UC-8410A Hardware User's Manual

Edition 2.0, June 2018

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MOXA®

UC-8410A Hardware User's Manual

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Introduction

Thank you for purchasing the Moxa UC-8410A RISC-based dual-core ready-to-run embedded computer.

This manual introduces the hardware features of the UC-8410A embedded computer and provides step-by-step instructions on installing and configuring the hardware.

The following topics are covered in this chapter:

❒ **Overview**
❒ **Package Checklist**
❒ **Product Features**
❒ **Product Hardware Specifications**

Overview

The UC-8410A computer comes with various communication interfaces, which make it an ideal communication platform for industrial applications. The communication interfaces include eight RS-232/422/485 serial ports, three 10/100/1000 Mbps Ethernet ports, four digital input and four digital output channels, and a wireless communication slot (not in –NW model). In addition, the UC-8410A is provided with an mSATA slot for storage expansion, and 2 USB ports for additional memory (such as a USB flash drive). The computer is built using a NXP Cortex-A7 dual-core 1GHz RISC CPU. This powerful computing engine supports several useful communication functions, but will not generate too much heat. The computer's built-in 8 GB eMMC and 1 GB DDR3 SDRAM give you sufficient memory to run your application software while the SD slot and mSATA socket provide you the flexibility to expand the data storage capacity.

Package Checklist

Before installing the UC-8410A, verify that the following items are in the package:

- UC-8410A embedded computer
- Wall-mounting kit
- Power jack
- 3-pin terminal block for power
- CBL-4PINDB9F-100: 4-pin pin header to DB9 female console port cable, 100 cm
- Quick installation guide (printed)
- Warranty card

NOTE: Please notify your sales representative if any of the above items are missing or damaged.

Product Features

- NXP LS1021A Cortex-A7 1 GHz dual-core processor
- 8 GB eMMC with OS pre-installed
- 1 GB DDR3 SDRAM
- 8 x RS-232/422/485 serial ports
- 3 x 10/100/1000 Mbps Ethernet ports
- 1 x mini-PCIe socket for wireless expansion (not for –NW model)
- -40 to 75°C system operating temperature
- Ready-to-run Debian 8

Product Hardware Specifications

Computer

CPU: ARMv7 Cortex-A7 dual-core 1.2 GHz

USB: USB 2.0 hosts x 2, Type A connector

DRAM: 1 GB DDR3 SDRAM onboard

OS (pre-installed): Debian 8

Storage

Main Storage: 8 GB eMMC with OS pre-installed

Storage Expansion: 1 SD card slot, 1 mSATA slot

Other Peripherals (Not in –NW Model)

Expansion Slot: 1 Mini-PCIe socket w/ USB + PCIe signal

USIM: 1 USIM slot

Wireless SMA Interface: 2 SMA connectors

Ethernet Interface

LAN: Auto-sensing 10/100/1000 Mbps ports (RJ45) x 3

Magnetic Isolation Protection: 1.5 kV built-in

Serial Interface

Serial Standards: RS-232/422/485 software-selectable ports (8-pin RJ45) x 8

Console Port: RS-232 (TxD, RxD, GND), 4-pin header output (115200, n, 8, 1)

Serial Communication Parameters

Data Bits: 5, 6, 7, 8

Stop Bits: 1, 1.5, 2

Parity: None, Even, Odd, Space, Mark

Flow Control: RTS/CTS, XON/XOFF, ADDC® (automatic data direction control) for RS-485

Baudrate: 50 bps to 115.2 kbps (supports non-standard baudrates; see the UC-8410A user's manual for details)

Serial Signals

RS-232: TxD, RxD, DTR, DSR, RTS, CTS, DCD, GND

RS-422: TxD+, TxD-, RxD+, RxD-, GND

RS-485-4w: TxD+, TxD-, RxD+, RxD-, GND

RS-485-2w: Data+, Data-, GND

Digital Input

Input Channels: DI x 4

Input Voltage: 0 to 30 VDC

Digital Input Levels for Dry Contacts:

• Logic level 0: Close to GND

• Logic level 1: Open

Digital Input Levels for Wet Contacts:

• Logic level 0: +10 to +30 V (COM to DI)

• Logic level 1: +3 V max.

Connector Type: 10-pin screw terminal block (4 points, COM, GND)

Isolation: 3 kV optical isolation

Digital Output

Output Channels: 4, sink type

Output Current: Max. 200 mA per channel

On-State Voltage: 24 VDC nominal, open-drain to 30 V

Connector Type: 10-pin screw terminal block (4 points, GND)

Isolation: 3 kV optical isolation

LEDs

System: Power, Ready, Storage, Diagnostic, Wireless signal strength

LAN: 100M/Link/Act x 3, 1000M/Link/Act x 3 (on connector)

Serial: TxD x 8, RxD x 8 (on connector)

Reset Button: Supports "Reset to Factory Default and System diagnostics"

Physical Characteristics

Housing: SECC sheet metal (1 mm)

Weight: 1 kg (2.21 lb)

Dimensions: 200 x 120 x 48.6 mm (7.87 x 4.72 x 1.91 in)

Mounting: wall mounting

Environmental Limits

Operating Temperature:

Standard Models: -10 to 60°C (14 to 140°F)

Wide Temp. Models: -40 to 75°C (-40 to 167°F)

Storage Temperature:

Standard Models: -20 to 75°C (-4 to 167°F)

Wide Temp. Models: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Anti-Vibration: 2 Grms @ IEC-68-2-34, random wave, 5-500 Hz, 1 hr per axis

Anti-Shock: 20 g @ IEC-68-2-27, half sine wave, 11 ms

Power Requirements

Input Voltage: 12 to 48 VDC (3-pin terminal block, V+, V-, SG)

