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**MODEL USB-104-IHUB**

**INDUSTRIAL FOUR PORT USB 2.0  
ISOLATED HUB**

**USER MANUAL**

### **Notice**

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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, 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.

## **Terms and Conditions**

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.

## **Coverage**

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.

## **Equipment Not Manufactured by ACCES**

Equipment provided but not manufactured by ACCES is warranted and will be repaired according to the terms and conditions of the respective equipment manufacturer's warranty.

## **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 arising 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

The USB-104-IHUB is a high performance and low cost solution for isolated, rugged, reliable, Made-in-the-USA USB expansion. It is compliant with the USB 2.0 specification as well as being fully backwards compatible with USB 1.1. Each of the four downstream ports are capable of Low-speed and Full-speed transfers.

### Features

- Full-speed USB 2.0 device, USB 3.0 and 1.1 compatible
- Rugged, industrial grade (-40 °C to 85 °C) operation
- One upstream host port isolated from the four downstream ports
- Downstream ports capable of low-speed (1.5 Mbps) and full-speed (12 Mbps) transfers aggregate
- LED status indicators for power and overcurrent fault conditions for each downstream port
- Compact, low profile enclosure
- High retention USB connectors on up- and downstream ports
- Embedded miniature USB headers in parallel with each USB standard connector (both upstream and downstream)
- Tru-Iso™ signal isolation up to 4kV upstream to downstream
- ESD protection  $\pm 20\text{kV}$  on all signal pins (air and contact)
- Upstream short-circuit protection
- High common-mode transient immunity:  $>25\text{kV}/\mu\text{S}$
- Max working isolation 863 Volt peak ( $V_{\text{IORM}}$ )

### Applications

- Medical
- Portable / Laptop
- Education / Laboratory
- Industrial Automation
- Embedded OEM
- Military Systems Expansion

### Functional Description

This product utilizes a high-performance, low-power USB 2.0 hub controller. It is USB-IF certified, Windows Hardware Quality Lab (WHQL) compliant, and its operating temperature is rated for industrial grade environments. Being able to operate at industrial grade temperatures, the USB-104-IHUB offers its functionality to a wider range of user applications that many competitors' USB hubs can't provide.

The card has light emitting diodes (LED) that indicate its status. A green LED near the upstream port's high-retention type B connector (visible through a cutout in the enclosure) indicates power to the upstream side. Each downstream port has two respective surface mount diode (SMD) LEDs that provide status. A green LED near the downstream port's high-retention Type A receptacle (visible through a cutout in the enclosure) indicates that the port is enabled whereas the red LED indicates an

overcurrent fault condition. The customer also has the option to specify jumper posts or a header connector to connect their own LEDs for panel mounting instead of the on-board SMD's if desired.

The USB-104-IHUB is fully protected from faulty peripherals connected to its downstream ports. Each port utilizes its own power distribution switch that provides overcurrent and short-circuit protection. If a fault occurs, the power distribution switch will disengage the respective port and enable its fault LED as a latched visual indicator to the user. A fault occurring on one downstream port will not affect devices attached to the hub's other downstream ports. Any detected fault that occurs will result in a Windows message popping up on the monitor notifying the operator. To re-enable a faulted port, the user must clear the fault then cycle power to the hub.

The USB-104-IHUB needs bus power and isolated power via an available medical grade external supply.

All Type A and the Type B USB connectors on the board feature a high retention design that complies with the class 1, Div II minimum withdrawal requirement of over 3 pounds of force (15 Newtons). This connector has an orange color-coded insulator to quickly differentiate it from standard USB connectors. Using these USB connectors increases reliability and ensures a tight connection. For embedded OEM type applications, all ports (upstream and downstream) have an alternative miniature USB header in parallel with the standard port connector. This method facilitates the smallest possible footprint to be occupied by the hub and associated cables.

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 module is PC/104 sized (3.550 by 3.775"), while the enclosure is 4" x 4" x 1".

