AX5410P

16 Channels Opto-Isolated Digital Input Card with PCI Bus

User's Manual

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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 AX5410P 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.

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.

After unpacking the AX5410P, check and see if the following items are included and in good condition. If any of the items is missing or damaged, notify your dealer immediately.

- AX5410P Board
- CN-D 37P 180D
- Cable HOODS CN-37P
- AS59099 DAC Driver CD
- AX5410P User's Manual
- 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
Introduction

1.1 General Description

The AX5410P provides 16 isolated digital input channels. It plugs directly into any 32-bit PCI Bus. The 16 opto-isolated D/I channels are ideal for sensing digital inputs, and provide 1000V of isolation. Each channel is optically isolated from system circuit and other input channels. You can configure each input channel individually by setting the jumpers for either ***voltage mode*** or ***dry contact mode*** input operation. The configuration of a channel in voltage mode may either be DC signal or AC signal input, depending on the jumper setting. In the past, we usually perform polling in order to acknowledge status change of input signal, causing a waste in CPU time. Now, AX5410P offers an onboard intelligent detector circuit that asserts an interrupt signal to CPU when change of input signal occurs. For this reason, the AX5410P supports 16 onboard LEDs that displays the input channel's status.

1.2 Features

- 32-bit PCI Bus compatible D/I card
- Plug and play
- 16 opto-isolated digital inputs
- 1000V fully isolation
- 37-pin D-type male connector included
- LEDs indicate input status
- Intelligent signal change detection to assert interrupt
- DC/AC input signal selectable
- Voltage/Dry contact mode selectable(Both with isolation)
- Windows 95/Windows NT driver and DOS DEMO program provided

1.3 Specifications

Isolated Input

- Indication Display: **16 Red LEDs**
- Indication Mode: **Logic "1" :LED on**
  Logic "0" :LED off
- Opto-isolator: **PC814**
- Input Channels: **16**
- Isolation: **1000V channel-to-channel and channel-to-ground**
- Throughput: **10KHz max.**
- Interrupt Throughput: **7KHz max.**

Voltage Input Mode

- Input Signal: **AC and DC Don't care polarity**
- Input Range: **4 to 24VDC/AC**
- Input Impedance: **1.2K/1W**

Dry Contact Input Mode

- Internal Detecting Voltage Supply: **+5VDC**
- Input Type: **Logic "1" : Close**
  Logic "0" : Open

Interface Characteristic

- I/O Connector: 37-pin D-type male connector

Power Requirements

- +5VDC: **0.6A max.**

Physical/Environmental

- Dimensions: **175x100 mm**
- Weight: **155g**
- Relative Humidity: **0 to 90%; non-condensing**

1.4 Screw Terminal Panel

AX851: DP-37 Universal Screw Terminal Panel

1.5 Software Package

AS59020: DAC Win 95 Driver

AS59040: DAC Win NT Driver

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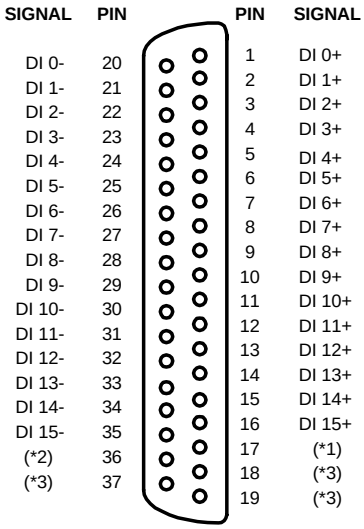
Chapter 2
Installation

2.1 Base I/O Port Address and IRQ Level

AX5410P occupies eight I/O port spaces. The PCI Plug & Play BIOS assigns the I/O port base address and IRQ level. From the device driver, user can get the base address, IRQ level and plus the slot number where AX5410P is plugged into. For more detailed information, refer to the Chapter *"Device Driver"*.

2.2 Connector Pin Assignments

All AX5410P D/I signals are built inside one 37-pin D-type male connector **(CN1)**. Shown on the following diagram are the pin assignments of **CN1**.



