

**MODELS USB-DIO-96, USB-DIO-48  
USB 96 and 48 CHANNEL HIGH-SPEED  
DIGITAL INPUT/OUTPUT MODULES  
USER MANUAL**

FILE: MUSB-DIO-96.A1b

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## WARNING!!

**ALWAYS CONNECT AND DISCONNECT YOUR FIELD CABLING WITH THE COMPUTER POWER OFF. ALWAYS TURN COMPUTER POWER OFF BEFORE INSTALLING A CARD. CONNECTING AND DISCONNECTING CABLES, OR INSTALLING CARDS INTO A SYSTEM WITH THE COMPUTER OR FIELD POWER ON MAY CAUSE DAMAGE TO THE I/O CARD AND WILL VOID ALL WARRANTIES, IMPLIED OR EXPRESSED.**

## Warranty

Prior to shipment, PORTWELL equipment is thoroughly inspected and tested to applicable specifications. However, should equipment failure occur, PORTWELL assures its customers that prompt service and support will be available. All equipment originally manufactured by PORTWELL which is found to be defective will be repaired or replaced subject to the following considerations.

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If a unit is suspected of failure, contact PORTWELL' Customer Service department. Be prepared to give the unit model number, serial number, and a description of the failure symptom(s). We may suggest some simple tests to confirm the failure. We will assign a Return Material Authorization (RMA) number which must appear on the outer label of the return package. All units/components should be properly packed for handling and returned with freight prepaid to the PORTWELL designated Service Center, and will be returned to the customer's/user's site freight prepaid and invoiced.

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## Chapter 1: Introduction

### Features

- 96/48 lines of digital I/O
- High-speed USB 2.0 device, USB 1.1 backwards compatible
- Twelve (12) / Six (6) 8-bit ports independently selectable for inputs or outputs
- All I/O lines buffered with 32 mA source, 64mA sink current capabilities
- I/O Buffers can be enabled or tri-stated under program control
- Drivers and sample application provided
- Jumper selectable I/O pulled up to 5V for contact monitoring or pulled down to ground
- Jumper selectable power provided via USB cable or external power supply for higher current sourcing capabilities
- Resettable fused +5VDC output
- Standard 50-pin IDC-type shrouded connectors with key
- PC/104 size (3.550 by 3.775 in.)
- Rugged industrial enclosure
- Compatible with Industry-Standard I/O Racks such as Gordos, OPTO22, Potter & Brumfield, etc. with optional cable

### Applications

- Automatic Test Systems
- Laboratory Automation
- Robotics
- Machine Control
- Security Systems, Energy Management
- Relay Monitoring and Control
- Parallel Data Transfer to PC
- Sensing Switch Closures or TTL, DTL, CMOS Logic
- Driving Indicator Lights or Recorders

