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ISOLATED DIGITAL INPUT / RELAY OUTPUT BOARD

MODEL 104-IIRO-8
104-IIRO-8E

USER MANUAL

File: M104-IIRO-8.A1i

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Chapter 1: FUNCTIONAL DESCRIPTION

This board provides isolated input, digital inputs and relay output interface for PC/104 compatible computers. The board provides eight each optically-isolated inputs for AC or DC control signals, digital TTL compatible inputs and electromechanical relay outputs. The board occupies four consecutive addresses in I/O space. Read and write operations are done on an 8-bit-byte oriented basis. Two models are available, the basic model includes Change of State Detection (COS) which will flag an interrupt, while the E model doesn't include COS detection or use interrupts.

INPUTS

The isolated inputs can be driven by either AC or DC signals and are not polarity sensitive. Input signals are rectified by photocoupler diodes. A 1.8K-ohm resistor in series dissipates unused power. Standard 12/24 AC control transformer outputs can be accepted as well as DC voltages. The input voltage range is 3 to 28 volts (rms). External resistors connected in series may be used to extend the input voltage range.

Each input circuit contains a switchable slow/fast filter that has a 4.7 millisecond time constant. (Without filtering, the response is 10 uSec.) The filter must be selected for AC inputs in order to eliminate response to zero crossings. 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. The filters are switched into the circuit when the jumpers are installed in position FLT0 to FLT7.

Eight digital inputs are available for digital applications. Inputs are TTL compatible and include 10K pullup resistors.

INTERRUPTS

When enabled by a software read to base address +2 (and when a jumper is installed to select one of the interrupt levels IRQ2-7, IRQ10-12, and IRQ14-15), the board asserts an interrupt whenever any of the inputs changes state from low to high or high to low. This is called Change-of-State (COS) detection and greatly frees up computer resources by eliminating the need for constant polling to determine when an input has changed. Once an interrupt has been generated and serviced, it is cleared automatically after 2 usec.

This interrupt capability may be disabled by a software write to base address +2. It may be re-enabled with a read to base address + 2. (Basic model only)

OUTPUTS

The electromechanical relay outputs are comprised of eight FORM C SPDT outputs. The relays are all de-energized at power-on. Data to the relays are latched by a write to the base address.

