MS-9988

COM Express Carrier Board

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Trademarks

All trademarks are the properties of their respective owners.

Revision History

Revision	Date
V2.0	2017/08

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 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 UNCONDI-TIONED, STORAGE TEMPERATURE ABOVE 60°C (140°F), IT MAY DAM-AGE THE EQUIPMENT.

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/evmtprtt_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.

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.

CONTENTS

1 **Overview**

Thank you for choosing the MS-9988, an excellent COM (computer-on-module) Express Carrier Board. It is a highly advanced, feature-rich carrier that offers PCIe and Mini-PCIe expansion. This carrier board also features USB 3.0/USB 2.0 ports, a VGA port, DisplayPorts, LVDS interface, a parallel port connector, serial port connectors, audio jacks, SATA ports, etc.

Specifications

Storage

- 2 x SATA 6Gb/s ports
- 2 x SATA 3Gb/s ports

Audio

- Realtek ALC887 audio codec
- 3 x rear audio jacks
- 1 x front audio connector

Graphics

- VGA, DisplayPort, LVDS interfaces

Rear Panel I/O

- 3 x audio jacks
- 4 x USB3.0 ports
- 3 x DisplayPorts
- 1 x VGA port
- 1 x GbE RJ45 port
- 2 x USB2.0 ports

Onboard Headers/ Connectors/ Jumpers

- 1 x 24-pin power connector
- 1 x 4-pin power connector
- 2 x system fan connectors
- 2 x SATA 6Gb/s ports
- 2 x SATA 3Gb/s ports
- 1 x front panel connector
- 1 x front audio connector
- 1 x parallel port connector
- 4 x COM port connectors
- 2 x GPIO headers
- 2 x SMBus connectors
- 1 x USB2.0 connector (1 port)
- 1 x LVDS/eDP connector
- 1 x LVDS/eDP select header
- 1 x keyboard/mouse connector
- 1 x inverter power connector
- 2 x BIOS select jumpers
- 1 x inverter power jumper
- 1 x LVDS power jumper
- 1 x AT/ATX select jumper
- 3 x COM port power jumpers
- 1 x clear CMOS jumper

Expansion Slots

- 1 x PCIe x16 slot
- 6 x PCIe x1 slots
- 2 x Mini-PCIe slots

Form Factor

- ATX form factor: 12" x 9.6"

Compliance

- PICMG COM Express R2.0, Type 6

Environmental

- Operating Temperature: 0ºC ~ 60ºC
- Storage Temperature: -20ºC ~ 80ºC
- Humidity: 5% ~ 90% RH, Non-Condensing

Board Layout

Front Audio Connector

COM Port Power Jumper

Parallel Port Connector

GPIO Pin Header

System Fan Connector

COM Port Connector

Power Connector

Power Connector

AT/ATX Jumper

Keyboard/ Mouse Connector

System Fan Connector

Front Panel Connector

Rear Panel I/O

USB2.0 Connector

Inverter Power Connector

Inverter Power Jumper

LVDS Power Jumper

LVDS/eDP Select Header

SMBus Connector

SATA Port

PCIe Slot

SMBus Connector

GPIO Header

BIOS Select Jumper

COM Port Power Jumper

COM Port Connector

LVDS Connector

COM Express Connector

PCIe Slot

Mini-PCIe Slot

Clear CMOS Jumper

Line-In

Line-Out

VGA Port

GbE RJ45 Port

Mic-In

USB3.0 Port

USB3.0 Port

DisplayPort

DisplayPort

USB2.0 Port

2 Hardware Setup

This chapter provides you with the information about hardware setup procedures. While doing the installation, be careful in holding the components and follow the installation procedures. For some components, if you install in the wrong orientation, the components will not work properly.

Use a grounded wrist strap before handling computer components. Static electricity may damage the components.

Components Reference Guide

Power Supply

System Power Connector: PWRCONN1

This connector allows you to connect a power supply. To connect to the power supply, make sure the plug of the power supply is inserted in the proper orientation and the pins are aligned. Then push down the power supply firmly into the connector.
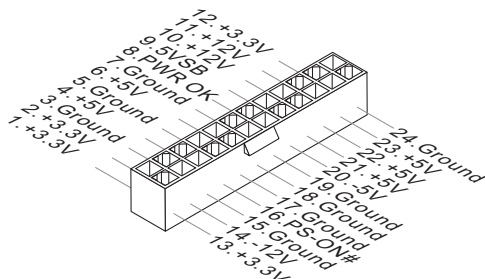
CPU Power Connector: JPWR1

This connector is used to provide power to the CPU.
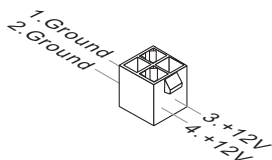
Important

Make sure that all power connectors are connected to the power supply to ensure stable operation of the motherboard.

Rear Panel I/O
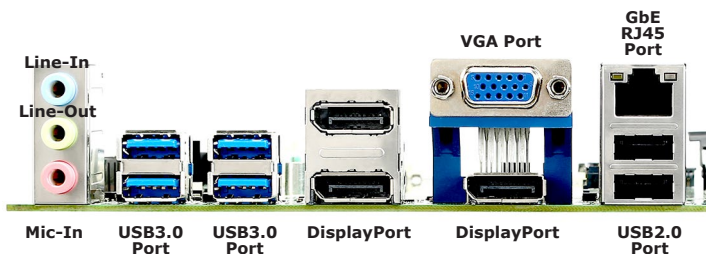
➤ Audio Ports

These audio connectors are used for audio devices. It is easy to differentiate between audio effects according to the color of audio jacks.

- Line-In (Blue) - Line In, is used for external CD player, tapeplayer or other audio devices.
- Line-Out (Green) - Line Out, is a connector for speakers or headphones.
- Mic (Pink) - Mic, is a connector for microphones.

➤ USB3.0 Port

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

➤ DisplayPort

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

➤ VGA Port

The DB15-pin female connector is provided for monitor.

➤ **GbE RJ45 Port**

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

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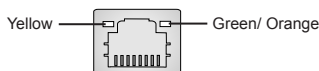
LED	Color	LED State	Condition
Left	Yellow	Off	LAN link is not established.
		On (steady state)	LAN link is established.
		On (blinking)	The computer is communicating with another computer on the LAN.
Right	Green	Off	10 Mbit/sec data rate is selected.
		On	100 Mbit/sec data rate is selected.
	Orange	On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

➤ **USB2.0 Port**

The USB (Universal Serial Bus) port is for attaching USB devices such as keyboard, mouse, or other USB-compatible devices.

Connector

Fan Power Connector: JSYSFAN1, JSYSFAN2

The fan power connectors support system cooling fan with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND.

1.GND
2.VOUT
3.AUX_FAN_IN
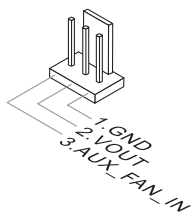
I2C Bus Connector: JSMB1, JI2C2

This connector, known as I2C, is for users to connect System Management Bus (SMBus) interface.

