OPERATOR'S MANUAL

Tough Devices for Tough Environments

RUGGED SCIENCE

MILSYNAPSE 1000 *series*

RUGGED EMBEDDED COMPUTER SYSTEM

Tough Devices for Tough Environments

RUGGED SCIENCE

MilSynapse-1000 USER MANUAL

Fanless Advanced Box PC, 2 LAN (4 LAN), 2 HDMI, 6 COM
Onboard Intel® Atom™ Bay Trail E3845 Quad Core
Processor

Record of Revision

Version	Date	Page	Description	Remark
V1.0.0	Jan 07, 2014	All	Preliminary Release	
V1.0.1	Jan 20, 2014	p30	GPS Module	
V1.0.2	Feb 05, 2014	p16-19	Rear Panel DC-IN	

Disclaimer

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Order Information

Part Number	Description
MilSynapse 1000	Fanless Advanced Box PC, 2 Lans, 2 HDMI, 6 COM (2 Isolated COM), 8 GPIO, 5 USB, Terminal Block, Onboard IntelC Atom™ Bay Trail E3845 Quad Core Processor

Optional Accessories

Part Number	Description
DDR3L8G	Kingston® DDR3L-1600 8G RAM
DDR3L4G	Kingston® DDR3L-1600 4G RAM
M340L-W28M1	DDR3L 4GB 1333 | 1066MHz RAM, Micron® Chip, Wide Temperature -40°C ~ +85°C
Onboard GPS Module	u-blox NEO GPS Module with Antenna and Cables Pre-Installed
PWA-60W	60W, 12V 100V AC to 240V AC Power Adapter for DC-Jack
PWA-60WP3	60W, 24V 100V AC to 240V AC Power Adapter for Terminal Block
WiFi module w/ Antenna	WiFi module (Intel N6205) with antenna and cables pre-installed
3G Module w/ Antenna	3G module (Sierra MC8090) with Antenna and cables pre-installed
4G Module w/ Antenna	Sierra MC7710 with Antenna and cables pre-installed

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General Introduction

1.1 Overview

MilSynapse 1000 series are equipped with Intel® Quad-Core Atom™ E3800 (formerly codenamed Bay Trail) processor family (1.91GHz) and DDR3L single channel 8GB ram, 2 HDMI display, 2 RS-232, 2 RS-232/422/485, 2 isolated RS-232/422/485, 2 GbE LANs, one 2.5" SATA 3Gp/s SSD/HDD tray, 3 USB 3.0 ports, 2 USB 2.0, and 2 miniPCI-express.

MilSynapse 1000 series is in fanless smart form factor and capable of operating under wide temperatures from -25°C to +70°C for harsh environments.With cutting-edge graphics and computing technologies, MilSynapse 1000 series enable to present high quality resolution 3D display as low power consumption.

Design with 6 COM to satisfy various applications' control and connection requirements, MilSynapse 1000 series still keep fanless and wide operation temperature plus with EN50155 standard and cable-less arrangement for industrial harsh environment.

MilSynapse 1000 series is ideal for information display in harsh environment, automation networking communication, IOT (Internet of Things), In-Vehicle Infotainment (IVI) systems, and M2M (Machine to Machine) applications.

1.2 Product Specification

1.2.1 Specifications of MilSynapse 1000

System	
Processor	Intel® Atom™ Quad Core Valleyview (Bay Trail) Processor (E3845 1.91GHz)
Chipset	Valleyview SoC
Memory	1 DDR3L 1600 SODIMM, Max. 8Gb
Video	1 DB 15 VGA 2 HDMI 1.4 Optional BOM: LVDS 48bit
Audio	1 Mic-In, 1 Line-Out
Software Support	Windows 8, Windows 7, WES7
I/O Ports	
Serial Interface	6 COM Ports; 2 RS-232, 4 RS-232/422/485 2 Isolated RS-232/422/485
LAN	2 Intel® GbE WG82574L
USB	3 USB 3.0, 2 USB 2.0
GPIO	8 GPIO
Mini PCIe Slot	miniPCIe Socket (PCIe+USB +SIM card socket) miniPCIe Socket (PCIe+USB) mSATA Socket 3 Pre-Cast Holes for Antenna
Power Supply	
Power Input	Terminal Block ATX: 2-Pin Remote Power On/Off Switch Optional BOM: On-Board Power Input for PPC
Power Output	On-Board 12V
Storage	
SATA HDD	1 SATA II Ports at 3.0Gb/s
mSATA	1 miniPCIe(full size) Supports mSATA
Other	
Watchdog Timer	Reset: 1 to 255 sec / min Per Step
GPS	On-Board GPS Module (Optional)
Mechanical	
Dimension (W x L x H)	257mm x 141mm x 48mm (10.1" x 5.6" x 1.9")
Weight	2.1Kg (4.6 lb)
Mounting	Wall-mount by Mounting Bracket
Design	Compact
Environmental	
Operating Temperature	-25°C to 70°C (-13°F to 157°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	10% to 95% Humidity, Non-condensing
Shock	Operating, 50 Gms, Half-Sine 11 ms Duration (w / SSD, According to IEC60068-2-27)
Vibration	Random: 5 Grms @ 5-500Hz according to IEC68-2-64 Sinusoidal: 5 Grms @5-500 Hz according to IEC68-2-64
EMC	CE, FCC, EN50155, RoHS

1.3 Supported CPU List

MilSynapse 1000 series is based on Intel® Atom™ Bay Trail platform and accepts the following Bay Trail-I Family processors.

E3845 and E3815 are selected in MilSynapse 1000 series standard models, and the rest is available upon project-base.

Processor No.	Core Count	CPU Freq (GHz)	Gfx Freq (MHz) Nominal/Turbo	TDP
E3845	4C	1.91GHz	542/792	10W
E3827	2C	1.75GHz	542/792	8W
E3826	2C	1.46GHz	533/667	7W
E3825	2C	1.33 GHz	533 (No Turbo)	6W
E3815	1C	1.46 GHz	400 (No Turbo)	5W

1.4 Mechanical Dimension

Figure 1.1 MilSynapse 1000
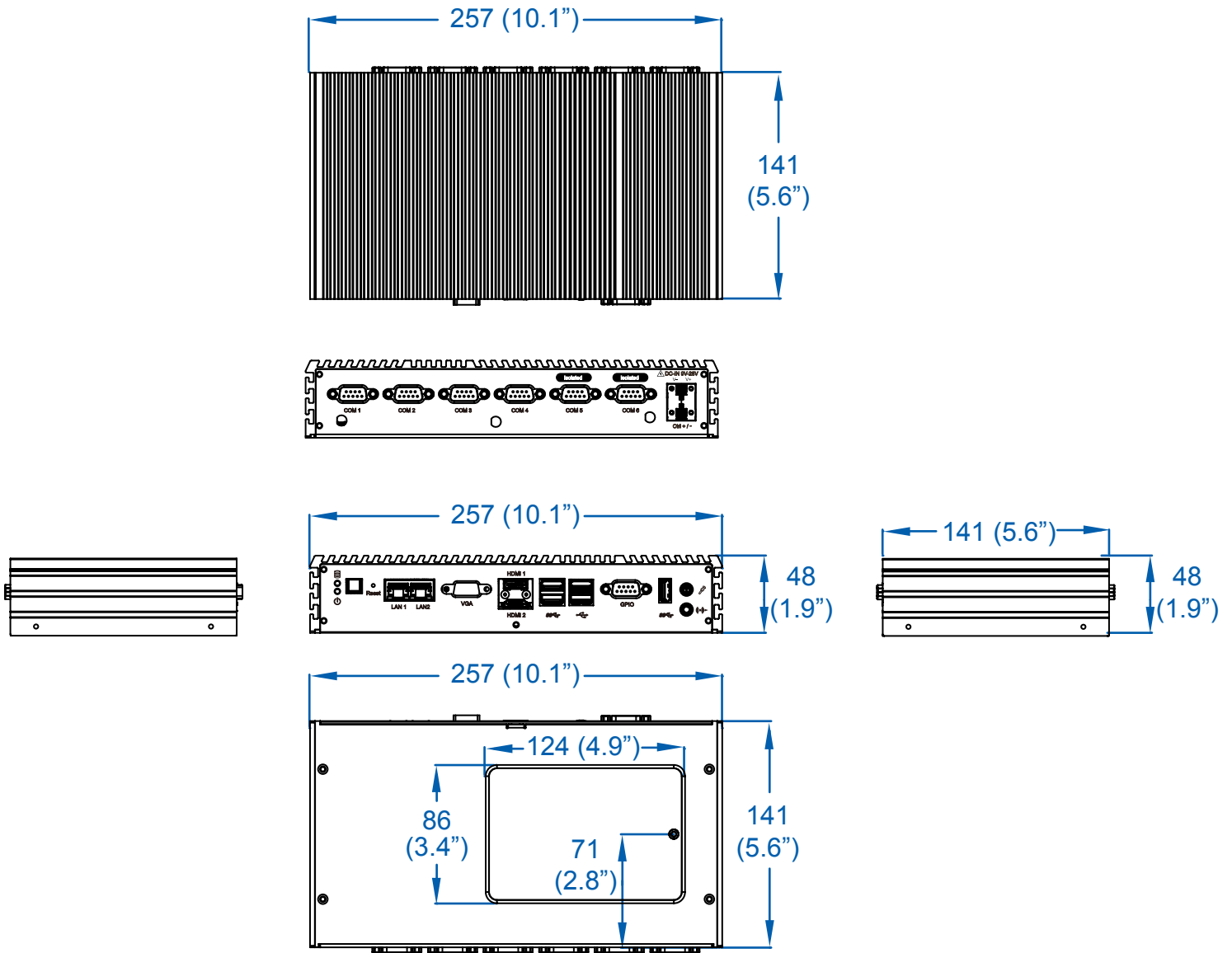
2

Getting to Know Your MilSynapse 1000

2.1 Packing List

Item	Description	Qty
1	MilSynapse 1000 series fanless controller (According to the configuration you order, the system may pre-install SSD/HDD and DDR3L SO-DIMM. Please verify these items if necessary.)	1
2	Accessory box, which contains • Rugged Science Drivers & Utilities DVD • Wall-mounting bracket • M4 screws for wall-mounting bracket • 2-pin pluggable terminal block	 1 2 4 2

2.2 Front Panel I/O Functions
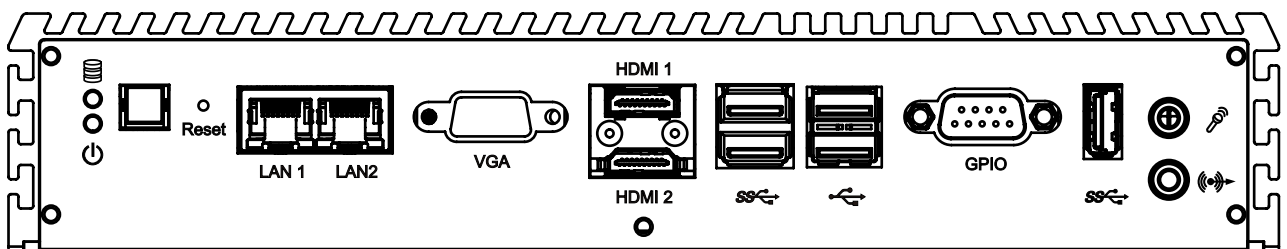
On MilSynapse 1000 series, all I/O connectors are located on front panel and rear panel. Most general computer connectors (i.e. audio, USB, HDMI, VGA and etc.) are placed on the front panel.

2.2.1 Power, HDD LED Indicator
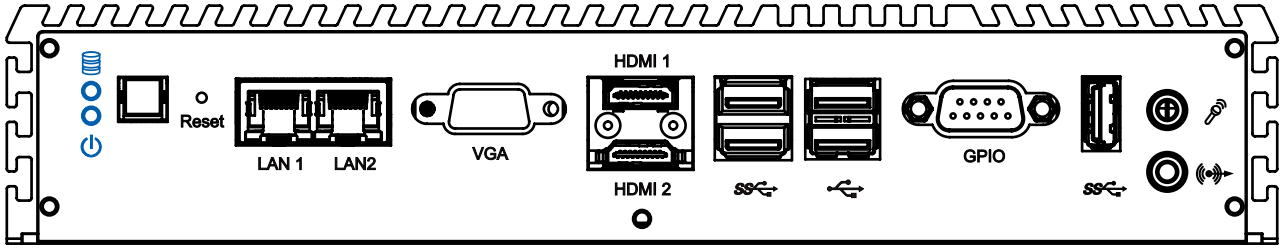
Yellow-HDD LED: A hard disk / CFast LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities.

Green-Power LED: If the LED is solid green, it indicates that the system is powered on.

2.2.2 Power Button
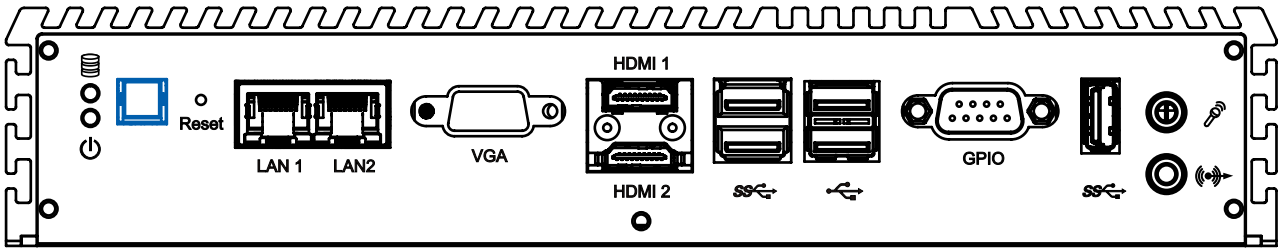
The power button is a non-latched switch with dual color LED (Blue/Orange) for indication S0, S3 and S5 status. Power button dual-color LED indicator:

Status	LED Display	System Situation
S0	Solid Blue	System working
S3, S5	Solid Orange	Suspend to RAM, System off with standby power

To turn on the MilSynapse 1000 series, press the power button and the blue LED is lighted up.To turn off the MilSynapse 1000 series, you can either issue a shutdown command in OS, or just simply press the power button.

In case of system halts, you can press and hold the power button for 4 seconds to compulsorily shut down the system.Please note that a 4 seconds interval is kept by the system between two on/off operations (i.e. once turning off the system, you shall wait for 4 seconds to initiate another power-on operation).

2.2.3 Rest Tact Switch
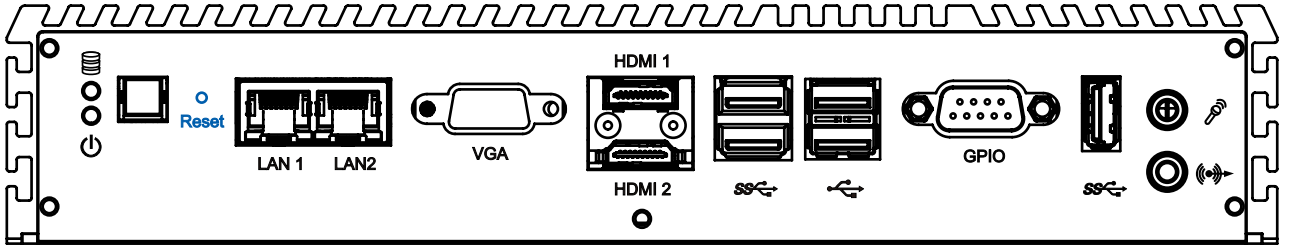
It is a hardware reset switch. Use this switch to reset the system without turning off the power. Momentarily pressing the switch will activate a reset.

2.2.4 Ethernet Ports
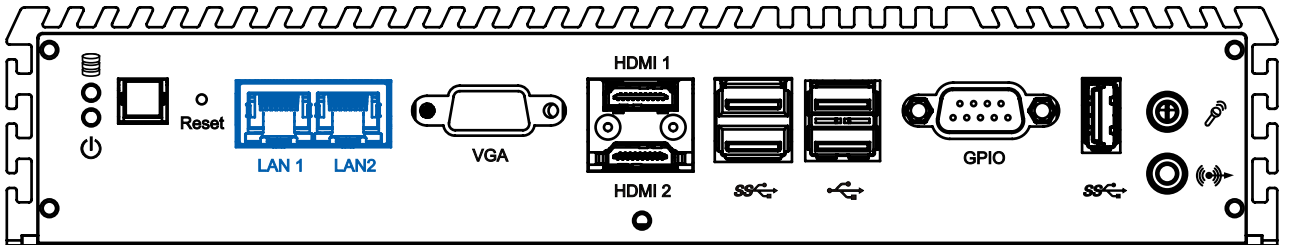
The 10/100/1000 Mbps Ethernet LAN ports 1 and 2 use 8-pin RJ-45 connectors. LNA1 and LAN2 are equipped with Intel® 82574L controllers.

Using suitable RJ-45 cable, you can connect MilSynapse 1000 series system to a computer, or to any other piece of equipment that has an Ethernet connection, for example, a hub or a switch. Moreover, both of them have Wake-on-LAN and pre-boot Execution Environment capabilities.

The following diagram shows the pinouts for LAN1 and

Pin No.	10 / 100 Mbps	1000 Mbps
1	E_TX+	MDI0_P
2	E_TX-	MDI0_N
3	E_RX+	MDI1_P
4	----	MDI2_P
5	-----	MDI2_N
6	E_RX-	MDI1_N
7	-----	MDI3_P
8	------	MDI3_N

The Ethernet ports use standard RJ-45 jack connectors with LED indicators on the front side to show Active/ Link status and Speed status. The LED indicators on

the right bottom corners glow a solid green color when the cable is properly connected to a 100 Mbps Ethernet network. The LED indicator on the left bottom corner will flash on and off when Ethernet packets are being transmitted or received.

