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## **MODEL USBP-II8IDO4A**

**8 ISOLATED DIGITAL INPUTS,  
4 SOLID STATE RELAY OUTPUTS  
and 2 16-BIT ANALOG INPUTS**

## **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.

## **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.

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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 multi-function I/O board is an ideal solution for adding portable, easy-to-install industrial grade I/O to any computer with a supported USB port. As a USB 2.0 high speed device it offers the fastest speed currently available with the USB bus, while being fully compatible with both USB 1.1 and USB 2.0 ports. The card is plug-and-play allowing for quick connection whenever you need additional I/O on your computer.

### Features

- High-speed USB 2.0 device, USB 1.1 compatible
- 8 individual optically isolated digital inputs
- Polarity insensitive discrete AC/DC inputs accept up to 31V DC or AC RMS
- Jumper selectable filtering per input channel for AC or voltage transients
- 4 optically isolated fully protected solid state high-side FET outputs
- Outputs capable of switching from 5-34 VDC at up to 3A each
- 2 general purpose 16-bit A/D inputs of 0-4.096V
- Custom high-speed function driver
- Alternate embedded USB connector
- All required power drawn from USB port, no external power adapter required

### Applications

The small size and easy connection makes it an excellent choice for embedded applications such as mobile, robotics, kiosks, and embedded medical and machine equipment. Designed to be used in rugged, industrial, and mobile environments it also has the option to be ordered to meet extended operating temperature (-40°C to +85°C) specifications for military and defense applications. The board is PICO I/O sized (60mm by 72mm) making it ideal for the smallest of embedded applications.

