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UNO-2160

Celeron-400 Universal Network Controller with PC/104 extension

User Manual

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This manual is for UNO-2160.

Part No. 2002160000

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CHAPTER 1

Overview

This chapter provides an overview of UNO-2160's specifications.

Sections include:

- Introduction
- Hardware specification
- Safety precautions
- Chassis dimensions

Chapter 1 Overview

1.1 Introduction

UNO-2160 is an embedded Application Ready Platform (ARP) that can shorten your development time and offers rich networking interfaces to fulfill extensive needs in different projects. Advantech's Universal Network Controller is designed to be a total solution for network enabled Application Ready Platforms.

Leveraging field-approved and worldwide approved real-time OS technology, Advantech's UNO-2000 series provides a Windows CE .NET and Windows XP Embedded ready solution, and supports several standard networking interfaces, such as Ethernet, Wireless LAN, RS-232/422/485 and so on. Because of its openness, great expansion capability and reliable design (fanless and diskless), the UNO-2000 series are ideal embedded platforms for implementing custom applications for diversified applications.

1.2 Hardware Specifications

- **CPU:** Celeron-400 MHz Ultra low-voltage version
- **Memory:** 256/512 MB SDRAM on board (Default: 256 MB SDRAM).
- **Battery-backup RAM:** 512 KB Battery-backup RAM
- **VGA/Keyboard/Mouse:** DB-15 VGA Connector, PS/2 keyboard and mouse
- **Serial Ports:** 2 × RS-232 and 2 x RS-232/422/485 with DB-9 connectors. Automatic RS-485 data flow control
- **Serial Speeds:** RS-232: 50~115.2 kbps, RS-422/485: 50~921.6 kbps
- **LAN:** Two 10/100 Base-T RJ-45 Ports
- **USB interface:** Two USB ports, USB UHCI, Rev. 1.1 compliant
- **Printer port:** One printer port
- **PC Card:** One PC Card slot. Supports CardBus (Card-32) Card and 16-bit (PCMCIA 2.1/JEIDA4.2) Card.
  Supports +5 V, +3.3 V and +12 V @ 120 mA working power
- **SSD:** One internal Type I / Type II CompactFlash card slot
- **LEDs:** Power, IDE, Alarm for RAM Backup Battery
- **PC/104:** Two PC/104 Extension. (Optional)
- **HDD:** HDD extension kit for installation of one standard 2.5” HDD
- **Anti-Shock:** 20 G @ Wall mounting, IEC 68 2-27, half sine, 11 ms w/ HDD50 G @ Wall mounting, IEC 68 2-27, half sine, 11 ms w/CF
- **Anti-Vibration:** 2 Grms w/CF @IEC 68 section 2-64, random, 5 ~ 500 Hz, 1 Oct./min, 1 hr/axis.0.5 Grms w/ HDD @ IEC 68 section 2-64, random, 5 ~ 500 Hz, 1 Oct./min, 1 hr/axis
- **Power supply:** 9 ~ 36 VDC
- **Power consumption:** Max. 35 W
- **Operating temperature:** -10~50°C (14~122° F)@ 5~85% relative humidity.
- **Relative humidity:** 95% @ 40°C
- **Weight:** 1.6 kg
- **Chassis size (W × L × H):** 255 × 152 × 50 mm (10” × 6.0” × 2.0”)
- **Software options:** Windows® XP Embedded, Windows NT/2000/XP, Windows CE .NET V4.2

1.3 Safety Precautions

The following sections tell how to make each connection. In most cases, you will simply need to connect a standard cable.

Warning!



Always disconnect the power cord from your chassis whenever you are working on it. Do not connect while the power is on. A sudden rush of power can damage sensitive electronic components. Only experienced electronics personnel should open the chassis.

