

AX10450
16 Channel Opto-isolated
Digital Input Module
Operating Guide

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ESD Precautions

Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This helps to discharge any static electricity on your body.
- Wear a wrist grounding strap, available from most electronic component stores, when handling boards and components.

Unpacking

The AX10450 is packed in an anti-static bag. The board has components that are easily damaged by static electricity. Do not remove the anti-static wrapping until proper precautions have been taken. Safety instructions in front of this User's Manual describe anti-static precautions and procedures.

Inventory and Inspection

After unpacking the board, place it on a raised surface and carefully inspect the board for any damage that might have occurred during shipment. Ground the board and exercise extreme care to prevent damage to the board from static electricity.

Integrated circuits will sometimes come out of their sockets during shipment. Examine all integrated circuits, particularly the BIOS, processor and keyboard controller chip to ensure that they are firmly seated.

The AX10450/AX10450-16 16 Channel Opto-isolated Digital Input Module package includes the following:

- AX10450/AX10450-16 board
- Screw 3mm (x4)
- Bronze stick 6mm (x4)
- AS59099 CD
- Warranty Card

Make sure that all of the items listed above are present.

What To Do If There Is A Problem

If there are damaged or missing parts, contact your supplier and/or dealer immediately. Do not attempt to apply power to the board if there is damage to any of its components.

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Chapter 1

General Description

The AX10450 opto-isolated input PC/104 module is designed for monitoring digital input status. It provides 16 channels of input to detect ON/OFF, OPEN/CLOSE signals and has interrupt capability on its first channel. The input range is from 5V to 24V suitable for many application. Also the isolation voltage is up to 1000 Vrms from the input end to the host. This feature cases voltage spikes that often occur in harsh industrial environments to be safely isolated from the computer.

Features

- 16 channel opto-isolated input
- Isolation up to 1000 Vrms
- Filter circuit included
- Wide input range

Applications

- Industrial ON/OFF monitoring
- Limit switch monitoring
- Valve/Solenoid monitoring

Specifications

Input

- Opto-isolator : PC814 or equivalent
- Number of Channels : 16
- Voltage Range : $\pm 5V$ - $\pm 24V$ (logic 1 output)
- Current Limit Resistor : $1.2K\Omega$, $0.5W$
- Max Current : $\pm 50mA$
- Connector : 50-pin mating connector

Power Requirements

- +5VDC : $400mA$

Physical/Environmental

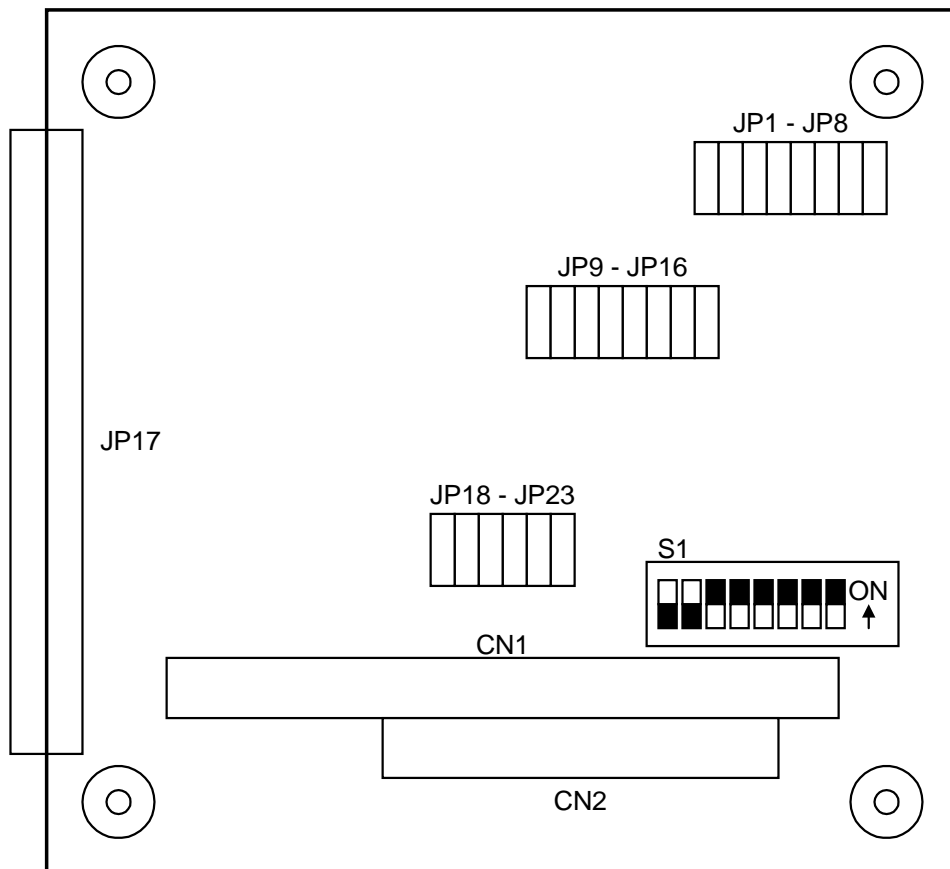
- Dimension : $95mm \times 90mm$
- Weight : $80g$
- Operating Temperature Range : $0^{\circ}C$ to $50^{\circ}C$
- Storage Temperature Range : $-25^{\circ}C$ to $85^{\circ}C$
- Relative Humidity : 0 to 90%, non-condensing

