P8R8DIO / P16R16DIO

User's Manual

Warranty

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Contents :

1. Introduction

The P8R8DIO / P16R16DIO is a isolated input / output interface board for control and sensing operations.

The P8R8DIO / P16R16DIO installs in any IBM PC XT/AT or compatible computer.

1.1. Features and Applications

1.1.1. Features

P8R8DIO / P16R16DIO

- 8/16 Electromechanical Relay Outputs
- 8/16 Optically Isolated Inputs
- For IBM PC XT/AT
- AC/DC Signals Input
- AC Signal Input With Filter

1.1.2. Applications

- Factory Automation
- Laboratory Automation
- Annunciation
- Security Control
- Product Test
- Energy Management

P8R8DIO

1.2. Specifications

INPUT	Channels	8
	Photo-coupler	PC-814
	Input-Current	60mA Max.
	Input-Voltage	AC/DC 5 - 24 V (AC 50 - 1K HZ)
	Input Impedance	1.2 KΩ
	Withstanding Voltage	1KV
	Response Time	Without Filter 20μS With Filter 2.2mS
OUTPUT	Relay Output Channels	8
	Relay Type	4 SPDT / 4 SPST
	Contact Rating	120 V AC/DC 0.3 A 30 V DC 1 A
	Breakdown Voltage	1KV
	Operate Time	5 m Sec
	Release Time	5 m Sec
	Insulation Resistance	100 M Ω
	Expected life Electrical at 30V /1A	> 100,000 Times
	Relay Input Current	16mA
etc.	Dimensions	173 mm X 115 mm
	Temperature	0 ~ 50
	Power Consumption	+5V 160mA MAX. +12V 150mA MAX.

2. Installation

This chapter describes how to install the P8R8DIO . the unpacking information that you should be careful is described. the jumpers and switches setting for the P8R8DIO configuration.

2.1. Unpacking

CAUTION :
Your P8R8 D/I/O Card contains sensitive electronic components can be easily damaged by static electricity.

1. The P8R8DIO should be done on a grounded anti-static mat.
2. The user should wear an anti-static wristband, grounded at the same point as the anti-static mat.
3. Inspect the carton for obvious damage. shipping & handing may cause damage to the board . Be sure there are no shipping and handling damages on the board before using.
4. After opening the carton, exact the system board and place it on a grounded anti-static surface & component side up.

CAUTION : Do not Apply Power to the Board if it has been damaged.

You are now ready to install your P8R8DIO .

2.2. Layout
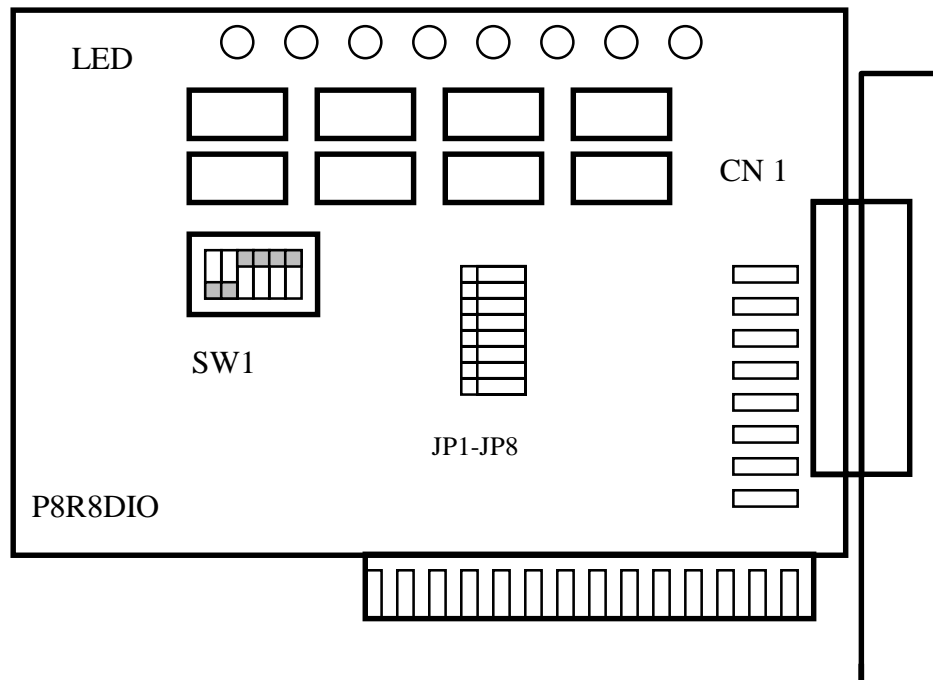
P8R8DIO layout

2.3. Address & Jumper Setting

You can change the P8R8DIO configuration by setting jumper & switches on the board . The board's jumpers are set at the factory . Under normal circumstances , you should not need to change the jumper settings.

2.3.1. Address Setting

The P8R8DIO requires two consecutive I/O addresses, one for output & read back and the other for input. You can set the base address on any 4-byte boundary using the DIP switch(SW1). If you install one more P8R8DIO boards, you must set a different base address for each board.

The base address switch is preset at 300H (see Figure 2-1).

S 1 : Default Address 300 Hex
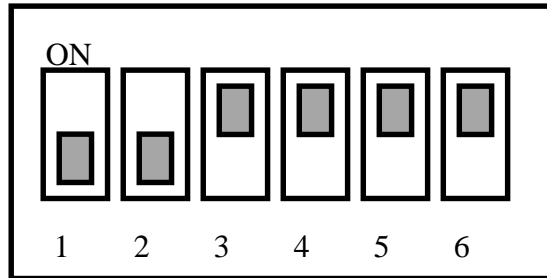
Figure 2-1

S1 Dip Switch	1	2	3	4	5	6
Address (Hex)	A9	A8	A7	A6	A5	A4
200	OFF	ON	ON	ON	ON	ON
210	OFF	ON	ON	ON	ON	OFF
220	OFF	ON	ON	ON	OFF	ON
:	:	:	:	:	:	:
2A0	OFF	ON	OFF	ON	OFF	ON
:	:	:	:	:	:	:
2F0	OFF	ON	OFF	OFF	OFF	OFF
(*)300	OFF	OFF	ON	ON	ON	ON
310	OFF	OFF	ON	ON	ON	OFF
320	OFF	OFF	ON	ON	OFF	ON
330	OFF	OFF	ON	ON	OFF	OFF
340	OFF	OFF	ON	OFF	ON	ON
350	OFF	OFF	ON	OFF	ON	OFF
360	OFF	OFF	ON	OFF	OFF	ON
:	:	:	:	:	:	:
3F0	OFF	OFF	OFF	OFF	OFF	ON

(*) Default Setting   Table 2-1

2.3.2. Jumper Setting

Each digital input channel can be jumper selected, single-pole ,RC filter with a time constant of 1.2 ms. Refer to Figure 2-2 to see which response jumper . correspond to which digital input channel.