The LED indicators on the right bottom corners glow a solid orange color when the cable is properly connected to a 1000 Mbps Ethernet network. The LED indicator on the left bottom corner will flash on and off when Ethernet packets are being transmitted or received.
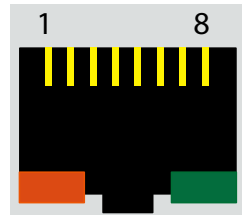
Location	10 Mbps	100 Mbps	1000 Mbps
Right Bottom LED	off	Solid Green	Solid Orange
Left Bottom LED	Flash Yellow	Flash Yellow	Flash Yellow

2.2.5 VGA Connector
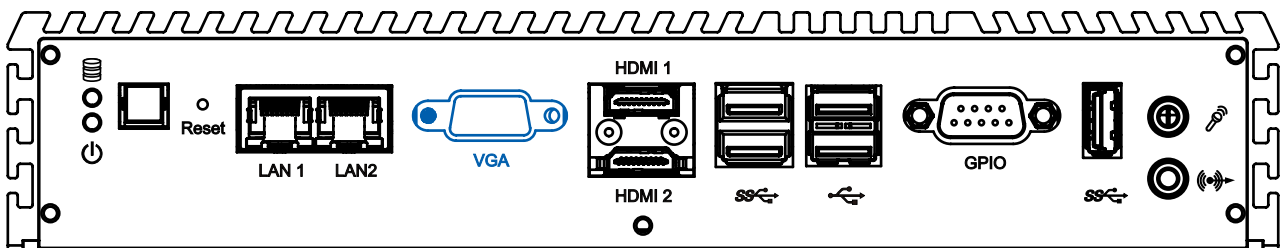
The MilSynapse 1000 series comes with a DB15 female connector on the front panel to connect a VGA monitor. To ensure that the monitor image remains clear, be sure to tighten the monitor cable after connecting it to the MilSynapse 1000. The VGA output mode supports up to **2560x1600** resolutions. The pin assignments of the VGA connector are shown below.

Pin No.	Description
1	Red Color Signal
2	Green Color Signal
3	Blue Color Signal
4	NC
5	Ground
6	VGA Detect
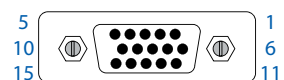
Pin No.	Description
7	Ground
8	Ground
9	VCC
10	Ground
11	NC
12	DDC-DATA
13	H-Sync.
14	V-Sync.
15	DDC-CLK

2.2.6 Dual HDMI Connectors
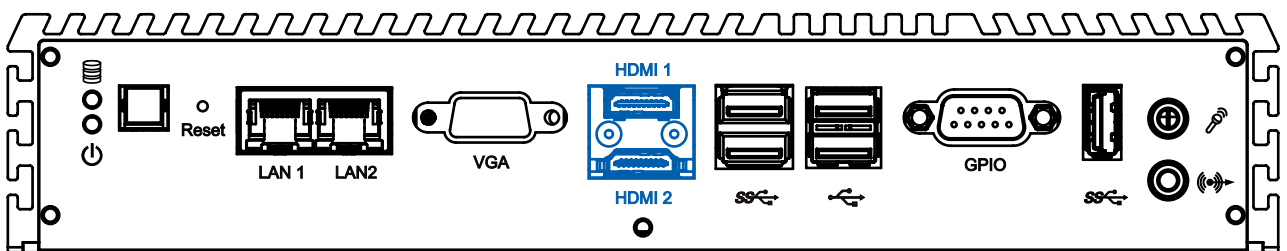
Each HDMI output mode supports up to **2560x1600** resolutions. The HDMI mode is automatically selected according to the display device connected.

2.2.7 Triple USB 3.0 Ports
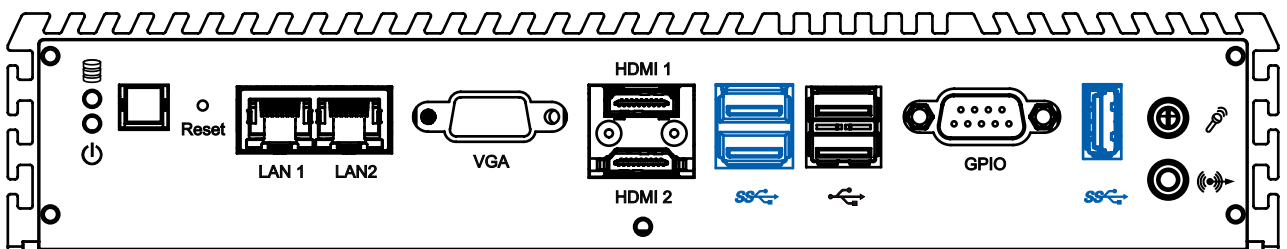
The MilSynapse 1000 series comes with 3 USB 3.0 hosts on the front panel. These USB 3.0 ports allow data transfers up to 5 Gb/s. The controller supports SuperSpeed (SS), high-speed (HS), full-speed (FS) and low-speed (LS) traffic on the bus.

2.2.8 Dual USB 2.0 Ports
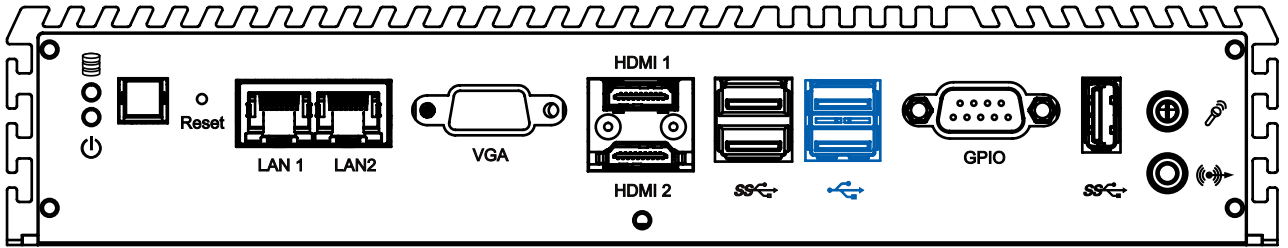
The MilSynapse 1000 series comes with 2 USB 2.0 hosts on the front panel. The USB interface supports Plug and Play, which enables you to connect or disconnect a device whenever you want, without turning off the system.

The hosts can be used for an external flash disk or hard drive for storing large amounts of data. You can also use these USB hosts to connect to a keyboard or a mouse. The following diagram shows the pinouts for USB ports.
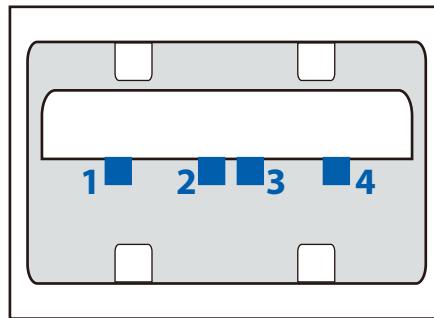
Pin Number	1	2	3	4
USB1	+5V	USB1-	USB1+	GND
USB2	+5V	USB2-	USB2+	GND

2.2.9 Eight Bits DIO
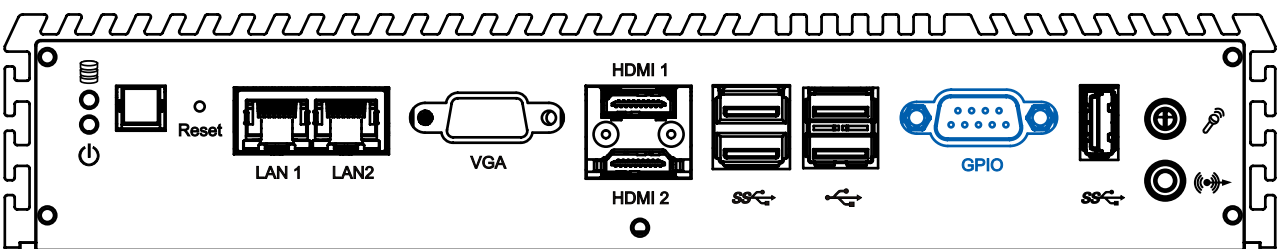
The MilSynapse 1000 series offers an 8-bit DIO connector. Each bit internal pull up a weak resistor to +V3.3_SB. Each bit can be configured for DO or DI you can find the setting in BIOS.
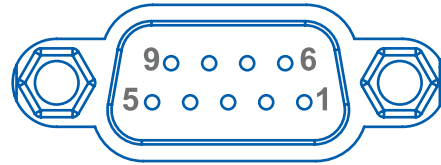
GPIO

Pin No.	Definition	Mapping to SIO GPIO Function
1	GPIO 0	SIO_GPI70
2	GPIO 1	SIO_GPI71
3	GPIO 2	SIO_GPI72
4	GPIO 3	SIO_GPI73
5	GND	GND
6	GPIO 4	SIO_GPI74
7	GPIO 5	SIO_GPI75
8	GPIO 6	SIO_GPI76
9	GPIO 7	SIO_GPI76

2.2.10 Audio Connectors
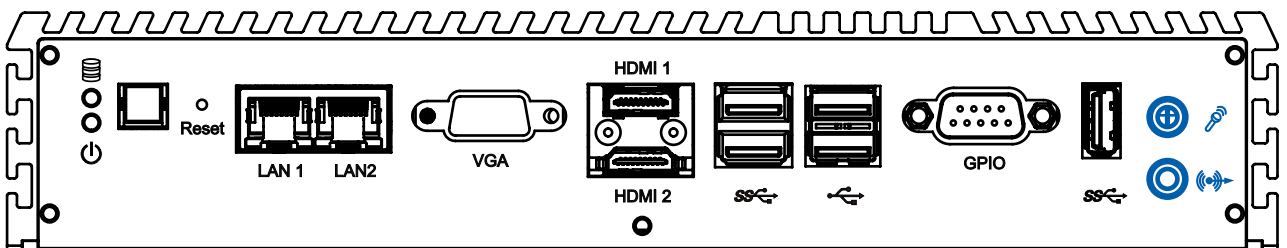
The MilSynapse 1000 series offers stereo audio connectors of MIC and Line-In. The audio chip controller is by ALC892 which is compliant with the Intel® Azalia standard. To utilize the audio function in Windows, you need to install corresponding drivers for Realtek® ALC892 codec.

2.3 Rear Side Exernal I/O Connectors

Figure 2.3.1 MilSynapse 1000 Rear Panel
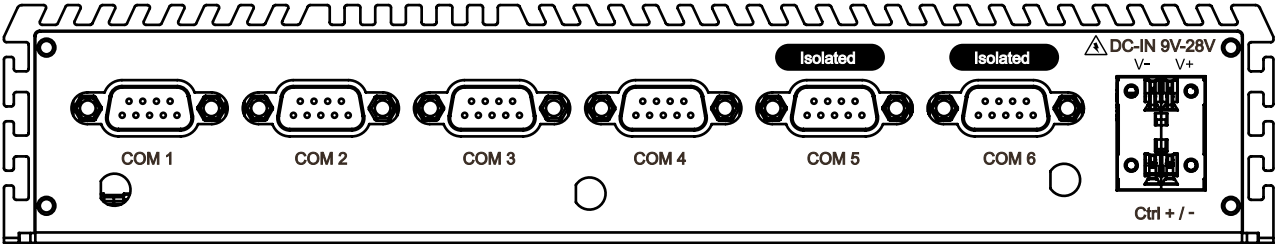
2.3.1 Serial Ports COM1 and COM2
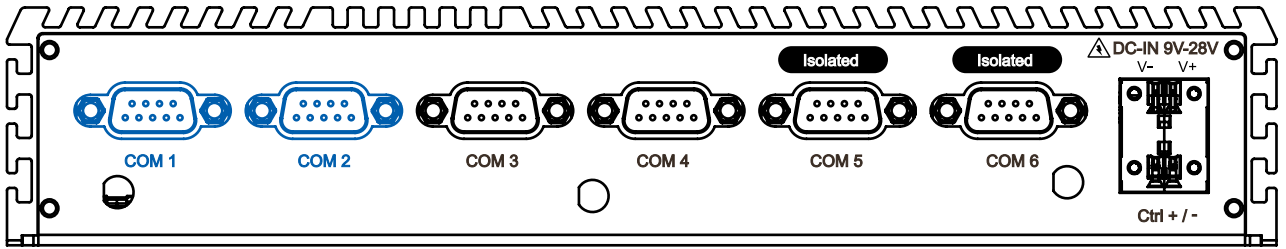
COM1 and COM2 are RS-232 only and provide up to 115200 bps baud rates. The pin assignments are shown in the following table:

Serial Port	Pin No.	RS-232
COM1, 2	1	DCD
	2	RXD
	3	TXD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS
	9	RI

2.3.2 Serial Ports COM3 and COM4
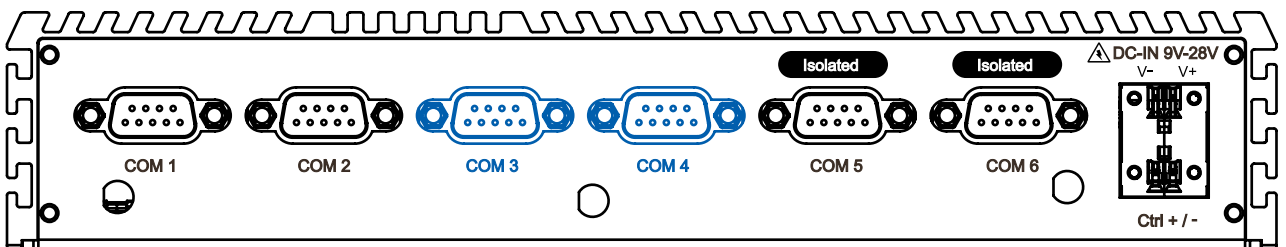
COM3 and COM4 can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. Serial Port 3 & 4 default setting are RS-232, if you want to use RS-422 or RS-485, you can find the setting in BIOS.

BIOS Setting	Function
COM3	COM4	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

The pin assignments are shown in the following table:

Serial Port	Pin No.	RS-232	RS-422 (5-Wire)	RS-422 (9-Wire)	RS-485 (3-Wire)
3.4	1	DCD	TXD-	TXD-	DATA-
	2	RXD	TXD+	TXD+	DATA+
	3	TXD	RXD+	RXD+	-----------
	4	DTR	RXD-	RXD-	-----------
	5	GND	GND	GND	GND
	6	DSR	-----------	RTS-	-----------
	7	RTS	-----------	RTS+	-----------
	8	CTS	-----------	CTS+	-----------
	9	RI	-----------	CTS-	-----------

2.3.3 Isolated Serial Port COM5 | COM6
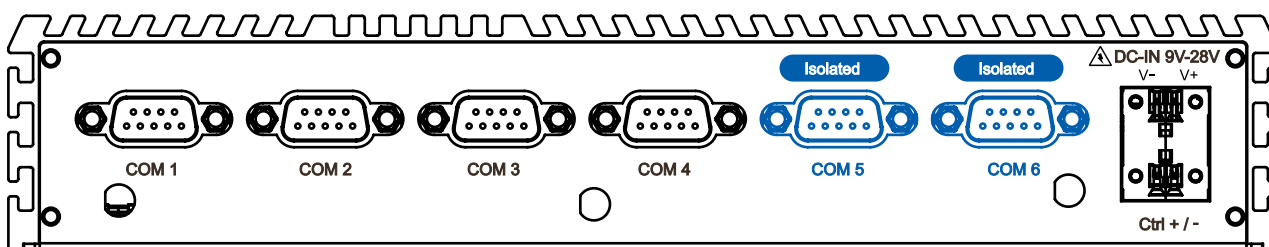
Only **MilSynapse 1000** provides Isolated serial ports COM5 | COM6. COM5 and COM6 can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. Serial Port 5 and 6 default setting are RS-232, if you want to use RS-422 or RS-485, you can find the setting in BIOS.

BIOS Setting	Function
COM5	COM6	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

The pin assignments are shown in the following table:

Serial Port	Pin No.	RS-232	RS-422 (5-Wire)	RS-422 (9-Wire)	RS-485 (3-Wire)
2	1	DCD	TXD-	TXD-	DATA-
	2	RXD	TXD+	TXD+	DATA+
	3	TXD	RXD+	RXD+	-----------
	4	DTR	RXD-	RXD-	-----------
	5	GND	GND	GND	GND
	6	DSR	-----------	RTS-	-----------
	7	RTS	-----------	RTS+	-----------
	8	CTS	-----------	CTS+	-----------
	9	RI	-----------	CTS-	-----------

2.3.4 DC-IN 9~28V 3.5Ø DC Jack or Terminal Block
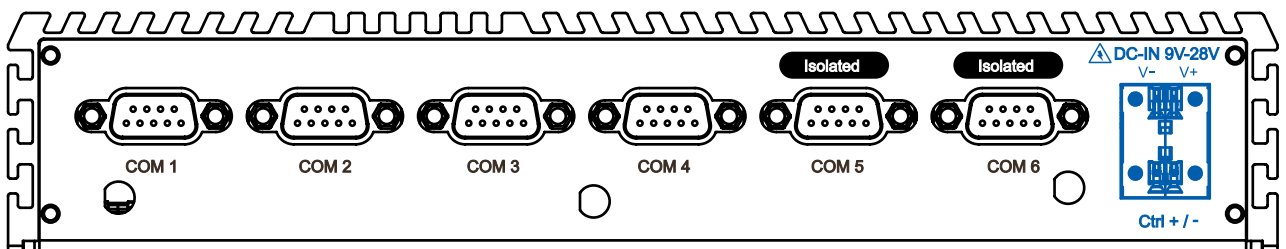
The MilSynapse 1000 series offers 9 to 28 VDC power input, MilSynapse 1000 Terminal Block, DC Jack connector. If the power is supplied properly, the Power LED will light up a solid green.

