UNO-2176

Pentium M/Celeron M UNO
with 2 X LAN, 6 X COM, 16 x DI/O

User Manual

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This manual is for UNO-2176.

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Product Warranty

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for one year from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details. If you think you have a defective product, follow these steps:

Step 1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any on-screen messages you get when the problem occurs.

Step 2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.

Step 3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.

Step 4. Carefully pack the defective product, a fully completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

Step 5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

FCC Class A

Note: 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.

Technical Support and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.

Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:

- Product name and serial number
- Description of your peripheral attachments
- Description of your software (OS, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Contents

CHAPTER 1

Overview

This chapter provides an overview of UNO-2176's specifications.

Sections include:

- Introduction
- Hardware specification
- Safety precautions
- Chassis dimensions

Chapter 1 Overview

1.1 Introduction

UNO-2176 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:** Pentium M / Celeron M
- **Memory:** 512MB on board
- **Battery-backup RAM:** 512 KB Battery-backup RAM
- **VGA/Keyboard/Mouse:** DB-15 VGA Connector, PS/2 keyboard & mouse
- **Serial Ports:** 2 x RS-232
  2 x Isolated RS-232/422/485 with DB9 connectors
  2 x Isolated RS-232/422/485 with 5-pin screw terminal
  Automatic RS-485 data flow control
  Isolation protection: 2,000 VDC
  Surge protection: 2,000 VDC (EFT)

- **Serial Speeds:** (COM1,COM2) RS-232: 50 ~ 115.2 kbps,
  (COM3-COM6) RS-232: 300 ~ 115.2 kbps
  RS-422/485: 300 ~ 921.6 kbps (Max.)
- **LAN:** Two 10/100 Base-T RJ-45 Ports
- **USB interface:** Two USB ports, USB UHCI, Rev. 2.0 compliant
- **SSD:** One internal Type I / Type II CompactFlash card slot
- **LEDs:** IDE, Alarm for RAM Backup Battery, Programmable LED and Serial (Tx, RX, COM1~COM4)
- **PC/104**: PC/104 slot, Supports +5V Power
- **HDD:** One standard 2.5" HDD
- **Digital Inputs:** 8-ch wet contact
  2,000 VDC isolation
  2,000 VDC ESD protection
  70 VDC over-voltage protection
  ±50 VDC input range and 10 kHz speed
  Interrupt handling speed: 10 kHz
- **Input Voltage:** Logic 0: 0 ~ 3 VDC
  Logic 1: 10 ~ 50 VDC

- **Input Currents:** 10 VDC: 1.7 mA (typical)
  12 VDC: 2.1 mA (typical)
  24 VDC: 4.4 mA (typical)
  48 VDC: 9.0 mA (typical)
  50 VDC: 9.4 mA (typical)
- **Digital Outputs:** 8-ch DO
  2,000 VDC Isolation &
  200 mA max/channel sink current
  Keep output status after system hot reset
  5 ~ 40 VDC output range and 10 kHz speed
- **Timer/Counter:** Counter source: DI1 & DI3
  Pulse output: DO2 & DO3
  Can be cascaded as one 32-bit counter/timer
  Down counting, preset counting value
  Timer time base: 100 kHz, 10 kHz, 1 kHz, 100 Hz
- **Watchdog Timer:** Programmable
- **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. 1 Grms w/ HDD @ IEC 68 section 2-64, random, 5 ~ 500 Hz, 1 Oct./min, 1 hr/axis
- **Power Requirement:** Min. 48 W (9 ~ 36 VDC) (e.g +24 V @ 2 A) (AT)
- **Power Consumption:** 24W (Typical)
- **Operating Temperature:**
  -20~65° C (-4~149° F)@ 5 ~ 85% RH (Celeron)
  -20~60° C (-4~149° F) @ 5 ~ 85% RH (Pentium Model)
- **Storage Temperature**: -20~80° C (-4~176° F)
- **Relative Humidity:** 95% @ 40°C
- **Weight:** 2.4 kg
- **Chassis Size (W × L × H):** 255 x 152 x 59 mm (10”× 6.0”× 2.36”)
- **Software:** Windows XP Embedded, Win2000/XP, Win CE 5.0
- **Certification**: CE, FCC Class A, UL

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-2176. 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

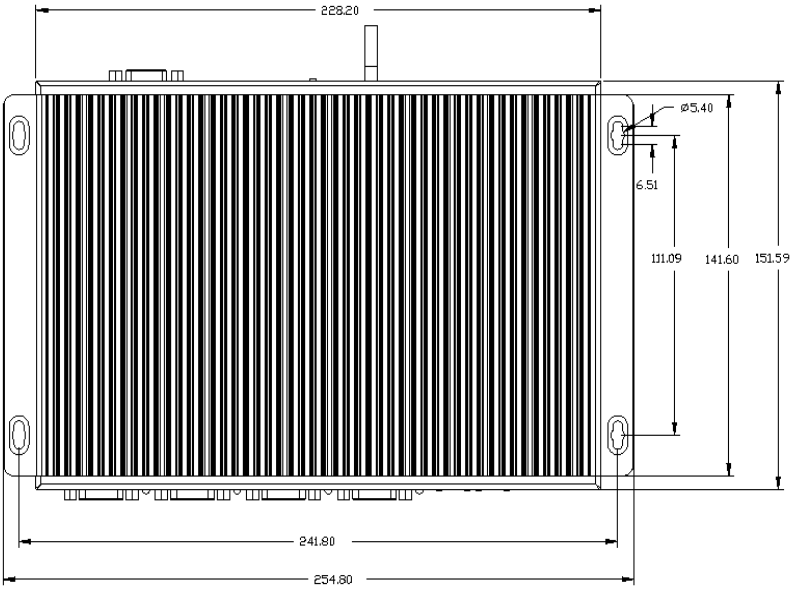


Figure 1.1: Chassis Dimensions 1

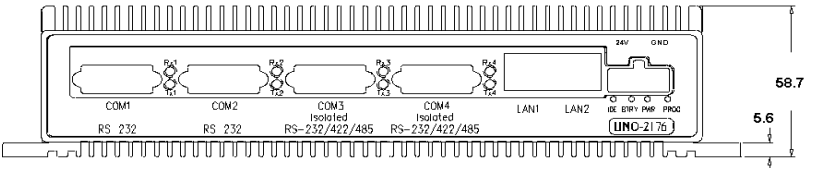


Figure 1.2: Chassis Dimensions 2

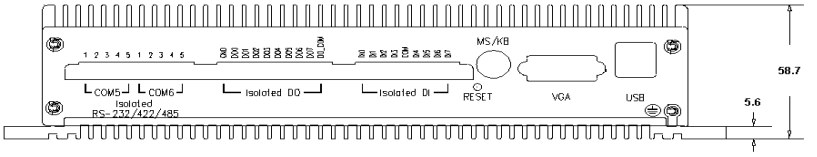


Figure 1.3: Chassis Dimensions 3

CHAPTER 2

Hardware Functionality

This chapter shows how to setup the UNO-2176's hardware functions, including connecting peripherals, setting switches and indicators.