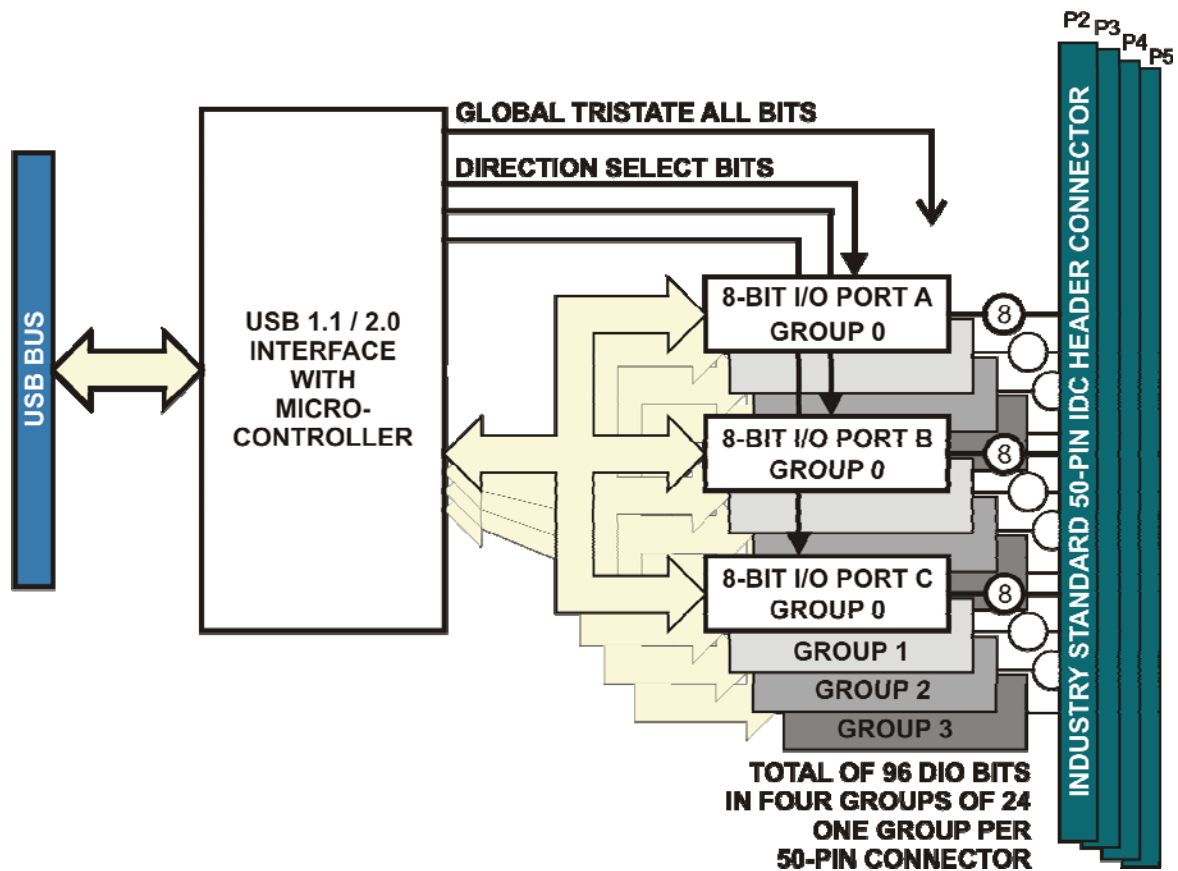
## Functional Description

This USB board is an ideal solution for adding portable, easy-to-install digital I/O capabilities to any computer with a USB port. The board is a USB 2.0 high speed device, offering the fastest speed available with the USB bus. It is fully compatible with both USB 1.1 and USB 2.0 ports. The card is plug-and-play allowing quick connect/disconnect whenever you need additional I/O on your USB port.

The board features 96 or 48 bits of TTL-compatible digital I/O with high-current capabilities. Each digital port can be programmed to accept inputs or to drive outputs in 12 groups of 8-bit ports. Power is supplied to the card via the USB cable or for higher current capabilities, external power may be used. The I/O wiring connections are via two or four industry standard 50-pin connectors. For external circuits, fused +5VDC power is available at the connector. The resettable fuse is rated at 0.5A.

All I/O lines are buffered by a type 74ABT543A tristate buffer transceiver capable of sourcing 32 mA or sinking 64 mA. The buffers are configured under program control for input or output. Jumper selectable pull-ups (to +5 VDC) or pull-downs (to ground) on the card allow for contact monitoring and assure that there are no erroneous outputs at power-up until the card is initialized by system software.

Unlike most USB digital I/O products which primarily use a human interface device (HID) driver, we provide an easy to use, Windows-based, custom function driver optimized for maximum data throughput. This approach exposes the full functionality of the hardware along with maximizing the advantage of using the high-speed USB 2.0 bus.



**Figure 1-1: Block Diagram**

### Ordering Guide

USB-DIO-96 USB 96-channel Digital Input/Output Module  
 USB-DIO-48 USB 48-channel Digital Input/Output Module

### Model Options

- -OEM Board only version with no enclosure
- -RA Right angle headers (USB-DIO-48-OEM only)
- -DIN DIN rail mounting bracket for integrating into existing DIN rail systems
- -P On-board DC power circuitry and external power AC/DC adapter
- -RoHS This product is available in a RoHS compliant version. Please call for specific pricing then be sure to add this suffix to the model number on any hard-copy or verbal purchase orders.

### Special Order

Contact factory with your special requirement. Examples of special orders would be conformal coating, latching I/O headers.

## Included with your board

The following components are included with your shipment, depending on options ordered. Please take the time now to ensure that no items are damaged or missing.

