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MODELS
PCI-IDI-XX SERIES

USER MANUAL

File: mpci-idi-xx.B1l

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Chapter 1: Introduction

Features

- Individually-Isolated AC/DC Inputs for up to Three 16-Bit Groups, 48 total.
- Reverse Polarity protection
- AC Filtering
- Optical Isolation, Channel-to-Channel and Channel-to-Host PC.
- Change-of-State detection (certain models).

Description

This series of cards provide as many as 48 optically-isolated inputs for AC/DC signals with Change-of-State (COS) Detection capability. Each input is reverse polarity protected and rectified by photo-coupler diodes. Standard 12/24 AC control transformer outputs can be accepted as well as DC voltages. The input range is up to 60VDC or AC Rms at frequencies of 40 to 10kHz.

Each input circuit contains a switchable filter that has a 4.7 millisecond time constant (without filtering, the response is less than 30 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 selected by jumpers. See Figures 1-1 and 3-1 for jumper arrangements.

The Change-of-State (COS) Detection capability (denoted by a “C” after the model number) provides a means to automatically interrupt the host computer in real time. When one or more input bits change state, a PCI interrupt is generated. That interrupt, in turn, can be used by your application program to initiate a poll of the inputs, then signal appropriate alarms, and/or initiate scan of other I/O points that have not been previously activated. This can greatly simplify your application program and eliminate need to continuously poll inputs. Chapter 5 describes the programming aspects of the COS feature.

These cards provide a much lower cost per point than externally-mounted, optically-isolated, solid-state modules or PLCs. Input connections are via ribbon-cable headers on the card, and a tie-down bar is included to provide strain relief for those cables.

These cards are especially useful in applications where high-common-mode external voltages are present as found in factory automation, energy management, security systems, and process monitoring applications. In addition to protecting your computer from accidental contact with high external voltages, the isolation provided eliminates troublesome ground loops.

There are 48-bit, 32-bit, and 16-bit versions. The latter two models are de-populated versions of the 48-bit card. Further, letters are appended to the model numbers to signify options included on the card. Refer to Table 1-1 for model specific information.

MODEL	No. of Bits	Max Input Voltage	Change-of State Interrupt Capability	AC Filter
16A	16	31V	No	Yes
16AC	16	31V	Yes	Yes
32A	32	31V	No	Yes
32AC	32	31V	Yes	Yes
48A	48	31V	No	Yes
48AC	48	31V	Yes	Yes
16B	16	60V	No	Yes
16BC	16	60V	Yes	Yes
32B	32	60V	No	Yes
32BC	32	60V	Yes	Yes
48B	48	60V	No	Yes
48BC	48	60V	Yes	Yes

Table 1-1: Model Versions

Specification

Digital Isolated Inputs

Number of inputs:		16, 32, or 48
Type:		Non-polarized, optically isolated from each other and from the computer (CMOS compatible)
Voltage Range		
	xxA:	Logic Low: 0 to 1.5VDC or AC Rms (40 to 10kHz) Logic High: 3 to 31VDC or AC Rms (40 to 10kHz)
	xxB:	Logic Low: 0 to 5VDC or AC Rms (40 to 10kHz) Logic High: 11 to 60VDC or AC Rms (40 to 10kHz)
Isolation:		Optically Isolated channel-to-ground and channel-to channel * see note
Input Resistance		
	xxA:	1.8K ohms in series with optocoupler
	xxB:	15K ohms in series with optocoupler
Non-Filter Response Times:		Rise Time = 10 uS / Fall Time = 30 uS
Filter Time Constant:		4.7ms
Power Required:		+5VDC @ 300mA typical

Environmental

Operating Temperature:	0°C to 70°C
Storage Temperature:	-55°C to +150°C
Humidity:	5% to 95% RH, without condensation
Board Dimension:	6.875" (174.6mm) long

****Note 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 60V DC or AC rms. The design intention was to eliminate the influence of common mode. Use proper wiring techniques to minimize voltage between channels and to ground. Tolerance of higher isolation voltage can be obtained on request by applying a conformal coating to the board.