Caution! *Always ground yourself to remove any static electric charge before touching UNO-2160. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag.*

1.4 Chassis Dimensions

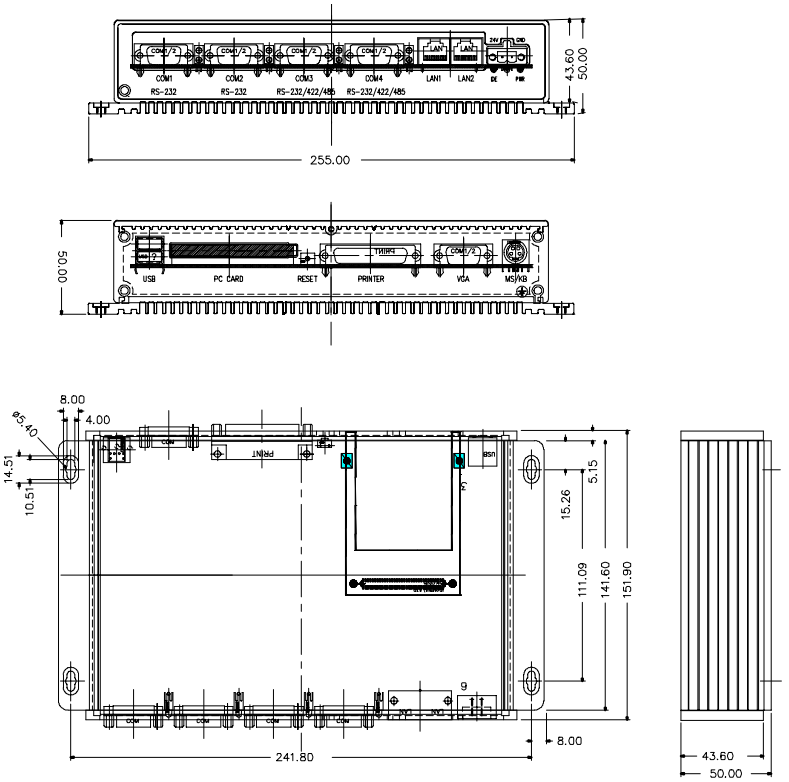


Figure 1.1: Chassis Dimensions

CHAPTER 2

Hardware Functionality

This chapter shows how to setup the UNO-2160's hardware functions, including connecting peripherals, setting switches and indicators.

Sections include:

- Peripherals
- RS-232 Interface
- RS-232/422/485 Interface
- LAN / Ethernet Connector
- Power Connector
- PS/2 Mouse and Keyboard Connector
- USB Connector
- PCMCIA: PC Card Slot
- VGA Display Connector
- Battery Backup SRAM
- Reset Button

Chapter 2 Hardware Functionality

2.1 Introduction

The following two figures show the connectors on UNO-2160. The following sections give you detailed information about function of each peripheral.

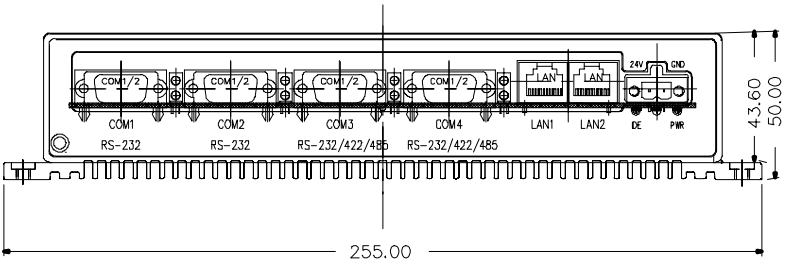


Figure 2.1: Front panel of UNO-2160

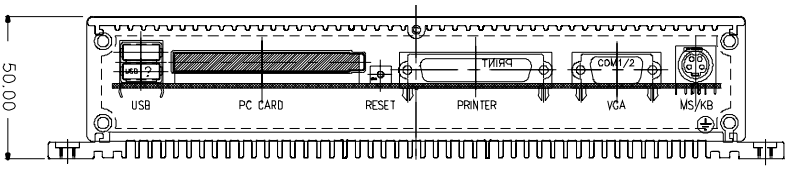


Figure 2.2: Rear panel of UNO-2160

2.2 RS-232 Interface (COM1~COM2)

The UNO-2160 offers two standard RS-232 serial communication interface ports: COM1 and COM2. Please refer to A.3 for their pin assignments.

