ACCES I/O PRODUCTS, INC.

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USB ISOLATED DIGITAL INPUT BOARD MODELS USB-II16-OEM, USB-II8-OEM and USB-II4-OEM

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 BOARD. CONNECTING AND DISCONNECTING CABLES, OR INSTALLING BOARDS INTO A SYSTEM WITH THE COMPUTER OR FIELD POWER ON MAY CAUSE DAMAGE TO THE I/O BOARD AND WILL VOID ALL WARRANTIES, IMPLIED OR EXPRESSED.

Warranty

Prior to shipment, ACCES equipment is thoroughly inspected and tested to applicable specifications. However, should equipment failure occur, ACCES assures its customers that prompt service and support will be available. All equipment originally manufactured by ACCES 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 ACCES' 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 ACCES designated Service Center, and will be returned to the customer's/user's site freight prepaid and invoiced.

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First Three Years: Returned unit/part will be repaired and/or replaced at ACCES option with no charge for labor or parts not excluded by warranty. Warranty commences with equipment shipment.

Following Years: Throughout your equipment's lifetime, ACCES stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry.

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General

Under this Warranty, liability of ACCES is limited to replacing, repairing or issuing credit (at ACCES discretion) for any products which are proved to be defective during the warranty period. In no case is ACCES liable for consequential or special damage arriving from use or misuse of our product. The customer is responsible for all charges caused by modifications or additions to ACCES equipment not approved in writing by ACCES or, if in ACCES opinion the equipment has been subjected to abnormal use. "Abnormal use" for purposes of this warranty is defined as any use to which the equipment is exposed other than that use specified or intended as evidenced by purchase or sales representation. Other than the above, no other warranty, expressed or implied, shall apply to any and all such equipment furnished or sold by ACCES.

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Chapter 1: Introduction

This board is an ideal solution for adding portable, easy-to-install digital inputs to any computer with a USB port. As a USB 2.0 high speed device it offers the fastest speed available with the USB 2.0 bus, while being compatible with both USB 1.1 and USB 2.0 ports. The board is plug-and-play allowing for quick connect/disconnect whenever you need additional inputs on your computer.

Features
- High-Speed USB 2.0 device, USB 3.0 and 1.1 compatible
- 16, 8, or 4 optically isolated inputs
- On-board 45 degree angled screw terminals
- Custom high-speed function driver
- PC/104 module size (3.550" by 3.775") and mounting compatibility

Applications

These boards are especially useful in applications where high common-mode external voltages are present. Isolation is required to guard electronics from transient voltage spikes and offers greater common-mode noise rejection in electronically noisy surroundings containing industrial machinery and inductive loads. These applications include factory automation, energy management, industrial ON/OFF control, security systems, manufacturing test, and process monitoring. In addition to protecting industrial applications from accidental contact with high external voltages, the isolation provided eliminates troublesome ground loops.

Inputs

The board provides sixteen optically-isolated inputs. These inputs can accept either AC or DC signals and are not polarity sensitive. Input signals are rectified by photocoupler diodes while unused power gets dissipated through a 1.8k-ohm resistor in series. The inputs may be driven by either DC sources of 3 to 31 volts (rms) or AC sources at frequencies of 40 Hz to 10 KHz. Standard 12/24 AC control transformer outputs can be accepted as well. External resistors connected in series may be used to extend the input voltage range, however this will raise the input threshold range. See Table 1-1 for modified input ranges.

Each input circuit contains a switchable filter that has a 4.7 millisecond time constant. (Without filtering, the response is less then 40 microseconds) The filter must be selected for AC inputs in order to eliminate the on/off response to AC. The filter is also valuable for use with slow DC input signals in a noisy environment. The filter may be switched out for DC inputs in order to obtain faster response. Filters are individually jumper selected. Filters are switched into the circuit when jumpers are installed in position FLT0 to FLT15.