Input Current: 790 mA @ 24 VDC

Power Consumption: 19 W (without USB devices, wireless modules, SIM card, and mSATA card)

Standards and Certifications

Safety: UL 60950-1

EMC: EN 55032/24

EMI: CISPR 32, FCC Part 15B Class A

EMS:

IEC 61000-4-2 ESD: Contact 4 kV; Air 8 kV

IEC 61000-4-3 RS: 3 V/m (80 MHz to 1 GHz)

IEC 61000-4-4 EFT: Power 0.5 kV; Signal 0.5 kV

IEC 61000-4-5 Surge: Power 0.5 kV; Signal 1 kV

IEC 61000-4-6 CS: 3 V IEC 61000-4-8

Reliability

Alert Tools: Built-in buzzer and RTC (real-time clock)

Automatic Reboot Trigger: Built-in WDT (watchdog timer)

Warranty

Warranty Period: 5 years

Details: See www.moxa.com/warranty

Note: The Hardware Specifications apply to the embedded computer unit itself, but not to accessories. In particular, the wide temperature specification does not apply to accessories such as the power adapter and cables.
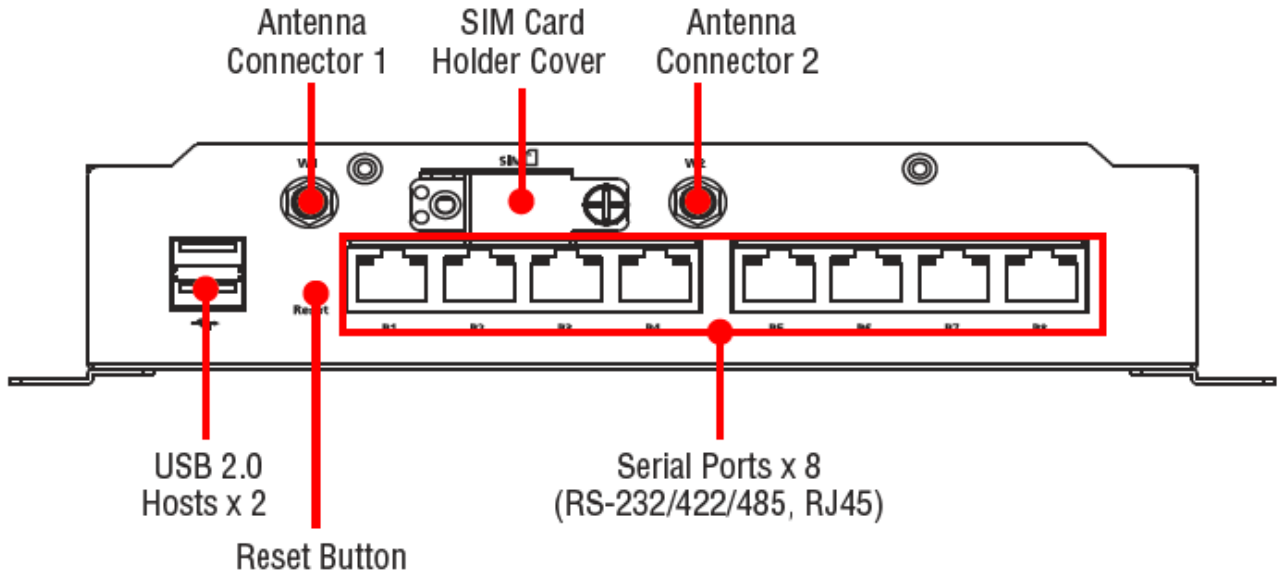
2

Appearance and Dimensions

The following topics are covered in this chapter:

❒ **Appearance**
❒ **Dimensions**
❒ **LED Indicators**
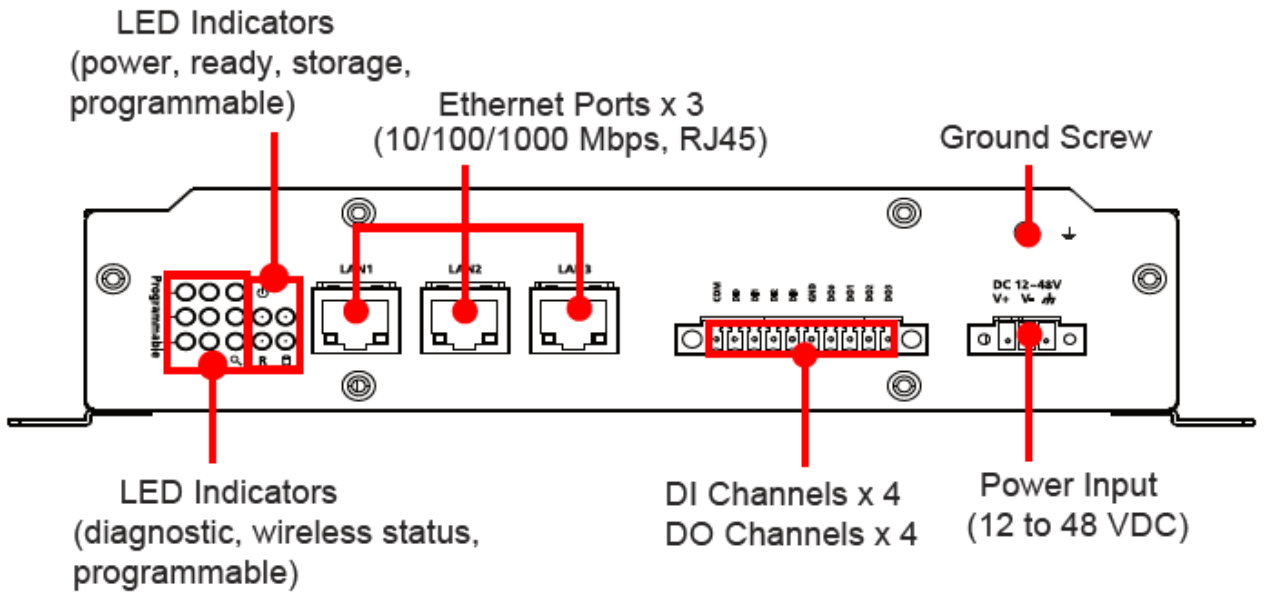❒ **Diagnostic LEDs**
❒ **Reset Button**
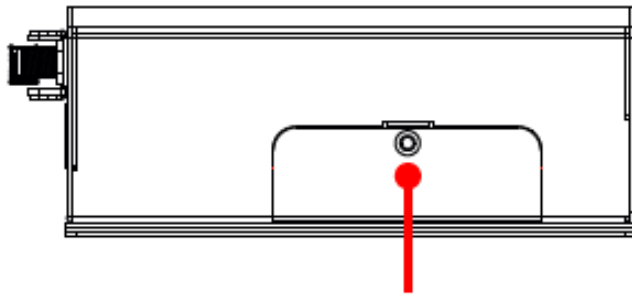❒ **Real-Time Clock**