- USB Module in labeled enclosure with an anti-skid bottom
- 6' USB 2.0 cable
- Software Master CD
- USB I/O Quick-Start Guide

## Optional Portwellsories

- CAB50F-6 Six-foot ribbon cable assembly with 50-pin female connectors
- CAB50-6 Six-foot ribbon cable assembly with a 50-pin female header connector and a 50-pin female edge connector (typically for use with solid-state module mounting racks)
- STB-50 Screw terminal board, typically ships with standoffs but can also mount on SNAP-TRACK
- DIN-SNAP Six inch length SNAP-TRACK with two clips, for mounting one STB-50 screw terminal board on a DIN rail.
- DIN-SNAP-6 One foot length of SNAP-TRACK with four clips, for mounting up to two STB-50 screw terminal boards on a DIN rail.
- MP104-DIN DIN-rail mounting adapter plate for affixing any USB/104 module to a DIN-rail.



## Chapter 2: Installation

### Software CD Installation

The software provided with this board is contained on one CD and must be installed onto your hard disk prior to use. To do this, perform the following steps as appropriate for your software format and operating system. Substitute the appropriate drive letter for your CD-ROM or disk drive where you see  $\text{Z:}$  in the examples below.

#### WIN95/98/Me/NT/2000/XP/2003

- a. Place the CD into your CD-ROM drive.
- b. The install program should automatically run. If it does not click START | RUN and type  $\text{Z:}$ , click OK or press  $\text{Enter}$ .
- c. Follow the on-screen prompts to install the software for this board.

### Hardware Installation

The board can be installed in any USB 2.0 or USB 1.1 port. Please refer to the USB I/O Quick Start Guide which can be found on the CD, for specific, quick steps to complete the hardware and software installation.

# Chapter 3: Hardware Details

## Option Selections

Refer to the setup programs on the CD provided with the board. Also, refer to the Block Diagram and the Option Selection Map when reading this section of the manual.

There are three primary versions of this board, each has an option selection map.