Model Versions

- USB-II16-OEM   16 isolated digital inputs module with on-board screw terminals
- USB-II8-OEM   8 isolated digital inputs module with on-board screw terminals
- USB-II4-OEM   4 isolated digital inputs module with on-board screw terminals

Each version is a different population on the same PCB. This manual primarily describes the 16 input version. Wherever references occur to the number of inputs, substitute the number of inputs with the quantity specific to the model you are considering, or have purchased. All lesser quantity than the fully populated versions start their input counts from input 00. So the II8 version would be populated with inputs IN00 through IN07. The II4 version would be populated with inputs IN00 through IN03. The corresponding screw terminals would also be only populated with the terminals to access the inputs on the model you purchased.
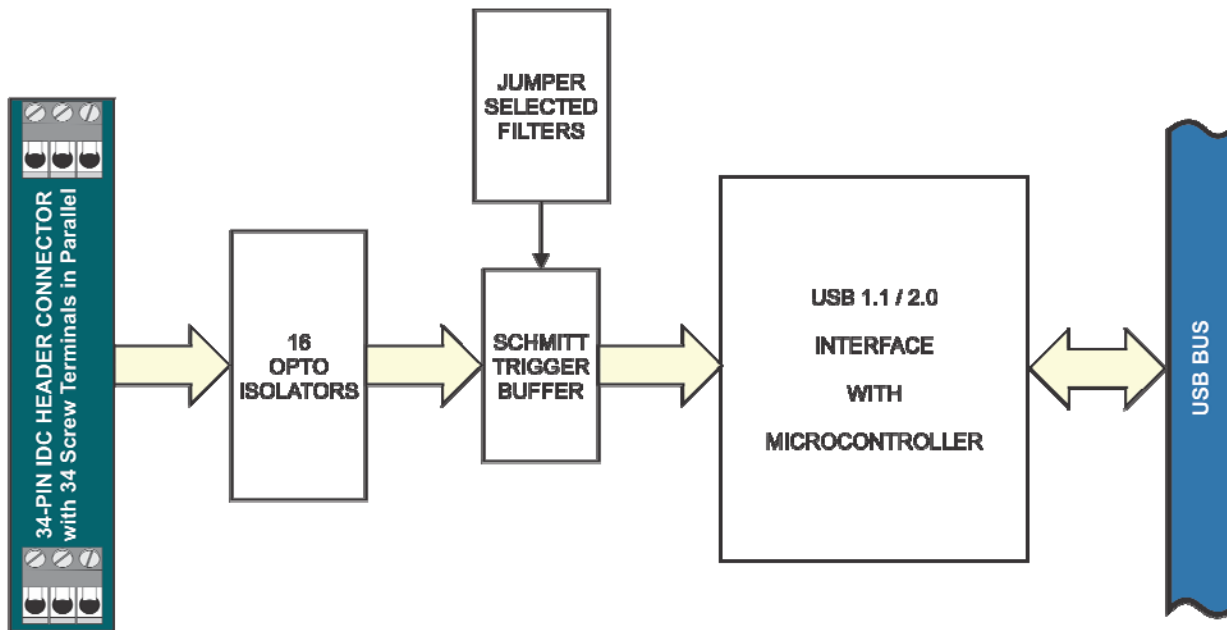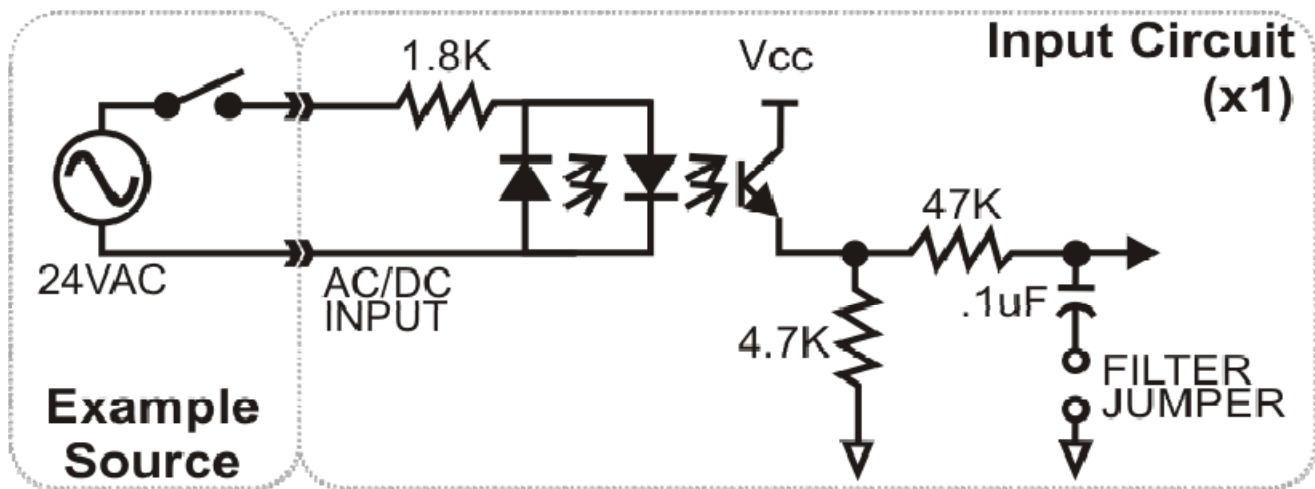