IRQ and Address Setting

The IRQ and I/O address range of COM1 and COM2 are listed below:

COM1: 3F8H, IRQ4

COM2: 2F8H, IRQ3

2.3 RS-232/422/485 Interface (COM3~COM4)

The UNO-2160 offers two RS-232/422/485 serial communication interface ports: COM3 and COM4. Please refer to Appendix A.4 for their pin assignments. The default setting of COM3 and COM4 are RS-422/485.

2.3.1 16C550 UARTs with 16-byte standard

Advantech UNO-2160 comes with TI16C550 UARTs containing 16 bytes FIFOs.

2.3.2 RS-422/485 detection

In RS-422/485 mode, UNO-2160 automatically detects signals to match RS-422 or RS-485 networks. (No jumper change required)

2.3.3 Automatic Data Flow Control Function for RS-485

In RS-485 mode, UNO-2160 automatically detects the direction of incoming data and switches its transmission direction accordingly. So no handshaking signal (e.g. RTS signal) is necessary. This lets you conveniently build an RS-485 network with just two wires. More importantly, application software previously written for half duplex RS-232 environments can be maintained without modification.

2.3.4 Termination Resistor (JP6)

The onboard termination resistor (120 ohm) for COM3/COM4 can be used for long distance transmission or device matching. (Default Open.)

2.3.5 RS-232/422/485 Selection

COM3 and COM4 support 9-wire RS-232, RS-422 and RS-485 interfaces. The system detects RS-422 or RS-485 signals automatically in RS-422/485 mode.

To select between RS-422/485 and RS-232 for COM3, adjust JP4.

To select between RS-422/485 and RS-232 for COM4, adjust JP5.

Jumper setting for RS-422/485 interface: (Default setting). (JP4 and JP5)

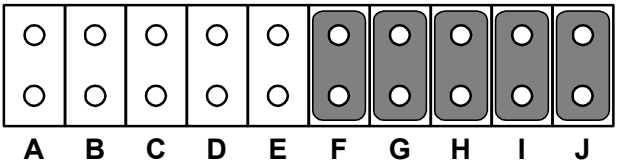


Figure 2.3: RS-422/485 jumper setting

Jumper setting for RS-232 interface: (JP4 and JP5)

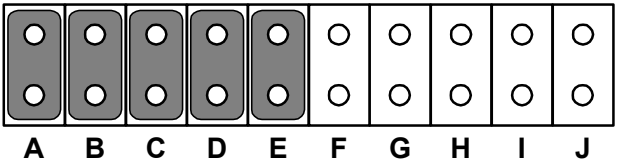


Figure 2.4: RS-232 jumper setting

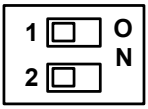
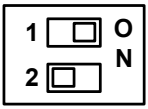
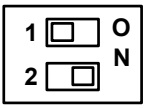
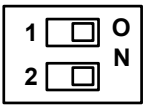
2.3.6 RS-485 Auto Flow Control Mode and RS-422 Master/Slave Mode Selection

You can set the "Auto Flow Control" mode of RS-485 or "Master/Slave" mode of RS-422 by using the SW3 DIP switch for each RS-422/485 port.

In RS-485, if the switch is set to "Auto", the driver automatically senses the direction of the data flow and switches the direction of transmission. No handshaking is necessary.

In RS-422, if DIP switch is set to "On," the driver is always enabled, and always in high or low status.

