to call up the sub-menu. Then you can use the control keys to enter values and move from field to field within a sub-menu. If you want to return to the main menu, just press the <Esc>.

General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing <F1>. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press <Esc> to exit the Help screen.

MS-9A66 (Q87)

The Menu Bar



► Main

Use this menu for basic system configurations, such as time, date, etc.

► Advanced

Use this menu to set up the items of special enhanced features.

► Boot

Use this menu to specify the priority of boot devices.

► Security

Use this menu to set supervisor and user passwords.

► Chipset

This menu controls the advanced features of the onboard chipsets.

► Power

Use this menu to specify your settings for power management.

► Save & Exit

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes.

Main



► System Date

This setting allows you to set the system date. The date format is <Day>, <Month> <Date> <Year>.

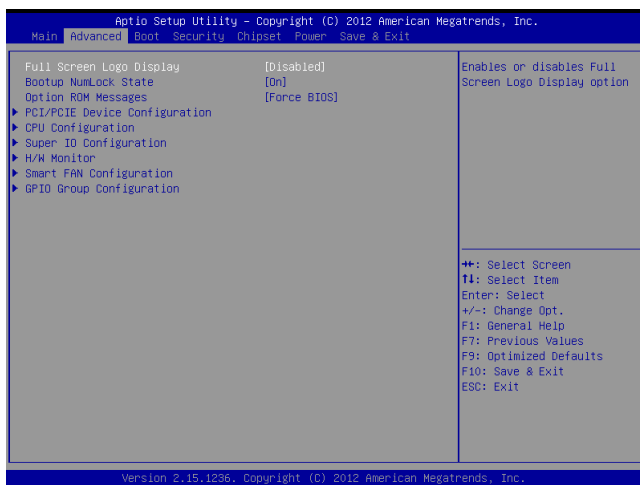
► System Time

This setting allows you to set the system time. The time format is <Hour> <Minute> <Second>.

► SATA Mode Selection

This setting specifies the SATA controller mode.

Advanced



► Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

When it is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

Please note that enabling this BIOS feature often adds 2-3 seconds of delay to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended that you disable this BIOS feature for a faster boot-up time.

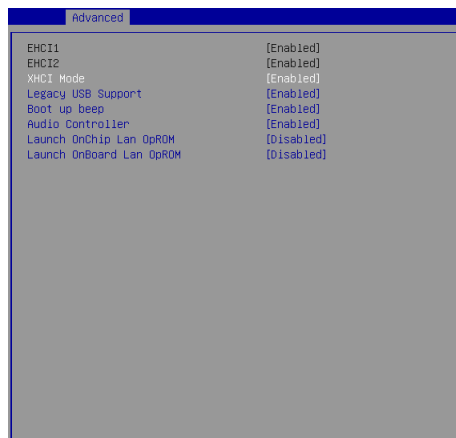
► Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on. Setting to [On] will turn on the Num Lock key when the system is powered on. Setting to [Off] will allow users to use the arrow keys on the numeric keypad.

► Option ROM Messages

This item is used to determine the display mode when an optional ROM is initialized during POST. When set to [Force BIOS], the display mode used by AMI BIOS is used. Select [Keep Current] if you want to use the display mode of optional ROM.

► PCI/PCIE Device Configuration



► EHCI1, EHCI2

This setting disables/enables the USB EHCI controller. The Enhanced Host Controller Interface (EHCI) specification describes the register-level interface for a Host Controller for the Universal Serial Bus (USB) Revision 2.0.

► XHCI Mode

This setting disables/enables the USB XHCI controller. The eXtensible Host Controller Interface (XHCI) is a computer interface specification that defines a register-level description of a Host Controller for Universal Serial bus (USB), which is capable of interfacing to USB 1.0, 2.0, and 3.0 compatible devices. The specification is also referred to as the USB 3.0 Host Controller specification.

► Legacy USB Support

Set to [Enabled] if you need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix.

► Boot Up Beep

Beep codes are used by the BIOS during the POST to report certain initial system errors. Use this setting to disable/enable the system boot up beep.

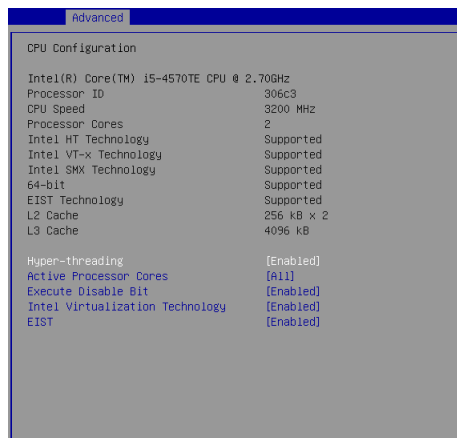
► Audio Controller

This setting enables/disables the onboard audio controller.

► Launch OnChip/OnBoard LAN OpROM

These settings enable/disable the initialization of the onboard/onchip LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

► CPU Configuration



► Hyper-Threading

The processor uses Hyper-Threading technology to increase transaction rates and reduces end-user response times. The technology treats the two cores inside the processor as two logical processors that can execute instructions simultaneously. In this way, the system performance is highly improved. If you disable the function, the processor will use only one core to execute the instructions. Please disable this item if your operating system doesn't support HT Function, or unreliability and instability may occur.

► Active Processor Cores

This setting specifies the number of active processor cores.

► Execute Disable Bit

Intel's Execute Disable Bit functionality can prevent certain classes of malicious "buffer overflow" attacks when combined with a supporting operating system. This functionality allows the processor to classify areas in memory by where application code can execute and where it cannot. When a malicious worm attempts to insert code in the buffer, the processor disables code execution, preventing damage or worm propagation.

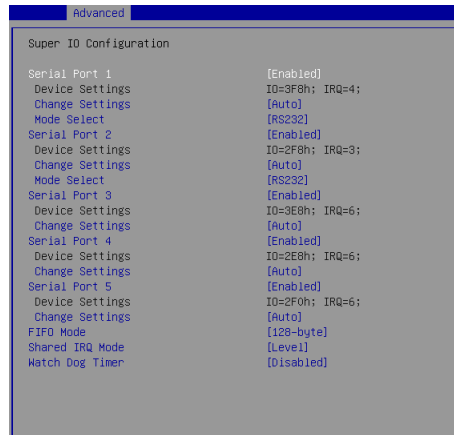
► Intel Virtualization Technology

Virtualization enhanced by Intel Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple "Virtual" systems.

► EIST

EIST (Enhanced Intel SpeedStep Technology) allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production. When disabled, the processor will return the actual maximum CPUID input value of the processor when queried.

► Super IO Configuration



► Serial Port 1/ 2/ 3/ 4/ 5

This setting enables/disables the specified serial port.

► Change Settings

This setting is used to change the address & IRQ settings of the specified serial port.

► Mode Select

Select an operation mode for the specified serial port.

► FIFO Mode

This setting controls the FIFO data transfer mode.

