Chapter 1
Introducing the Motherboard

Introduction

Thank you for choosing the 86500 motherboard. This motherboard is a high performance, enhanced function motherboard designed to support Intel® Skylake™ U SoC for embedded system or industrial computer markets.

This motherboard is based on Intel® Skylake™ U platform. This processor is a multi-core system-on-a-chip (SoC) that integrates the next generation Intel® processor core, graphics, memory, and I/O interfaces into one solution. This motherboard supports up to 4 GB of system memory with dual channel DDR4 2133 MHz on board RAM. It supports one mini PCI Express slot (you can install a mSATA card/PCIE card for it), and two M.2 slots (1 x 2230 E Key, 1 x 2242 B Key), and one Micro SIM Card Slot for extending usage.

It implements an EHCI (Enhanced Host Controller Interface) compliant interface that provides four USB 2.0 ports (two USB 2.0 ports at the back panel and one 2*5-pin USB 2.0 header supports additional two USB 2.0 ports) and four USB 3.0 ports at the back panel.

The motherboard is equipped with advanced full set of I/O ports in the rear panel, one DC_IN port, two Ethernet LAN connectors, one combo PS2, four USB 3.0 ports, six COM ports (COM5~COM6 provided by 5*2 pin header), one VGA port, one HDMI port, and one audio jack.

In addition, this motherboard supports one SATA 6Gb/s connector for expansion.

Feature

Processor

The motherboard uses a SoC that carries the following features:

- Accommodates the Intel® Skylake™ U SoC

Chipset

The Intel® Skylake™ U Chipset is a single-chip with proven reliability and performance.

- Support one mini PCI Express slot
- Integrated one SATA 6Gb/s Host Controller
- Four USB 2.0 ports supported
- Four USB 3.0 ports supported

Memory

- Supports DDR4 2133 MHz on board RAM
- Onboard memory design
- Maximum memory size up to 4 GB

Audio

- 5.1+2 Channel High Definition Audio Codec
- Meets Microsoft Windows Logo Program and Lync audio requirements
- All DACs supports 44.1k/48k/96k/192kHz sample rate
- Software selectable 2.5V/3.2V/4.0V VREFOUT
- Direct Sound 3D™ compatible
- Power Support: Digital: 3.3V; Analog: 5.0V

LAN

The onboard LAN provides the following features:

- Supports Wake up on LAN function, including from S3, S4, S5, G3->S5, power button off (non-ACPI OS)

Expansion Options

The motherboard comes with the following expansion options:

- One Mini PCI Express slot
- Two M.2 slots
- One Serial ATA 6Gb/s connector

Integrated I/O

The motherboard has a full set of I/O ports and connectors:

- One DC_IN port
- Two Ethernet LAN connectors
- Four USB 3.0 ports
- One Serial port (COM1)
- One VGA port
- One Audio jack

BIOS Firmware

This motherboard uses AMI BIOS that enables users to configure many system features including the following:

- Power management
- Wake-up alarms
- CPU parameters
- CPU and memory timing
- Graphic parameters

The firmware can also be used to set parameters for different processor clock speeds.

1. Some hardware specifications and software items are subject to change without prior notice.

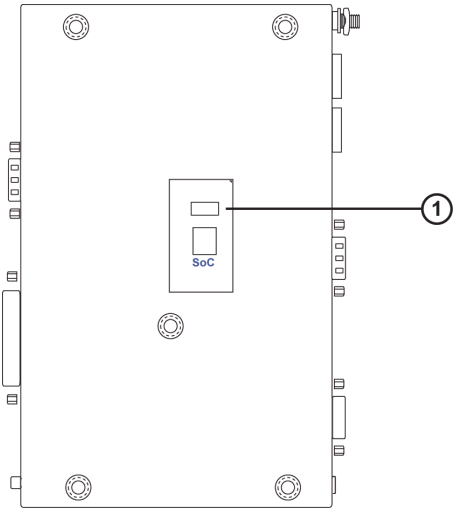
2. Due to chipset limitation, we recommend that motherboard be operated in the ambiance between 0 and 50 ° C.