Appearance

Front View

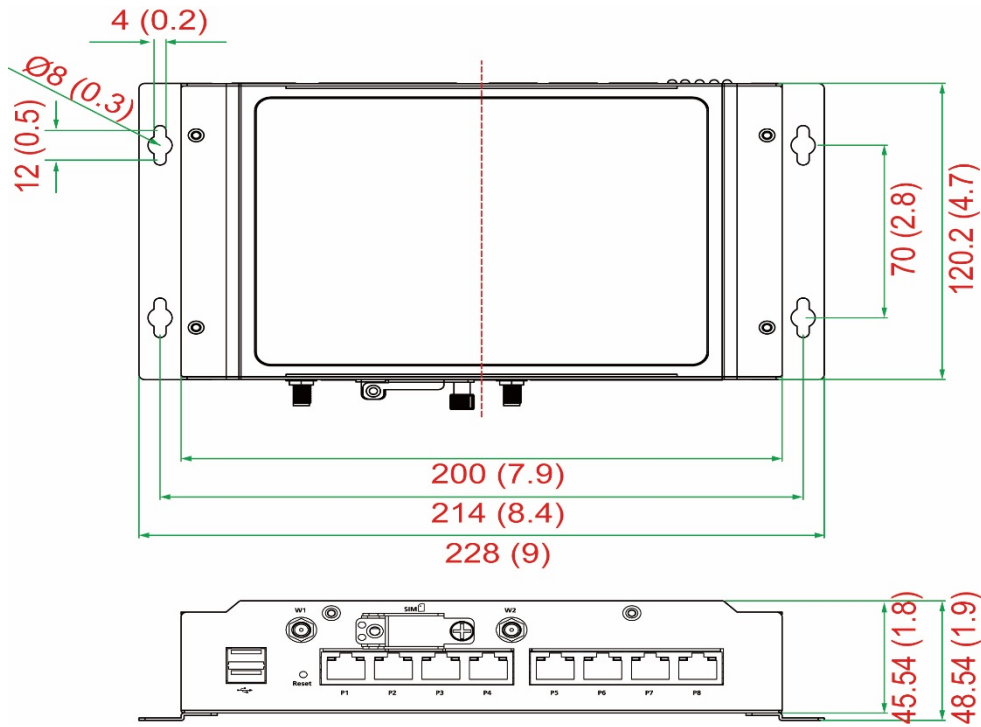| NOTE	The -NW model is not provided with the antenna connectors and SIM card socket. However, all models come with a cover.

Rear View

Left-Side View

SD Card slot x 1
Mini-PCIe socket x 1

Dimensions

Unit: mm (inch)

LED Indicators

Refer to the following table for information about each LED:

LED Name	Status	Function
Power	Green	Power is on
	Off	No power input or any other power error
Ready	Green	System is ready
	Off	OS boot up failure or other system initialization error
WAN	Yellow	Steady On: 1000 Mbps Ethernet link Blinking: Data transmission is in progress
	Green	Steady On: 100 Mbps Ethernet link Blinking: Data transmission is in progress
	Off	Speed at 10 Mbps or WAN is not connected
LAN	Yellow	Steady On: 1000 Mbps Ethernet link Blinking: Data transmission is in progress
	Green	Steady On: 100 Mbps Ethernet link Blinking: Data transmission is in progress
	Off	Speed at 10 Mbps or LAN is not connected
Serial	Green	Blinking: Data transmission is in progress
	Yellow	Blinking: Receiving Data
	Off	No operation
Storage	Yellow	Blinking: Access to SD card or mSATA module
	Off	The SD card or the mSATA module is not accessible.
Programmable	Green	Programmable
	Green	Programmable
	Green	Programmable
Wireless	Green	The number of glowing LEDs indicate the wireless signal strength as follows: 3 Green: Excellent 2 Green: Good 1 Green: Poor Note: The wireless LEDs are disabled on the –NW model.
	Off	No wireless signal or wireless signal failure
Diagnostic	Green/Yellow/Red	Various combinations of the on/off/blinking statuses of the Green/Yellow/Red LEDs indicate different hardware diagnostic statuses. Refer to the *Diagnostic LEDs* section for details.