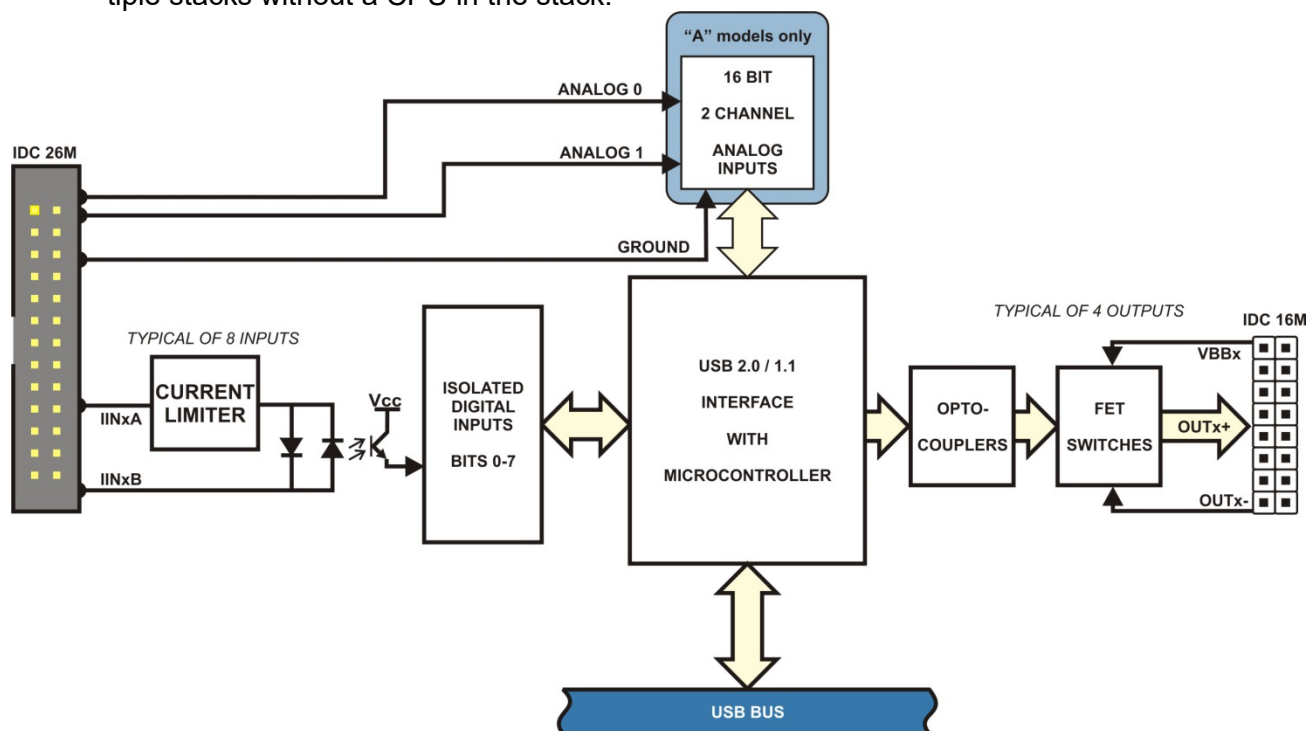
### Functional Description

The unit can be installed in stack configurations. It can also be mounted alone near I/O sensors or devices to be controlled in a star configuration away from the host USB ports. The module is always connected and powered over the provided USB cable to any computer USB port via its external micro B connector or on-board friction-lock micro-fit connector.

Featuring 4 solid state FET outputs, 8 optically isolated digital inputs and 2 high-resolution analog inputs, the unit is the smallest of its kind for multi-function control and monitoring using USB. The FET outputs can switch customer supplied voltages from 5 to 34V at *up to 3A!* The outputs are de-energized at power-up to prevent an unintended control output signal. The output connections are available via a 16-pin IDC vertical header type connector. The digital inputs accept AC or DC signals as high as 31 volts and are interfaced via a 26-pin IDC type vertical header. The pinout allows a simple accessory cable to interface to one of the many available external screw terminal boards, or go cable-less and use our direct plug-in spring cage terminal board model STBP-II8IDO4A. Two analog inputs are also available on the 26-pin connector for a well-rounded multi-function compact solution.

## OEM USB/PICO™ Form Factor

This standard OEM version is perfect for a variety of embedded applications. What makes the board unique is that its PCB size and mounting holes match the PICO-I/O™ form factor (without the SUMIT A connector). This allows our rugged digital board to be added to any PICO-ITXe stack by connecting it to an available USB port, especially if a SUMIT B only express I/O board was already used with the PICO-ITXe embedded CPU. The board can also be installed using standoffs inside other enclosures or systems either stand-alone or in multiple stacks without a CPU in the stack.



**Figure 1-1: Block Diagram**

Note: FETs have two output states: Off, where the output is high impedance (no current flows between the VBB and the output – except for the FET's leakage current, amounting to a few  $\mu\text{A}$ ), and On, where VBB is connected to the output pin. Therefore, if no load is connected the FET output will have a high floating voltage (due to the leakage current and no path to the VBB switching voltages return). To mitigate this, please add a load to ground at the output.

### Ordering Guide

USBP-II8IDO4A	8 isolated inputs, 4 solid state FET outputs and 2 analog inputs module with USB micro-B and micro-header interface connectors
USBP-II8IDO4	8 isolated inputs, 4 solid state FET outputs module with USB micro-B and micro-header interface connectors

### Model Options

-T	Extended temperature version -40°C to +85°C
-I	4-20mA analog inputs
-2.5	0-2.5V analog inputs



## Special Order

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

## 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/PICO™ Isolated Digital Input / FET Output Board
2. Software Master CD (PDF user manual installed with product package)
3. Printed USB I/O Quick-Start Guide
4. CUSB-Micro-B-6 6' USB type A to type Micro B cable

## Optional Accessories

- CUSB-EMB-6 6' USB cable type A to Micro-fit header connector
- CAB26F6D25F Six-inch ribbon cable assembly with 26-pin female header to DB25F
- CAB26F6D25M Six-inch ribbon cable assembly with 26-pin female header to DB25M
- CAB16F6D15F Six-inch ribbon cable assembly with 16-pin female header to DB15F
- STB-25 Screw terminal board for use with CAB26F6D25M for connecting inputs, ships with standoffs but can also mount on SNAP-TRACK or DIN-SNAP
- DIN-SNAP One foot length of SNAP-TRACK with four clips, for mounting up to two "STB" screw terminal boards on a DIN rail
- STBP-II8IDO4A Spring cage terminal board plugs directly onto the two male headers on the USBP-II8IDO4A board, eliminates need for ribbon cables



**Figure 1-2: STBP-II8IDO4A mounted on I/O board**




## Chapter 2: Installation

### Software CD Installation

These paragraphs are intended to detail the software installation steps.

