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MODEL 104-IDI-48 SERIES

USER MANUAL

File: m104-idi-48.A1d

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Chapter 1: Introduction

Features

- Individually-Isolated AC/DC Inputs for two 24-bit groups, 48 total
- Reverse Polarity protection
- AC Filtering (first 24 channels)
- Optical Isolation, Channel-to-Channel and Channel-to-Host PC
- Change-of-State detection (certain models)

Description

This series of boards provides 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 on the first 24 channels as well as DC voltages on all 48. The input range is up to 60VDC or AC RMS at frequencies of 40 to 10kHz.

The first 24 input circuits contain 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 a 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 a 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 boards provide a much lower cost per point than externally-mounted, optically-isolated, solid-state modules or PLCs. Input connections are via 50-pin ribbon-cable headers on the card.

These boards 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.

Letters are appended to the model numbers to signify options (described above) 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
48A	48	31V	No	Yes
48AC	48	31V	Yes	Yes
48B	48	60V	No	Yes
48BC	48	60V	Yes	Yes

Table 1-1: Model Versions

Specification

Digital Isolated Inputs

Number of inputs:		48
Type:		Non-polarized, optically isolated from each other and from the computer (CMOS compatible)
Voltage Range		
	48A:	Logic Low: 0 to 1.5VDC or AC Rms (40 to 10kHz) Logic High: 3 to 31VDC or AC Rms (40 to 10kHz)
	48B:	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 or channel-to channel * see note
Input Resistance		
	48A:	1.8K ohms in series with optocoupler
	48B:	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 (optional industrial temperature range -40°C to +85°C)
Storage Temperature:	-55°C to +150°C
Humidity:	0% to 95% RH, without condensation
Board Dimension:	PC/104 format, 3.550” by 3.775”

****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.

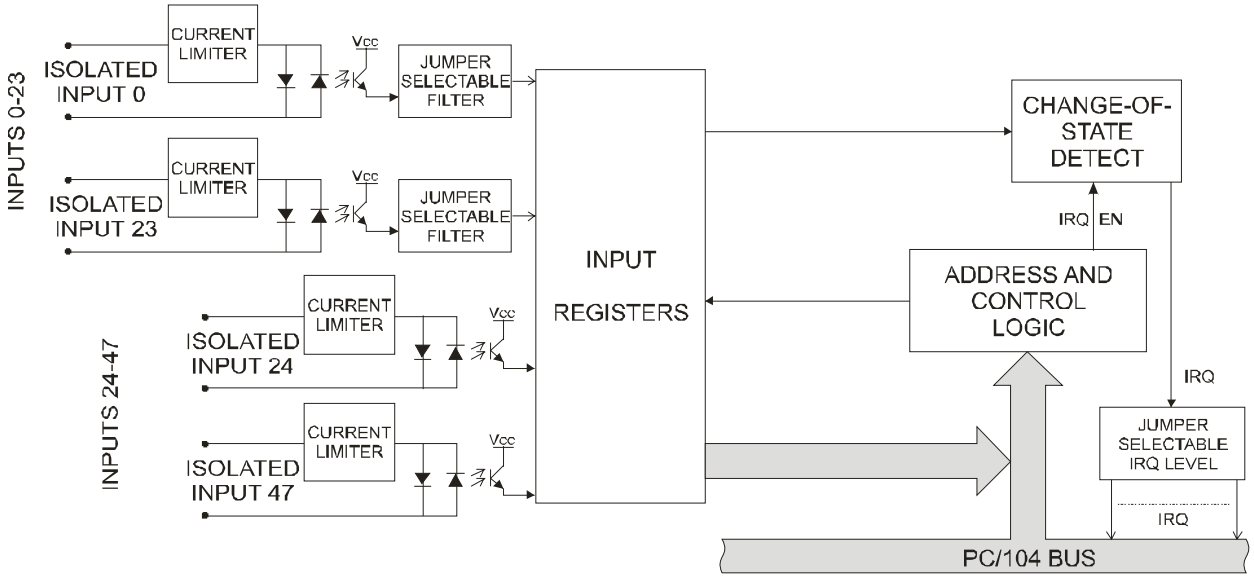


Figure 1-1: Block Diagram

Chapter 2: Installation

A printed Quick-Start Guide (QSG) is packed with the board 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 PC/104 Board 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. Substitute the appropriate drive letter for your CD-ROM where you see d: in the examples below.