4.GND
3.SUS_SMBDATA
2.SUS_SMBCLK
1.3VSB
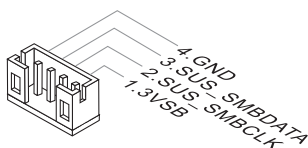
GPIO Pin Header: JGPIO1, JGPIO2

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.
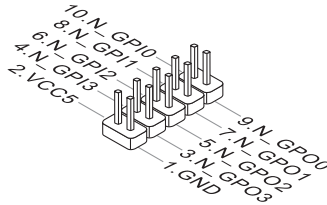
Serial ATA Connector: SATA1 ~ SATA4

This connector is a high-speed Serial ATA interface port. Each connector can connect to one Serial ATA device.
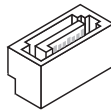
Important

Please do not fold the SATA cable into a 90-degree angle. Otherwise, data loss may occur during transmission.

Keyboard/Mouse Connector: JKBMS1

This connector is provided to connect a keyboard and a mouse.

6. MSC
5. 5VSB
4. KBC
3. MSD
2. GND
1. KBD
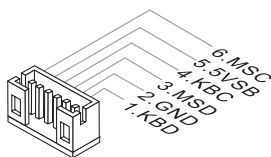
Front Panel Connector: JFP1

This front panel connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.

10. KEY
8. PWSW-
6. PWSW-
4. SLED
2. PLED

9. NC
7. RESET+
5. RESET-
3. HDDLED-
1. HDDLED+
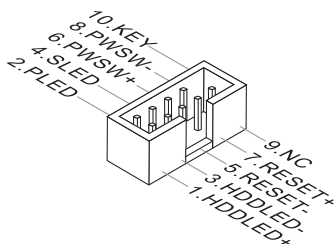
USB2.0 Connector: JUSB1

This connector, compliant with Intel I/O Connectivity Design Guide, is ideal for connecting high-speed USB interface peripherals such as USB HDD, digital cameras, MP3 players, printers, modems and the like.

5. NC
4. GND
3. SBD9P
2. SBD9N
1. 5V
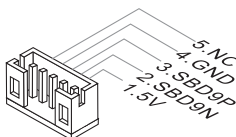
Important

Note that the pins of VCC and GND must be connected correctly to avoid possible damage.

LVDS Inverter Connector: JINVDD1

The connector is provided for LCD backlight options.

6. GND
5. GND
4. L_BKLT_CTRL#
3. INV_ON
2. JINV_VDD
1. JINV_VDD
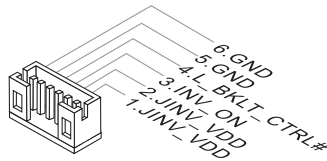
LVDS/eDP Select Header: JVDD2

The connector is provided for LVDS / eDP HDP selection (Default to SIO).

1. eDP_HDP (to Module)
2. LVDS_eDP DET#
3. LVDS_DET# (to SIO)
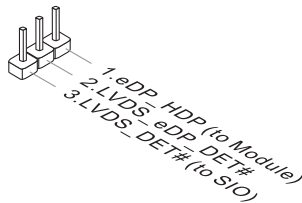
LVDS/eDP Connector: JLVDS1

The LVDS (Low Voltage Differential Signal) connector provides a digital interface typically used with flat panels. After connecting an LVDS interface flat panel to the JLVDS1, be sure to check the panel datasheet and set the LVDS jumper to proper power voltage.

8. LVDS
10. LVDS
12. LVDS_DETECT#
14. LVDSA_VDD
16. LVDSA_DATA0
18. GND
20. LVDSA_DATA#0
22. LVDSA_DATA2
24. GND
26. LVDSB_DATA#2
28. LVDSB_DATA#0
30. GND
32. LVDSB_DATA2
34. LVDSB_DATA#2
36. GND
38. LVDSA_CLK
40. LVDSA_CLK#

6. LCD_DDC_DATA
4. +12V
2. +12V

1. +12V
3. LCD_VDD
5. LCD_VDD
7. LVDS_EN
9. LCD_DDC_CLK
11. LVDSA_B ON
13. LVDSA_DATA1
15. GND
17. LVDSA_DATA3
19. LVDSA_DATA#1
21. GND
23. LVDSA_DATA#3
25. LVDSB_DATA1
27. GND
29. LVDSB_DATA3
31. LVDSB_DATA#1
33. GND
35. LVDSB_DATA#3
37. LVDSB_CLK
39. LVDSB_CLK#

Important

Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

COM Port Connector: JCOM1 ~ JCOM4

This connector is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. You can attach a serial device to it.

➤ JCOM1

RS232

RS422

RS485

➤ JCOM2

RS232

> **JCOM3, JCOM4**

RS232

10.KEY
8.NC
6.NC
4.NC
2.SER_RX

9.VCC_COM
7.NC
5.GND
3.SER_TX
1.NC
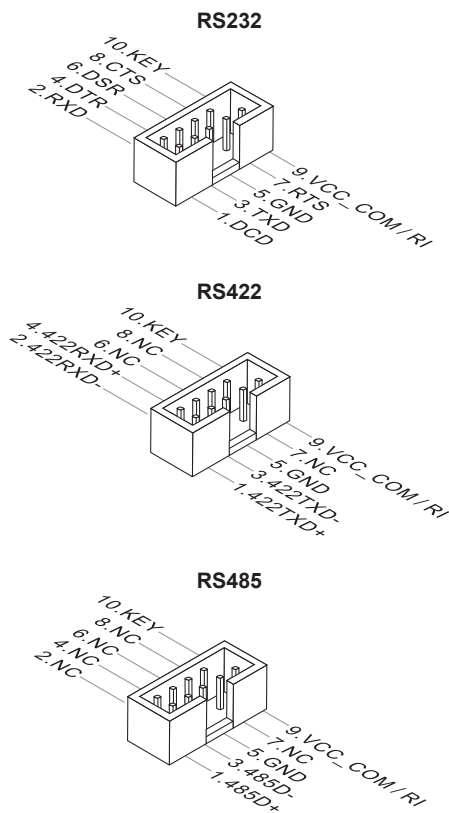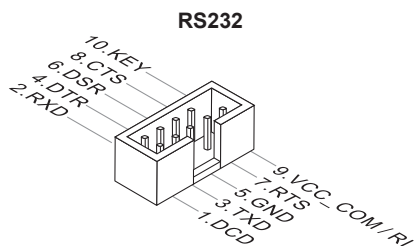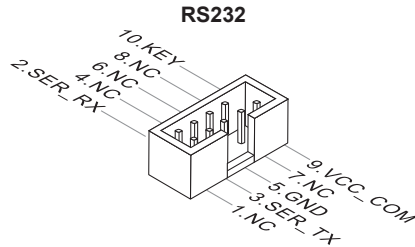
Front Audio Connector: JAUD1

This connector allows you to connect the front panel audio and is compliant with Intel Front Panel I/O Connectivity Design Guide.

10.Headphone Detection
8.Key
6.MIC Detection
4.NC
2.Ground

9.Headphone L
7.Sense_Send
5.Headphone R
3.MIC R
1.MIC L
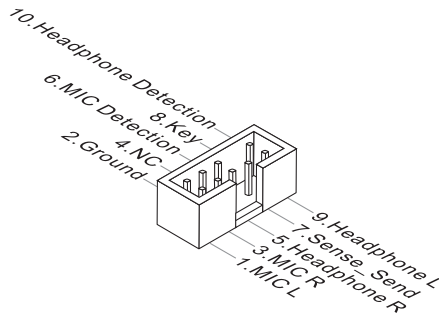
Parallel Port Connector: JLPT1

The mainboard provides a 26-pin header for connection to an optional parallel port bracket. The parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.

