

**MODEL USB-DIO-32I**

**32-Individually I/O-Selectable  
Digital Module**

**USER MANUAL**

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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.**

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## Table of Contents

<b>Chapter 1: Introduction</b> .....	5
<b>Features</b> .....	5
<b>Applications</b> .....	5
<b>Functional Description</b> .....	6
<b>Figure 1-1: Block Diagram</b> .....	7
<b>Ordering Guide</b> .....	7
<b>Model Options</b> .....	7
<b>Chapter 2: Installation</b> .....	8
<b>Software CD Installation</b> .....	8
<b>WINNT/2000/XP/2003</b> .....	8
<b>Hardware Installation</b> .....	8
<b>Chapter 3: Hardware Details</b> .....	9
<b>Option Selections</b> .....	9
<b>USB Connector</b> .....	9
<b>LED</b> .....	9
<b>DC Power Jack (Optional)</b> .....	9
<b>50 Pin Box Header</b> .....	9
<b>Chapter 4: USB Address Information</b> .....	10
<b>Chapter 5: Programming</b> .....	11
<b>Chapter 6: Connector Pin Assignments</b> .....	12
<b>Table 6-1: 50-Pin Connector Pin Assignments</b> .....	12
<b>Chapter 7: Specifications</b> .....	13
<b>Customer Comments</b> .....	14

# Chapter 1: Introduction

## Features

- 32 lines of digital I/O
- High-speed USB 2.0 device, USB 1.1 backwards compatible
- All lines independently selectable for inputs or outputs
- All 32 I/O lines buffered with 32 mA source, 64mA sink current capabilities
- Terminal block adapter card for easy wiring
- I/O Buffers can be enabled or tri-stated under program control
- I/O's pulled up to 5V (via 10K $\Omega$ ) for dry-contact monitoring
- Jumper selectable power provided via USB cable or external power supply for higher source current capabilities
- Resettable fused +5VDC output
- Standard 50pin IDC type connector with key
- Dimensions (L,W): 3.550 x 3.775 inches
- Rugged industrial enclosure
- Compatible with Industry-Standard I/O Racks such as Gordos, OPTO22, Potter & Brumfield, etc. with optional cable

## Applications

- Automatic Test Systems (e.g., factories)
- 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 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 2.0 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 32 bits of TTL-compatible digital I/O with high-current capabilities. Each digital line can be programmed to accept an input or to drive an output. Power is supplied to the card via the USB cable or for higher source current capabilities, external power may be used. The I/O wiring connections are via an industry standard 50-pin connector or via an optional terminal block adapter card. 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 ABT tri-stateable buffer transceiver capable of sourcing 32 mA or sinking 64 mA. The buffers are configured under program control for input or output. I/O lines are pulled-up via 10K $\Omega$  to +5 VDC.

For compatibility with industry standard solid state module mounting racks external power is required for the logic side of the module mounting rack as the load is typically greater than what can be provided over a USB port.

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.

The board is designed to be used in rugged industrial environments but is small enough to fit nicely onto any desk or testing station. The board is PC/104 size (3.550 by 3.775 inches) and can be ordered to ship inside a steel powder-coated enclosure with an anti-skid bottom.