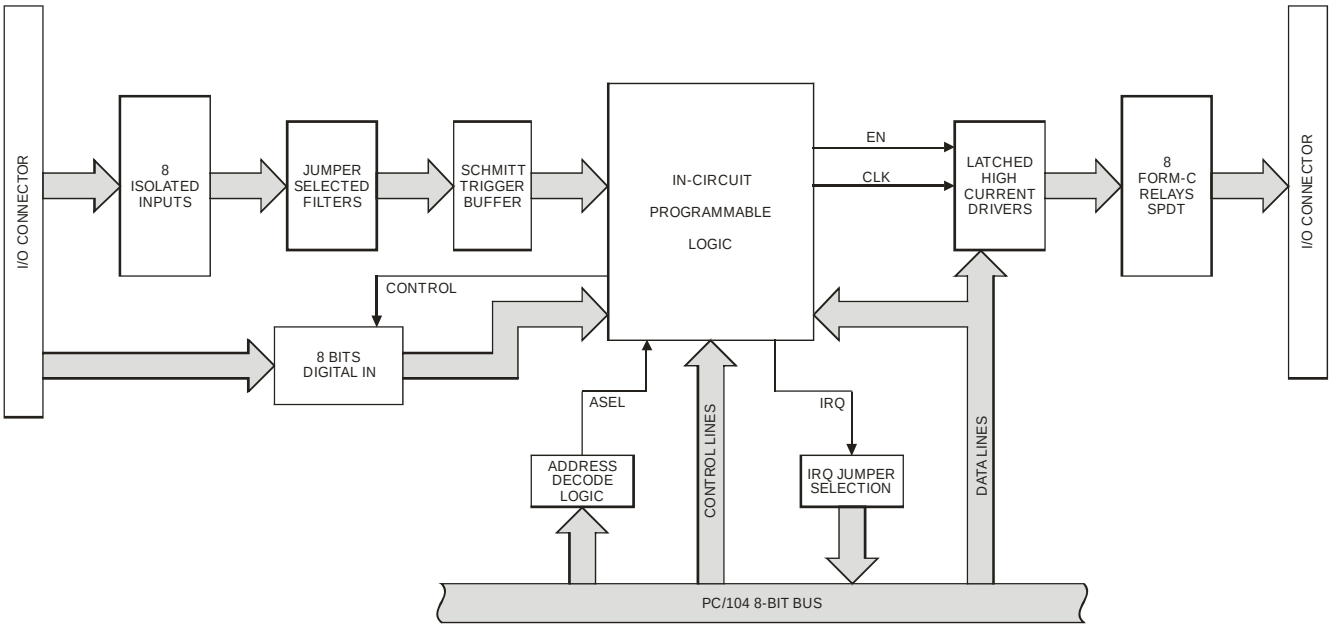


Figure 1-1: BLOCK DIAGRAM

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.

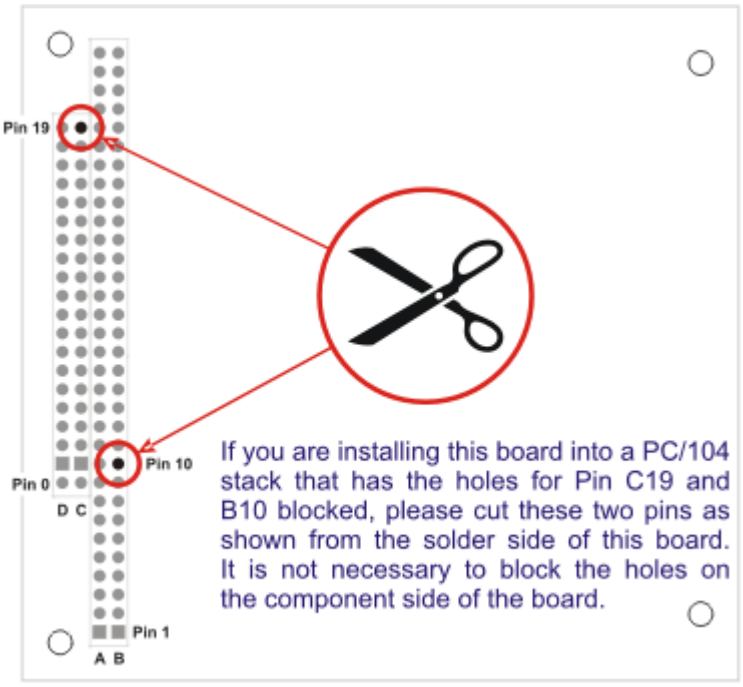


Figure 2-1: PC/104 Key Information

Chapter 3: OPTION SELECTION

FILTER RESPONSE JUMPERS

Jumpers are used to select input filtering on a channel-by-channel basis. When jumper FLT0 is installed, additional filtering is introduced for input bit 0, FLT1 for bit 1, etc.

JUMPER SELECTION	Bit Filtered
FLT-0	IN0
-1	IN1
-2	IN2
-3	IN3
-4	IN4
-5	IN5
-6	IN6
-7	IN7

This additional filtering provides a slower response as described previously and should be used when AC inputs are applied.

INTERRUPTS

Select the desired interrupt level by installing a jumper at one of the locations marked IRQxx. An interrupt is asserted by the board when an input data bit changes state if software enabled as previously described.