2.4 Main Board Expansion Connectors

The figure below is the top view of the MilSynapse 1000 series main board. It shows the location of the connectors.
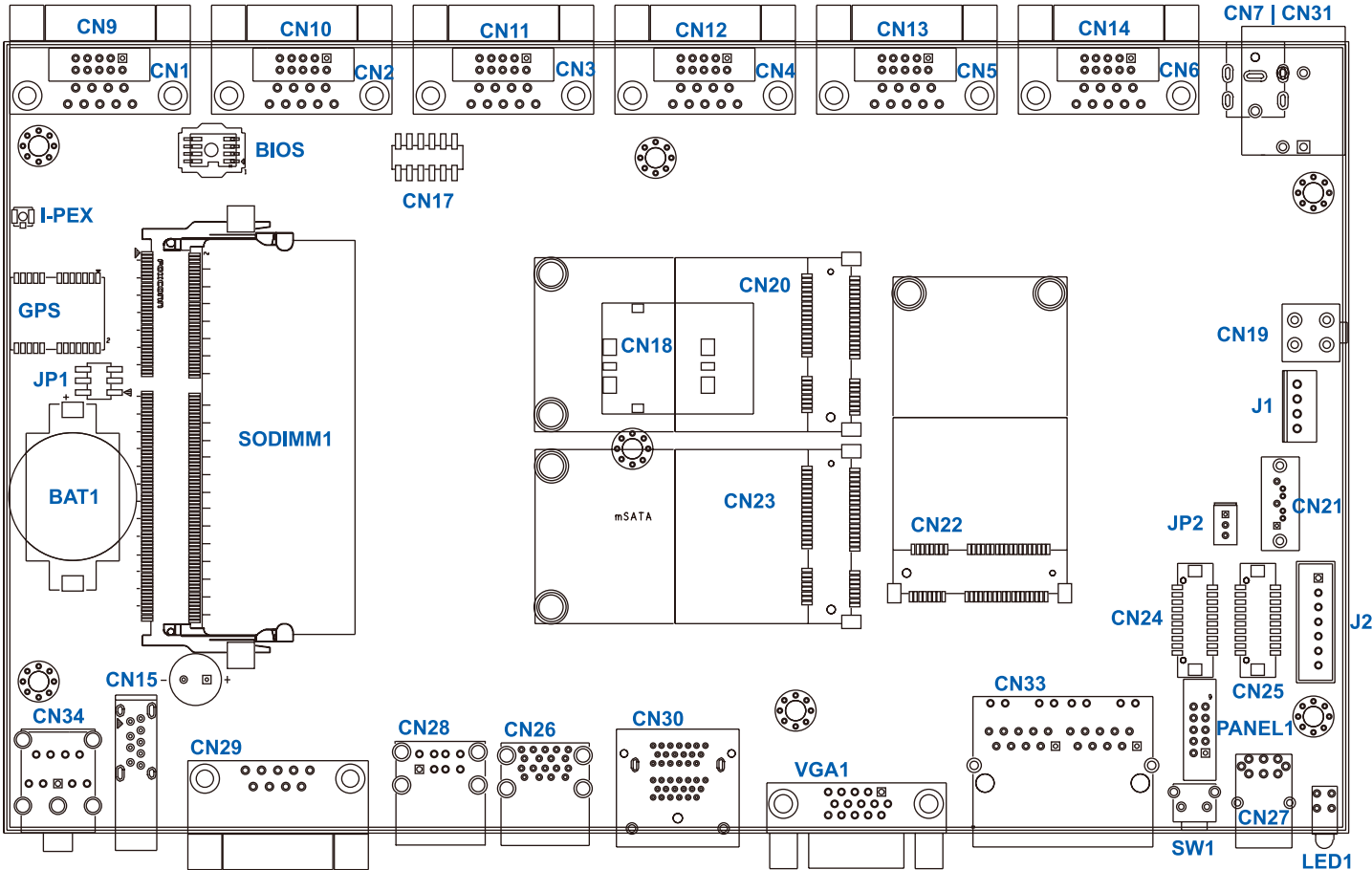
Figure 2.4.1 Internal Connectors and Jumpers

The figure below is the bottom view of the MilSynapse 1000 series main board.

IT8786E

CPU
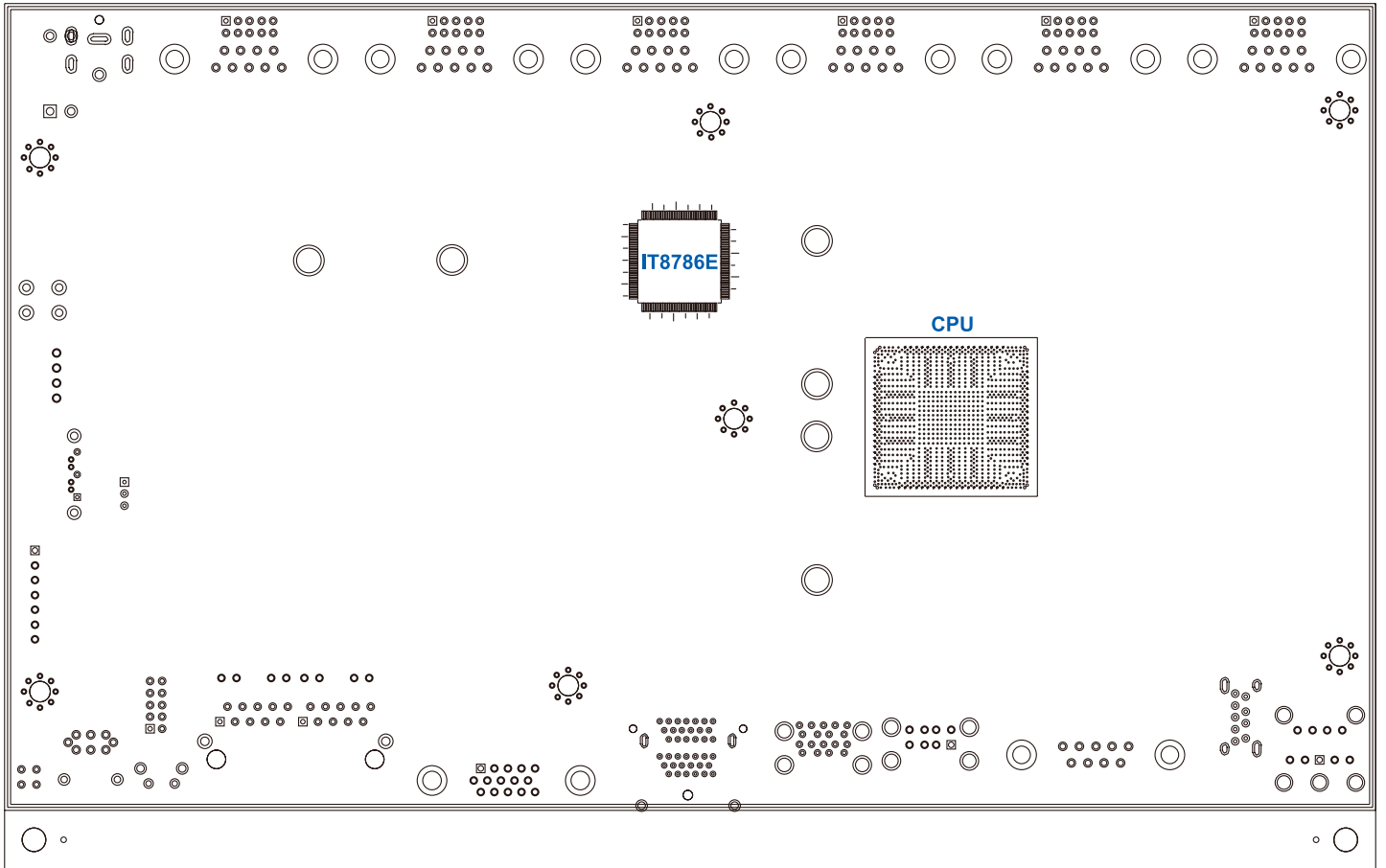
2.4.1 PANEL 1 Miscellaneous Pin Header
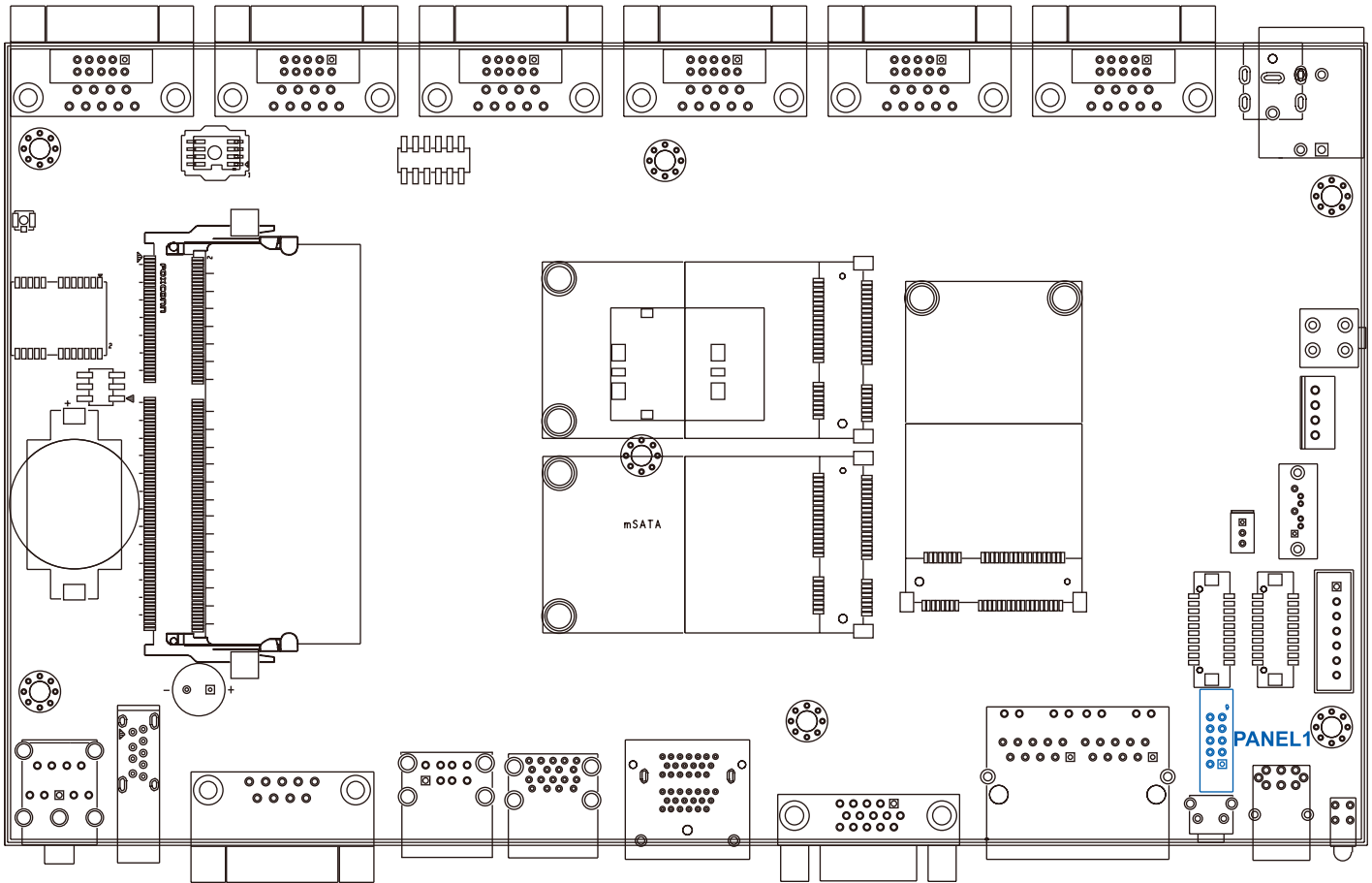
These pin headers can be used as a backup for the following functions: hard drive LED indicator, reset button, power LED indicator, and power-on/off button. The front and top panel already provides access to these functions. The following table shows the pinouts for Miscellaneous port.

J1 Miscellaneous Pin Header

Group	Pin No.	Description
HDD LED	2	HD_LED+
	4	HD_LED-
RESET BUTTON	6	FP_RST_BTN_N
	8	GND
POWER LED	2	PWR_LED+
	4	PWR_LED_N
POWER BUTTON	6	FP_PWR_BTN_N
	8	GND
POWER	9	+V5
	10	+V5_SB

2.4.2 CN24, CN25, J2 LVDS
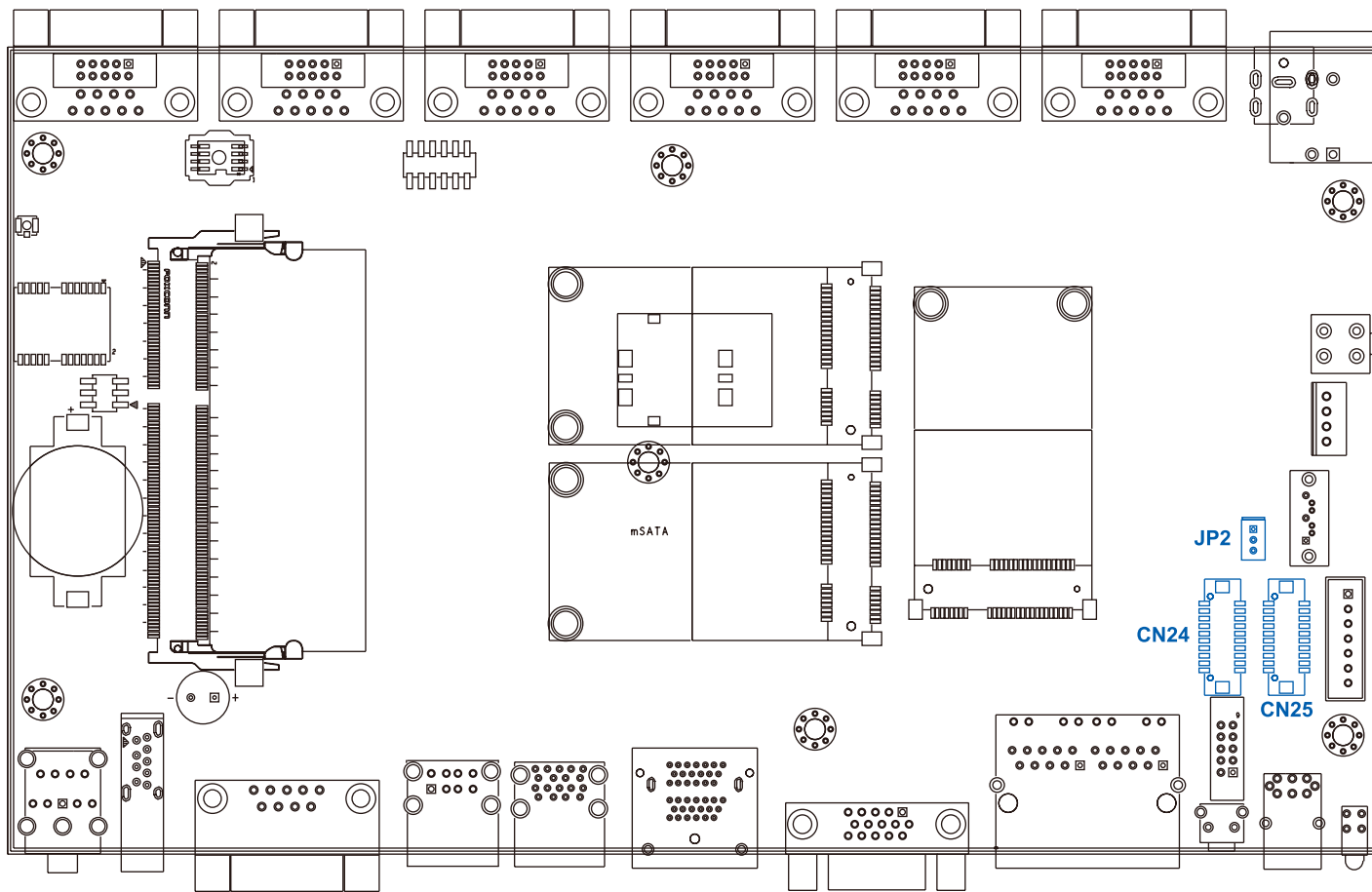
The MilSynapse 1000 series supports Dual-channel 24-bit LVDS Panel up to 1920x1200 pixels

Pin No.	Definition	
	CN24 Channel A	CN25 Channel
1	LDDC_CLK	LDDC_CLK
2	LDDC_DATA	LDDC_DATA
3	PANEL_VDD (+3.3V or +5V by JP2 jumper)	PANEL_VDD(+3.3V or +5V by JP2 jumper)
4	LA_ DATA0_P	LB_ DATA0_P
5	LA_ DATA3_P	LB_ DATA3_P
6	LA_ DATA0_N	LB_ DATA0_N
7	LA_ DATA3_N	LB_ DATA3_N
8	PANEL_VDD (+3.3V or +5V by JP2 jumper)	PANEL_VDD (+3.3V or +5V by JP2 jumper)
9	GND	GND
10	LA_ DATA1_P	LB_ DATA1_P
11	LA_ CLKP	LB_ CLKP
12	LA_ DATA1_N	LB_ DATA1_N
13	LA_ CLKN	LB_ CLKN
14	GND	GND
15	GND	GND
16	PANEL_BACKLIGHT (+12V)	PANEL_BACKLIGHT (+12V)
17	LA_ DATA2_P	LB_ DATA2_P

Pin	Definition	
No.	CN24 Channel A	CN25 Channel
18	PANEL_BACKLIGHT (+12V)	PANEL_BACKLIGHT (+12V)
19	LA_ DATA2_N	LB_ DATA2_N
20	GND	GND

The LCD inverter is connected to J2 via a JST 7-pin, 2.5mm connector to provide +5V/+12V power to the LCD display.