Chapter 2

Module Configuration and Installation

Location Diagram

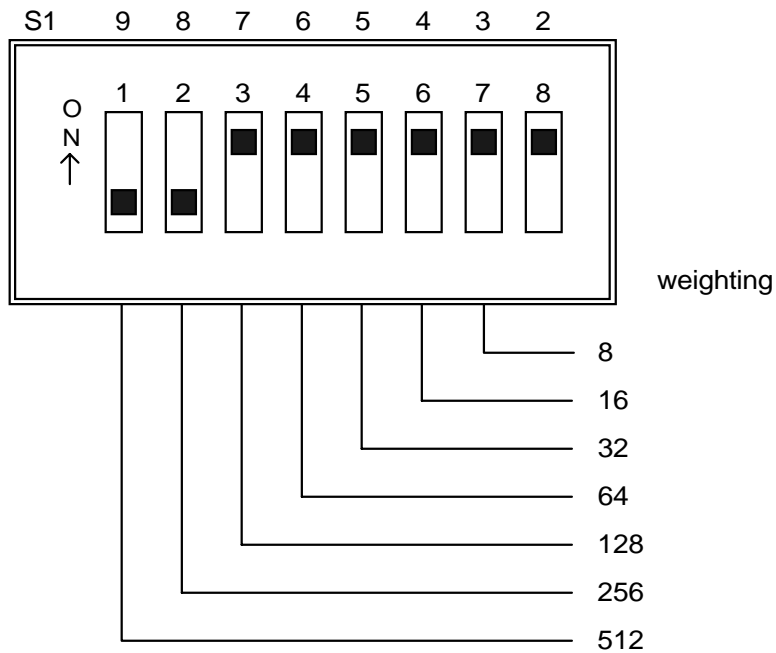
Refer to the following location diagram for help locating components needed during installation of the AX10450 module.



DIP Switch Setting

AX10450 occupies four consecutive I/O port spaces. The I/O port addresses are set via a DIP switch labeled S1. Set the DIP switch to correct address and avoid conflicting with other devices. Valid addresses are from 200 Hex to 3F8 Hex. The following figure is the default setting; 300 Hex.