Diagnostic LEDs

The descriptions of the statuses indicated by the diagnostic LEDs are listed in the table below:

Priority	Green	Yellow	Red	Status Description
1	On	Off	Blinking	Self-diagnosis in progress
2	Off	Off	On	LAN1 Ethernet controller error
3	Blinking	Off	On	LAN2 Ethernet controller error
4	On	Off	On	LAN3 Ethernet controller error
5	Off	On	On	UART interface error—indicates an error in any one of the UART interfaces
6	Blinking	Blinking	Blinking	LED device issue
7	Off	Blinking	On	Button device issue
8	On	Blinking	Blinking	Ready for reset to factory default
9	Off	On	Blinking	CPU usage (over 90%)

Priority	Green	Yellow	Red	Status Description
10	Off	On	Off	RAM usage (over 90%)
11	Blinking	On	Off	Disk usage (over 90%)
12	Blinking	On	Blinking	File system corrupted
13	Blinking	Blinking	On	TPM device issue

Reset Button

The **Reset** button returns the UC-8410A to its factory default configuration and also performs the system diagnostic function. Please check the table below for details:

Function	Button Operation
Self-diagnosis	The red LED will start blinking once you press the **Reset** button. Keep the button pressed until the green LED lights up for the first time and then release the button to enter the diagnostic mode. Refer to the *Diagnostic LEDs* section for descriptions of the diagnostic statuses.
Resetting the computer to the factory default configuration	The red LED will start blinking once you press the **Reset** button. Keep the button pressed until the green LED lights up for the second time and then release the button to enter the process of resetting the computer to the factory default.

We recommend that you only use this function if the software is not working properly and you want to load the factory default settings. To reset an embedded system, always use the software reboot command **/>reboot** to protect the integrity of data being transmitted or processed.

> **ATTENTION**
>
> **Reset button preserves user's data**
>
> The **Reset** button will NOT format the user directory and erase the user's data. Pressing the **Reset** button continuously for at least 5 seconds will only load the configuration file. For the Linux OS, all files in the **/etc, /home,** and **/tmp** directories will revert to their factory defaults, but other user data will still exist in the Flash ROM. For the Windows CE 6.0 OS, all registry configurations will revert to the factory default.

Real-Time Clock

The UC-8410A'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 of battery.

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Mounting Options

The following topics are covered in this chapter:

❒ **Wall or Cabinet Mounting**

Wall or Cabinet Mounting

The two metal brackets that come standard with the UC-8410A are used to attach the UC-8410A to a wall or the inside of a cabinet. First, use two screws per bracket to attach the brackets to the bottom of the UC-8410A (Fig. A). Next, use two screws per bracket to attach the UC-8410A to a wall or cabinet (Fig. B).

Figure A: UC-8410A Embedded Computer—Wall Mounting Brackets (bottom view)

Figure B: UC-8410A Embedded Computer—Wall Mounting Brackets (top view)

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Hardware Connection Description

This section describes how to connect the UC-8410A to serial devices for first time testing purposes.

The following topics are covered in this chapter:

❒ **Wiring Requirements**

❒ **Connecting the Power**

❒ **Connecting to the Network**

❒ **Connecting to a Serial Device**

❒ **Connecting to the Console Port**

❒ **Installing the SD Card and mSATA Card**

❒ **USB**

❒ **DI/DO**

➢ Digital Input Wiring

➢ Digital Output Wiring

❒ **Installing the Wireless Modules (Not for –NW Module)**

➢ Installing the Wi-Fi Module

➢ Installing the Cellular Module

➢ Installing the SIM Card

Wiring Requirements

> ⚠️ **ATTENTION**
>
> **Safety First!**
> Be sure to disconnect the power cord before installing and/or wiring your UC-8410A.
>
> **Wiring Caution!**
> Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes that dictate the maximum current allowed 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 UC-8410A. When plugged in, the UC-8410A's internal components generate heat, and the outer casing may feel hot to the touch.

You should also observe the following common wiring rules:

- 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.
  NOTE: 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.
- 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.
- We strongly recommend that you label wiring to all devices in the system for easy identification.

Connecting the Power

The UC-8410A has a 3-pin terminal block for a 12 to 48 VDC power input.

The following figures show how the power input interface connects to external power source. If the power is properly supplied, the **Ready** LED will illuminate with a solid green color after 30 to 60 seconds have passed.
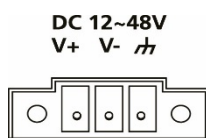
> ⚠️ **ATTENTION**
>
> The power for this product is intended to be supplied by a Listed Power Supply Unit that is rated to deliver 12 to 48 VDC at a minimum of 1010 mA for 12 VDC, and 240 mA for 48 VDC.
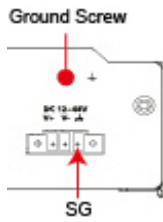
Grounding the UC-8410A

Grounding and wire routing help 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**
>
> This product is intended to be mounted to a well-grounded mounting surface, such as a metal panel.

SG: The *Shielded Ground* (sometimes called *Protected Ground*) contact is the right most contact of the 3-pin power terminal block connector when viewed from the angle shown here. Connect the SG wire to an appropriate grounded metal surface. An additional ground connector is provided just above the power block, which you can use for additional grounding protection.

ATTENTION

A shielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to nearby radio and television reception. It is essential that only the power cord supplied with the unit is used to supply power.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

Connecting to the Network

Connect one end of the Ethernet cable to one of the UC-8410A's 10/100/1000 Mbps Ethernet ports (8-pin RJ45) and the other end of the cable to the Ethernet network. If the cable is properly connected, the UC-8410A will indicate a valid connection to the Ethernet in the following ways:
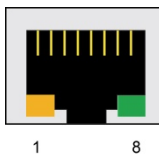
The lower right corner LED indicator maintains a solid green color when the cable is properly connected to a 100 Mbps Ethernet network. The LED will flash on and off when Ethernet packets are being transmitted or received.

The lower left corner LED indicator maintains a solid orange color when the cable is properly connected to a 10 Mbps Ethernet network. The LED will flash on and off when Ethernet packets are being transmitted or received.

