EM-2260 Hardware Development Kit
User's Manual

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EM-2260 Hardware Development Kit
User's Manual

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Introduction

Thank you for purchasing the Moxa EM-2260 RISC-based industrial ready-to-run embedded module.

This manual introduces the hardware installation, connector interfaces as well as software configurations of the EM-2260 Embedded Module and EM-2260 Development Kit.

The following topics are covered in this chapter:

❑ **Overview**
❑ **Appearance**
  ➢ EM-2260 Development Kit
  ➢ EM-2260 Embedded Module
  ➢ EM-2260-DK Carrier Board and Peripheral Extension Board
❑ **Package Checklist**
❑ **Features**
❑ **Hardware Block Diagram**
❑ **Hardware Specifications**
❑ **Hive-Based Registry—Contrast to RAM-Based Registry**
❑ **Dimensions**
  ➢ EM-2260 Embedded ModuleEM-2260-DK Carrier Board
  ➢ EM-2260 Peripheral Extension Board

Overview

The Moxa EM-2260 Embedded Module features Cirrus Logic ARM9 CPU, 128 MB RAM, 32 MB Flash Disk, dual 10/100 Mbps Ethernet, eight digital inputs and eight digital outputs, four high speed serial ports, two USB 2.0 Hosts and an EIDE interface for external storage connection such as CompactFlash card. In addition, with built-in VGA interface, EM-2260 is suitable for SCADA system in industrial applications, that require VGA and HMI features.

The EM-2260 Embedded Module uses Cirrus Logic EP9315 ARM9, 32-bit, 200 MHz RISC CPU. This powerful computing engine supports several useful communication functions, without generating a lot of heat. This module has a compact design that is easily integrated with a variety of industrial applications, including gas stations, vending machines, and ticketing machines, and offers a powerful serial communication capability for better system integration.

The built-in 32 MB NOR Flash ROM and 128 MB SDRAM give you enough memory to run your application software directly on the EM-2260. Programmers will find the pre-installed, ready-to-run Windows CE 6.0 or Linux platform and full-function development kit a great benefit for developing software and building reliable communication applications.

In addition to the standard model, the EM-2260 Embedded Module also comes in wide temperature model that offers the operating temperature range from -40 to 75°C, and is appropriate for harsh industrial automation environments.

The EM-2260 Development Kit, which is designed for system and software development at the system evaluation stage, is also available. The kit combines the EM-2260 and carrier board EM-2260-DK. It is convenient for users to evaluate the functionality of EM-2260, develop and integrate the specific systems on it in advance, enabling EM-2260 embedded module to be completely compatible with the industrial systems and applications.

Appearance

The EM-2260 Development Kit contains EM-2260 embedded module, carrier board (EM-2260-DK) and Peripheral Extension Board.

EM-2260 Development Kit
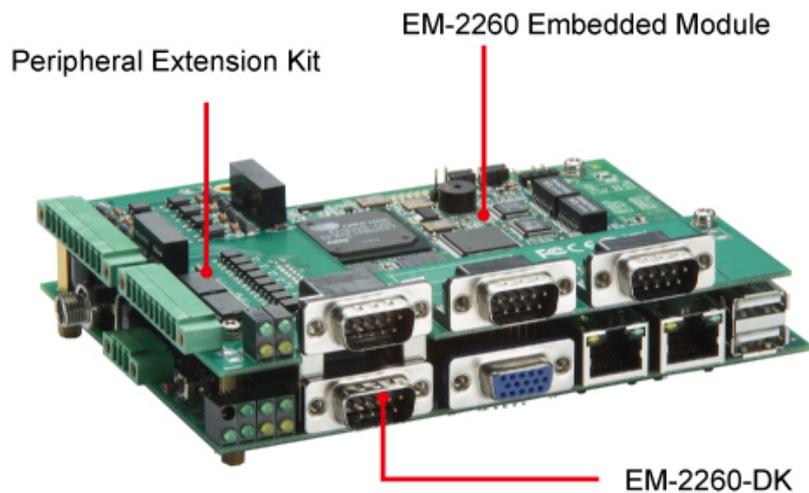
⚠️ **ATTENTION**

The EM-2260 package includes the EM-2260 embedded module only. The EM-2260 Development Kit is available for evaluation purposes.