26.No Pin
24.Ground
22.Ground
20.Ground
18.Ground
16.Ground
14.Ground
12.Ground
10.Ground
8.LPT_SLIN#
6.PINIT#
4.ERR#
2.AFD#

25.SLCT
23.PE
21.BUSY
19.ACK#
17.PRND7
15.PRND6
13.PRND5
11.PRND4
9.PRND3
7.PRND2
5.PRND1
3.PRND0
1.RSTB#
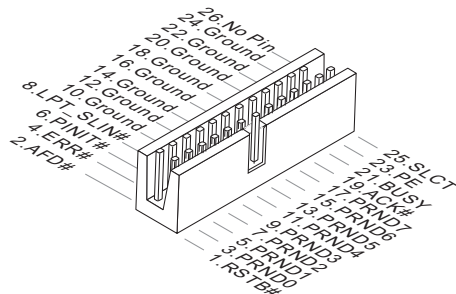
TPM Module Connector: JDP1

This connector connects to a TPM (Trusted Platform Module) module (optional).
Please refer to the TPM security platform manual for more details.

14.Ground
12.Ground
10.No Pin
8.5V Power
6.Serial IRQ
4.3.3V Power
2.3V Standby power

13.LPC Frame
11.LPC address & data pin3
9.LPC address & data pin2
7.LPC address & data pin1
5.LPC address & data pin0
3.LPC Reset
1.LPC Clock
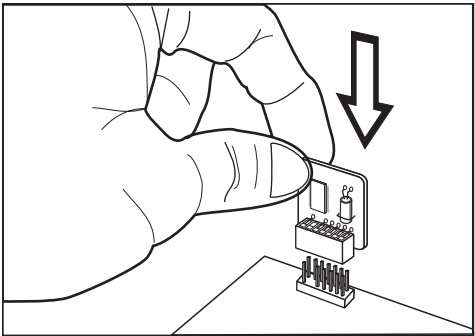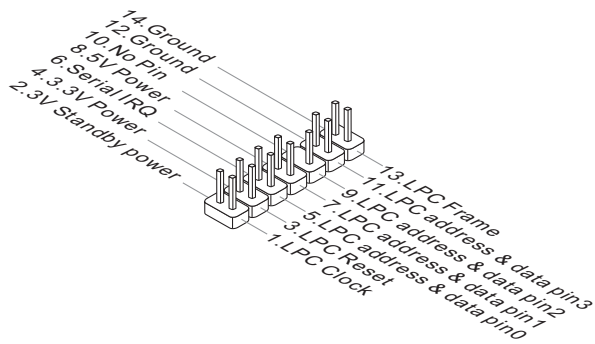
COM Express Connectors

The COM Express connectors are used to interface the COM Express carrier board to a module board. Connect the COM Express connectors on the carrier board (as indicated below) to the COM Express connectors on the module board.

D1   D110
C1   C110

B1   B110
A1   A110
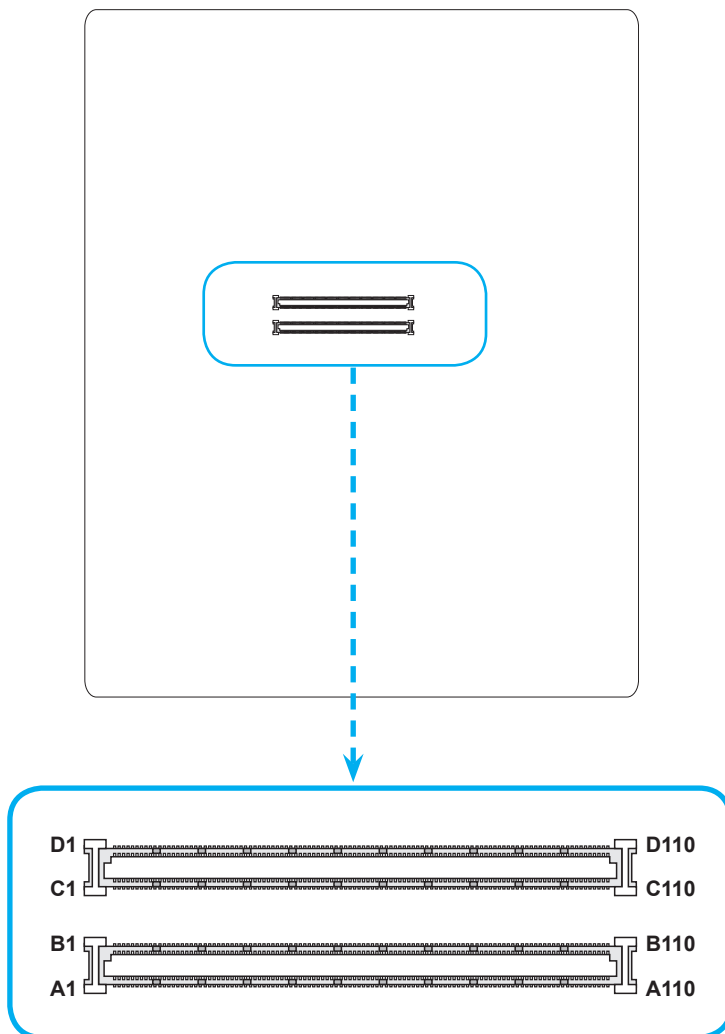
	Row A		Row B		Row C		Row D
A1	GND (FIXED)	B1	GND (FIXED)	C1	GND (FIXED)	D1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#	C2	GND	D2	GND
A3	GBE0_MDI3+	B3	LPC_FRAME#	C3	USB_SSRX0-	D3	USB_SSTX0-
A4	GBE0_LINK100#	B4	LPC_AD0	C4	USB_SSRX0+	D4	USB_SSTX0+
A5	GBE0_LINK1000#	B5	LPC_AD1	C5	GND	D5	GND
A6	GBE0_MDI2-	B6	LPC_AD2	C6	USB_SSRX1-	D6	USB_SSTX1-
A7	GBE0_MDI2+	B7	LPC_AD3	C7	USB_SSRX1+	D7	USB_SSTX1+
A8	GBE0_LINK#	B8	LPC_DRQ0#	C8	GND	D8	GND
A9	GBE0_MDI1-	B9	RSVD*	C9	USB_SSRX2-	D9	USB_SSTX2-
A10	GBE0_MDI1+	B10	LPC_CLK	C10	USB_SSRX2+	D10	USB_SSTX2+
A11	GND (FIXED)	B11	GND (FIXED)	C11	GND (FIXED)	D11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#	C12	USB_SSRX3-	D12	USB_SSTX3-
A13	GBE0_MDI0+	B13	SMB_CK	C13	USB_SSRX3+	D13	USB_SSTX3+
A14	GBE0_CTREF	B14	SMB_DAT	C14	GND	D14	GND
A15	SUS_S3#	B15	RSVD*	C15	RSVD*	D15	DDI1_CTRLCLK_AUX+
A16	SATA0_TX+	B16	SATA1_TX+	C16	RSVD*	D16	DDI1_CTRLDATA_AUX-
A17	SATA0_TX-	B17	SATA1_TX-	C17	RSVD*	D17	RSVD*
A18	SUS_S4#	B18	RSVD*	C18	RSVD*	D18	RSVD*
A19	SATA0_RX+	B19	SATA1_RX+	C19	PCIE_RX6+	D19	PCIE_TX6+
A20	SATA0_RX-	B20	SATA1_RX-	C20	PCIE_RX6-	D20	PCIE_TX6-
A21	GND (FIXED)	B21	GND (FIXED)	C21	GND (FIXED)	D21	GND (FIXED)
A22	SATA2_TX+	B22	SATA3_TX+	C22	PCIE_RX7+	D22	PCIE_TX7+
A23	SATA2_TX-	B23	SATA3_TX-	C23	PCIE_RX7-	D23	PCIE_TX7-
A24	RSVD*	B24	PWR_OK	C24	DDI1_HPD	D24	RSVD*
A25	SATA2_RX+	B25	SATA3_RX+	C25	RSVD*	D25	RSVD*
A26	SATA2_RX-	B26	SATA3_RX-	C26	RSVD*	D26	DDI1_PAIR0+
A27	RSVD*	B27	WDT	C27	RSVD*	D27	DDI1_PAIR0-
A28	(S)ATA_ACT#	B28	RSVD*	C28	RSVD*	D28	RSVD*
A29	AC/HDA_SYNC	B29	RSVD*	C29	RSVD*	D29	DDI1_PAIR1+
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0	C30	RSVD*	D30	DDI1_PAIR1-
A31	GND (FIXED)	B31	GND (FIXED)	C31	GND (FIXED)	D31	GND (FIXED)
A32	AC/HDA_BITCLK	B32	SPKR	C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
A33	AC/HDA_SDOUT	B33	I2C_CK	C33	DDI2_CTRLDATA_AUX	D33	DDI1_PAIR2-
A34	BIOS_DIS0#	B34	I2C_DAT	C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
A35	THRMTRIP#	B35	THRM#	C35	RSVD*	D35	RSVD*
A36	USB6-	B36	USB7-	C36	DDI3_CTRLCLK_AUX+	D36	DDI1_PAIR3+
A37	USB6+	B37	USB7+	C37	DDI3_CTRLDATA_AUX	D37	DDI1_PAIR3-
A38	USB_6_7_OC#	B38	USB_4_5_OC#	C38	DDI3_DDC_AUX_SEL	D38	RSVD*
A39	USB4-	B39	USB5-	C39	DDI3_PAIR0+	D39	DDI2_PAIR0+
A40	USB4+	B40	USB5+	C40	DDI3_PAIR0-	D40	DDI2_PAIR0-
A41	GND (FIXED)	B41	GND (FIXED)	C41	GND (FIXED)	D41	GND (FIXED)
A42	USB2-	B42	USB3-	C42	DDI3_PAIR1+	D42	DDI2_PAIR1+
A43	USB2+	B43	USB3+	C43	DDI3_PAIR1-	D43	DDI2_PAIR1-
A44	USB_2_3_OC#	B44	USB_0_1_OC#	C44	DDI3_HPD	D44	DDI2_HPD
A45	USB0-	B45	USB1-	C45	RSVD*	D45	RSVD*
A46	USB0+	B46	USB1+	C46	DDI3_PAIR2+	D46	DDI2_PAIR2+
A47	VCC_RTC	B47	RSVD*	C47	DDI3_PAIR2-	D47	DDI2_PAIR2-
A48	RSVD*	B48	RSVD*	C48	RSVD*	D48	RSVD*
A49	RSVD*	B49	SYS_RESET#	C49	DDI3_PAIR3+	D49	DDI2_PAIR3+
A50	LPC_SERIRQ	B50	CB_RESET#	C50	DDI3_PAIR3-	D50	DDI2_PAIR3-
A51	GND (FIXED)	B51	GND (FIXED)	C51	GND (FIXED)	D51	GND (FIXED)
A52	PCIE_TX5+	B52	PCIE_RX5+	C52	PEG_RX0+	D52	PEG_TX0+
A53	PCIE_TX5-	B53	PCIE_RX5-	C53	PEG_RX0-	D53	PEG_TX0-
A54	GPI0	B54	GPO1	C54	TYPE0#	D54	PEG_LANE_RV#
A55	PCIE_TX4+	B55	PCIE_RX4+	C55	PEG_RX1+	D55	PEG_TX1+
A56	PCIE_TX4-	B56	PCIE_RX4-	C56	PEG_RX1-	D56	PEG_TX1-
A57	GND	B57	GPO2	C57	TYPE1#	D57	TYPE2#
A58	PCIE_TX3+	B58	PCIE_RX3+	C58	PEG_RX2+	D58	PEG_TX2+
A59	PCIE_TX3-	B59	PCIE_RX3-	C59	PEG_RX2-	D59	PEG_TX2-