CD 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.htm on the CD-ROM for information on installing under linux.

Installing the Hardware

Before installing the board, carefully read Chapter 3 and Chapter 4 of this manual and configure the board according to your requirements. The SETUP Program can be used to assist in configuring jumpers on the board. Be especially careful with Address Selection. If the addresses of two installed functions overlap, you will experience unpredictable computer behavior. To help avoid this problem, refer to the FINDBASE.EXE program installed from the CD. The setup program does not set the options on the board, these must be set by jumpers.

To Install the Board

1. Install jumpers for selected options and base address according to your application requirements, as mentioned above.
2. Remove power from the PC/104 stack.
3. Assemble standoff hardware for stacking and securing the boards.
4. Carefully plug the board onto the PC/104 connector on the CPU or onto the stack, ensuring proper alignment of the pins before completely seating the connectors together.
5. Install I/O cables onto the board's I/O connectors and proceed to secure the stack together or repeat steps 3-5 until all boards are installed using the selected mounting hardware.
6. Check that all connections in your PC/104 stack are correct and secure then power up the system.
7. Run one of the provided sample programs appropriate for your operating system that was installed from the CD to test and validate your installation.

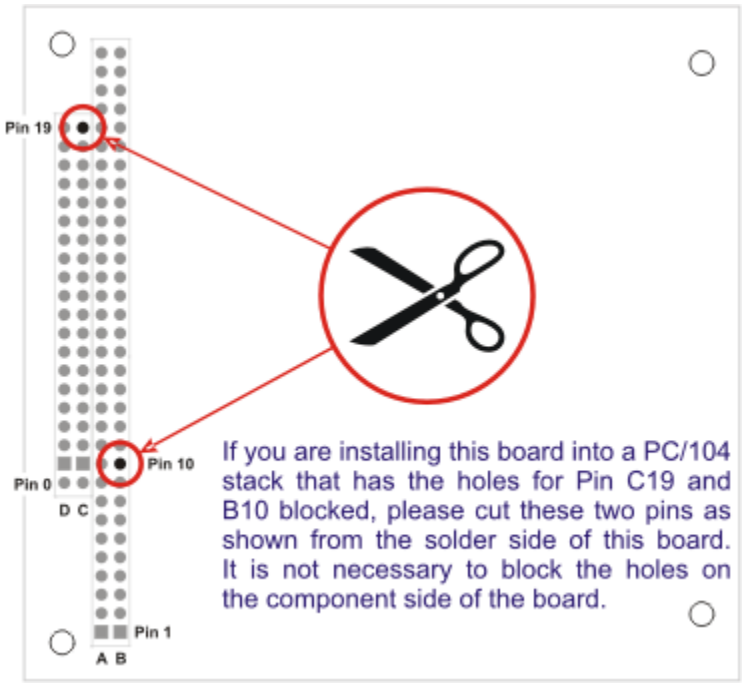


Figure 2-1: PC/104 Key Information

Chapter 3: Option Selection

FILTER RESPONSE SWITCH

Filters are used to select input filtering on a channel-by-channel basis. When jumper FLT 0 is installed, filtering is introduced for input BIT 0, FLT 1 for BIT 1, etc.

JUMPER SELECTION	Bit Filtered		JUMPER SELECTION	Bit Filtered
FLT-0 FLT-1 FLT-2 ...	Bit 0 Bit 1 Bit 2 ...		… FLT-21 FLT-22 FLT-23	… Bit 21 Bit 22 Bit 23

This filtering provides a slower response for DC signals as described previously and must be used when AC inputs are applied. If you believe an input may be electrically noisy, install the jumper to avoid false readings.