Table 2.1: Auto Flow Control and RS-422 Slave/Master Selection

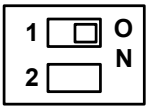
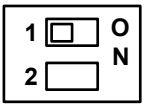
SW3 DIP Switch Setting	COM Port	Mode Selections
	COM3	RS-422: Slave mode
		RS-485: Auto flow control
	COM4	RS-422: Slave mode
		RS-485: Auto flow control
	COM3	RS-422: Master mode
		RS-485: N/A
	COM4	RS-422: Slave mode
		RS-485: Auto flow control
	COM3	RS-422: Slave mode
		RS-485: Auto flow control
	COM4	RS-422: Master mode
		RS-485: N/A
	COM3	RS-422: Master mode
		RS-485: N/A
	COM4	RS-422: Master mode
		RS-485: N/A

2.3.7 IRQ and Address Setting

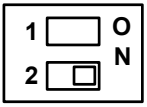
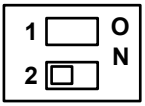
The IRQ and I/O address range of COM3 and COM4 are listed below:

- **COM3:** $3E8_H$, IRQ10 (Independent IRQ), IRQ10 (Share IRQ)
- **COM4:** $2E8_H$, IRQ5 (Independent IRQ), IRQ10 (Share IRQ)
- **Vector address for share IRQ:** $1D0_H$

You can set "Share IRQ" or "Independent IRQ" by the first switch of SW2.

Table 2.2: IRQ Setting via switch 1 at SW2	
Switch 1 at SW2 setting	**Function**
	Share IRQ (default)
	Independent IRQ

You can adjust the transmission rate by the second switch of SW2.

Table 2.3: IRQ Setting via switch 1 at SW2	
Switch 1 at SW2 setting	**Function**
	Speed x 8*
	Speed x 1 (default)

* To increase the normal baud rates by eight times, (e.g. if 115.2K bps is set, the baud rate will be increased to 921.6K bps), set switch 2 of SW2 to "on".

2.4 LAN: Ethernet Connector

The UNO-2160 is equipped with a Realtek RTL8139C Ethernet LAN controller that is fully compliant with IEEE 802.3u 10/100Base-T CSMA/CD standards. The Ethernet port provides a standard RJ-45 jack on board, and LED indicators on the front side to show its Link (Green LED) and Active (Yellow LED) status.

2.5 Power Connector

The UNO-2160 comes with a Phoenix connector that carries 9~36 VDC external power input, and features reversed wiring protection. Therefore, it will not cause any damage to the system by reversed wiring of ground line and power line. Please refer to Appendix A.6

2.6 PS/2 Keyboard and Mouse Connector

The UNO-2160 provides a PS/2 keyboard and PS/2 mouse connector. A 6-pin mini-DIN connector is located on the rear panel of the UNO-2160. The UNO-2160 comes with an adapter to convert from the 6-pin mini-DIN connector to two 6-pin mini-DIN connectors for PS/2 keyboard and PS/2 mouse connection. Please refer to Appendix A.7 for its pin assignments.

2.7 USB Connector

The USB connector is used for connecting any device that conforms to the USB interface. Many recent digital devices conform to this standard. The USB interface supports Plug and Play, which enables you to connect or disconnect a device whenever you want, without turning off the computer.

The UNO-2160 provides two connectors of USB interfaces, which gives complete Plug & Play and hot swapping for up to 127 external devices. The USB interface complies with USB UHCI, Rev. 1.1 compliant. The USB interface can be disabled in the system BIOS setup. Please refer to Appendix A.8 for its pin assignments.

2.8 PCMCIA: PC Card Slot

The UNO-2160 provides one PC Card slot that supports CardBus (Card-32) cards and 16-bit (PCMCIA 2.1/JEIDA 4.2) card standards. It supports +3.3 V, +5 V and +12 V @ 120 mA working voltage. The PC Card is 85.6 mm long by 54 mm wide (3.37" x 2.126"), use a 68-pin connector and a removable module standardized by PCMCIA that is known as "PCMCIA card."

