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Embedded & Industrial Computing

Hardware Platforms for Embedded and Industrial Computing

LEC-7230-CT1 V1.0

User's Manual

Release date: 2016/11/28

Overview

Icon Descriptions

The icons are used in the manual to serve as an indication of interest topics or important messages. Below is a description of these icons:

NOTE: This check mark indicates that there is a note of interest and is something that you should pay special attention to while using the product.

WARNING: This exclamation point indicates that there is a caution or warning and it is something that could damage your property or product.

Online Resources

The listed websites are links to the on-line product information and technical support.

Resource	Website
Lanner	http://www.lannerinc.com
Product Resources	http://www.lannerinc.com/download-center/
RMA	http://eRMA.lannerinc.com

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Compliances and Certification

CE Certification

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A Certification

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.

Revision History

Version	Date	Revision
1.0	2014/12/30	Official release

EMC Notice

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 users will be required to correct the interference at their own expense.

Safety Guidelines

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free before, during and after installation.
- Do not wear loose clothing or jewelry that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses/goggles if you are working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Disconnect all power by turning off the power and unplugging the power cord before installing or removing a chassis or working near power supplies
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit; always check the circuit.

LITHIUM BATTERY CAUTION:

Risk of explosion could occur if battery is replaced by an incorrect type. Please dispose of used batteries according to the recycling instructions of your country.

- Installation only by a trained electrician or only by an electrically trained person who knows all the applied or related installation and device specifications..
- Do not carry the handle of power supplies when moving to other place.
- The machine can only be used in a fixed location such as labs or computer facilities.

Operating Safety

- Electrical equipment generates heat. Ambient air temperature may not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Be sure that the room in which you choose to operate your system has adequate air circulation.
- Ensure that the chassis cover is secure. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. Be sure to follow ESD-prevention procedures when removing and replacing components to avoid these problems.

- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. If no wrist strap is available, ground yourself by touching the metal part of the chassis.
- Periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

Rack Mounting Installation Environment Precaution

1. Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
2. Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not created due to uneven mechanical loading.
3. Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
4. Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on over-current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
5. Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips)."

Chapter 1: Introduction 5

System Specifications 5
Package Contents 6
Standard Accessories 6
Optional Power Cords 6
Optional Mounting Kit 6
Optional Accessories 6

Chapter 2: System Components 7

System Drawing 7
Block Diagram 8
Front Components 9
Rear Components 10

Chapter 3: Board Layout 11

External Connectors 11
Internal Connectors and Jumpers 12
Add-on Card 13
Connectors and Jumpers List 14
Jumper and Connectors 15

Chapter 4: Hardware Setup 18

Preparing the Hardware Installation 18
Installing the System Memory 18
Installing the Wireless Module 19
Installing the 3G SIM Card 19
Installing the Hard Disk 19

Appendix A: Programming Watchdog Timer 20

Chapter 1: Introduction

Thank you for choosing Lanner LEC-7230-CT1. The LEC-7230-CT1 is a fanless and robust embedded box PC system utilizing the Intell® Bay Trail CPU J1900 with improved graphical and media performance, including supports for USB 3.0, low-powered DDR3L and VGA/HDMI display. The system is ideal for efficient imaging workflows, digital signage with secure content delivery, visual appealing interactive clients (interactive kiosks, intelligent vending, ATM and point-of-sale(POS) terminals) and industrial control systems.

The following highlight the features of the LEC-7230-CT1 system:

- Dual HDMI and VGA video output powered by Intel® HD Graphics
- Dual 10/100/1000 Mbps LAN ports
- 6 USB ports (3 from add-on board)
- Support 2.5" SATA HDD/SSD storage
- Two RS-232/422/485 serial COM ports supporting hardware control via DB9 connectors
- Audio input and output through Mic-in and Line-out jack
- Fanless design
- Integrated SIM card reader
- Dustproof
- Wide operating temperature from -20-55°C

System Specifications

Processor Options		Intel® Bay Trail Celeron® Processor J1900 4C (2M Cache, up to 2.42 GHz) 10W
Chipset		None
BIOS		AMI SPI Flash BIOS
System Memory	Sockets	1 x SO-DIMM socket for up to 1066/1333 4GB DDR3L SDRAM
USB		1 x USB 3.0 port 2 x USB 2.0 Type-A ports 3 x USB 2.0 ports from add-on board
Super I/O		1x LPC Super I/O Fintek F81865F
Expansion Bus		Mini-PCIe x 1, with SIM card reader
OS Support		Microsoft Embedded Windows 8 Standard, Ubuntu LTS 12.04
Storage	HDD/SSD Support	1 x 2.5" HDD/SSD drive bay
Networking	LAN	2 x 10/100/1000Mbps, Autosensing,RJ-45
	Controller	Intel i210 x 2
Display	Graphics Controller	Intel® Integrated Graphics Media Accelerator
	Display Interface	VGA x 1 (1600x1200@60 24bpp), HDMI x1 (1920x1080)
	Video Decode Acceleration	MPEG2, H.264, MVC, VC-1/WMV9 @1080p, VP8
	Video Encode Acceleration	MPEG2, H.264 @ 1080p
Audio	Codec	Audio Codec ALC-886 HD Audio, Low Power Audio
	Output	1x green phone-jack connector for audio line-out 1x pink phone-jack connector for audio mic-in
LEDs		Power, HDD active, 3G active (if 3G mini-card inserted)
Physical Characteristics	Housing	Aluminum
	Dimensions (WxHxD)	198.0 x 144.8 x 48.0, unit: mm
	Mounting Options	Rack, VESA, DIN-rail and Wall mount
Environment	Operating Temperature	-20~55°C (PCBA needs thermal solution on heat-sink or cased design;)
	Ambient Relative Humidity (non-condensing)	5 to 95% (non-condensing)
Power	Input Voltage	+12 V +/- 5% DC
	Connector	DC jack with lock
	AC Adapter	
Standard and Regulation	EMC	CE/FCC
	Green product	RoHS
Reliability	Alter tool	Built-in buzzer and RTC (real-time clock) with battery lithium backup
	Automatic Reboot Trigger	Watchdog Timer 256 level time interval system reset, software programmable