EM-2260 Embedded Module

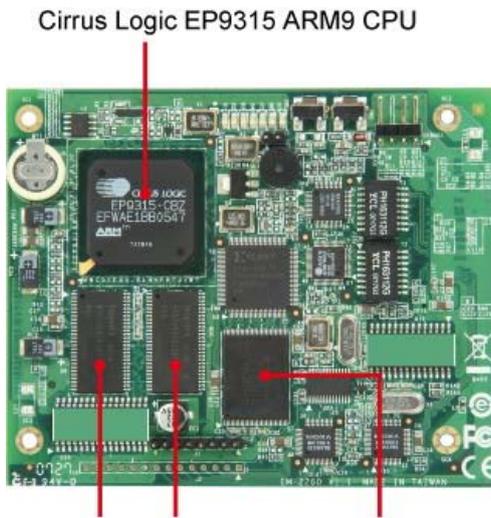**Front View**   **Rear View**

EM-2260-DK Carrier Board and Peripheral Extension Board

EM-2260-DK   **Peripheral Extension Board**
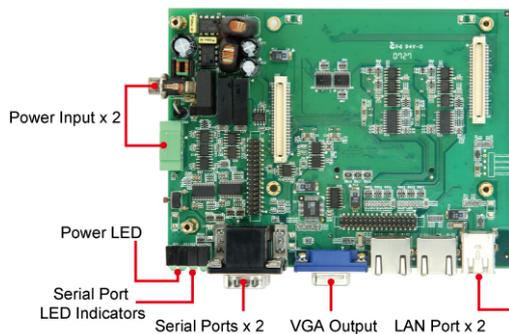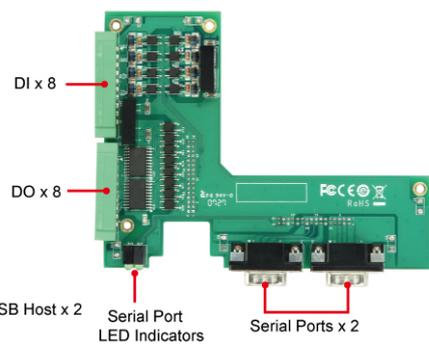
Package Checklist

The EM-2260 Development Kit contains the following items:

- EM-2260 Embedded Module
- EM-2260-DK, the carrier board of the EM-2260 Development Kit
- Peripheral Extension Board
- Quick Installation Guide
- Document & Software CD
- Ethernet Cable: RJ45 to RJ45 cross-over cable, 100 cm
- Universal Power Adapter
- Product Warranty Paper

⚠ **ATTENTION**

Notify your sales representative if any of the above items are missing or damaged.

Features

The EM-2260 Embedded Module/EM-2260 Development Kit has the following features:

- Cirrus Logic EP9315 ARM9 CPU, 200 MHz
- 128 MB RAM on-board, 32 MB Flash Disk
- Graphical interface for external VGA output connection
- 4 high speed TTL serial ports
- Dual 10/100 Mbps Ethernet for network redundancy
- 8+8 DI/DO
- Support EIDE interface and USB 2.0 Host
- Ready-to-Run WinCE 6.0 or Linux platform
- Full-function development kit for quick evaluation and application development

Hardware Block Diagram

Ethernet x 2

USB 2.0 Host x 2	VGA	LAN	LAN
		PHY	PHY
			LAN Controller

Power Circuit — MAC — 128MB RAM

Power Circuit — Cirrus Logic EP9315 32-bit ARM9 200 MHz — 32MB Flash

RTC — CF Function

Watchdog — UART

MOXA UART ASIC | MOXA UART ASIC | MOXA UART ASIC | MOXA UART ASIC

DIx8 | DOx8 | Serial Port 1 | Serial Port 2 | Serial Port 3 | Serial Port 4 | Console Port

RS-232/422/485 x 4   **RS-232**
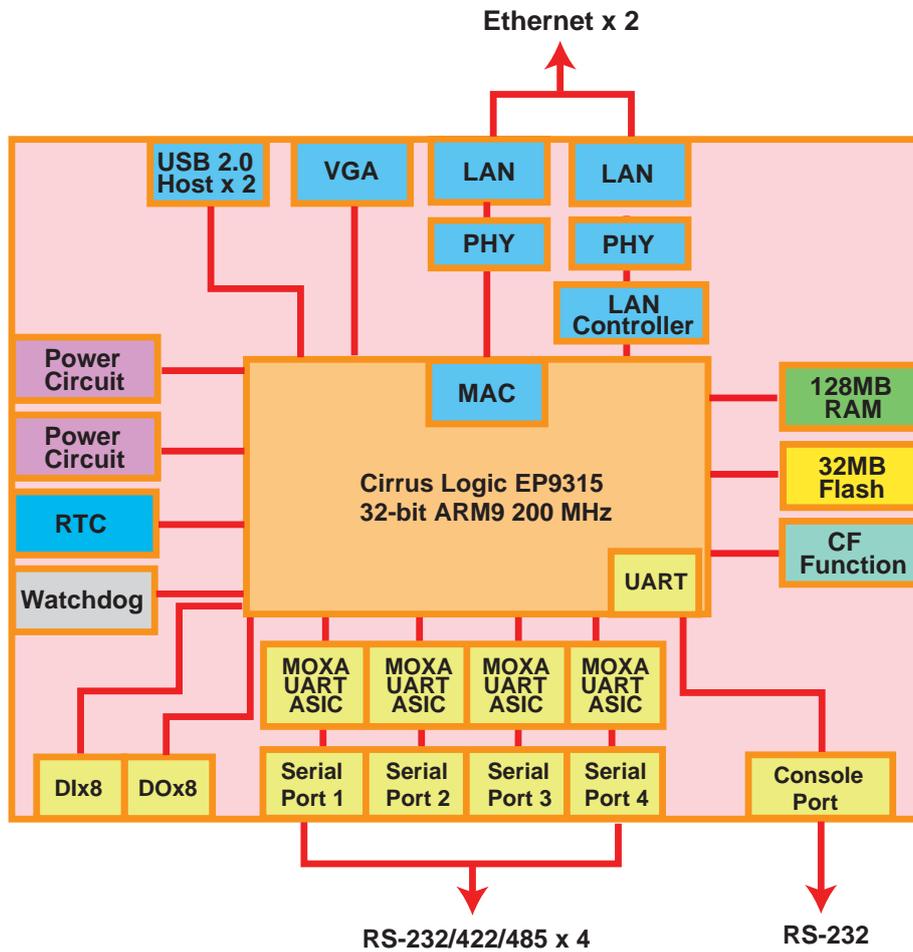
ATTENTION