Specifications

Description	
CPU	
CPU/SoC	Intel® SkyLake™ U SOC
Super I/O	
Super I/O	IT8786E-I-CX
PCB Dimension	
Dimension	185mm*115mm
System Dimension	
Dimension	209.8*120*38.2mm
MEMORY	
Onboard	Support DDR4 2133
Socket numbers / type	N/A
MEM size	Max 8GB
STORAGE	
M.2 SSD	1 x M.2 2242, - PCIE and SATA interface - SSD support
SATA 6GB/s	1 x SATA connector, for 2.5" / HDD(customized by customer)
Additional Feature	
Mini PCIe Slot	1 x Full size, - PCIE/SATA/USB interface - LTE/3G/4G, Wifi/BT,mSATA support
SIM Slot	1 x Micro SIM slot
Chip	
AUDIO chip	Realtek ALC269Q-VC3-GR
LAN chip	Intel I211*2
Front Port I/O	
PS/2	1 x Combo Port (KB & MS)
HDMI	1 (HDMI 1.4)
USB 2.0	2
COM	3x DB9 (For COM2~COM4)
Power Button	1
Reset Button	1
Power LED	1
HDD LED	1
Rear I/O	
Audio	1 (Only support Audio out)
VGA	1x (Support by Chrontel CH7517A-BFI)
USB 3.0	4x USB 3.0
COM	1x DB9 (For COM1)
LAN	2x LAN Port
INTERNAL I/O CONNECTORS & HEADERS	
ATX 12V Power Connector	2*2 Pin connector
Battery Type	Header(1*2 Pin) with Battery
CPU FAN Pin Header	3*1 Pin header
Clear CMOS Pin Header	3*1 Pin header(with jumper)
ME Disable Pin Header	3*1 Pin header(with jumper)
Buzzer	Onboard Buzzer
SATA Power Connector	5*1 Pin Housing Header

Micro SIM Socket	1
Watchdog Timer	1
LVDS Header Connector	1 (40pins)
USB2.0 Pin Header	5*2 Pin Header
Power On Pin Header	2*1 Pin header
DIO Switch Jumper	3*8 Pin header(with 2*1 Jumper)
Power LED	1
Reset Button	1
AT/ATX Mode Pin Header	3*1 Pin header(with Jumper)
USB3.0 Power Pin Header	2*2 Pin header(with Jumper)
USB2.0 Power Pin Header	2*2 Pin header(with Jumper)
Power On Button(W/LED)	1
HDD LED	2
Environment	
Humidity requirement-Upper Limit(%)	90%
Temperature requirement-Upper Limit(℃)	Operating:mainboard 60°C
Temperature requirement-Lower Limit(℃)	Operating:mainboard 0°C
SYSTEM	
OS	Windows 10/Win7 (Driver Ready)
BIOS	64Mb SPI ROM
Description	
Adapter	FSP060-DIBAN2