	Row A		Row B		Row C		Row D
A60	GND (FIXED)	B60	GND (FIXED)	C60	GND (FIXED)	D60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+	C61	PEG_RX3+	D61	PEG_TX3+
A62	PCIE_TX2-	B62	PCIE_RX2-	C62	PEG_RX3-	D62	PEG_TX3-
A63	GPI1	B63	GPO3	C63	RSVD*	D63	RSVD*
A64	PCIE_TX1+	B64	PCIE_RX1+	C64	RSVD*	D64	RSVD*
A65	PCIE_TX1-	B65	PCIE_RX1-	C65	PEG_RX4+	D65	PEG_TX4+
A66	GND	B66	WAKE0#	C66	PEG_RX4-	D66	PEG_TX4-
A67	GPI2	B67	WAKE1#	C67	RSVD*	D67	GND
A68	PCIE_TX0+	B68	PCIE_RX0+	C68	PEG_RX5+	D68	PEG_TX5+
A69	PCIE_TX0-	B69	PCIE_RX0-	C69	PEG_RX5-	D69	PEG_TX5-
A70	GND (FIXED)	B70	GND (FIXED)	C70	GND (FIXED)	D70	GND (FIXED)
A71	LVDS_A0+ / eDP_TX2+	B71	LVDS_B0+	C71	PEG_RX6+	D71	PEG_TX6+
A72	LVDS_A0- / eDP_TX2-	B72	LVDS_B0-	C72	PEG_RX6-	D72	PEG_TX6-
A73	LVDS_A1+ / eDP_TX1+	B73	LVDS_B1+	C73	GND	D73	GND
A74	LVDS_A1- / eDP_TX1-	B74	LVDS_B1-	C74	PEG_RX7+	D74	PEG_TX7+
A75	LVDS_A2+ / eDP_TX0+	B75	LVDS_B2+	C75	PEG_RX7-	D75	PEG_TX7-
A76	LVDS_A2- eDP_TX0-	B76	LVDS_B2-	C76	GND	D76	GND
A77	LVDS_VDD_EN	B77	LVDS_B3+	C77	RSVD*	D77	RSVD*
A78	LVDS_A3+	B78	LVDS_B3-	C78	PEG_RX8+	D78	PEG_TX8+
A79	LVDS_A3-	B79	LVDS_BKLT_EN	C79	PEG_RX8-	D79	PEG_TX8-
A80	GND (FIXED)	B80	GND (FIXED)	C80	GND (FIXED)	D80	GND (FIXED)
A81	LVDS_A_CK+ / eDP_TX3+	B81	LVDS_B_CK+	C81	PEG_RX9+	D81	PEG_TX9+
A82	LVDS_A_CK- / eDP_TX3-	B82	LVDS_B_CK-	C82	PEG_RX9-	D82	PEG_TX9-
A83	LVDS_I2C_CK / eDP_AUX+	B83	LVDS_BKLT_CTRL	C83	RSVD*	D83	RSVD*
A84	LVDS_I2C_DAT / eDP_AUX-	B84	VCC_5V_SBY	C84	GND	D84	GND
A85	GPI3	B85	VCC_5V_SBY	C85	PEG_RX10+	D85	PEG_TX10+
A86	SLP_SUS#	B86	VCC_5V_SBY	C86	PEG_RX10-	D86	PEG_TX10-
A87	eDP_HPD RSVD	B87	VCC_5V_SBY	C87	GND	D87	GND
A88	PCIE_CLK_REF+	B88	BIOS_DIS1#	C88	PEG_RX11+	D88	PEG_TX11+
A89	PCIE_CLK_REF-	B89	VGA_RED	C89	PEG_RX11-	D89	PEG_TX11-
A90	GND (FIXED)	B90	GND (FIXED)	C90	GND (FIXED)	D90	GND (FIXED)
A91	SPI_POWER	B91	VGA_GRN	C91	PEG_RX12+	D91	PEG_TX12+
A92	SPI_MISO	B92	VGA_BLU	C92	PEG_RX12-	D92	PEG_TX12-
A93	GPO0	B93	VGA_HSYNC	C93	GND	D93	GND
A94	SPI_CLK	B94	VGA_VSYNC	C94	PEG_RX13+	D94	PEG_TX13+
A95	SPI_MOSI	B95	VGA_I2C_CK	C95	PEG_RX13-	D95	PEG_TX13-
A96	RSVD*	B96	VGA_I2C_DAT	C96	GND	D96	GND
A97	TYPE10#	B97	SPI_CS#	C97	RSVD*	D97	RSVD*
A98	SER0_TX	B98	RSVD*	C98	PEG_RX14+	D98	PEG_TX14+
A99	SER0_RX	B99	RSVD*	C99	PEG_RX14-	D99	PEG_TX14-
A100	GND (FIXED)	B100	GND (FIXED)	C100	GND (FIXED)	D100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT	C101	PEG_RX15+	D101	PEG_TX15+
A102	SER1_RX	B102	FAN_TACHIN	C102	PEG_RX15-	D102	PEG_TX15-
A103	LID#	B103	SLEEP#	C103	GND	D103	GND
A104	VCC_12V	B104	VCC_12V	C104	VCC_12V	D104	VCC_12V
A105	VCC_12V	B105	VCC_12V	C105	VCC_12V	D105	VCC_12V
A106	VCC_12V	B106	VCC_12V	C106	VCC_12V	D106	VCC_12V
A107	VCC_12V	B107	VCC_12V	C107	VCC_12V	D107	VCC_12V
A108	VCC_12V	B108	VCC_12V	C108	VCC_12V	D108	VCC_12V
A109	VCC_12V	B109	VCC_12V	C109	VCC_12V	D109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)	C110	GND (FIXED)	D110	GND (FIXED)