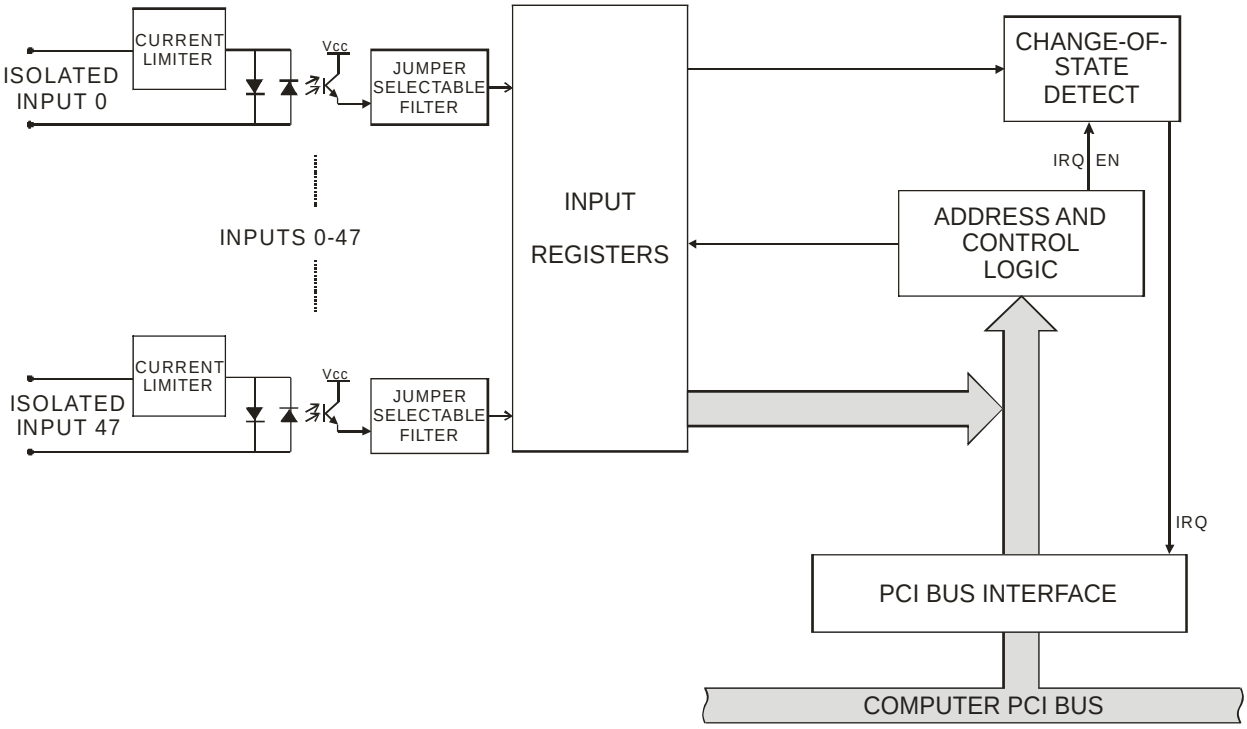


Figure 1-1: Block Diagram

Chapter 2: Installation

A printed Quick-Start Guide (QSG) is packed with the card for your convenience. If you've already performed the steps from the QSG, you may find this chapter to be redundant and may skip forward to begin developing your application.

The software provided with this card is on 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.

Configure Card Options via Jumper Selection

Before installing the card into your computer, carefully read Chapter 3: Option Selection of this manual, then configure the card according to your requirements. Our Windows based setup program can be used in conjunction with Chapter 3 to assist in configuring jumpers on the card, as well as provide additional descriptions for usage of the various card options.

CD Software Installation

The following instructions assume the CD-ROM drive is drive "D". Please substitute the appropriate drive letter for your system as necessary.

DOS

1. Place the CD into your CD-ROM drive.
2. Type D : Enter to change the active drive to the CD-ROM drive.
3. Type I N S T A L L Enter to run the install program.
4. Follow the on-screen prompts to install the software for this board.

WINDOWS

1. Place the CD into your CD-ROM drive.
2. The system should automatically run the install program. If the install program does not run promptly, click START | RUN and type D : I N S T A L L, click OK or press Enter.
3. Follow the on-screen prompts to install the software for this board.