Motherboard Components



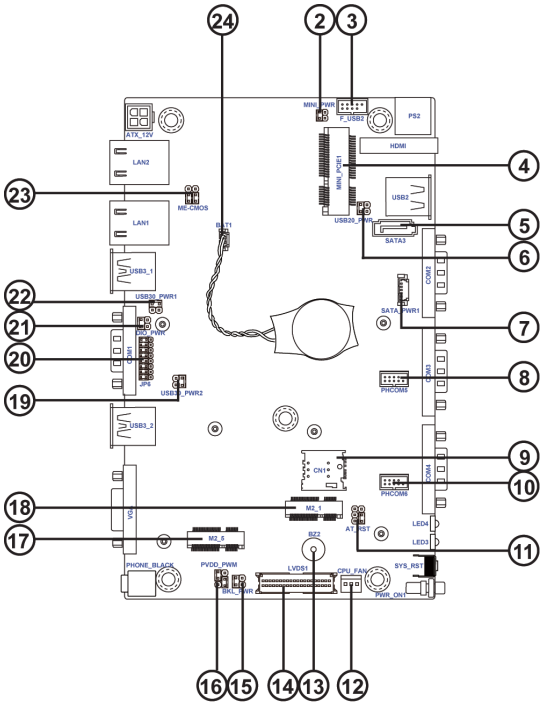


Table of Motherboard Components

LABEL	COMPONENTS
1. SoC	Intel® Skylake™ U SoC
2. MINI_PWR	Mini PCIe Source jumper
3. F_USB2	2*5 pin 2mm USB 2.0 header (2 ports)
4. MINI_PCIE1	Mini PCI Express slot (supports PCIe, mSATA, USB 2.0)
5. SATA3	Serial ATA 6Gb/s connector
6. USB20_PWR	USB 2.0 Power Source jumper
7. SATA_PWR1	SATA power connector
8. PHCOM5	2 * 5 pin 2 mm COM port header
9. CN1	Micro SIM Card slot
10. PHCOM6	2 * 5 pin 2 mm COM port header
11. AT_RST	AX/ATX Mode jumper
12. CPU_FAN	CPU cooling fan connector
13. BZ2	Buzzer
14. LVDS1	LVDS header connector
15. BKL_PWR	Backlight Power Source jumper
16. PVDD_PWM	Panel Power Source jumper and PWM/DC Mode jumper
17. M.2_5	M.2 slot (2242 for storage)
18. M.2_1	M.2 slot (2230 for BT/WiFi)
19. USB30_PWR2	USB 3.0 Power Source jumper
20. JP6	GPIO header
21. DIO_PWR	DIO Power Source jumper
22. USB30_PWR1	USB 3.0 Power Source jumper
23. ME-CMOS	Clear CMOS jumper & ME Disable/Enable jumper
24. BAT1	Battery connector

This concludes Chapter 1. The next chapter explains how to install the motherboard.

Memo

Chapter 2
Installing the Motherboard

Safety Precautions

- Follow these safety precautions when installing the motherboard
- Wear a grounding strap attached to a grounded device to avoid damage from static electricity
- Discharge static electricity by touching the metal case of a safely grounded object before working on the motherboard
- Leave components in the static-proof bags they came in
- Hold all circuit boards by the edges. Do not bend circuit boards

Choosing a Computer Case

There are many types of computer cases on the market. The motherboard complies with the specifications for 185 x 115mm system case. Some features on the motherboard are implemented by cabling connectors on the motherboard to indicators and switches on the system case. Make sure that your case supports all the features required.

Most cases have a choice of I/O templates in the rear panel. Make sure that the I/O template in the case matches the I/O ports installed on the rear edge of the motherboard.

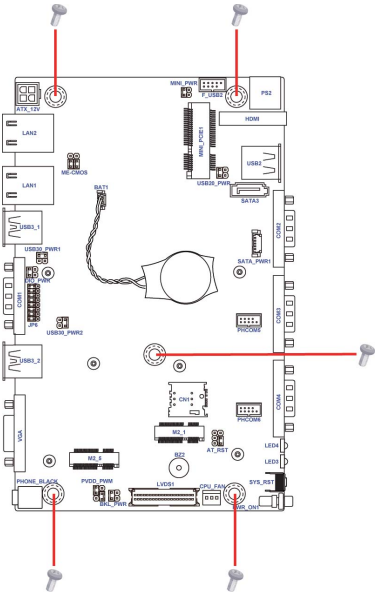
This motherboard carries a form factor of 185 x 115mm. Choose a case that accommodates this form factor.

Installing the Motherboard in a Case

Refer to the following illustration and instructions for installing the motherboard in a case.

Most system cases have mounting brackets installed in the case, which correspond the holes in the motherboard. Place the motherboard over the mounting brackets and secure the motherboard onto the mounting brackets with screws.

Ensure that your case has an I/O template that supports the I/O ports and expansion slots on your motherboard.



Do not over-tighten the screws as this can stress the motherboard.

Checking Jumper Settings

This section explains how to set jumpers for correct configuration of the motherboard.