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.

#### WIN2000/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 `D:\INSTALL`, click OK or press .
- c. Follow the on-screen prompts to install the software for this board.

### Hardware Installation

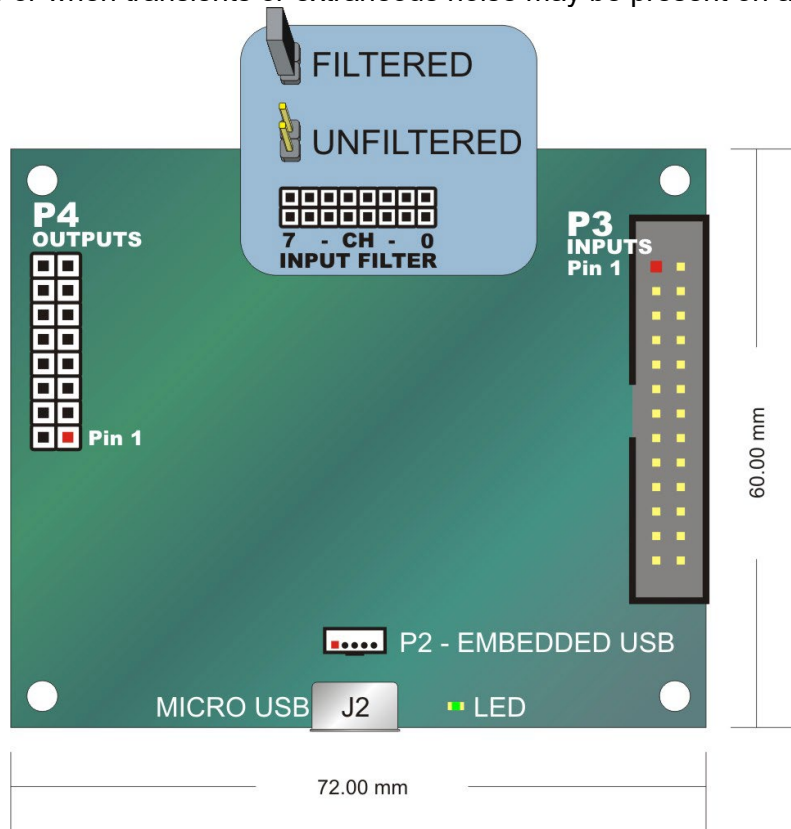
The board can be installed in any USB 2.0 or USB 1.1 port. Please refer to the USB I/O Quick Start Guide which can be found on the CD, for specific, quick steps to complete the hardware and software installation.

## Chapter 3: Hardware Details

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.

### Option Selections

The only user configurable options on this board are the input filter jumpers. Install a jumper for specific inputs when connecting an AC signal to prevent responses to zero-crossings or when transients or extraneous noise may be present on a particular input.



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

### J2 Micro USB connector

The USB connector is a Micro B type connector and mates with the cable provided. The USB port provides communication signals along with +5 VDC power.

### P2 Embedded USB connector

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

## **LED**

The surface mount LED on the board 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.

## **P3 Input connector, 26-pin male keyed header**

The 26 pin box header has standard 0.100" spacing between pins and is keyed to prevent improper connections. It can be used with standard IDC type ribbon cables.

## **P4 Output connector, 16-pin male header**

The 16 pin male header has standard 0.100" spacing between pins. It can be used with standard IDC type ribbon cables.

## 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 PID is "0x8036".

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 are provided in Borland Delphi, Microsoft Visual Basic, and Microsoft Visual C++ and demonstrate the use of the driver.

API function calls that are provided by the driver in Windows as well as detailed information on each function are detailed in the Software Reference Manual located in the Win32 directory for this board.