Sections include:

- Introduction
- RS-232 Interface
- RS-232/422/485 Interface
- LAN / Ethernet Connector
- Power Connector
- PS/2 Mouse and Keyboard Connector
- USB Connector
- VGA Display Connector
- Battery Backup SRAM
- Reset Button
- Onboard Isolated Digital Input
- Onboard Isolated Digital Output
- Onboard Isolated Counter/Timer

Chapter 2 Hardware Functionality

2.1 Introduction

The following two figures show the connectors on UNO-2176. The following sections give you detailed information about function of each peripheral.

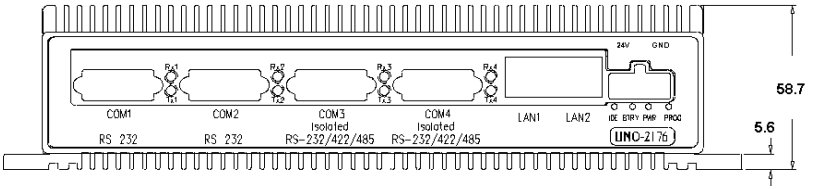


Figure 2.1: UNO-2176 Front Panel

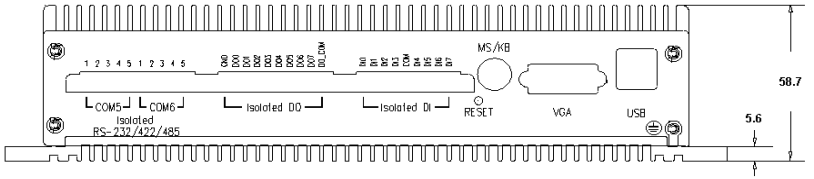


Figure 2.2: UNO-2176 Rear Panel

2.2 RS-232 Interface (COM1~COM2)

The UNO-2176 offers two standard RS-232 serial communication interface ports: COM1 and COM2. Please refer to A.3 for their pin assignments.

2.2.1 IRQ and Address Setting

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

COM1: 3F8H, IRQ4

COM2: 2F8H, IRQ3

COM3 & COM4 support 9-wire RS-232, RS-422 and RS-485 interfaces.

COM5 & COM6 support 5-wire RS-232, RS-422 and RS-485 interfaces.

2.3 RS-232/422/485 Interface (COM3~COM6)

The UNO-2176 offers four RS-232/422/485 serial communication interface ports: COM3 and COM6. COM3 and COM4 support 9-wire RS-232, RS-422 and RS-485 interfaces. COM5 and COM6 support 5-wire RS-232, RS-422 and RS-485 interfaces. Please refer to Appendix A.4 for their pin assignments. The default setting of COM3 and COM6 are RS-422/485.

2.3.1 16PCI954 UARTs with 128-byte Standard

Advantech UNO-2176 comes with Oxford 16PCI964 UARTs containing 128 bytes FIFOs.

2.3.2 RS-422/485 Detection

In RS-422/485 mode, UNO-2176 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-2176 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 (J1~J4)

The onboard termination resistor (120 ohm) for COM3/COM6 can be used for long distance transmission or device matching. (Default Open.)

Pin	Description
A	DATA+, DATA-, TX+, TX-
B	RX+, RX-

2.3.5 RS-232/422/485 Selection

COM3 and COM4 support 9-wire RS-232, RS-422 and RS-485 interfaces. COM5 and COM6 support 5-wire RS-232, RS-422 and RS-485 interfaces. The system detects RS-422 or RS-485 signals automatically in RS-422/485 mode. Please refer below table to adjust SW for selecting serial type of COM3~COM6.

Switch setting for RS-422/485 interface: (Default setting). (SW3~SW6)

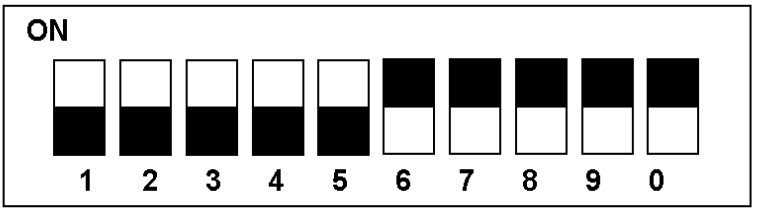


Figure 2.3: RS-422/485 Jumper Setting

Switch setting for RS-232 interface: (SW3~SW6)

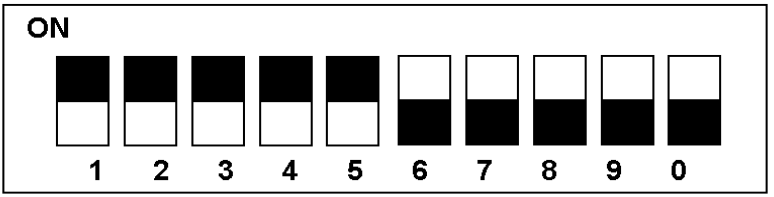


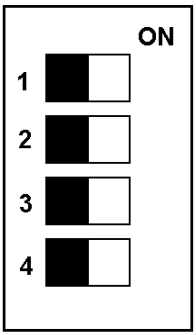
Figure 2.4: RS-232 Jumper Setting

2.3.6 RS-485 Auto Flow & RS-422 Master/Slave Mode

You can set the "Auto Flow Control" mode of RS-485 or "Master/Slave" mode of RS-422 by using the SW7 DIP switch for COM3~COM6.

In RS-485, if the switch is set to "Off", 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. Please refer below for the default setting.