Base Address Switch Setting



$$\begin{aligned} \text{Base Address} &= 512 + 256 = 768 \text{ (Decimal)} \\ &= 300 \text{ (Hex)} \end{aligned}$$

I/O Port Range	DIP Switch Position							
Hexadecimal	1	2	3	4	5	6	7	8
	A9	A8	A7	A6	A5	A4	A3	A2
200 – 203	1	0	0	0	0	0	0	0
204 - 207	1	0	0	0	0	0	0	1
208 – 20B	1	0	0	0	0	0	1	0
20C – 20F	1	0	0	0	0	0	1	1
.
220 - 223	1	0	0	0	1	0	0	0
.
* 300 - 303	1	1	0	0	0	0	0	0
.
3F8 – 3FB	1	1	1	1	1	1	1	0
3FC – 3FF	1	1	1	1	1	1	1	1

NOTE *0 = ON, 1 = OFF,*
 () : Factory default setting*

Jumper Setting

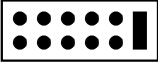
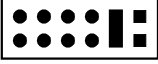




JP1 – JP8: These are filter control jumpers used to enable or disable channel 0 through channel 7 filterings. If jumper cap is installed, the filter is turn on when the 3-dB frequency located at about 50Hz.

Channel	0	1	2	3	4	5	6	7
Corresponding Jumper	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8

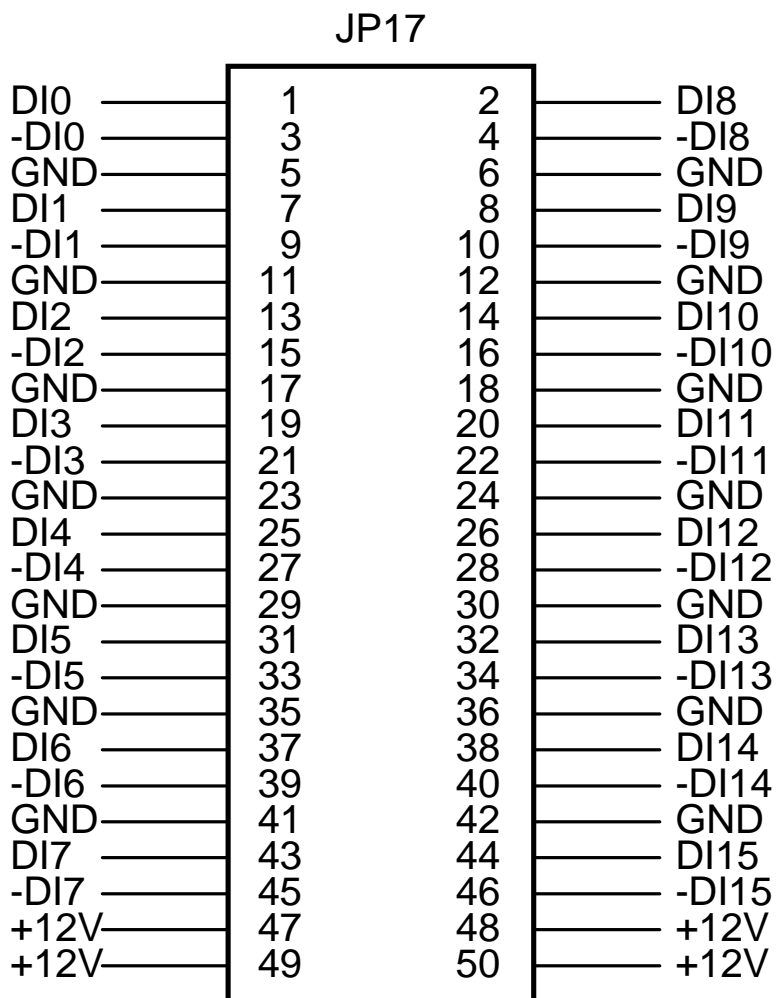
JP9 – JP16: These are filter control jumpers used to enable or disable channel 8 through channel 15 filterings. If jumper cap is installed, the filter is turn on where the 3-dB frequency is located at about 50Hz.

Channel	8	9	10	11	12	13	14	15
Corresponding Jumper	JP9	JP10	JP11	JP12	JP13	JP14	JP15	JP16

JP18 – JP23: These are interrupt request output selection jumpers. The following table shows jumper cap position versus IRQ channel relationship. Remember only channel 0 has interrupt capability.