* RSVD pins are reserved for future use and should be no connect. Do not tie the RSVD pins together.

Jumper

Important

Avoid adjusting jumpers when the system is on; it will damage the motherboard.

Clear CMOS Jumper: JCMOS1

There is a CMOS RAM onboard that has a power supply from an external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, set the jumper to clear data.

Normal   Clear CMOS

Important

You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the motherboard.

AT/ATX Select Jumper: JAT_ATX1

This jumper allows users to select between AT and ATX power.

ATX   AT

BIOS Select Jumper: JBIOS1, JBIOS2

This jumper is used to enable/disable the BIOS flash. When you intend to update the BIOS code, short connect pin#2-3 first. Under normal operation, we suggest that you enable the BIOS flash protection by short connecting pin#1-2 to protect the system BIOS from virus infection.

JBIOS1	JBIOS2	Description
1	1	Enable Carrier Board Flash ROM (Default)
1	1	Enable Module Board Flash ROM

COM Port Power Jumper: VCOM1, VCOM2

These jumpers specify the operation voltage of the onboard **JCOM1** and **JCOM2** serial ports.

```
5 □ □ ■ 1    5 □ ■ □ 1    5 ■ □ □ 1
6 □ □ ■ 2    6 □ ■ □ 2    6 ■ □ □ 2
   +5V          Ring         +12V
```
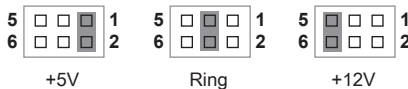
COM Port Power Jumper: JVDD3

This jumper specifies the operation voltage of the onboard **JCOM3** and **JCOM4** serial ports.

```
1 □■□      1 □■□
   +5V        +12V
```
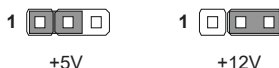
LVDS Power Jumper: JVDD1

Use this jumper to specify the operation voltage of the LVDS interface flat panel.

```
1 □■□      1 □■□
   3V          5V
```
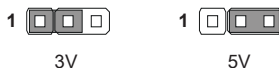
Inverter Power Jumper: JINV1

Use this jumper to specify the operation voltage of the inverter module.

```
1 □■□      1 □■□
   5V          12V
```

Slot

PCIe (Peripheral Component Interconnect Express) Slot

The PCI Express slot supports PCIe interface expansion cards.
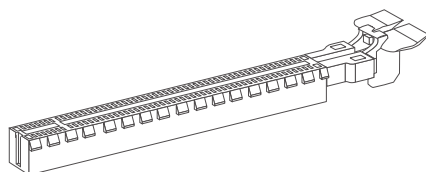
PCIe x16 slot

PCIe x1 slot

Mini-PCIe (Peripheral Component Interconnect Express) Slot

The Mini-PCIe slot is provided for wireless LAN cards, TV tuner cards, Robson NAND Flash cards and other Mini-PCIe cards.
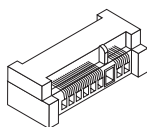
Important

When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to config-ure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

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 <DEL> key to enter Setup.

Press <DEL> 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.