LINUX

1. Please refer to linux.html on the CD-ROM for information on installing under linux.

Caution! * ESD A single static discharge can damage your card and cause premature failure! Please follow all reasonable precautions to prevent a static discharge such as grounding yourself by touching any grounded surface prior to touching the card.

Hardware Installation

1. Do not install card into the computer until the software has been fully installed.
2. Turn OFF computer power AND unplug AC power from the system.
3. Remove the computer cover.
4. Remove the two (2) nuts retaining the strain relief brackets from the card, set one bracket aside with the nuts.
5. Carefully install the card in an available 5V or 3.3V PCI expansion slot (you may need to remove a backplate first).
6. Inspect for proper fit of the card and tighten screws. Make sure that the card mounting bracket is properly screwed into place and that there is a positive chassis ground.
7. Feed ribbon cable(s) through the cutout in the mounting bracket one at a time and plug onto the card header, starting closest to the mounting bracket. When all cables are installed, re-install the strain relief bracket and nuts, and tighten until snug. DO NOT OVERTIGHTEN!
8. Make connections from installed ribbon cables to the field equipment / wiring.
9. Check all connections and installations to ensure the system is ready to be turned on. Do not turn on field power before turning on the computer.
10. Replace the computer cover and turn ON the computer which should auto-detect the card (depending on the operating system) and automatically finish installing the drivers.
11. Run PCIfind.exe to complete installing the card into the registry (for Windows only) and to determine the assigned resources.
12. External / field power may now be turned on if desired.
13. Run one of the provided sample programs that was copied to the newly created card directory (from the CD) to test and validate your installation.

The base address assigned by BIOS or the operating system can change each time new hardware is installed into or removed from the computer. Please recheck PCIFind or Device Manager if the hardware configuration is changed. Software you write can automatically determine the base address of the card using a variety of methods depending on the operating system. In DOS, the PCI\SOURCE directory shows the BIOS calls used to determine the address and IRQ assigned to installed PCI devices. In Windows, the Windows sample programs demonstrate querying the registry entries (created by PCIFind and NTIOPCI.SYS during boot-up) to determine this same information.

Chapter 3: Option Selection

Each channel has a jumper configurable filter option.