JP18 – JP23 Jumper Cap Position	Description
	IRQ2 Selected
	IRQ3 Selected
	IRQ4 Selected
	IRQ5 Selected
	IRQ6 Selected
	IRQ7 Selected

Connector Pin Assignment



Pin	Signal Name	Description
1, 7, 13, 19, 25, 31, 37, 43	DI0 – DI7	The lower eight positive digital input channels. These pin are labeled as positive.
3, 9, 15, 21, 27, 33, 39, 45	-DI0-DDI7	The lower eight negative digital input channels. These pins are labeled as negative.
2, 8, 14, 20, 26, 32, 38, 44	DI8 – DI15	The upper eight positive digital input channels. These pins are labeled as negative.
4, 10, 16, 22, 28, 34, 40, 46	-DI8 – DI15	The upper eight negative digital input channels. These pins are labeled as negative.
47, 48, 49, 50	+12V	+12V PC bus power.
5, 6, 11, 12, 17, 18, 23, 24, 29, 30, 35, 36, 41, 42	GND	PC ground.

NOTE

Be careful when using the +12V power as it is directly from PC bus. Users are suggested to use external power source for data safety reasons.

Module Installation

The AX10450 PC/104 module is shipped with protective electrostatic cover. When unpacking, touching the module electro-statically shielded packaging with the metal frame of your computer to discharge the accumulated static electricity prior to touching the module.

Following description summarizes the procedure for installing the AX10450:

WARNING *Turn off the PC and all accessories connected to the PC whenever installing or removing any peripheral board including the AX10450 module.*

Installation Procedures:

1. Turn off the system power.
2. Unplug all power cords.
3. Remove the case cover if necessary.
4. Remove the top module if it is a non-stackthrough module.
5. Put the AX10450 module in line with the top present module as described in ***Appendix C PC/104 Mechanical Specifications***.
6. Install four spacers if necessary.
7. Connect cable if necessary.
8. Crush between the modules until inside distance is SPACER's height (0.6"). Restore all the screws.
9. Repeat step 6 until all modules are set into position.
10. Connect cable to AX10450 if necessary.
11. Replace the case cover and connect all the necessary cables.
12. Turn on the system power.

Chapter 3

Register Description

I/O Map

The AX10450 occupies 4 consecutive addresses in I/O address space, but only two of the I/O addresses are actually used. The 16 individually opto-isolated inputs are read as two bytes of data.

The following table shows the two 8-bit digital input registers:

- **Base Address +0**

Bit No.	7	6	5	4	3	2	1	0
Digital Input	DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0

This is a read only register for the lower digital input byte data. The write action will not have any effect.

- **Base Address +1**

Bit No.	7	6	5	4	3	2	1	0
Digital Input	DI15	DI14	DI13	DI12	DI11	DI10	DI9	DI8

This is a read only register for the higher digital input byte data. The write action will not have any effect.

Chapter 4

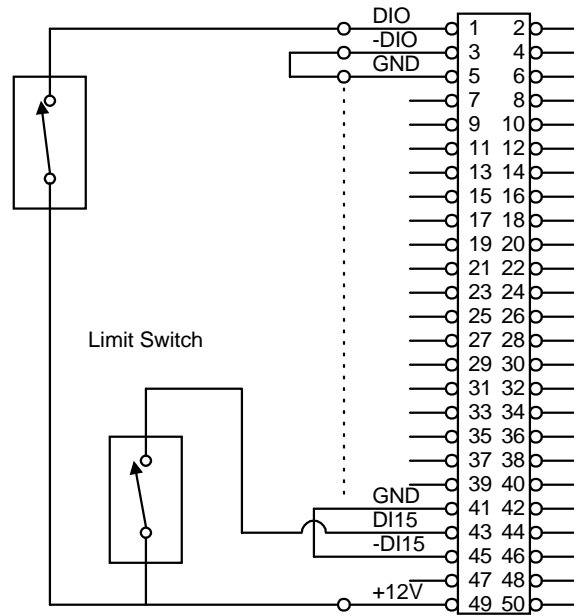
Programming

Programming the AX10450 is very simple. It can be easily accomplished using direct I/O instructions of whatever application languages. In this selection an example in BASIC is given.