The Menu Bar
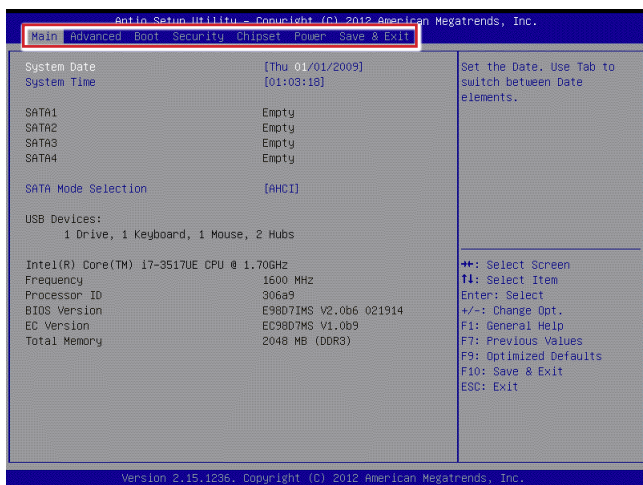
> **Main**

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


```
                    Aptio Setup Utility – Copyright (C) 2012 American Megatrends, Inc.
 Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

 System Date                      [Thu 01/01/2009]         Set the Date. Use Tab to
 System Time                      [01:03:18]               switch between Date
                                                           elements.
 SATA1                            Empty
 SATA2                            Empty
 SATA3                            Empty
 SATA4                            Empty

 SATA Mode Selection              [AHCI]

 USB Devices:
     1 Drive, 1 Keyboard, 1 Mouse, 2 Hubs

 Intel(R) Core(TM) i7-3517UE CPU @ 1.70GHz                 →←: Select Screen
 Frequency                        1600 MHz                 ↑↓: Select Item
 Processor ID                     306a9                     Enter: Select
 BIOS Version                     E98D7IMS V2.0b6 021914    +/-: Change Opt.
 EC Version                       EC98D7MS V1.0b9           F1: General Help
 Total Memory                     2048 MB (DDR3)            F7: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit

                    Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

▶ **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
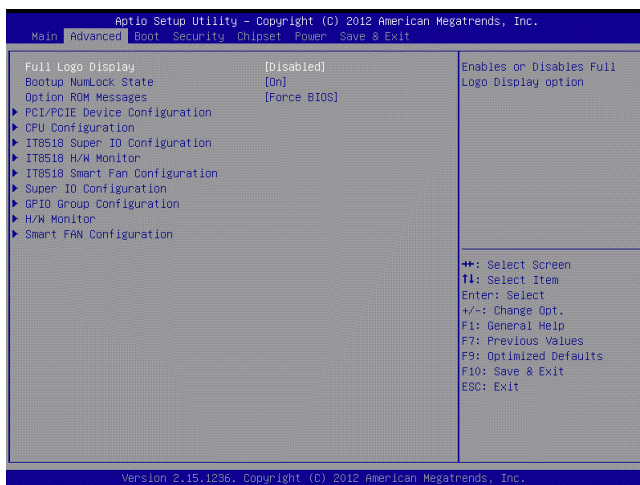
▶ **Full Screen Logo Display**

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**

```
                  Advanced
PCI Latency Timer              [32 PCI Bus Clocks]
EHCI1                          [Enabled]
EHCI2                          [Enabled]
xHCI Mode                      [Enabled]
Legacy USB Support             [Enabled]
Audio Controller               [Enabled]
Launch Lan1 OpRom              [Disabled]
```
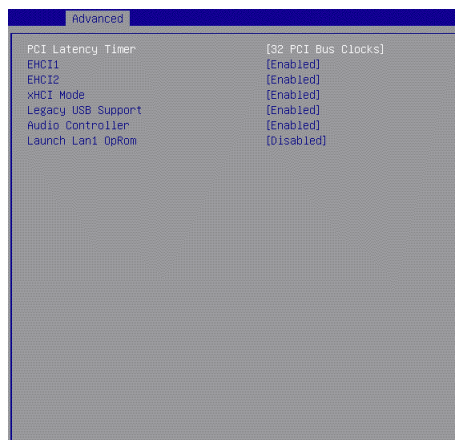
▶ **PCI Latency Timer**

This item controls how long each PCI device can hold the bus before another takes over. When set to higher values, every PCI device can conduct trans-actions for a longer time and thus improve the effective PCI bandwidth. For better PCI performance, you should set the item to higher values.

▶ **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 specifica-tion.

▶ **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 LAN1 OpROM**

This setting enables/disables the initialization of the specified LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

▶ **CPU Configuration**

```
                    Advanced

CPU Configuration

Intel(R) Core(TM) i7-3517UE CPU @ 1.70GHz
CPU Signature                 306a9
Microcode Patch               19
CPU Speed                     1600 MHz
Processor Cores               2
Intel HT Technology           Supported
Intel VT-x Technology         Supported
Intel SMX Technology          Supported
64-bit                        Supported
L2 Cache                      256 kB x 2
L3 Cache                      4096 kB

Hyper-threading               [Enabled]
Active Processor Cores        [All]
Execute Disable Bit           [Enabled]
Intel Virtualization Technology  [Disabled]
EIST                          [Enabled]
```

▶ **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.

▸ **IT8518 Super IO Configuration**
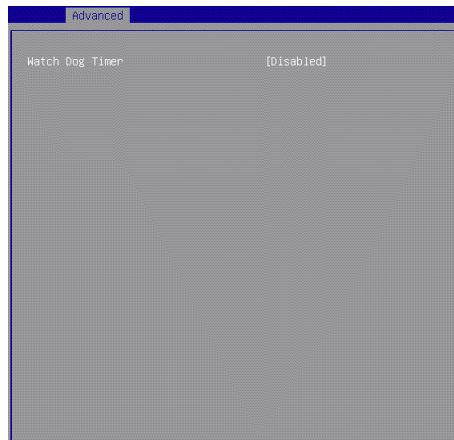
▸ **Watch Dog Timer**

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.

▸ **IT8518 H/W Monitor** *(the Compact Module)*

These items display the current status of all monitored hardware devices/components such as voltages, temperatures and all fans' speeds.
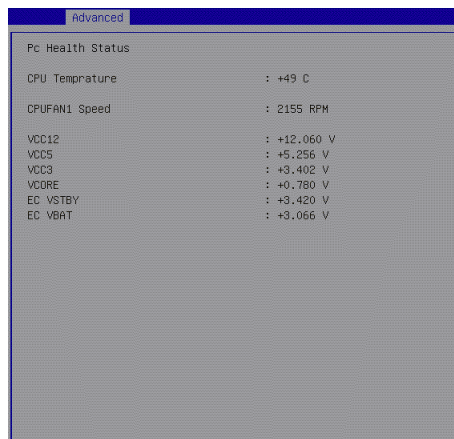
▸**IT8518 Smart Fan Configuration** *(the Compact Module)*

```
                    Advanced

   IT8518 Smart Fan Configuration

   Smart CPUFan Target              [Disabled]
```
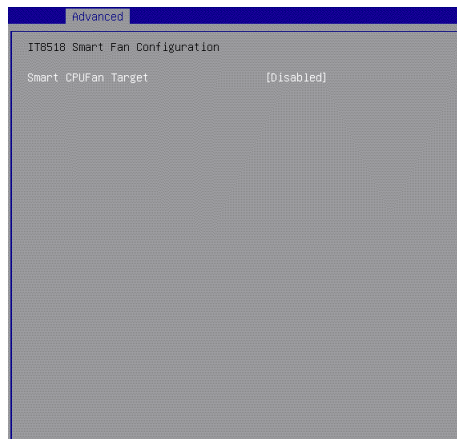
▸**Smart CPUFAN Target**

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.

▸**Super IO Configuration** *(the Carrier Board)*