Pin No.	Definition
1	+5V
2	+12V
3	+12V
4	LBKLT_CTL
5	GND
6	GND
7	LBKLT_EN

2.4.3 CN21 SATA II Connector & J1 SATA Power Connector
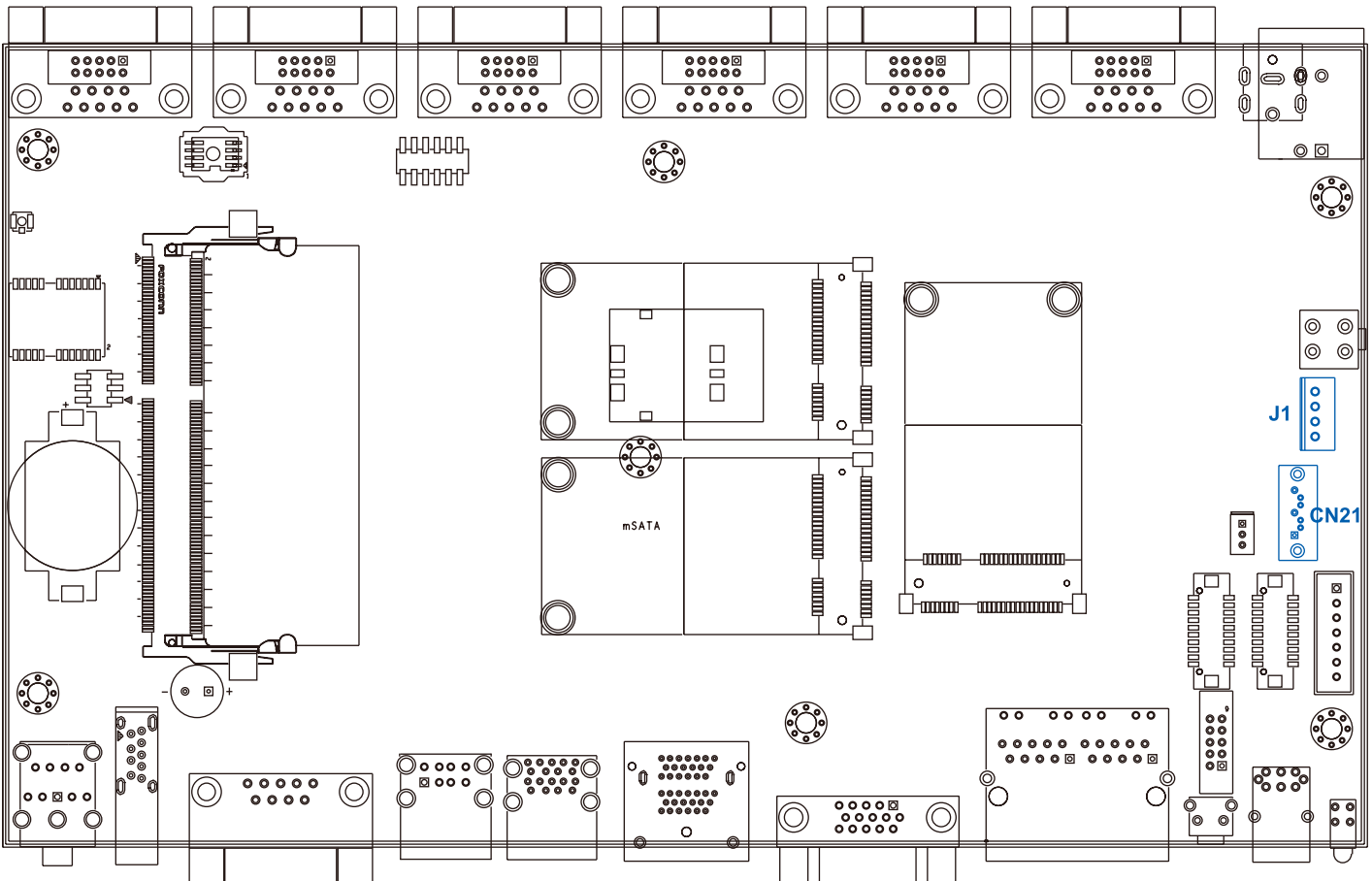
The MilSynapse 1000 series features two high performance Serial ATA II interfaces that eases cabling to hard drives or SSD with thin and short cables while application need larger storage capacity.

Pin No.	Definition
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND

The MilSynapse 1000 series is equipped with one SATA power connector. It supply 5V (1A max.) and 12V (1A max) current to the hard drive or SSD.

CN21 SATA HDD Power Connector

Pin No.	Definition
1	+12V
2	GND
3	GND
4	+5V

2.4.4 CN23 mSATA Connector
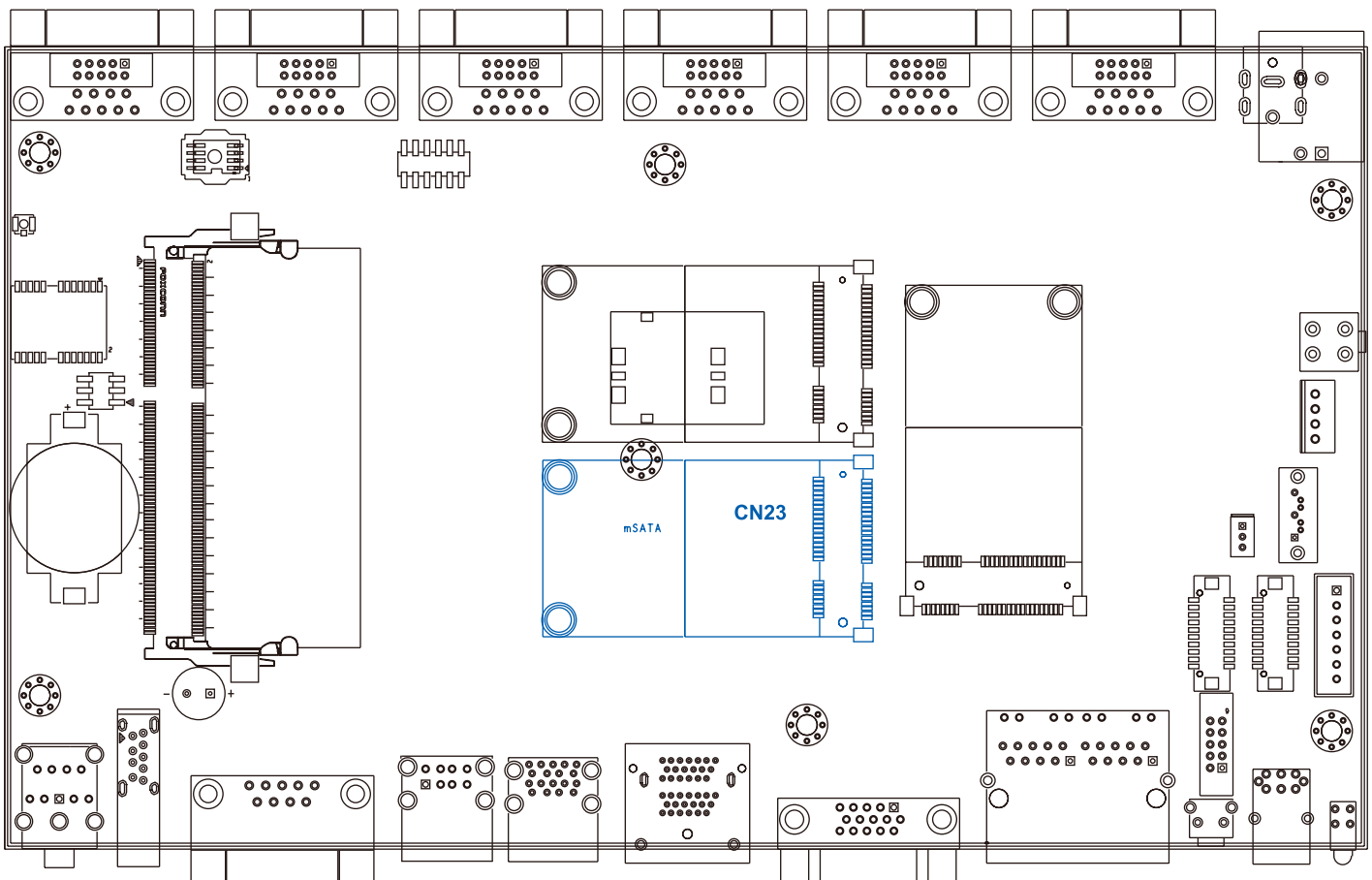
It is for connecting an eSATA storage device. There was no clear mechanism to distinguish if a mSATA drive or a Mini PCI-E device is plugged into the socket until recently that SATA-IO issued an ECN change (ECN #045) to re-define pin 43 on mSATA connector as "no connect" instead of "return current path" (or GND).

When an mSATA drive is inserted, its pin 43 is "no connect", and the respective pin on the socket is being pulled-up to logic 1. When a Mini PCI-E device is inserted, its pin 43 forces the respective pin on the socket to ground, or logic 0.

CN23 mSATA Connector Pin-Out

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
51	NC	52	+3.3Vaux	33	SATA_TXp	34	GND
49	NC	50	GND	31	SATA_TXn	32	NC
47	NC	48	+1.5V	29	GND	30	NC
45	NC	46	NC	27	GND	28	+1.5V
43	GND	44	NC	25	SATA_RXp	26	GND
41	+3.3Vaux	42	NC	23	SATA_RXn	24	+3.3Vaux
39	+3.3Vaux	40	GND	21	GND	22	NC
37	GND	38	NC	19	NC	20	NC
35	GND	36	NC	17	NC	18	GND
Mechanical Key							
15	GND	16	NC	7	NC	8	NC
13	NC	14	NC	5	NC	6	1.5V
11	NC	12	NC	3	NC	4	GND
9	GND	10	NC	1	NC	2	3.3Vaux

2.4.5 CN20, CN22, mini-PCIe Connectors

CN20 Mini-PCIe Connector Pin-Out

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
51	NC	52	+3.3Vaux	33	PETp0	34	GND
49	NC	50	GND	31	PETn0	32	SMB_DATA
47	NC	48	+1.5V	29	GND	30	SMB_CLK
45	NC	46	NC	27	GND	28	+1.5V
43	GND	44	NC	25	PERp0	26	GND
41	+3.3Vaux	42	NC	23	PERn0	24	+3.3Vaux
39	+3.3Vaux	40	GND	21	GND	22	PERST#
37	GND	38	USB_D+	19	NC	20	NC
35	GND	36	USB_D-	17	NC	18	GND
Mechanical Key							
15	GND	16	UIM_VPP	7	CLKREQ#	8	UIM_PWR
13	REFCLK+	14	UIM_RST	5	NC	6	1.5V
11	REFCLK-	12	UIM_CLK	3	NC	4	GND
9	GND	10	UIM_DATA	1	WAKE#	2	3.3Vaux

CN22 Mini-PCIe Connector Pin-Out

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
51	NC	52	+3.3Vaux	33	PETp0	34	GND
49	NC	50	GND	31	PETn0	32	SMB_DATA
47	NC	48	+1.5V	29	GND	30	SMB_CLK
45	NC	46	NC	27	GND	28	+1.5V
43	GND	44	NC	25	PERp0	26	GND

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
41	+3.3Vaux	42	NC	23	PERn0	24	+3.3Vaux
39	+3.3Vaux	40	GND	21	GND	22	PERST#
37	GND	38	USB_D+	19	NC	20	NC
35	GND	36	USB_D-	17	NC	18	GND
Mechanical Key							
15	GND	16	NC	7	CLKREQ#	8	NC
13	REFCLK+	14	NC	5	NC	6	1.5V
11	REFCLK-	12	NC	3	NC	4	GND
9	GND	10	NC	1	WAKE#	2	3.3Vaux

2.4.6 CN29 GPIO
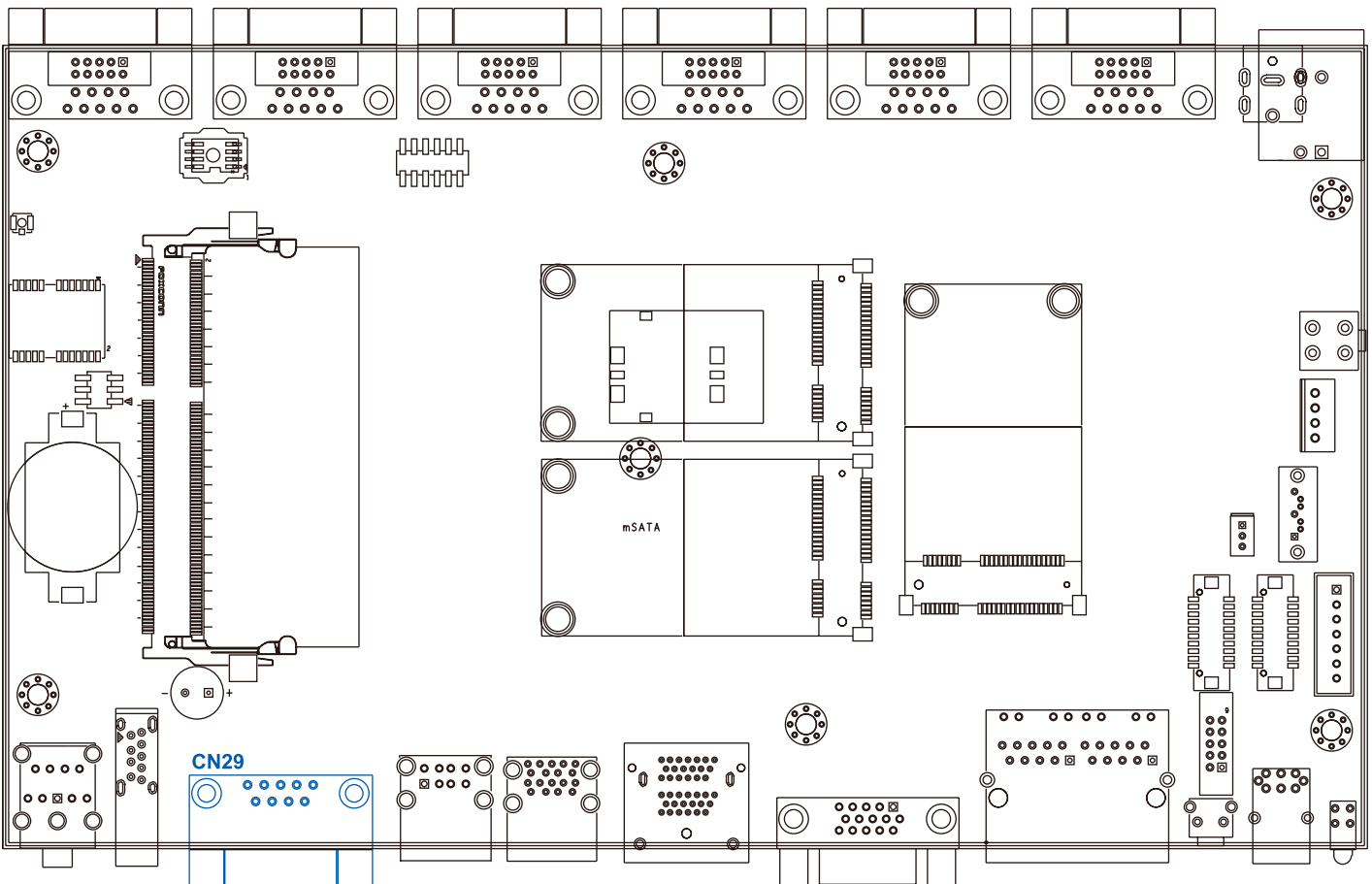
These pin headers can be used as a backup for the The MilSynapse 1000 series offers 8 programmable I/O within TTL 3.3V tolerance. If the GPIO is logic high, it indicates that the mapping SIO GPIO pin is logic high level. If the GPIO is logic low, it indicates that the mapping SIO GPIO pin is logic low level.

Pin No.	SIO GPIO Function
1	SIO_GPIO77
2	SIO_GPIO76
3	SIO_GPIO75
4	SIO_GPIO74

Pin No.	SIO GPIO Function
5	SIO_GPIO73
6	SIO_GPIO72
7	SIO_GPIO71
8	SIO_GPIO70
9	GND

2.4.7 Battery
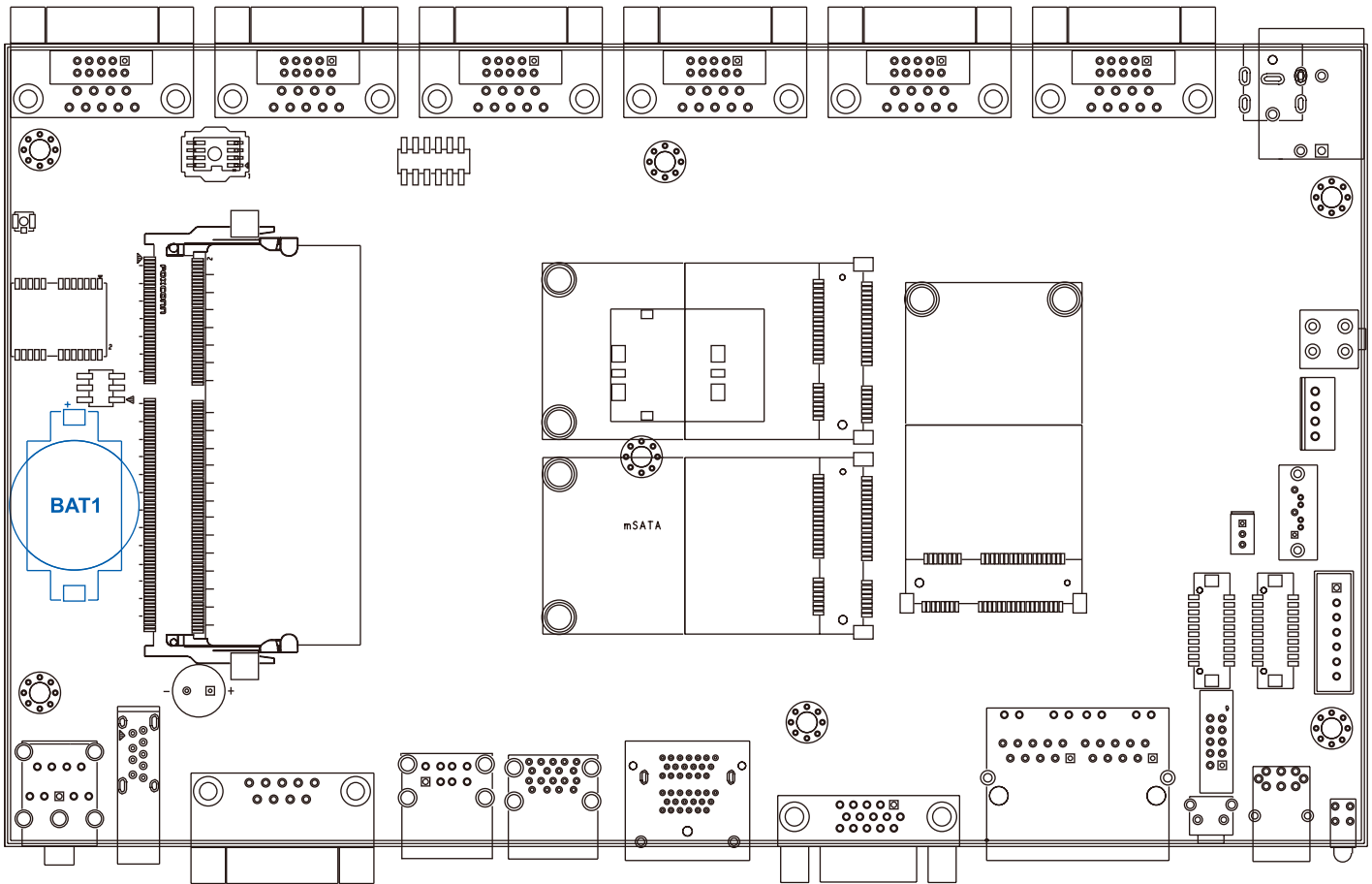
The MilSynapse 1000 series' real-time clock is powered by a lithium battery. It is Equipped with Panasonic BR2032 190mAh lithium battery. It is recommended that you not replace the lithium battery on your own. If the battery needs to be changed, please contact the Rugged Science RMA service team.