PIN	10/100 Mbps	1000 Mbps
1	ETx+	TRD(0)+
2	ETx-	TRD(0)-
3	ERx+	TRD(1)+
4	---	TRD(2)+
5	---	TRD(2)-
6	ERx-	TRD(1)-
7	---	TRD(3)+
8	---	TRD(3)-

Connecting to a Serial Device

Use properly wired serial cables to connect the UC-8410A to serial devices. The UC-8410A's serial ports (P1 to P8) use 8-pin RJ45 connectors. The ports can be configured by software for RS-232, RS-422, or 2-wire RS-485. The precise pin assignments are shown in the following table:
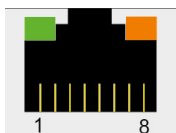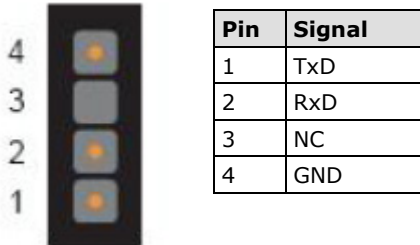
Pin	RS-232	RS-422/ RS-485-4w	RS-485-2w
1	DSR	–	–
2	RTS	TXD+	–
3	GND	GND	GND
4	TXD	TXD-	–
5	RXD	RXD+	Data+
6	DCD	RXD-	Data-
7	CTS	–	–
8	DTR	–	–

Connecting to the Console Port

The UC-8410A's console port is a 4-pin pin header RS-232 port. Refer to the following figure for the pin assignments of the console port cable:
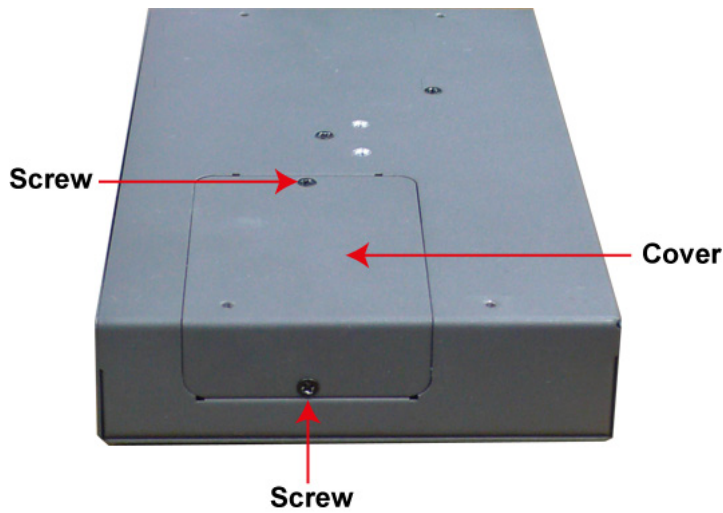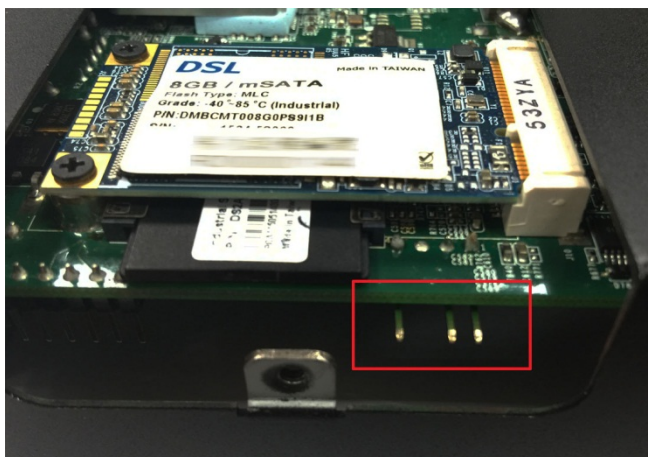
Serial Console Port and Pinouts   **Serial Console Cable**

Pin	Signal
1	TxD
2	RxD
3	NC
4	GND

The console port is located below the mSATA/SD socket. Use a screwdriver to remove the two screws holding the cover to the embedded computer's housing.

Refer to the following figure for the location of the console port:

Installing the SD Card and mSATA Card

The UC-8410A comes with a SD card slot and an mSATA socket for storage expansion. To replace or install the SD card, or to install an mSATA card, follow these steps:

1. Use a screwdriver to remove the screws on the rear and side panels of the cover over the mSATA socket.
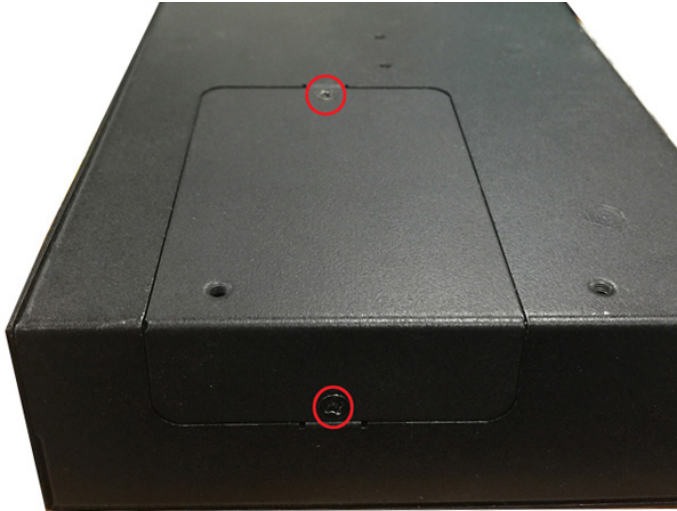
2. Remove the cover to access the SD-card slot and the mSATA socket.