Setting Jumpers

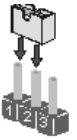
Use the motherboard jumpers to set system configuration options. Jumpers with more than one pin are numbered. When setting the jumpers, ensure that the jumper caps are placed on the correct pins.

The illustrations show a 2-pin jumper. When the jumper cap is placed on both pins, the jumper is SHORT. If you remove the jumper cap, or place the jumper cap on just one pin, the jumper is OPEN.

SHORT

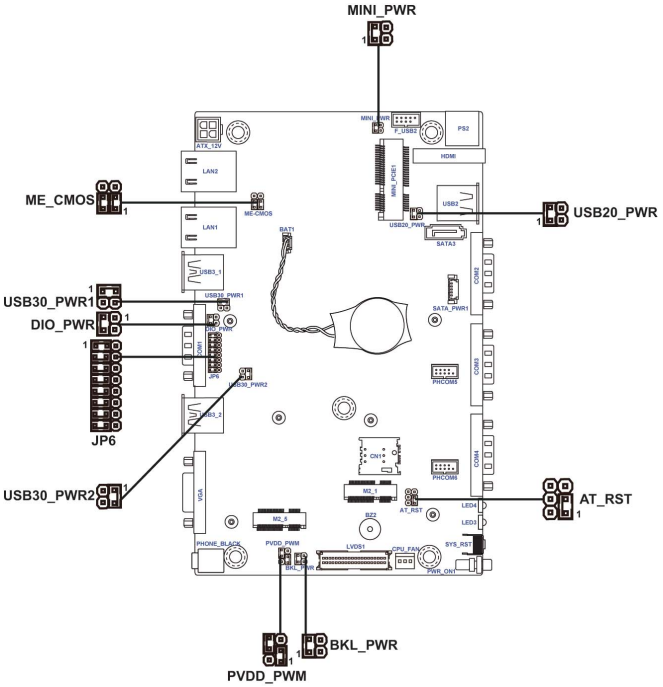
OPEN

This illustration shows a 3-pin jumper. Pins 1 and 2 are SHORT.

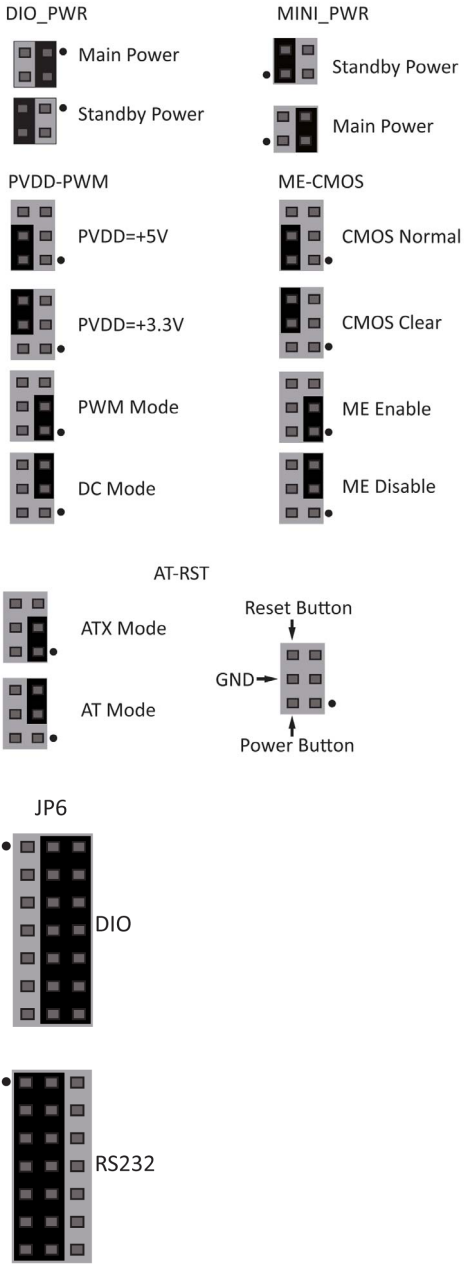


Checking Jumper Settings

The following illustration shows the location of the motherboard jumpers. Pin 1 is labeled.



