



**MODEL USB-DIO-96
USB 96 CHANNEL
DIGITAL INPUT/OUTPUT MODULE
USER MANUAL**

FILE: MUSB-DIO-96.A1f

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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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Chapter 1: Introduction

Features

- 96 lines of digital I/O
- High-speed USB 2.0 device, USB 1.1 backwards compatible
- Twelve (12) 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, pulled down to ground or floating
- Jumper selectable power provided via USB cable or external power supply for higher current sourcing capabilities
- Resettable fused +5VDC output per I/O connector
- Standard 50-pin IDC-type shrouded connectors with key
- PC/104 size board (3.550 by 3.775 in.)
- Rugged industrial enclosure
- Compatible with Industry-Standard I/O Racks such as Gordos, OPTO22, Potter & Brumfield, etc.

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 lines 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 four industry standard 50-pin connectors. For external circuits, fused +5VDC power is available at the each connector. The two resettable fuses are rated at 0.5A, with each fuse feeding two I/O connectors.

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.

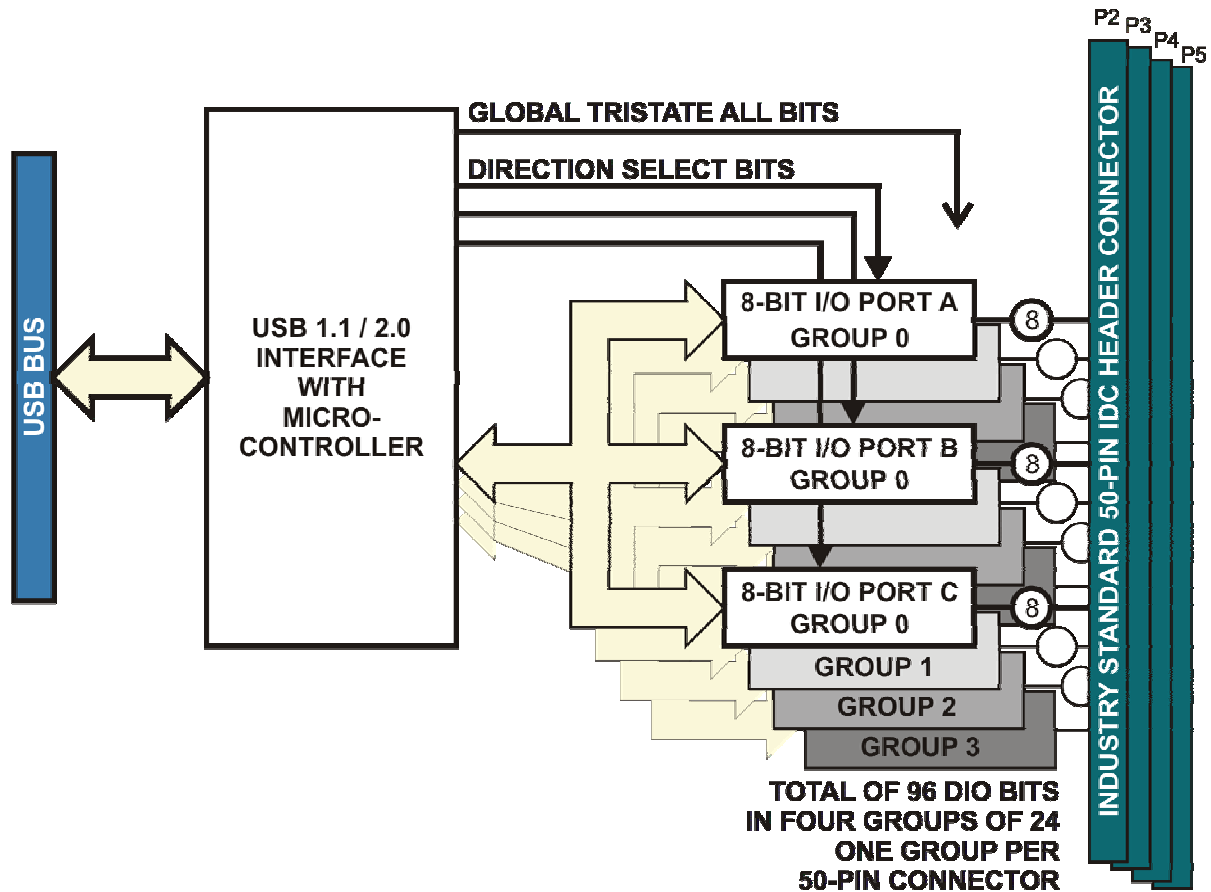


Figure 1-1: Block Diagram

Ordering Guide

USB-DIO-96 USB 96-channel digital input/output module

Model Options

- -OEM Board only version with no enclosure
- -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 Accessories

- 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
- STB-50 Screw terminal board, typically ships with standoffs but can also mount on SNAP-TRACK or DIN-SNAP
- DIN-SNAP-6 Six inch length of SNAP-TRACK with two clips, for mounting one STB-50 screw terminal board on a DIN rail
- DIN-SNAP 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 X . in the examples below.

WIN 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 X .] b g h U ` ` , 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 and the Option Selection Map when reading this section of the manual.