SW7 Switch	Serial Port	Status	Status
1	COM3	ON	RS-422: Master mode RS-485: N/A
		OFF (Default)	RS-485: Auto flow control RS-422: Slave mode
2	COM4	ON	RS-422: Master mode RS-485: N/A
		OFF (Default)	RS-485: Auto flow control RS-422: Slave mode
3	COM5	ON	RS-422: Master mode RS-485: N/A
		OFF (Default)	RS-485: Auto flow control RS-422: Slave mode
4	COM6	ON	RS-422: Master mode RS-485: N/A
		OFF (Default)	RS-485: Auto flow control RS-422: Slave mode

2.4 LAN: Ethernet Connector

The UNO-2176 is equipped with a Realtek RTL8139DL 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-2176 comes with a Phoenix connector that carries 9~36 VDC (AT) 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-2176 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-2176. The UNO-2176 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-2176 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 EHCI, Rev. 2.0 compliant. The USB interface can be disabled in the system BIOS setup. Please refer to Appendix A.8 for its pin assignments.

2.8 VGA Display Connector

The UNO-2176 provides a VGA controller (Intel 855/852 GME, supports a single 1.5V accelerated graphics port interface) for a high resolution VGA interface. It supports CRT Mode: 1280 x 1024 @ 32bpp (60Hz), 1024 x 768 @ 32bpp (85Hz); LCD/Simultaneous Modes: 1280 x 1024 @ 16bpp(60Hz), 1024 x 768 @16bpp(60Hz) and up to 32 MB shared memory.

2.9 Battery Backup SRAM

UNO-2176 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-2176, please replace the lithium battery with a new one if the BTRY LED is activated.

2.9.1 Lithium Battery Specification

- **Type:** BR2032 (Using CR2032 is NOT recommended)
- **Output voltage:** 3 V_{DC}
- **Location:** the backside of UNO-2176 board.

  (BH2 is for real time clock, BH1 is for SRAM)

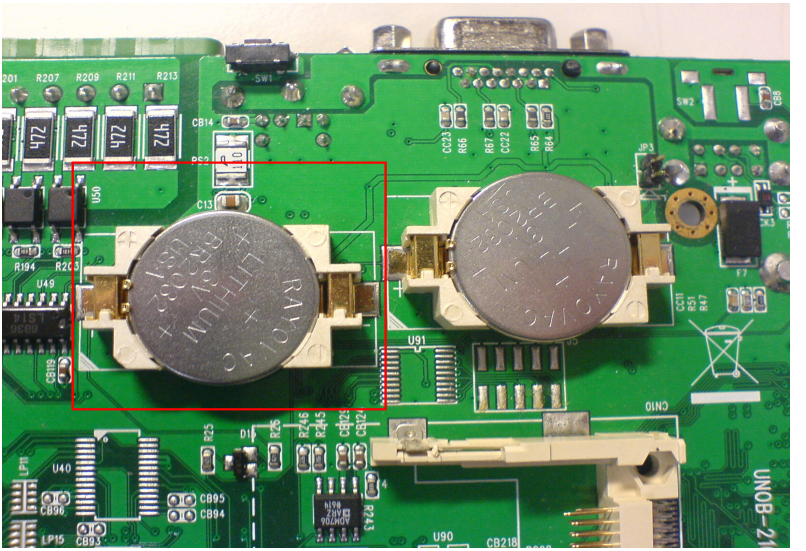


Figure 2.5: SRAM Lithium Battery Location

2.10 Reset Button

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

2.11 Onboard Isolated Digital Input

The UNO-2176 has 8 isolated DI channels designated DI0~DI7.

2.11.1 Pin Assignments

The connector type of UNO-2176 is plug-in screw terminal block that enables you to connect to field I/O devices directly without additional accessories. Figure 2.6 and Table 2.1 shows its pin assignment as well as signal description.

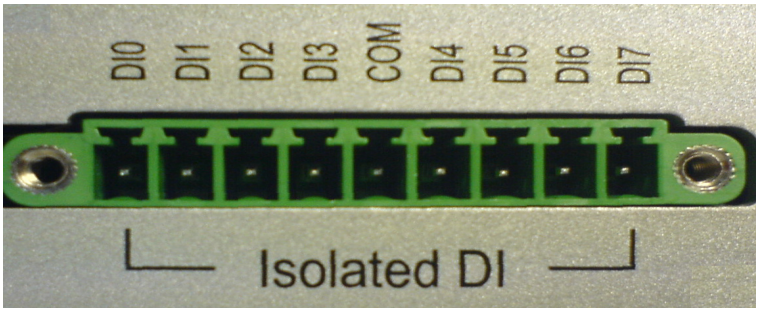


Figure 2.6: Digital Input Connector Pin Assignments

Table 2.1: Digital Input Connector Signal Description			
Signal Name	**Reference**	**Direction**	**Description**
DI <0...7>	COM	Input	Isolated DI signals
COM	-	-	DI, DO isolated ground

2.11.2 Isolated Inputs

Each of isolated digital input channels accepts 0 ~ 50 VDC voltage inputs, and accepts bi-directional input. The voltage range is -3 ~ 3 VDC for logic 0 (low), -50 ~ -10 VDC and 10 ~ 50 VDC for logic 1 (high). It means that you can apply positive or negative voltage to an isolated input pin (Vin). All channels share one common pin (COM). Figure 2.7 shows how to connect an external input source to an UNO-2176 isolated input channel.

Please note that DI0 and DI2 may be configured as gate control pins of Counter 0 and Counter 1; While DI1 and DI3 may be configured as input pins of Counter 0 and Counter 1. Please refer to section 2.13 for details.

Note: Refer to Appendix A.10 for command of DI

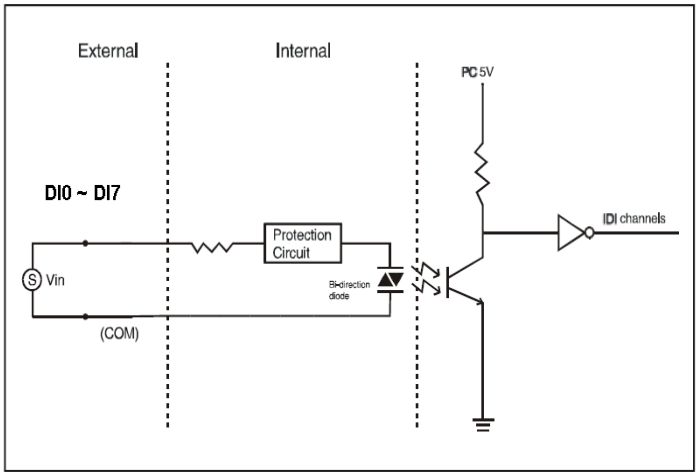


Figure 2.7: Isolated Digital Input Connection

2.11.3 Interrupt Function of the DI Signals

DI0 and DI1 can be used to generate hardware interrupts. Users can setup the configuration of them by programming the interrupt control register.