► Shared IRQ Mode

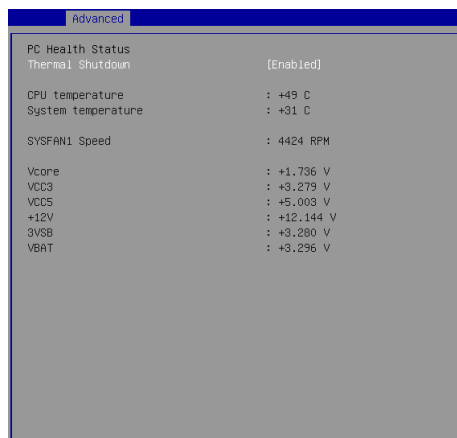
This setting provides the system with the ability to share interrupts among its serial ports.

► Watch Dog Timer

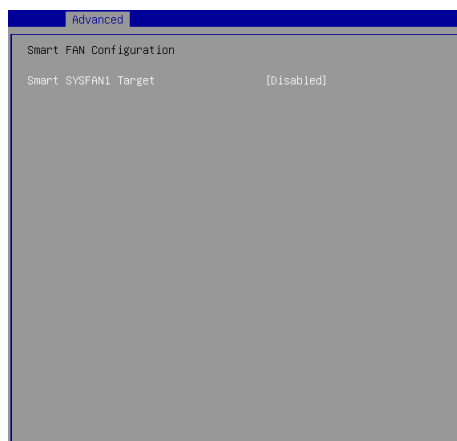
You can enable the system watch-dog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watch dog polls it.

► H/W Monitor

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.



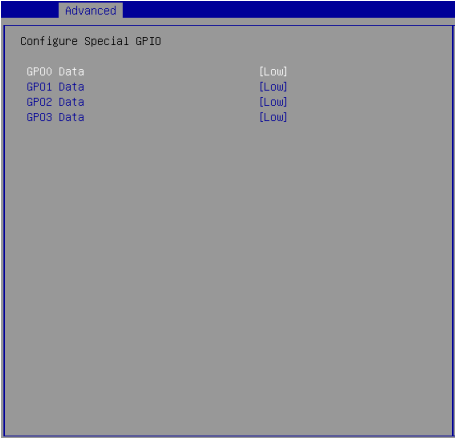
► Smart Fan Configuration



► Smart SYSFAN1 Target

These settings enable/disable the Smart Fan function. Smart Fan is an excellent feature which will adjust the CPU/system fan speed automatically depending on the current CPU/system temperature, avoiding the overheating to damage your system.

► GPIO Group Configuration

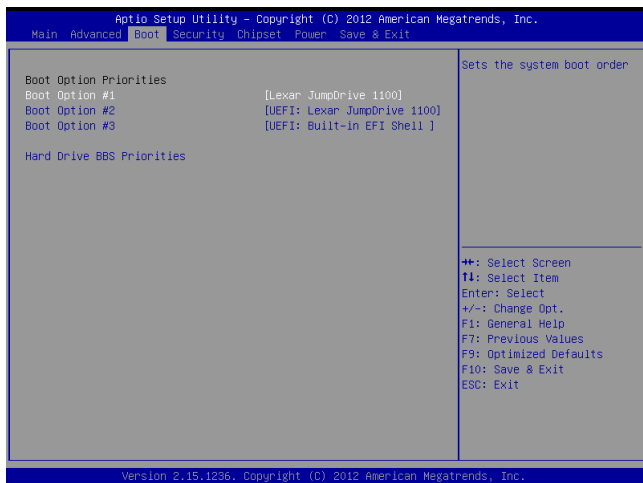


Configure Special GPIO	
GP00 Data	[Low]
GP01 Data	[Low]
GP02 Data	[Low]
GP03 Data	[Low]

► GP00 ~ GP03 Data

These settings control the operation mode of the specified GPIO.

Boot



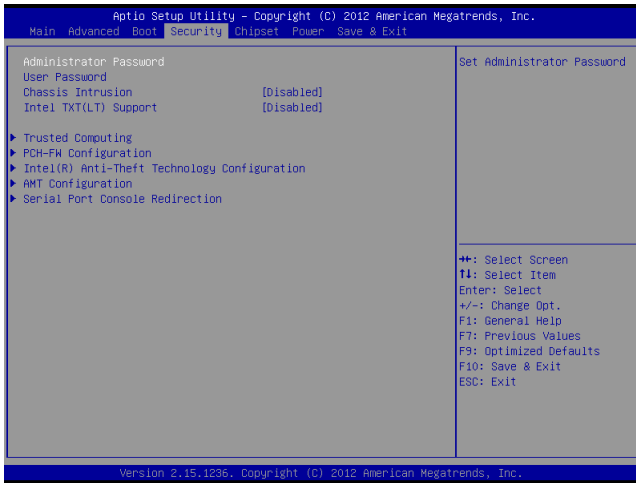
► Boot Option Priorities

This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

► Hard Drive BBS Priorities

This setting allows users to set the priority of the specified devices. First press <Enter> to enter the sub-menu. Then you may use the arrow keys (↑↓) to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list.

Security



► Administrator Password

Administrator Password controls access to the BIOS Setup utility.

► User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

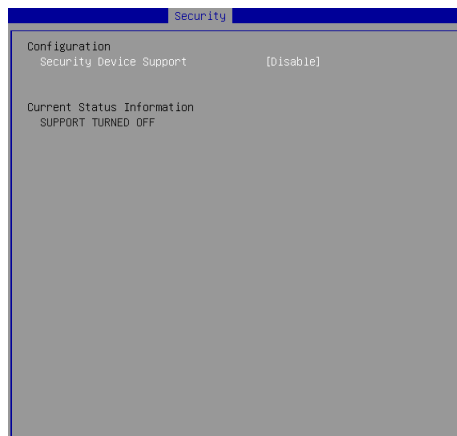
► Chassis Intrusion

The field enables or disables the feature of recording the chassis intrusion status and issuing a warning message if the chassis is once opened.

► Intel TXT(LT) Support

Intel TXT (Trusted Execution Technology) can only be enabled/disabled if SMX is enabled. VT and VT-d support must also be enabled prior to TXT.

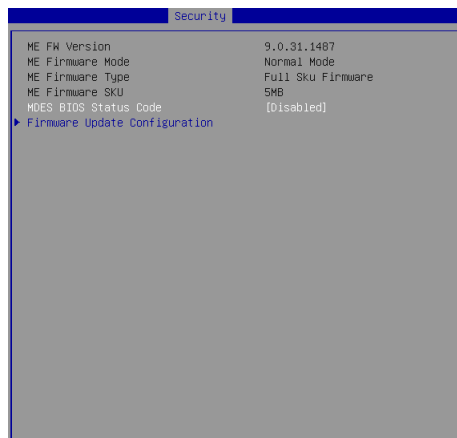
► Trusted Computing



► Security Device Support

This setting enables/disables BIOS support for security device. When set to [Disable], the OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

► PCH-FW Configuration



► ME FW Version, ME Firmware Mode/ Type/ SKU

These settings show the firmware information of the Intel ME (Management Engine).

► **MDES BIOS Status Code**

This setting enables/disables the MDES BIOS status code.

