MODEL ETH-IDIO-16 FAMILY

ETH-IDIO-16, ETH-IDIO-8, ETH-IDO-16, & ETH-II-16

ETHERNET ISOLATED DIGITAL INPUT / FET OUTPUT MODULES

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.

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 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.

Table of Contents

Chapter 1: Introduction

Features

- Ethernet 10/100 RJ45 connector for interfacing to CPU or network
- DHCP or static IP assignment
- 16 optically isolated inputs (3V to 31V)
- 16 fully protected and isolated High-Side FET 2A outputs
- Internal, removable terminal board for easy wiring
- PC/104 module size and mounting compatibility
- Small (4" x 4"x 1.7") rugged industrial enclosure
- DC Jack and screw terminals for external power

Factory Options

- Eight and four input/output versions
- Input only and relay only versions
- Economy "E" version without the screw terminal board
- OEM (board only) version with PC/104 mounting holes and PCB footprint for added flexibility in embedded applications
- Extended operating temperature (-40˚C to +80˚C)
- Wide input (7VDC to 30VDC) external power
- RoHS compliant version
- DIN Rail Mounting provision

Typical Applications

- Automatic Test Systems
- Kiosks
- 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

The ETH-IDIO-16 Series (4, 8 and 16 channels) is an ideal solution for adding portable, easy-to-install, isolated input and solid state output digital I/O capabilities to any Ethernet network. It is excellent for controlling external relays, driving indicator lights, fuel pumps, high voltage control and more. Typical industries are Automotive, Industrial, and Factory and Home automation.

This unit features 16 high-side MOSFET switch outputs and 16 optically isolated digital inputs. The isolated, non-polarized inputs may be driven by either DC sources of 3-31 V (or higher by special order) or AC sources at frequencies of 40 Hz to 10KHZ. Optically isolating the digital inputs from each other, and from the computer and network, assures smooth, error-free data transmission in noisy, real-world environments.

The input channels are accessed via a 34-pin IDC type vertical header. The fully protected isolated outputs are de-energized at power-up to prevent an unintended control output signal. Data to the solid state outputs are latched and are available via a 50-pin IDC type vertical header. To simplify field wiring connections, the ETH-IDIO-16 family includes an internal, removable termination board (ETH-STB-84), that mounts directly to the headers.

The ETH-IDIO-16 is designed to be used in rugged industrial environments but is small enough to fit nicely onto any desk or testing station. Its board is PC/104 sized (3.550 by 3.775 inches) and ships inside a steel powder-coated enclosure with an anti-skid bottom.

The ETH-IDIO-16 has a DC Jack and screw terminals to connect the required external power. This power can be provided by our PWR-ACDC-5V, your +5Vdc regulated power supply, or by ordering the –WI option where you provide 7 VDC - 30 VDC.

OEM ETH/104 Form Factor

The OEM (board only) version is perfect for a variety of embedded applications. What makes the OEM option unique is that its PCB size and mounting holes match the PC/104 form factor (without the bus connections). The board can be added to any PC/104 type stack by connecting it to an available 10/100 base T port typically available on embedded CPU form factors such as EPIC, and PC/104. It can also be installed using standoffs inside other enclosures or systems.
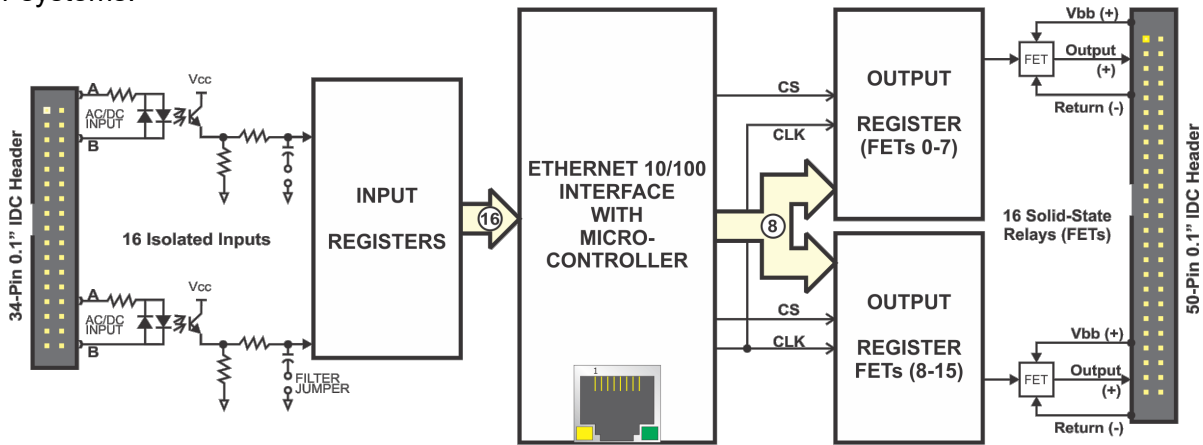