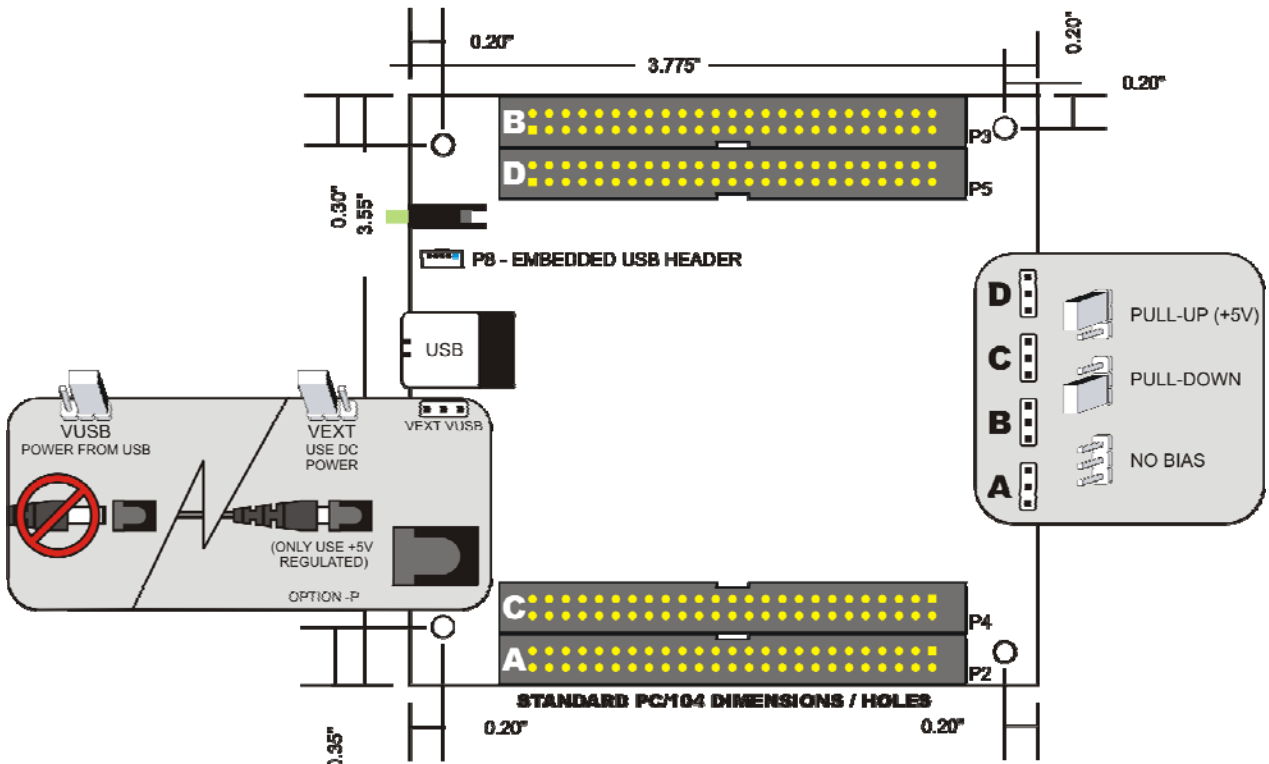


Figure 3-1: 96 Channel Board Option Selection Map

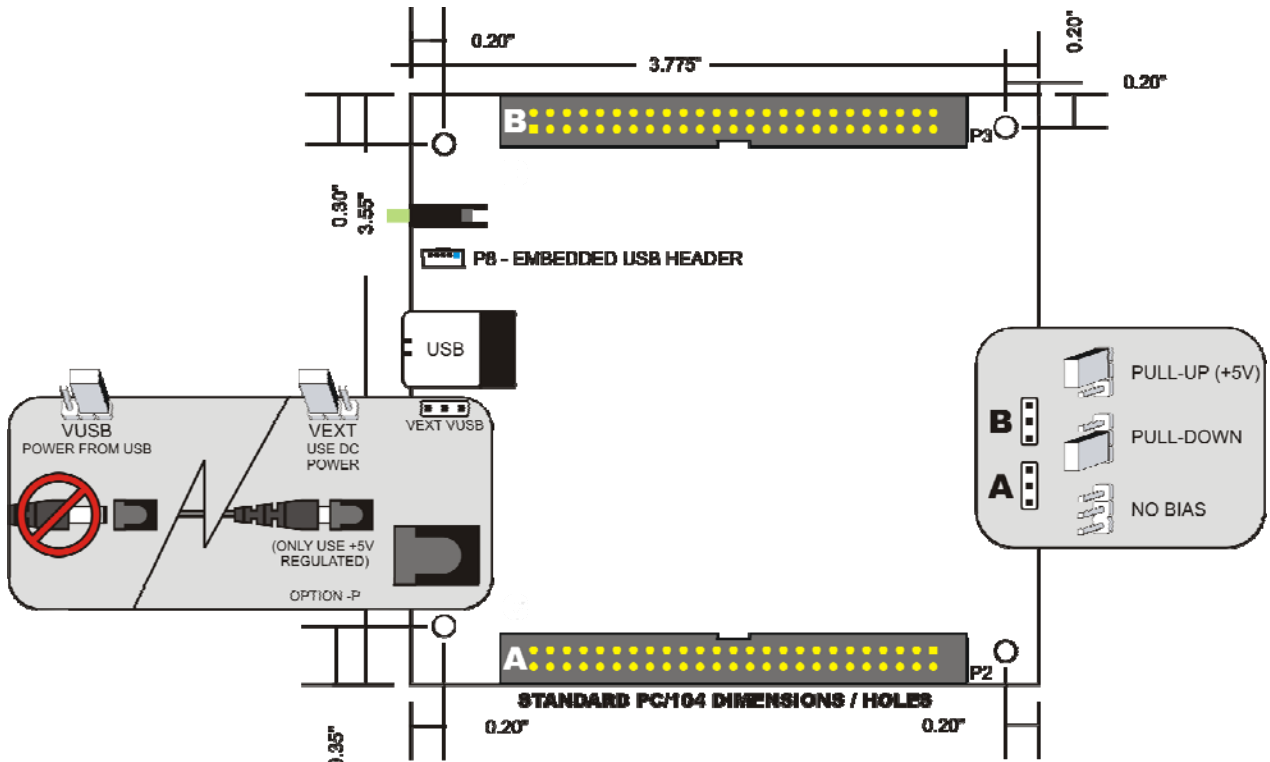


Figure 3-2: 48 ChI OEM Board Option Selection Map

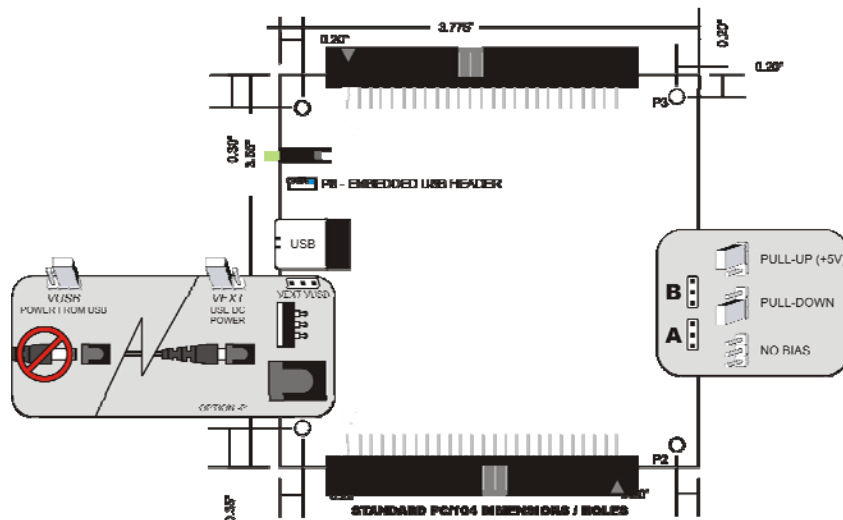


Figure 3-3: 48 ChI OEM Board w/Right Angle Headers Option Selection Map

## **USB Connector**

The USB connector is a Type B high-retention type connector and mates with the cable provided. The USB port provides communication signals along with +5 VDC power. The board can be powered from the USB port or, if needed for higher source current applications, an external power supply can be used.

## **Embedded USB Connector**

Mini 5-pin header in parallel with type B connector to provide a compact interface within embedded devices.

## **LED**

The LED on the front of the enclosure is used to indicate power and data transmissions. When the LED is in an illuminated steady green state, this signifies that the board is successfully connected to the computer and has been detected and configured by the operating system. When the LED flashes continuously, this signifies that there is data being transmitted over the USB bus.

## **DC Power Jack (Optional)**

This is an option for high current applications when more current is needed than what your computer can provide on the USB port (typically 500 mA). The DC jack has a 2.00mm post on board and is designed to be used with the 9 VDC AC/DC external power supply that ships with this option. The voltage regulator on board regulates the 9 VDC and provides 5 VDC to the onboard circuitry. When using external power, switch the jumper located near the USB connector to VEXT, otherwise when the jumper is in the VUSB position current is drawn from the USB port (please consult the option selection map for a visual reference).