Jumper Settings

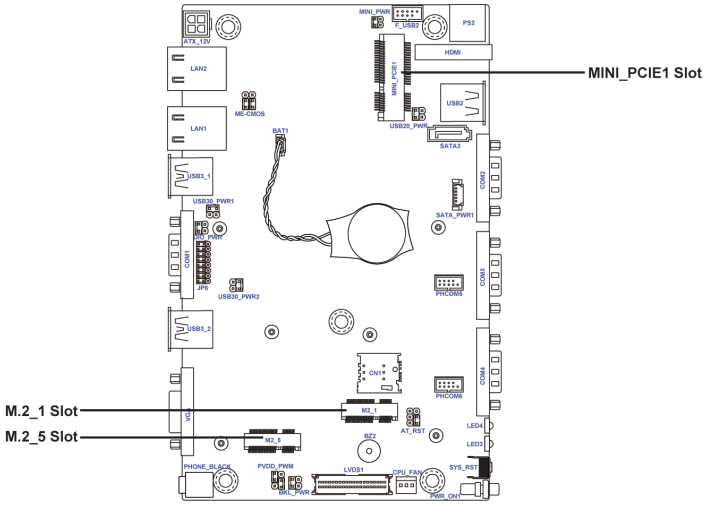

DIO_PWR
Main Power
Standby Power
MINI_PWR
Standby Power
Main Power
PVDD-PWM
PVDD=+5V
PVDD=+3.3V
PWM Mode
DC Mode
ME-CMOS
CMOS Normal
CMOS Clear
ME Enable
ME Disable
AT-RST
ATX Mode
AT Mode
Reset Button
GND
Power Button
JP6
DIO
RS232

Installing Hardware

Expansion Slots

Installing Add-on Cards

The slots on this motherboard are designed to hold expansion cards and connect them to the system bus. Expansion slots are a means of adding or enhancing the motherboard's features and capabilities. With these efficient facilities, you can increase the motherboard's capabilities by adding hardware that performs tasks that are not part of the basic system.



MINI_PCIE1 Slot You can install a mSATA card/USB 2.0 card into this slot.

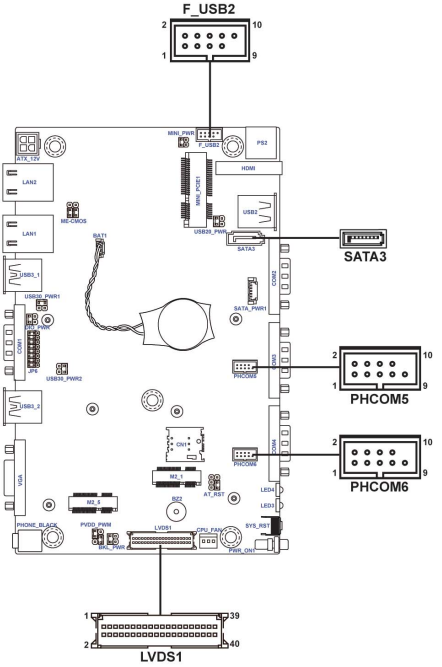
M.2_1 Slot This is 2230 E Key slot.

M.2_5 Slot This is 2242 B Key slot.

Before installing an add-on card, check the documentation for the card carefully. If the card is not Plug and Play, you may have to manually configure the card before installation.

Connecting Optional Devices

Refer to the following for information on connecting the motherboard's optional devices:



SATA3: Serial ATA Connector

SATA3 connector is used to support the Serial ATA 6Gb/s devices, simpler disk drive cabling and easier PC assembly.

Pin	Signal Name	Pin	Signal Name
1	Ground	2	TX+
3	TX-	4	Ground
5	RX-	6	RX+
7	Ground	-	-

F_USB2: Front Panel USB 2.0 Header

The onboard 5*2-pin F_USB2 header supports two USB 2.0 ports. Additionally, some computer cases have USB 2.0 ports at the front of the case. If you have this kind of case, use auxiliary USB 2.0 connector to connect the front-mounted ports to the motherboard.