Figure 1-1: Block Diagram

Ordering Guide

- ETH-IDIO-16 16 isolated digital inputs and 16 FETs in enclosure with breakout board
- ETH-IDIO-8   8 isolated digital inputs and 8 FETs in enclosure with breakout board
- ETH-IDO-16   16 relays in enclosure with breakout board
- ETH-II-16   16 isolated digital inputs in enclosure with breakout board

Model Options

- -WI   Accepts Wide Input external power from 7 to 30VDC
- -OEM   Board only version with no enclosure or breakout board
- -T   Extended operating temperature of -40 to +80 ˚C
- -RoHS   This product is available in a RoHS compliant version. Please call for specific pricing then add this suffix to the model number on any purchase orders

Special Order

Contact factory with your special requirement. Examples of special orders would be conformal coating, right angle or latching I/O headers etc.

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.

- ETH Module in labeled enclosure with an anti-skid bottom
- Internal removable spring cage terminal board

Optional Accessories

• CAB50F-6*	Six-foot ribbon cable assembly with 50-pin female connectors	
• 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 ETH/104 module to a DIN-rail	
• PWR-ACDC-5V	External 5 VDC power supply	

*Note: Ribbon cables carry significantly less current than discrete wires.

Chapter 2: Installation

Software Installation

The software provided with this board is must be downloaded from the product page at
https://accesio.com/files/packages/ETH-IDIO-16 Install.exe then installed onto your system.

Hardware Installation

The board can be installed on any Ethernet network or even just connected directly to a NIC in your PC. Installing the Ethernet module is as simple as connecting power, then the Ethernet cable itself. If you're not using an external supply with a DC jack, to connect power to the pair of screw terminals provided you'll need to open the enclosure by removing four screws and lifting off the lid. Insert your wires into the terminals observing proper polarity and tighten the screw terminals. You may want to leave the lid off to start making I/O field wiring connections on the removable spring cage terminal board. Turn the power on. You'll know it worked if you see the link/activity light on the Ethernet connector housing light/blink. If you do not see activity, check the other end of the Ethernet cable to ensure it is plugged into your LAN switch/router/gateway/hub/ or directly into your PC.

This Ethernet module ships preconfigured at a factory-default MAC and IP Address and networking configuration (listed in Chapter 4: Addressing). The *Settings* program allows you to change the module's networking configuration to match your LAN requirements. However, in order to use the Settings program you will need a Windows computer connected to the same subnet as the Ethernet module. (You can modify a Windows PC's networking configuration temporarily if needed, contact an IT support staffer if you need assistance with this.) In other operating systems please refer to the ETH API Doc (.html) for the low-level command packet format for the "ChMC" command.

Any networking configuration changes made via the *Settings* program will be entered into the onboard non-volatile memory and used at each power-on or reset in the future, as well as taking immediate effect.

If necessary you can reset the module to the factory default networking configuration by briefly shorting the OPT1 jumper position while power is applied. (You may need to open the device' enclosure to reach the OPT1 jumper).