SIGNAL	PIN	PIN	SIGNAL
DI 0-	20	1	DI 0+
DI 1-	21	2	DI 1+
DI 2-	22	3	DI 2+
DI 3-	23	4	DI 3+
DI 4-	24	5	DI 4+
DI 5-	25	6	DI 5+
DI 6-	26	7	DI 6+
DI 7-	27	8	DI 7+
DI 8-	28	9	DI 8+
DI 9-	29	10	DI 9+
DI 10-	30	11	DI 10+
DI 11-	31	12	DI 11+
DI 12-	32	13	DI 12+
DI 13-	33	14	DI 13+
DI 14-	34	15	DI 14+
DI 15-	35	16	DI 15+
(*2)	36	17	(*1)
(*3)	37	18	(*3)
		19	(*3)

CN1

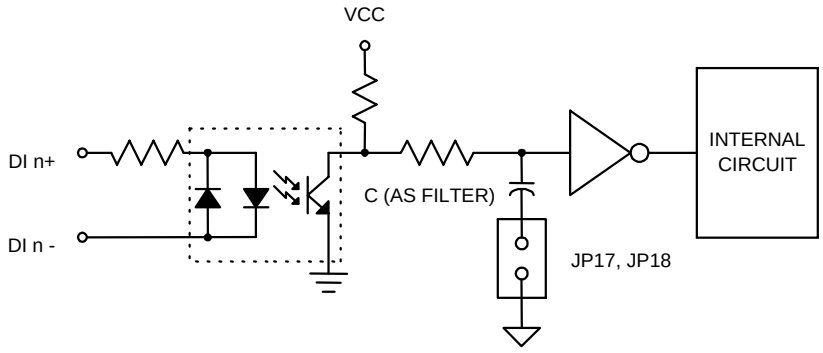
(*1): +12V / NC SELECTABLE
(*2): VCC / NC SELECTABLE
(*3): GND / NC SELECTABLE

Pin	Jumper	ON	OFF
17	J1	+12V	NC
36	J2	VCC	NC
18,19,37	J3	GND	NC

2.3 AC or DC Input Select

Both AC and DC signals can be input to AX5410P channels. Each input channel is equipped with jumper-selectable filter. The jumpers are JP17 and JP18. For DC input, filter is not required. For AC input, filter must be configured to the associated channel. The following table lists jumpers and its corresponding channels. In factory, filter is configured to each input channels.

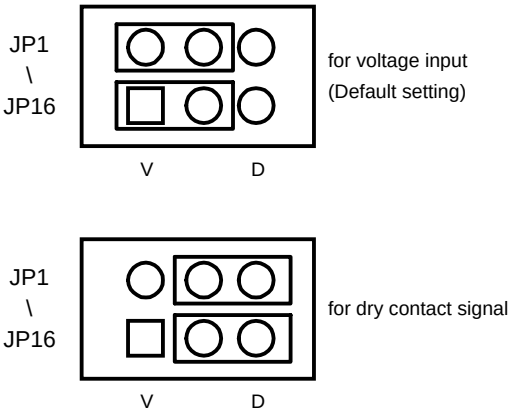
Jumper	Input Channels
JP17	Channels 1 through 8
JP18	Channels 9 through 16



2.4 Jumper Settings

AX5410P accepts two kinds of signals as digital inputs: ***voltage input*** and ***dry contact***, both configurable by setting the jumpers **JP1** through **JP16** onboard.

Refer to the following diagrams for the corresponding jumper settings of both signals.



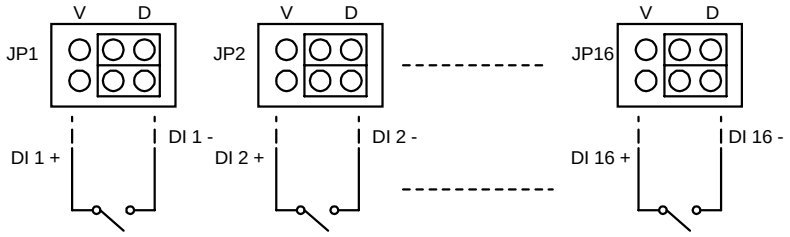
V: Voltage Input
D: Dry Contact Signal

2.5 Signal Wiring

The AX5410P accepts digital input signals from *TTL devices, dry contacts and voltage inputs*. Install jumpers (JP1~JP16) for dry contacts or voltage inputs according to previous section. With jumpers installed, the input signal is isolated from the internal circuit. Described on the following sections are the signal wirings for each case.