► **Firmware Update Configuration**

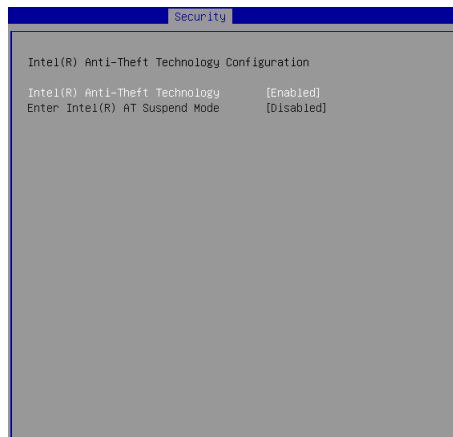


► **ME FW Image Re-Flash**

This setting enables/disables the ME FW image reflash.

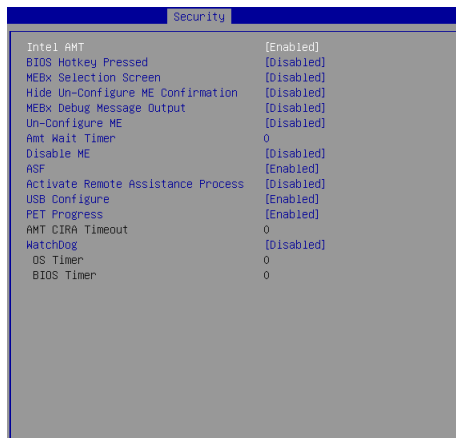
► **Intel(R) Anti-Theft Technology Configuration**

Intel Anti-Theft Technology is hardware-based technology that can lock a lost or stolen system so that personal confidential information is protected and inaccessible by unauthorized users.



► AMT Configuration

Intel Active Management Technology (AMT) is hardware-based technology for remotely managing and securing PCs out-of-band.



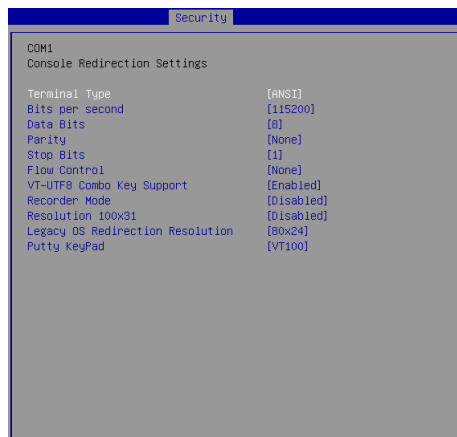
► Serial Port Console Redirection



► Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

► Console Redirection Settings



► Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). This setting specifies the type of terminal device for console redirection.

► Bits per second, Data Bits, Parity, Stop Bits

This setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

► Flow Control

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

► VT-UTF8 Combo Key Support

This setting enables/disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

► Recorder Mode, Resolution 100x31

These settings enable/disable the recorder mode and the resolution 100x31.

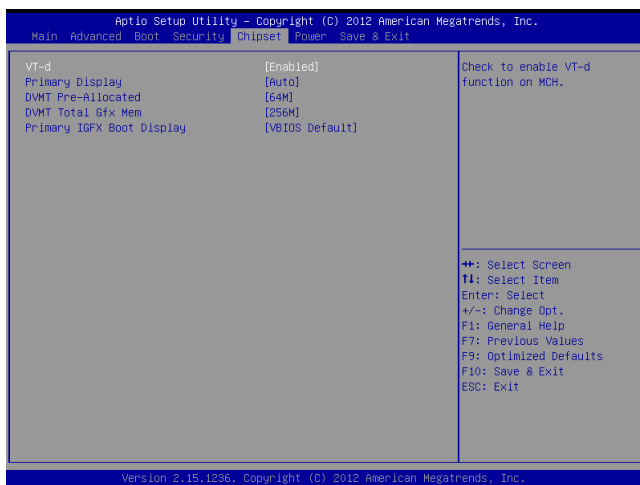
► Legacy OS Redirection Resolution

This setting specifies the redirection resolution of legacy OS.

► Putty Keypad

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

Chipset



► VT-d

Intel Virtualization Technology for Directed I/O (Intel VT-d) provides the capability to ensure improved isolation of I/O resources for greater reliability, security, and availability.

► Primary Display

This setting specifies which is your primary graphics adapter.

► DVMT Pre-Allocated

This setting defines the DVMT pre-allocated memory. Pre-allocated memory is the small amount of system memory made available at boot time by the system BIOS for video. Pre-allocated memory is also known as locked memory. This is because it is "locked" for video use only and as such, is invisible and unable to be used by the operating system.

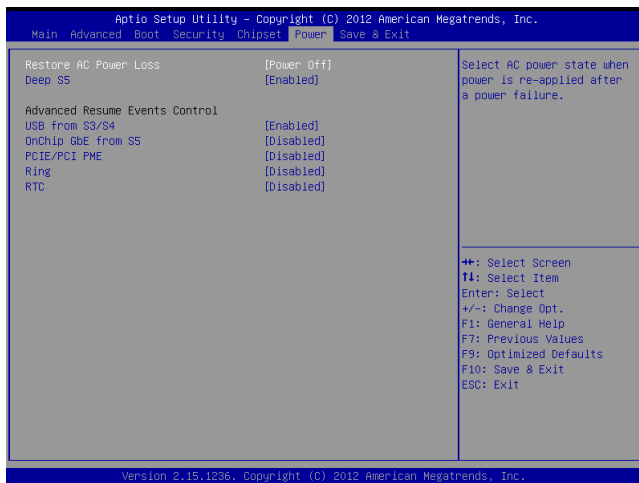
► DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

► Primary IGFX Boot Display

Use the field to select the type of device you want to use as the display(s) of the system.

Power



► Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off]	Leaves the computer in the power off state.
[Power On]	Leaves the computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

► Deep S5

The setting enables/disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can "wake" on input from the keyboard, clock, modem, LAN, or USB device.

**** Advanced Resume Events Control ******► USB from S3/S4**

The item allows the activity of the USB device to wake up the system from S3/S4 sleep state.

► OnChip GbE from S5

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onchip LAN is detected.

► PCIE/PCI PME

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onboard PCIE/PCI PME is detected.

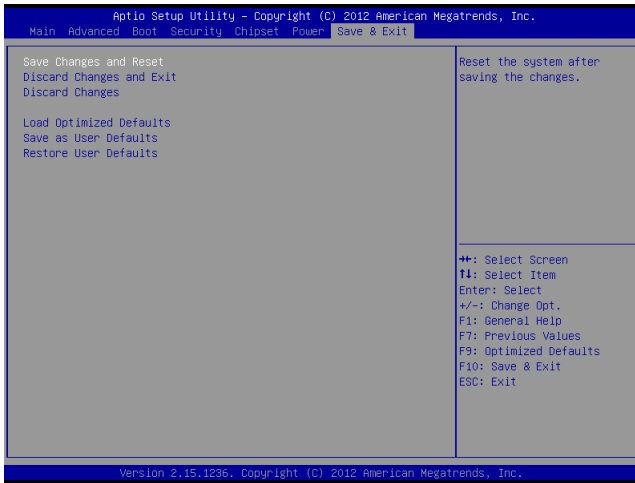
► Ring

An input signal on the serial Ring Indicator (RI) line (in other words, an incoming call on the modem) awakens the system from a soft off state.