Chapter 3: Hardware Details

Option Selections

Refer to the settings program installed with the software package. Also, refer to the Block Diagram and the Option Selection Map when reading this section of the manual.
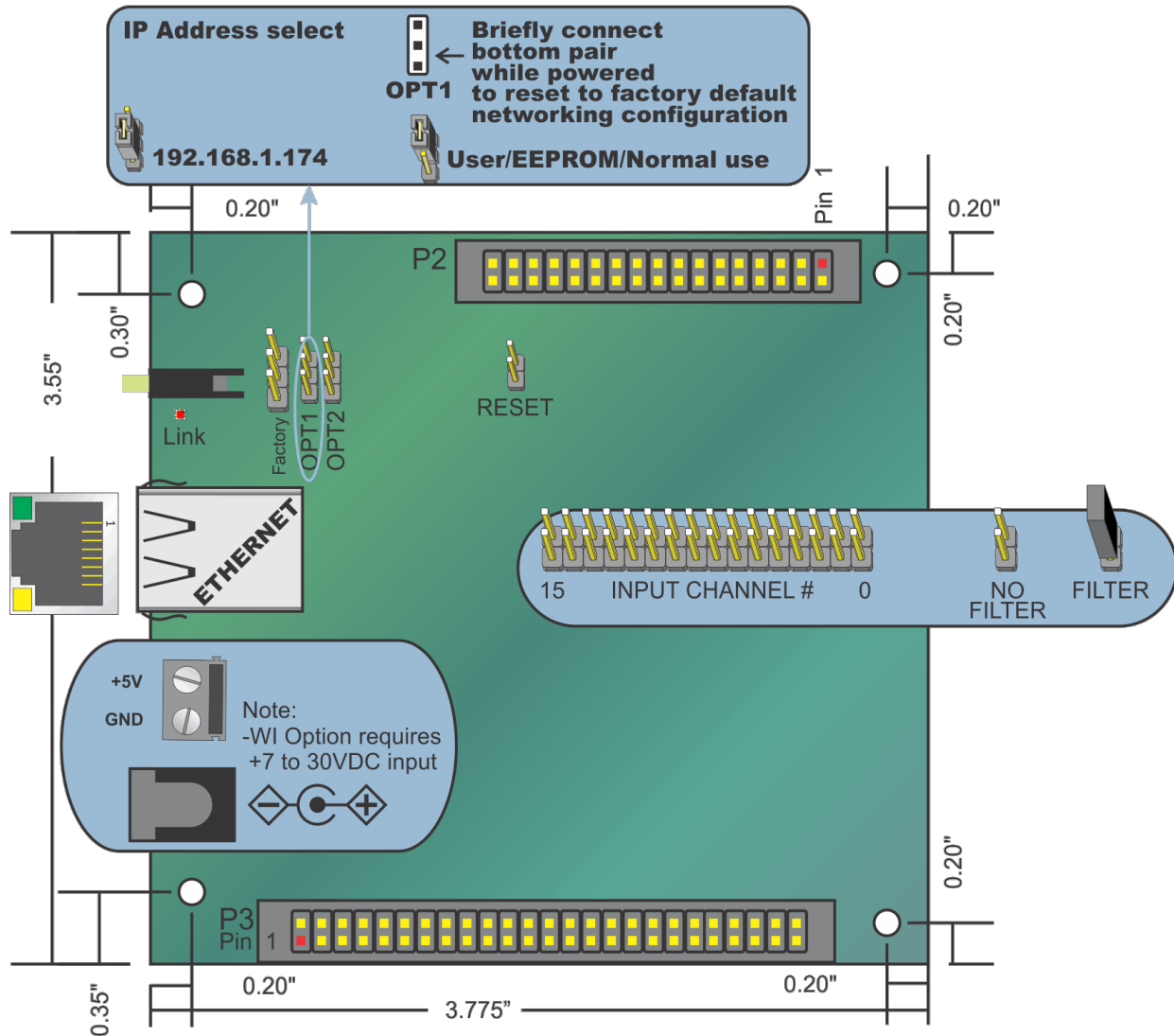
Figure 3-1: ETH-IIRO-16 Option Selection Map

Ethernet Connector

The Ethernet Connector is an industry standard RJ45 10/100 Base T type with integrated transmit / receive LEDs.