3. Push the SD card in gently to release it and remove the SD card to insert a new one in the socket.
   Insert the mSATA card into the socket and fasten the screws.
   Please note that the mSATA card is NOT included in the product package and must be purchased separately. Standard mSATA card types have been tested with the UC-8410A computer and have been found to work normally.

USB

The UC-8410A supports 2 USB 2.0 hosts for external storage expansion. The USB hosts are located on the front panel.

DI/DO

The UC-8410A has 4 channels for digital outputs and 4 channels digital inputs. The pinouts for the I/Os are shown in the following figures:
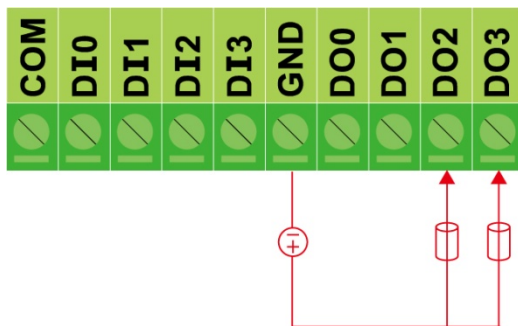
Digital Input Wiring

Dry Contact
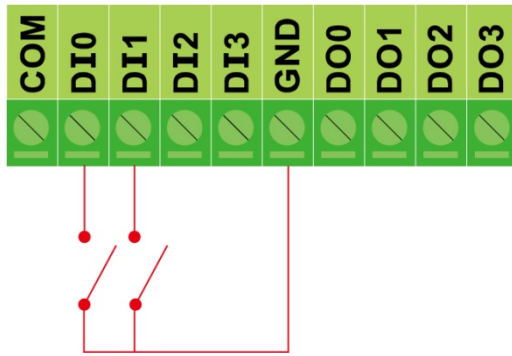
Wet Contact
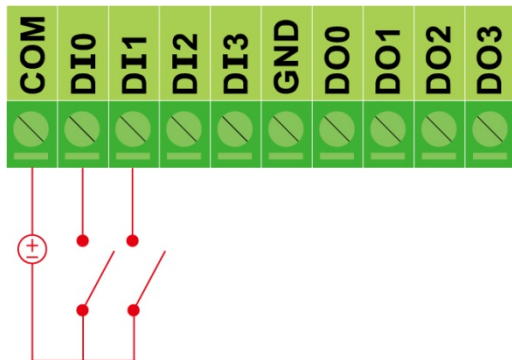
| NOTE	If you are using wet contacts, you must connect "COM" to power.

Digital Output Wiring

Installing the Wireless Modules (Not for –NW Module)

The UC-8410A comes with one internal socket that allows you to install either a Wi-Fi module or a cellular module.

To install a wireless module you must first remove the four screws on the top panel, two screws on the front panel, and two screws on the rear panel, and remove the top cover of the UC-8410A. See the following figures for details on the location of the screws:
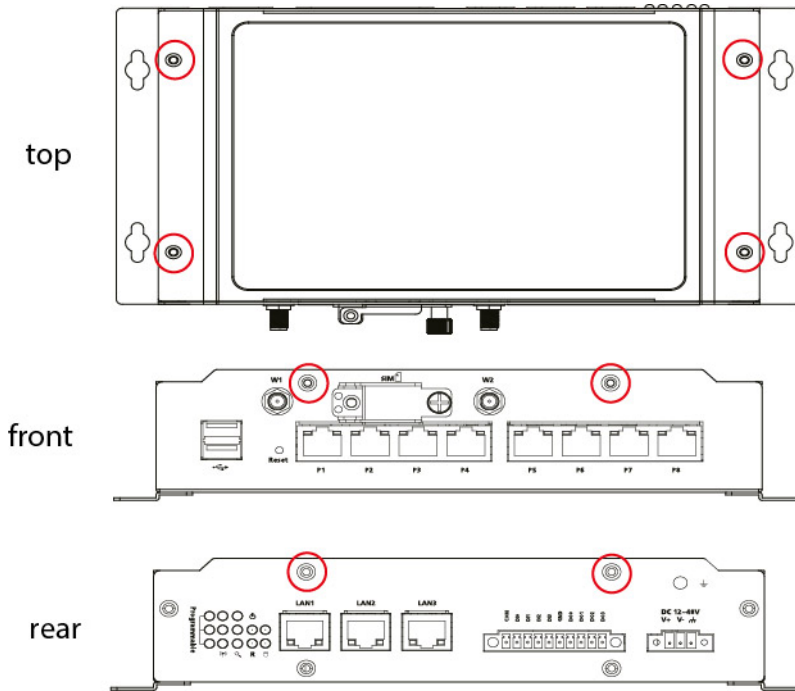
NOTE	The top cover comes loose only after you have removed all eight screws as indicated in the diagrams.