Let's assume the base address is 300 Hex, the programming is as follows:

```
BASE = &H300
X1% = INP (BASE)
IF X1%&1 THEN PRINT "Channel 0 is ON "ELSE PRINT" Channel 0 is OFF"
:
:
X2% = INP (BASE+1)
IF X2%&1 THEN PRINT "Channel 8 is ON "ELSE PRINT" Channel 8 is OFF"
```

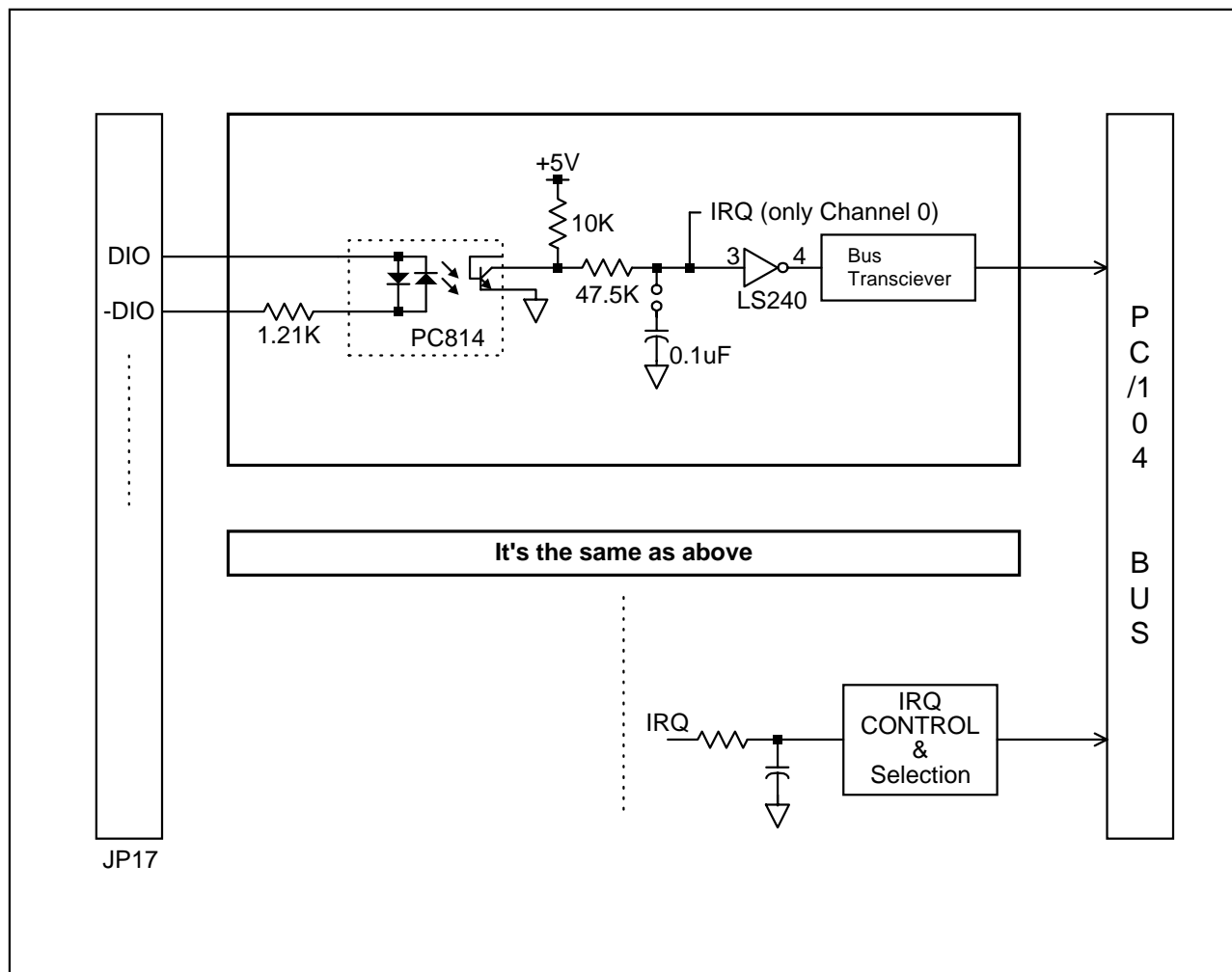
WARNING This is the simplest way to detect a switch whether it is close or open.