### Ordering Guide

- USB-104-IHUB                      USB 2.0 Isolated Industrial HUB
- PWR-ISO-5V                        Isolated medical grade external power adaptor 5VDC @ 2.5A

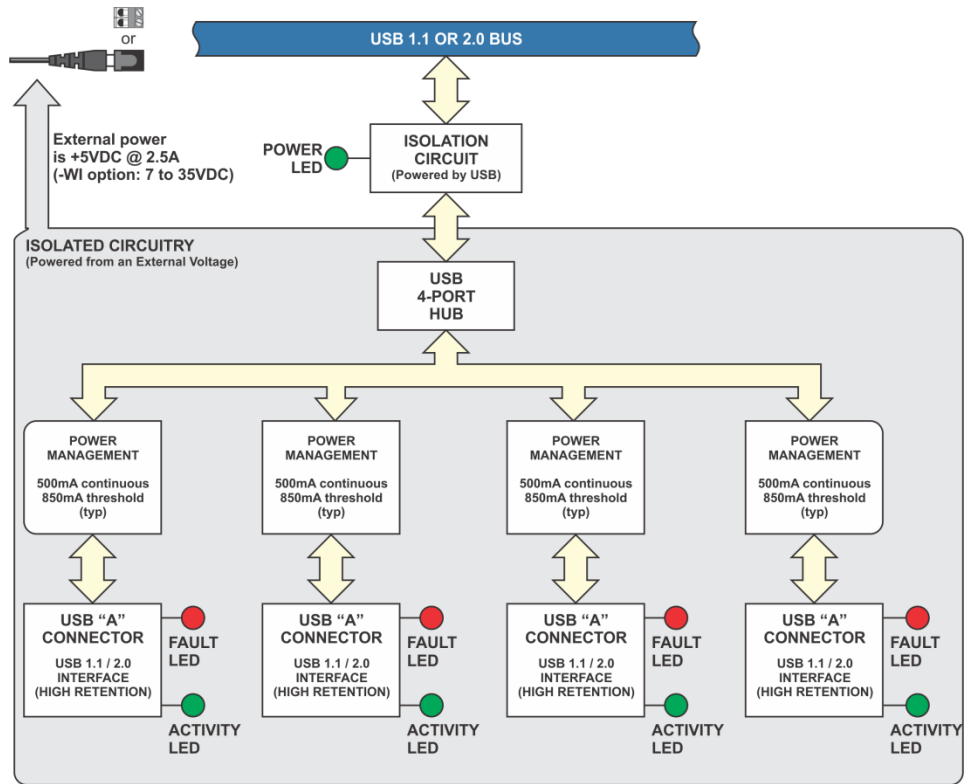
### Model Options

- -WI                                    Wide Input power range from 7V to 35VDC
- -OEM                                  Board only version (no enclosure)
- -HDR                                  Jumper header posts for LEDs (-OEM version only)
- -ST                                    High retention external power connection

### Included with your USB-104-IHUB

The following components are included in 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 type A to B



**Figure 1-1: Block Diagram**

**Optional Accessories**

• MP104-DIN	DIN-rail mounting provision
• CUSB-EMB-1	1ft USB Type A to micro-fit OEM header
• CUSB-EMB-6	6ft USB Type A to micro-fit OEM header
• CUSB-EMB-HDR	30" USB 1x5 standard header to micro-fit OEM cable
• CUSB-EMB-HDRM	30" USB 1x5 metric header to micro-fit OEM cable
• CUSB-EMB	6" micro-fit to micro-fit embedded OEM cable