► RTC

When [Enabled], you can set the date and time at which the RTC (real-time clock) alarm awakens the system from suspend mode.

Save & Exit



► Save Changes and Reset

Save changes to CMOS and reset the system.

► Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

► Discard Changes

Abandon all changes.

► Load Optimized Defaults

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

► Save as User Defaults

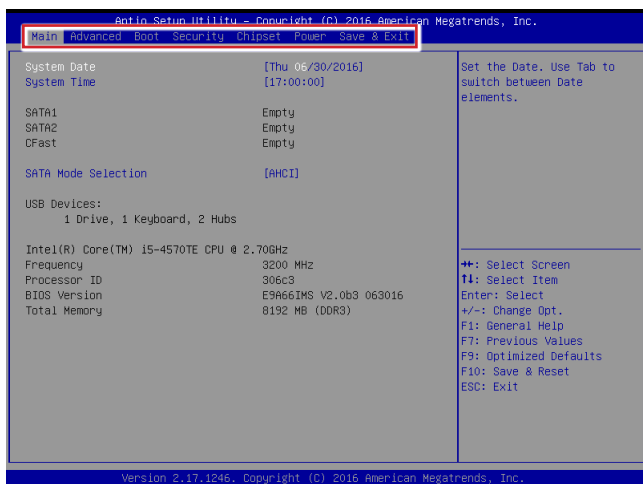
Save changes as the user's default profile.

► Restore User Defaults

Restore the user's default profile.

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The Menu Bar



► Main

Use this menu for basic system configurations, such as time, date, etc.

► Advanced

Use this menu to set up the items of special enhanced features.

► Boot

Use this menu to specify the priority of boot devices.

► Security

Use this menu to set supervisor and user passwords.

► Chipset

This menu controls the advanced features of the onboard chipsets.

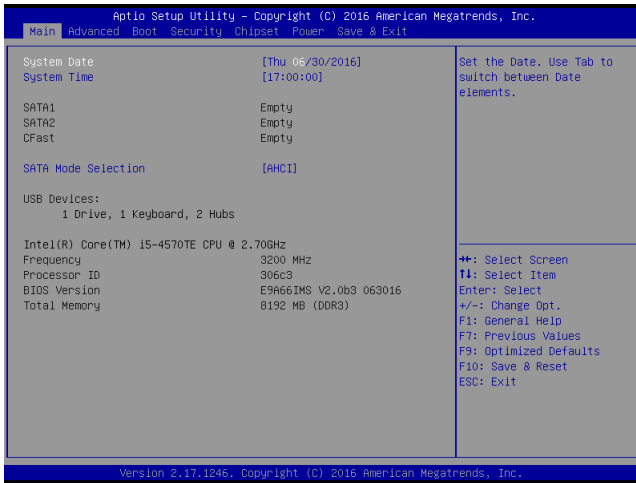
► Power

Use this menu to specify your settings for power management.

► Save & Exit

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes.

Main



► System Date

This setting allows you to set the system date. The date format is <Day>, <Month> <Date> <Year>.

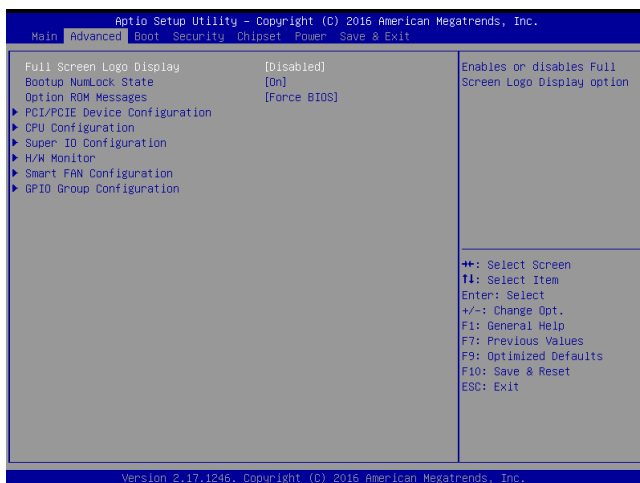
► System Time

This setting allows you to set the system time. The time format is <Hour> <Minute> <Second>.

► SATA Mode Selection

This setting specifies the SATA controller mode.

Advanced



► Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

When it is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

Please note that enabling this BIOS feature often adds 2-3 seconds of delay to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended that you disable this BIOS feature for a faster boot-up time.

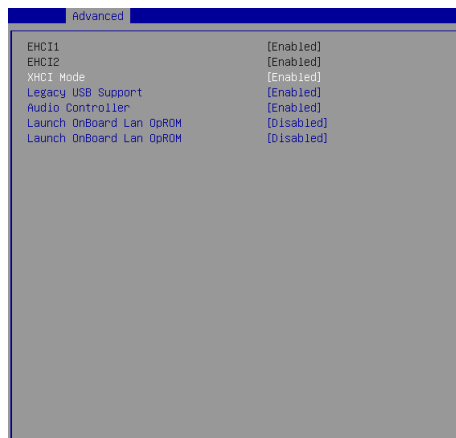
► Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on. Setting to [On] will turn on the Num Lock key when the system is powered on. Setting to [Off] will allow users to use the arrow keys on the numeric keypad.

► Option ROM Messages

This item is used to determine the display mode when an optional ROM is initialized during POST. When set to [Force BIOS], the display mode used by AMI BIOS is used. Select [Keep Current] if you want to use the display mode of optional ROM.

► PCI/PCIE Device Configuration



► EHCI1, EHCI2

This setting disables/enables the USB EHCI controller. The Enhanced Host Controller Interface (EHCI) specification describes the register-level interface for a Host Controller for the Universal Serial Bus (USB) Revision 2.0.

► XHCI Mode

This setting disables/enables the USB XHCI controller. The eXtensible Host Controller Interface (XHCI) is a computer interface specification that defines a register-level description of a Host Controller for Universal Serial bus (USB), which is capable of interfacing to USB 1.0, 2.0, and 3.0 compatible devices. The specification is also referred to as the USB 3.0 Host Controller specification.

► Legacy USB Support

Set to [Enabled] if you need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix.

► Audio Controller

This setting enables/disables the onboard audio controller.

► Launch OnBoard LAN OpROM

These settings enable/disable the initialization of the onboard/onchip LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

► CPU Configuration



► Hyper-Threading

The processor uses Hyper-Threading technology to increase transaction rates and reduces end-user response times. The technology treats the two cores inside the processor as two logical processors that can execute instructions simultaneously. In this way, the system performance is highly improved. If you disable the function, the processor will use only one core to execute the instructions. Please disable this item if your operating system doesn't support HT Function, or unreliability and instability may occur.

► Active Processor Cores

This setting specifies the number of active processor cores.

► Execute Disable Bit

Intel's Execute Disable Bit functionality can prevent certain classes of malicious "buffer overflow" attacks when combined with a supporting operating system. This functionality allows the processor to classify areas in memory by where application code can execute and where it cannot. When a malicious worm attempts to insert code in the buffer, the processor disables code execution, preventing damage or worm propagation.