The channels are connected to the interrupt circuitry. Users can disable/enable interrupt function, select trigger type or latch the port data by setting the Interrupt Control Register of the UNO-2176 (refer to section 2.11.5 below). When the interrupt request signals occur, then the software will service these interrupt requests by ISR (Interrupt Service Routine). The multiple interrupt sources provide the card with more capability and flexibility.

2.11.4 IRQ Level

The IRQ level is by default set by the system BIOS. IRQ 7 is reserved for DI interrupt and counter interrupt.

2.11.5 Interrupt Control Register

Table 2.2: Interrupt Control Register Bit Map									
Base Address		7	6	5	4	3	2	1	0
202H	R/W	Interrupt Enable Control/Status Register							
								DI1EN	DI0EN
203H	R/W	Interrupt Triggering Edge Control/Status Register							
								DI1TE	DI0TE
207H	R/W	Interrupt Flag/Clear Register							
								DI1F	DI0F

The Interrupt Control Register controls the function and status of each interrupt signal source. Table 2.2 shows the bit map of the Interrupt Control Register. The register is readable/writeable register. While being written, it is used as a control register; and while being read, it is used as a status register.

DI0EN & DI1EN: DI0 & DI1 Interrupt disable/enable control bit

DI0TE & DI1TE: DI0 & DI1 Interrupt triggering edge control bit

DI0F & DI1F: DI0 & DI1 interrupt flag bit

2.11.6 Interrupt Enable Control Function

Table 2.3: Interrupt Disable/Enable Control	
DI0EN & DI1EN	**Interrupt Disable/Enable Control**
0	Disable
1	Enable

The user can choose to enable or disable the interrupt function by writing its corresponding value to the interrupt disable/enable control bit in the interrupt control register, as shown in Table 2.3.

2.11.7 Interrupt Triggering Edge Control

The interrupt can be triggered by a rising edge or a falling edge of the interrupt signal, as determined by the value in the interrupt triggering edge control bit in the interrupt control register, as shown in Table 2.4.

Table 2.4: Interrupt Triggering Edge Control	
DI0TE & DI1TE	**Triggering edge of interrupt signal**
0	Falling edge trigger
1	Rising edge trigger

2.11.8 Interrupt Flag Bit

The interrupt flag bit is a flag indicating the status of an interrupt. It is a readable/writable bit. To find the status of the interrupt, you have to read the bit value. To clear the interrupt, you have to write "1" to this bit. This bit must first be cleared to service the next coming interrupt.

Table 2.5: Interrupt Flag Bit Values		
DI0F & DI1F		**Interrupt Status**
Read	0	No interrupt
	1	Interrupt occur
Write	0	Don't care
	1	Clear interrupt

Note: *UNO-2176 provides built-in examples to show how to deliver digital input functionality. Refer to console mode examples in*

C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console.

(Please install DI/O driver from the UNO CD to use these examples)

2.12 Onboard Isolated Digital Output

The UNO-2176 has 8 isolated DO channels designated DO0 ~ DO7.

2.12.1 Pin Assignments

The connector type of UNO-2176 is plug-in screw terminal block that enables you to connect to field I/O devices directly without additional accessories. Figure 2.8 and Table 2.6 show its pin assignment as well as signal description.

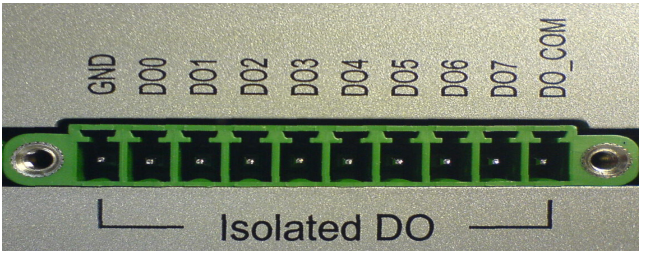


Figure 2.8: Digital Output Connector Pin Assignments

Table 2.6: Digital Output Connector Signals

Signal Name	Reference	Direction	Description
DO<0...7>	GND	Output	Isolated DO signals
GND	-	-	DI, DO isolated ground
COM	-	-	DO_COM as using inductance load

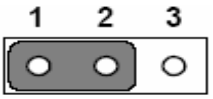
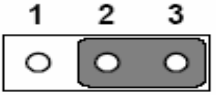
2.12.2 Power On Configuration

Default configuration after power on or hardware reset is to set all the isolated digital output channels to open status (the current of the load can't be sink) so that users need not worry about damaging external devices during system startup or reset. When the system is hot reset, then the status of isolated digital output channels are selected by jumper JP13. Table 2.7 shows the configuration of jumper JP13.

Note: Please refer to Figure A.2 for location of JP13

Table 2.7: Digital Output Power On Configuration

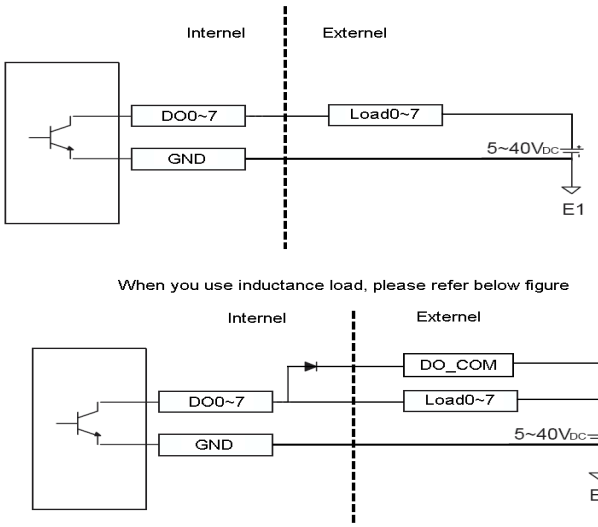
JP13	Power on configuration after hot reset

	**Set to "Open" status** **Default setting**
	**Keep last status after hot reset**

2.12.3 Isolated Outputs

Each of isolated output channels comes equipped with a Darlington transistor. All output channels share common emitters.