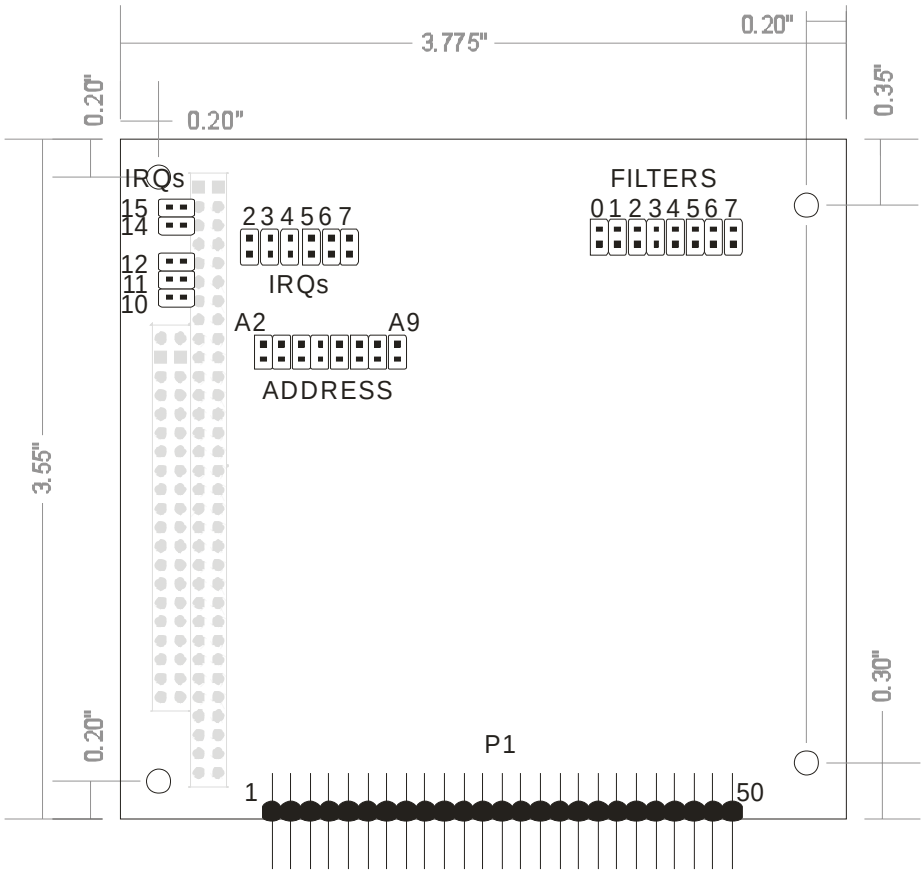


Figure 3-1: OPTION SELECTION MAP

Chapter 4: ADDRESS SELECTION

The board occupies four consecutive addresses in I/O space. The base or starting address can be selected anywhere within the I/O address range 100-3FF (except 1F0 through 1F8) for AT's and 200-3FF for XT's 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 will assist you in selecting a base address that will avoid this conflict.

Table 4-1: ADDRESS ASSIGNMENTS FOR COMPUTERS

HEX RANGE	USAGE
000-00F	8237 DMA Controller 1
020-021	8259 Interrupt
040-043	8253 Timer
060-06F	8042 Keyboard Controller
070-07F	CMOS RAM, NMI Mask Reg, RT Clock
080-09F	DMA Page Register
0A0-0BF	8259 Slave Interrupt Controller
0C0-0DF	8237 DMA Controller 2
0F0-0F1	Math Coprocessor
0F8-0FF	Math Coprocessor
170-177	Fixed Disk Controller 2
1F0-1F8	Fixed Disk Controller 1
200-207	Game Port
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	reserved
310-31F	reserved
320-32F	Hard Disk (XT)
370-377	Floppy Controller 2
378-37F	Parallel Printer
380-38F	SDLC
3A0-3AF	SDLC
3B0-3BB	MDA
3BC-3BF	Parallel Printer
3C0-3CF	VGA EGA
3D0-3DF	CGA
3E8-3EF	Serial Port
3F0-3F7	Floppy Controller 1
3F8-3FF	Serial Port

The base address is set up by JUMPERS. Those jumpers control address bits A2 through A9. (Lines A1 and A0 are used on the board to control individual registers. How these two lines are used is described in the Programming section of this manual.)

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 00xx). The "xx" represents address lines A1, and A0 used on the board to select individual registers as described in the Programming section of this manual.

Base Address in Hex Code	3		0				0	
Conversion Factors	2	1	8	4	2	1	8	4
Binary Representation	1	1	0	0	0	0	0	0
Jumper Legend	A9	A8	A7	A6	A5	A4	A3	A2
Addr. Line Controlled	A9	A8	A7	A6	A5	A4	A3	A2
Jumper Selection	OFF	OFF	ON	ON	ON	ON	ON	ON

Carefully review the address selection reference table on the preceding page before selecting the board address. If the addresses of two installed functions overlap, you will experience unpredictable computer behavior.