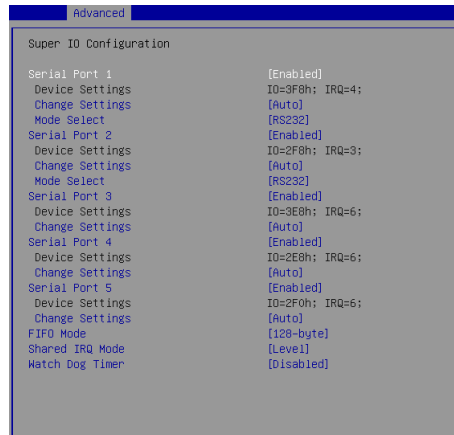
► Intel Virtualization Technology

Virtualization enhanced by Intel Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple "Virtual" systems.

► EIST

EIST (Enhanced Intel SpeedStep Technology) allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production. When disabled, the processor will return the actual maximum CPUID input value of the processor when queried.

► Super IO Configuration



► Serial Port 1/ 2/ 3/ 4/ 5

This setting enables/disables the specified serial port.

► Change Settings

This setting is used to change the address & IRQ settings of the specified serial port.

► Mode Select

Select an operation mode for the specified serial port.

► FIFO Mode

This setting controls the FIFO data transfer mode.

► Shared IRQ Mode

This setting provides the system with the ability to share interrupts among its serial ports.

► Watch Dog Timer

You can enable the system watch-dog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watch dog polls it.

► H/W Monitor

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.

Advanced	
PC Health Status	
Thermal Shutdown	[Enabled]
CPU temperature	: +46 C
System temperature	: +30 C
SYSFAN1 Speed	: 4531 RPM
Vcore	: +1.728 V
VCC3	: +3.237 V
VCC5	: +4.961 V
+12V	: +11.968 V
3VSB	: +3.248 V
VBAT	: +3.184 V

► Thermal Shutdown

This setting enables/disables the thermal shutdown function for system thermal protection.

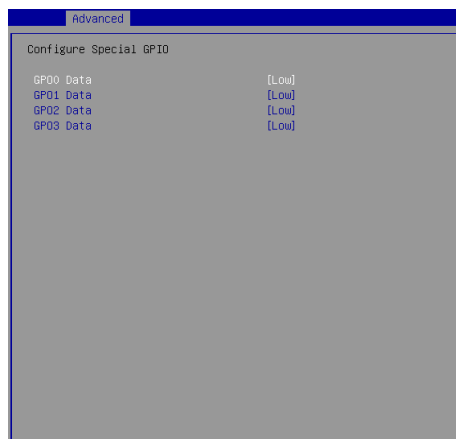
► Smart Fan Configuration

Advanced	
Smart FAN Configuration	
Smart SYSFAN1 Target	[Disabled]

► Smart SYSFAN1 Target

These settings enable/disable the Smart Fan function. Smart Fan is an excellent feature which will adjust the CPU/system fan speed automatically depending on the current CPU/system temperature, avoiding the overheating to damage your system.

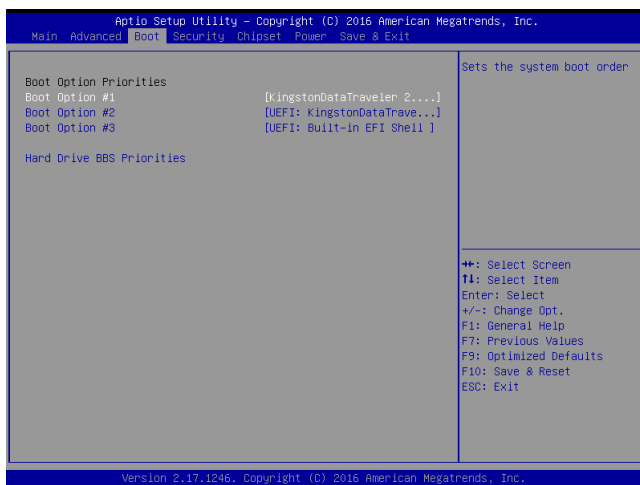
► GPIO Group Configuration



► GP00 ~ GP03 Data

These settings control the operation mode of the specified GPIO.

Boot



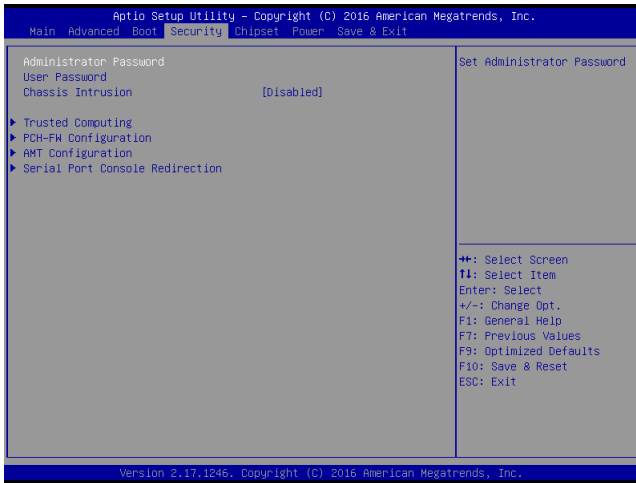
► Boot Option Priorities

This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

► Hard Drive BBS Priorities

This setting allows users to set the priority of the specified devices. First press <Enter> to enter the sub-menu. Then you may use the arrow keys (↑ ↓) to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list.

Security



► Administrator Password

Administrator Password controls access to the BIOS Setup utility.

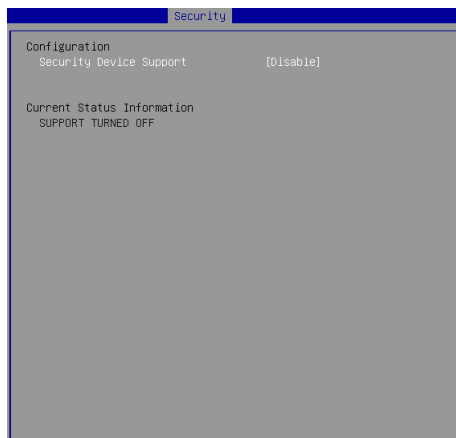
► User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

► Chassis Intrusion

The field enables or disables the feature of recording the chassis intrusion status and issuing a warning message if the chassis is once opened.