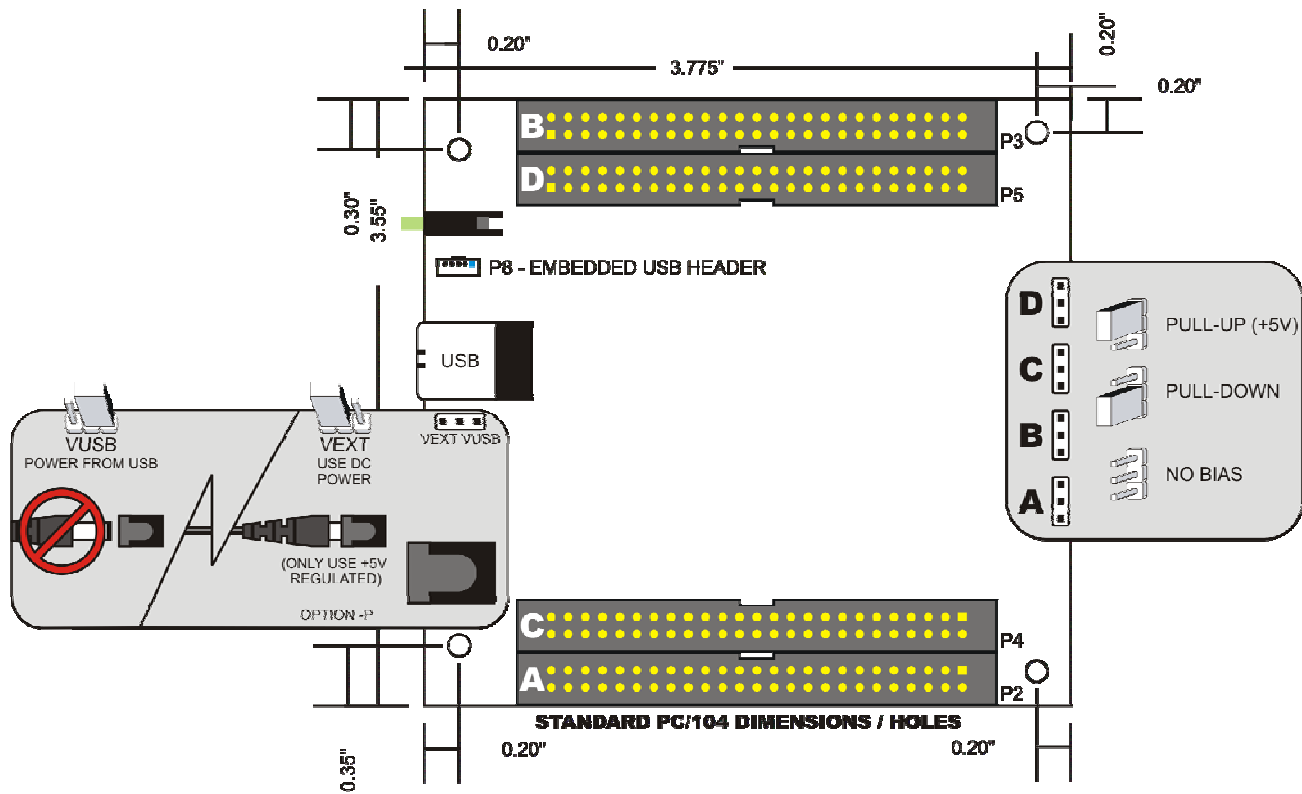


Figure 3-1: 96 Channel Board Option Selection Map

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

Micro 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.

5V Resettable Fused Outputs

Two 0.5A resettable fuses each feed two I/O connectors at pin 49 used to power external module racks or relay boards, or for general purposes. If an over-current persists on a circuit protected by a resettable fuse, it will open interrupting power to the circuit. The amount of time it takes the fuse to act depends on the amount of over-current and other conditions such as ambient temperature, humidity, etc. The fuse will remain open until the bi-metal elements cool sufficiently, at which time the circuit will be restored.

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 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 VID is "0x1605" while the 96 bit board PID is "0x8003".

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

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 is a list of the most common function calls provided by the driver in Windows.

For a complete list of available functions and details on how to use them refer to the USB Software Reference Manual located in the installation path for this board.

unsigned long DIO_Configure(DeviceIndex, bTristate, pOutMask, pData)

unsigned long **DIO_Configure**(

unsigned long DeviceIndex - number from 0-31 of the device you want to configure
unsigned char bTristate - boolean value. TRUE causes all bits on the device to enter tristate (high-impedance) mode. FALSE removes the tristate. The tristate is changed **after** the remainder of the configuration has occurred. All devices with this feature power-on in the "tristate" mode at this time.

void *pOutMask - a pointer to the first element of an array of bytes; one byte per 8 ports or fraction. Each "1" bit in the array indicates that the corresponding byte of the device is Output.

void *pData - a pointer to the first element of an array of bytes. Each byte is copied to the digital output ports on the device before the ports are taken out of tristate. Any bytes in the array associated with ports configured as input are ignored.

)

The size of the out mask and data is as follows:

Out Mask	2 bytes
Data	12 bytes

unsigned long DIO_WriteAll(DeviceIndex,pData)

unsigned long DeviceIndex - number from 0-31 of the device to which you wish to write all output bits

void *pData - pointer to the first element of an array of bytes. Each byte is copied to the corresponding output byte. Bytes written to ports configured as inputs are ignored

)

Note that the size of "all" is the same as the size of the data given under DIO_Configure.

unsigned long DIO_ReadAll(DeviceIndex,Buffer)

unsigned long DeviceIndex - number from 0-31 of the device from which you wish to read all digital bits

void *Buffer - pointer to the first element of an array of bytes. Each port will be read, and the reading stored in the corresponding byte in the array.

)

Note that the size of "all" is the same as the size of the data given under DIO_Configure.

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 feeds two I/O connectors each

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: sales@adl-usa.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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