JP 1 ~ JP 8

Without Filter
For DC Signal

(Default Setting)

With AC Filter
For AC Signal
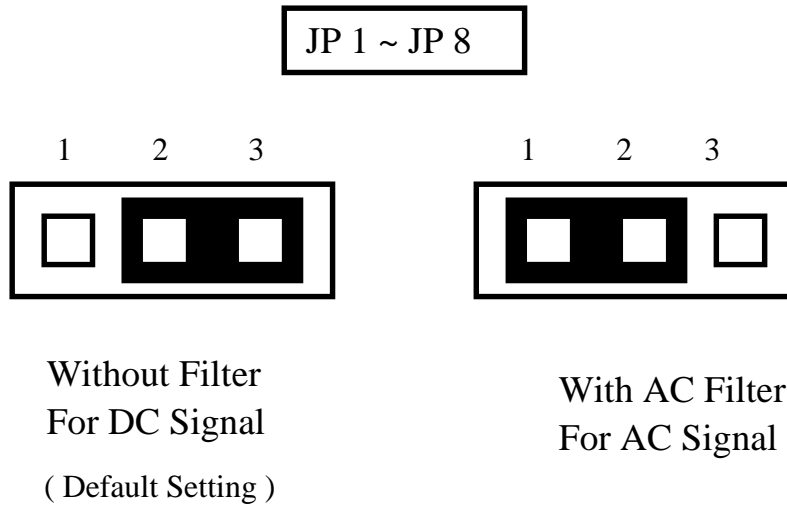
Jumper	Input Channels
JP1	DI 0
JP2	DI 1
JP3	DI 2
JP4	DI 3
JP5	DI 4
JP6	DI 5
JP7	DI 6
JP8	DI 7

Table 2-2

If you are using AC input signals , you must short the AC FILTER jumper 1-2 . If you are using DC input signals , the AC FILTER is optional. If the DC input signals response less than 20 us, set the filter off. If you want a slow response (about 5 to 10 ms)for rejecting noise or contact bouncing , short the AC FILTER jumper 1-2.7

2.4. Pin Assignments

.Figure 2-3 are CN 1 pin assignments of the P8R8DIO connector.

	Pin		Pin	
NO0	1			
COM0	2		20	NO3
NC0	3		21	COM3
NO1	4		22	NC3
COM1	5		23	NO4
NC1	6		24	COM4
NO2	7		25	NO5
COM2	8		26	COM5
NC2	9		27	NO6
NO7	10		28	COM6
COM7	11		29	GND
DI 0	12		30	DI 0
DI 1	13		31	DI 1
DI 2	14		32	DI 2
DI 3	15		33	DI 3
DI 4	16		34	DI 4
DI 5	17		35	DI 5
DI 6	18		36	DI 6
DI 7	19		37	DI 7
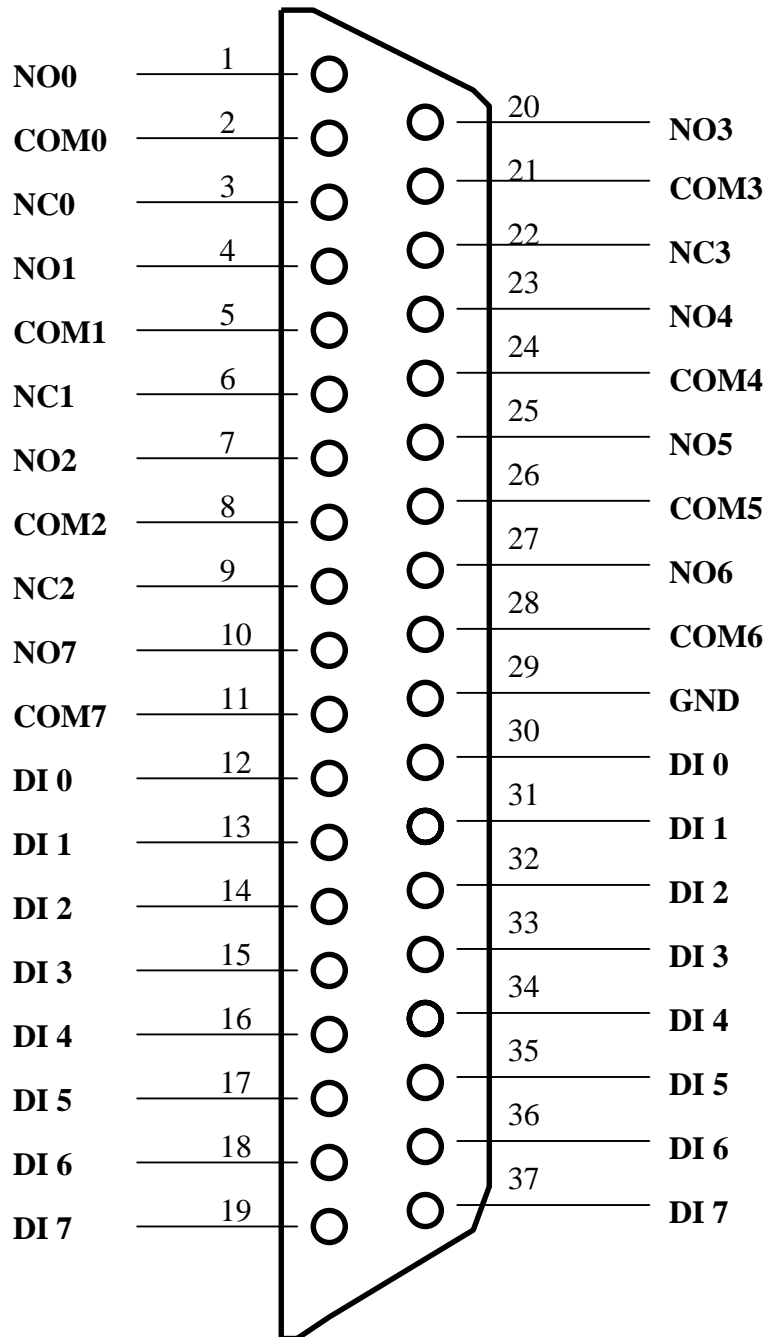
NO n   : normally open

COM n : common

NC n   : normally close

DI n   : Digital input channel n

3.Programming

This chapter provides the I/O map of P8R8DIO registers. Example programs and programming information are also included.