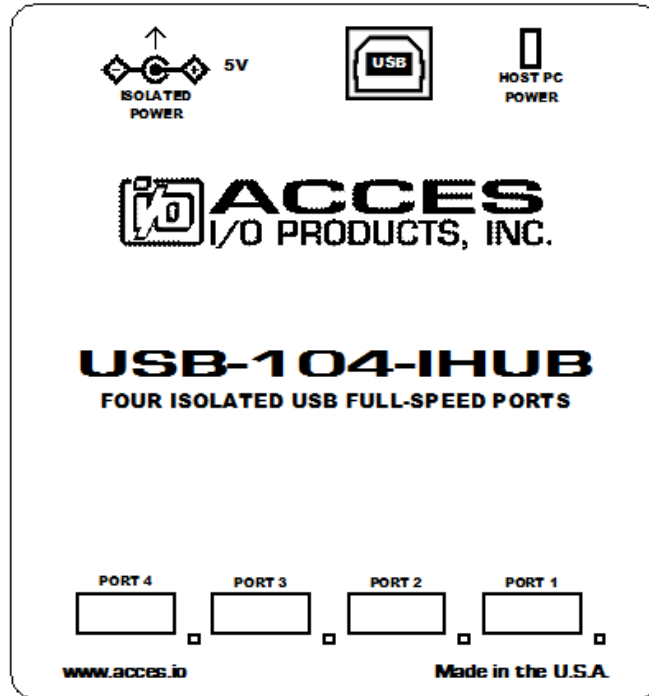


Figure 1-2: Enclosure Label



## **Chapter 2: Installation**

### **Software CD Installation**

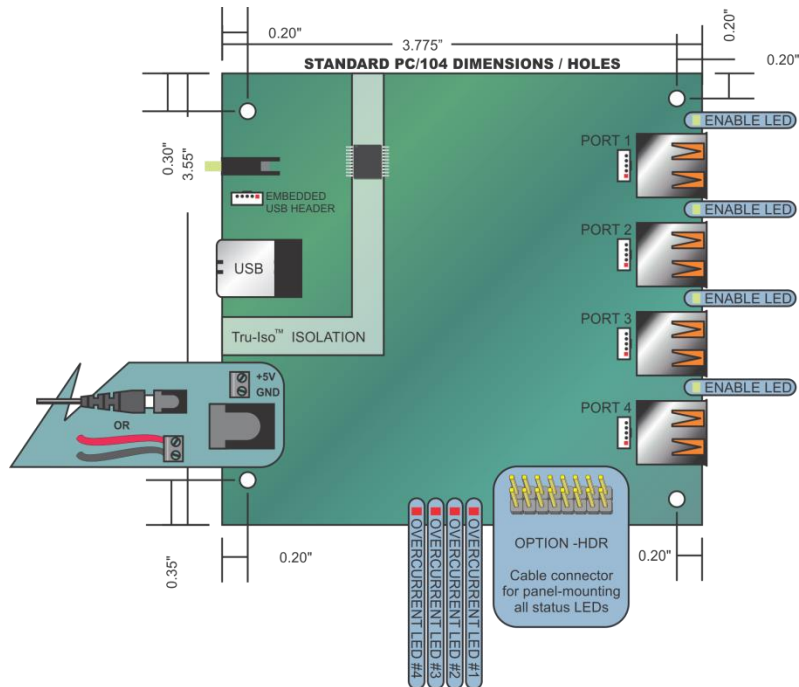
No software is provided with this board. There is no need to install any drivers for the USB-104-IHUB product. It will enumerate as a Generic Hub using the USB Hub Class Driver that is built into Windows OS or Linux. There's no driver needed from the user.

### **Hardware Installation**

The unit can be connected to any USB 2.0 or USB 1.1 port.

## Chapter 3: Hardware Details

Refer to the Block diagram and the Option Selection Map when reading this section of the manual.



**Figure 3-1: Option Selection Map**

### USB Connectors

The primary USB connector is a high-retention Type B and connects to the host USB port with the “A to B” cable provided. The host USB port provides communication signals along with +5 VDC power for the upstream side. Secondary USB connectors are powered by an external +5VDC and are high-retention Type A.

### Embedded USB Connector (Upstream)

Mini 5-pin header in parallel with type B connector. See Embedded USB Connector (Downstream) on next page for mating connector information.

### LED

The LED on the front of the enclosure is used to indicate power to the upstream side.

### Power (Upstream Port)

Power for the upstream port is drawn from the host USB port. The LED next to the upstream USB connector on the front of the enclosure is used to indicate power to the upstream side.