## **50 Pin Box Headers**

The 50 pin box headers have standard 0.100" spacing between pins and are keyed to prevent improper connections. It can be used with standard IDC type ribbon cables.

## **Pull-Up / Pull-Down Configuration Jumpers**

Each connector's digital bits can be pulled up or down, or left floating, when in input mode or tristated. For pull-ups (most common), install these jumpers in the +5V position. For pull-downs, install these jumpers in the GND position. For neither, remove these jumpers.

## Chapter 4: USB Address Information

Use the provided driver to Portwells the USB board. This driver will allow you to determine how many supported USB devices are currently installed, and each device's type. This information is returned as a Vendor ID (VID), Product ID (PID) and Device Index.

Both board versions (96 and 48 bit) VID is "0x1605".

The 96 bit board version PID is "0x8003".

The 48 bit board version PID is "0x8002".

The Device Index is determined by how many of the device you have in your system, and provides a unique identifier allowing you to Portwells a specific board at will.

## Chapter 5: Programming

The driver software provided with the board uses a 32-bit .dll front end compatible with any Windows programming language. Samples provided in Borland C++Builder, Borland Delphi, Microsoft Visual Basic, and Microsoft Visual C++ demonstrate the use of the driver.

The following functions are provided by the driver in Windows.

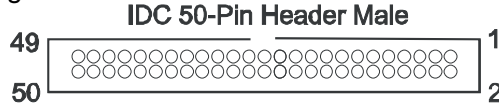
These functions will allow you to read or write individual bits, bytes, or the entire board worth of data. In addition board-level functions complete the driver package.