The dual Power Circuit, extra LAN controller and CF card socket are support only by EM-2260 Development Kit. EM-2260 embedded module connects to all the input/output peripherals through signals of two 100-pin connectors.

Hardware Specifications

EM-2260 embedded module supports all the peripherals through signals of two 100-pin connectors, CN1 and CN2. Differences of EM-2260 embedded module and EM-2260 Development Kit will be specially specified.

System

CPU:	Cirrus Logic EP9315 ARM9 CPU, 200 MHz
DRAM:	128 MB onboard
Flash:	32 MB Flash onboard
Storage Expansion:	
EM-2260:	EIDE Interface signals support up to 2 external devices connection
EM-2260 Development Kit:	CompactFlash socket x 1 for storage expansion
USB:	
EM-2260:	Signals support USB 2.0 Host (OHCI) x3
EM-2260 Development Kit:	USB 2.0 Host (OHCI) x 2, Type A connector
Console/Debugging Port:	RS-232 x 1 (TxD, RxD, GND), 4-pin header output
LED	
EM-2260 Development Kit:	System: Power x 1, Ready x 1, Storage x 1
	LAN: 10M/Link x 2 (on connector), 100M/Link x 2 (on connector)
	Serial: TxD x 4, RxD x 4
Others:	RTC, buzzer, Watchdog Timer, Reset button
Display	
Graphical Controller:	EP9315 internal graphics accelerator engine with TTL graphical signal support
Display Memory:	Dynamic video memory, share system memory
Graphical Resolution:	1024 x 768 (8-bit), 800 x 600 (16-bit), 640 x 480 (24-bit)
Serial Communication	
Serial Port	
EM-2260:	Signals support High speed TTL serial port x 4
	(TxD, RxD, DTR, DSR, RTS, CTS, DCD, GND)
EM-2260 Development Kit:	RS-232/422/485 D-Sub male 9-pin connector x 4, software-selectable.
	RS-232 signals: TxD, RxD, DTR, DSR, RTS, CTS, DCD, GND
	RS-422 signals: TxD+, TxD-, RxD+, RxD-, GND
	4-wire RS-485 signals: TxD+, TxD-, RxD+, RxD-, GND
	2 -wire RS-485 signals: Data+, Data-, GND

Protection

EM-2260 Development Kit:	Built-in 15KV ESD protection for all signals, 2KV optical isolation protection

Data bits:	5, 6, 7, 8
Stop bits:	1, 1.5, 2
Parity:	None, Even, Odd, Space, Mark
Flow Control:	RTS/CTS, XON/XOFF, RS-485 ADDC^{TM}
Speed:	50 bps to 921.6 Kbps, support ANY BAUD RATE

Network Communication

LAN:	Auto-sensing 10/100Mbps x 2, RJ45
Protection:	Build-in 1.5KV magnetic isolation protection

Digital Input

Input Channels

EM-2260:	Signals of 8 input channels
EM-2260 Development Kit:	8, source type

Digital Input Levels

EM-2260:	3.3V, CMOS level
EM-2260 Development Kit:	Dry contact: Logic level 0 -- Close to GND, Logic level 1 – Open.
	Wet contact: Logic level 0 -- +3V max, Logic level 1: +10V ~ +30V (COM to DI)

Protection

EM-2260 Development Kit:	3KV optical isolation protection

Connector Type

EM-2260 Development Kit:	10 Pin Screw Terminal Block (8 points / COM / GND)

Digital Output

Input Channels

EM-2260:	Signals of 8 output channels
EM-2260 Development Kit:	8, sink type

Digital Output Levels

EM-2260:	3.3V, CMOS level
EM-2260 Development Kit:	On-state Voltage -- 24V DC nominal, open collector to 30 V
	Output Current Rating -- Max. 200mA per channel