Please note that if an external voltage (5 ~ 40 VDC) is applied to an isolated output channel while it is being used as an output channel, the current will flow from the external voltage source to the UNO-2176. Please take care that the current through each DO pin not exceed 200 mA. Figure below shows how to connect an external output load to the UNO-2176 isolated outputs. Please note that DO2 and DO3 may be configured as output pins of Counter 0 and Counter 1 (refer to section 2.13 for more details)



Note: Please refer to Appendix A.10 for command of DO

Note: UNO-2176 provides built-in examples to show how to deliver digital output functionality. Refer to console mode examples in C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console. (Please install DI/O driver from the UNO CD to use these examples)

2.13 Onboard Isolated Counter/Timer

The UNO-2176 uses one 82C54 programmable timer/counter chip that includes three independent 16-bit down counters: counter 0, counter 1 and counter 2. Counter 0 and counter 1 are for users, and counter 2 is specified for the system and can't be used by user. Each counter has clock input, gate input and pulse output. They can be programmed to count from 2 up to 65535 or cascaded into one 32-bit counter.

The UNO-2176 has two isolated counter input channels designated DI1 and DI3 with two isolated output channels designated DO2 and DO3. Therefore, you can set each counter of 82C54 as counter function or timer function.

2.13.1 Counter/Timer Control Register

The Counter/Timer Control Register controls the function and status of each counter/timer signal source. Table 2.8 shows the bit map of the Counter/Timer Control Register. The register is readable/writable register. While being written, it is used as a control register; and while being read, it is used as a status register.

Table 2.8: Counter/Timer Control Register Bit Map									
Base Address		**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
207H	R/W	Interrupt Flag/Clear Register							
						CTR1F	CTR0F		
208H	R/W	82C54 Chip Counter0 Register							
209H	R/W	82C54 Chip Counter1 Register							
20BH	R/W	82C54 Chip Control Register							
20CH	R/W	Counter0 Start Control / Output Status Register							
					CTR0 Out				CTR0 Gate
20DH	R/W	Counter1 Start Control / Output Status Register							
					CTR1 Out				CTR1 Gate
20EH	R/W	Counter0 Setting Register							
						CTR0 IntSet	CTR0 OutSet	CTR0 GateSet	CTR0 CLKSet
20FH	R/W	Counter1 Setting Register							
			CTR32 Set	S1	S0	CTR1 IntSet	CTR1 OutSet	CTR1 GateSet	CTR1 CLKSet

CTR0F/CTR1F: (Counter 0/1) interrupt flag bit

CTR0Gate/CTR1Gate: (Counter 0/1) gate control bit

CTR0Out /CTR1Out: (Counter 0/1) output status bit

CTR0CLKSet /CTR1CLKSet: (Counter 0/1) clock source control bit

CTR0GateSet/CTR1GateSet: (Counter 0/1) gate source control bit

CTR0OutSet/CTR1OutSet: (Counter 0 /1) output destination control bit

CTR0IntSet/CTR1IntSet: (Counter 0/1) interrupt control bit

S0/S1: (Counter 0/1) internal clock control bit

CTR32Set: Cascaded 32-bit counter control bit

2.13.2 Counter 0 Function Block

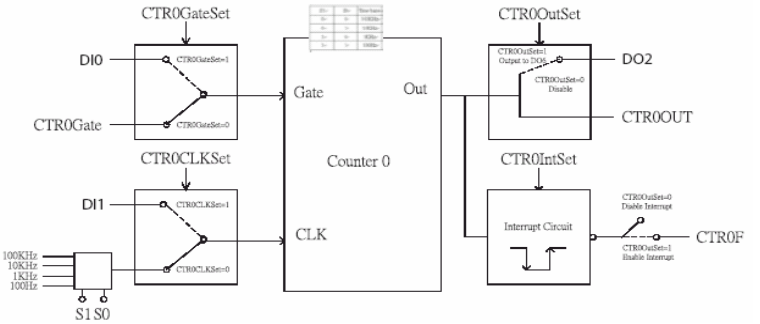


Figure 2.9: Counter 0 Function Block

2.13.3 Counter 1 Function Block

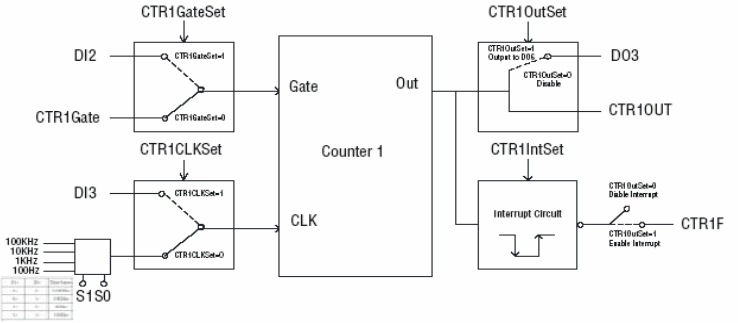


Figure 2.10: Counter 1 Function Block

2.13.4 32-bit Counter Function Block (CTR32Set=1)

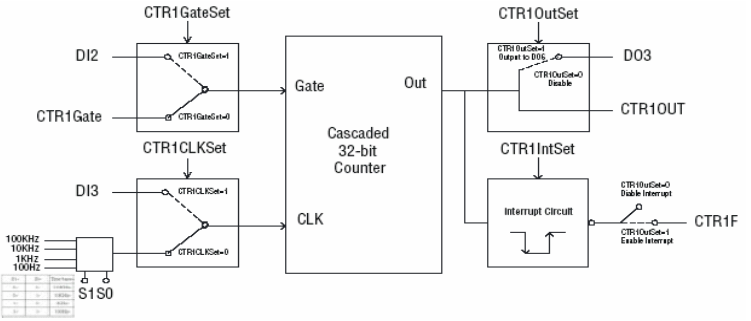


Figure 2.11: 32-bit Counter Function Block

2.13.5 Counter Clock Source

There are two clock sources available for the user counters by setting counter clock control bits - CTR0CLKSet and CTR1CLKSet.