3.1. Address Map

The P8R8DIO boards occupy two consecutive addresses in the computer's I/O space . The base address is selected by DIP switch , The I/O map are shown in Table 3-1.

Base Address at 300 Hex

Address	Write	Read
Base + 0	Relay Output (CH 0 ~ CH 7)	Read Back The Output Status
Base + 1	NO FUNCTION	DIGITAL INPUT (CH0~CH7)

Table 3-1 I/O Map

3.2. Relay Output

You write data to relays (CH0 - CH 7) as a single Byte. Each of the eight bits within a byte controls a single relay. A high bit(equal to1) energizes (closes the contacts of)a relay while a low bit (equal to 0) turns the relay off.

3.2.1. Output Register

Relay Output register bits are assigned as shown in Table 3-2

Base Address at 300 Hex

Base+0	D7	D6	D5	D4	D3	D2	D1	D0
Output Channel	7	6	5	4	3	2	1	0

Table 3-2 Relay Addresses in the Relay Output Register

For Example (Basic Language)

REM : Set all relay output is ON , (Output data FFh)

```
Base=&h300                 ' Set Base Address at 300 (Hex)
Out Base , &hFF            ' Set Relay Output (Ch 0 ~ Ch 7) On
RB= Inp(Base)             ' Read Back Relay Output Ch 0 ~ Ch 7
```

REM : Set relay output CH 3 is ON ,Output data 8h (00001000 BIN)
```
Out Base,&h8              ' Set relay output CH 3 ON
```

(For C Language)

```
outportb(0x300,0x0FF);      /* Set all relay output is On*/
outportb(0x300,0x0);        /* Set all relay output is Off*/
```

3.2.2. Using Relay Output

Basic Circuitry : (Current Rating < 0.3 A) , Refer to Fig. 3-1
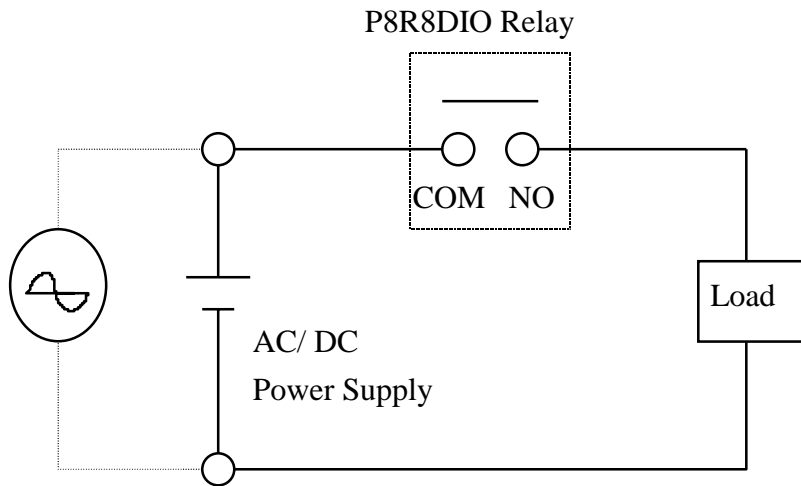
P8R8DIO Relay

COM   NO

AC/ DC
Power Supply

Load

Figure 3-1

Heavy Loading Application (> 0.3 A) , Refer to Fig.3-2

AC/ DC
Power Supply

P8R8DIO
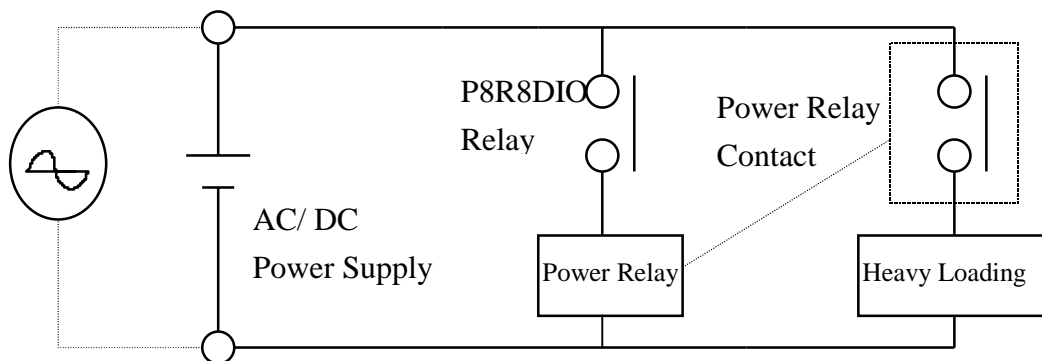Relay

Power Relay
Contact

Power Relay

Heavy Loading

Figure 3-2

3.3. Isolated Input

The digital input state 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 so that a high bit (equal to 1) represent a high state while a low bit (equal to 0) represent a low state . Register bits are assigned as shown in Table 3-3

3.3.1. Input Register

Base Address at 300 Hex

Base + 1	D7	D6	D5	D4	D3	D2	D1	D0
Input Channel	7	6	5	4	3	2	1	0

Table 3-3 input addresses in the isolated control input Register

For Example (Basic Language)

Base=&h300   ' Set Base Address at 300 (Hex)
RIH=INP(Base+1)   ' Read Isolated Input Ch 0 ~ Ch 7

(C Language)

int rih;
rih=inportb(0x301);

3.3.2. Using Isolated Input

Basic Circuit

Figure 3-3

The normal input voltage range is 5 to 24V AC or DC . The normal input range can be changed by choosing suitable resistor to limit the current through the opto-isolator to about 10 mA(If). The default resistor is 1.2 KΩ / 1 W .

Ri = Vin / If

Pw = Vin X If
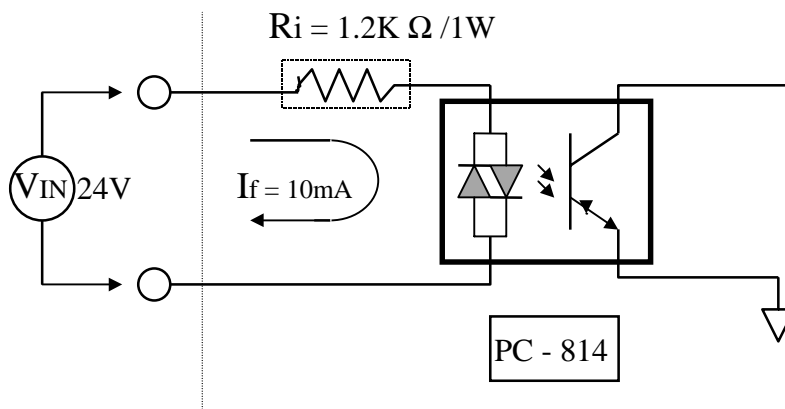
Figure 3-4

Calculation Example :