2.4.8 GPS Module
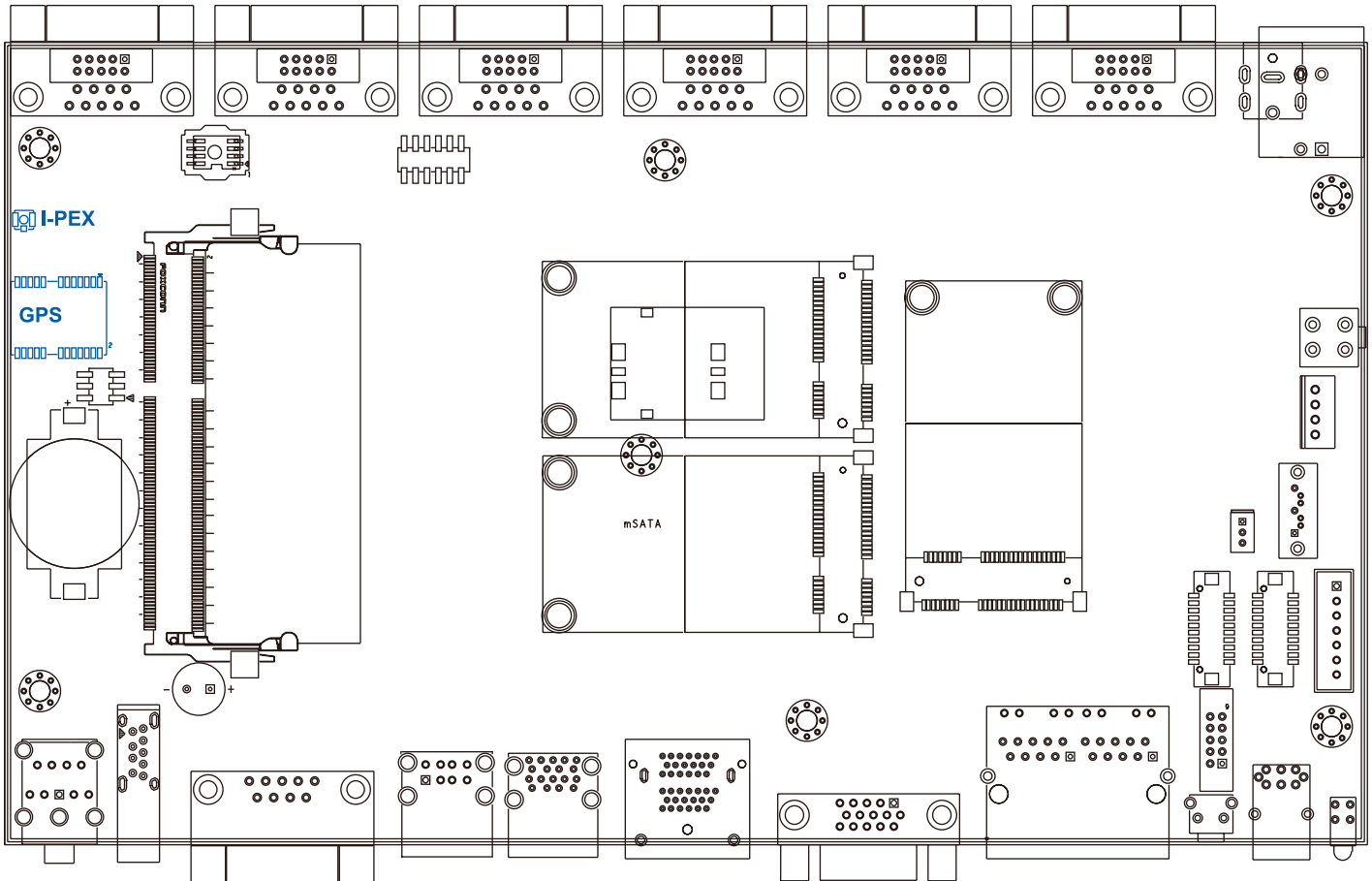
The MilSynapse 1000 series offers a u-blox NEO-7 GPS/GNSS modules (can upgrade to NEO-8) and 2.0mm diameter I-PEX antenna connector with 3.3 voltage power. Antenna circuit as follows.
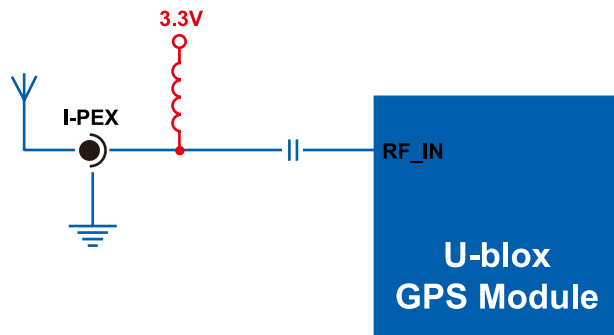
2.5 Main Board Jumper Setting

The figure below is the top view of the MilSynapse 1000 series main board. It shows the location of the jumpers.
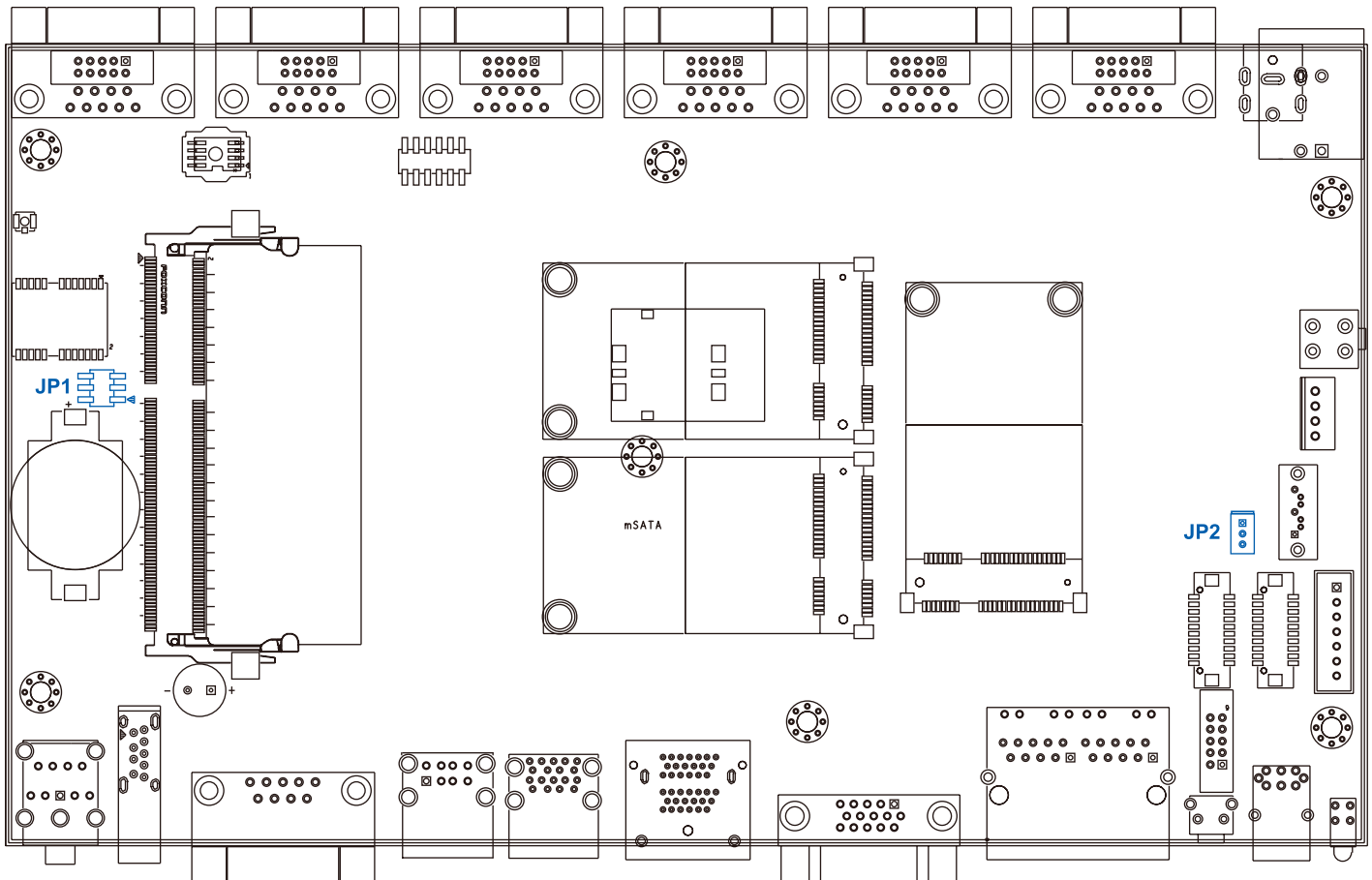
You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit.

It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them.

To "close" a jumper, you connect the pins with the clip. To "open" a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2, or 2 and 3.

open   closed   closed 2-3
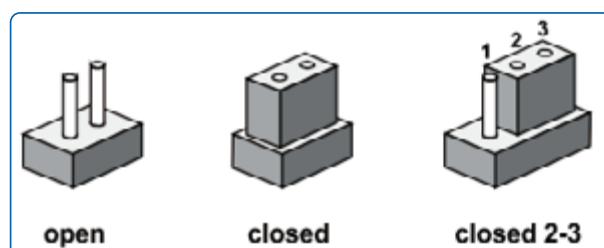
2.5.1 JP1(A) CMOS Clear Jumper Setting
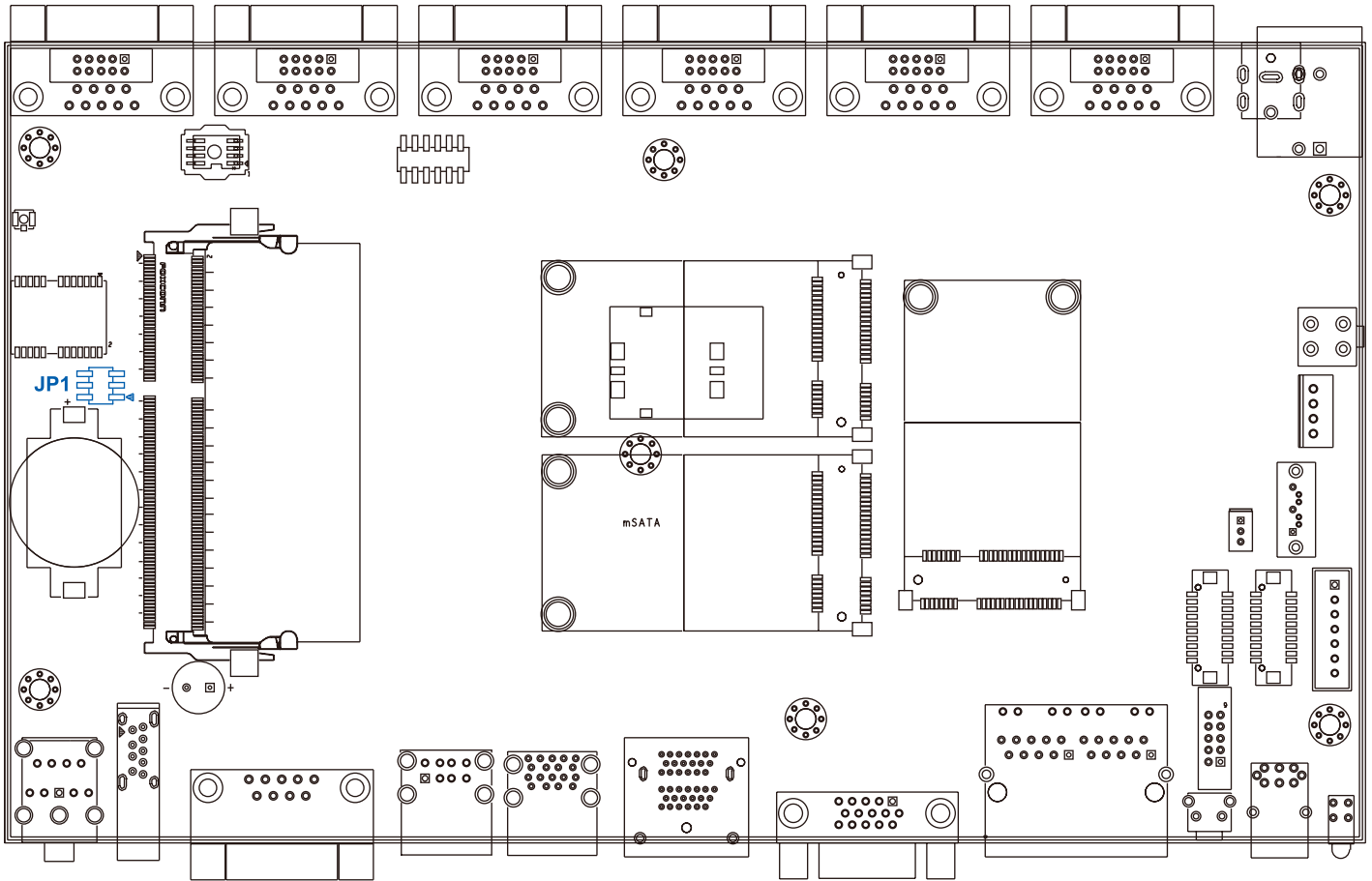
Setting	Description
1-3	Normal (Default)
3-5	Clear CMOS

2.5.2 JP1(B) ME Clear Jumper Setting
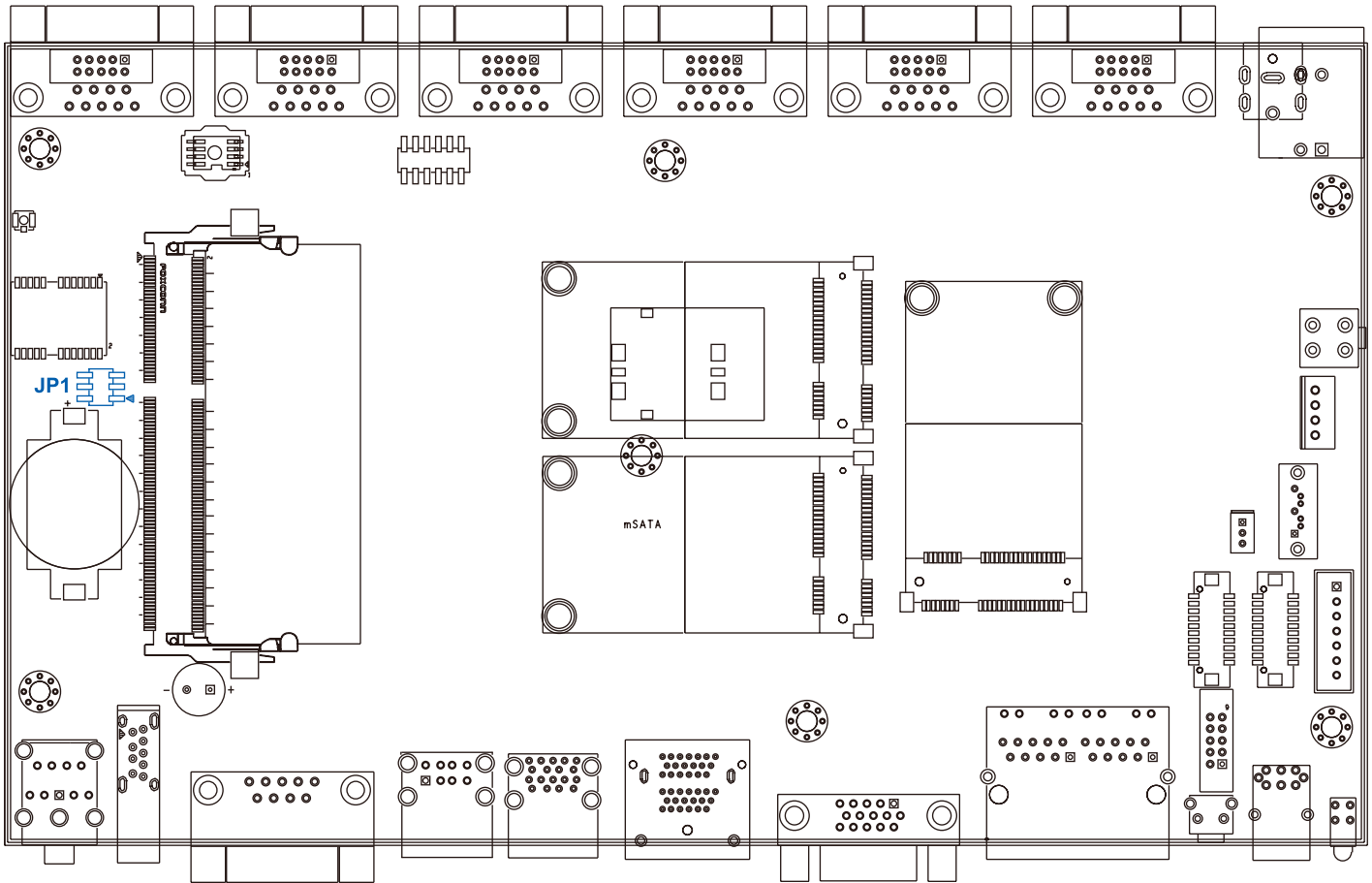
Setting	Description
2-4	Normal (Default)
4-6	Clear ME