```
                    Advanced

   Super IO Configuration
   Serial Port 1                    [Enabled]
    Device Settings                 IO=3F8h; IRQ=4;
    Change Settings                 [Auto]
    Mode Select                     [RS232]
   Serial Port 2                    [Enabled]
    Device Settings                 IO=2F8h; IRQ=3;
    Change Settings                 [Auto]
   Parallel Port                    [Enabled]
    Device Settings                 IO=378h; IRQ=5;
    Change Settings                 [Auto]
    Device Mode                     [STD Printer Mode]
   FIFO Mode                        [128-byte]
   Shared IRQ Mode                  [Level]
   Watch Dog Timer                  [Disabled]
```
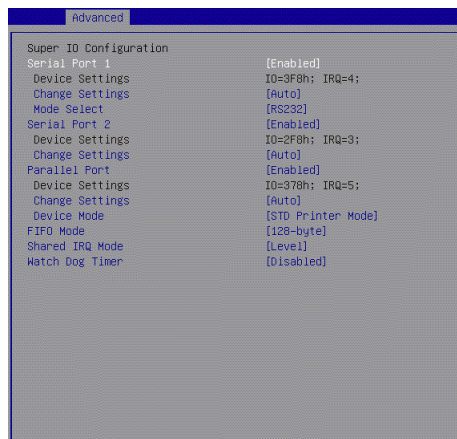
▸**Serial Port 1, Serial Port 2**

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 serial port 1.

▸ **Parallel Port**

This setting enables/disables the parallel port.

▸ **Change Settings**

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

▸ **Device Mode**

Select an operation mode for the parallel 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.

▸ **GPIO Group Configuration** *(the Carrier Board)*
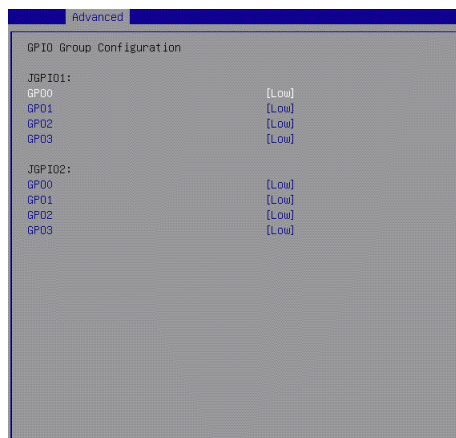
▸ **GPO0 ~ GPO3**

These settings control the operation mode of the specified GPIO.

▸ **H/W Monitor** *(the Carrier Board)*

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.
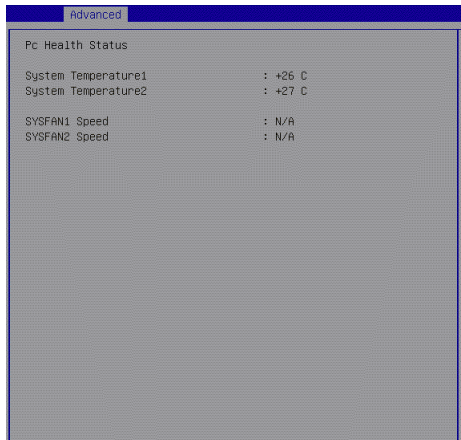
▸ **Smart Fan Configuration** *(the Carrier Board)*
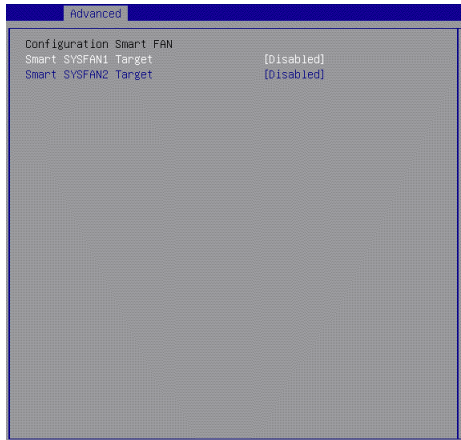
▸ **Smart SYSFAN1, SYSFAN2 Target**

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.

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.

▸ **Trusted Computing**
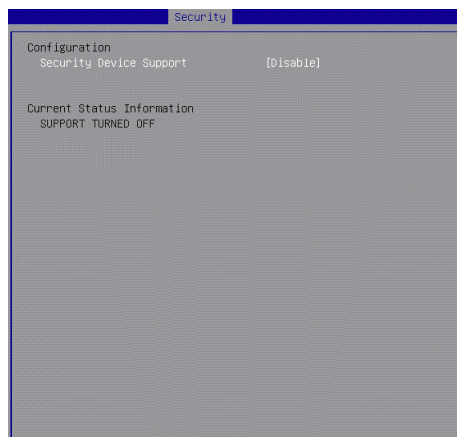
▸ **Security Device Support**

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.

▸ **Intel TXT(LT) Configuration**
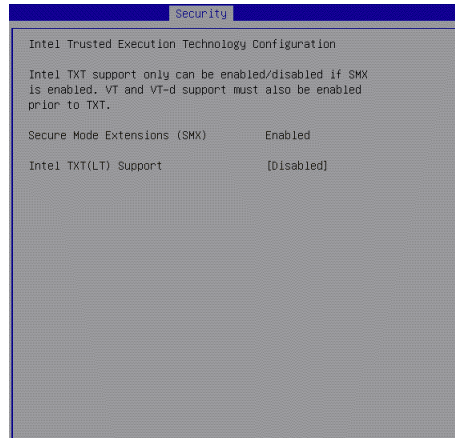
▸ **Intel TXT(LT) Support**

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.

▸ **PCH-FW Configuration**
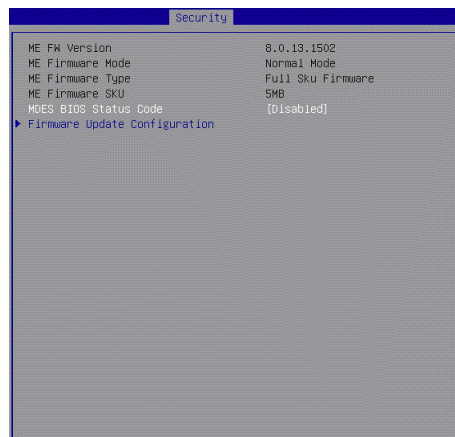
> ▶ **ME FW Version, ME Firmware Mode/ Type/ SKU**

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.
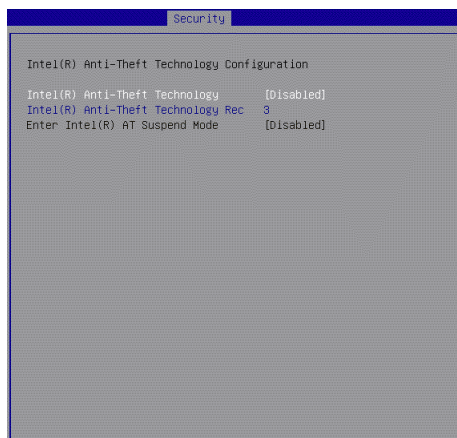
▸ **AMT Configuration**

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

```
                        Security

Intel AMT                       [Enabled]
BIOS Hotkey Pressed             [Disabled]
MEBx Selection Screen           [Disabled]
Hide Un-Configure ME Confirmation [Disabled]
MEBx Debug Message Output       [Disabled]
Un-Configure ME                 [Disabled]
Amt Wait Timer                  0
Disable ME                      [Disabled]
ASF                             [Enabled]
Activate Remote Assistance Process [Disabled]
USB Configure                   [Enabled]
PET Progress                    [Enabled]
AMT CIRA Timeout                0
WatchDog                        [Disabled]
 OS Timer                       0
 BIOS Timer                     0
```

▸ **Serial Port Console Redirection**

```
                        Security

COM1
Console Redirection             [Disabled]
▸ Console Redirection Settings

COM1(Pci Bus0,Dev0,Func0) (Disabled)
Console Redirection             Port Is Disabled
```
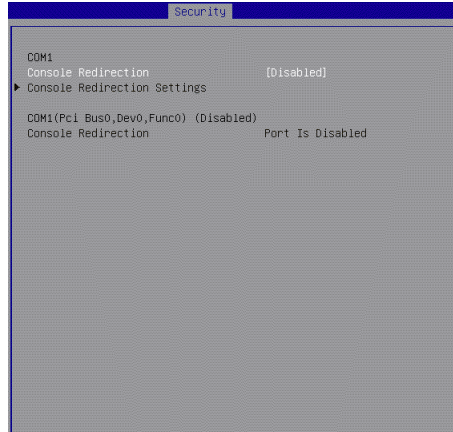
▸ **Console Redirection**

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console re-direction. 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**