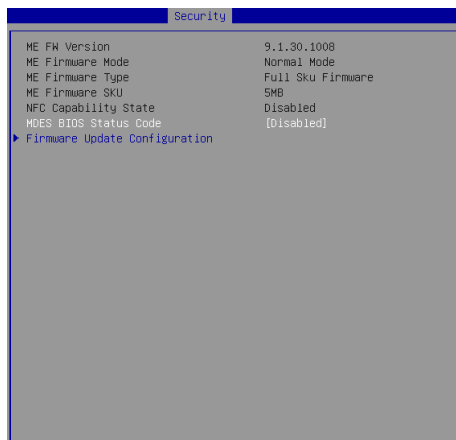
► Trusted Computing



► Security Device Support

This setting enables/disables BIOS support for security device. When set to [Disable], the OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

► PCH-FW Configuration



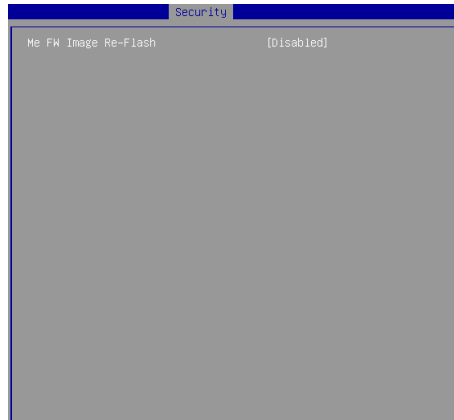
► ME FW Version, ME Firmware Mode/ Type/ SKU

These settings show the firmware information of the Intel ME (Management Engine).

► **MDES BIOS Status Code**

This setting enables/disables the MDES BIOS status code.

► **Firmware Update Configuration**

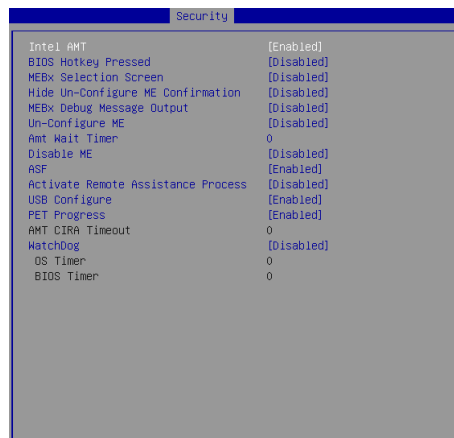


► **ME FW Image Re-Flash**

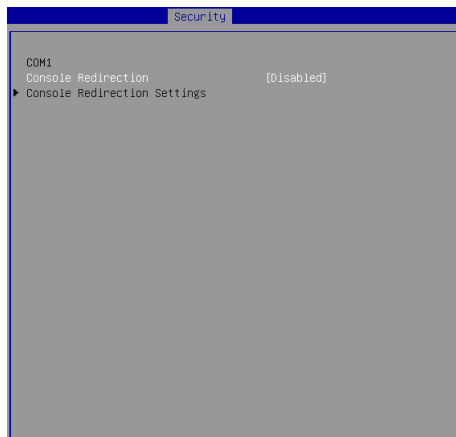
This setting enables/disables the ME FW image reflash.

► **AMT Configuration**

Intel Active Management Technology (AMT) is hardware-based technology for remotely managing and securing PCs out-of-band.



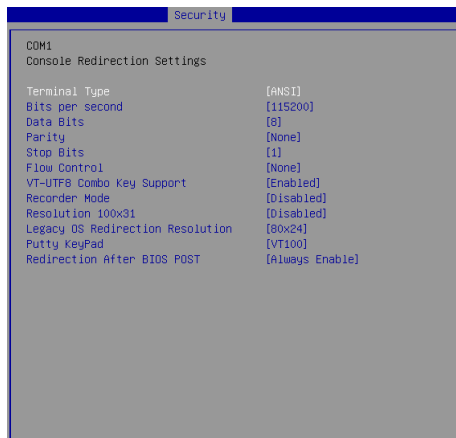
► Serial Port Console Redirection



► Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

► Console Redirection Settings



► Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). This setting specifies the type of terminal device for console redirection.

► Bits per second, Data Bits, Parity, Stop Bits

This setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

► Flow Control

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

► VT-UTF8 Combo Key Support

This setting enables/disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

► Recorder Mode, Resolution 100x31

These settings enable/disable the recorder mode and the resolution 100x31.

► Legacy OS Redirection Resolution

This setting specifies the redirection resolution of legacy OS.

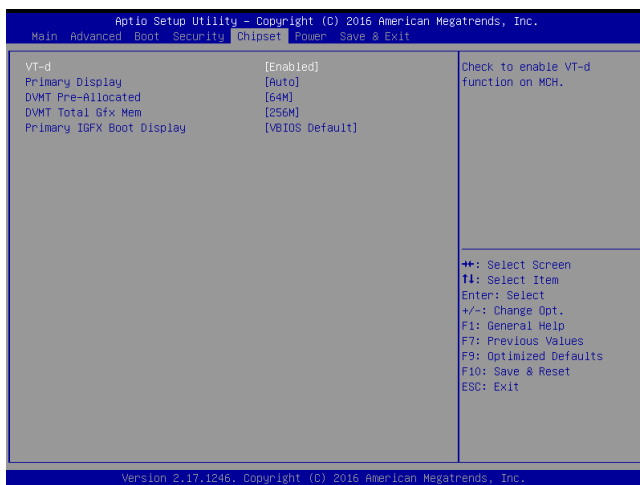
► Putty Keypad

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

► Redirection After BIOS POST

This setting determines whether or not to keep terminals' console redirection running after the BIOS POST has booted.

Chipset



► VT-d

Intel Virtualization Technology for Directed I/O (Intel VT-d) provides the capability to ensure improved isolation of I/O resources for greater reliability, security, and availability.

► Primary Display

This setting specifies which is your primary graphics adapter.

► DVMT Pre-Allocated

This setting defines the DVMT pre-allocated memory. Pre-allocated memory is the small amount of system memory made available at boot time by the system BIOS for video. Pre-allocated memory is also known as locked memory. This is because it is "locked" for video use only and as such, is invisible and unable to be used by the operating system.

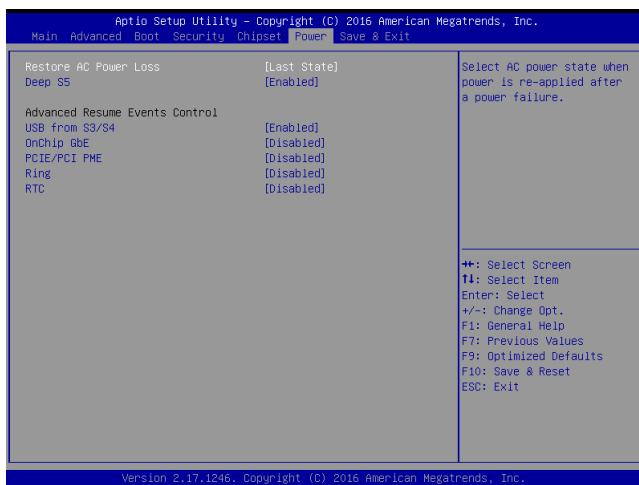
► DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

► Primary IGFX Boot Display

Use the field to select the type of device you want to use as the display(s) of the system.

Power



► Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off]	Leaves the computer in the power off state.
[Power On]	Leaves the computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

► Deep S5

The setting enables/disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can "wake" on input from the keyboard, clock, modem, LAN, or USB device.

**** Advanced Resume Events Control ******► USB from S3/S4**

The item allows the activity of the USB device to wake up the system from S3/S4 sleep state.

► OnChip GbE

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onchip LAN is detected.

► PCIE/PCI PME

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onboard PCIE/PCI PME is detected.