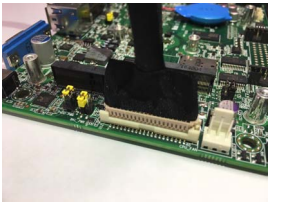
Pin	USB1	USB2	Color
1	VBUS	N/A	Red
2	N/A	VBUS	Red
3	D-	N/A	White
4	N/A	D-	White
5	D+	N/A	Green
6	N/A	D+	Green
7	GND	N/A	Black
8	N/A	GND	Black
9	Block	Block	N/A
10	Block	Block	N/A

Please make sure that the USB cable has the same pin assignment as indicated above. A different pin assignment may cause damage or system hang-up.

LVDS1: LVDS Header Connector

Pin	Signal Name	Pin	Signal Name
1	BackLigh Power	2	Panel Power
3	BackLigh Power	4	PWM
5	GND	6	GND
7	ODD0-	8	EVEN0-
9	ODD0+	10	EVEN0+
11	GND	12	GND
13	ODD1-	14	EVEN1-
15	ODD1+	16	EVEN1+
17	GND	18	GND
19	ODD2-	20	EVEN2-
21	ODD2+	22	EVEN2+
23	GND	24	GND
25	ODDCLK-	26	EVENCLK-
27	ODDCLK+	28	EVENCLK+
29	GND	30	GND
31	EDID SCL	32	EDID SDA
33	GND	34	GND
35	ODD3-	36	EVEN3-
37	ODD3+	38	EVEN3+
39	BackLigh Enable	40	3.3V

LVDS cable



Connect LVDS device

PHCOM5~6: 2 *5 pin 2 mm COM Port headers

Pin	Define	Pin	Define
1	DCD	6	DSR
2	SIN	7	RTS
3	SOUT	8	CTS
4	DTR	9	RI
5	GND	10	Block

Installing a SATA Hard Drive

This section describes how to install a SATA Hard Drive.

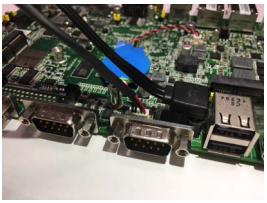
About SATA Connectors

Your motherboard features one SATA connector supporting a total of one drive. SATA refers to Serial ATA (Advanced Technology Attachment) is the standard interface for the IDE hard drives which are currently used in most PCs. These connectors are well designed and will only fit in one orientation. Locate the SATA connectors on the motherboard and follow the illustration below to install the SATA hard drives.

Installing Serial ATA Hard Drives

To install the Serial ATA (SATA) hard drives, use the SATA cable that supports the Serial ATA protocol. This SATA cable comes with a SATA power cable. You can connect the small end of the SATA cable to the SATA hard drive.

SATA cable (optional)



SATA power cable (optional)

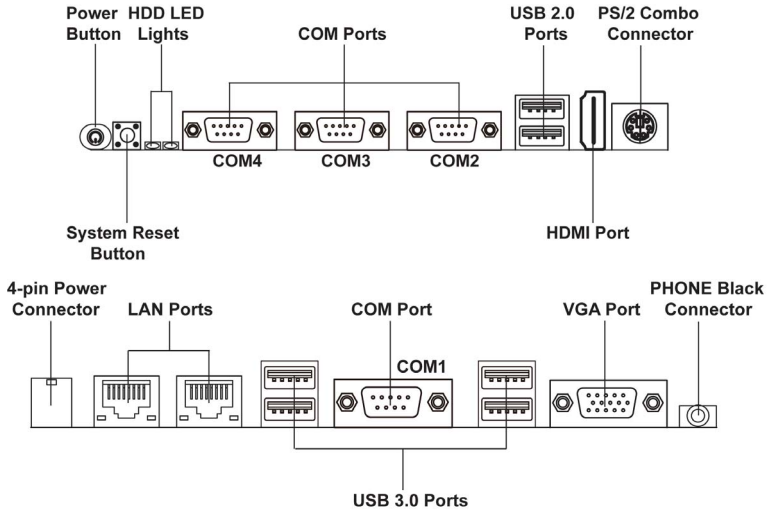
Refer to the illustration below for proper installation:

1 Attach either cable end to the connector on the motherboard.
2 Attach the other cable end to the SATA hard drive.
3 Attach the SATA power cable to the SATA hard drive and connect the other end to the power supply.