```
COM1
Console Redirection Settings

Terminal Type                        [ANSI]
Bits per second                      [115200]
Data Bits                            [8]
Parity                               [None]
Stop Bits                            [1]
Flow Control                         [None]
VT-UTF8 Combo Key Support            [Enabled]
Recorder Mode                        [Disabled]
Resolution 100x31                    [Disabled]
Legacy OS Redirection Resolution     [80x24]
Putty KeyPad                         [VT100]
Redirection After BIOS POST          [Always Enable]
```

▶ **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

```
                Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
      Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

   VT-d                             [Enabled]              Check to enable VT-d
   Primary Display                  [Auto]                 function on MCH.
   Internal Graphics                [Auto]
   DVMT Pre-Allocated               [64M]
   DVMT Total Gfx Mem               [256M]
   Primary IGFX Boot Display        [VBIOS Default]
   Active LFP                       [Int-LVDS]
   LCD Panel Type                   [1024x 768]
   Panel Color Depth                [18 Bit]


                                                           →←: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F7: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit


                Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

▶ **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.

▶ **Internal Graphics**

The field specifies the size of system memory allocated for video memory.

▶ **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.

▶ **Active LFP**

This item is used for turning on/off LVDS support. (LVDS or No LVDS)

▶ **LCD Panel Type**
This setting allows you to set the resolution of the LCD display.

▶ **Panel Color Depth**
This item is used for setting the matching panel color depth.

Power

```
                    Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
         Main   Advanced  Boot   Security  Chipset   Power   Save & Exit

         ACPI Sleep State                    [S3 only(Suspend to RAM)]    Select ACPI sleep state
         Restore AC Power Loss               [Last State]                 the system will enter when
         Deep S5                             [Enabled]                    the SUSPEND button is
                                                                          pressed.
         Advanced Resume Events Control
         USB from S3/S4                      [Enabled]
         OnChip GbE from S5                  [Enabled]
         PCIE PME                            [Disabled]
         Ring                                [Disabled]
         RTC                                 [Disabled]

                                                                          ↔: Select Screen
                                                                          ↑↓: Select Item
                                                                          Enter: Select
                                                                          +/-: Change Opt.
                                                                          F1: General Help
                                                                          F7: Previous Values
                                                                          F9: Optimized Defaults
                                                                          F10: Save & Exit
                                                                          ESC: Exit

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```

▸ **ACPI Sleep State**

This item specifies the power saving modes for ACPI function. If your operating system supports ACPI, you can choose to enter the Standby mode in S1 (POS) or S3 (STR) fashion through the setting of this field.

▸ **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 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.
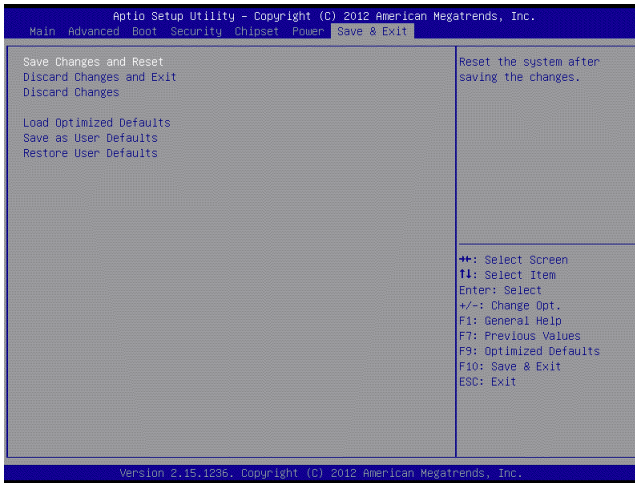
▸**Ring**

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

Save & Exit

```
                Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
           Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

           Save Changes and Reset                          Reset the system after
           Discard Changes and Exit                        saving the changes.
           Discard Changes

           Load Optimized Defaults
           Save as User Defaults
           Restore User Defaults

                                                           ↔: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F7: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit

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```

▶ **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.

Appendix
WDT & GPIO

This appendix provides the sample codes of WDT (Watch Dog Timer) and GPIO (General Purpose 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
;Acive 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 UINT
    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

JGPIO1

● GPI 0 ~ GPI 3

	GPI 0	GPI 1	GPI 2	GPI 3				
IO Address								
SIO GPIO Register	B2h							
Bit	0	1	2	3				
Sample code	#1							

● GPO 0 ~ GPO 3

	GPO 0	GPO 1	GPO 2	GPO 3				
IO Address								
SIO GPIO Register	B1h							
Bit	4	5	6	7				
Sample code	#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
GPI_REG             equ    0B2h
GPO_REG             equ    0B1h
GPO0_Value          equ    00010000b
```

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, GPI_REG
        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, GPO_REG
        out     dx, al
        mov     dx, SIO_DATA_Port
        in      al, dx
        and     al, not GPO0_Value    ;clear al bit4 (GPO 0)
        or      al, GPO0_Value        ;set GPO 0
        out     dx, al

    ; Exit SIO
        mov     dx, SIO_INDEX_Port
        mov     al, SIO_Lock_Value
        out     dx, al
```

JGPIO2
● GPI 0 ~ GPI 3

	GPI 0	GPI 1	GPI 2	GPI 3				
IO Address								
EC GPIO Register	16h							
Bit	4	5	6	7				
Sample code	#1							

● GPO 0 ~ GPO 3

	GPO 0	GPO 1	GPO 2	GPO 3				
IO Address								
EC GPIO Register	16h							
Bit	0	1	2	3				
Sample code	#2							

```
INDEX_Port      equ     066h
DATA_Port       equ     062h
Read_cmd        equ     080h
Write_cmd       equ     081h
GPI_REG         equ     016h
GPO_REG         equ     016h
GPO0_Value      equ     00000001b
```

Sample Code:

#1 : Get GPI 0 status

```
; Enable config mode
  mov   dx, INDEX_Port
  mov   al, Read_cmd
  out   dx, al
  jmp   short $+2            ;Io_delay
  jmp   short $+2            ;Io_delay

; Get GPI 0 Pin Status Register
  mov   dx, DATA_Port
  mov   al, GPI_REG
  out   dx, al
  mov   dx, DATA_Port
  in    al, dx
  ;al bit4 = GPI 0 status
```

#2 : Set GPO 0 to high
  ; Enable config mode

```
    mov    dx, INDEX_Port
    mov    al, Read_cmd
    out    dx, al
    jmp    short $+2              ;Io_delay
    jmp    short $+2              ;Io_delay

    mov    dx, DATA_Port
    mov    al, GPI_REG
    out    dx, al
    mov    dx, DATA_Port
    in     al, dx

    and    al, not GPO0_Value     ;clear al bit (GPO 0)
    or     al, GPO0_Value         ;set GPO 0
    mov    bl, al

    mov    dx, INDEX_Port
    mov    al, Write_cmd
    out    dx, al
    jmp    short $+2              ;Io_delay
    jmp    short $+2              ;Io_delay

    mov    dx, DATA_Port
    mov    al, GPO_REG
    out    dx, al
    mov    dx, DATA_Port
    mov    al, bl
    out    dx, al
```