Chapter 5: PROGRAMMING

The board occupies four consecutive addresses in PC I/O space. The base or starting address is selected during installation and will fall on an eight-byte boundary. The read and write functions are as follows (Model E does not use Base +2):

I/O Address	Read	Write
Base +0	N/A	Write Relay Output
Base +1	Read Isolated Inputs	N/A
Base +2	Enable IRQ	Disable IRQ
Base +3	Read digital inputs	N/A

ISOLATED DIGITAL INPUTS

Isolated digital input states are read as a single byte from the port at Base Address +1. Each of the eight bits within the byte corresponds to a particular digital input. A "1" signifies that the input is energized and a "0" signifies that the input is de-energized.

Bit Position	D7	D6	D5	D4	D3	D2	D1	D0
Iso Digital Input	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0

The board response to inputs is rated at 10 uSec. Sometimes it is necessary to slow down that response to accommodate AC inputs or in noisy environments. Hardware installation of JUMPERS to implement filtering is provided.

The board supports interrupts on change of state of isolated digital inputs. Thus, it is not necessary to continuously poll inputs (by reading at base address +1) to detect any state change. To enable this interrupt capability, read at base address +2. To disable interrupts, write at base address +2 or remove the jumper that selects interrupt level IRQ2 through IRQ7, IRQ10 through IRQ12, IRQ14, or IRQ15. To clear an IRQ, write to base address +1.

DIGITAL INPUTS

Digital input states are read as a single byte from the port at Base Address +3. Each of the eight bits within the byte corresponds to a particular digital input. A "1" signifies that the input is high and a "0" signifies that the input is low.

Bit Position	D7	D6	D5	D4	D3	D2	D1	D0
Digital Input	DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0

RELAY OUTPUTS

At power-up, all relays are initialized in the de-energized state. The relay outputs are controlled by writing to the Base Address. Data are written to all eight relays as a single byte. Each bit within the byte controls a specific relay. A "1" energizes the corresponding relay and a "0" turns it off.

Bit Position	D7	D6	D5	D4	D3	D2	D1	D0
Relay Contr'd	OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0

For example, if bit D5 is turned on by writing hex DF to the base address, then the relay that controls OUT5 is energized closing the associated normally-open contacts. All other relays would be de-energized and their normally-closed contacts would be closed.

PROGRAMMING EXAMPLES

No driver software is provided with the board because programming is very simple and can be accomplished most efficiently using direct I/O instructions in the language that you are using. The following examples are in C but are readily translated into other languages:

Example: Turn on OUT0 and OUT7

```
Base=0x300                  //Base I/O address
outportb(Base, 0x7E);
```

Example: Read back the state of the relays

```
X=inportb(Base);            //relay register data to X
printf("%02x");             //display results
```

Example: Read the digital inputs

```
Y=inportb(Base+1);          //digital input register to Y
```

SOFTWARE

Utility software provided on CD with the board is the base address locator, an illustrated setup program and a sample program. The sample program sequentially turns on each relay until all are on and then sequentially turns them off. After each relay is turned on, the relay states are read back, the opto-isolated inputs are read, and the data are displayed.

The sample programs are in forms suitable for use with, QuickBASIC, C, and Pascal. The programs as follows:

FINDBASE: Program locates active and available port addresses.

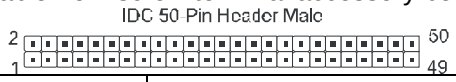
SETUP: Board Setup Program

CSAMPLES: SAMPLE1 This sample program will sequentially turn on all bits of the relay input and sequentially turns them off. Each time it sets a new bit, both the relay output and the relay input are read and the data displayed. This demonstrates how to read and write to a port.

BSAMPLES: SAMPLE1Same sample in Quickbasic

Chapter 6: CONNECTOR PIN ASSIGNMENTS

Isolated inputs, digital inputs and relay outputs are connected to the board via a 50-pin HEADER type connector P1. The mating connector is an IDC type with 0.1 inch centers or equivalent. The wiring may be directly from the signal sources or may be on ribbon cable from screw terminal accessory boards. Pin assignments follow.