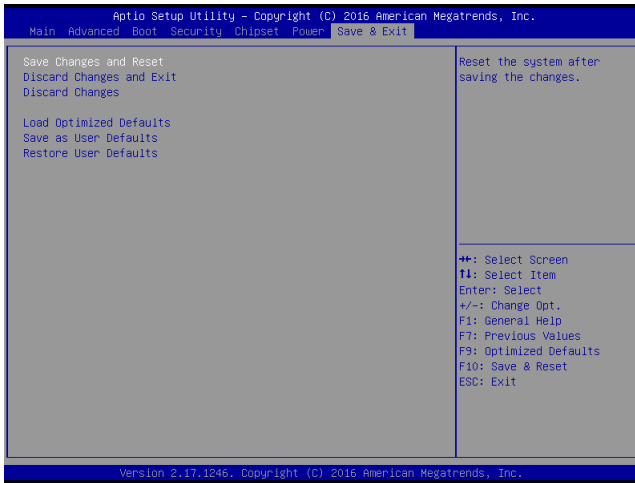
► Ring

An input signal on the serial Ring Indicator (RI) line (in other words, an incoming call on the modem) awakens the system from a soft off state.

► RTC

When [Enabled], you can set the date and time at which the RTC (real-time clock) alarm awakens the system from suspend mode.

Save & Exit



► Save Changes and Reset

Save changes to CMOS and reset the system.

► Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

► Discard Changes

Abandon all changes.

► Load Optimized Defaults

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

► Save as User Defaults

Save changes as the user's default profile.

► Restore User Defaults

Restore the user's default profile.



4 MSI HIDAC Utility



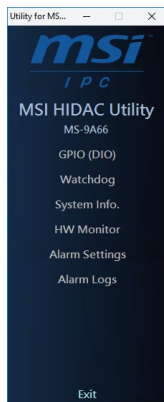
This section introduces the MSI HIDAC utility for overall system monitor and control.

Activating the Utility

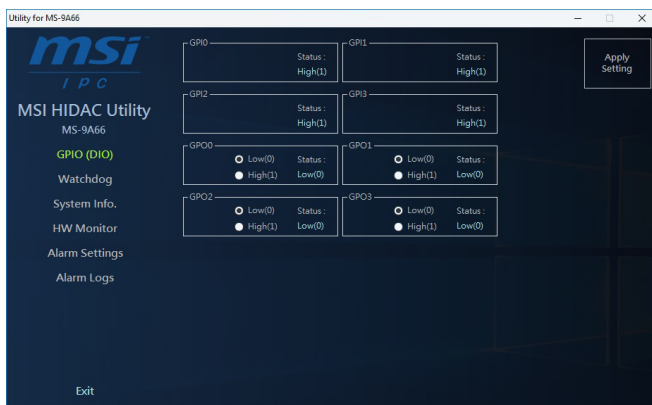
Select [MSI HIDAC Utility] on Desktop to activate the utility.

This MSI HIDAC Utility provides information on:

- GPIO (DIO)
- Watchdog Timer
- System Information
- Hardware Monitor
- Alarm Settings for Hardware Monitor
- Alarm Logs for Hardware Monitor



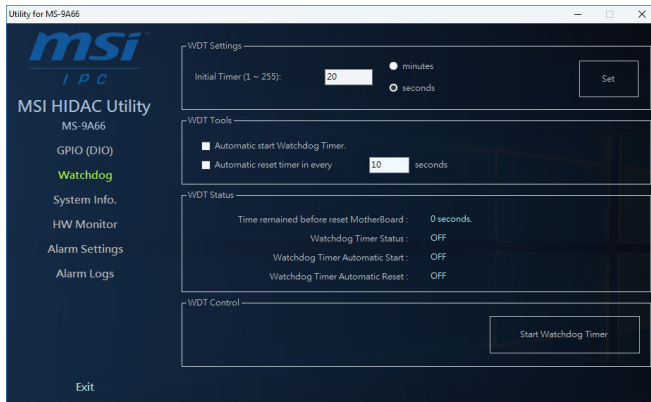
GPIO (DIO)



Features:

- 4 GPIOs and 4 GPOs available
- Real-time display of GPIO status
- Selectable GPO status

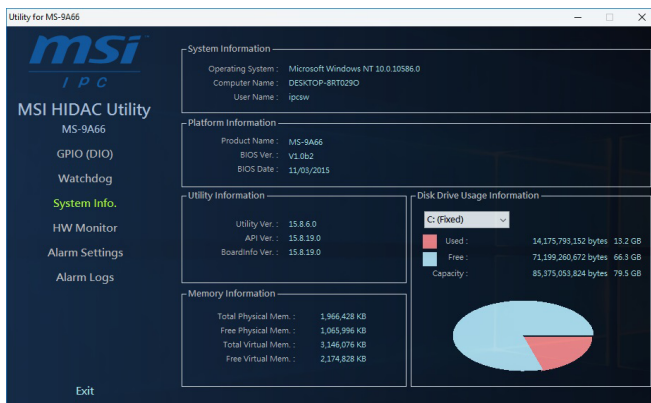
Watchdog



Features:

- Initial Timer configurable through **WDT Settings**
- **WDT Tools** available for automatically activating Watchdog Timer at system boot and automatically resetting timer after a preset time interval
- Real-time display of Watchdog Timer status

System Info.



Features:

- Real-time display of *System Information*, *Platform Information*, *Utility Information*, *Memory Information* and *Disk Drive Usage Information*

HW Monitor



Features:

- Real-time display of Hardware Monitor status including CPU/system temperatures, fan speeds and CPU/system voltage info

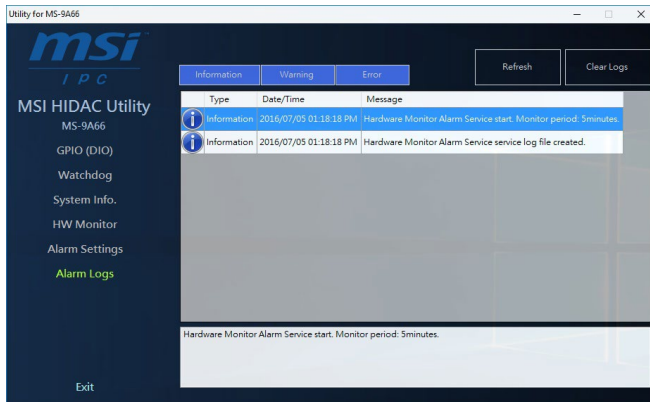
Alarm Settings



Features:

- Custom settings of a tolerance range for the alarm triggers
- Automatic alarm logs of monitored hardware items when the alarm trigger thresholds are exceeded

Alarm Logs



Features:

- Real-time display of Hardware Monitor alarm logs
- Alarm logs sortable by button (*Information*, *Warning* or *Error*)
- Alarm logs clearable through **Clear Logs**



Appendix

WDT, GPIO, DIO



This appendix provides information on WDT (Watch Dog Timer), GPIO (General Purpose Input/Output) and DIO (Digital Input/Output).