PS: PCMCIA interrupt assignment is IRQ 9.

2.9 VGA Display Connector

The UNO-2160 provides a VGA controller (Chipset VIA Twister chip with Integrated S3 Savage4 2D/3D Video Accelerator) for a high resolution VGA interface. It supports VGA and VESA, up to 1280 x 1024 @ 8 bpp / 1024 x 768 @ 16bpp resolution and up to 32 MB shared memory. The VGA interface is reserved for system testing and debugging. The UNO-2160's JP8 is a 6-pin mini connector and CN7 is a 15-pin connector for a VGA monitor. A VGA cable is attached to convert from a 6-pin mini connector to standard VGA connector. You can choose one of the VGA interfaces for system testing and debugging. Pin assignments for the VGA display are detailed in Appendix A.9.

2.10 Battery Backup SRAM

UNO-2160 provides 512 KB of battery backed SRAM. This ensures that you have a safe place to store critical data. You can now write software applications without being concerned that system crashes will erase critical data from the memory.

There is a BTRY LED in the front panel of the UNO-2160, please replace the lithium battery with a new one if the BTRY LED is activated.

2.10.1 Lithium Battery Specification

- **Type:** BR2032 (Using CR2032 is NOT recommended)
- **Output voltage:** 3 V_{DC}
- **Location:** the backside of UNO-2160 board.

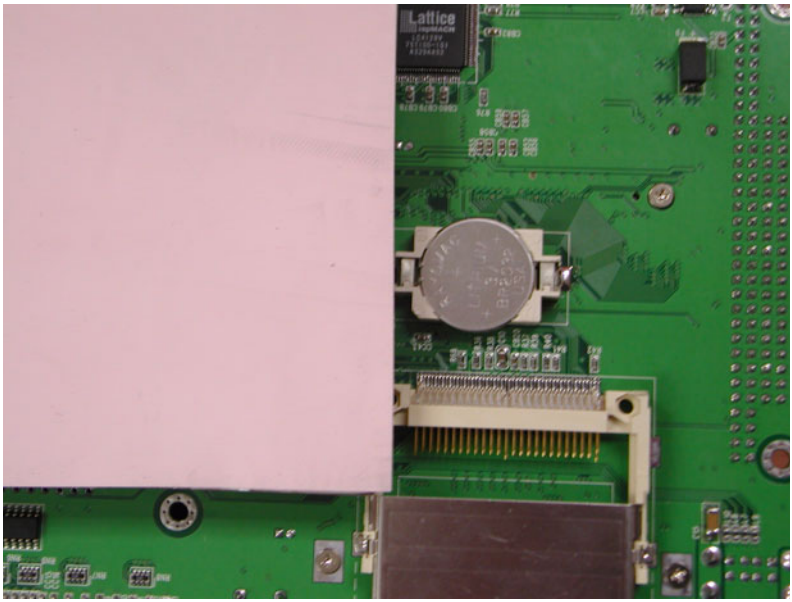


Figure 2.5: The location of the lithium battery for SRAM

2.11 Reset Button

Press the "Reset" button to activate the reset function. (SW1)

CHAPTER 3

Initial Setup

This chapter introduces how to initialize the UNO-2160.

Sections include:

- Introduction
- Inserting a CompactFlash™ Card
- Chassis Grounding
- Conneting Power
- Connecting a Hard Disk
- BIOS Setup and System Assignments

Chapter 3 Initial Setup

3.1 Inserting a CompactFlash™ Card

The procedure for installing a CompactFlash™ card into the UNO-2160 is detailed below, please follow these steps carefully.

1. Remove the power cord.
2. Unscrew the four screws from the rear panel of the UNO-2160.
3. Remove the rear panel.
4. Plug a CompactFlash card with your OS and application program into a CompactFlash card slot on board.
5. Screw back the rear panel with four screws.