Installing the Wi-Fi Module

The Wi-Fi Module package includes 1 Wi-Fi module, 2 Wi-Fi antenna cables and connectors, 1 thermal pad, 2 black screws 2 locking washers, and 2 nuts.
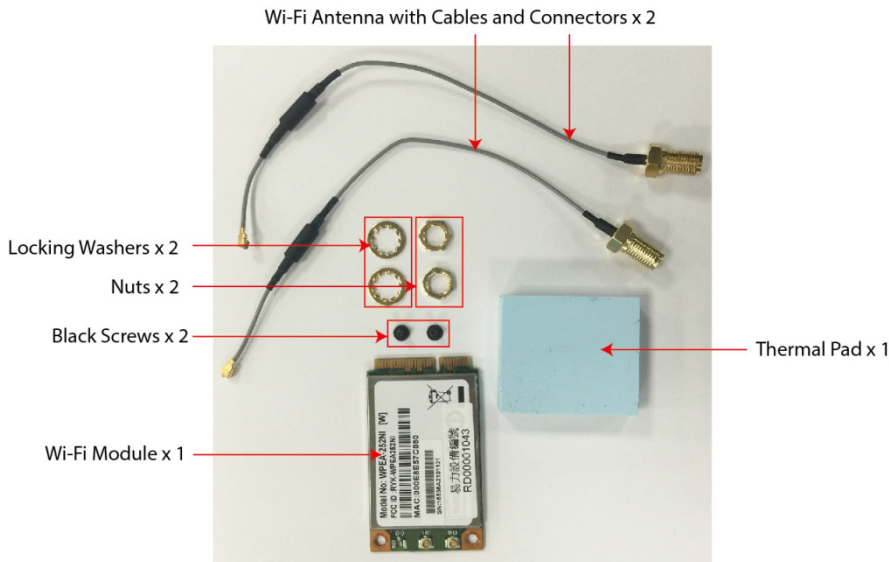
Follow these steps to install the wireless module.

1. Find the location of the module socket.
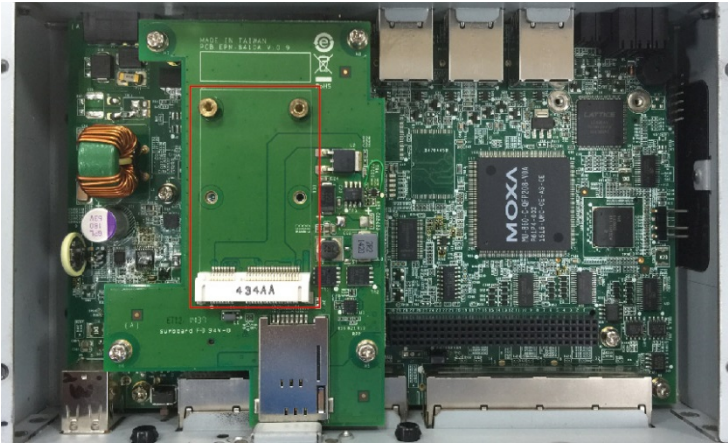
2. Insert the module in the socket and fasten the two black screws on the module.

3. Attach one end of the Wi-Fi cable on the connector marked CH0, and then connect the other end of the cable on the W1 hole on the front panel of the computer.Remove the antenna hole protection cover before you do so.
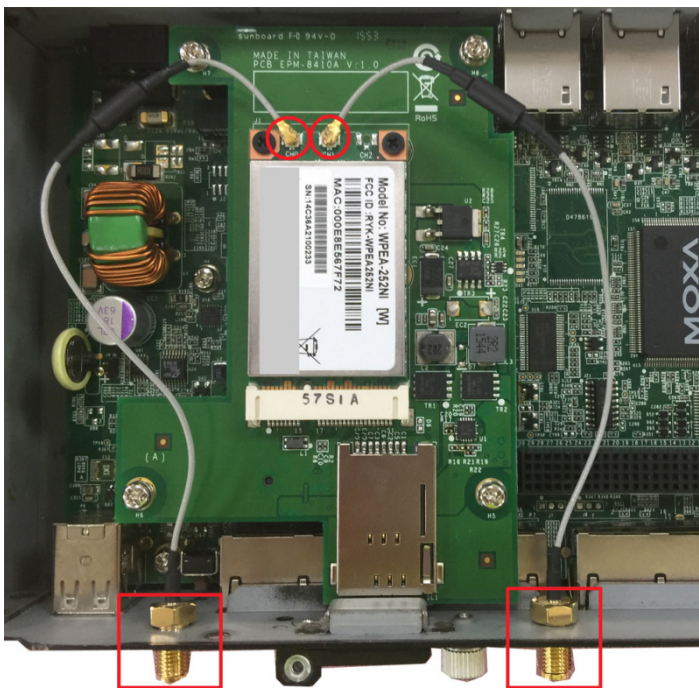
4. Pass the antenna mount's threaded connection ring through the mounting hole, hold the locking washer against the rear panel and secure the antenna connector by tightening the nut onto the threaded protection ring.
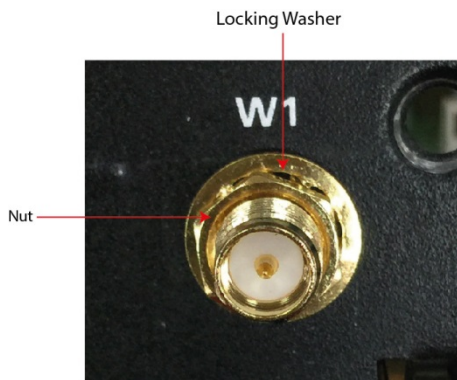
Use the method described in steps 3 and 4 to connect the second antenna cable. Attach one end of the Wi-Fi cable on the connector marked CH1, and then connect the other end of the cable on the W2 hole on the front panel of the computer. When finished, connect the antenna.

5. Place the thermal pad on the module and check to make sure the internal antenna wire is securely connected to the Wi-Fi module.