PIN	NAME	FUNCTION
1	OUT7-C	Bit 7 Relay Common
2	OUT6-C	Bit 6 Relay Common
3	OUT7-NC	Bit 7 Relay, Normally-Closed Contact
4	OUT6-NC	Bit 6 Relay, Normally-Closed Contact
5	OUT7-NO	Bit 7 Relay, Normally-Open Contact
6	OUT6-NO	Bit 6 Relay, Normally-Open Contact
7	OUT5-C	Bit 5 Relay Common
8	OUT4-C	Bit 4 Relay Common
9	OUT5-NC	Bit 5 Relay, Normally-Closed Contact
10	OUT4-NC	Bit 4 Relay, Normally-Closed Contact
11	OUT5-NO	Bit 5 Relay, Normally-Open Contact
12	OUT4-NO	Bit 4 Relay, Normally-Open Contact
13	OUT3-C	Bit 3 Relay Common
14	OUT2-C	Bit 2 Relay Common
15	OUT3-NC	Bit 3 Relay, Normally-Closed Contact
16	OUT2-NC	Bit 2 Relay, Normally-Closed Contact
17	OUT3-NO	Bit 3 Relay, Normally-Open Contact
18	Out2-NO	Bit 2 Relay, Normally-Open Contact
19	OUT1-C	Bit 1 Relay Common
20	OUT0-C	Bit 0 Relay Common
21	OUT1-NC	Bit 1 Relay, Normally-Closed Contact
22	OUT0-NC	Bit 0 Relay, Normally-Closed Contact
23	OUT1-NO	Bit 1 Relay, Normally-Open Contact
24	OUT0-NO	Bit 0 Relay, Normally-Open Contact
25	IIN7 A	Isolated Input 7 A
26	IIN7 B	Isolated Input 7 B
27	IIN6A	Isolated Input 6 A
28	IIN6 B	Isolated Input 6 B
29	IIN5 A	Isolated Input 5 A
30	IIN5 B	Isolated Input 5 B
31	IIN4 A	Isolated Input 4 A
32	IIN4 B	Isolated Input 4 B
33	IIN3 A	Isolated Input 3 A
34	IIN3 B	Isolated Input 3 B
35	IIN2 A	Isolated Input 2 A
36	IIN2 B	Isolated Input 2 B
37	IIN1 A	Isolated Input 1 A
38	IIN1 B	Isolated Input 1 B
39	IIN0 A	Isolated Input 0 A
40	IIN0 B	Isolated Input 0 B
41	DIN 0	Digital Input Bit 0
42	DIN 1	Digital Input Bit 1
43	DIN 2	Digital Input Bit 2
44	DIN 3	Digital Input Bit 3
45	DIN 4	Digital Input Bit 4
46	DIN 5	Digital Input Bit 5
47	DIN 6	Digital Input Bit 6
48	DIN 7	Digital Input Bit 7
49	GND	Digital Ground
50	GND	Digital Ground

Chapter 7: SPECIFICATIONS

ISOLATED INPUTS

Number of inputs:	Eight
Type:	Non-polarized, optically isolated from each other and from the computer. (CMOS compatible)
Voltage Range:	3 to 28 DC or AC Rms (40 to 10000 Hz)
Isolation:	60V channel-to-ground or channel-to channel
Input Resistance:	1.8K ohms in series with opto-coupler
Response Time:	4.7 mSec w/filter, 10 uSec w/o filter (typical)
Interrupts:	Software controlled with jumper IRQ selection (basic model only)

DIGITAL INPUTS

Number of inputs:	Eight inputs with 10K pullup (TTL/CMOS compatible)

RELAY OUTPUTS

Number of outputs:	Eight SPDT form C
Contact Rating:	1A max at 24VDC, 60VDC max, 0.5A at 125VAC max
Contact Type:	Single crossbar, Ag with Au clad, (Bifurcated contacts optional)
Contact Resistance:	Initial 100 milliohms maximum
Contact Life: mech'l:	5 million operations minimum
Operating Time:	5 milliseconds maximum
Release Time:	5 milliseconds maximum

INTERRUPTS: Interrupts are generated when isolated inputs change state and when enabled by software (basic model only).

POWER REQUIRED: +5VDC @ 0.4 A (all relays ON)

ENVIRONMENTAL

Ambient Temperature:	Operating: -30^{o} to +70^{o}C (Non-Icing)
Weight:	Approx. 4 oz.

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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