If Vin = 120 V Then Ri = 120 (V) / 0.01 (A) = 12 K Ω

Pw = 120 (V) X 0.01 (A) = 1.2 W

The Ri Must Replace By 12K Ω / 2 W (1.2W)

P16R16 DIO

4.Specifications

INPUT	Channels	16
	Photo-coupler	PC-814
	Input-Current	60 mA Max.
	Input-Voltage	AC/DC 5 - 24 V (AC 50 - 1K HZ)
	Input Impedance	1.2 K
	Withstanding Voltage	1KV
	Response Time	Without Filter 20μS With Filter 2.2mS
OUTPUT	Relay Output Channels	16
	Relay Type	8 SPDT 8 SPST
	Contact Rating	120 V AC/DC 0.3 A 30 V DC 1 A
	Breakdown Voltage	1KV
	Operate Time	5 m Sec
	Release Time	5 m Sec
	Insulation Resistance	100 M Ω
	Expected life Electrical at 30V /1A	> 100,000 Times
	Relay Input Current	16mA
etc.	Dimensions	173 mm X 115 mm
	Temperature	0 ~ 50
	Power Consumption	+5V 200mA MAX. +12V 260mA MAX.

5.Installation

This chapter describes how to install the P16R16DIO . the unpacking information that you should be careful is described. the jumpers and switches setting for the P16R16DIO configuration.

5.1.Unpacking

CAUTION :
Your P16R16DIO D/I/O Card contains sensitive electronic components can be easily damaged by static electricity.

1. The P16R16DIO should be done on a grounded anti-static mat.
2. The user should wear an anti-static wristband, grounded at the same point as the anti-static mat.
3. Inspect the carton for obvious damage. shipping & handing may cause damage to the board . Be sure there are no shipping and handing damages on the board before using.
4. After opening the carton, Place the system board handle place on a grounded anti-static surface & component side up.

CAUTION : Do not Apply Power to the Board if it has been damaged.

You are now ready to install your P16R16DIO .

5.2. Layout
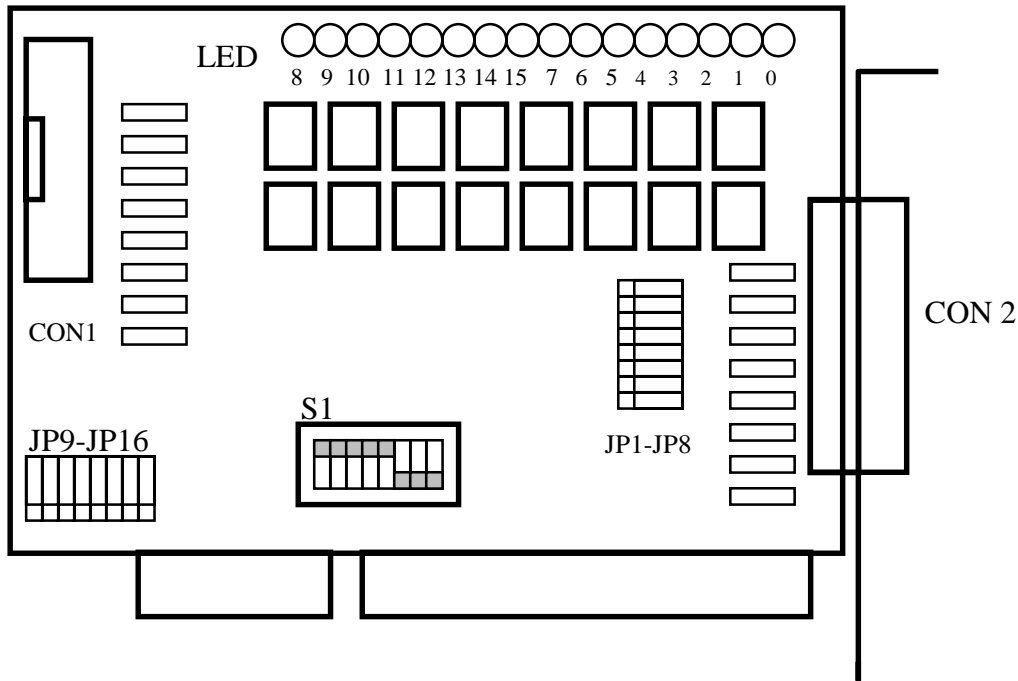
P16R16DIO layout

5.3. Address & Jumper Setting

You can change the P16R16DIO configuration by setting jumper & switches on the board . The board's jumpers are set at the factory . Under normal circumstances , you should not need to change the jumper settings.

5.3.1. Address Setting

The P16R16DIO requires four consecutive I/O addresses, two is for output & read back and the other's is for input. You can set the base address on any 4-byte boundary using the DIP switch(S1). If you install one more P16R16DIO boards, you must set a different base address for each board.

The base address switch is preset at 300H (see Figure 2-1).

S 1 : Default Address 300 Hex
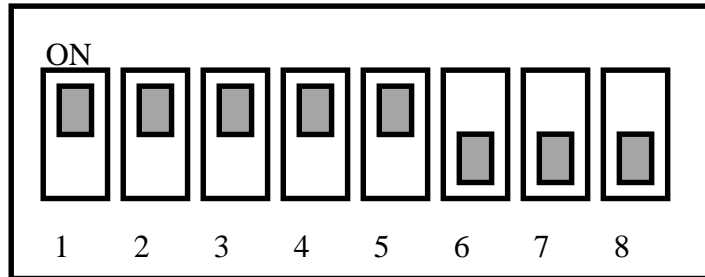
Figure 2-1

S1 Dip Switch	8	7	6	5	4	3	2	1
Address (Hex)	X	A9	A8	A7	A6	A5	A4	A3
200		OFF	ON	ON	ON	ON	ON	ON
:		:	:	:	:	:	:	:
2A0		OFF	ON	OFF	ON	OFF	ON	ON
:		:	:	:	:	:	:	:
(*) 300		OFF	OFF	ON	ON	ON	ON	ON
308		OFF	OFF	ON	ON	ON	ON	OFF
310		OFF	OFF	ON	ON	ON	OFF	ON
318		OFF	OFF	ON	ON	ON	OFF	OFF
:		:	:	:	:	:	:	:
3E8		OFF	OFF	OFF	OFF	OFF	ON	OFF
3F0		OFF	OFF	OFF	OFF	OFF	OFF	ON
3F8		OFF	OFF	OFF	OFF	OFF	OFF	OFF

(*) Default Setting   Table 2-1

5.3.2. Jumper Setting

Each digital input channel can be jumper selected, single-pole ,RC filter with a time constant of 1.2 ms. Refer to Figure 2-2 to see which response jumper . correspond to which digital input channel.