Package Contents

Your package contains the following items:

- LEC-7230-CT1 Fanless Embedded System
- Power adapter : 0P0W060122002
- Drivers and User's Manual CD : S09OADA92H100

Standard Accessories

0P0W060122002	AC power adapter

Optional Power Cords

080W240318306	US Power Cord
080W240318305	Schuko (EU) Power Cord
080W240318301	UK Power Cord
080W240318307	China Power Cord
080W240318309	Japan Power Cord

Optional Mounting Kit

SE9ESA900R100	Wall Mount 4
PE9ESA8300100	VESA Mount
SE9ESA8310100	Rack Mount
090W405000001	DIN Rail Mount

Optional Accessories

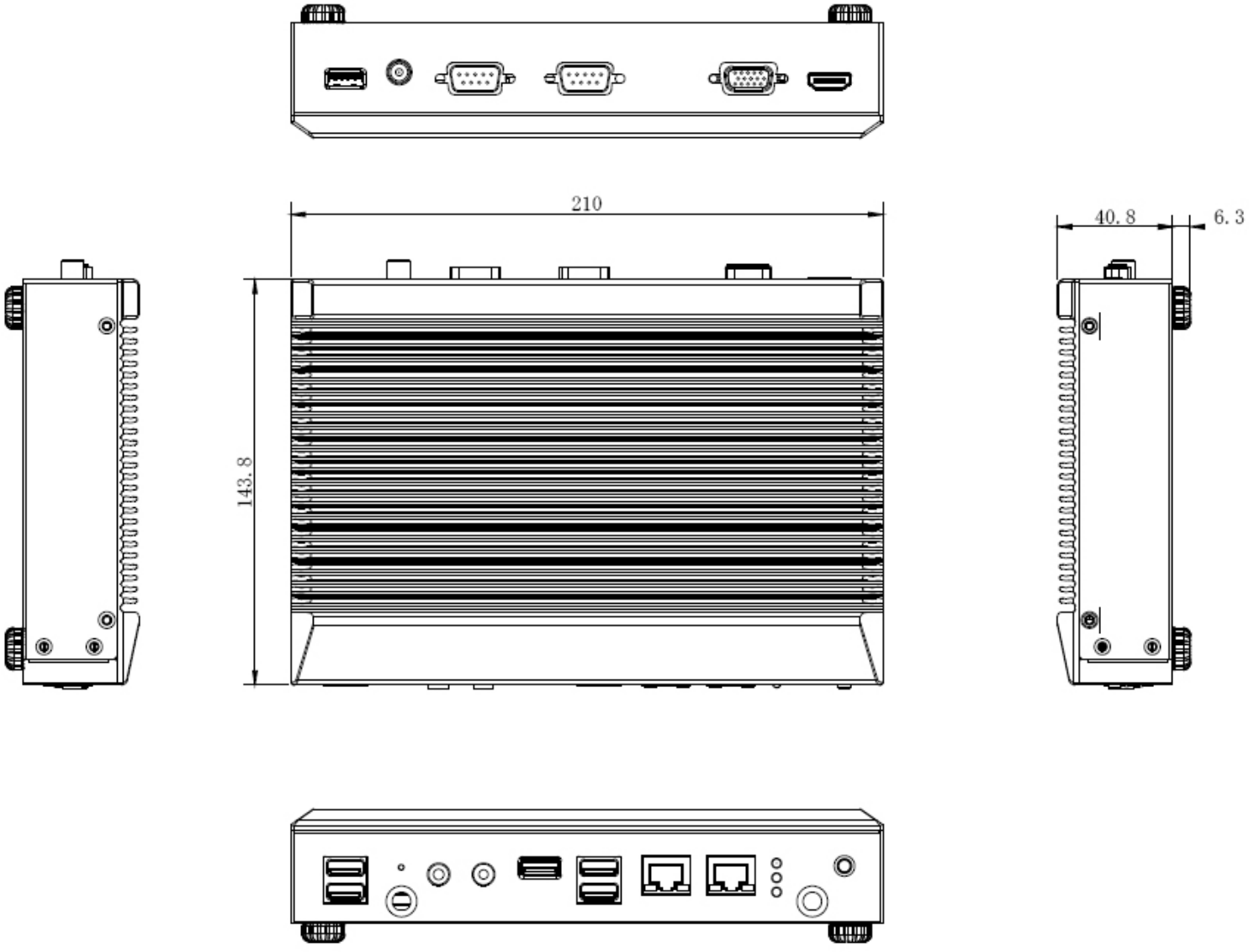
0TAWMC8090Z01	3G card	Green MC8090 PCI EXPRESS MINI CARD 3G MODULES SIERRA
0TAWWPER11Z01	WiFi card	Green WPER-116GN 802.11bgn Mini PCIe module with HMCE-101(Half-Mini-Card extender) SparkLAN
0TAWWPER12Z01	WiFi card	Green WPEA-121N 802.11abgn Mini PCIe module with HMCE-101(Half-Mini-Card extender) SparkLAN
080W1Q0001501	WiFi card	Internal Cable for Wifi
0TZW000000039	WiFi card	External Antenna for WiFi
080W0Q0001501	WiFi card	Internal Cable for 3G
0TZW000000072	WiFi card	External Antenna for 3G