Table 2.9: Counter Clock Source Control Bit		
CTR0CLKSet	0	Internal clock (default)
	1	External clock from digital input 1 (DI1) channel
CTR1CLKSet	0	Internal clock (default)
	1	External clock from digital input 3 (DI3) channel

2.13.6 Counter Internal Clock

There are four frequency options to choose according to applications, and it's set by internal clock control bits - S0 and S1.

Table 2.10: Counter Internal Clock Control Bit		
S1	**S0**	**Time base**
0	0	100 KHz (default)
0	1	10 KHz
1	0	1 KHz
1	1	100 Hz

2.13.7 Counter Gate Source

The gate sources you select determine what kind of gate input signal to enable your counter/timer when receiving clock input. There are two gate sources available for the user counters by setting gate source control bits - CTR0GateSet and CTR1GateSet.

Table 2.11: Counter Gate Source Control Bit		
CTR0GateSet	0	Gate source from "CTR0Gate" control bit (Default)
	1	Gate source from digital input 0 (DI0) channel
CTR1GateSet	0	Gate source from "CTR1Gate" control bit (Default)
	1	Gate source from digital input 2 (DI2) channel

2.13.8 Counter Output Destination

You can choose the output destination of counter 0 and counter 1 by setting "Output Destination control bits"- CTR0OutSet and CTR1OutSet.

Table 2.12: Counter Output Destination Control Bit		
CTR0OutSet	0	Output destination to "CTR0Out" status bit (Default)
	1	Output destination to "CTR0Out" status bit and digital output 2 (DO2) channel
CTR1OutSet	0	Output destination to "CTR1Out" status bit. (Default)
	1	Output destination to "CTR1Out" status bit and digital output 3 (DO3) channel

2.13.9 Counter Interrupt Flag

The interrupt flag bit is a flag indicating the status of an interrupt. It is a readable/writable bit. To find the status of the interrupt, you have to read the bit value; to clear the interrupt, you have to write "1" to this bit. This bit must first be cleared to service the next coming interrupt. Besides, you can choose if counter 0 or counter 1 generate interrupt signal by configuring "CTR0IntSet" and "CTR1IntSet" control bit.

Table 2.13: Counter Interrupt Flag Control Bit

CTR0F, CTR1F		Counter Interrupt Status
Read	0	No interrupt
	1	Interrupt occur
Write	0	Don't care
	1	Clear interrupt
CTR0IntSet, CTR1IntSet		Counter Interrupt Control
0		Disable (Default)
1		Enable

2.13.10 Cascaded 32-bit Counter

You can also cascade counter 0 and counter 1 together as one 32-bit counter/timer, and it's configured by control bit - CTR32Set.

Table 2.14: 32-bit Counter Control Bit

0	Disable (Default)
1	Cascade counter 0 and counter 1 into one 32-bit counter

Note: UNO-2176 provides built-in examples to show how to deliver counter functionality. Refer to console mode examples in C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console. (Please install DI/O driver from the UNO CD to use these examples)

2.14 LED and Buzzer for System Diagnosis

In a “headless application” (an application without a monitor display), it is always difficult to know the system status. Another PC may be needed to monitor a headless device's status via RS-232 or Ethernet. In order to solve this problem, UNO-2176 offers a programmable LED indicator and buzzer. They can be programmed to show a systems status by LED indicator flickering and buzzer alarm.

Table 2.15: LED & Buzzer Control Register

210H	R/W	DIAG LED Register							
							LEDS1	LEDS0	LEDEn
211H	R/W	Buzzer Register							
							SPKS1	SPKS0	SPKEn

LEDEn: =0, DIAG LED disable

=1, DIAG LED enable

LEDS0 and LEDS1: LED flickering speed setting bit (refer to Table 2.16)

SPKEn: =0, Speaker disable

=1, Speaker enable

SPKS0 & SPKS1: Buzzer alarming setting bit (refer to Table 2.17)

Note: UNO-2176 provides built-in examples to show how to configure DIAG LED and Buzzer. Refer to console mode examples in C:\Program Files\Advantech\UNO\UNO_IsaDIO\Examples\Console.

(Please install DI/O driver from the UNO CD to use these examples)

Table 2.16: Programmable LED Control Bit		
	LEDS1	**LEDS0**
Light on	0	0
Fast flicker	0	1
Normal flicker	1	0
Short flicker	1	1

Table 2.17: Programmable Buzzer Control Bit		
	SPKS1	**SPKS0**
Beep on	0	0
Short beep	0	1
Normal beep	1	0
Long beep	1	1

PS/2 Keyboard and Mouse Connector

The UNO-2176 provides a PS/2 keyboard and PS/2 mouse connector. A 6-pin mini-DIN connector is located on the front panel of the UNO-2176. UNO-2176 comes with an adapter in the accessory package (see section 1.5) 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.

CHAPTER 3

Initial Setup

This chapter introduces how to initialize the UNO-2176.

Sections include:

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

Chapter 3 Initial Setup

3.1 Chassis Grounding

The aluminum made UNO-2176 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-2176 with "EARTH" as ground.

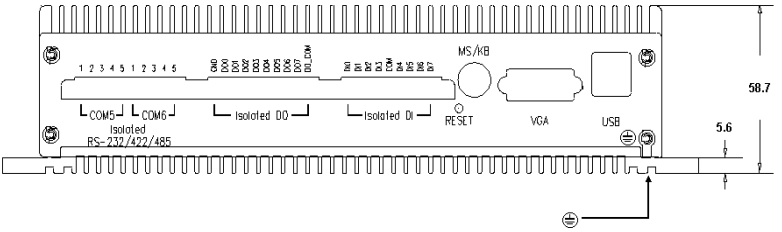
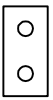
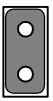


Figure 3.1: Chassis Grounding Connection

You can select if you wish to combine the chassis grounding point with the system grounding by using an onboard jumper selection. (JP1)

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

3.2 Inserting a CompactFlash Card

The procedure for installing a CompactFlash card into the UNO-2176 is detailed below, please follow these steps carefully.