Figure 1-1: Block Diagram

Figure 1-2: Example of one Input Circuit

Input Voltage Range	External Series Resistor
3-31V DC or AC rms	None
6-62V DC or AC rms	1.8KΩ, 1/2W, 5%
9-93V DC or AC rms	3.6KΩ, 1/2W, 5%
12-124V DC or AC rms	5.4KΩ, 1/2W, 5%

Table 1-1: Modified Input Voltage Ranges

Ordering Guide

USB-II16-OEM	16-channel Isolated digital input module with on-board screw terminals
USB-II8-OEM	8-channel isolated digital input module with on-board screw terminals
USB-II4-OEM	4-channel isolated digital input module with on-board screw terminals

Model Options

-T	Extended operating temperature -40° to +85°C
-PR	+5VDC external power jack and regulated AC/DC adapter
-ST	External power components & screw terminals for power input (high retention)
-RoHS	RoHS compliant version

Optional Accessories

MP104-DIN	DIN-rail mounting plate
C34F-12	12" female to female ribbon cable assembly
STB-34	Remote Screw Terminal Adaptor
DIN-SNAP6	DIN rail snap track for mounting STB-34
CUSB-EMB-6	6' USB Cable with Type A to mini connector

Included with your board

The following components are included with your shipment. Please take time now to ensure that no items are damaged or missing.

1. USB Isolated Input OEM Board
2. 6' USB 2.0 Type A to B cable
3. Software Master CD (PDF user manual installed with product package)
4. Printed USB I/O Quick-Start Guide

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 operating system. Substitute the appropriate drive letter for your drive where you see d: in the examples below.

WIN98/Me/2000/XP/2003/Vista/7

a.   Place the CD into your CD-ROM drive.
b.   The CD should automatically run the install program. If the install program does not run, 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 compatible port, including USB 3.0 and 1.1. 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: Option Selection