Protection

EM-2260 Development Kit:	3KV optical isolation protection

Connector Type

EM-2260 Development Kit: 9-pin Screw Terminal Block

Power Requirments

Power Input

EM-2260:   +5V DC and +3.3V DC

EM-2260 Development Kit: Dual power input design

                                                 PWR1: 12 to 48V DC, power jack with thread

                                                 PWR2: 12 to 48V DC, 3-pin terminal block

Power Consumption

EM-2260:   5.4 W

EM-2260 Development Kit: 783 mA @ 12V DC without loading of USB ports
                                                 1.2A @ 12V DC with loading of USB ports

Mechanical

Dimensions

EM-2260:   87 x 106 mm

EM-2260 Development Kit: 110 x 146 mm
Environmental

Operating Temperature: -10 to 60°C (14 to 140°F)

Storage Temperature: -20 to 80°C (-4 to 176°F), 5 to 95% RH

Regulatory Approvals and Warranty

EMC: FCC, CE (Class A)

Others: RoHS, WEEE

Warranty: 5 years

# Hive-Based Registry—Contrast to RAM-Based Registry

The registry for the EM-2260 is a hive-based registry in contrast to a RAM-based registry. The hive-based registry stores registry data inside files, or hives, which can be kept on any file system. This removes the need for performing backup and restore on power off.
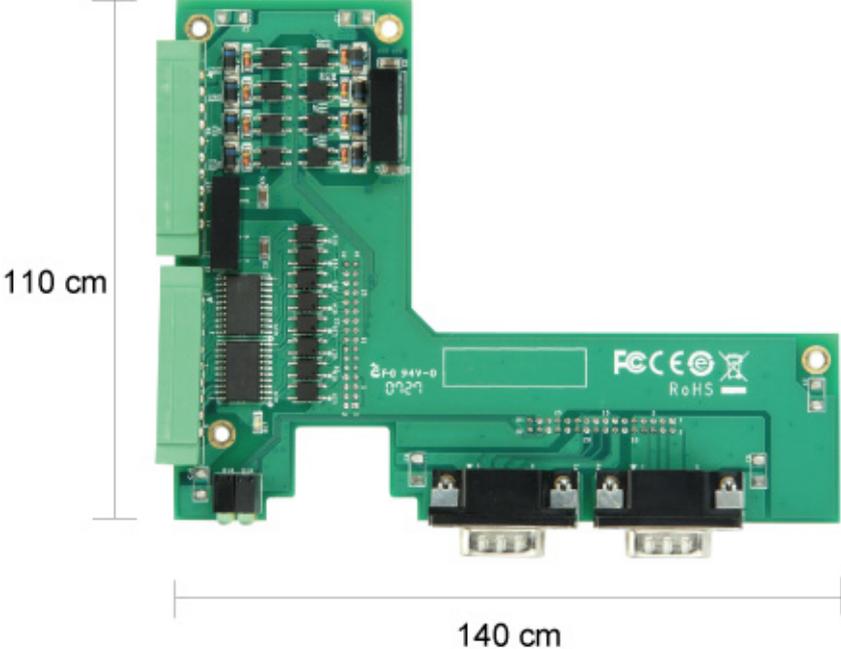
Dimensions

EM-2260 Embedded Module

EM-2260-DK Carrier Board
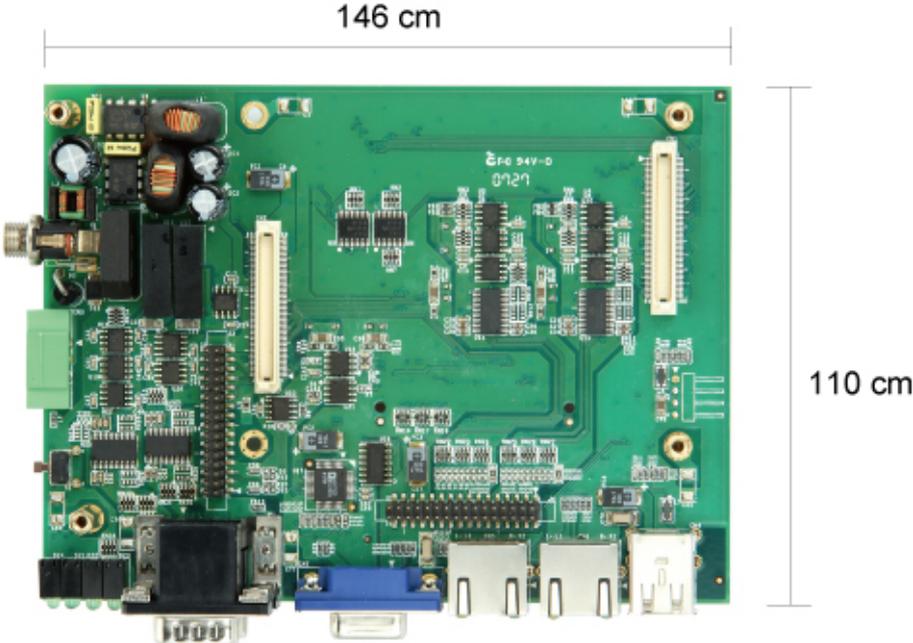
EM-2260 Peripheral Extension Board