Chapter 2:
System Components

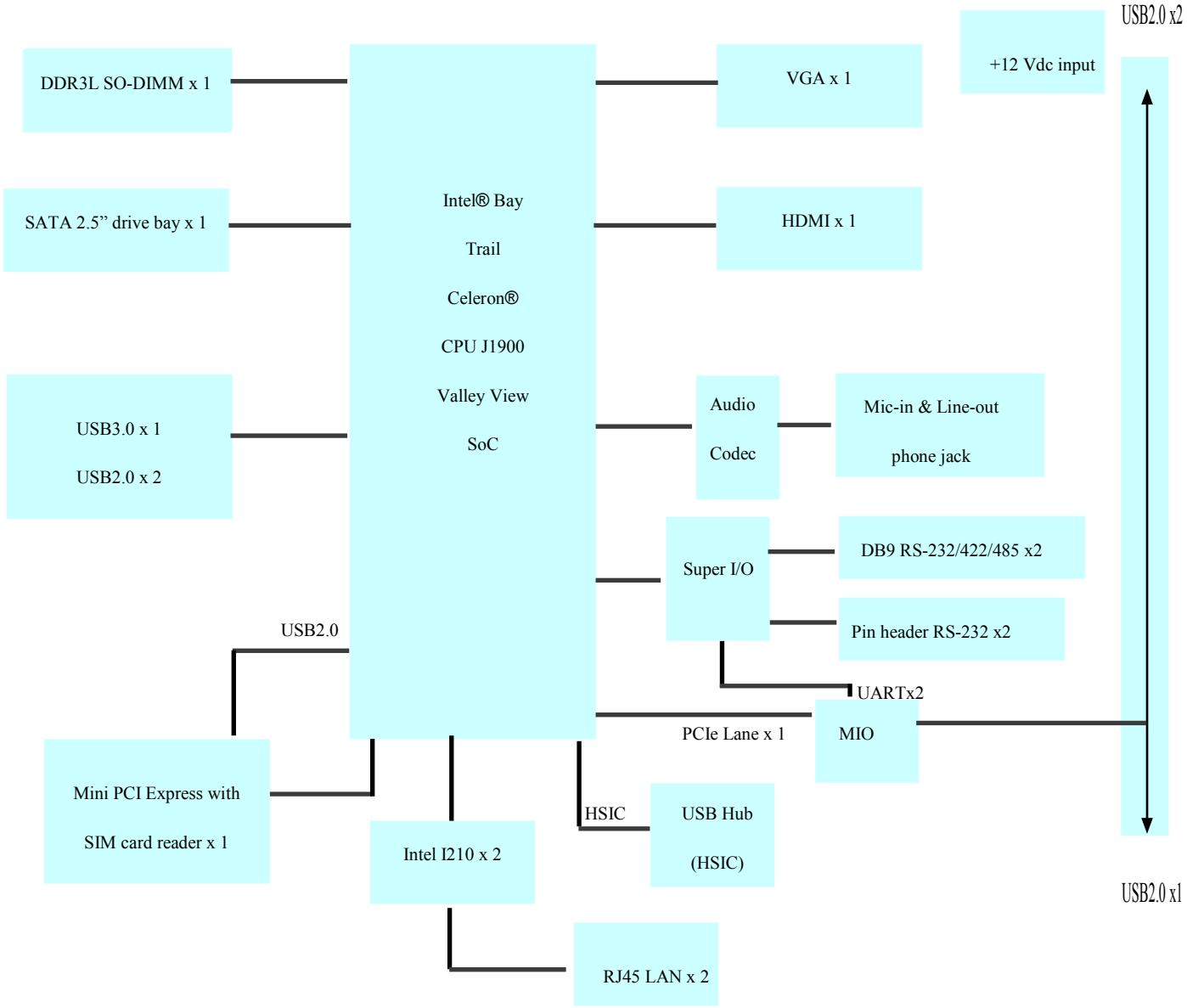
System Drawing

Mechanical dimensions of the LEC-7230-CT1

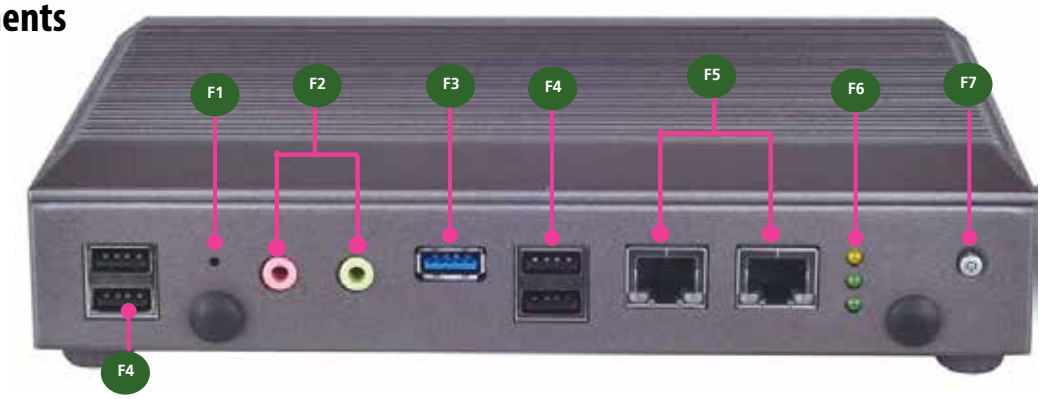
Unit: mm

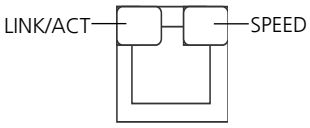


Block Diagram

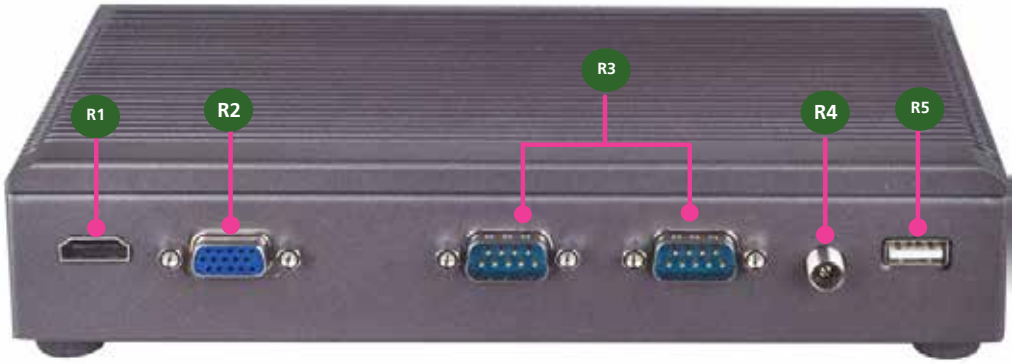


Front Components



Component	Description	Remarks
F1 Reset	Reset switch	
F2 MIC IN/LINE OUT	Connect the audio devices to these ports. The Microphone and line out port are provided by Realtek ALC 886-GR.	
F3 USB 3.0 Port	An USB 3.0 type A connector.	
F4 Four USB 2.0 Ports	Double-stacked USB 2.0 type A connectors Two additional USB 2.0 ports by LEK-IOA11. add-on board	Please refer to the USB pin definition on LEK-IOA11 for the 2 additional USB ports
F5 Two 10/100/1000Mbps LAN ports 	Two RJ-45 (network) jacks with LED indicators are as described below. LINK/ACT (Yellow) • On/Flashing: The port is linking and active in data transmission. • Off: The port is not linking. SPEED (Green/Yellow) • Yellow: The connection speed is 1000Mbps. • Green: The connection speed is 100Mbps • Off: The connection speed is 10Mbps.	
F6 HDD (Yellow) 3G Status (Green) and Power LED (Green)	HDD • Blinking: data access activities • Off: no data access activities 3G Status • Blinking: 3G transmission activities • On: 3G expansion card exists • Off: no 3G expansion card present Power • On: The computer is on. • Off: The computer is off .	
F7 Power Button with dual LED	ATX Power-on button with LEDs: Standby mode in Red; Power-on mode in Green	

Rear Components



Component	Description	Remarks
R1 HDMI	The HDMI (High-Definition Multimedia Interface). This port can support up to 1920x1080 resolution.	
R2 VGA Port	The displays can support VGA up to 1600x1200 resolution.	
R3 Serial COM Ports	The serial COM ports are in DB-9 connector type with signals RS232/422/485 configured with automatic hardware flow control D-SUB connector that manages the connection of serial peripherals. To switch among RS232/422/485, use the BIOS menu.	
R4 Power Adapter Socket	DC-in 12V. Only use the power adapter supplied with the LEC-7230-CT1 System	
R5 USB	Additional USB2.0 port by the LEK-IOA11 add-on board	

WARNING: Improper installation can cause injury or property damage.

For proper and safe operation use in field site with AC Power, please follow these instructions:

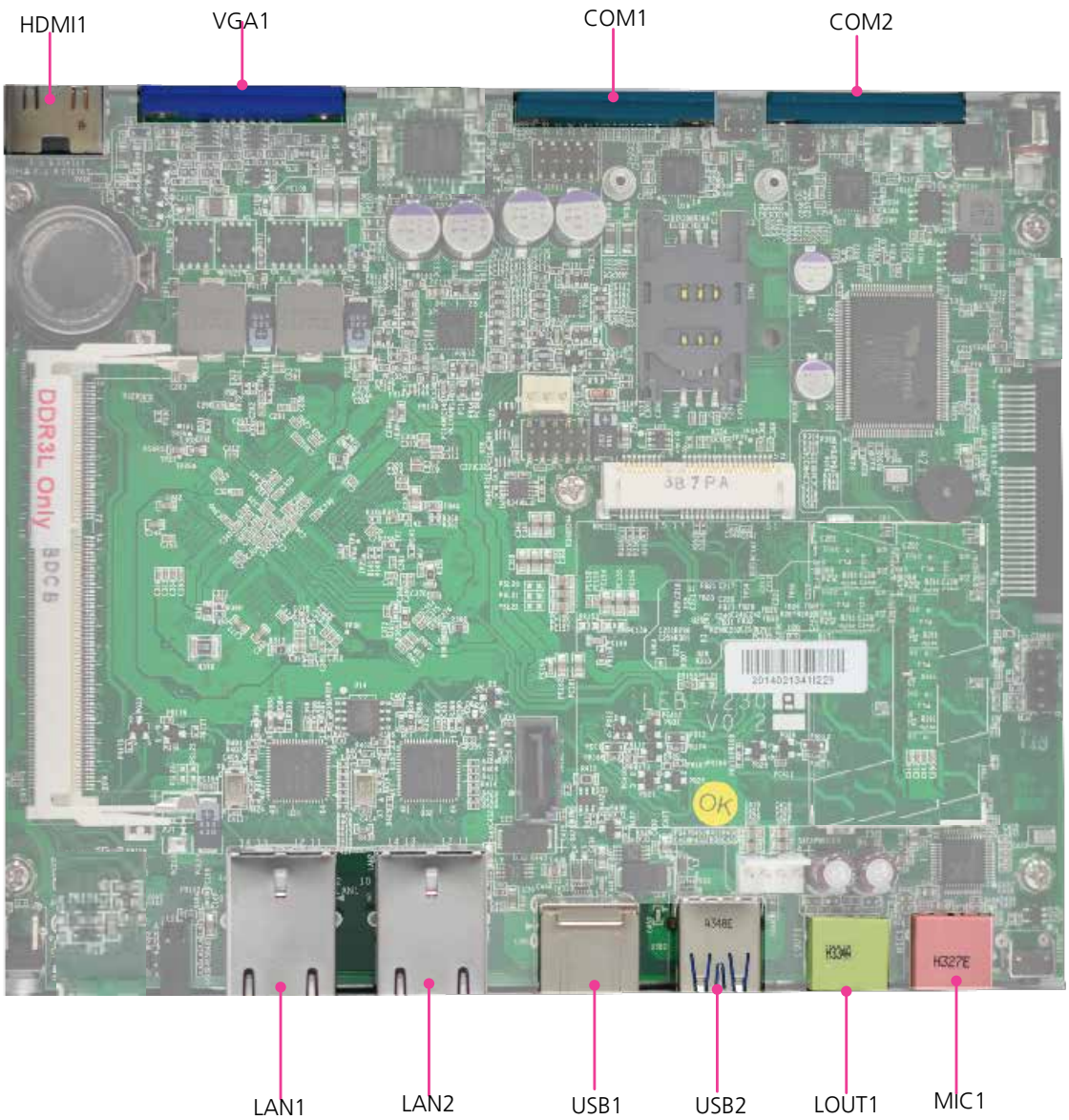
1. Securely plugged and locked the DC-Jack to the machine

2. Connect the AC adapter power cord into a standard 110v/220v AC outlet

Chapter 3:
Board Layout

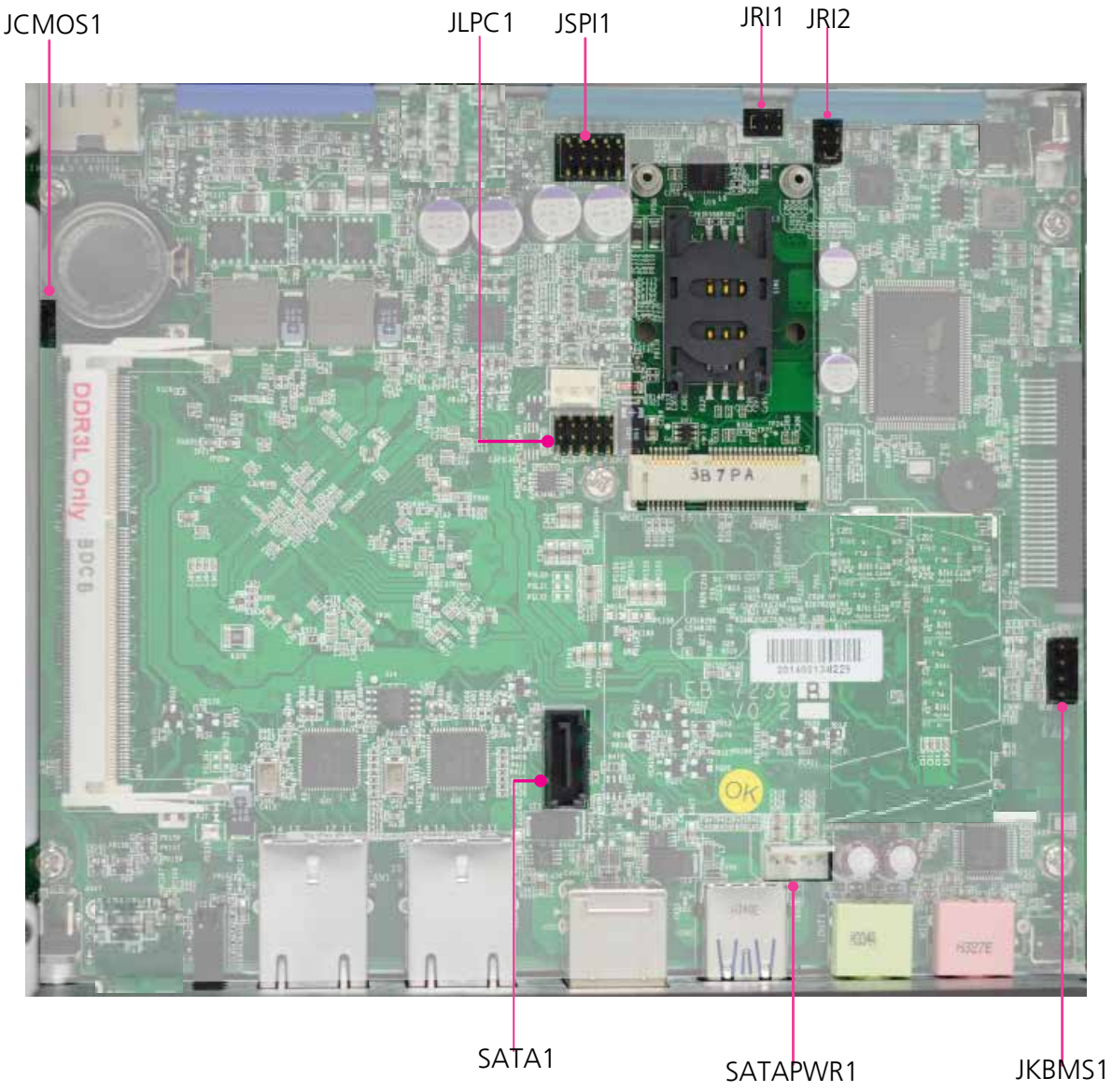
External Connectors

The following picture highlights the location of the external ports. Refer to the table 3.1 Connector List for more details.