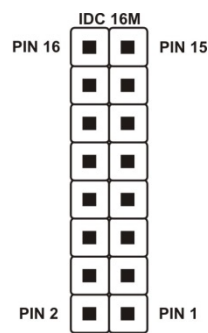
These functions will allow you to read or write individual bits, bytes, or the entire board worth of data.

Here are a few examples from the Software Reference Manual:

```
unsigned long GetDevices(void )  
unsigned long QueryDeviceInfo(DeviceIndex, pPID, pName, pDIOBytes, pCounters)  
2unsigned long DIO_ReadAll()
```

## Chapter 6: Connector Pin Assignments

Solid state FET outputs are interfaced to external equipment via a 16-pin male header type connector designated as P4. The mating connector is an IDC type with 0.1 inch centers or equivalent.

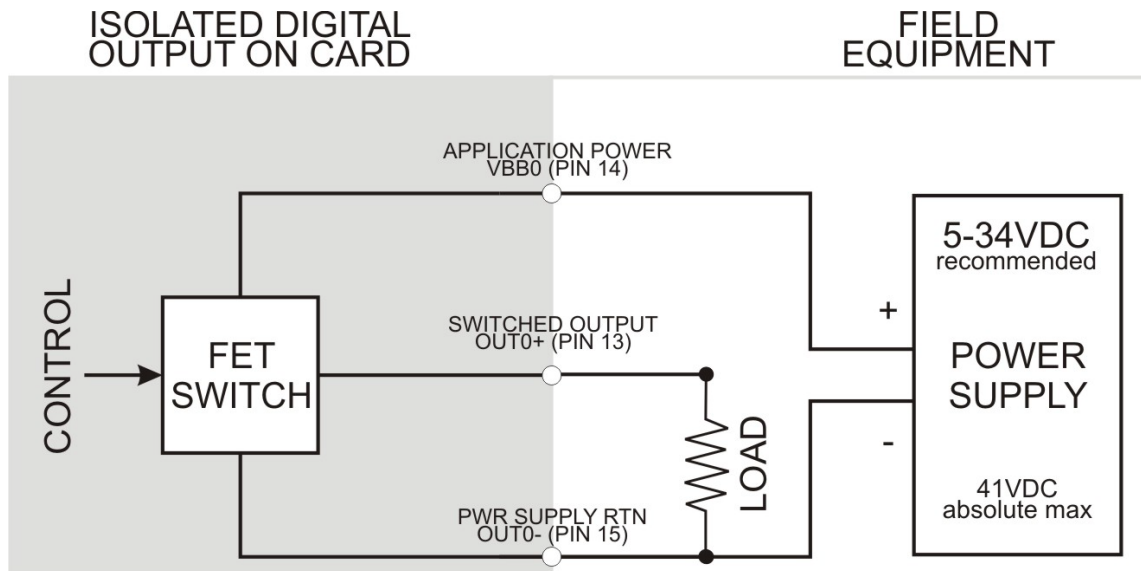


Pin	Signal	Pin	Signal
16	N/C	15	OUT0-
14	VBB0	13	OUT0+
12	N/C	11	OUT1-
10	VBB1	9	OUT1+
8	N/C	7	OUT2-
6	VBB2	5	OUT2+
4	N/C	3	OUT3-
2	VBB3	1	OUT3+

**Table 6-1: FET Output Pin Assignments (P4)**

Signal Name	I/O	Signal Description Name
VBBx	I	User supplied application voltage positive lead (Voltage bias for opto-isolator and FET)
OUTx-	x	User supplied application voltage negative lead (Return bias for opto-isolator and FET)
OUTx+	O	Switched VBB output to user load
N/C	x	No connection / unused

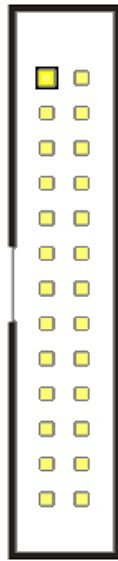
**Table 6-2: FET Output Header Signal Names, Directions and Descriptions**



**Figure 6-1: Isolated FET Output Circuit with Example Field Equipment Connected**

Isolated digital inputs and analog inputs are connected to the board via a 26-pin male header type connector named P3. The mating connector is an IDC type with 0.1 inch centers or equivalent.