2

Hardware Installation

The EM-2260 Embedded Module is designed to be integrated directly into the user's system and application. The pre-installed Windows CE 6.0 or Linux makes it easy for users to develop programs for a variety of applications. The EM-2260 Development Kit is a well-designed embedded computer with complete peripheral interfaces. This kit helps users to evaluate, develop, and integrate the EM-2260 Embedded Module into their systems and applications. Simply combine the EM-2260 Embedded Module with the Development Kit to start porting the relevant software, and create a solution for the applications you wish to implement.

The following topics are covered in this chapter:

❑ **Wiring Requirements**
❑ **Connecting the Power**
❑ **Resetting Your EM-2260 Computer**
❑ **LED Indicators**
❑ **Connecting to a Display**
❑ **Connecting Keyboard/Mouse and USB Mass Storage**
❑ **Debug Ports**
❑ **Serial Ports**
❑ **Insert CompactFlash Card**
❑ **LAN Ports**
❑ **Real Time Clock**
❑ **Connecting to the DI/DO**
❑ **Pin Assignments of CN1 and CN2**

Wiring Requirements

Please follow the following common safety precautions before proceeding with the installation of any electronic device:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.

- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.

- Keep input wiring and output wiring separate.

- When necessary, it is strongly advised that you label wiring to all devices in the system.

⚠ **ATTENTION**

Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

⚠ **ATTENTION**

Safety First!
Be sure to disconnect the power cord before installing and/or wiring.

Electrical Current Caution!
Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.

If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Temperature Caution!
Be careful when handling the unit. When the unit is plugged in, the internal components generate heat, and consequently the outer casing may feel hot to the touch.

Connecting the Power

EM-2260 Development Kit provides 2 kinds of power input, power jack and 3-pin terminal block, both of them allow 12 to 48V DC power input, and are able to work at the same time, providing redundant power solution. If the power is properly supplied, the Power LED will light up first, and then, it takes about **30 to 60 seconds** for the operating system to boot up. Once the system is ready, the Ready LED will light up.
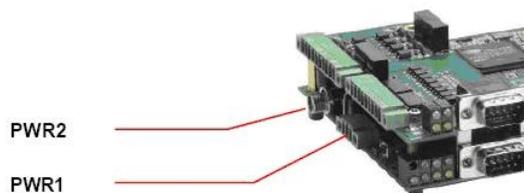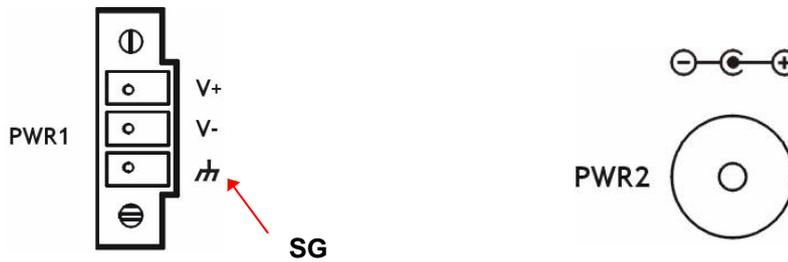
The Shielded Ground (**SG**, sometimes called Protected Ground) helps to limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.


⚠️ **ATTENTION**

The power for this product is intended to be supplied by a Listed Power Supply Unit, and rated to deliver 12 to 48V DC at a minimum of 1200mA for 12V DC, 260mA for 48V DC.

Resetting Your EM-2260 Computer

Cold-Start: Disconnect power and then connect the power again. The computer reboots itself right away.

Warm-Start: In power-on state, push the Reset Switch near power terminal block and release it in 1 second. The computer reboots itself.

Reset to Factory Default: If the computer is not working properly, and you want to load factory default settings. Press the Reset Switch for at least 5 seconds. After the factory default configuration has been loaded, the system will reboot automatically.

Reset Switch

---
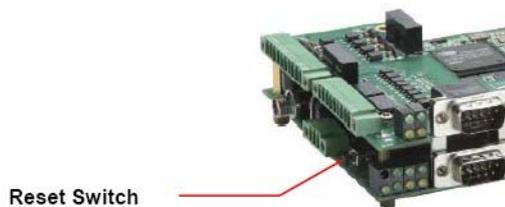
⚠️ **WARNING**

Reset to Default preserves user's data. It will NOT format the user directory and erase the user's data, pressing the Reset to Default will only load the configuration file. If the computer cannot start up, please use Console Port and go to the Boot Loader to format the file system. After the formatting procedure is done, you should be able to restart it.