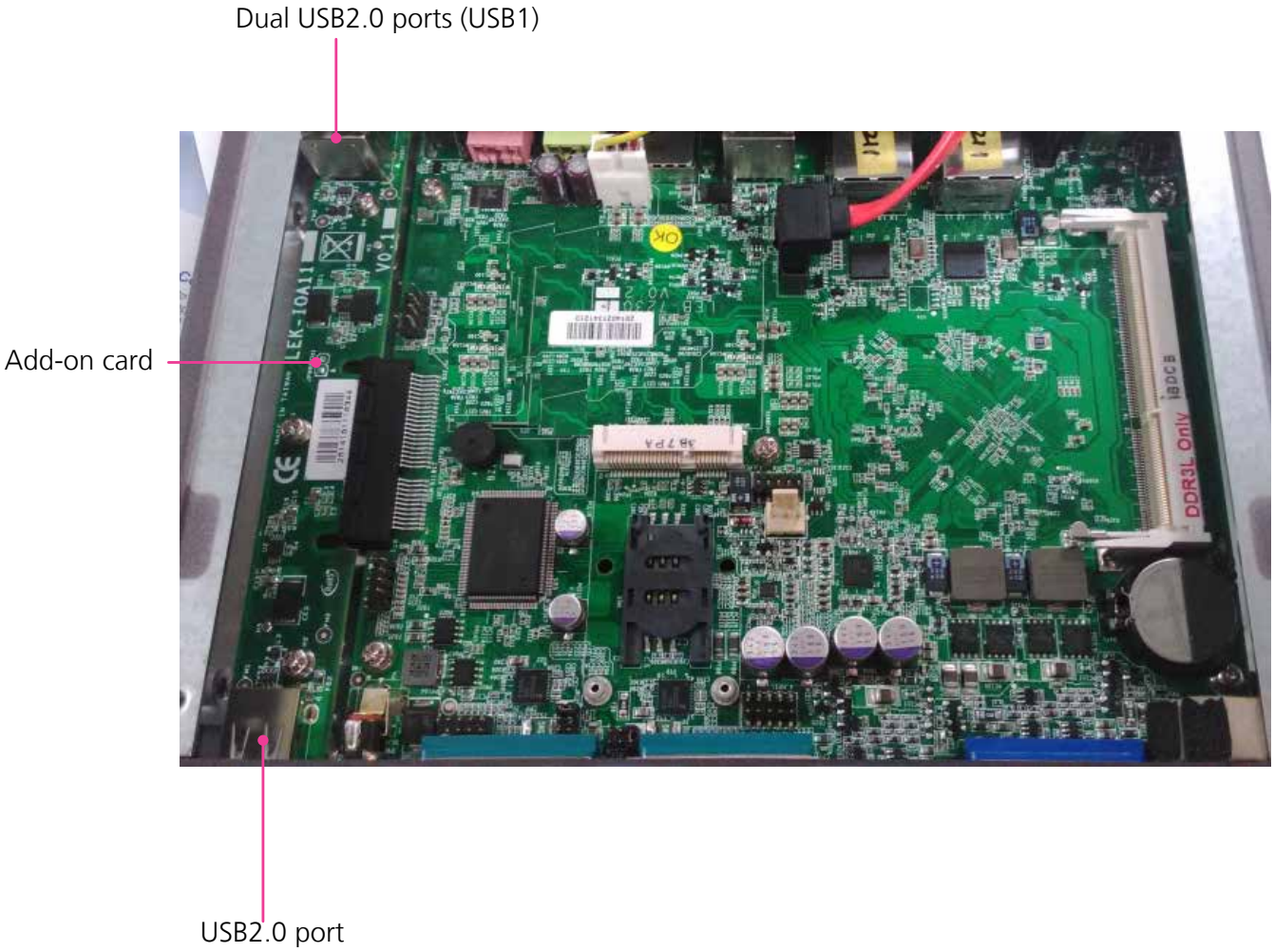
Internal Connectors and Jumpers

The following picture highlights the location of internal connectors and jumpers. Refer to the table 3.1 Connector List for more details.



Add-on Card

The add-on card (LEK-IOA11), enabled by MIO, provides 3 additional USB2.0 ports for LEC-7230-CT1.



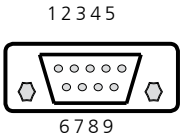
Connectors and Jumpers List

The tables below list the function of each of the board jumpers and connectors by labels shown in the above section. The next section in this chapter gives pin definitions and instructions on setting jumpers.