This motherboard supports the "Hot-Plug" function.

Connecting I/O Devices

The backplane of the motherboard has the following I/O ports:



Power Button Press this button to turn on/off the system.

System Reset Button Press this button to reset the system.

HDD LED Lights This is HDD LED lights.

Serial Ports (COM1~4) Use the COM port to connect the serial devices such as mice or fax/modems.

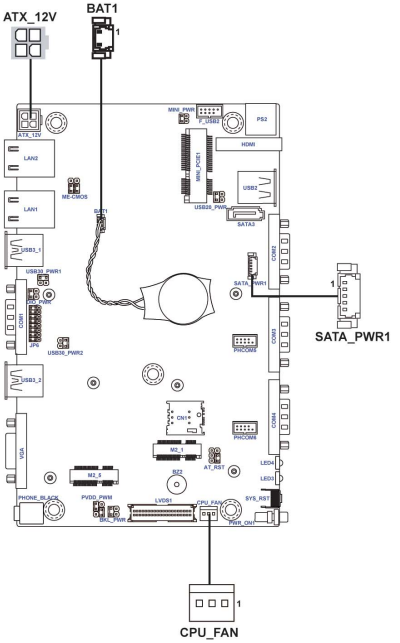
Pin	Define(RS232)	Define(RS422)	Define(RS485)
1	DCD	TX+	Data+
2	SIN	TX-	Data-
3	SOUT	RX+	
4	DTR	RX-	
5	GND		
6	DSR		
7	RTS		
8	CTS		
9	RI		
10	-		

USB 2.0 Ports	Use the USB 2.0 ports to connect USB 2.0 devices.
HDMI Port	Use the HDMI port to connect the HDMI device.
PS/2 Connector	Connect the Keyboard or Mouse to this connector.
4-pin Power Connector	Connect the auxiliary case power supply connector to this connector.
LAN Ports	Connect an RJ-45 jack to the LAN port to connect your computer to the Network.
USB 3.0 Ports	Use the USB 3.0 ports to connect USB 3.0 devices.
VGA Port	Connect your monitor to the VGA port.
PHONE Black Connector	This is phone black connector.

Connecting Case Components

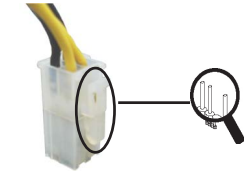
After you have installed the motherboard into a case, you can begin connecting the motherboard components. Refer to the following:

1 Connect the CPU cooling fan cable to **CPU_FAN**.
2 Connect the SATA power supply connector to **SATA_PWR1**.
3 Connect the auxiliary case power supply connector to **ATX_12V**.
4 Connect the Battery cable to **BAT1**.



Connecting 4-pin power cable

The ATX_12V power connector is used to provide power to the CPU.



4-pin power cable

When installing 4-pin power cable, the latches of power cable and the ATX_12V match perfectly.

CPU_FAN: CPU Cooling FAN Connector

Pin	Signal Name	Function
1	GND	System Ground
2	+12V	Power +12V
3	Sense	Sensor

Users please note that the fan connector supports the CPU cooling fan of 1.1A ~ 2.2A (26.4W max) at +12V.

ATX_12V: ATX 12V Power Connector

Pin	Signal Name
1	Ground
2	Ground
3	+12V
4	+12V

SATA_PWR1: Serial ATA Power Connector

Pin	Define	Color
1	+VCC	Red
2	+VCC	Red
3	+VCC3	Red
4	GND	Black
5	GND	Black

BAT1: Battery Connector

Pin	Signal Name
1	Power
2	Ground

This concludes Chapter 2. The next chapter covers the BIOS.