2.5.3 JP2 LVDS Backlight Power Selection
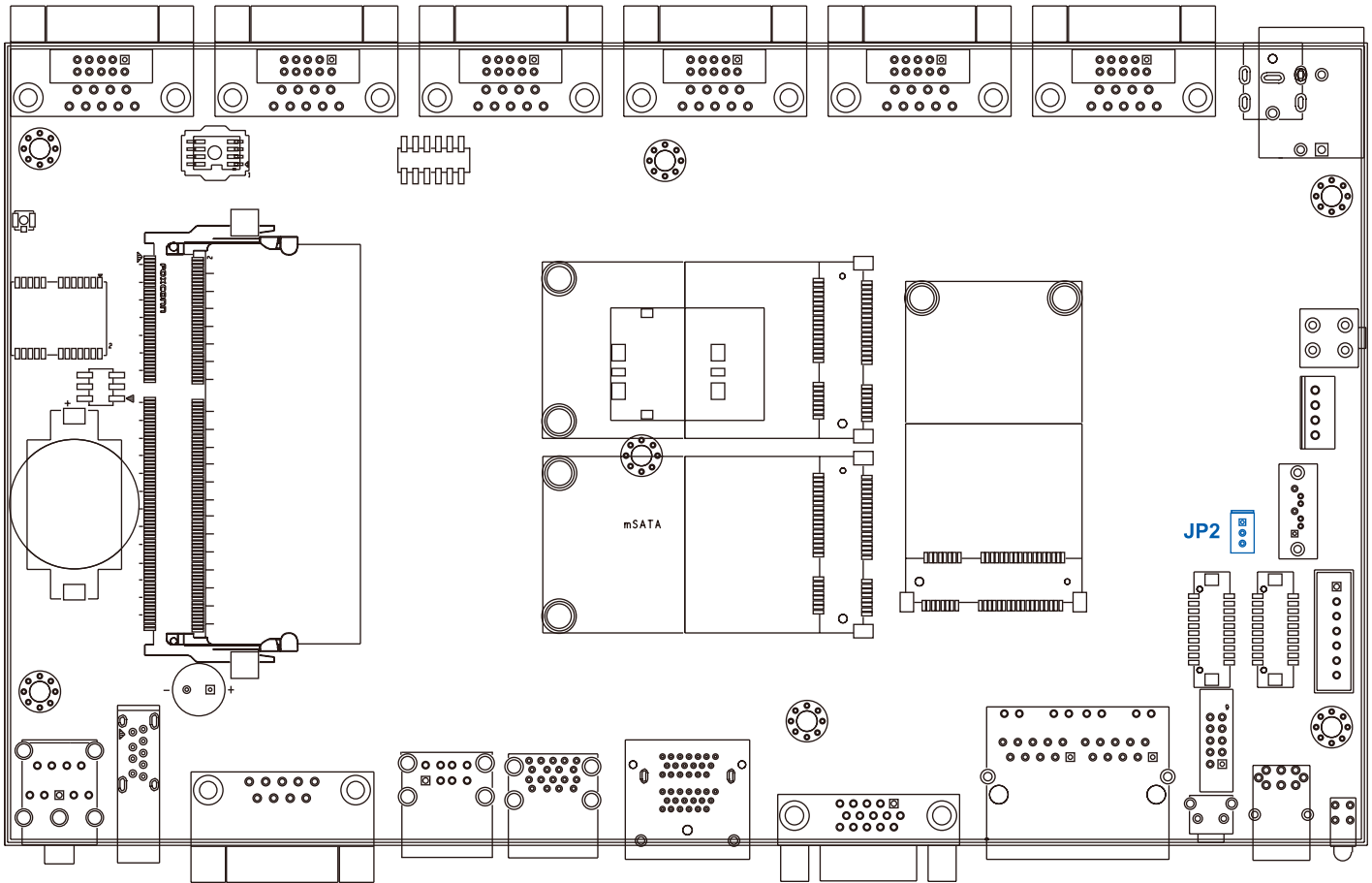
JP2 provides LVDS voltage selection function, closing Pin 1, 2 is for 3.3V LVDS power input; closing Pin 2, 3 is for 5V LVDS power input.

Setting	Description
1-2	+3.3V (Default)
2-3	+5V

3

System Setup

3.1 Install DDR3 / DDR3L SODIMM Modules

Step1.

Put the MilSynapse 1000 series upside down on a flat surface. You can see the "Pet-Door" exposed. Use a Philips screwdriver to loose the M3 flat-head screw on the "Pet-Door".

Step2.

Remove the "Pet-Door" and you can see a DDR3 SODIMM socket exposed.

Step3.	
	Tile the SODIMM module and insert it to the SODIMM socket.
	As it's firmly contacted with socket connectors, press it down until the clamps of the socket snap into the latching position of SODIMM module.

3.2 Install SSD | HDD

Step1.	
	Put the MilSynapse 1000 series upside down on a flat surface. You can see the "Pet-Door" exposed. Use a Philips screwdriver to loose the M3 flat-head screw on the "Pet-Door".
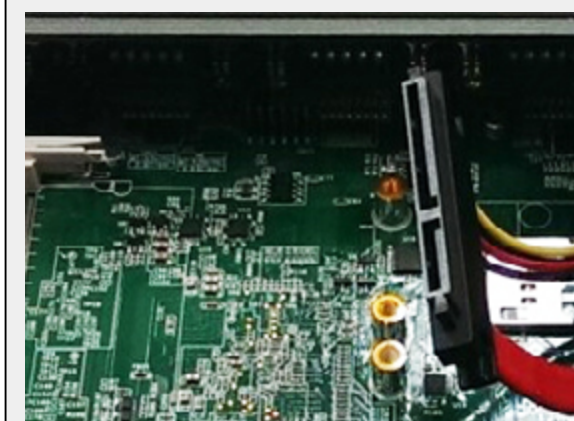
Step2.	
	Remove the "Pet-Door" and you can see a DDR3 SODIMM socket exposed.

Step3.

Place the HDD into the bracket and gently push it down to make it contact with thermal pad. Use a Philips screwdriver to fix the HDD with M3 screws. Please note that the HDD must be placed in the right direction as below.

Step4.

SATA Connector of HDD
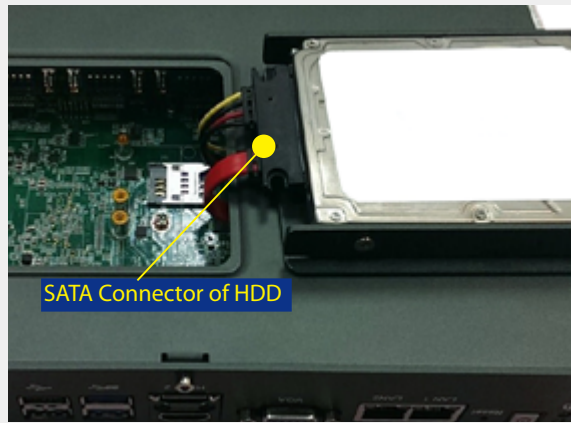
Pull out the SATA cable inside the chassis and connect it to HDD.

3.3 Mount Your MilSynapse 1000

Installation Method 1
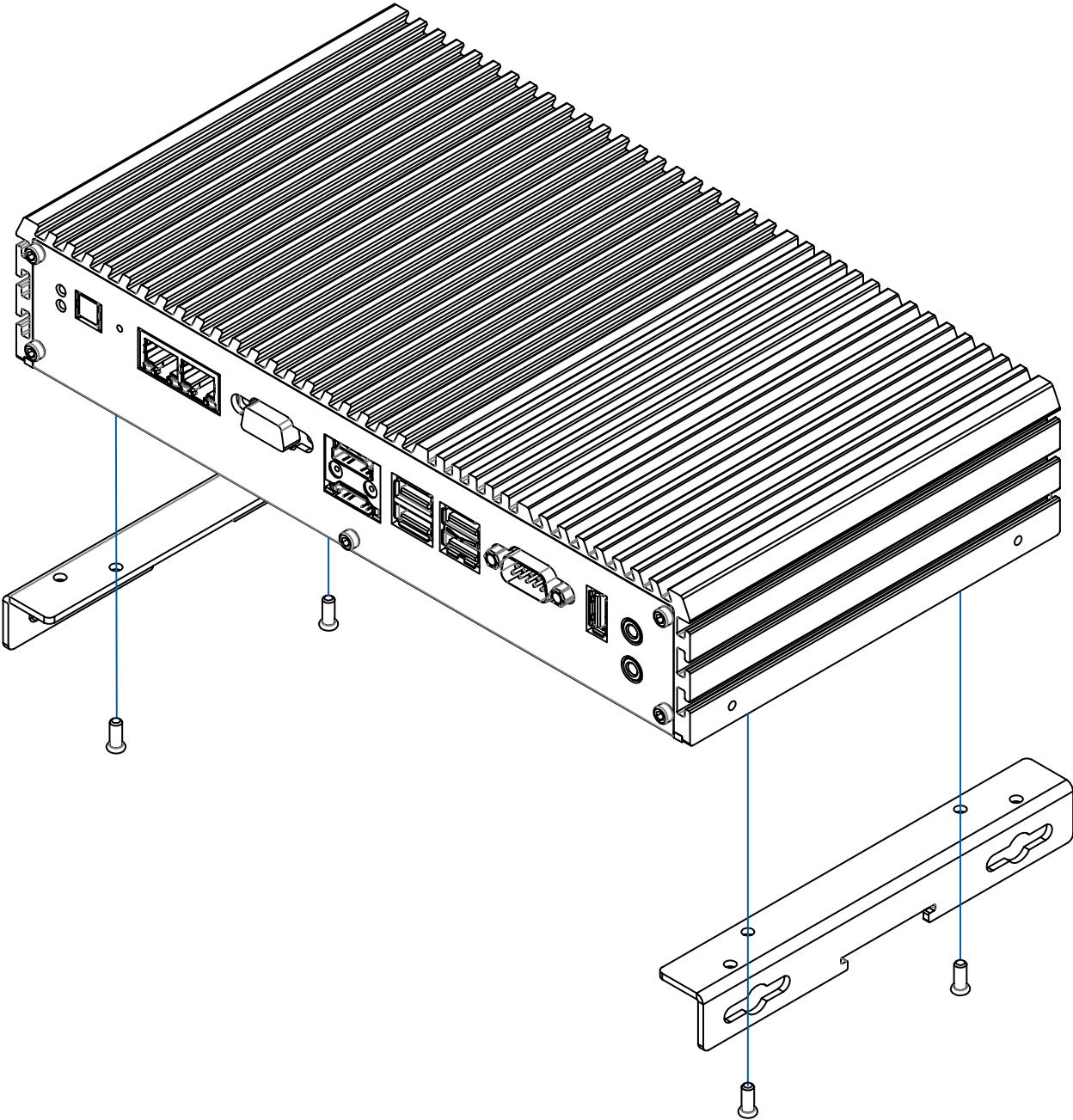
Installation Method 2
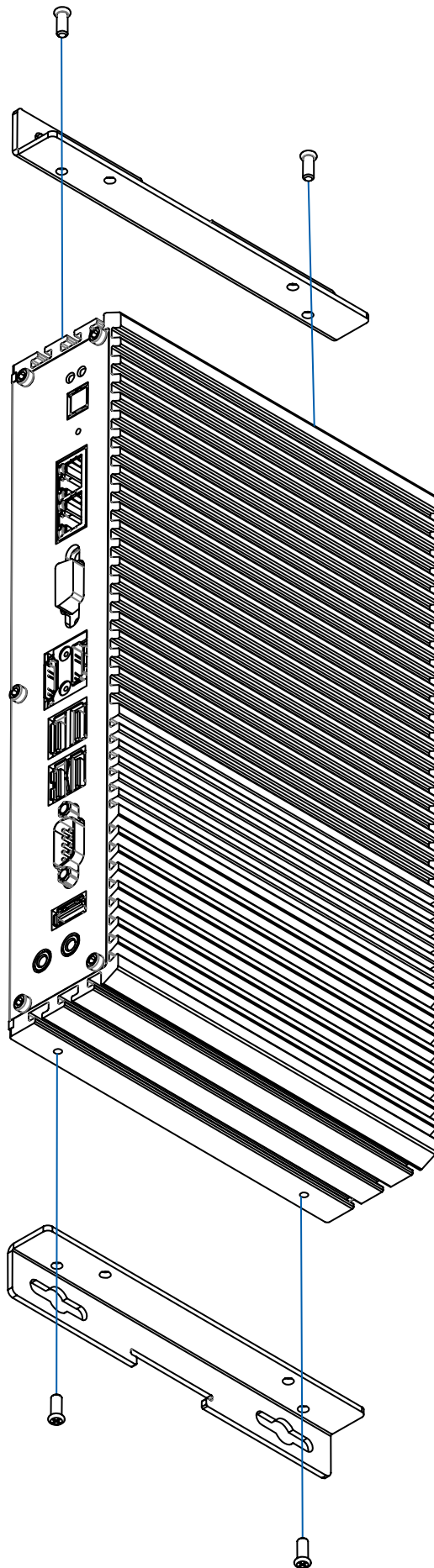
4

BIOS and Driver

4.1 BIOS Settings

The board uses UEFI BIOS that is use Serial Peripheral Interface (SPI) Flash. The SPI Flash contains the BIOS Setup program, POST, the PCI auto-configuration utility, LAN, EEPROM information, and Serial port support. The BIOS setup program is accessed by pressing the **<Del>** key after the Power-On Self-Test (POST) memory test begins and before the operating system boot begins. The menu bar is shown below.

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**

Figure 4.1: BIOS Menu Bar

4.1.1 Main Menu

Main	Advanced	Chipset	Security	Boot	Save & Exit

BIOS Information

BIOS Vendor   Vecow ABP-2000 B20-001

BIOS Version   5.008

Release time   12/06/2013 09:39:15

Item Specific Help

System Language   [English]

System Date   [Thu 02/21/2013]

System Time   [12:00:00]

Figure 4.1.1: BIOS Main screen

System Time / Date : Press "TAB" key to switch sub-items of value .Then press " +" key or "-" key number key for modify value.
In this page , you could make sure you CPU type and DRAM type that you are install into this system.

4.2 Advanced Function

4.2.1 ACPI Setting

Main	Advanced	Chipset	Security	Boot	Save & Exit

ACPI Settings

Enable ACPI Auto Configuration   [Disabled]

Enable Hibernation   [Enabled]

ACPI Sleep State   [S3]

Item Specific Help

Figure 4.2.1: ACPI Setting setup screen

Enable ACPI Auto Configuration: This system support ACPI function as auto process. You should Enable / Disable that depend as your O.S.

Enable Hibernation: It is able to use Hibernate function if O.S support. But some Operation system maybe not effective with this function.

ACPI Sleep state: Select sleep state while SUSPEND button pressed.

4.2.2 Serial Port 1 Configuration

Advanced->IT8786E Super IO Configuration->Serial Port 1 Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**

	Item Specific Help
Serial Port 1 Configuration	
Serial Port [Enabled]	
Device Settings IO=3F8h; IRQ=4;	
Change Settings [Auto]	

Figure 4.2.2: Serial Port 2 Setup screen

Serial Port :
Enable or Disable Serial port.

Device Setting:
Current IO addresses and interrupts resource of Serial Port.

Change Settings :
Select another device setting.
Here have 6 options :
 Auto
 IO=3F8h; IRQ=4;
 IO=3F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
 IO=2F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
 IO=3E8h; IRQ=3,4,5,6,7,8,9,10,11,12;
 IO=2E8h; IRQ=3,4,5,6,7,8,9,10,11,12;

4.2.3 Serial Port 2 Configuration

Advanced->IT8786E Super IO Configuration->Serial Port 1 Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

Serial Port 2 Configuration

Item Specific Help

Serial Port   [Enabled]

Device Settings   IO=3F8h; IRQ=4;

Change Settings   [Auto]

Figure 4.2.3: Serial Port 1 Setup screen

Serial Port :
Enable or Disable Serial port.

Device Setting:
Current IO addresses and interrupts resource of Serial Port.

Change Settings :
Select another device setting.
Here have 6 options :
  Auto
  IO=3F8h; IRQ=4;
  IO=3F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
  IO=2F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
  IO=3E8h; IRQ=3,4,5,6,7,8,9,10,11,12;
  IO=2E8h; IRQ=3,4,5,6,7,8,9,10,11,12;

4.2.4 Serial Port 3 Configuration

Advanced->IT8786E Super IO Configuration->Serial Port 1 Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**

Serial Port 3 Configuration	Item Specific Help
Serial Port [Enabled]	
Device Settings **IO=3F8h; IRQ=4;**	
Change Settings **[Auto]**	
Interface Mode **[RS-232 Mode]**	

Figure 4.2.4: Serial Port 1 Setup screen

Serial Port :
Enable or Disable Serial port.

Device Setting:
Current IO addresses and interrupts resource of Serial Port.