2.5.1 Dry Contact (1)

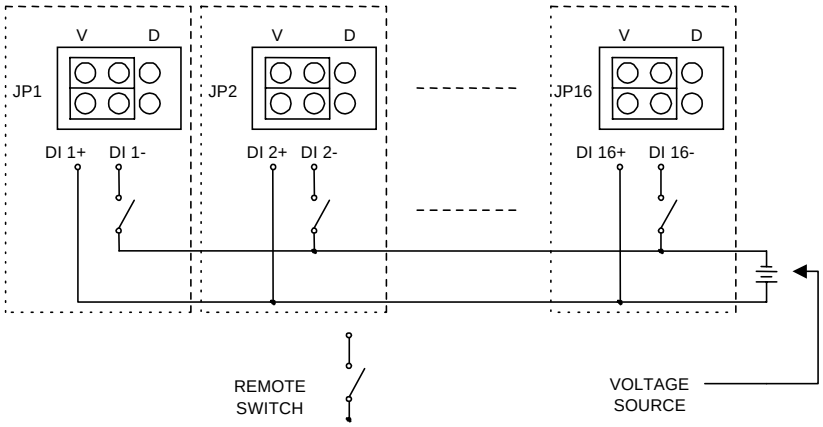
Connect the dry contacts directly to the digital input (DI+, DI-) and set jumpers as shown below. Use this connection in high voltage interference free environment (i.e. indoors, short distance).



2.5.2 Dry Contact (2)

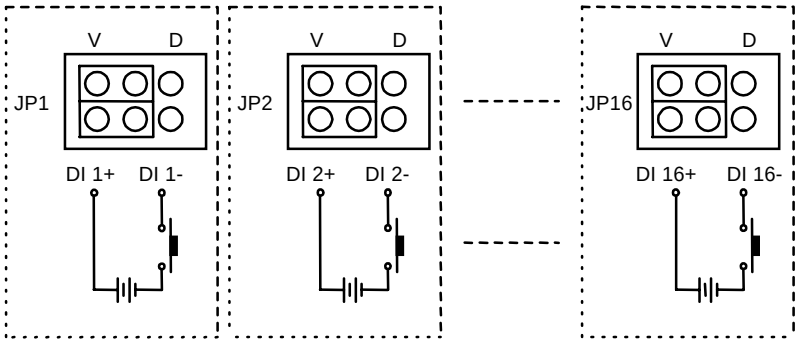
In some situations, the dry contacts are connected in a distance from the system. User may use the following connection to isolate the internal circuit, and to protect the internal circuit from noise interference.

NOTE: *You must add a voltage source (3V – 24V) between the dry contact and digital input in order to activate the opto isolator. Jumpers are set for voltage input.*



2.5.3 Voltage Input

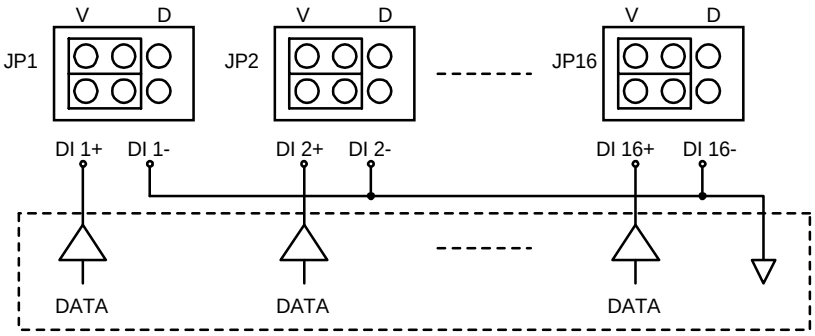
Set jumpers and place a voltage source (3V-24V) according to the description below. The voltage input signals are isolated from the internal circuit.



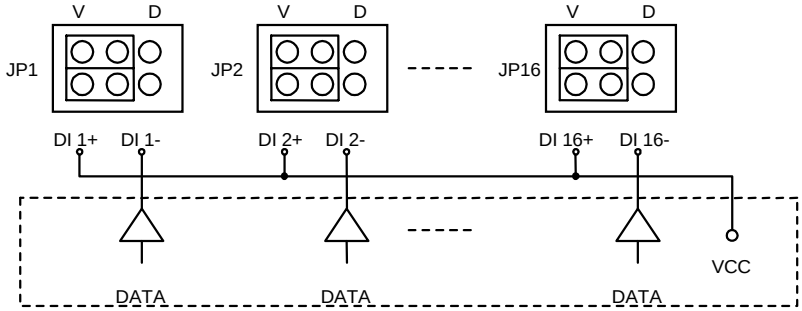
2.5.4 TTL Devices (With Isolation)

Simply connect the output points of TTL devices to AX5410P. The figures below give a brief description of the connections and jumpers settings.