WARNING The +12V PC power had better not to be effected by outside world, otherwise it may cause the PC to fail accessing data to hard disk!

Chapter 5

Block Diagram



Appendix A

PC I/O Port Mapping

I/O Port Address Range	Function
000 – 1FF	PC reserved
200 – 20F	Game controller (Joystick)
278 – 27F	Second parallel printer port (LPT2)
2E1	GPIB controller
2F8 – 2FF	Second serial port (COM2)
320 – 32F	Fixed disk (XT)
378 – 37F	Primary parallel printer port (LPT1)
380 – 38F	SDLC communication port
3B0 – 3BF	Monochrome adapter/printer
3C0 – 3CF	EGA, reserved
3D0 – 3DF	Color/graphics adapter
3F0 – 3F7	Floppy disk controller
3F8 – 3FF	Primary serial port (COM1)

Appendix B

Summary of Interrupt Levels

Interrupt Level	Usage
NMI	Parity, AT Channel Check
IRQ0	Interval Timer 1, Counter 0 Out
IRQ1	Keyboard Controller
IRQ2	Reserved (XT) Cascade Interrupts from IRQ8 to IRQ15 (AT)
IRQ3	Serial Port #2
IRQ4	Serial Port #1
IRQ5	Hard Disk (XT) Parallel Port #2(AT)
IRQ6	Floppy Disk
IRQ7	Parallel Port #1
IRQ8	Real Time Clock (AT)
IRQ9	Re-directed to IRQ2 (AT)
IRQ10	Unassigned
IRQ11	Unassigned
IRQ12	Unassigned
IRQ13	Coprocessor Error
IRQ14	Hard Disk
IRQ15	Unassigned

Appendix C

PC/104 Mechanical Specifications

PC/104 General Description

While the PC and PC/AT architectures have become extremely popular in both general purpose (desktop) and dedicated (non-desktop) applications, its use in embedded microcomputer applications has been limited due to the large size of standard PC and PC/AT motherboards and expansion cards. PC/104 module can be of two bus types, 8 bit and 16 bit, which correspond to the PC and PC/AT buses, respectively.

Besides bus option, there are stackthrough and non-stackthrough difference. The stackthrough version provides a self-stacking PC bus. It can be placed anywhere in a multi-module stack. The non-stackthrough version offers minimum thickness, by omitting bus stackthrough pins. It must be positioned at one end of a stack.

For convenience, the AX10410 is equipped with stackthrough version only.