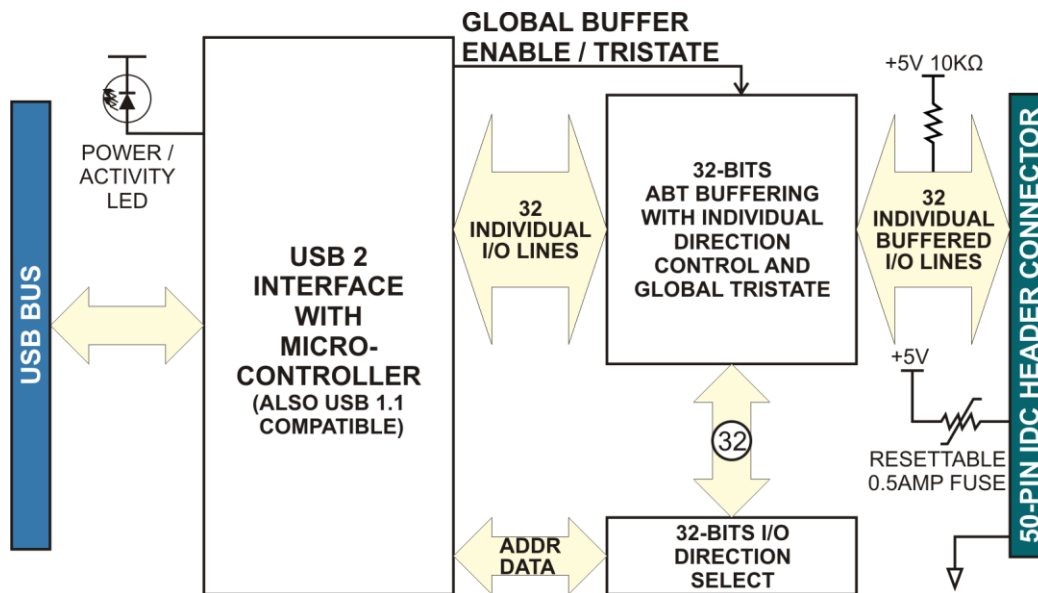


Figure 1-1: Block Diagram

## Ordering Guide

- USB-DIO-32I USB 32-individually selectable I/O digital module


## Model Options

- -OEM Board only version with no enclosure
- -E Economy version includes no screw terminal
- -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.










## Chapter 2: Installation

### Software CD Installation

These paragraphs are intended to detail the software installation steps as well as describe what is being installed.

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  in the examples below.

#### WINNT/2000/XP/2003

- a. Place the CD into your CD-ROM drive.
- b. The CD should automatically run the install program. If the install program does not click START | RUN and type        , click OK or press .
- 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 when reading this section of the manual.

### USB Connector

The USB connector is a Type B 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 current applications, an external power supply can be used.

### 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 Header

The 50 pin box header has standard .100" spacing between pins and is keyed to prevent improper connections. It can be used with standard IDC type ribbon cables or the screw terminal board that plugs directly into the box header.

## Chapter 4: USB Address Information

Use the provided driver to access 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.

The board's VID is "0x1605", and its PID is "0x8004".

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

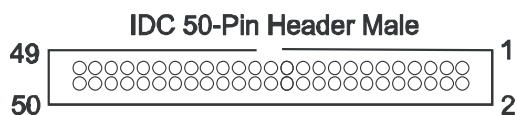
These functions will allow you to read or write individual bits, bytes, or the entire board worth of data. In addition, counter-timer functionality and board-level functions complete the driver package.

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)
unsigned long CTR_8254Mode(DeviceIndex, BlockIndex, CounterIndex, Mode)
unsigned long CTR_8254ModeLoad(DeviceIndex, BlockIndex, CounterIndex,Mode,
LoadValue)
unsigned long CTR_8254ReadModeLoad(DeviceIndex, BlockIndex, CounterIndex, Mode,
LoadValue , pReadValue)
unsigned long CTR_8254Read(DeviceIndex, BlockIndex, CounterIndex, pReadValue)
unsigned long CTR_StartOutputFreq(DeviceIndex, CounterIndex, pHz)
```

## Chapter 6: Connector Pin Assignments

A 50-pin male header connector protrudes through a cutout in the enclosure for I/O connections. Connector pin assignments are listed below.



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

PIN	FUNCTION	PIN	FUNCTION
1	DIO C7	2	GND
3	DIO C6	4	GND
5	DIO C5	6	GND
7	DIO C4	8	GND
9	DIO C3	10	GND
11	DIO C2	12	GND
13	DIO C1	14	GND
15	DIO C0	16	GND
17	DIO B7	18	GND
19	DIO B6	20	DIO D7
21	DIO B5	22	DIO D6
23	DIO B4	24	GND
25	DIO B3	26	DIO D5
27	DIO B2	28	GND
29	DIO B1	30	DIO D4
31	DIO B0	32	GND
33	DIO A7	34	DIO D3
35	DIO A6	36	GND
37	DIO A5	38	DIO D2
39	DIO A4	40	GND
41	DIO A3	42	DIO D1
43	DIO A2	44	GND
45	DIO A1	46	DIO D0
47	DIO A0	48	GND
49	Fused +5VDC	50	GND

## Chapter 7: Specifications

### Digital Inputs (TTL Compatible, @ 4kHz)

Logic High: 2.0 to 5.0 VDC  
Logic Low: -0.5 to +0.8 VDC

### Digital Outputs

Logic High: 2.0 VDC minimum, source 32 mA  
Logic Low: 0.55 VDC maximum, sink 64 mA

Pull-Up Resistor: 10k ohms (to +5V)

**Bus Type:** USB 2.0 High-speed,  
USB 1.1 Full-speed compatible

### Environmental

Operating Temp: 0° to 70°C  
Storage Temp: -40° to +85°C  
Humidity: 5%-95%, non-condensing  
Board Dim.: 3.550 x 3.775 inches  
Box Dim.: 4.0 x 4.0 x 1.25 inches

### Power

+5VDC: 60mA (All inputs, no load)  
150mA (All outputs low, no load)  
provided via USB bus at up to 500mA\*\*

### Environmental

- Operating Temperature Range: 0 °C. to 70 °C.
- Storage Temperature Range: -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***. Please detail any errors you find so that we can send you any manual updates.