INTERRUPTS

Select the desired interrupt level by installing a jumper at one of the locations marked IRQxx. If IRQs are enabled in software, an interrupt latch is set by the board when an Isolated Digital Input bit changes state. A full description of how to enable/disable and clear IRQs is described in the Programming section of this manual.

Refer to Figure 3-1 for more on filter and interrupt selection.

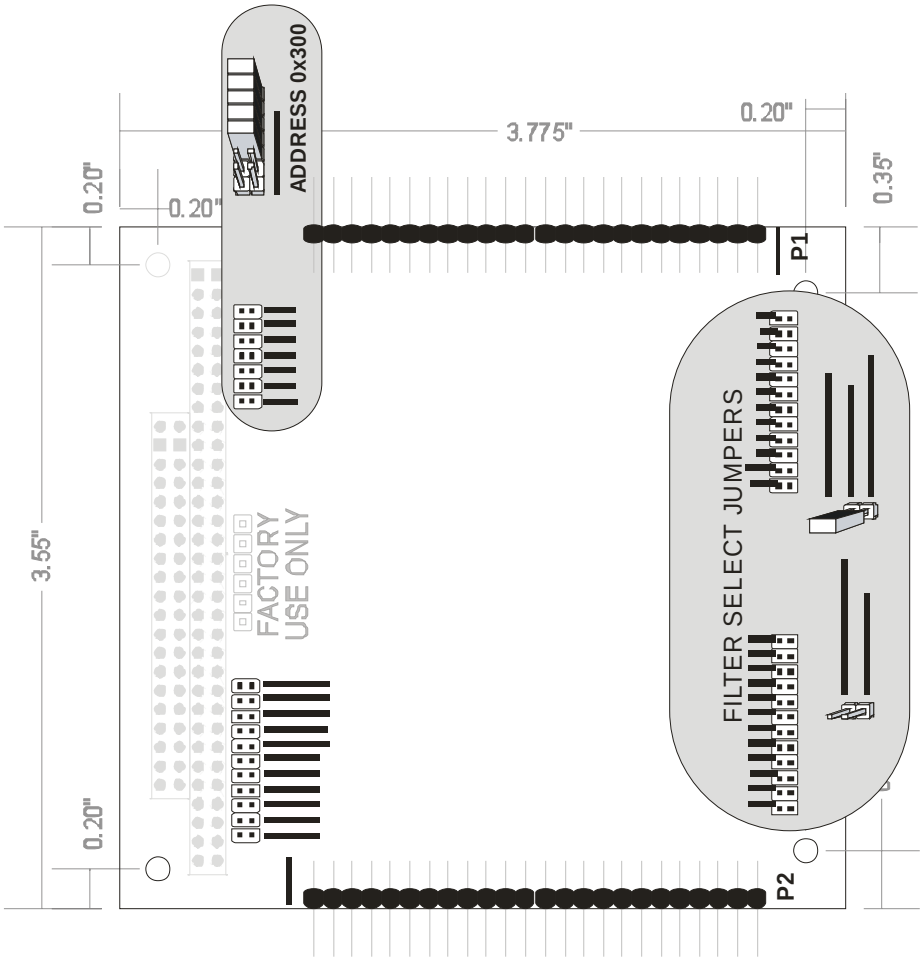


Figure 3-1: Option Selection Map

Chapter 4: Address Selection

The board occupies 8 consecutive addresses in I/O space. The base or starting address can be selected anywhere within ght I/O address range of 100-3FF, provided that it does not cause an overlap with other functions. If the addresses of two installed functions overlap, you will experience unpredictable computer behavior. The FINDBASE program supplied with the product will assist you in selecting a base address that will avoid this conflict.