DATA	STATUS
1	ON
0	OFF



DATA	STATUS
1	OFF
0	ON



2.6 Hardware Installation

The AX5410P board is shipped with protective electrostatic cover. When unpacking, touch the board's electrostatically shielded packaging with the metal frame of your computer to discharge the accumulated static electricity prior to touching the board.

The following summarizes the installation procedures of AX5410P:

WARNING: *TURN OFF the PC and all accessories connected to the PC whenever installing or removing any peripheral board including the AX5410P board.*

2.6.1 Board Installation

Turn off the PC and all accessories power.

Unplug all power cords and entire cables from the rear of the PC.

Remove the PC's cover (see your PC operation Guide if you are not skillful about it).

Find an unused expansion slot. Remove the blank expansion slot cover and save the screw for affixing retaining bracket.

Grab the upper edge of the AX5410P board. Align the AX5410P board's retaining bracket with the expansion slot rear panel, and straighten the board's gold finger with the expansion slot, crush the board into the slot.

Restore the screw to the expansion slot retaining bracket.

Replace the PC's cover and connect the cables you detached in step 2.

Turn on the PC and other peripheral devices power, go on the next chapter for software installation procedures.

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Chapter 3
Register Structure & Format

3.1 I/O Address Mapping

This chapter describes the register format and function. The AX5410P use only one I/O address. The register is 16 bits wide and show below.

Location	Function	Type
Base Address	Channels 1 through 16	Read

Base Address

MSB

D16	D15	D14	D13	D12	D11	D10	D9

D8	D7	D6	D5	D4	D3	D2	D1

LSB

D1-D16 represent digital input status for channels 1 through 16. AX5410P registers can be accessed easily through direct I/O instructions, using whatever application language available (i.e., Assembly, Basic, Pascal, C, etc.).

Enable interrupt

AX5410P offers an onboard intelligent detector circuit that asserts an interrupt signal to CPU when a change of input signal occurs.

Enable : write "1" to base address, outport(base+0,0x01);

After generating an interrupt, a read action at base address in user's ISR (interrupt service routine) program is necessary to release the interrupt line, enabling others to interrupt.

Disable: write "0" to base address, outport(base+0,0x00);

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Chapter 4
Device Driver

The AX5410P device driver is suitable for Plug & Play under DOS environment when generating information from PCI BIOS. This chapter describes in detail on how to install the device driver and use the device driver command to get base address, IRQ level, slot number. Testing programs are also provided for reference.

After successfully retrieving the information, user can use the information to act as parameter for driver function. All operations within this section will only work if the device driver *"AX5410P.SYS"* is successfully installed. There are testing programs provided in this chapter for reference purposes only.

4.1 Installing the Device Driver

Before executing any application program (including the following examples), this device driver must be installed. To install the device driver, type

SETUP [SOURCE DRIVE] [TARGET DRIVE] [DIRECTORY]

This will copy the device driver to the desired directory. After completion, add the following command line to your *config.sys*:

DEVICE = [PATH] AX5410P.SYS

Example

If you insert this diskette in drive A: and want to copy the file into C:\AX5410P. You must key in the following command line at the DOS prompt.

A:\SETUP A: C: AX5410P [ENTER]

Then add the following line to your *config.sys* file.

DEVICE = C:\AX5410P\AX5410P.SYS

Reboot your computer.

If the AX5410P is plugged in your system, the following message appears:

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  *
*          Copyright 1998 by AXIOMTEK Co., LTD                   *
*                          Ver 1.0                               *
*          AX5410P DEVICE DRIVER INSTALLED                       *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  *
```

Now AX5410P acts like a file. You can OPEN, CLOSE, WRITE (command), READ (base address, IRQ level, slot number) it via this device driver. If there is no AX5410P in your system, the following message appears:

AX5410P or PCI BIOS Not Found !!

Any attempt to OPEN the device driver will fail !

4.1.1 Using the Device Driver Command

The device driver is for the user to retrieve Base Address, IRQ Level, and Slot Number of AX5410P plugged in your system. Before accessing the device driver, open it as needed. After accessing the device driver, close it as also needed. To get any information (Base Address, IRQ Level or Slot Number), you must first write a command to the device driver in order for the needed data to be read from the device driver.

There are three commands for user to obtain Base Address, IRQ level and Slot Number. To get base address, you must write the command string *"B?"* to the device driver and then read a WORD (two bytes) from the device driver. This is the base address you need.

To get the IRQ level, you must write the command string *"I?"* to the device driver and then read a WORD (two bytes) from the device driver. This is the IRQ level you need.

To acquire the slot number, you must write the command string *"S?"* to the device driver and then read a WORD (two bytes) from the device driver. This is the slot number you need.

NOTE: *The question mark **"?"** must be replaced by a card number. If Base Address returns to 0, it means all information retrieved by the card number are not available.*

4.2 Programming Examples

4.2.1. Sample Program in Turbo C