Refer to the setup program 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.
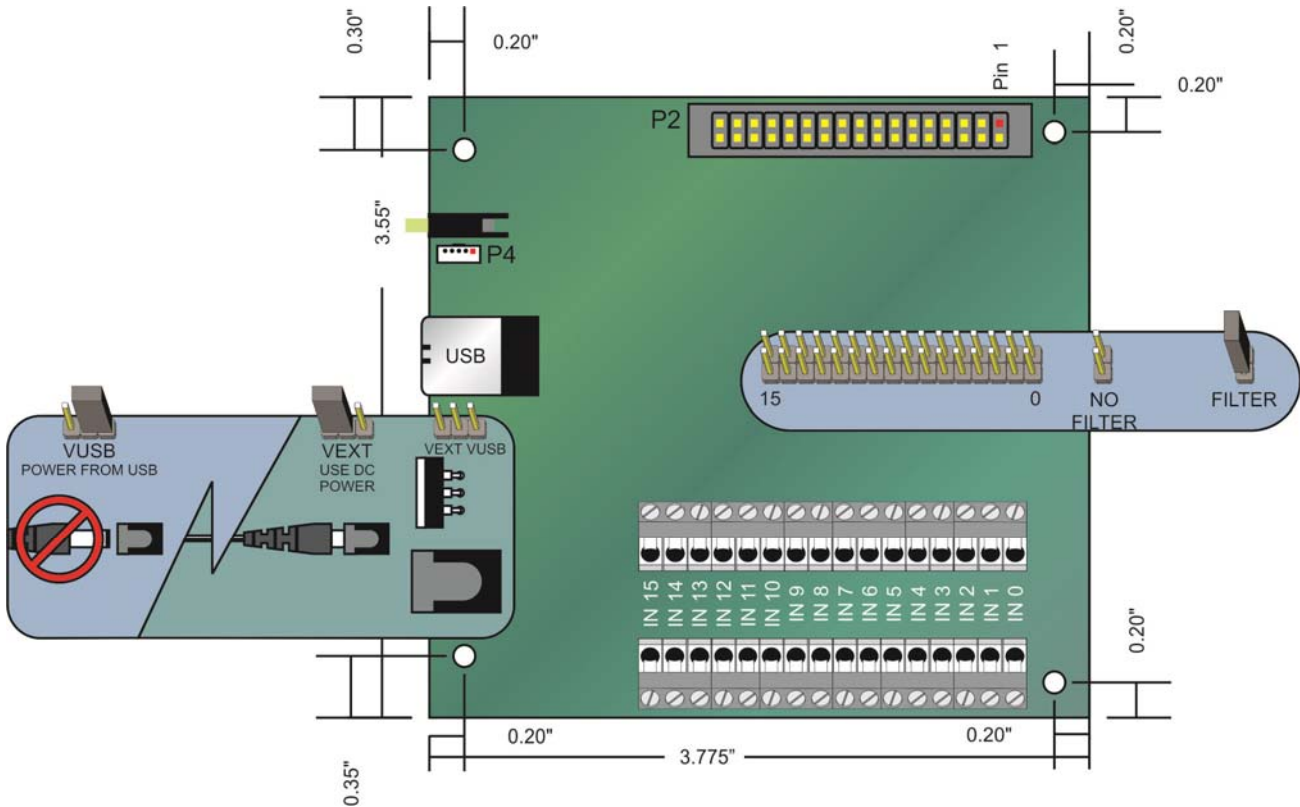

Figure 3-1: Option Selection Map

Input Power

This is an option for applications that use more current 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 a 5VDC AC/DC external power supply that ships with this option. 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.

USB Connectors

The primary 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 desired, an external power supply can be used. Selection of power source is accomplished via a hardware jumper setting. A secondary USB connector (P4) is available to use instead of the Type B which is an embedded mini 5-pin connector that is in parallel with and next to the primary connector.

LED

The LED next to the USB type B connector 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.

Filter Response Jumpers

Jumpers are used to select input filtering on a channel-by-channel basis. When jumper FLT0 is installed, additional filtering is introduced for input bit 0, FLT1 for bit 1, etc.

JUMPER SELECTION	Bit Filtered
FLT-0	IN00
FLT-1	IN01
FLT-2	IN02
FLT-3	IN03
FLT-4	IN04
FLT-5	IN05
FLT-6	IN06
FLT-7	IN07

JUMPER SELECTION	Bit Filtered
FLT-8	IN08
FLT-9	IN09
FLT-10	IN10
FLT-11	IN11
FLT-12	IN12
FLT-13	IN13
FLT-14	IN14
FLT-15	IN15

This additional filtering provides a slower response for DC signals as described previously and must be used when AC inputs are applied.