Input Filters

Filter jumpers for the isolated inputs are installed in the shipping configuration, which eliminates response to transient noise or spikes on the inputs. For faster response to changing inputs, remove the filter jumpers for the affected channels.

LED

The LED on the front of the board is used to indicate power when on steady, and activity / communication on the Ethernet lines when flickering.

DC Power Jack

The DC jack has a 2.00mm post and is designed to be used with the optional accessory AC/DC regulated 5V external power supply.

When the –WI factory option is installed, the 7-30VDC external power may be connected to this jack.

DC Power Screw Terminals

If a more secure retention method of providing the unit with power is desired, use these clearly marked screw terminals to connect regulated 5VDC.

When the –WI factory option is installed, the 7-30VDC external power may be connected to these screw terminals.

Wide Input External Power Option (-WI)

This factory option allows the device to be powered from an external source of 7VDC to 30VDC. This external power can be connected either via the DC Power Jack, or at the pair of screw terminals next to the DC jack. The silk screen on the board labels these terminals as +5VDC and GND. Connect the + lead of your external 7 to 30VDC supply to the +5VDC terminal.

50 and 34 Pin Box Headers

These 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, or the included spring cage accessory board.

RESET

Connect a pushbutton (normally open) across the PUSHBUTTON RESET CONNECT jumper posts, which will reset the board to the customer setup MAC / IP address while pushed.

BOOT/FLASH (Factory Use Only)

The FLASH position of the BOOT/FLASH jumper is the required selection needed for normal operation by customer.

Chapter 4: Ethernet Address Information

Use the provided AIOETHW.dll driver to access the Ethernet board.

All units are shipped from the factory with an identical default MAC address: 00 08 DC 11 99 77. If you are using more than one device in the same ethernet environment you will need to change the MAC.

The unit is shipped from the factory with a default static IP address: **192.168.1.174**

Most customers will need to change this IP address and related network configuration. Our Settings... program can assist with this process in Windows. Refer to the ETH API Doc for details on the packet-level commands to configure the device in other operating systems.

For your information, the device listens on port 51936 for normal operation, and listens on 51937 for upgrading onboard firmware should it become necessary. Under very rare circumstances you may need to modify your network settings to allow access to these ports.

The firmware supports at most six simultaneous connections during normal operation.

Manual ETH-IDIO-16 B1a

Chapter 5: Programming

TCP/IP

This model family is TCP/IP. The source for our Windows DLL is installed with the samples, into the .\Win32\Driver.SRC\AIOETHW\DLL\ directory. The intent is for any language and operating system able to send TCP/IP packets to be able to utilize the unit.

Client API

To install the client, simply copy AIOETHW.dll next to the program that will use it, or to the 32-bit system directory.

The general sequence to use it is:
- AEW_Connect() to open a connection.
- AEW_DIO_Configure() to set the initial digital input vs output configuration, and disable the tristate.
- Repeated I/O calls, using AEW_DIO_WriteAll()/AEW_DIO_Write1(), AEW_DIO_ReadAll().
- AEW_Disconnect() to close the connection when done.

If the connection fails during operation, a new connection can be swapped in, like this:
- AEW_Disconnect() to close the old connection.
- AEW_Connect() to open a new connection.
- Resume with the I/O calls.

The following is a brief reference of common AIOETHW.dll functions.

AEW_Connect()

AEW_Connect() connects to the specified host device. It returns a client reference (like a handle) that represents the connection, or zero on a failure.

AEW_Disconnect()

AEW_Disconnect() disconnects a client reference, closing the connection and cleaning up any memory used. After being passed to AEW_Disconnect(), the client reference is invalid.

AEW_GetStatus()

AEW_GetStatus() reads the device's status block.

AEW_DIO_Configure()

AEW_DIO_Configure() sets the direction of the DIO bytes, writes to all of them, and then disables the tristate. Writes to input bytes are ignored.

AEW_DIO_WriteAll()

AEW_DIO_WriteAll() writes to all the DIO.

AEW_DIO_ReadAll()

AEW_DIO_ReadAll() reads from all the DIO.