Note *The CompactFlash slot is allocated as "Secondary IDE Master".*

3.2 Chassis Grounding

The aluminum made UNO-2160 provides good EMI protection and a stable grounding base. There is an easy-to-connect chassis grounding point for you to use.

Please connect chassis ground of UNO-2160 with "EARTH" as ground.

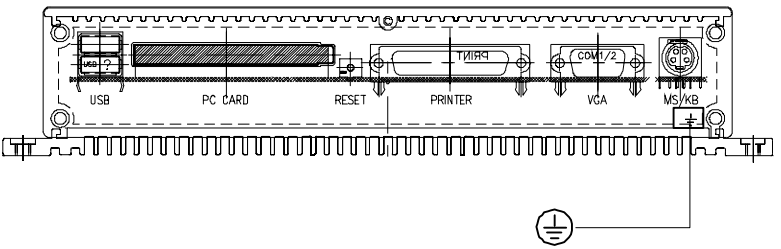


Figure 3.1: Chassis Grounding Connection

You can select if you wish to combine the chassis grounding point with the system grounding by using an onboard jumper selection. (JP7)

	Open - Separates system power ground and chassis ground.
	Closed - Connects system power ground and chassis ground. (default)

3.3 Connecting Power

Connect the UNO-2160 to a 9~36 VDC power source. The power source can either be from a power adapter or an in-house power source.

3.4 Installing a Hard Disk

The procedure for installing a hard disk into the UNO-2160 is below. Please follow these steps carefully.

1. Remove the power cord.
2. Unscrew four screws from the rear panel of the UNO-2160.
3. Remove the rear panel.
4. Connect the IDE flat cable to Primary (recommended; CN8) or secondary IDE connector (CN9), then connect the other side of the connector to the hard disk.
5. Screw back the rear panel with the four screws.

3.5 BIOS Setup and System Assignments

UNO-2160 adopts Advantech's SOM-4475 CPU module. Further information about the SOM-4475 CPU module, can be found in SOM-4475's user's manual. You can find this manual on the UNO-2160's driver and utility CD-ROM.

Please note that you can try to "LOAD BIOS DEFAULTS" from the BIOS Setup manual if the UNO-2160 does not work properly.

Appendix A

System Settings and Pin Assignments

Appendix A System Settings and Pin Assignments

A.1 System I/O Address and Interrupt Assignment

Table A.1: UNO-2160 System I/O Ports

Address Range	Device
000-01F	DMA controller (slave)
020-03F	Interrupt controller 1, (master)
040-05F	8254 timer/counter
060-06F	8042 (keyboard controller)
070-07F	Real-time clock, non-maskable interrupt (NMI)mask
080-09F	DMA page register,
0A0-0BF	Interrupt controller 2 (slave)
0C0-0DF	DMA controller (master)
0F0	Clear math co-processor
0F1	Reset math co-processor
0F8-0FF	Math co-processor
1D0	Vector address; for COM port share IRQ
1E0	Battery backup resource
11E	Battery backup resource
1F0-1F8	1st fixed disk
200-207	Game I/O
278-27F	Reserved
2E8-2EF	Serial port 4
2F8-2FF	Serial port 2
300-31F	Ethernet**
360-36F	LPT2
378-37F	Parallel printer port 1 (LPT1)
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome display
3C0-3CF	Reserved

Table A.1: UNO-2160 System I/O Ports

Address Range	Device
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3E8-3EF	Serial port 3
3F8-3FF	Serial port 1
443	Watchdog timer
DC000-DFFFF	Battery backup resource

Table A.2: UNO-2160 Interrupt Assignment

Interrupt No.	Interrupt Source
NMI	Parity error detected
IRQ 0	Interval timer
IRQ 1	Keyboard
IRQ 2	Interrupt from controller 2 (cascade)
IRQ 3	COM2
IRQ 4	COM1
IRQ 5	COM4 (Independent IRQ)
IRQ 6	Diskette controller (FDC)
IRQ 7	Parallel port 1 (print port)
IRQ 8	Real-time clock
IRQ 9	PCMCIA
IRQ 10	COM3 (Independent IRQ)/COM3&COM4 Share IRQ
IRQ 11	Reserved for watchdog timer
IRQ 12	PS/2 mouse
IRQ 13	INT from co-processor
IRQ 14	Primary IDE
IRQ 15	Secondary IDE for CompactFlash