LED Indicators

EM-2260 Development Kit has 15 LED indicators on the front. Refer to the following table for information about each LED.
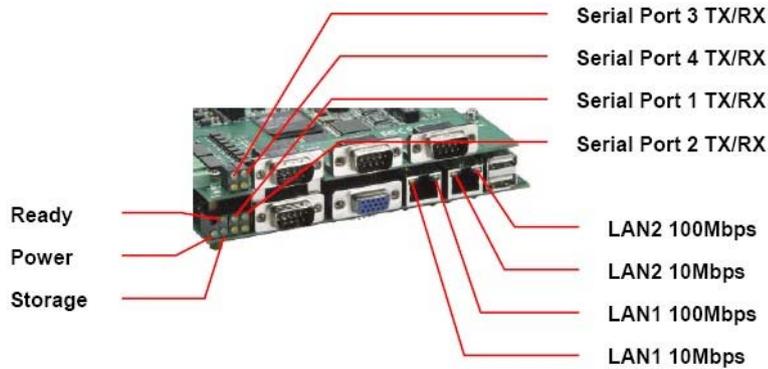
LED	Color	Description
Power	Green	Power is ON.
	Off	No power is being received, or power error exists.
Ready	Green	OS is ready and functioning normally (after booting up).
	Off	OS is not ready.
Storage	Green	Data is being written to or read from the storage unit.
	Off	Storage unit is idle.
LAN1, LAN2	Orange	10 Mbps Ethernet connection
	Green	100 Mbps Ethernet connection
P1-P4 (TX)	Green	Serial port is transmitting TX data to the serial device.
	Off	Serial port is not transmitting TX data to the serial device.
P1-P4 (RX)	Orange	Serial port is receiving RX data from the serial device.
	Off	Serial port is not receiving RX data to the serial device.

Connecting to a Display

EM-2260 Development Kit comes with a D-Sub 15-pin female connector to connect to VGA monitor. Be sure to remove power before you connect or disconnect the monitor cable.

VGA
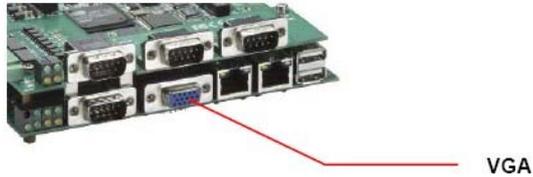
DB15 Female Connector	Pin No.	Signal Definition
	1	Red
	2	Green
	3	Blue
	4	---
	5	GND
	6	GND
	7	GND
	8	GND
	9	---
	10	GND
	11	---
	12	---
	13	H-Sync
	14	V-Sync
	15	---

Connecting Keyboard/Mouse and USB Mass Storage

The EM-2260 Development Kit provides 2 USB 2.0 full speed hosts (OHCI), type A connector, which support not only keyboard or mouse, but also the ability to connect a flash disk for storing large amounts of data.


USB 2.0 Host x2

When an empty USB storage device is plugged into the USB ports of the EM-2260 Development Kit, the computer automatically formats it to the FAT system. A directory named **"USBDisk"** under the root directory is created as a link to the first USB mass storage device that is plugged-in. The directory created for the second plugged-in USB device is **"USBDisk2"**.

Debug Ports

There is a 4-pin pin-header RS-232 debug port (or called console port) designed for serial terminals, which gives users a convenient way of connecting the development workstation (The PC) to the console utility of the target computer (The EM-2260). This method is particularly useful when using the computer for the first time or for debugging while the system cannot boot up. A special Serial Console Cable (Optional) is needed for this function.
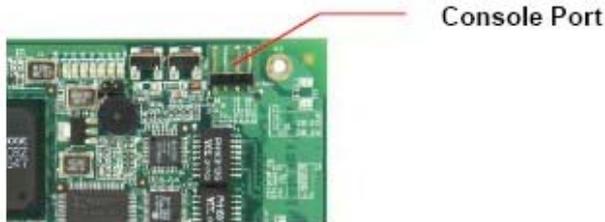
Console Port

Serial Console Port & Pinouts   **Serial Console Cable**
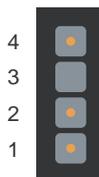
Pin	Signal
1	TxD
2	RxD
3	NC
4	GND

Serial Ports

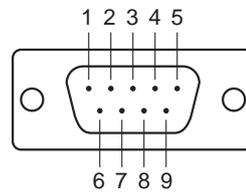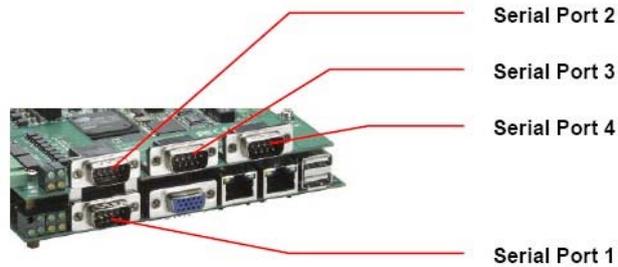EM-2260 Development Kit offers 4 software-selectable serial ports. Each port can be configured by software for RS-232, RS-422, or RS-485. The pin assignments for the ports are shown in the following table:

Pin	RS-232	RS-422	RS-485 (4-wire)	RS-485 (2-wire)
1	DCD	TxDA(-)	TxDA(-)	---
2	RxD	TxDB(+)	TxDB(+)	---
3	TxD	RxDB(+)	RxDB(+)	DataB(+)
4	DTR	RxDA(-)	RxDA(-)	DataA(-)
5	GND	GND	GND	GND
6	DSR	---	---	---
7	RTS	---	---	---
8	CTS	---	---	---

Insert CompactFlash Card

EM-2260 Development Kit comes with a CompactFlash socket. A mass storage card is considered to be a standard attachment to the computer. Thus, when an empty mass storage card is inserted into the slot, the computer automatically formats it to the FAT system. This process takes a few minutes to complete. The EM-2260, when a mass storage card is inserted, creates a directory named **"HardDisk"** under the root directory and the newly created directory serves a link to the storage.

There are some CompactFlash storage disks which are not compatible with EM-2260. You could try the other CompactFlash storage or disable ultra DMA by using the "System Manager" to change this setting.

The following table describes the compatible CompactFlash storages list that we had tested successfully.

| Vendor	Device Name	Size
ScanDisk	Ultra Ⅱ	1GB
Transcend	Compact Flash 80X	512MB
Apacer	Photo CIENO	2GB
Unigen	Compact Flash card	128MB

ATTENTION

The EM-2260 does not support CompactFlash hot swap and PnP (Plug and Play) function. It is necessary to remove power source first before inserting or removing the CompactFlash card.

LAN Ports

EM-2260 Development Kit Embedded Module offers 2 LAN ports supporting 10/100 Mbps. The default IP addresses and netmasks of the network interfaces are as follows:
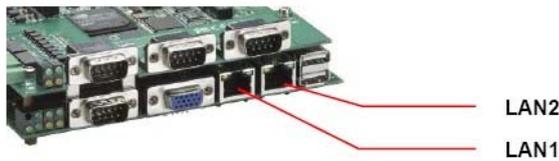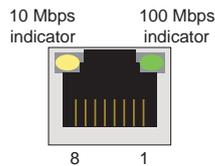
8-pin RJ 45   **Pinouts**

Pin	Signal
1	ETx+
2	ETx-
3	ERx+
4	---
5	---
6	ERx-
7	---
8	---

10 Mbps indicator   100 Mbps indicator

8   1

	Default IP Address	Netmask
LAN 1	192.168.3.127	255.255.255.0
LAN 2	192.168.4.127	255.255.255.0

Real Time Clock

The EM-2260's real time clock is powered by a lithium battery. We strongly recommend that you do not replace the lithium battery without help from a qualified Moxa support engineer. If you need to change the battery, contact the Moxa RMA service team.

⚠️ **WARNING**

There is a risk of explosion if the battery is replaced by an incorrect type

Connecting to the DI/DO

The EM-2260 Development Kit has 8 digital inputs and 8 digital outputs, both of them support 3KV optical isolation protection. The pinouts for the I/O are shown below.

Digital Input Channel (10-pin Terminal Block)

Digital Output Channel (9-pin Terminal Block)
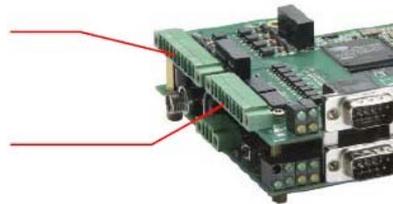
Digital Input Wiring

Dry Contact   **Wet Contact**

⚠️ **WARNING**

If you are using wet contacts, you must supply power to "COM".

Digital Output Wiring
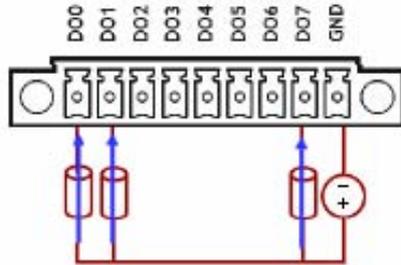
Pin Assignments of CN1 and CN2

There are two 100-pin connectors on the rear of EM-2260 embedded module, to independently use EM-2260 Embedded Module for developing your own system, please refer to the following tables for the pin assignments of CN1 and CN2.
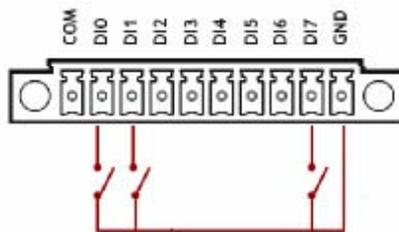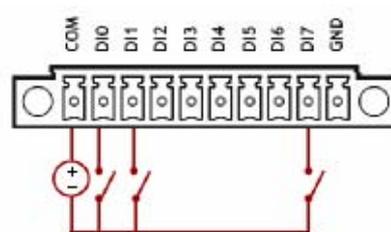
CN1 Pin Assignment