1. Remove the power cord.
2. Unscrew the six screws from the down storage panel.
3. Remove the storage panel.
4. Plug a CompactFlash card with your OS and application program into a CompactFlash card slot on board. (CN10)
5. Screw back the rear panel with six screws

Note *CN8 is Primary*

CN10 is secondary's master

CN9 is secondary

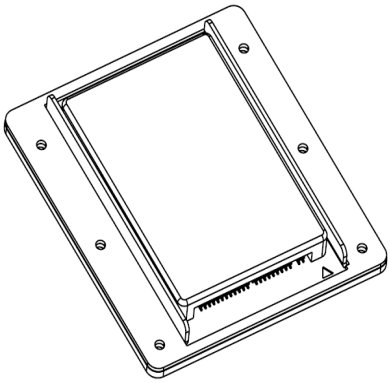
Please do not use CN9 and CN10 simultaneously.

If your OS is build in CF card and program,application and data are save in HDD, please install CF in CN10 and connect HDD in CN8.

3.3 Installing a Hard Disk

The procedure for installing a hard disk into the UNO-2176 is below. Please follow these steps carefully.

1. Remove the power cord.
2. Unscrew six screws from the down storage panel of the UNO-2176.
3. Remove the storage panel.
4. Install 2.5" HDD on storage panel and please notice the cable connector on HDD for IDE should be near bottom triangle sign of storage panel, and screw 4 screws on the back side of storage panel connector IDE cable with HDD and CN8



5. Screw back the down storage panel with 6 screws

Note: CN8 is Primary

CN10 is secondary's master

CN9 is secondary

Please do not use CN9 and CN10 simultaneously.

If your OS is build in CF card and program,application and data are save in HDD, please install CF in CN10 and connect HDD in CN8.

3.4 Connecting Power

Connect the UNO-2176 to a 9~36 VDC power source. The power source can either be from a power adapter or an in-house power source.

3.5 BIOS Setup and System Assignments

UNO-2176 adopts Advantech's SOM-4486/4481 CPU module. Further information about the SOM-4486/4481 CPU module, can be found in SOM-4486/4481's user's manual. You can find this manual on the UNO-2176's driver and utility CD-ROM.

Please note that you can try to "LOAD BIOS DEFAULTS" from the BIOS Setup manual if the UNO-2176 does not work properly.

Appendix A

System Settings and Pin Assignments

Appendix A System Settings & Pin Assignments

A.1 System I/O Address & Interrupt Assignments

Table A.1: UNO-2176 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
200-218	Digital inputs, outputs and counter
278-27F	Reserved
2F8-2FF	Serial port 2
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome display
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1
DC000-DFFFF	Battery backup resource

Table A.2: UNO-2176 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 6	Diskette controller (FDC)
IRQ 7	Digital inputs, outputs and counter
IRQ 8	Real-time clock
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-2176 board. The following sections tell you how to configure the UNO-2176 hardware setting. Figure A-1 and Figure A-2 show the locations of UNO-2176's connectors and jumpers.

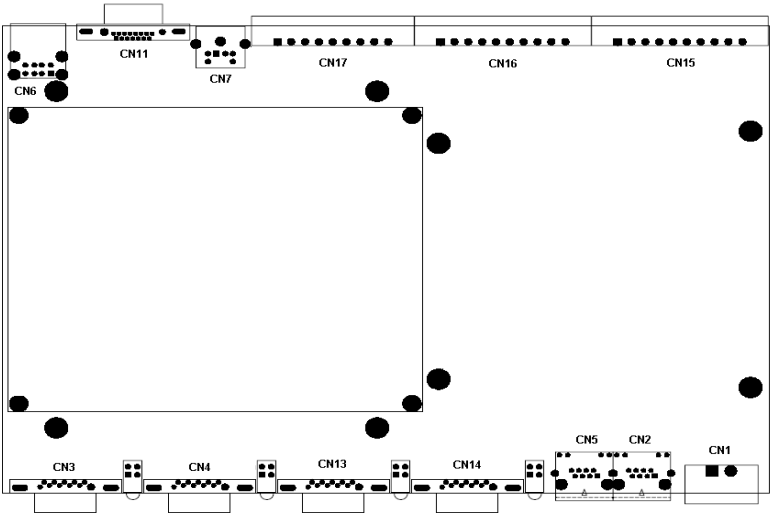


Figure A.1: Connectors & Jumpers (frontside)

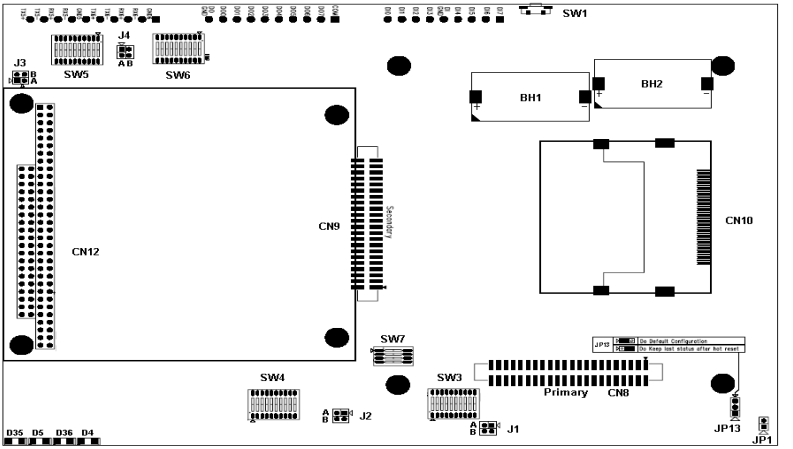


Figure A.2: Connectors & Jumpers (backside)

Table A.3: UNO-2176 Connectors & Jumpers	
Label	Function
CN1	Phoenix power connector
CN2	Ethernet port 2
CN3	COM1 RS-232 serial port
CN4	COM2 RS-232 serial port
CN5	Ethernet port 1
CN6	USB connector
CN7	PS/2 keyboard and mouse connector
CN8	Primary IDE connector
CN9	Secondary IDE connector
CN10	Secondary's master IDE connector
CN11	VGA DB15 display connector
CN12	PC/104 slot
CN13	COM3 RS-232/422/485 serial port
CN14	COM4 RS-232/422/485 serial port
JP1	System grounding jumper
JP13	Digital output status seeting
SW1	Reset button
SW3	COM3 RS-232/422/485 selection
SW4	COM4 RS-232/422/485 selection
SW5	COM5 RS-232/422/485 selection
SW6	COM6 RS-232/422/485 selection
SW7	COM3/COM4/COM5/COM6 RS-422 master/slave selection
J1	Terminator resistor (120 ohm) for COM3 (RS-422/485)
J2	Terminator resistor (120 ohm) for COM4 (RS-422/485)
J3	Terminator resistor (120 ohm) for COM5 (RS-422/485)
J4	Terminator resistor (120 ohm) for COM6 (RS-422/485)
BH1	Battery for SRAM
BH2	Battery for RTC