HexRange	Usage
000-00F	DMA Controller 1
020-021	INT Controller 1, Master
040-043	Programmable Interrupt Timer
060-06F	Keyboard Controller
070-07F	Real Time Clock, NMI Mask
080-09F	DMA Page Register
0A0-0BF	INT Controller 2
0C0-0DF	DMA Controller 2
0F0-0F1	Math Coprocessor
0F8-0FF	Math Coprocessor
170-177	Fixed Disk #1
1F0-1F8	Fixed Disk #2
200-207	Game I/O
238-23B	Bus Mouse
23C-23F	Alt. Bus Mouse
278-27F	Parallel Printer
2B0-2BF	EGA
2C0-2CF	EGA
2D0-2DF	EGA
2E0-2E7	GPIB (AT)
2E8-2EF	Serial Port
2F8-2FF	Serial Port
300-30F	Prototype Board
310-31F	Prototype Board
320-32F	Hard Disk (XT)
370-377	Floppy Controller #2
378-37F	Parallel Printer Port 1
380-38F	SDLC
3A0-3AF	SDLC
3B0-3BB	Monochrome Display/Printer
3BC-3BF	Parallel Printer Port 2
3C0-3CF	VGA EGA
3D0-3DF	CGA
3E8-3EF	Serial Port
3F0-3F7	Floppy Diskette Controller
3F8-3FF	Serial Port

Table 4-1: Standard Address Assignments for Standard Computers

The board's base address is set up by JUMPERS (see Figure 3-1). Those jumpers control address bits A3 thought A9. (Lines A2, A1 and A0 are used on the board to select the offset from the jumper-selected base address. This is referred to as the Base + 'offset' in the programming section.) To determine how to set these jumpers for a desired hex-code address, refer to the SETUP program provided with the board. If you prefer to determine proper jumper settings yourself, first convert the hex-code address to binary form. Then, for each "0", install corresponding jumpers and for each "1" remove the corresponding jumper.

The following example illustrates jumper selection corresponding to hex 300 (or binary 11 0000 0xxx). The “xxx” represents address lines A2, A1, and A0.

Base Address in Hex Code	3		0				0
Conversion Factors	2	1	8	4	2	1	8
Binary Representation	1	1	0	0	0	0	0
Jumper Legend	A9	A8	A7	A6	A5	A4	A3
Address Line Controlled	A9	A8	A7	A6	A5	A4	A3
Jumper Selection	OFF	OFF	ON	ON	ON	ON	ON

Table 4-2: Jumper Selection Example

Chapter 5: Programming

The board occupies eight consecutive addresses in PC I/O space. The base address is 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 Mid Byte	N/A
Base Address + 2	Port 0 High Byte	N/A
Base Address + 3	N/A	N/A
Base Address + 4	Port 1 Low Byte	N/A
Base Address + 5	Port 1 Mid Byte	N/A
Base Address + 6	Port 1 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 third of a port. The Addresses labeled "Low Byte" are associated with pins 3 through 18, the Addresses labeled "Mid Byte" are associated with pins 19 through 34, and the Addresses labeled "High Byte" are associated with pins 35 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, Middle, and/or High byte). To enable COS IRQs, write a "1" to the bit corresponding to the Port's Low, Middle and/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(s) will set the IRQ latch. 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 board. 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 1 High Byte IRQ Status	Port 1 Mid Byte IRQ Status	Port 1 Low Byte IRQ Status	Port 0 High Byte IRQ Status	Port 0 Mid Byte IRQ Status	Port 0 Low Byte IRQ Status

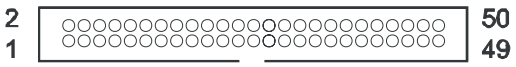
Write Base + 7: COS Enable/Disable Register

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

Chapter 6: Connector Pin Assignments

Two identical 50-pin right-angle headers are provided on the product, one for each 24-bit input group. Port 0 is located on the same side as the address jumpers, while Port 1 is on the opposite side, near the IRQ level jumpers. Connector pin assignments are listed below for Port 0. Port 1 follows the same pinout but for bits 24-47.

IDC 50-Pin Header Male



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

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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