For a complete AIOETHW.dll API reference please refer to the HTML API reference installed in your software directory.

Low Level Interface Information

The following information is provided for users who cannot or choose to not use AIOETHW.dll. This is necessary in non-windows operating systems. For your reference consider reading the source code for AIOETHW.dll provided with your software install. More information is available in the HTML API reference installed in your software directory

Packet Structure

A packet is a byte-lengthed string; the first byte is the length(in bytes) of the body. A packet's body consists of a 4-byte (ASCII) "type" followed zero or more bytes of payload.

A few defined packet types are as follows:

Type	Direction	Meaning	Payload
ChIP	M>S	Change IP address.	4-byte big-endian IP address. For example, C0 A8 01 AE for 192.168.1.174. Device should reply with **W_OK** or **_Err**.
RADI	M>S	Read "all" DIO data.	No payload defined at this time. Device should reply with **R_OK** or **_Err**.
WADO	M>S	Write "all" DIO data.	1-byte length of DIO data, then DIO data. For example, 06 01 02 04 08 10 20 to set bit 0 on the first byte of DIO, bit 1 on the next byte of DIO, etc. up to bit 5 on the last byte of DIO. Device should reply with **W_OK** or **_Err**.
W_OK	S>M	Write succeeded.	1-byte length of written data. For example, 01 to indicate success of a 1-byte write.
R_OK	S>M	Read succeeded.	1-byte length of read data, then read data. For example, 03 42 49 4F to read 42h, 49h, and 4Fh.
_Err	S>M	Transaction failed.	4-byte little-endian Windows error code. For example, 42 00 00 00 for ERROR_BAD_DEV_TYPE, indicating read from a write-only device or vice versa.

Table 5-1: Packet Type Definitions

Refer to the ETH API Reference for a complete and detailed DLL API function and packet-level command and control reference.

Chapter 6: Connector Pin Assignments

Isolated Inputs Connector Pins			
Pin	Function	Pin	Function
1	Iso In 00 A	2	Iso In 00 B
3	Iso In 01 A	4	Iso In 01 B
5	Iso In 02 A	6	Iso In 02 B
7	Iso In 03 A	8	Iso In 03 B
9	Iso In 04 A	10	Iso In 04 B
11	Iso In 05 A	12	Iso In 05 B
13	Iso In 06 A	14	Iso In 06 B
15	Iso In 07 A	16	Iso In 07 B
17		18	
19	Iso In 08 A	20	Iso In 08 B
21	Iso In 09 A	22	Iso In 09 B
23	Iso In 10 A	24	Iso In 10 B
25	Iso In 11 A	26	Iso In 11 B
27	Iso In 12 A	28	Iso In 12 B
29	Iso In 13 A	30	Iso In 13 B
31	Iso In 14 A	32	Iso In 14 B
33	Iso In 15 A	34	Iso In 15 B

High-Side FET Outputs Connector Pins			
Pin	Function	Pin	Function
1	OUT 15+	2	OUT 15VBB
3	OUT 15-	4	OUT 14+
5	OUT 14VBB	6	OUT 14-
7	OUT 13+	8	OUT 13VBB
9	OUT 13-	10	OUT 12+
11	OUT 12VBB	12	OUT 12-
13	OUT 11+	14	OUT 11VBB
15	OUT 11-	16	OUT 10+
17	OUT 10VBB	18	OUT 10-
19	OUT 09+	20	OUT 09VBB
21	OUT 09-	22	OUT 08+
23	OUT 08VBB	24	OUT 08-
25		26	
27	OUT 07-	28	OUT 07VBB
29	OUT 07+	30	OUT 06-
31	OUT 06VBB	32	OUT 06+
33	OUT 05-	34	OUT 05VBB
35	OUT 05+	36	OUT 04-
37	OUT 04VBB	38	OUT 04+
39	OUT 03-	40	OUT 03VBB
41	OUT 03+	42	OUT 02-
43	OUT 02VBB	44	OUT 02+
45	OUT 01-	46	OUT 01VBB
47	OUT 01+	48	OUT 00-
49	OUT 00VBB	50	OUT 00+