6. Connect the Wi-Fi antenna to the computer via the connector provided on the rear panel.

7. Reattach the cover on to the computer and fasten the screws to secure it.
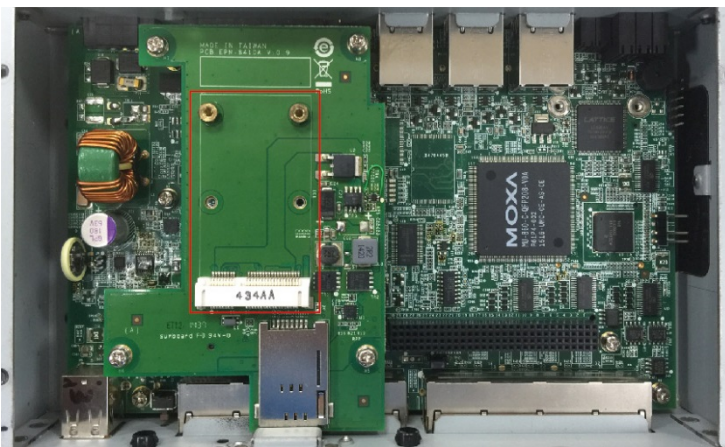
Installing the Cellular Module

Unpack the cellular module package and check the contents. The package should contain 1 cellular module, 1 cellular antenna cable and connector, 1 thermal pad, 2 black screws, 1 locking washer, and 1 nut.
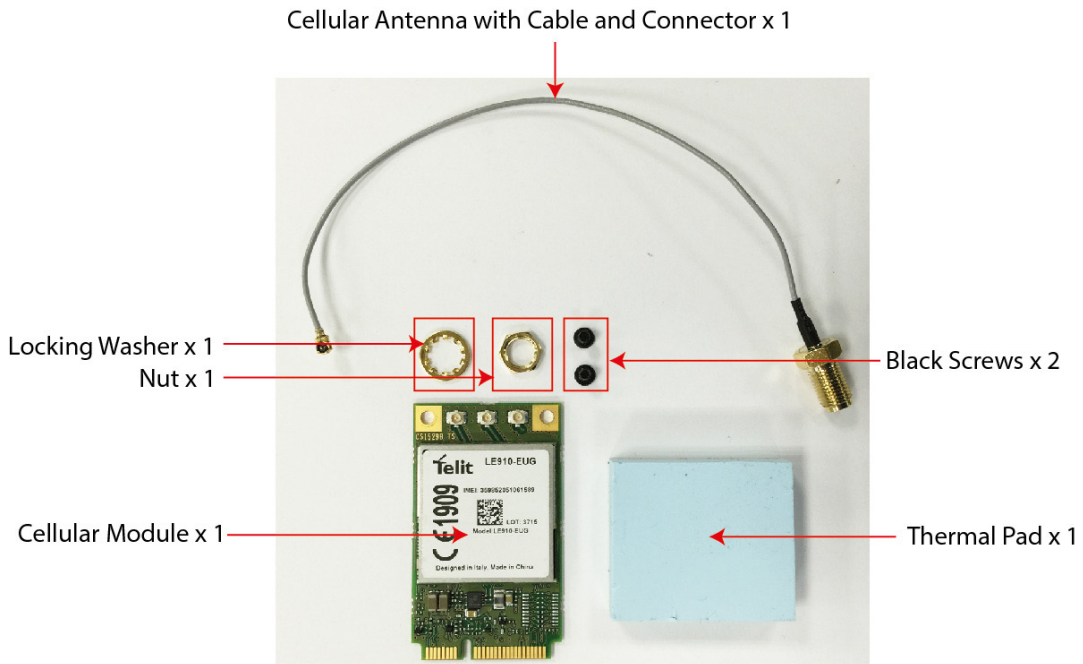
Follow these steps to install the cellular module:

1. Find the location of the module socket.

2. Insert the module into the socket and fasten the two black screws on the module.


3. Attach one end of the cellular cable on the central connector, and then connect the other end of the cable on the W1 hole on the front panel of the computer.Remove the antenna hole protection cover before you do so.

4. Pass the antenna mount's threaded connection ring through the mounting hole, keeping the locking washer against the rear panel face. Secure the antenna connector by tightening the nut onto the threaded protection ring.

5. Place the thermal pad on the module and check to make sure the internal antenna wire is securely connected to the cellular module.
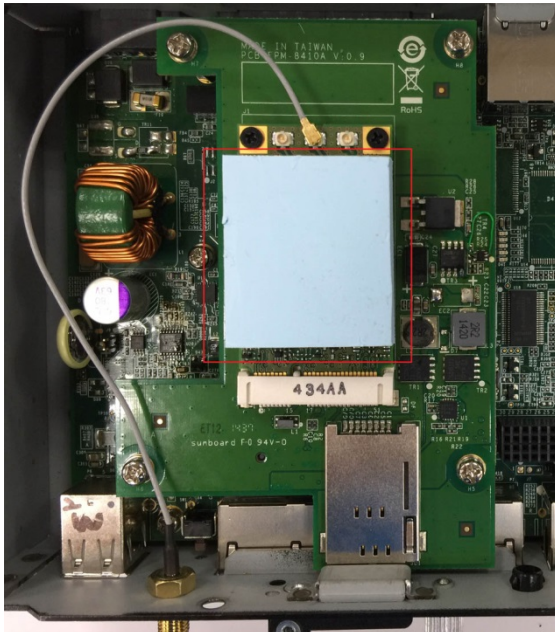
6. Connect the cellular antenna to the computer via the connectors provided on the rear panel.
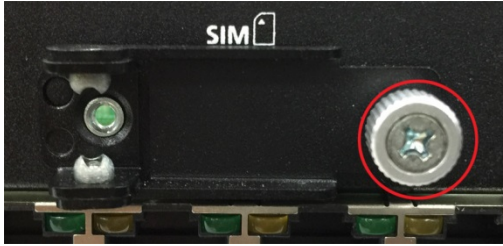

7. Reattach the cover on to the computer and fasten the screws to secure it in place.

Installing the SIM Card

Follow these steps to install the SIM card for the cellular module.

1. Unfasten the screw on the SIM card holder cover located on the front panel of the computer.

2. Insert the SIM card into the slot. Make sure you insert the card in the direction indicated above the card slot.

3. Close the cover and fasten the screw.

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Regulatory Approval Statements

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.