Table 3.1 Connector List for **LEB-7230-CT1** Board	
Labels	**Function**
COM1/COM2	RS232 Serial Ports COM1 and COM2
HDMI1	High-Definition Multimedia Interface Port
JCMOS1	Clear CMOS Jumper
JKBMS1	PS/2 Keyboard & Mouse Connector
JLPC1	Low-pin Count Interface
JRI1/2	COM1/COM2 Pin 9 Signal Selection
JSPI1	SPI ROM Interface (for debug use only)
MPCIE1	Mini-PCIe Connectors (with SIM1)
SATA1	Serial-ATA Connector (SATA1)
SATAPWR1	SATA HDD Power Connector
SIM1	SIM Card Reader
USB1	USB 2.0 Type A Dual Port
USB2	USB 3.0 Type A Port
VGA1	VGA Connector

Jumper and Connectors

RS-232/422/485 Serial Port (COM1 and COM2): It is an RS-232/422/485 port with automatic hardware flow control through a D-SUB9 connector.



Pin No.	Signal
	RS-232
1	Data Carrier Detect (DCD #)
2	Receive Data (RXD)
3	Transmit Data (TXD)
4	Data Terminal Ready (DTR #)
5	Ground (GND)
6	Data Set Ready (DSR #)
7	Request To Send (RTS #)
8	Clear To Send (CTS #)
9	Ring Indicator (RI #)

Pin No.	Signal
	RS-422
1	TXD-
2	TXD+
3	RXD+
4	RXD-
5	GND

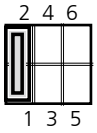
Pin No.	Signal
	RS-485
1	DATA-
2	DATA+
3	
4	
5	GND

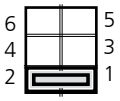
Note: To switch among RS-232, 422, 485 communication protocols, use the BIOS menu.

Select COM1/COM2 Pin 9 Function (JRI1/JRI2): The pin 9 of COM1 and COM2 can be altered by JRI1 and JRI2 respectively according to the following jumper settings.

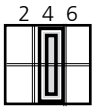
JRI1: COM1 **JRI2**: COM2

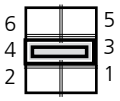
Default



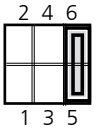


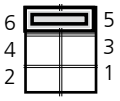
+5V





+12V



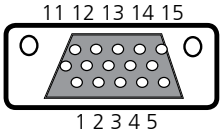


Jumper Setting / Function	SW1/SW4
RI# (default)	1-2
+5V	3-4
+12V	5-6

Clear CMOS jumper (JCMOS1): It is for clearing the CMOS settings.

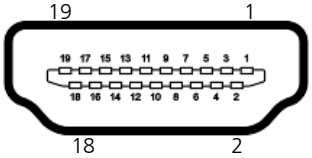
Pin No.	Signal
1-2	Normal (Default)
2-3	Clear CMOS

VGA (VGA1)



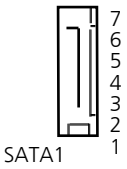
Pin	Signal	Pin	Signal	Pin	Signal
1	Red Color Signal	6	GND	11	NC
2	Green Color Signal	7	GND	12	DDC DATA
3	Blue Color Signal	8	GND	13	HSYNC
4	Reserved	9	+5V	14	VSYNC
5	GND	10	GND	15	DDC CLK

HDMI Connector (HDMI1): High-Definition Multimedia Interface Connector



Pin	Signal	Pin	Signal
1	DATA2+	2	GND
3	DATA2-	4	DATA1+
5	GND	6	DATA1-
7	DATA0+	8	GND
9	DATA0-	10	CLK+
11	GND	12	CLK-
13	N.C	14	N.C
15	DDC CLK	16	DDC DAT
17	GND	18	HDMI_VCC
19	HPD		

Serial-ATA Connector (SATA1): It is for connecting a 2.5" harddisk to serve as your system's storage. It can support SATA II which features Data transfer rates up to 3.0 Gb/s (300 MB/s).



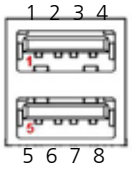
Pin No.	Signal
1	GND
2	TX0_P
3	TX0_N
4	GND
5	RX0_N
6	RX0_P
7	GND

4-pin Serial-ATA Power Connector (SATAPWR1): It is for connecting the SATA power cord.

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

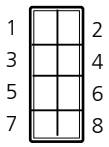
Dual USB 2.0 Port (USB1):

USB 3.0 Port (USB2)



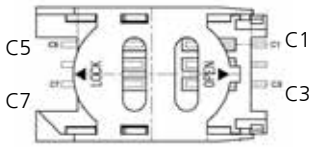
Pin No.	Signal
1	+5V
2	DATA-
3	DATA+
4	GND
5	SSRX-
6	SSRX+
7	GND
8	SSTX-
9	SSTX+

PS/2 Keyboard and Mouse Connector (JKBMS1)



Pin NO.	Description	Pin NO.	Description
1	VCC	2	MSCLK
3	MSDATA	4	KEY
5	KBDATA	6	KEY
7	GND	8	KBCLK

SIM Card Reader (SIM1)



Pin NO.	Signal	Pin NO.	Signal
C1	UIM_PWR	C5	GND
C2	UIM_RST#	C6	UIM_VPP
C3	UIM_CLK	C7	UIM_DATA

Mini PCI Express Connector (for 3G card with PCI Express 1X and USB 2.0 signals and a SIM card reader, MPCIE1):

PIN	Signal	PIN	Signal
1	WAKE#	2	+3.3Vaux
3	COEX1	4	GND
5	COEX2	6	+1.5V
7	CLKREQ#	8	UIM_PWR
9	GND	10	UIM_DATA
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_RESET
15	GND	16	UIM_VPP
Key			
17	RSVD	18	GND
19	RSVD	20	W_DISABLE#
21	GND	22	PERST#
23	PERn0	24	+3.3Vaux
25	PERp0	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PETn0	32	SMB_DATA
33	PETp0	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	+3.3Vaux	40	GND
41	+3.3Vaux	42	LED_WWAN#
43	GND	44	LED_WLAN#
45	RSVD	46	LED_WPAN#
47	RSVD	48	+1.5V
49	RSVD	50	GND
51	RSVD	52	+3.3Vaux

Chapter 4: Hardware Setup

Preparing the Hardware Installation

To access some components and perform certain service procedures, you must perform the following procedures first.