IDC 26M

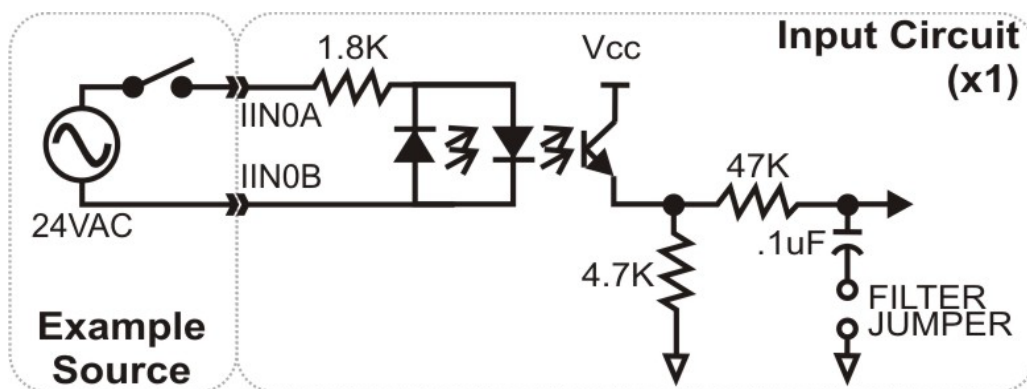


Pin	Signal	Pin	Signal
1	IIN0A	2	IIN0B
3	IIN1A	4	IIN1B
5	IIN2A	6	IIN2B
7	IIN3A	8	IIN3B
9	IIN4A	10	IIN4B
11	IIN5A	12	IIN5B
13	IIN6A	14	IIN6B
15	IIN7A	16	IIN7B
17	GND	18	GND
19	AGND	20	AIN0
21	AGND	22	AIN1
23	AGND	24	N/C
25	N/C	26	N/C

**Table 6-3: Isolated Inputs and Analog Inputs Pin Assignments (P3)**

Signal Name	I/O	Signal Description Name
IINxA	I	Isolated input connection, non-polarity sensitive, pairs with the signal on the “B” terminal
IINxB	I	Isolated input connection, non-polarity sensitive, pairs with the signal on the “A” terminal
AINx	I	Analog input signal, 0-4.096V, single-ended in reference to AGND
AGND	X	Analog inputs are referenced to this ground
GND	x	GROUND
N/C	x	No connection / unused