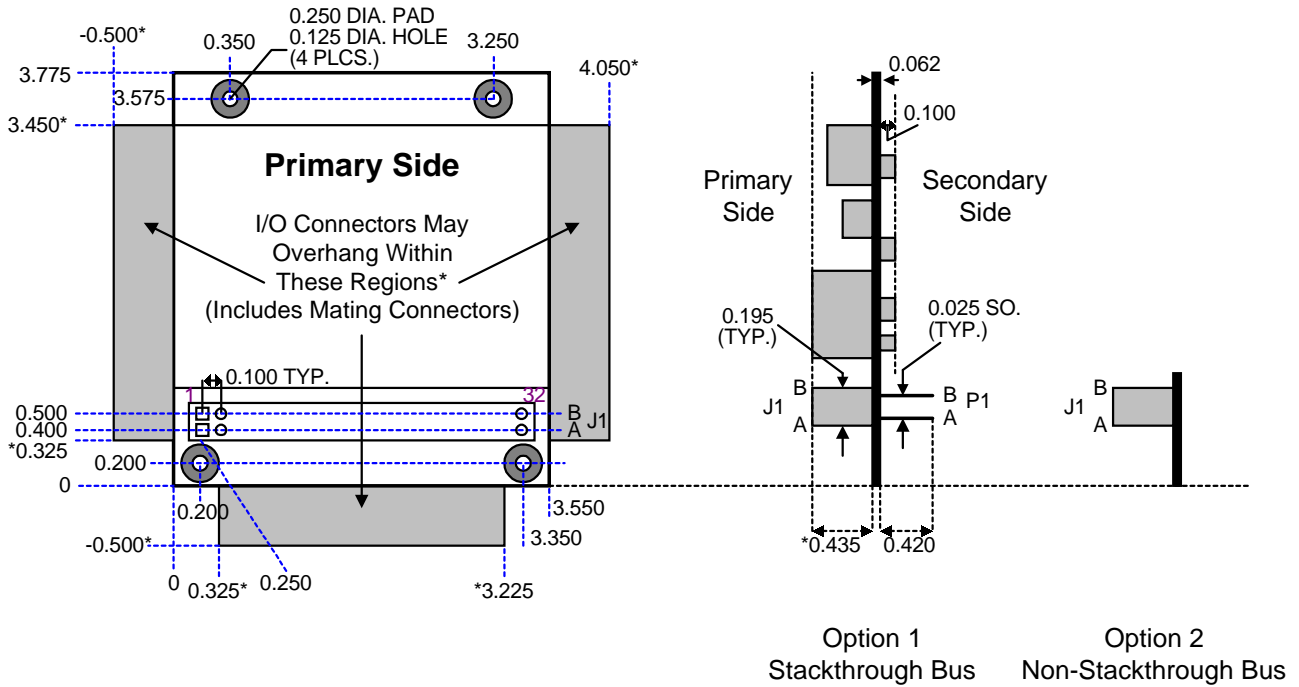
NOTE *For safety, you are suggested to cut bus stackthrough pins of the last module on condition; that you are sure you won't add/plug any module to the module stack in the future.*

The following sections provide the mechanical and electrical specifications for a compact version of the PC/AT bus, optimized for the unique requirements of embedded systems applications. The specification is herein referred to as "PC/104". Based on the 104 signal contacts on the two bus connectors (64 pins on CN1 plus 40 pins on CN2).

Module Dimensions

PC/104 modules can be of two bus types, 8-bit and 16-bit. These correspond to the PC and PC/AT buses, respectively.