Change Settings :
Select another device setting.
Here have 6 options :
    Auto
    IO=3F8h; IRQ=4;
    IO=3F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
    IO=2F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
    IO=3E8h; IRQ=3,4,5,6,7,8,9,10,11,12;
    IO=2E8h; IRQ=3,4,5,6,7,8,9,10,11,12;

Interface Modes :
Select UART transfer and receive protocol
Here have 3 options :
    RS-232 Mode
    RS-422 Mode
    RS-485 Mode

4.2.5 Serial Port 4 Configuration

Advanced->IT8786E Super IO Configuration->Serial Port 1 Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

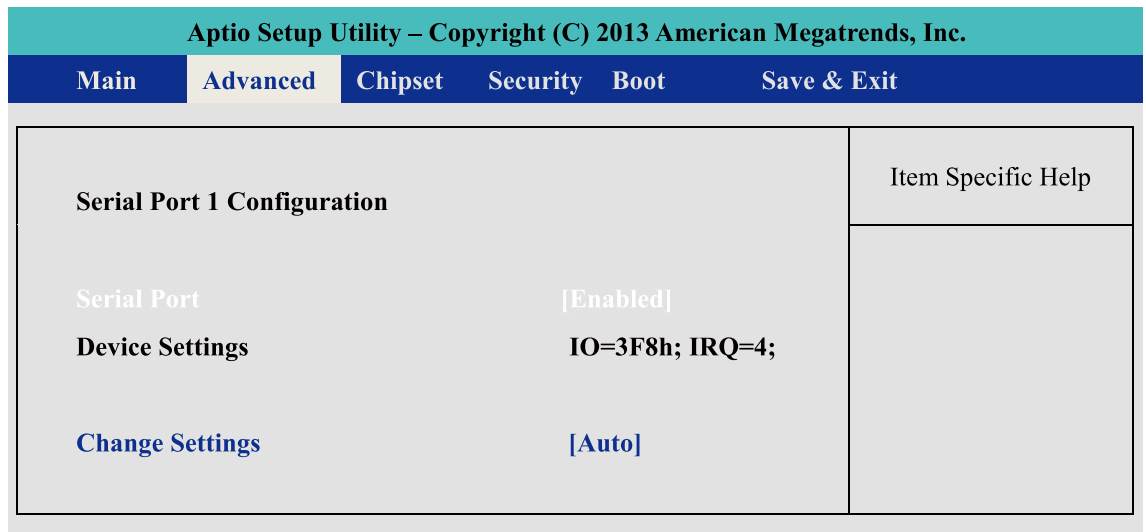|	
Serial Port 4 Configuration	Item Specific Help
Serial Port	[Enabled]
Device Settings	**IO=3F8h; IRQ=4;**
Change Settings	**[Auto]**
Interface Mode	**[RS-232 Mode]**

Figure 4.2.5: Serial Port 1 Setup screen

Serial Port :
Enable or Disable Serial port.

Device Setting:
Current IO addresses and interrupts resource of Serial Port.

Change Settings :
Select another device setting.
Here have 6 options :
　　Auto
　　IO=3F8h; IRQ=4;
　　IO=3F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
　　IO=2F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
　　IO=3E8h; IRQ=3,4,5,6,7,8,9,10,11,12;
　　IO=2E8h; IRQ=3,4,5,6,7,8,9,10,11,12;

Interface Modes :
Select UART transfer and receive protocol
Here have 3 options :
　　RS-232 Mode
　　RS-422 Mode
　　RS-485 Mode

4.2.6 Serial Port 5 Configuration

Advanced->IT8786E Super IO Configuration->Serial Port 1 Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

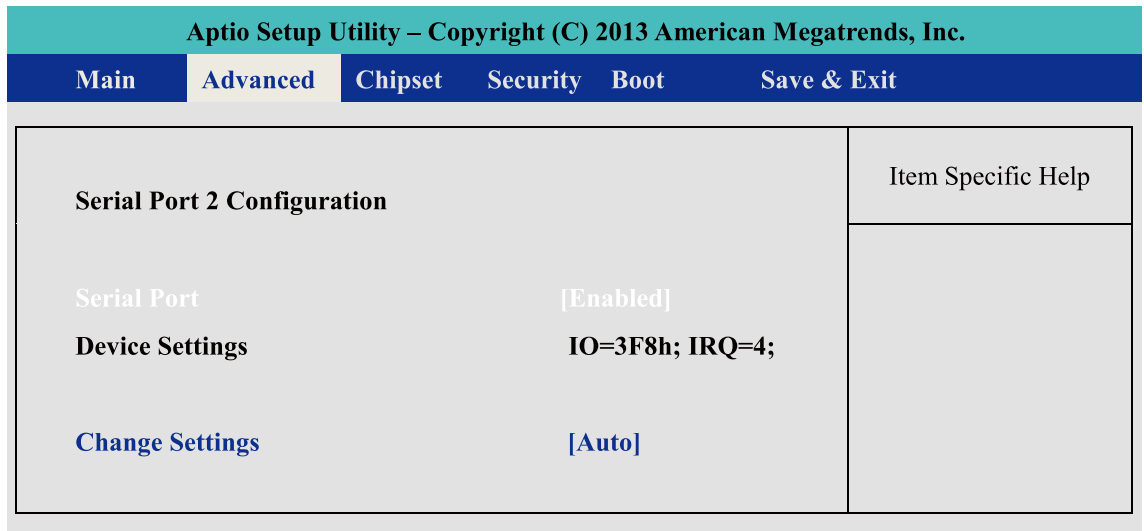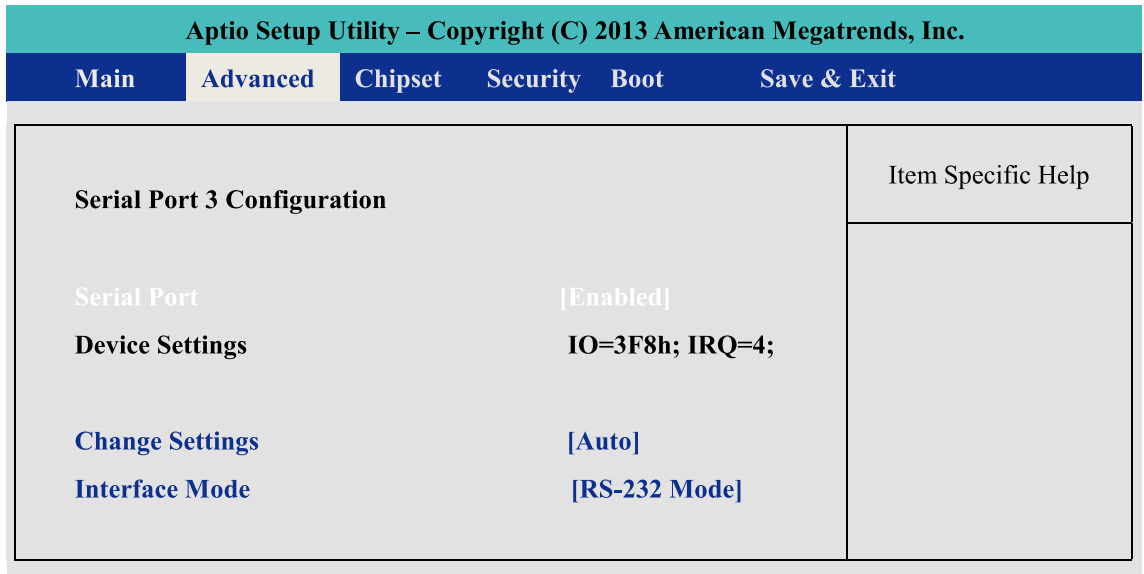|	Item Specific Help
Serial Port 1 Configuration	
Serial Port [Enabled]	
Device Settings IO=3F8h; IRQ=4;	
Change Settings [Auto]	
Interface Mode [RS-232 Mode]	
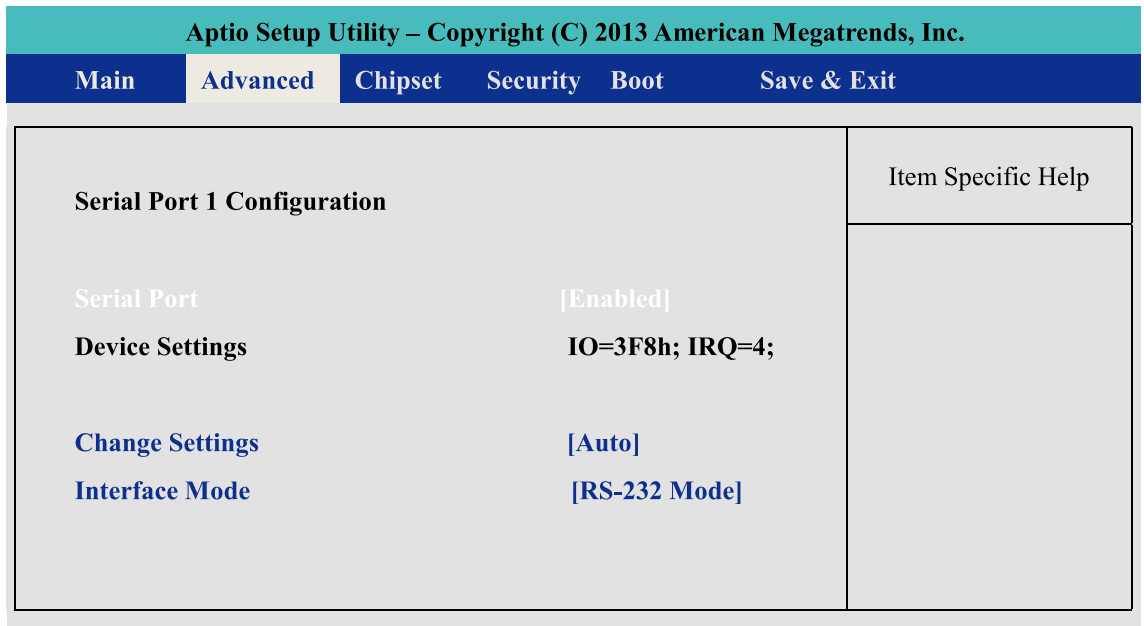
Figure 4.2.6: Serial Port 1 Setup screen

Serial Port :
Enable or Disable Serial port.

Device Setting:
Current IO addresses and interrupts resource of Serial Port.

Change Settings :
Select another device setting.
Here have 6 options :
    Auto
    IO=3F8h; IRQ=4;
    IO=3F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
    IO=2F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
    IO=3E8h; IRQ=3,4,5,6,7,8,9,10,11,12;
    IO=2E8h; IRQ=3,4,5,6,7,8,9,10,11,12;

Interface Modes :
Select UART transfer and receive protocol
Here have 3 options :
    RS-232 Mode
    RS-422 Mode
    RS-485 Mode

4.2.7 Serial Port 6 Configuration

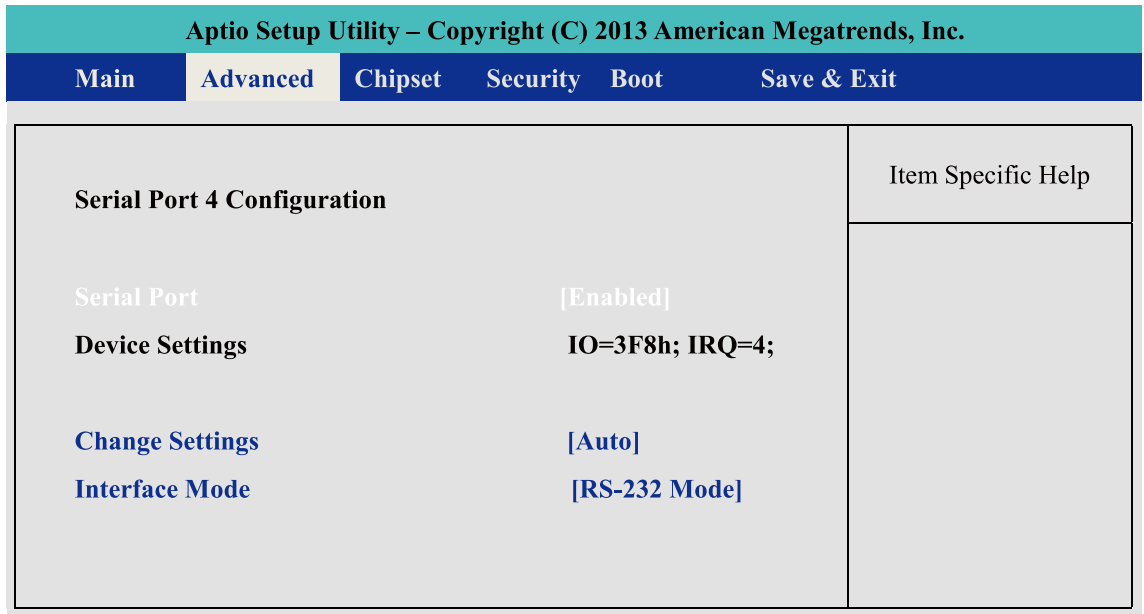**Advanced->IT8786E Super IO Configuration->Serial Port 1 Configuration**

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

Serial Port 6 Configuration

		Item Specific Help
Serial Port	[Enabled]	
Device Settings	IO=3F8h; IRQ=4;	
Change Settings	[Auto]	
Interface Mode	[RS-232 Mode]	
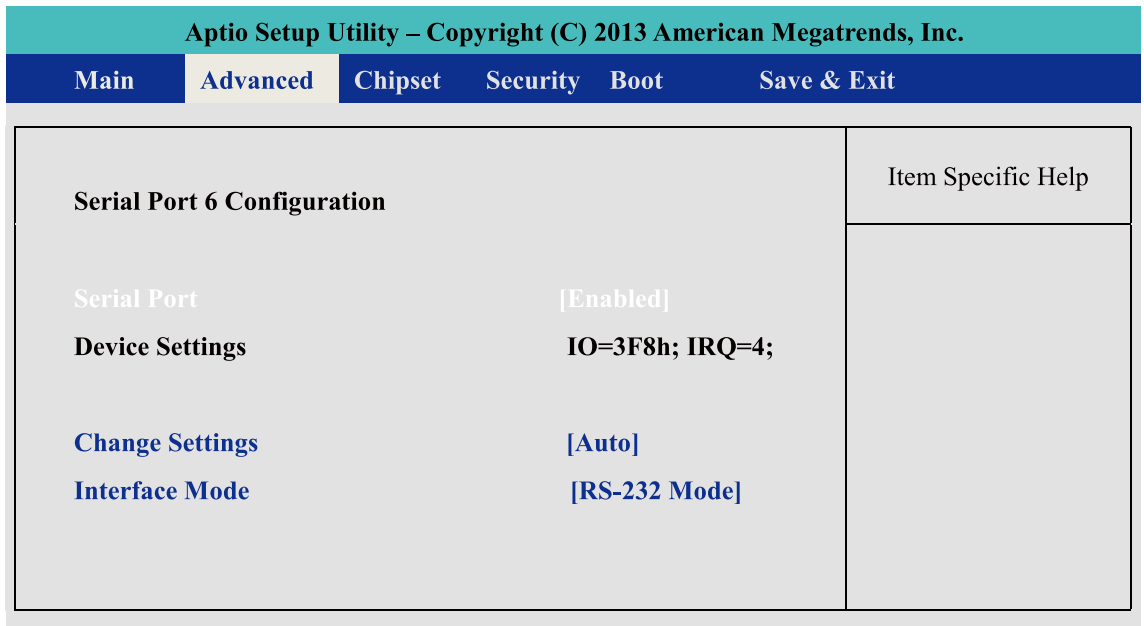
Figure 4.2.7: Serial Port 1 Setup screen

Serial Port :
Enable or Disable Serial port.

Device Setting:
Current IO addresses and interrupts resource of Serial Port.

Change Settings :
Select another device setting.
Here have 6 options :
   Auto
   IO=3F8h; IRQ=4;
   IO=3F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
   IO=2F8h; IRQ=3,4,5,6,7,8,9,10,11,12;
   IO=3E8h; IRQ=3,4,5,6,7,8,9,10,11,12;
   IO=2E8h; IRQ=3,4,5,6,7,8,9,10,11,12;

Interface Modes :
Select UART transfer and receive protocol
Here have 3 options :
   RS-232 Mode
   RS-422 Mode
   RS-485 Mode

4.2.8 PPM Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

PPM Configuration

		Item Specific Help
EIST	[Disabled]	
CPU C State Report	[Enabled]	
Enhance C State	[Enabled]	
Max CPU C-State	[C7]	
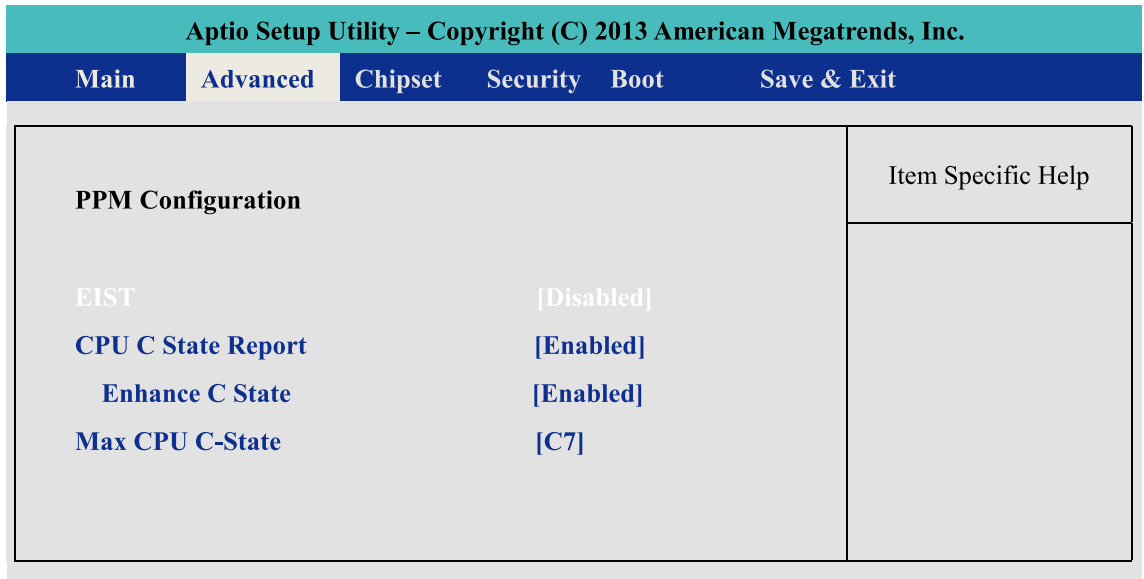
Figure 4.2.8: Trusted Computing setup screen

EIST :
Enables or Disables Intel Speed function , once you enabled it , you could use the Intel Turbo Boost software to monitor you CPU performance. Please refer to CPU check list.