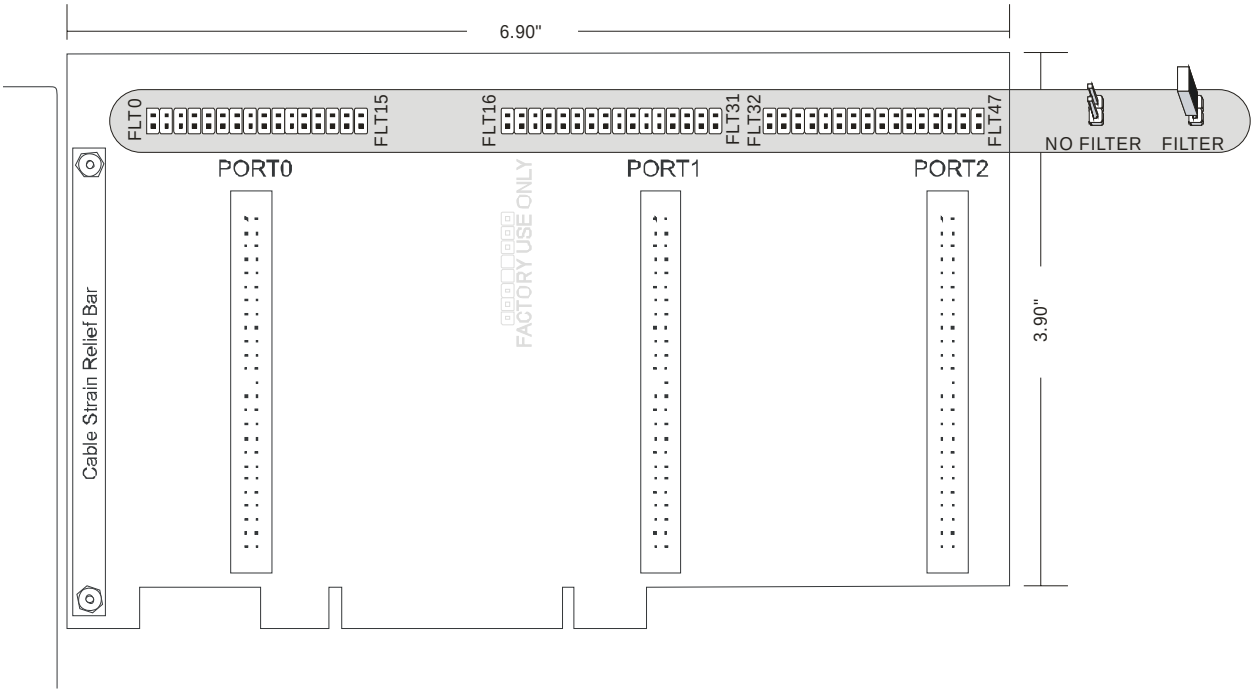


Figure 3-1: Option Selection Map

Filter Response Switch

Jumpers are used to select input filtering on a channel-by-channel basis (see Figure 3-1). When jumper FLT0 is installed, filtering is introduced for input bit 0, FLT1 for bit 1, and so on. The tables below describe filtering for Port 0. Ports 1 and 2 follow the same pattern with Port 1 having FLT16-31 (Bits 16-31) and Port 2 having FLT32-47 (Bits 32-47). Filtering provides a slower response for DC signals as described previously and must be used when AC inputs are applied.

JUMPER SELECTION	Bit Filtered		JUMPER SELECTION	Bit Filtered
FLT-0 FLT-1 FLT-2 ...	Bit 0 Bit 1 Bit 2 ...		FLT-8 FLT-9 FLT-10 ...	Bit 8 Bit 9 Bit 10 ...

Chapter 4: Address Selection

This card uses I/O addresses offset from the base address assigned by the PCI bus. The address spaces are defined in the Programming section of this manual.

PCI architecture is Plug-and-Play. This means that the BIOS or Operating System determines the resources assigned to PCI cards rather than the user selecting these resources with switches or jumpers. As a result, you cannot set or change the card's base address or IRQ level. You can only determine what the system has assigned.

To determine the base address that has been assigned, run the PCIFind utility program. This utility will display a list of all the cards detected on the PCI bus, the addresses assigned to each function on each of the cards, and the respective IRQs.

Alternatively, Windows systems can be queried to determine which resources were assigned. In these operating systems, you can use either PCIFind, or the Device Manager utility from the System Properties applet of the control panel. The card is installed in the Data Acquisition class of the Device Manager list. Selecting the card, clicking Properties, and then selecting the Resources Tab will display a list of the resources allocated to the card.

The PCI bus supports 64K of I/O address space, so your card's addresses may be located anywhere in the 0000h to FFFFh range. The card occupies eight consecutive 8 bit registers in the I/O address space.

PCIFind uses the Vendor ID and Device ID to search for your card, then reads the base address and IRQ. If you want to determine the base address and IRQ without using PCIFind, use the following information:

The Vendor ID code is 494F (ASCII for "I/O")
The Device ID code for the card is 0920

An example of how to locate PCI card resources is provided in the PCI/SOURCE directory, under your installation directory. This code runs in DOS, and uses the PCI defined interrupt BIOS calls to query the PCI bus for card-specific information. You will need the Device ID and Vendor ID listed above to use this code.

Chapter 5: Programming

The base address is assigned by the computer system during installation and will fall on an eight byte boundary. The card's read and write functions are as follows:

Address	Read	Write
Base Address + 0	Port 0 Low Byte	N/A
Base Address + 1	Port 0 High Byte	N/A
Base Address + 2	Port 1 Low Byte	N/A
Base Address + 3	N/A	N/A
Base Address + 4	Port 1 High Byte	N/A
Base Address + 5	Port 2 Low Byte	N/A
Base Address + 6	Port 2 High Byte	N/A
Base Address + 7	IRQ Status Register/IRQ Clear	IRQ Enable/Disable

Note: Base + 7 only applies to COS ("C") boards

Read Base + 0 (+1, +2, +4, +5, +6)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
D7 of input data	D6 of input data	D5 of input data	D4 of input data	D3 of input data	D2 of input data	D1 of input data	D0 of input data

Reading a byte from the Port Data Base Address reads the 8 bits associated with that half of a port. The Addresses labeled "Low Byte" are associated with pins 1 through 25, and the Addresses labeled "High Byte" are associated with pin 26 through 50, as shown in Chapter 6, connector pin assignments.