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

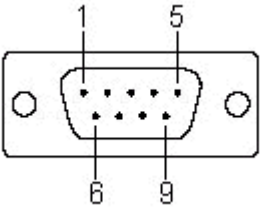


Table A.4: RS-232 Standard Serial Port Pin Assigns

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

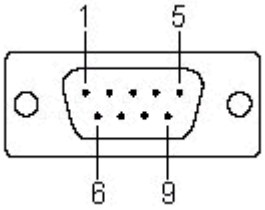


Table A.5: RS-232/422/485 Serial Ports COM3~4

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

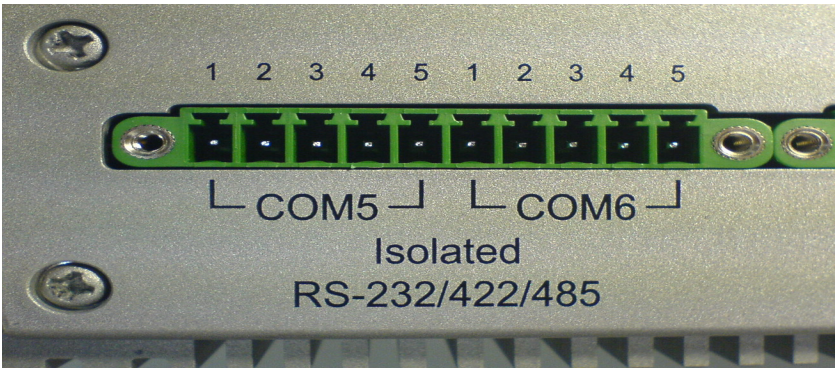


Table A.6: RS-232/422/485 Serial Ports (COM5~6)

Pins	RS-232	RS-422	RS-485
1	RxD	Tx+	Data+
2	TxD	Tx-	Data-
3	RTS	Rx+	-
4	CTS	Rx-	-
5	GND	GND	GND

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

Table A.7: 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)

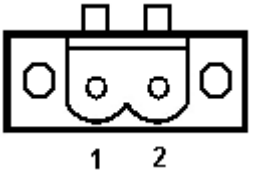


Table A.8: Power Connector Pin Assignments

Pin	Signal Name
1	+9~36VDC
2	GND

A.7 PS/2 Keyboard and Mouse Connector

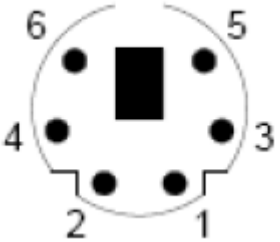


Table A.9: Keyboard & Mouse Connector Pin Assigns

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.10: 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

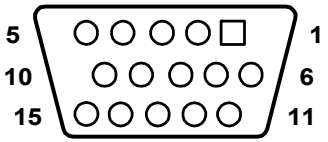


Table A.11: VGA Adaptor Cable Pin Assignments

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

A.10 UNO-2176 Control Register

Table A.12: UNO-2176 Control Register									
Base Address		7	6	5	4	3	2	1	0
200H	R	Isolated Digital Input Status Register							
		DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0
201H	R/W	Isolated Digital Output Control/Status Register							
		DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
202H	R/W	Interrupt Enable Control/Status Register							
								DI1EN	DI0EN
203H	R/W	Interrupt Triggering Edge Control/Status Register							
								DI1TE	DI0TE
207H	R/W	Interrupt Flag/Clear Register							
						CTR1F	CTR0F	DI1F	DI0F
208H	R/W	82C54 Chip Counter0 Register*							
209H	R/W	82C54 Chip Counter1 Register*							
20BH	R/W	82C54 Chip Control Register*							
20CH	R/W	Counter0 Start Control / Output Status Register							
					CTR0 Out				CTR0 Gate
20DH	R/W	Counter1 Start Control / Output Status Register							
					CTR1 Out				CTR1 Gate
20EH	R/W	Counter0 Setting Register							
						CTR0 IntSet	CTR0 OutSet	CTR0 GateSet	CTR0 CLKSet
20FH	R/W	Counter1 Setting Register							
			CTR 32Set	S1	S0	CTR1 IntSet	CTR1 OutSet	CTR1 GateSet	CTR1 CLKSet
210H	R/W	DIAG LED Control Register							
							LEDS1	LEDS0	LEDEn
211H	R/W	Buzzer Control Register							
							SPKS1	SPKS0	SPKEn
218H	R	Power Register							
							PWR	P2	P1

** Refer to 82c54 manual*

Appendix B

Programming the Watchdog Timer

Appendix B Programming the Watchdog Timer

Below are samples of code for controlling the Watchdog Timer function.

```
-------------------------------------------------------------------------------
Enter the extended function mode, interruptible double-write |
-------------------------------------------------------------------------------
MOV DX,2EH
MOV AL,87H OUT DX,AL OUT DX,AL
-------------------------------------------------------------------------------
Configured logical device 8, configuration register CRF6 |
-------------------------------------------------------------------------------
MOV DX,2EH
MOV AL,2BH OUT DX,AL MOV DX,2FH IN AL,DX
AND AL.OEFH;Setbit 4=0 Pin 89=WDTO OUT DX,AL
MOV DX,2EH
MOV AL,07H; point to Logical Device Number Reg. OUT DX,AL
MOV DX,2FH
MOV AL,08H; select logical device 8
OUT DX,AL; MOV DX,2EH
MOV AL,30H;Set watch dog activate or inactivate
OUT DX,AL MOV DX,2FH
MOV AL,01H; 01:activate 00:inactivate
OUT DX,AL; MOV DX,2EH
MOV AL,F5H; Setting counter unit is second
OUT DX,AL MOV DX,2FH MOV AL,00H OUT DX,AL; MOV
DX,2EH MOV AL,F6H OUT DX,AL MOV DX,2FH
MOV AL,05H; Set 5 seconds
OUT DX,AL
;-----------------------------------------
; Exit extended function mode |
;-----------------------------------------
MOV DX,2EH
MOV AL,AAH OUT DX,AL
```