4.2.9 CPU Configuration

Advanced->CPU Configuration->Socket 0 CPU Information

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

CPU Configuration

Intel (R) ATOM (TM) CPU E3845 @ 1.91GHz

		Item Specific Help
Max CPU Speed	1910MHz	
Min CPU Speed	500MHz	
Inter Virtualization	[Disable]	
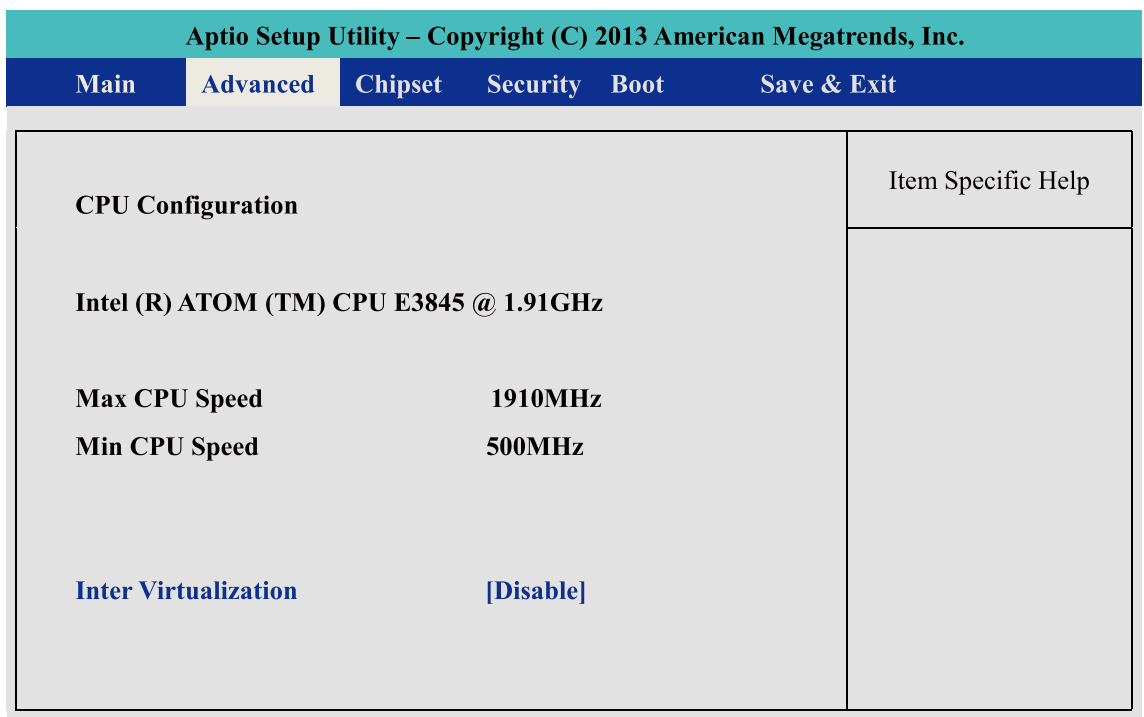
Figure 4.2.9: Trusted Computing setup screen

Intel® Virtualization Technology :
This is for Virtualization Application or platform usage, when enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology,

4.2.10 IDE Configuration

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.
Main   **Advanced**   Chipset   Security Boot   Save & Exit

	Item Specific Help
IDE Configuration	
Serial-ATA (SATA) [Enabled]	
SATA Mode **[AHCI Mode]**	
Serial-ATA Port 0 **[Enabled]**	
Serial-ATA Port 0 **[Enabled]**	

Figure 4.2.10: SATA Configuration setup screen

Serial-ATA(SATA) :
Enables or Disables integrate SATA controller for Storage device use.

SATA Mode Selection:
Determines how the SATA transfer mode for operate. Here have three option for choice [IDE] / [AHCI] .

Serial Port 0~1 :
This system offers two SATA port for connection SATA device.

4.3 Chipset Function

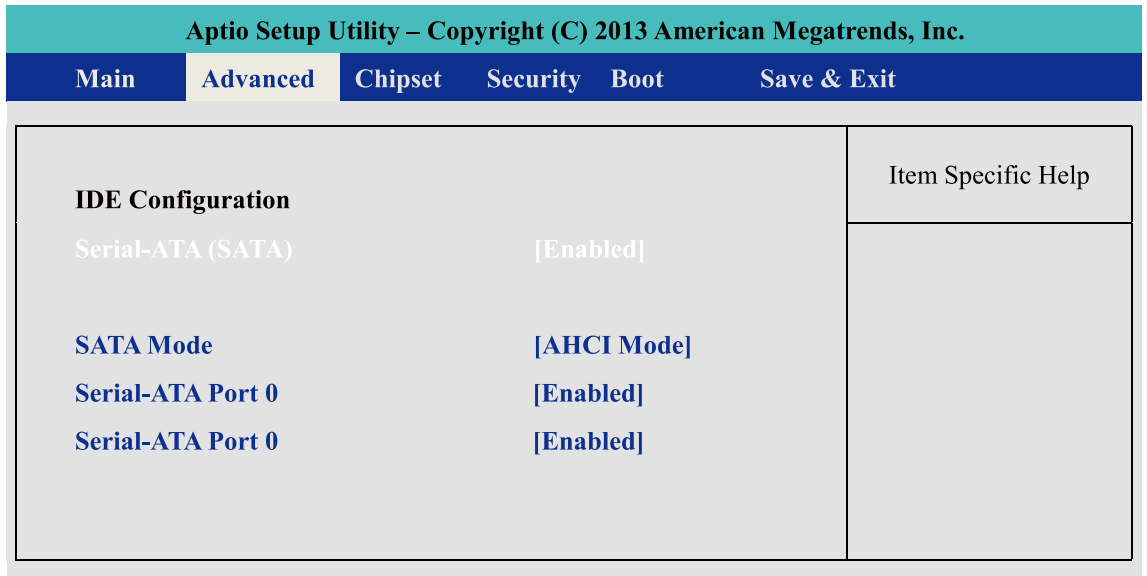| Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

4.3.1 Display Configuration

Chipset->North Bridge->Intel IGD Configuration->Primary Display

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	Advanced	Chipset	Security	Boot	Save & Exit

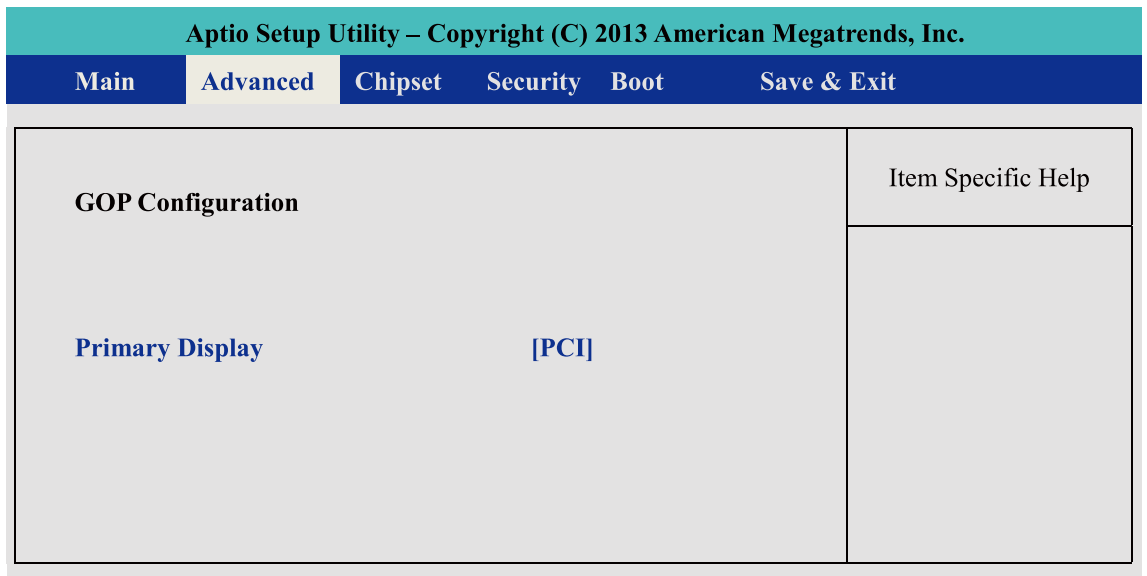|	Item Specific Help
GOP Configuration	
Primary Display [PCI]	

Figure 4.3.1: Network Setup screen

Primary Display:
Select which Display module you would like to you on current system.

[PCI] : System display function will be change to internal PCI or PCIe bus.

[IGD] : Use Internal Intel HD Graphics unit for unique display output.

4.3.2 Power Loss Configuration

Chipset->South Bridge

Aptio Setup Utility – Copyright (C) 2013 American Megatrends, Inc.					
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**

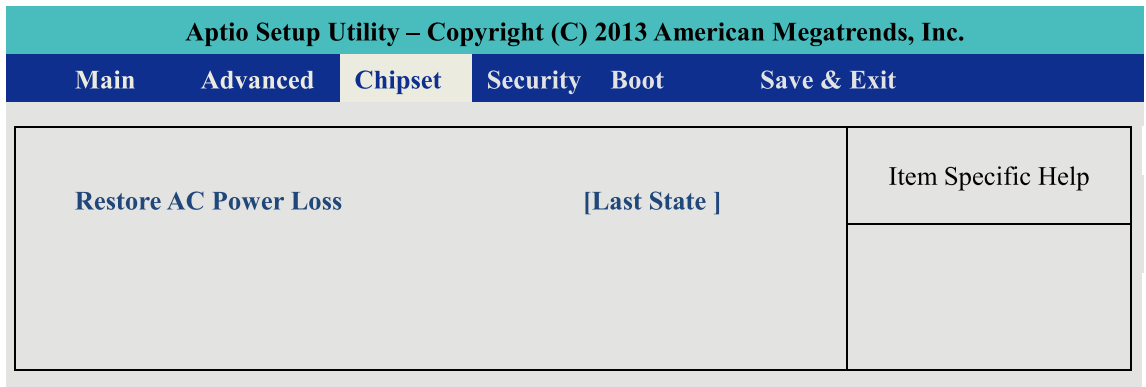|		Item Specific Help
Restore AC Power Loss	**[Last State]**	

Figure 4.3.2: Power Loss Setup screen

Restore AC Power Loss :

[Power Off] : When plug-in the power source , system will keep on SB mode.

[Power On] : When plug-in the power source , system will auto booting .

[Last State] : When plug-in the power source , system will keep on last power status.

4.4 Boot Function

4.4.1 Change Boot Configuration

Phoenix SecureCore(tm) Setup Utility					
Main	Advanced	Chipset	Security	Boot	Save & Exit

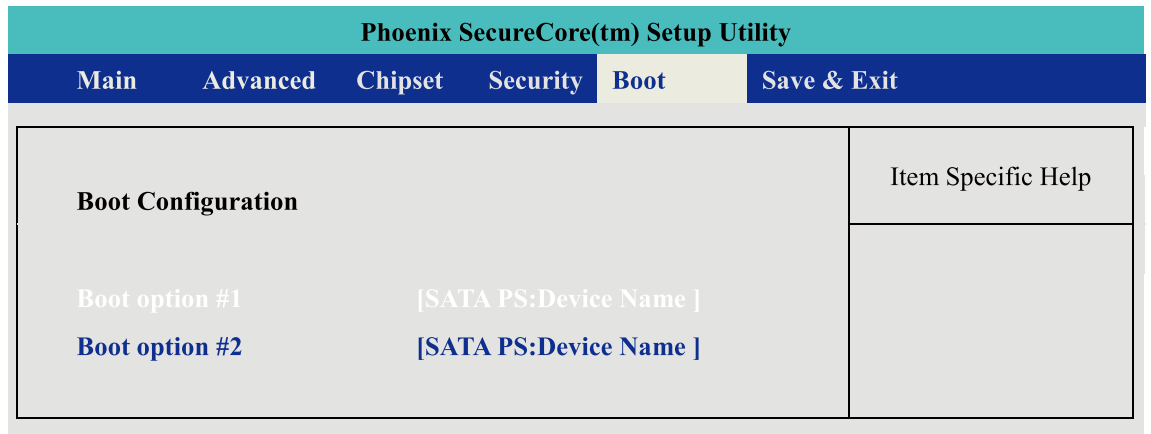|	Item Specific Help
Boot Configuration	
Boot option #1 [SATA PS:Device Name]	
Boot option #2 [SATA PS:Device Name]	

Figure 4.4.1: Boot Setup screen

Boot option:
When you press "Enter" , you can select which device you would like to boot.

4.5 Save & Exit

4.5.1 1.5.1. Reload Default BIOS Value

Phoenix SecureCore(tm) Setup Utility						
Main	**Advanced**	**Chipset**	**Security**	**Boot**	**Save & Exit**	

Boot Configuration

Item Specific Help

Restore Defaults

Save as User Defaults
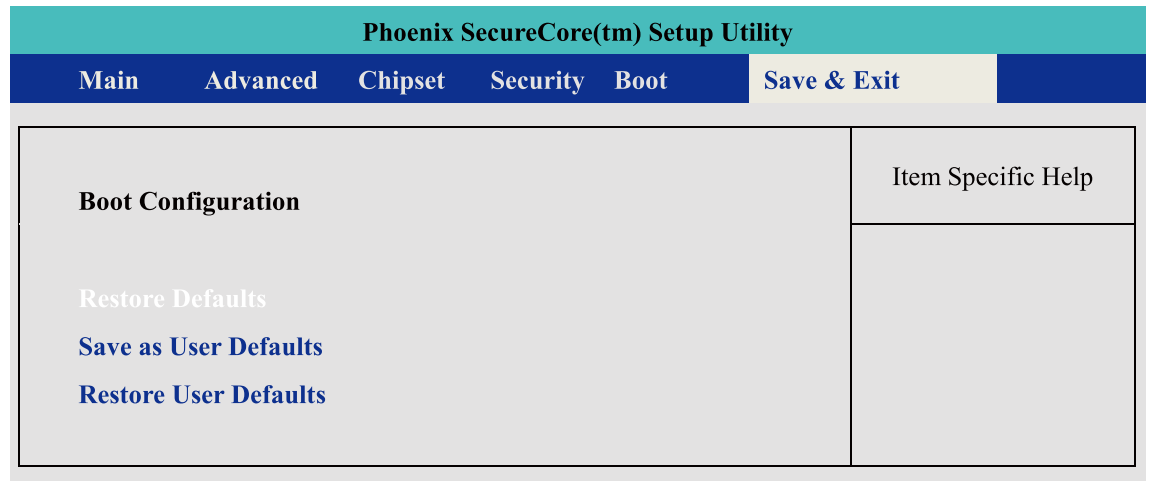
Restore User Defaults

Figure 4.5.1: Boot Setup screen

Restore Default:
Use the function to restore all BIOS setting, but not include administrator password and system RTC value.

Save as Use Default:
Uses can use this function to match the target system.

Restore as Use Default:
Restore all BIOS setting to User Default.

Appendix A : GPIO & WDT

■ **Operation System Support**

Linux :
Ubuntu 12.04 LTS or Above
Fedora 16 or Above
And another Linux kernel 2.6.38 and RHL6.0
(* The Linux kernel of RHL , please check RadHat website first)

Windows :
Windows 7 Home/Professional/MediaCenter/
Windows 8 (Do not support RT version)
Windows Server 2012

■ **GPIO & WDT Function**

The GPIO& WDT are using internal Super IO function. However, you must entry super I/O configuration mode to set it.

The output port is set as GPIO 1 on CN13 , reg. index = **0x60**

The input port is set as GPIO 4 on CN12 , reg. index = **0x62**.

Super I/O special address port = 0x2E
Super I/O special data port = 0x2F
GPIO Logical device is 0x07

Pin No.	SIO GPIO Function
1	SIO_GPIO77
2	SIO_GPIO76
3	SIO_GPIO75
4	SIO_GPIO74
5	SIO_GPIO73
6	SIO_GPIO72
7	SIO_GPIO71
8	SIO_GPIO70
9	GND

A. Entry MB PnP mode.

//write twice 0x87 value.
outportb(Super I/O special address port, 0x87);
outportb(Super I/O special address port, 0x01);
outportb(Super I/O special address port, 0x55);
outportb(Super I/O special address port, 0x55);

B. Located on Logical Device 7

//write 0x07 on Reg [0x07] , this setup must follow Step A.
that can be workable.
outportb(Super I/O special address port, 0x07);
outportb(Super I/O special data port, 0x07);

C. Access the Super I/O register

Base control for write Super I/O register.
outportb(Super I/O special address port, Register Index.);
outportb(Super I/O special data port, update_value);

Base control for read Super I/O register
outportb(Super I/O special address port, Register Index.);
inportb(Super I/O special data port);   //It will return a
BYTE value.

D. Start to Access the MilSynapse 1000 series GPIO port

Please refer to source code for set_data() and get_data() function.

Write data to GPO(output) port
set_data(Register Index , update_value);

example :
unsigned char data = 0x82;
set_data(0xE5 , data);
//Set bit 7 & bit 1 of GPO output port as High
level ,another bit is Low

Read data to GPI(input) port

get_data(Register Index) //It will return a BYTE value.
example :
unsigned char data
get_data(0xF1 , data);
//Get GPI(input) port status on input_data variable.

E. WDT ON/OFF and Timer-Counter setting

Refer to GPIO setting of Step A and B. , located Logical

0x08 for WDT function.

Reg [0x72] is WatchDog ON/OFF control.
WatchDog On :   set_data(0x30 , 0x01);
WatchDog Off :   set_data(0x30 , 0x00);

Reg [0x73] is WatchDog timer – For WDT Timer out value

WatchDog counter start :   set_data(0xF0 , 0x02);
WatchDog counter start :   set_data(0xF0 , 0x00);

Reg [0x72] is WatchDog time-out value, "Reading" this register returns the current value in the Watch Dog Counter, not the Watch Dog Timer Time-out value..

WatchDog time-out value: set_data(0xF1 ,);