Writing to these addresses has no effect.

Address Base + 7 is used to control and monitor Change-of-State IRQs. COS IRQs are enabled/disabled on 8 bit boundaries (Port's Low or High byte). To enable COS IRQs, write a "1" to the bit corresponding to the Port's Low or High byte. The "Write Base + 7" table describes which bits enable each byte. Writing "0" to the bit will disable COS IRQs for that byte. A read from bit 7 will show a "1" if one or more of the COS IRQs have been enabled.

Once COS IRQs have been enabled for the byte(s), a change of input level (low-to-high or high-to-low) within that byte will cause an IRQ to be generated. After an IRQ is generated, bit 6 of Base + 7 will be set Low ("0"), which can be used to confirm that a shared interrupt was generated by this card. Also, bits 0-5 will be set High ("1") depending upon which byte(s) the COS occurred on. Any read of Base + 7 will clear the IRQ latch, return bit 6 to it's High ("1") state, and return bits 0-5 to their Low ("0") state. For more on reading Base + 7 refer to the "Read Base + 7" table.

Please note: Enabling or Disabling IRQs does not clear the IRQ latch. If you disable IRQs while one is pending, it is still required to read from Base + 7 to clear the pending IRQ.

Read Base + 7: COS Status Register

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IRQ Enable Status	IRQ Status (Active Low)	Port 2 High Byte IRQ Status	Port 2 Low Byte IRQ Status	Port 1 High Byte IRQ Status	Port 1 Low Byte IRQ Status	Port 0 High Byte IRQ Status	Port 0 Low Byte IRQ Status

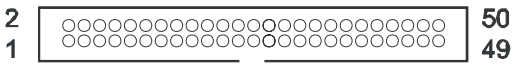
Write Base + 7: COS Enable/Disable Register

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
N/A	N/A	Port 2 High Byte IRQ Enable / Disable	Port 2 Low Byte IRQ Enable / Disable	Port 1 High Byte IRQ Enable / Disable	Port 1 Low Byte IRQ Enable / Disable	Port 0 High Byte IRQ Enable / Disable	Port 0 Low Byte IRQ Enable / Disable

Chapter 6: Connector Pin Assignments

Isolated inputs are connected to the card via a 50-pin HEADER type connector. There are three connectors named PORT0, PORT1, and PORT2. The table below describes PORT0. PORT1 and PORT2 are identical pinouts. Pin 50 is located toward the Jumpers, while Pin 1 is located near connection to Motherboard.

IDC 50-Pin Header Male



PIN	NAME		PIN	NAME
1	GND		2	NC
3	Bit 0 A		4	Bit 0 B
5	NC		6	Bit 1 A
7	Bit 1 B		8	NC
9	Bit 2 A		10	Bit 2 B
11	NC		12	Bit 3 A
13	Bit 3 B		14	NC
15	Bit 4 A		16	Bit 4 B
17	NC		18	Bit 5 A
19	Bit 5 B		20	NC
21	Bit 6 A		22	Bit 6 B
23	NC		24	Bit 7 A
25	Bit 7 B		26	NC
27	Bit 8 A		28	Bit 8 B
29	NC		30	Bit 9 A
31	Bit 9 B		32	NC
33	Bit 10 A		34	Bit 10 B
35	NC		36	Bit 11 A
37	Bit 11 B		38	NC
39	Bit 12 A		40	Bit 12 B
41	NC		42	Bit 13 A
43	Bit 13 B		44	NC
45	Bit 14 A		46	Bit 14 B
47	NC		48	Bit 15 A
49	Bit 15 B		50	NC

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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