JP 1 ~ JP 8

1   2   3   1   2   3

Without Filter
For DC Signal

(Default Setting)

With AC Filter
For AC Signal

JP 9 ~ JP 16

3   3

2   2

1   1

Without Filter
For DC Signal

With AC Filter
For AC Signal

(Default Setting)   Figure 2-2
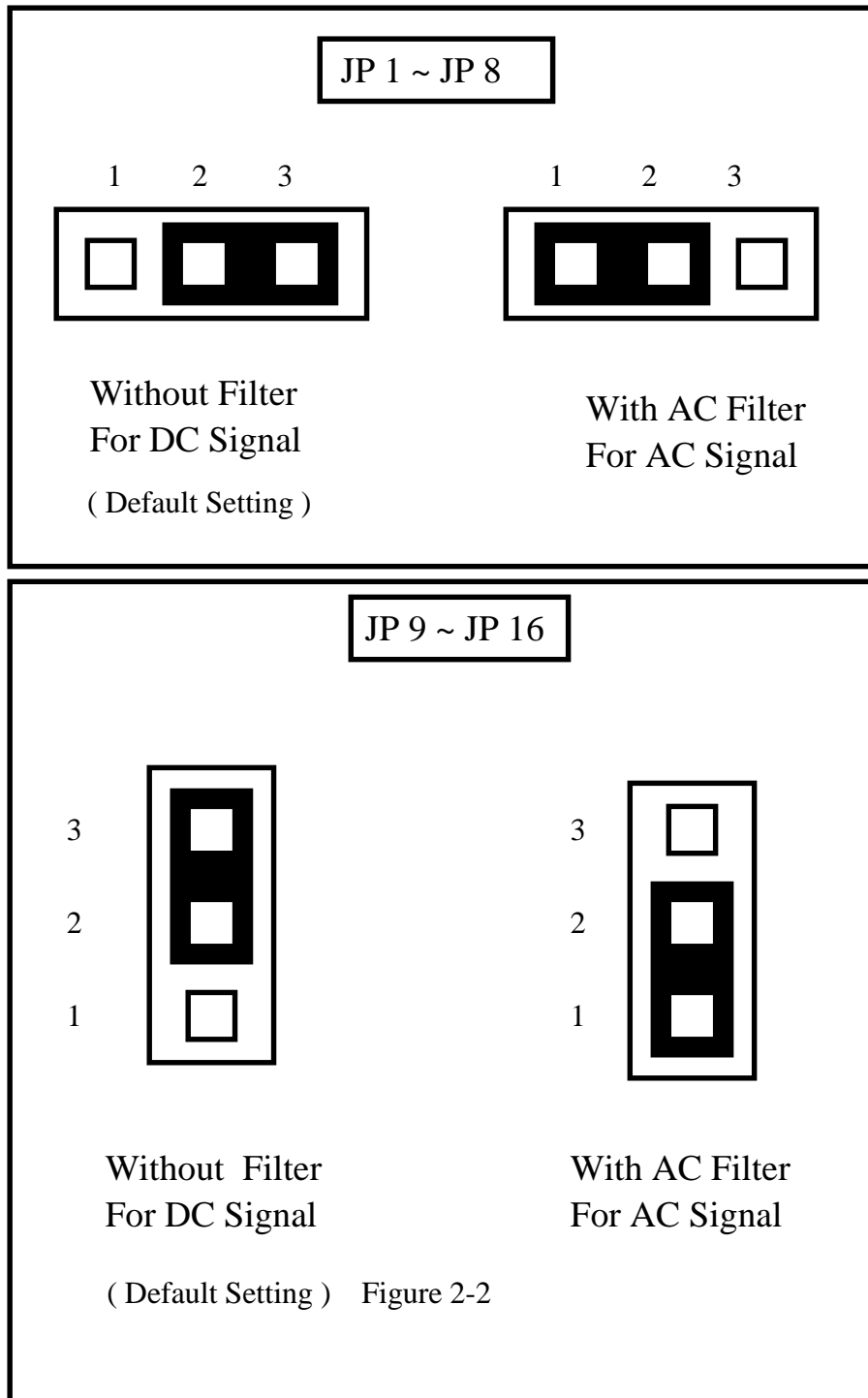
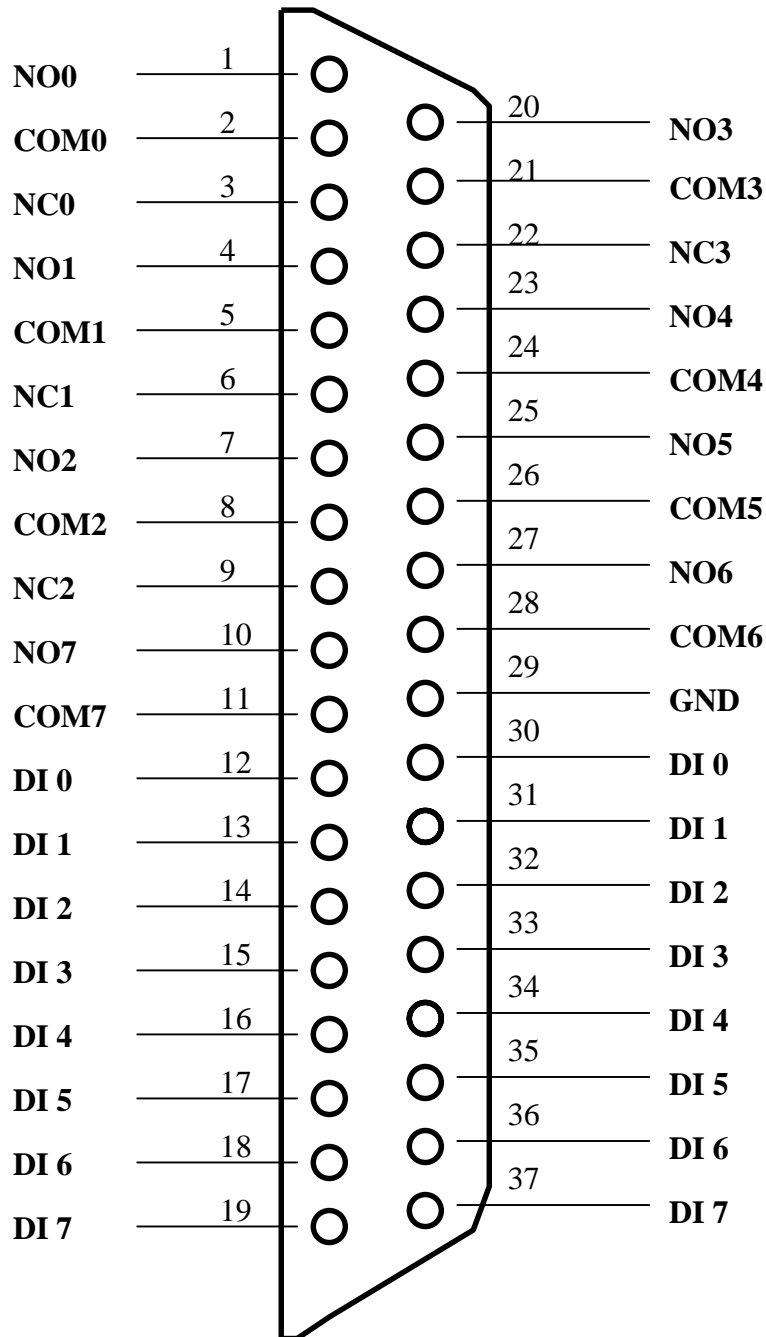| Jumper	Input Channels
JP1	DI 0
JP2	DI 1
JP3	DI 2
JP4	DI 3
:	:
JP13	DI 12
JP14	DI 13
JP15	DI 14
JP16	DI 15