For detailed information on each function refer to the .html Driver Manual located in the Win32 directory for this board.

```
unsigned long GetDevices(void )
unsigned long QueryDeviceInfo(DeviceIndex, pPID, pName, pDIOBytes, pCounters)
unsigned long DIO_Configure(DeviceIndex, bTristate, pOutMask, pData)
unsigned long DIO_Write1(DeviceIndex, BitIndex, bData)
unsigned long DIO_Write8(DeviceIndex, ByteIndex, Data)
unsigned long DIO_WriteAll(DeviceIndex,pData)
unsigned long DIO_Read8(DeviceIndex, ByteIndex,pBuffer)
unsigned long DIO_ReadAll(DeviceIndex,Buffer)
```

## Chapter 6: Connector Pin Assignments

Four 50-pin male headers are provided for I/O connections designated as P2, P3, P4 and P5. Connector pin assignments are listed below.



PIN	P2	P3	P4	P5	PIN	FUNCTION
1	I/O 23	I/O 47	I/O 71	I/O 95	2	GROUND
3	I/O 22	I/O 46	I/O 70	I/O 94	4	GROUND
5	I/O 21	I/O 45	I/O 69	I/O 93	6	GROUND
7	I/O 20	I/O 44	I/O 68	I/O 92	8	GROUND
9	I/O 19	I/O 43	I/O 67	I/O 91	10	GROUND
11	I/O 18	I/O 42	I/O 66	I/O 90	12	GROUND
13	I/O 17	I/O 41	I/O 65	I/O 89	14	GROUND
15	I/O 16	I/O 40	I/O 64	I/O 88	16	GROUND
17	I/O 15	I/O 39	I/O 63	I/O 87	18	GROUND
19	I/O 14	I/O 38	I/O 62	I/O 86	20	GROUND
21	I/O 13	I/O 37	I/O 61	I/O 85	22	GROUND
23	I/O 12	I/O 36	I/O 60	I/O 84	24	GROUND
25	I/O 11	I/O 35	I/O 59	I/O 83	26	GROUND
27	I/O 10	I/O 34	I/O 58	I/O 82	28	GROUND
29	I/O 09	I/O 33	I/O 57	I/O 81	30	GROUND
31	I/O 08	I/O 32	I/O 56	I/O 80	32	GROUND
33	I/O 07	I/O 31	I/O 55	I/O 79	34	GROUND
35	I/O 06	I/O 30	I/O 54	I/O 78	36	GROUND
37	I/O 05	I/O 29	I/O 53	I/O 77	38	GROUND
39	I/O 04	I/O 28	I/O 52	I/O 76	40	GROUND
41	I/O 03	I/O 27	I/O 51	I/O 75	42	GROUND
43	I/O 02	I/O 26	I/O 50	I/O 74	44	GROUND
45	I/O 01	I/O 25	I/O 49	I/O 73	46	GROUND
47	I/O 00	I/O 24	I/O 48	I/O 72	48	GROUND
49	+5VDC	+5VDC	+5VDC	+5VDC	50	GROUND

**Table 6-1: 50-Pin Connector Pin Assignments**

# Chapter 7: Specifications

## Digital Inputs (TTL Compatible)

- Logic High: 2.0 VDC min, 5.5 VDC max
- Logic Low: 0.8 VDC max, -0.5 VDC min

## Digital Outputs

- Logic High: 2.0 VDC min., source 32 mA
- Logic Low: 0.55 VDC max., sink 64 mA

## Bus Type

- USB2.0 high-speed (480 Mb/s)

## Power

- Basic 96 bit unit: 318 mA typical (no load)
- +5 VDC from the USB bus or external power supply depending on user configuration. The USB bus is specified to provide 500 mA to most desktop environments. This gives you 182 mA available (500 mA - 318mA = 182 mA). If using more than a total of 500mA, use optional 9 VDC (on board voltage regulator outputs +5 VDC to card) external power supply and **remove** VUSB jumper and place jumper on VEXT. Then plug in external power before plugging into USB port .
- +5V resettable fuse at 0.5A located on each connector.

## Environmental

- Operating Temperature: 0 °C. to 70 °C.
- Storage Temperature: -40 °C. to +85 °C.
- Humidity: 0 to 90% RH, non-condensing.
- Board Dimension: 3.550 x 3.775 inches.
- Box Dimension: 4.00 x 4.00" x 1.25 inches.



## Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: [tech@portwell.com](mailto:tech@portwell.com) Please detail any errors you find, we will reply with manual updates