WDT Sample Code

```

SIO_INDEX_Port    equ 04Eh
SIO_DATA_Port     equ 04Fh
SIO_UnLock_Value  equ 087h
SIO_Lock_Value    equ 0AAh
WatchDog_LDN      equ 007h
WDT_UNIT          equ 60h    ;60h=second, 68h=minute, 40h=Disabled watchdog timer
WDT_Timer         equ 30     ;ex. 30 seconds

```

Sample code:

```

;Enable config mode
mov     dx, SIO_INDEX_Port
mov     al, SIO_UnLock_Value
out     dx, al
jmp     short $+2          ;Io_delay
jmp     short $+2          ;Io_delay
out     dx, al

;Change to WDT
mov     dx, SIO_INDEX_Port
mov     al, 07h
out     dx, al
mov     dx, SIO_DATA_Port
mov     al, WatchDog_LDN
out     dx, al

;Active WDT
mov     dx, SIO_INDEX_Port
mov     al, 30h
out     dx, al
mov     dx, SIO_DATA_Port
in      al, dx
or      al, 01h
out     dx, al

;set timer
mov     dx, SIO_INDEX_Port
mov     al, 0F6h
out     dx, al
mov     dx, SIO_DATA_Port
mov     al, WDT_Timer
out     dx, al

;set UINIT
mov     dx, SIO_INDEX_Port
mov     al, 0F5h
out     dx, al
mov     dx, SIO_DATA_Port
mov     al, WDT_UNIT
out     dx, al

;enable reset
mov     dx, SIO_INDEX_Port
mov     al, 0FAh
out     dx, al
mov     dx, SIO_DATA_Port
in      al, dx
or      al, 01h
out     dx, al

;close config mode
mov     dx, SIO_INDEX_Port
mov     al, SIO_Lock_Value
out     dx, al

```

GPIO Sample Code

- GPI 0 ~ GPI 3

	GPI 0	GPI 1	GPI 2	GPI 3				
IO Address								
SIO_GPIO_Register	A2h	A2h	A2h	A2h				
Bit	0	1	2	7				
Sample code	#1	#1	#1	#1				

- GPO 0 ~ GPO 3

	GPO 0	GPO 1	GPO 2	GPO 3				
IO Address								
SIO_GPIO_Register	A1h	A1h	A1h	A1h				
Bit	3	4	5	6				
Sample code	#2	#2	#2	#2				

```

SIO_INDEX_Port      equ    04Eh
SIO_DATA_Port       equ    04Fh
SIO_UnLock_Value    equ    087h
SIO_Lock_Value      equ    0AAh
SIO_LDN_GPIO        equ    06h
SIO_GPIO_Data       equ    0A1h
SIO_GPIO_Status     equ    0A2h
GPI_0               equ    00000001b
GPO_0               equ    00001000b

```

Sample Code:

#1 : Get GPI 0 status

; Enable config mode

```

mov    dx, SIO_INDEX_Port
mov    al, SIO_UnLock_Value
out    dx, al
jmp    short $+2          ;Io_delay
jmp    short $+2          ;Io_delay
out    dx, al

```

; Switch GPIO Configuration for SIO LDN 0x06

```

mov    dx, SIO_INDEX_Port
mov    al, 07h
out    dx, al
mov    dx, SIO_DATA_Port
mov    al, SIO_LDN_GPIO
out    dx, al

```

; Get GPI 0 Pin Status Register

```

mov     dx, SIO_INDEX_Port
mov     al, SIO_GPIO_Status
out     dx, al
mov     dx, SIO_DATA_Port
in      al, dx                ;al bit0 = GPI 0 status

```

; Exit SIO

```

mov     dx, SIO_INDEX_Port
mov     al, SIO_Lock_Value
out     dx, al

```

#2 : Set GPO 0 to high

; Enable config mode

```

mov     dx, SIO_INDEX_Port
mov     al, SIO_UnLock_Value
out     dx, al
jmp     short $+2             ;Io_delay
jmp     short $+2             ;Io_delay
out     dx, al

```

; Switch GPIO Configuration for SIO LDN 0x06

```

mov     dx, SIO_INDEX_Port
mov     al, 07h
out     dx, al
mov     dx, SIO_DATA_Port
mov     al, SIO_LDN_GPIO
out     dx, al

```

; Set GPO 0 Register

```

mov     dx, SIO_INDEX_Port
mov     al, SIO_GPIO_Data
out     dx, al
mov     dx, SIO_DATA_Port
in      al, dx
and     al, not GPO_0
or      al, GPO_0
out     dx, al

```

; Exit SIO

```

mov     dx, SIO_INDEX_Port
mov     al, SIO_Lock_Value
out     dx, al

```

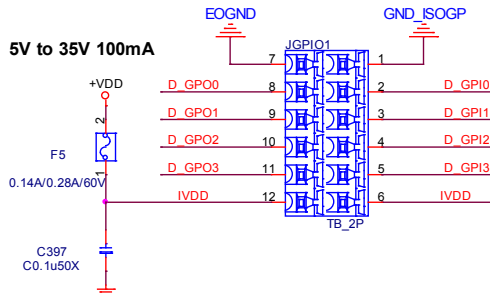
Digital I/O Connector

The MS-9A66 features an onboard isolated digital I/O circuit and supports the following features:

- 4-CH Isolated DI
 - Logic high: 5 to 24 V
 - Logic low: 0 to 1.5 V
 - Input resistance: 8.2K @ 0.75W
 - Isolation type: photocoupler
 - Isolation voltage: 1500 V DC
- 4-CH Isolated DO
 - Output Type: MOSFET transistor
 - Sink current up to 100 mA (sustained loading) or 250 mA (peak loading) on each isolated output channel
 - Supply voltage: 5 to 35 V DC
 - Isolation type: Digital Isolator
 - Isolation voltage: 1500 V DC
 - Flywheel diode for VDD on all DO channels
- Isolated 5V DC Power Source for DO
 - Supply voltage: 5 ± 0.5 V DC
 - Supply current: 180 mA (maximum)
 - Isolation type: DC-to-DC transformer
 - Isolation voltage: 1000 VRMS (channel to system)
 - Data transfer: programmed IO
 - Software Driver support for Windows XP 32/64 Bit, Windows 7 32/64 Bit, Windows 8.1 32/64 Bit, Windows 10 64 Bit

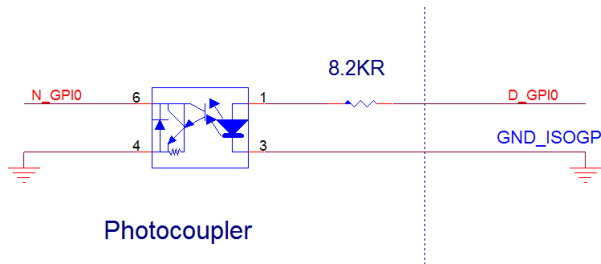


Digital I/O Pin Header



► Isolated Digital Input Circuits

Input accepts voltages up to 24V, with input resistors of 8.2 k Ω , with connections between outside signals as shown.



► Isolated Digital Output Circuits

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

The VDD pin is connected in series with a flywheel diode protecting the driver during inductance loading, such as relay, motor, or solenoid, wherein the VDD must connect to external power to form a flywheel current loop.