CN1 Signals	Pin	Pin	CN1 Signals
NC	2	1	XP
EGPIO9	4	3	XM
UR1_232EN	6	5	YP
UR1_TENA	8	7	YM
UR1_TENB	10	9	SXP
UR1_REN	12	11	SXM
UR1_RTS	14	13	SYP
UR1_DTR	16	15	SYM
UR1_TXD	18	17	GND
UR1_RXD	20	19	USB_P0
UR1_CTS	22	21	USB_M0
UR1_DCD	24	23	GND
UR1_DSR	26	25	USB_P1
UR2_232EN	28	27	USB_M1
UR2_TENA	30	29	GND
UR2_TENB	32	31	USB_P2
UR2_REN	34	33	USB_M2
UR2_RTS	36	35	GND
UR2_DTR	38	37	CPU_TXD0
UR2_TXD	40	39	CPU_RXD0
UR2_RXD	42	41	CPU_CTS#
UR2_CTS	44	43	CPU_RTS#
UR2_DCD	46	45	CPU_DTR#
UR2_DSR	48	47	CPU_DSR#
UR3_232EN	50	49	ARST#

CN1 Pin Assignment (Continue)

CN1 Signals	Pin	Pin	CN1 Signals
UR3_TENA	52	51	ABITCLK
UR3_TENB	54	53	ASYNC
UR3_REN	56	55	ASDI
UR3_RTS	58	57	ASDO
UR3_DTR	60	59	GND
UR3_TXD	62	61	TX1+
UR3_RXD	64	63	TX1-
UR3_CTS	66	65	GND
UR3_DCD	68	67	RX1+
UR3_DSR	70	69	RX1-
UR4_232EN	72	71	GND
UR4_TENA	74	73	TX2+
UR4_TENB	76	75	TX2-
UR4_REN	78	77	GND
UR4_RTS	80	79	RX2+
UR4_DTR	82	81	RX2-
UR4_TXD	84	83	GND
UR4_RXD	86	85	CAN_TX0
UR4_CTS	88	87	GND
UR4_DCD	90	89	CAN_TX1
UR4_DSR	92	91	GND
+5V	94	93	CAN_RX0
+5V	96	95	GND
+5V	98	97	CAN_RX1
+5V	100	99	+5V

CN2 Pin Assignment

CN2 Signals	Pin	Pin	CN2 Signals
DIN0	2	1	DD0
DIN1	4	3	DD1
DIN2	6	5	DD2
DIN3	8	7	DD3
DIN4	10	9	DD4
DIN5	12	11	DD5
DIN6	14	13	DD6
DIN7	16	15	DD7
DOUT0	18	17	DD8
DOUT1	20	19	DD9
DOUT2	22	21	DD10
DOUT3	24	23	DD11
DOUT4	26	25	DD12
DOUT5	28	27	DD13
DOUT6	30	29	DD14
DOUT7	32	31	DD15
BRIGHT	34	33	IDE_CS#1
LCD_P0	36	35	IDE_CS#3
LCD_P1	38	37	IDE_A0
LCD_P2	40	39	IDE_A1

LCD_P3	42	41	IDE_A2
LCD_P4	44	43	INT3_CF
LCD_P5	46	45	IDE_DREQ
LCD_P6	48	47	IORDY
LCD_P7	50	49	DMACK#

CN2 Pin Assignment (Continue)

CN2 Signals	Pin	Pin	CN2 Signals
LCD_P8	52	51	DIOW#
LCD_P9	54	53	DIOR#
LCD_P10	56	55	GND
LCD_P11	58	57	ROW0
LCD_P12	60	59	ROW1
LCD_P13	62	61	ROW2
LCD_P14	64	63	ROW3
LCD_P15	66	65	ROW4
LCD_P16	68	67	ROW5
LCD_P17	70	69	ROW6
SPCLK	72	71	ROW7
BLANK	74	73	COL0
HSYNC	76	75	COL1
VSYNC	78	77	COL2
P1_10_ACT	80	79	COL3
P1_100_ACT	82	81	COL4
P2_LINK	84	83	COL5
P2_100_ACT	86	85	COL6
SW_RELOAD	88	87	COL7
RESET#-1	90	89	+3.3V
P1_LINK	92	91	+3.3V
SW_READY	94	93	+3.3V
+3.3V	96	95	+3.3V
+3.3V	98	97	+3.3V
+3.3V	100	99	+3.3V

A

Regulatory Approval Statement

FC

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.

Class A： FCC Warning!

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.

CE **European Community**

Warning:

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.