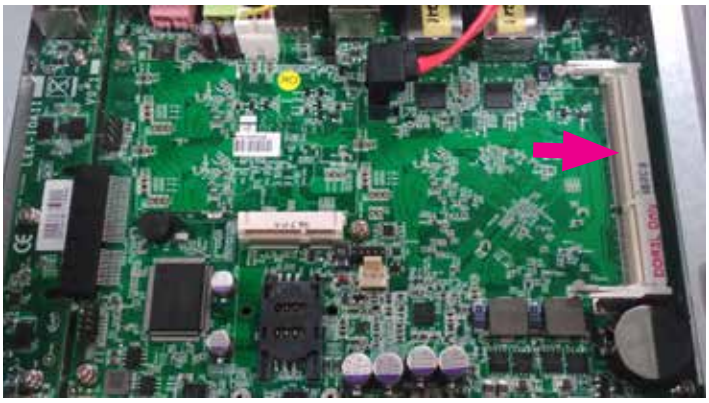
WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The power switch button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until power is removed.

1. Unpower the LEC-7230-CT1 and remove the power cord.
2. Turn the device upside down.
3. Unscrew the 4 rubber feet from the bottom cover.
4. Open the cover.

Installing the System Memory

The motherboard supports DDR3L memory to meet the higher bandwidth requirements of the latest operating system and Internet applications. It comes with one Low-Voltage Double Data Rate Three (DDR3L) Small Outline Dual Inline Memory Module (SO-DIMM) socket.

1. Align the memory module's key with the SO-DIMM socket's notch.
2. Install the SO-DIMM.

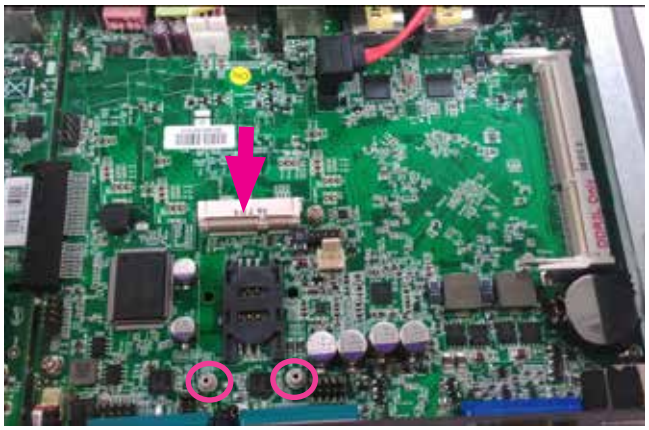


Note:

The system can support memory of DDR3L SO-DIMM up to 4 GB in maximum.

Installing the Wireless Module

1. Align the wireless module's key with the Mini-PCIe slot notch.
2. Insert the wireless module into the connector diagonally.
3. Fix the wireless module with the screws.



Installing the 3G SIM Card

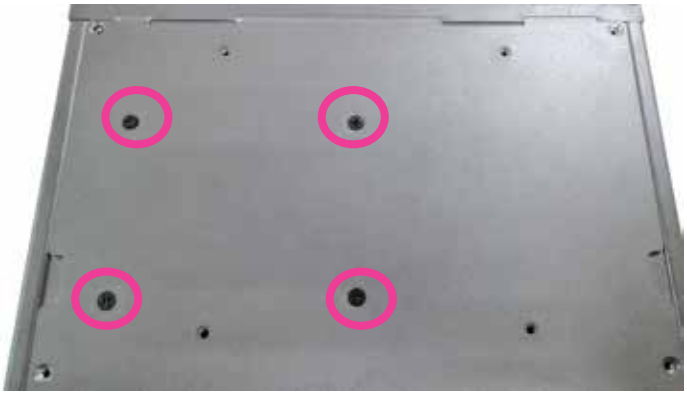
1. Unlock the SIM card reader first by sliding it outward.
2. Flip the SIM card reader diagonally.
3. Put the SIM card into the reader. The angled corner of the SIM ensures that the card fits only the correct way in the reader. Make sure the ICs will be in contact with the SIM card reader.
4. Close the tray. You should hear a click when the SIM card is locked securely in the SIM card reader.

Note: To remove the SIM card, push the card outward to unlock it.

Installing the Disk Drive

The system can accommodate one Serial-ATA disk drive. Follow these steps to install a hard disk into the system:

1. Align the mounting holes of the HDD/SSD and that on the LEC-7230-CT1 systems as illustrated in the following picture. Fix the hard disk on the system by attaching the screws through the back cover from the outside.
2. Plug the Serial-ATA cable to the disk.
3. Connect the Serial-ATA power and data disk cables to the Serial-ATA power and disk connectors on the main board respectively.



Appendix A: Programming Watchdog Timer

A watchdog timer is a piece of hardware that can be used to automatically detect system anomalies and reset the processor in case there are any problems. Generally speaking, a watchdog timer is based on a counter that counts down from an initial value to zero. The software selects the counter's initial value and periodically restarts it. Should the counter reach zero before the software restarts it, the software is presumed to be malfunctioning and the processor's reset signal is asserted. Thus, the processor will be restarted as if a human operator had cycled the power.

For sample watchdog code, see *Watch dog* in the *Driver and Manual CD*