**Table 6-4: Input Header Signal Names, Directions and Descriptions**



**Figure 6-2: Isolated Input Circuit with Example Source Connected**

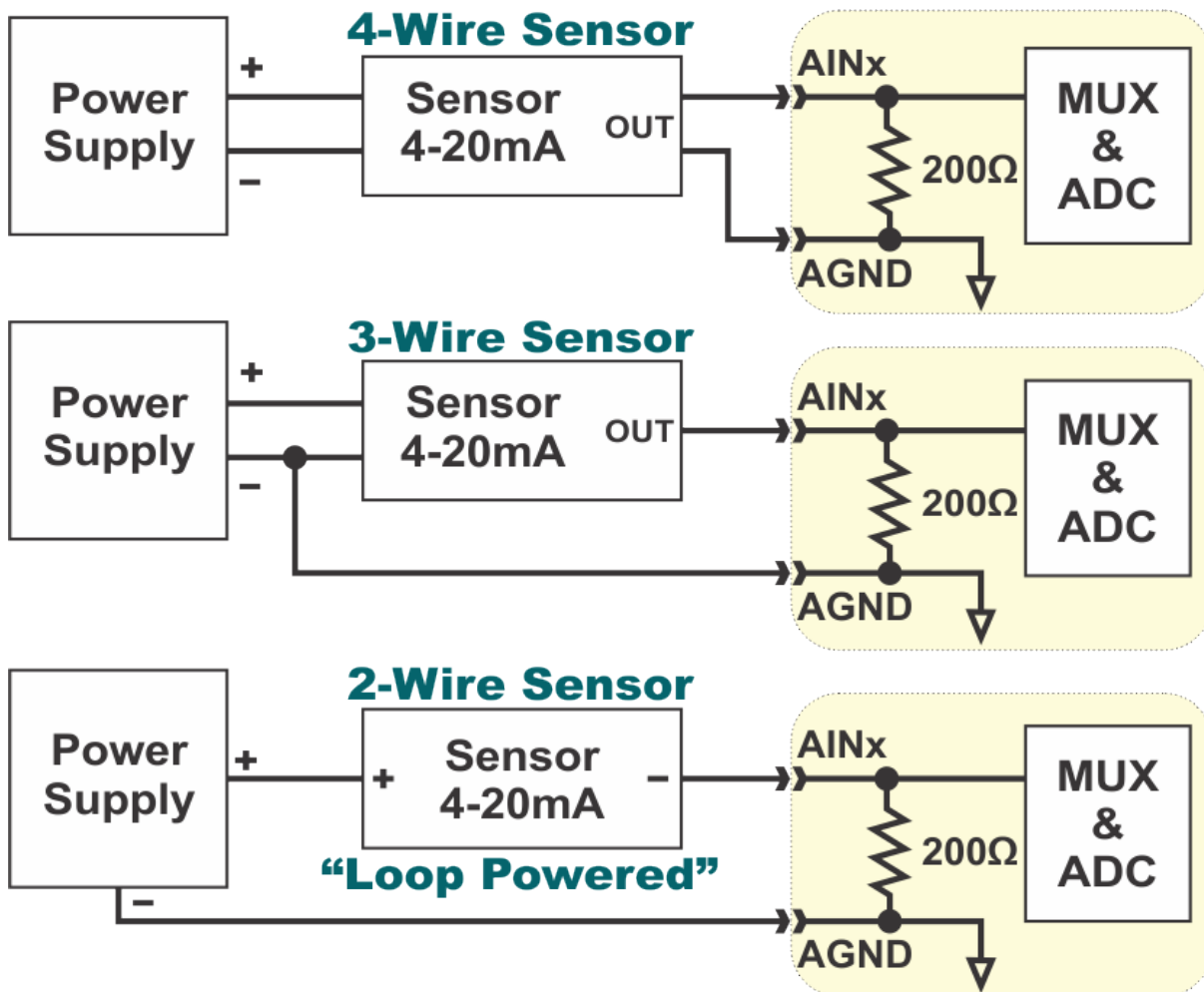


Figure 6-3: Analog Input Circuit with Example 4-20mA Sources Connected



## Chapter 7: Specification

### Digital Outputs

Number:	4
Type:	N-Channel smart high-side switch
Connector:	16-pin vertical IDC male header
Switch levels:	5 to 34V
Over-voltage:	Protected to 41V
Current:	2A steady state, 3A peak for 50Ms
Leakage Current:	5 $\mu$ A maximum

### Digital Inputs

Number:	8
Type:	Optically Isolated, non-polarized
Connector:	26-pin vertical IDC keyed male header
Signaling:	Powered, off below 3V, on from 3.1 to 31V DC or ACrms
Filters:	Jumper selectable per input
Filter response:	4.7mS with filter, 10uS w/o filter

### Analog Inputs

Channels:	2, Single-Ended
ADC Type:	Successive approximation
Sampling Rate:	4k samples per second per channel
Resolution:	16-bit
Unipolar range:	0-4.096V (0-2.5V factory option)
Current mode:	4-20mA factory option

### Bus

Type(s):	USB 2.0 high-speed USB 1.1 full-speed compatible
Connectors:	USB micro-B and micro-header

### Environmental

Operating Temp.:	0° to 70°C (-40° to +85°C factory option)
Storage Temp.:	-40°C to +85°C
Humidity:	Maximum 95% RH, without condensation
Board Dimension:	60mm x 72mm.

### Power

+5VDC	30mA typical with no load, provided via USB port
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## 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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