```
*****************************  *
* Example program for Turbo C language    *
* To get BASE ADDRESS                     *
*        SLOT NUMBER via device driver    *
* Before executing this program, device   *
* driver must be installed successfully.  *
*****************************  *
```

```
#include <dos.h>
#include <stdio.h>
#include <string.h>
#include <conio.h>
#include <fcntl.h>
#include <io.h>

main()
{
    int    fd;
    int    base, busno

if ((fd=open("5410drv",O_RDWR))= = -1 ) {
  printf("AX5410P OPEN FAIL !\n");
  exit(0);
  }
else
  printf("OK\n");

write(fd,"B1",2);
read(fd, &base,sizeof(int));

write(fd,"S1",2);
read(fd,&busno,sizeof(int));
```

```
close(fd);
clrscr();

printf("BASE    ADDRESS :%x\n",base);
printf("SLOT NUMBER :%x\n", busno);

if (base = = 0) {
   printf("ERROR INFORMATION !\n");
   exit(0);
   }
}
```

4.2.2. Sample Program in Turbo Pascal

```
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
        *  Example program for Turbo PASCAL language              *
        *  To get BASE ADDRESS                                    *
        *           SLOT NUMBER via device driver                 *
        *  Before executing this program, device driver must      *
        *  be installed successfully.                             *
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

PROGRAM AX5410P(input);
uses dos,crt;
      var
      fdw:text;
      fdr :file of integer;
      addr,slotno:intrger;
begin
      clrscr;
      assign(fdw,'5410drv');
      assign(fdr,'5410drv');

      rewrite(fdw);
      writeln(fdw,'b1');
      reset(fdr);
      read(fdr,addr);

      rewrite(fdw);
      writeln(fdw,'s1');
      reset(fdr);
      read(fdr,slotno);
```

```
close(fdw);
close(fdr );
writeln('BASE    ADDRESS : ',addr:10);
writeln('SLOT    NUMBER :',slotno:10);
if addr <> 0 then writeln('The information are correct');
END.
```

4.2.3. Sample Program in QBasic 4.5

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *    *
*  Example program for QB45 language                        *
*  To get BASE ADDRESS                                      *
*          SLOT NUMBER via device driver                    *
*  Before executing this program, device driver must        *
*  be installed successfully.                               *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * *    *

OPEN "5410drv" FOR OUTPUT AS #1
OPEN "5410drv" FOR BINARY AS #2
PRINT #1, "B1"
GET #2, 1, BL%
GET #2, 1, BH%
PRINT #1, "S1"
GET #2,    , S%
CLOSE #1
CLOSE #2
BL = BL%
BH = BH%
ADDR = BH * 256 + BL
PRINT "BASE ADDRESS: ", ADDR
PRINT "SLOT NUMBER :    ",S%
IF ADDR <> 0 THEN PRINT " The information are correct"
```

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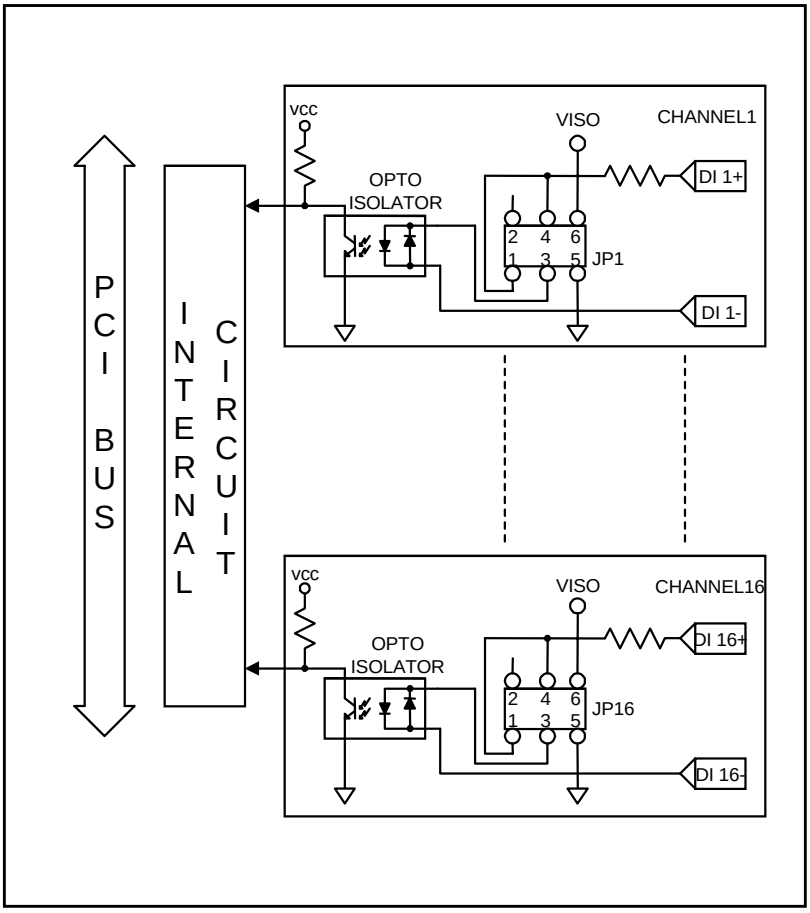
Appendix A
Block Diagram



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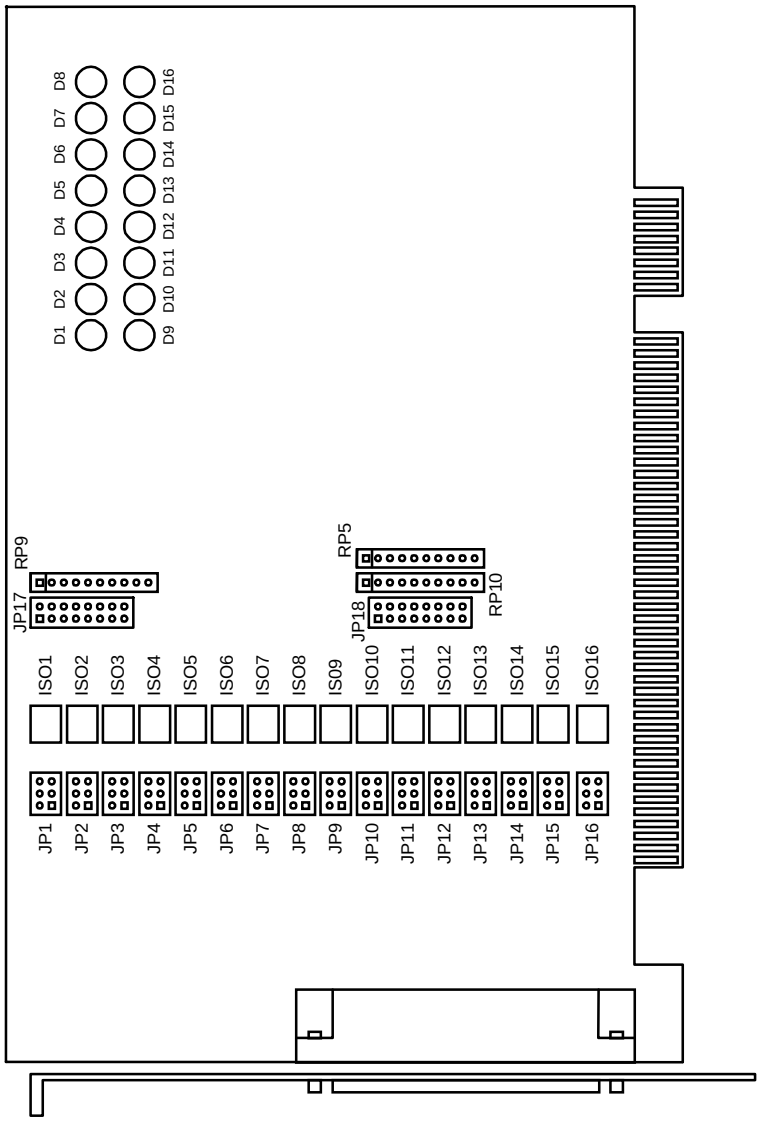
Appendix B
Location Diagram



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