A.2 Board Connectors and Jumpers

There are several connectors and jumpers on the UNO-2160 board. The following sections tell you how to configure the UNO-2160 hardware setting. Figure A-1 and Figure A-2 show the locations of UNO-2160's connectors and jumpers.

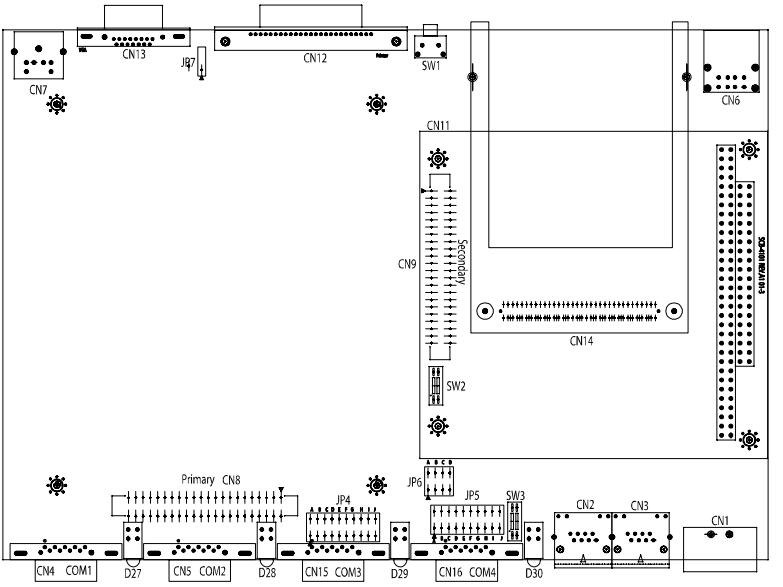


Figure A.1: UNO-2160 connector and jumper locations (frontside)

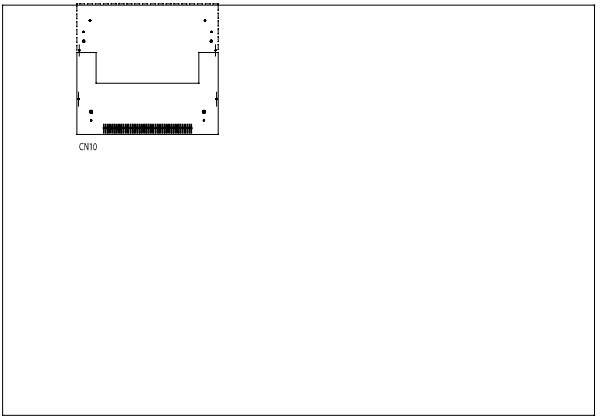


Figure A.2: UNO-2160 connector and jumper locations (backside)

Table A.3: UNO-2160 Connectors and Jumpers

Label	Function
CN1	Phoenix power connector
CN2	Ethernet port 1
CN3	Ethernet port 2
CN4	COM1 RS-232 serial port
CN5	COM2 RS-232 serial port
CN15	COM3 RS-232/422/485 serial port
CN16	COM4 RS-232/422/485 serial port
CN6	USB connector
CN7	PS/2 keyboard and mouse connector
CN8	Primary IDE connector
CN9	Secondary IDE connector
CN11	PC/104 slot
CN12	Printer port
CN13	VGA DB15 display connector
CN14	PC card slot
JP4	COM3 RS-232/422/485 selection
JP5	COM4 RS-232/422/485 selection
JP6	Terminator resistor (120 ohm) for COM3/COM4 (RS-422/485)
JP7	System grounding jumper
SW1	Reset button
SW2	Share IRQ/Independent IRQ selection /Speed selection
SW3	COM3/COM4 RS-422 master/slave selection