Table 2-2

If you are using AC input signals , you must short the AC FILTER jumper 1-2 .

If you are using DC input signals , the AC FILTER is optional. If the DC input signals response less than 20 us, set the filter off. If you want a slow response (about 5 to 10 ms)for rejecting noise or contact bouncing , short the AC FILTER jumper 1-2.

5.3.3.Pin-assignments

.Figure 2-3 are CN 2 pin assignments of the P16R16DIO connector.

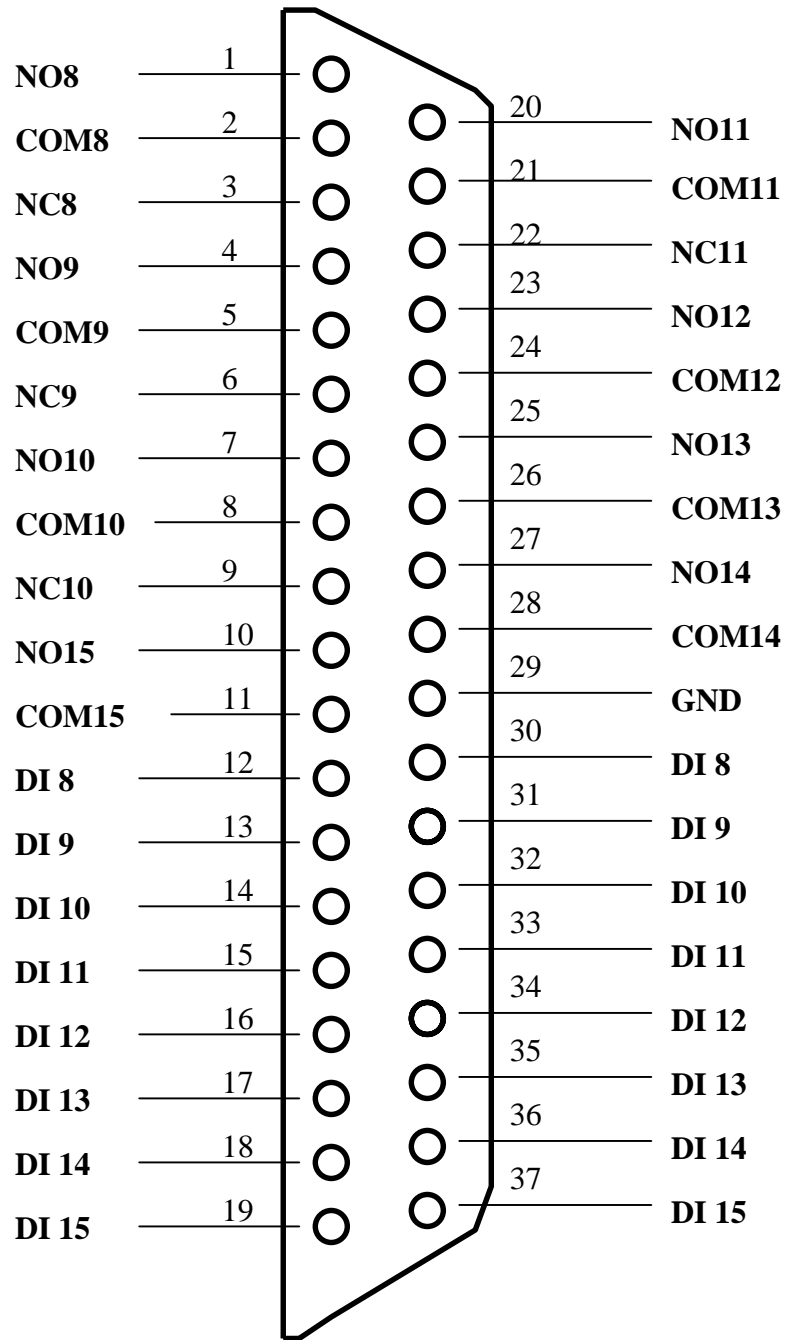| Left	Pin		Pin	Right
NO0	1			
COM0	2		20	NO3
NC0	3		21	COM3
NO1	4		22	NC3
COM1	5		23	NO4
NC1	6		24	COM4
NO2	7		25	NO5
COM2	8		26	COM5
NC2	9		27	NO6
NO7	10		28	COM6
COM7	11		29	GND
DI 0	12		30	DI 0
DI 1	13		31	DI 1
DI 2	14		32	DI 2
DI 3	15		33	DI 3
DI 4	16		34	DI 4
DI 5	17		35	DI 5
DI 6	18		36	DI 6
DI 7	19		37	DI 7

NO n   : normally open

COM n : common

NC n   : normally close

DI n   : Digital input channel n

.Figure 2-4 are the CN1 linked to 37 pin D-sub connector pin assignment.