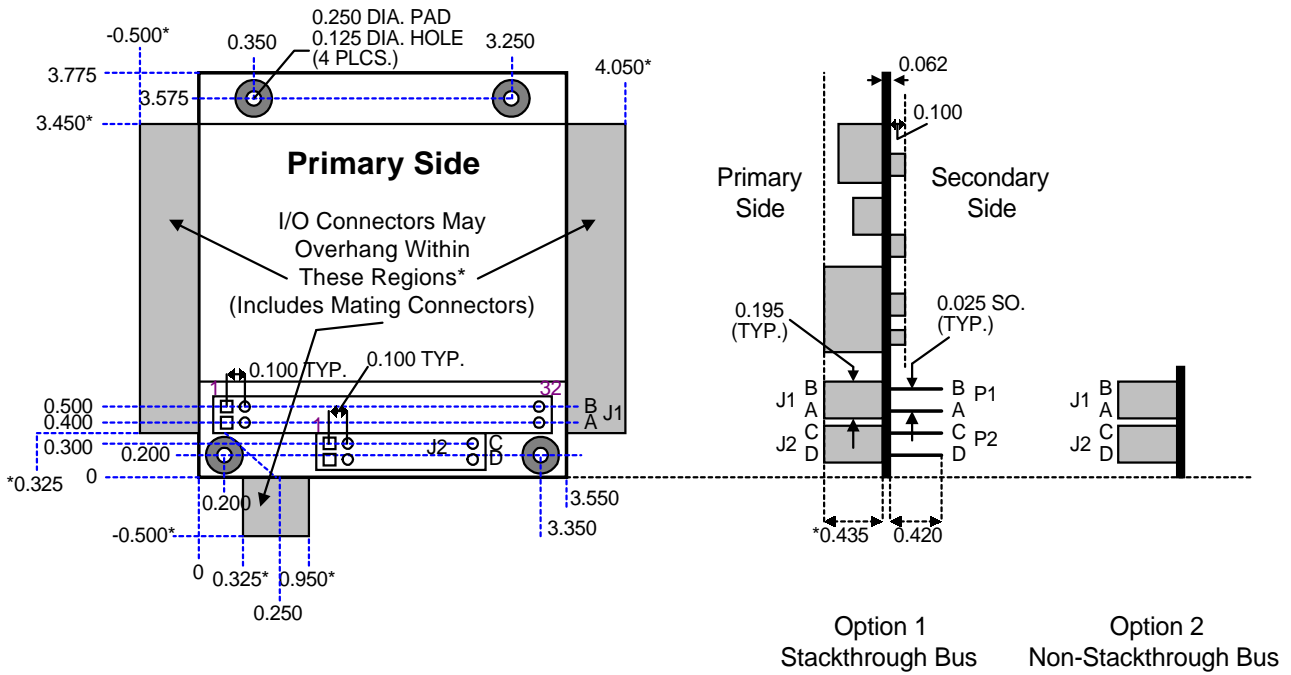
■ PC/10 8-Bit Module Dimensions



WARNING Dimensions are in inches ± 0.05 .

I/O mating connectors may not extend outside these boundaries.

■ PC/104 16- Bit Module Dimensions

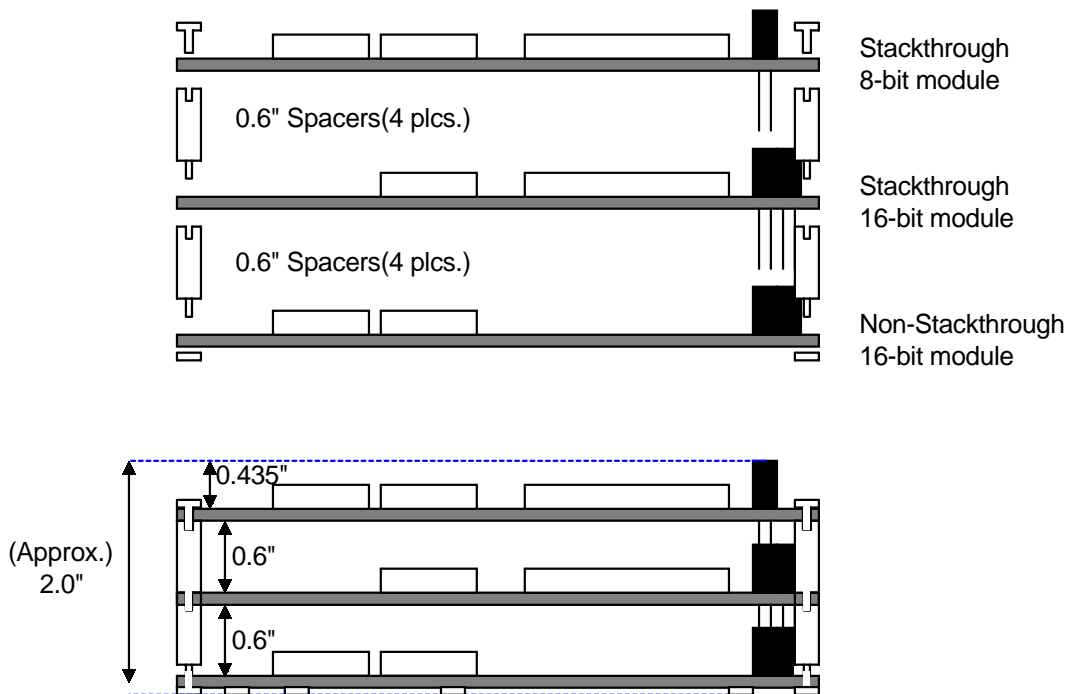


WARNING Dimensions are in inches ± 0.05 .

I/O mating connectors may not extend outside these boundaries.

■ **Typical Module Stack**

Figure illustrates a typical module stack of 8-bit modules, and shows the use of the “stack-through” and “non-stackthrough” CN1 bus connector options



- Figure 1 Typical Module Stack -