## Isolated Power (Downstream Ports)

### DC Power Jack

This DC jack has a 2.00mm post on board and is designed to be used with the medical grade +5 VDC external power supply that is available with your isolated hub.

### Screw Terminals (-ST Option)

This is an optionally available two-position screw terminal that provides a high-retention method to connect external isolated +5V power and return (GND) and replaces the DC power jack. Note that power applied using this method must follow the USB specification of providing no more than +5.25V and no less than +4.75V (+5V±5%)

### WI Option

With the “Wide Input” power factory option, provide between 7VDC and 35VDC connected to the DC Power Jack or with the –ST option, via the screw terminals.

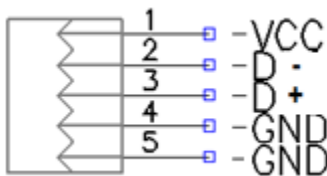
## Downstream LEDs and “-HDR” Factory option

Each downstream port has two status indicator LEDs. The green LED indicates power to the port and the red LED indicates an overcurrent fault condition. The user can specify the -HDR option when ordering which replaces the standard surface mount LEDs with a 16-pin right-angle header post. It has 0.100” spacing between pins.

PIN #	OVR4	EN4	OVR3	EN3	OVR2	EN2	OVR1	EN1	PIN #
	Port 4 overcurrent	Port 4 enabled	Port 3 overcurrent	Port 3 enabled	Port 2 overcurrent	Port 2 enabled	Port 1 overcurrent	Port 1 enabled	
1	Cathode	Cathode	Cathode	Cathode	Cathode	Cathode	Cathode	Cathode	1
2	Anode	Anode	Anode	Anode	Anode	Anode	Anode	Anode	2

## Embedded USB Connector (Downstream)

There is a mini 5-pin header in parallel with the type A USB connector. The mating connector part number ([at mouser.com](http://www.mouser.com)) is **51021-0500**, while the crimp pins are **50079-8000**. Finally, a special crimper is needed, part number **63819-0300**. Of course, ACCES I/O offers a variety of USB cable solutions to mate with the mini USB headers on this board. Refer to the optional accessory table or contact the factory.



**Figure 3-2: USB Mini Header Pinout**

## Chapter 4: Specifications

### Data Rate

1.5 / 12 Mbps

### Environmental

Operating Temp.	-40° to +85°C
Storage Temp.	-40° to +85°C
Humidity	5% to 95% non-condensing
Board Dimension	3.550 x 3.775 inches
Weight	56.2 grams
Ext. Power Supply	0° to 40°C

### Power

-WI Option	7VDC to 35VDC at the DC power jack or screw terminals
Upstream power	approximately 6 mA from host port
External power	approximately 500 mA available for each downstream port with our medical grade isolated power supply
Current-limiting	0.85 A typical per downstream port

### Isolation

ESD Protection	±20kV on all signal pins (IEC 61000-4-2 Level 4)
Tru-Iso™	IPC-2221B, UL60590-1, UL1577 4000 V isolation meets EN60601 for medical applications

Upstream to Downstream	1500 V peak (AC or DC)
Max Transient	4000 V rms
Max Working	863 V peak

Careful attention has been paid to isolation design, including extensive keep-out zones and hand-routed circuit paths, as well as component and material selection.

Our Tru-Iso™ products are designed under IPC-2221B, UL1577, and UL60950-1. The circuit is isolated with a ≥ 300mil gap between all signal and plane layers (upstream to downstream ports). These gaps are rated under IPC-2221B at 1500V (upstream to downstream).

Our circuit uses a chip-level high-frequency DC-DC isolator which is rated at 5000Vrms for 1 minute under UL 1577. This isolation component has an over 50 year isolation lifespan even if the isolation voltage potential is in excess of 846 volts AC. Under UL60590-1 the card design meets or exceeds the DC-DC isolator specification.

TRU-ISO™ by ACCES I/O Products, Inc., for true signal isolation.

## Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: ***manuals@accessio.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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Manual USB-104-IHUB