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". See the table for PID to model descriptions.

Model Description	PID
16 Inputs	0x8019
8 Inputs	0x801D
4 Inputs	0x801F

Table 4-1: Model Description to PID

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.

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

Isolated Inputs are connected to the board via 45 degree angle screw terminals.
Alternatively, connections may be made via a 34-pin HEADER type connector named P2.
The mating connector is an IDC type with 0.1 inch centers or equivalent.

PIN	NAME	FUNCTION
1	IN00 A	Isolated Input 00 A
2	IN00 B	Isolated Input 00 B
3	IN01 A	Isolated Input 01 A
4	IN01 B	Isolated Input 01 B
5	IN02 A	Isolated Input 02 A
6	IN02 B	Isolated Input 02 B
7	IN03 A	Isolated Input 03 A
8	IN03 B	Isolated Input 03 B
9	IN04 A	Isolated Input 04 A
10	IN04 B	Isolated Input 04 B
11	IN05 A	Isolated Input 05 A
12	IN05 B	Isolated Input 05 B
13	IN06 A	Isolated Input 06 A
14	IN06 B	Isolated Input 06 B
15	IN07 A	Isolated Input 07 A
16	IN07 B	Isolated Input 07 B
17		
18		
19	IN08 A	Isolated Input 08 A
20	IN08 B	Isolated Input 08 B
21	IN09 A	Isolated Input 09 A
22	IN09 B	Isolated Input 09 B
23	IN10 A	Isolated Input 10 A
24	IN10 B	Isolated Input 10 B
25	IN11 A	Isolated Input 11 A
26	IN11 B	Isolated Input 11 B
27	IN12 A	Isolated Input 12 A
28	IN12 B	Isolated Input 12 B
29	IN13 A	Isolated Input 13 A
30	IN13 B	Isolated Input 13 B
31	IN14 A	Isolated Input 14 A
32	IN14 B	Isolated Input 14 B
33	IN15 A	Isolated Input 15 A
34	IN15 B	Isolated Input 15 B

Table 6-1: Isolated Inputs Connector Pin Assignments

Chapter 7: Specifications

ISOLATED INPUTS

Number of inputs:	Sixteen
Type:	Non-polarized, optically isolated from each other and from the computer (CMOS compatible)
Voltage Range:	3 to 31 DC or AC Rms (40 to 10000 Hz)
Isolation:	500V*(see note) channel-to-ground or channel-to channel
Input Resistance:	1.8K ohms in series with opto coupler
Filter Response:	Rise Time = 4.7 mS
	Fall Time = 4.7 mS
Without Filter:	Rise Time = 10 uS
	Fall Time = 30 uS

POWER REQUIRED   +5V@ 30mA typical

ENVIRONMENTAL

Operating Temp:	0° to 70°C (-40° to +85°C available)
Storage Temp:	-40° to +85°C
Humidity:	5 to 95% RH, without condensation
Dimensions:	3.550 x 3.775 inches

*Notes on Isolation: Opto-Isolators and connectors are rated for at least 500V, but isolation voltage breakdowns will vary and is affected by factors like cabling, spacing of pins, spacing between traces on the PCB, humidity, dust and other environmental factors. This is a safety issue so a careful approach is required. For CE certification, isolation was specified at 40V AC and 60V DC. The design intention was to eliminate the influence of common mode. Use proper wiring techniques to minimize voltage between channels and to ground. For example, when working with AC voltages do not connect the hot side of the line to an input. Tolerance of higher isolation voltage can be obtained on request by applying a conformal coating to the board.

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: *manuals@accesio.com*. Please detail any errors you find and include your mailing address so that we can send you any manual updates.

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