A.3 RS-232 Standard Serial Port (COM1~COM2)

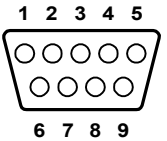


Table A.4: RS-232 standard serial port pin assignments

Pin	RS-232 Signal Name
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

A.4 RS-232/422/485 Serial Port (COM3~COM4)

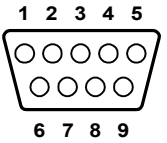


Table A.5: RS-232/422/485 serial port pin assignments

Pin	RS-232	RS-422	RS-485
1	DCD	Tx-	DATA-
2	RxD	Tx+	DATA+
3	TxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC

A.5 Ethernet RJ-45 Connector (LAN1~LAN2)

Table A.6: Table A-5: Ethernet RJ-45 connector pin assignments

Pin	10/100Base-T Signal Name
1	XMT+
2	XMT-
3	RCV+
4	NC
5	NC
6	RCV-
7	NC
8	NC

A.6 Phoenix Power Connector (PWR)

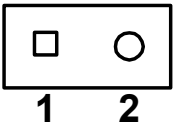


Table A.7: Power connector pin assignments

Pin	10/100Base-T Signal Name
1	+9~36VDC
2	GND

A.7 PS/2 Keyboard and Mouse Connector

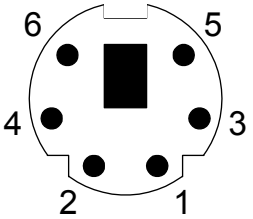


Table A.8: Keyboard and Mouse connector pin assignments

Pin	Signal Name
1	KB DATA
2	MS DATA
3	GND
4	VCC
5	KB Clock
6	MS Clock

A.8 USB Connector (USB1~USB2)

Table A.9: USB connector pin assignments

Pin	Signal Name	Cable Color
1	VCC	Red
2	DATA+	White
3	DATA-	Green
4	GND	Black

A.9 VGA Display Connector

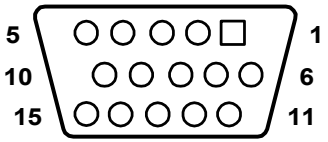


Table A.10: Table A-9: VGA adaptor cable pin assignment

Pin	Signal Name
1	Red
2	Green
3	Blue
4	NC
5	GND
6	GND
7	GND
8	GND
9	NC
10	GND
11	NC
12	NC
13	H-SYNC
14	V-SYNC
15	NC

Appendix B

Programming the Watchdog Timer

Appendix B Programming the Watchdog Timer

To program the watchdog timer, you must write a program which writes I/O port address 443 (hex). The output data is a value of time interval. The value range is from 01 (hex) to 3E (hex), and the related time interval is 1 sec. to 62 sec.

Data	Time Interval
01	1 sec.
02	2 sec.
03	3 sec.
04	4 sec.
..	
..	
..	
3E	62 sec.

After data entry, your program must refresh the watchdog timer by rewriting the I/O port 443 (hex) while simultaneously setting it. When you want to disable the watchdog timer, your program should read I/O port 443 (hex).

The following example shows how you might program the watchdog timer in BASIC:

```
10   REM Watchdog timer example program
20   OUT &H443, data REM Start and restart the watchdog
30   GOSUB 1000 REM Your application task #1,
40   OUT &H443, data REM Reset the timer
50   GOSUB 2000 REM Your application task #2,
60   OUT &H443, data REM Reset the timer
70   X=INP (&H443) REM, Disable the watchdog timer
80   END
1000  REM Subroutine #1, your application task
..
..
..
1070   RETURN
2000   REM Subroutine #2, your application task
..
..
..
2090   RETURN
```

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