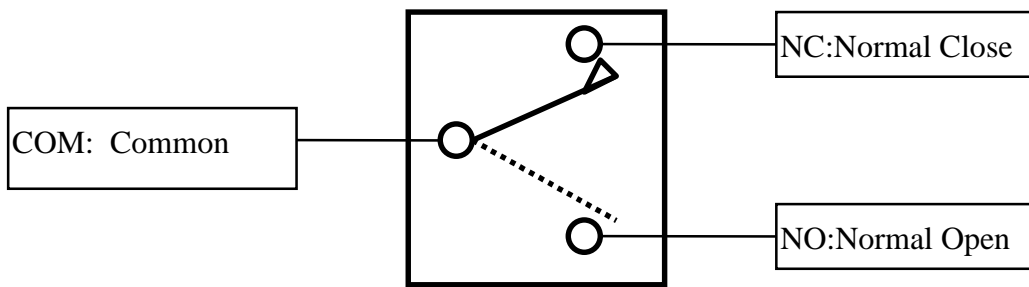| Pin	Signal		Pin	Signal
1	NO8			
2	COM8		20	NO11
3	NC8		21	COM11
4	NO9		22	NC11
5	COM9		23	NO12
6	NC9		24	COM12
7	NO10		25	NO13
8	COM10		26	COM13
9	NC10		27	NO14
10	NO15		28	COM14
11	COM15		29	GND
12	DI 8		30	DI 8
13	DI 9		31	DI 9
14	DI 10		32	DI 10
15	DI 11		33	DI 11
16	DI 12		34	DI 12
17	DI 13		35	DI 13
18	DI 14		36	DI 14
19	DI 15		37	DI 15

NO n   : normally open
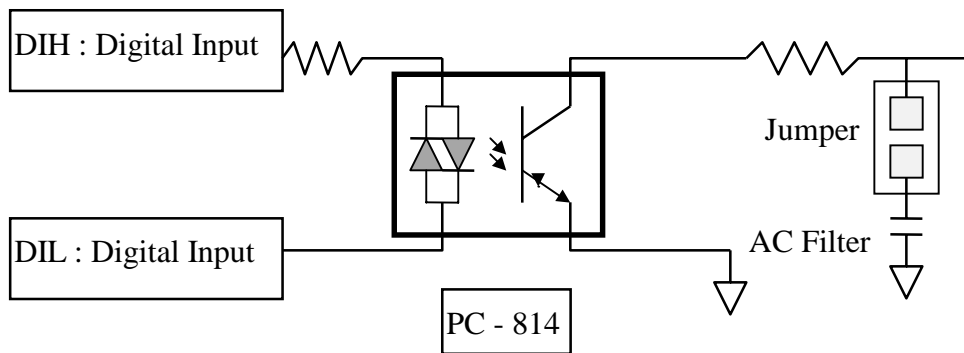
COM n : common

NC n   : normally close

DI n   : Digital input channel n

SPDT RELAY : Single Pole Double Throw

Figure 3-4

Isolated Input

Figure 3-5

6. Programming

This chapter provides the I/O map of P8R8DIO / P16R16DIO registers. Example programs and programming information are also included.

6.1.Address Map

The P16R16DIO boards occupy four consecutive addresses in the computer's I/O space . The base address is selected by DIP switch , The I/O map are shown in Table 3-1.

P16R16DIO Base Address at 300 Hex

Address	Write	Read
Base + 0	Relay Output (CH 0 ~ CH 7)	Read Back The Output Status
Base + 1	Relay Output (CH 8 ~ CH15)	Read Back The Output Status
Base + 2	No Function	Digital Input (CH0~CH7)
Base + 3	No Function	Digital Input (CH8~CH18)

Table 3-1 P16R16DIO I/O Map

6.2. Relay Output

You write data to relays as a single Byte. Each of the eight bits within a byte controls a single relay. A high bit(equal to1) energizes (closes the contacts of)a relay while a low bit (equal to 0) turns the relay off.

6.2.1.Output Register

Relay Output register bits are assigned as shown in Table 3-2

P16R16DIO Base Address at 300 Hex

Base+0	D7	D6	D5	D4	D3	D2	D1	D0
Output Channel	7	6	5	4	3	2	1	0
Base+1	D7	D6	D5	D4	D3	D2	D1	D0
Output Channel	15	14	13	12	11	10	9	8

Table 3-2 P16R16DIO Relay Addresses in the Relay Output Register

Base+0	D7	D6	D5	D4	D3	D2	D1	D0
Read back channel	7	6	5	4	3	2	1	0
Base+1	D7	D6	D5	D4	D3	D2	D1	D0
Read back channel	15	14	13	12	11	10	9	8

Table 3-3 Relay output read back register

For Example (Basic Language)
```
        REM : Set all relay output is ON , ( Output data FFh)
Base=&h300              ' Set Base Address at 300 (Hex)
Out Base , &hFF         ' Set Relay Output (Ch 0 ~ Ch 7) On
Out Base +1, &hFF       ' Set Relay Output (Ch 8 ~ Ch 15) On
RBL= Inp(Base)          ' Read Back Relay Output Ch 0 ~ Ch 7
RBH= Inp(Base+1)        ' Read Back Relay Output Ch 8 ~ Ch 15
REM : Set relay output CH 3 is ON  ,Output data 8h (00001000 BIN)
Out Base,&h8            ' Set relay output CN2 D3 ON
```

6.3. Relay Output

You write data to relays (CH0 - CH 7) as a single Byte. Each of the eight bits within a byte controls a single relay. A high bit(equal to1) energizes (closes the contacts of)a relay while a low bit (equal to 0) turns the relay off.

6.3.1. Output Register

Relay Output register bits are assigned as shown in Table 3-2

Base Address at 300 Hex

Base+0	D7	D6	D5	D4	D3	D2	D1	D0
Output Channel	7	6	5	4	3	2	1	0

Table 3-2 Relay Addresses in the Relay Output Register

For Example (Basic Language)

REM : Set all relay output is ON , (Output data FFh)

Base=&h300　　　　　' Set Base Address at 300 (Hex)
Out Base , &hFF　　　' Set Relay Output (Ch 0 ~ Ch 7) On

RB= Inp(Base)　　　　' Read Back Relay Output Ch 0 ~ Ch 7

REM : Set relay output CH 3 is ON ,Output data 8h (00001000 BIN)

Out Base,&h8　　　　　' Set relay output CH 3 ON

6.3.2. Using Relay Output

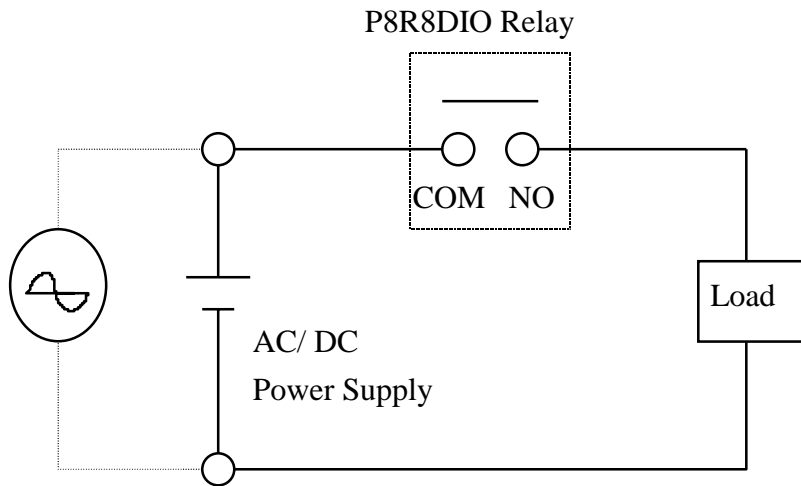Basic Circuitry : (Current Rating < 0.3 A) , Refer to Fig. 3-1