Table 6-1: Connector Pin Assignments

Signal Name	I/O	Signal Description Name
Iso In xx A Iso In xx B	In	Isolated digital input pins, non-polarity sensitive, connect a powered signal across these pins to read an active input

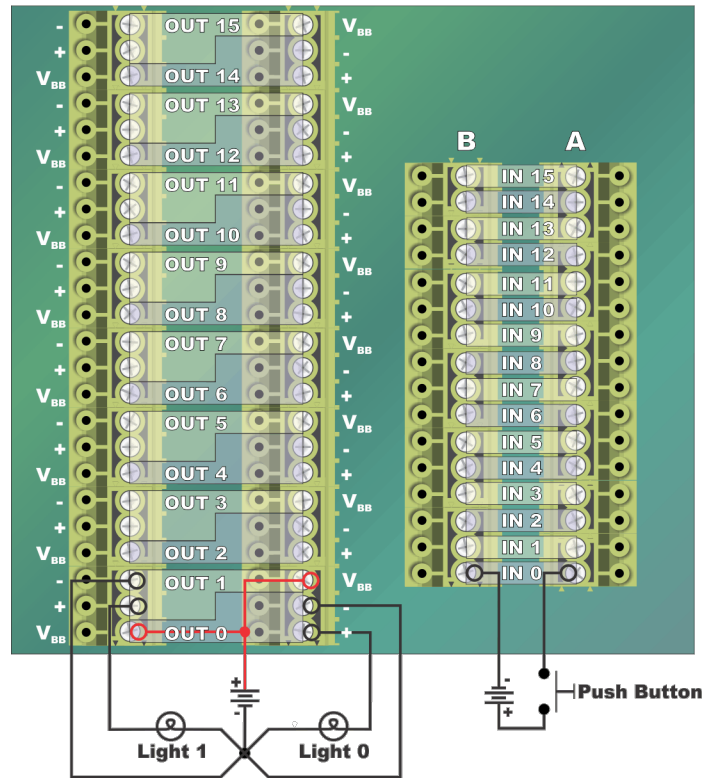**Table 6-2: Input Connector Signal Names and Descriptions**

Figure 6-1: ETH-STB-84 Removable Spring Cage Terminal Board
(showing example external device connections)

Chapter 7: Specifications

Isolated Inputs

Channels	8, or 16
Type	Non-polarized, optically isolated from each other and from the computer (CMOS compatible)
Voltage	3 to 31 DC or AC RMS (40 to 1000 Hz)
Isolation	500V* channel-to-ground and channel-to-channel
Resistance	1.8K ohms in series with opto-coupler
Response Times	Rise Time Fall time
Filtered	4.7 ms 4.7 ms
Non-Filtered	10 us 30 us

Solid State FET Outputs

Channels	8, or 16 Solid State FET's
Type	High Side Power MOSFET Switch. Protected against short circuit, over-temperature, ESD, and can drive inductive loads.
Voltage Range (customer supplied)	5-34VDC recommended for continuous use, (40VDC MAX)
Current rating	2A maximum
Turn-on time	90 uS (typ)
Turn-off-time	110 uS (typ)

Bus Type

Ethernet	10/100 Base T, Autodetecting, 1.5Kv isolation

Environmental

Temperature	Operating	0°C to +70°C -40°C to +80°C (-T option)
	Storage	-40° to +85°C
Humidity		Maximum 95% RH, non-condensing
Dimensions	Board	3.550" x 3.775"
	Enclosure	4.00" x 4.00" x 1.7"

Power

External Power	5 V_{DC} regulated (or 7 - 30 V_{DC} for –WI option) required
All FETs OFF	5V@35mA typical with all FET's off. (Add 5mA per FET)
All FETs ON	5V@115mA typical

Power Options (External Power required)

No option	If you have your own +5 V_{DC} regulated power supply
PWR-ACDC-5V	ACCES I/O +5 V_{DC} regulated power supply
-WI	Wide input power (7 - 30 V_{DC})

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, we will reply with manual updates.

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