P8R8DIO Relay

COM   NO

AC/ DC
Power Supply

Load

Figure 3-1

Heavy Loading Application (> 0.3 A) , Refer to Fig.3-2

P8R8DIO
Relay

Power Relay
Contact

AC/ DC
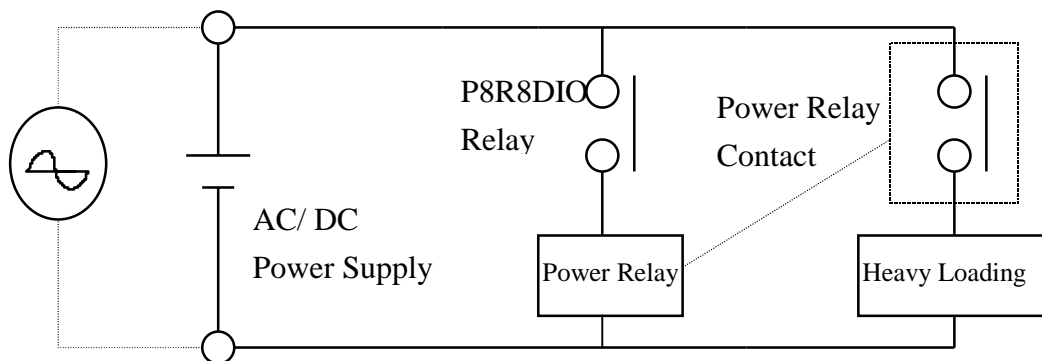Power Supply

Power Relay

Heavy Loading

Figure 3-2

6.4. Isolated Input

The digital input state 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 so that a high bit (equal to 1) represent a high state while a low bit (equal to 0) represent a low state . Register bits are assigned as shown in Table 3-3

6.4.1. Input Register

Base Address at 300 Hex

Base + 1	D7	D6	D5	D4	D3	D2	D1	D0
Input Channel	7	6	5	4	3	2	1	0

Table 3-3 input addresses in the isolated control input Register

For Example (Basic Language)

Base=&h300   ' Set Base Address at 300 (Hex)

RIH=Inp(Base+1) ' Read Isolated Input Ch 0 ~ Ch 7

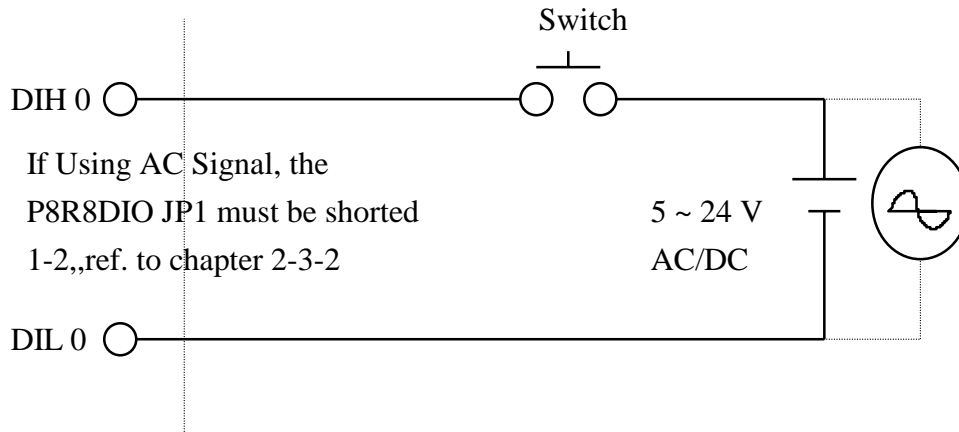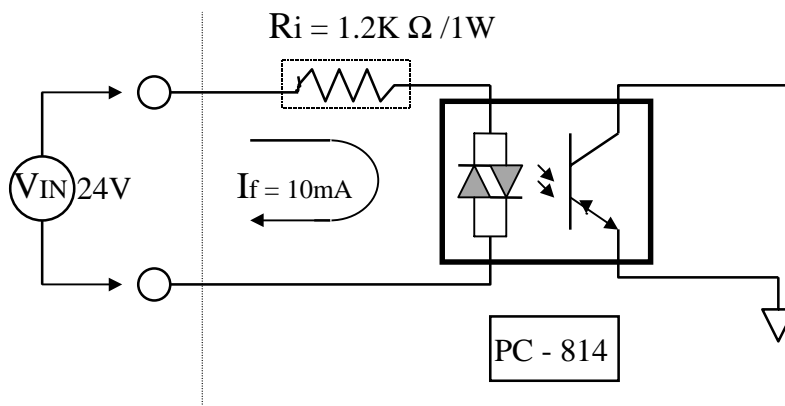# 6.4.2. Using Isolated Input

Basic Circuit

Figure 3-3

The normal input voltage range is 5 to 24V AC or DC . The normal input range can be changed by choosing suitable resistor to limit the current through the opto-isolator to about 10 mA($\mathbf{I}f$). The default resistor is 1.2 KΩ / 1 W .

$$\mathbf{R}i = \mathbf{V}in / \mathbf{I}f$$
$$\mathbf{P}w = \mathbf{V}in \times \mathbf{I}f$$

Figure 3-4

Calculation Example :
 If $\mathbf{V}in$ = 120 V Then $\mathbf{R}i$ = 120 (V) / 0.01 (A) = 12 K Ω
  $\mathbf{P}w$ = 120 (V) X 0.01 (A) = 1.2 W

The $\mathbf{R}i$ Must Replace By 12K Ω / 2 W (1.2W)

7.Troubleshooting

If your P8R8DIO board is not operating properly, use the information in this chapter to isolate the problem.

7.1. Problem Isolation

You can use an ohmmeter to check operation of the relay outputs and a low voltage power supply to check the isolated inputs. You can use DOS DEBUG program to exercise relay outputs or read the input ports, or you can use the INP and OUT commands of the BASIC language. For example, using DEBUG for a P8R8DIO at a base address set to &H300 is as follows:

```
O    300  FF              'Turn On all Relays.
O    300  0               'Turn Off all Relays.
O    300  08              'Turn On Bit D3 Relay.

I    300                  'Read back Relay status
I    301                  'Read Digital Input Data
```

MEMO: