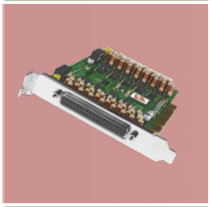
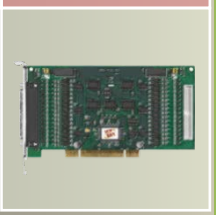




PEX/PISO-P32x32/x64 Series Board User Manual

Isolation Digital Input & Output Boards Version 4.9, Dec. 2018

SUPPORT

This manual relates to the following boards:

PCI Express	PEX-P32C32, PEX-P32A32, PEX-C64, PEX-P64,
Universal PCI	PISO-P32C32U, PISO-P32C32U-5V, PISO-P32A32U, PISO-P32A32U-5V, PISO-P32S32WU, PISO-P64U, PISO-P64U-24V, PISO-A64U, ISO-C64U
PCI bus	PISO-P32C32, PISO-P32A32, PISO-C64, PISO-P64, PISO-A64

WARRANTY

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

WARNING

ICP DAS assumes no liability for damages consequent to the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

COPYRIGHT

TRADEMARKS

Names are used for identification purposes only and may be registered trademarks of their respective companies.

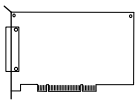
CONTACT US

If you have any question, feel to contact us by email at:
Email: service@icpdas.com or service.icpdas@gmail.com
We will respond to you within 2 working days.

TABLE OF CONTENTS

Packing List

The shipping package includes the following items:

Model	I/O Card 	Quick Start 	Software utility CD 	CA-4002 D-Sub Connector 	CA-4037B Cable 
PEX-P32C32	1	1	-	2	1
PEX-P32A32	1	1	1	2	1
PEX-P64	1	1	1	2	1
PEX-C64	1	1	1	2	1
PISO-P32C32U PISO-P32C32U-5V PISO-P32C32	1	1	-	2	1
PISO-P32A32U PISO-P32A32U-5V PISO-P32A32	1	1	1	2	1
PISO-P32S32WU	1	1	1	2	1
PISO-C64U PISO-C64	1	1	1	2	1
PISO-A64U PISO-A64	1	1	1	2	1
PISO-P64U PISO-P64U-24V PISO-P64	1	1	1	2	1

Note:

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you need to ship or store the product in the future.

1. Introduction

➢ **Comparison Table**

Model Name	Bus	DI		DO Channels		
		Channels	Input Voltage	Low Drive	High Drive	Type
PISO-P32S32WU	Universal PCI	32	Logic 1: 9 ~ 24 V	24-ch	8-ch	Current Sink, NPN
PEX-P32C32	PCI Express	32	Logic 1: 9 ~ 24 V	32-ch	-	Current Sink, NPN
PISO-P32C32U-5V	Universal PCI	32	Logic 1: 5 ~ 12 V	32-ch	-	Current Sink, NPN
PISO-P32C32U	Universal PCI	32	Logic 1: 9 ~ 24 V	32-ch	-	Current Sink, NPN
PEX-P32A32	PCI Express	32	Logic 1: 9 ~ 24 V	32-ch	-	Current Source, PNP
PISO-P32A32U	Universal PCI	32	Logic 1: 9 ~ 24 V	32-ch	-	Current Source, PNP
PISO-P32A32U-5V	5 V PCI	32	Logic 1: 5 ~ 12 V	32-ch	-	Current Source, PNP
PEX-P64	PCI Express	64	Logic 1: 5 ~ 24 V	-	-	-
PISO-P64U	Universal PCI	64	Logic 1: 5 ~ 24 V	-	-	-
PISO-P64U-24V	Universal PCI	64	Logic 1: 20 ~ 28 V	-	-	-
PEX-C64	PCI Express	-	-	64-ch	-	Current Sink, NPN
PISO-C64U	Universal PCI	-	-	64-ch	-	Current Sink, NPN
PISO-A64	5 V PCI	-	-	64-ch	-	Current Source, PNP
PISO-A64U	Universal PCI	-	-	64-ch	-	Current Source, PNP

➢ Phased-out models:

Model Name	Bus	DI		DO Channels		
		Channels	Input Voltage	Low Drive	High Drive	Type
PISO-P32C32	5 V PCI	32	Logic 1: 9 ~ 24 V	32-ch	-	Current Sink, NPN
PISO-P32A32	5 V PCI	32	Logic 1: 9 ~ 24 V	32-ch	-	Current Source, PNP
PISO-P64	5 V PCI	64	Logic 1: 5 ~ 24 V	-	-	-
PISO-C64	5 V PCI	-	-	64-ch	-	Current Sink, NPN

➢ General Description

The PISO-P32C32/P32A32/P64/C64/A64 series board supports +5 V PCI bus. The PISO-P32C32U/P32A32U/P32S32WU/P64U/C64U/A64U universal PCI board supports +3.3 V and +5 V PCI bus. The PEX-P32C32/P32A32/P64/C64 supports PCI Express bus.

These boards provide 32 or 64 optically-isolated Digital Input and/or Output channel, arranged into four isolated banks. Each input channel use a photo-coupler input which allows either internal isolated power supply or external power selected by jumper.

Each Digital Output offers a PNP transistor (P32A32/A64 Series) or Darlington transistor (P32C32/P32S32WU/C64 Series) and integral suppression diode for inductive load. The power supply of the input port may use the external power or the power from the PC side using DC/DC converter. The power supply of the output port should use the external power. This interface board is easily installed in any PC. The board interface to field logic signals, eliminating ground-loop problems and isolating the host computer from damaging voltages. The P32A32/P32C32/P32S32WU/P64/A64/C64 series boards have one 37-pin D-Sub connector and one 40-pin male header. The 40-pin to DB-37 flat-cable is used to fix with the case.

These boards support various OS versions, such as Linux, DOS, 32/64-bit Windows 10/8/7/XP. DLL and Active X control together with various language sample programs based on Turbo C++, Borland C++, Microsoft C++, Visual C++, Borland Delphi, Borland C++ Builder, Visual Basic, C#.NET, Visual Basic.NET and LabVIEW are provided in order to help users quickly and easily develop their own applications.

1.1 Features

➢ **Interface:**

- Supports the +5 V PCI bus for PISO-P32A32/P32C32/P64/C64/A64.
- Supports the +3.3 V/+5 V PCI bus for PISO-P32A32U/P32C32U/P32S32WU/P64U/C64U/A64U.
- Supports PCI Express x 1 for PEX-P32C32/P32A32/P64/C64.
- Card ID function (SMD Switch) for PEX-P32C32/P32A32/P64/C64 and PISO-P32C32U/P32A32U/P32S32WU/P64U/C64U/A64U.

➢ **Digital Input:**

- 32 optically-isolated Digital Input channels for PISO-P32A32/P32C32/P32S32WU and PEX-P32C32/P32A32.
- 64 optically-isolated Digital Input channels for PEX-P64 and PISO-P64.

➢ **Digital Output:**

- 32 optically-isolated open collector output channels, as follow:
  - Current Sink (NPN) for PEX-P32C32 and PISO-P32C32
  - Current Source (PNP) for PEX-P32A32 and PISO-P32A32
  - Current Sink (NPN), 500 mA (8-ch) high driving and 100 mA (24-ch) driving for PISO-P32S32WU
- 64 optically-isolated DO, as follow:
  - Current Sink (NPN) for PEX-C64 and PISO-C64/C64U
  - Current Source (PNP) for PISO-A64/A64U
- Output status readback for PEX-P32C32/P32A32/C64 and PISO-P32C32U/P32A32U/C64U/A64U.

➢ **Isolated Protection:**

- Built-in DC/DC converter providing 3000 V_{DC} isolation for PEX-P32C32/P32A32/P64 and PISO-P32C32U/P32A32U/P64U.
- 3750 V_{rms} photo-isolated protection.

1.2 Specifications

1.2.1 PEX/PISO-P32C32 Series

Model Name	PEX-P32C32	PISO-P32C32 (Phased-out)	PISO-P32C32U	PISO-P32C32U-5V
Digital Input				
Isolation Voltage	3750 Vrms (Using external power)			
Channels	32			
Compatibility	Sink or Source, Photo coupler isolated channel with common power or ground			
Input Voltage	Logic 0: 0 ~ 1 V Logic 1: 9 ~ 24 V (Logic 1: Min. 7 V; Max. 30 V)			Logic 0: 0 ~ 1 V Logic 1: 5 ~ 12 V (Logic 1: Min. 3.5 V; Max. 16 V)
Input Impedance	3 KΩ, 0.5 W			
Response Speed	4 kHz (Typical)			
Digital Output				
Isolation Voltage	3750 Vrms			
Channels	32			
Compatibility	Sink, Open Collector			
Output Capability	100 mA/+30 V for one channel @ 100% duty			
Response Speed	4 kHz (Typical)			
General				
Bus Type	PCI Express x1	5 V PCI, 32-bit, 33 MHz	3.3 V/5 V Universal PCI, 32-bit 33 MHz	
Data Bus	8-bit			
Card ID	Yes (4-bit)	No	Yes (4-bit) for version 1.1 or above	
I/O Connector	Female DB37 x 1, 40-pin box header x 1			
Dimensions (L x W x D)	180 mm x 105 mm x 22 mm			
Power Consumption	550 mA @ +3.3 V 350 mA @ +12 V	600 mA @ +5 V		
Operating Temperature	0 ~ 60 °C			
Storage Temperature	-20 ~ 70 °C			
Humidity	5 ~ 85% RH, non-condensing			

1.2.2 PEX/PISO-P32A32 Series

Model Name	PEX-P32A32	PISO-P32A32U	PISO-P32A32U-5V	PISO-P32A32 (Phased-out)
Digital Input				
Isolation Voltage	3750 Vrms (Using external power)			
Channels	32			
Compatibility	Photo coupler isolated			
Input Voltage	Logic 0: 0 ~ 1 V Logic 1: 9 ~ 24 V (Logic 1: Min. 7 V; Max. 30 V)		Logic 0: 0 ~ 1 V Logic 1: 5 ~ 12 V (Logic 1: Min. 3.5 V; Max. 16 V)	Logic 0: 0 ~ 1 V Logic 1: 9 ~ 24 V (Logic 1: Min. 7 V; Max. 30 V)
D/I Power	External		Internal/External	External
Input Impedance	3 KΩ, 0.5 W			
Response Speed	4 kHz (Typical)			
Digital Output				
Isolation Voltage	3750 Vrms			
Channels	32			
Compatibility	Source, Open Collector			
Output Capability	100 mA/+30 V for one channel @ 100% duty			
Response Speed	4 kHz (Typical)			
General				
Bus Type	PCI Express x1	3.3 V/5 V Universal PCI, 32-bit 33 MHz	3.3 V/5 V Universal PCI, 32-bit 33 MHz	5 V PCI, 32-bit, 33 MHz
Data Bus	8-bit			
Card ID	Yes(4-bit)			No
I/O Connector	Female DB37 x 1, 40-pin box header x 1			
Dimensions (L x W x D)	180 mm x 105 mm x 22 mm			
Power Consumption	550 mA @ +3.3 V 350 mA @ +12 V	600 mA @ +5 V		
Operating Temperature	0 ~ 60 °C			
Storage Temperature	-20 ~ 70 °C			
Humidity	5 ~ 85% RH, non-condensing			

1.2.3 PISO-P32S32WU Series

Model Name	PISO-P32S32WU
Digital Input	
Isolation Voltage	3750 Vrms (Using external power)
Channels	32
Compatibility	Photo coupler isolated
Input Voltage	Logic 0: 0 ~ 1 V Logic 1: 9 ~ 24 V
Input Impedance	3 KΩ, 0.5 W
Response Speed	4 kHz (Typical)
Digital Output	
Isolation Voltage	3750 Vrms
Channels	32
Compatibility	Sink, Open Collector
Output Capability	500 mA for one high driving channel @ 100% duty 500 mA for all high driving channels @ 100% duty (The GND pins all must be connected with GND of External Power)
	100 mA for one low driving channel @ 100% duty 100 mA for all low driving channels @ 100% duty (The GND pins all must be connected with GND of External Power)
Response Speed	4 kHz (Typical)
General	
Bus Type	3.3 V/5 V Universal PCI, 32-bit 33 MHz
Data Bus	8-bit
Card ID	Yes(4-bit) for version 1.5 or above
I/O Connector	Female DB37 x 1, 40-pin box header x 1
Dimensions (L x W x D)	180 mm x 105 mm x 22 mm
Power Consumption	600 mA @ +5 V
Operating Temperature	0 ~ 60 °C
Storage Temperature	-20 ~ 70 °C
Humidity	5 ~ 85% RH, non-condensing

1.2.4 PEX/PISO-C64 Series

Model Name	PEX-C64	PISO-C64U	PISO-C64 (Phased-out)
Digital Output			
Isolation Voltage	3750 Vrms		
Channels	64		
Compatibility	Sink, Open Collector		
Output Capability	100 mA/+30 V for one channel @ 60% duty		
Response Speed	4 kHz (Typical)		
General			
Bus Type	PCI Express x1	3.3 V/5 V Universal PCI, 32-bit 33 MHz	5 V PCI, 32-bit 33 MHz
Data Bus	8-bit		
Card ID	Yes(4-bit)		No
I/O Connector	Female DB37 x 1, 40-pin box header x 1		
Dimensions (L x W x D)	180 mm x 105 mm x 22 mm		
Power Consumption	400 mA @ +3.3 V 200 mA @ +12 V	800 mA @ +5 V	
Operating Temperature	0 ~ 60 °C		
Storage Temperature	-20 ~ 70 °C		
Humidity	5 ~ 85% RH, non-condensing		

1.2.5 PISO-A64 Series

Model Name	PISO-A64	PISO-A64U
Digital Output		
Isolation Voltage	3750 Vrms	
Channels	64	
Compatibility	Source, Open Collector	
Output Capability	100 mA/+30 V for one channel @ 60% duty	
Response Speed	4 kHz (Typical)	
General		
Bus Type	5 V PCI, 32-bit 33 MHz	3.3 V/5 V Universal PCI, 32-bit 33 MHz
Data Bus	8-bit	
Card ID	No	Yes(4-bit)
I/O Connector	Female DB37 x 1, 40-pin box header x 1	
Dimensions (L x W x D)	180 mm x 105 mm x 22 mm	
Power Consumption	800 mA @ +5 V	
Operating Temperature	0 ~ 60 °C	
Storage Temperature	-20 ~ 70 °C	
Humidity	5 ~ 85% RH, non-condensing	

1.2.6 PEX/PISO-P64 Series

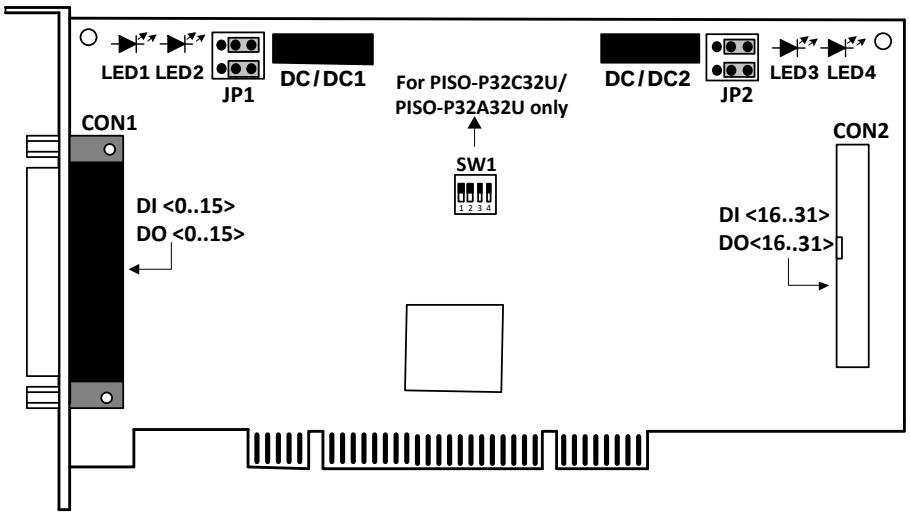
Model Name	PEX-P64	PISO-P64U	PISO-P64U-24V	PISO-P64 (Phased-out)
Digital Input				
Isolation Voltage	3750 Vrms (Using external power)			
Channels	64			
Compatibility	Photo coupler isolated			
Input Voltage	Logic 0: 0~1 V Logic 1: 5~15 V	Logic 0: 0~1 V Logic 1: 5~15 V (24 V max.)	Logic 0: 0~1 V Logic 1: 20~28 V (30 max.)	Logic 0: 0~1 V Logic 1: 5~24 V
Input Impedance	1.2 KΩ, 1 W			
Response Speed	4 kHz (Typical)			
General				
Bus Type	PCI Express x1	3.3 V/5 V Universal PCI, 32-bit 33 MHz		5 V PCI, 32-bit, 33 MHz
Data Bus	8-bit			
Card ID	Yes(4-bit)			No
I/O Connector	Female DB37 x 1, 40-pin box header x 1			
Dimensions (L x W x D)	180 mm x 105 mm x 22 mm			
Power Consumption	600 mA @ +3.3 V 400 mA @ +12 V	400 mA @ +5 V		
Operating Temperature	0 ~ 60 °C			
Storage Temperature	-20 ~ 70 °C			
Humidity	5 ~ 85% RH, non-condensing			

2. Hardware Configuration

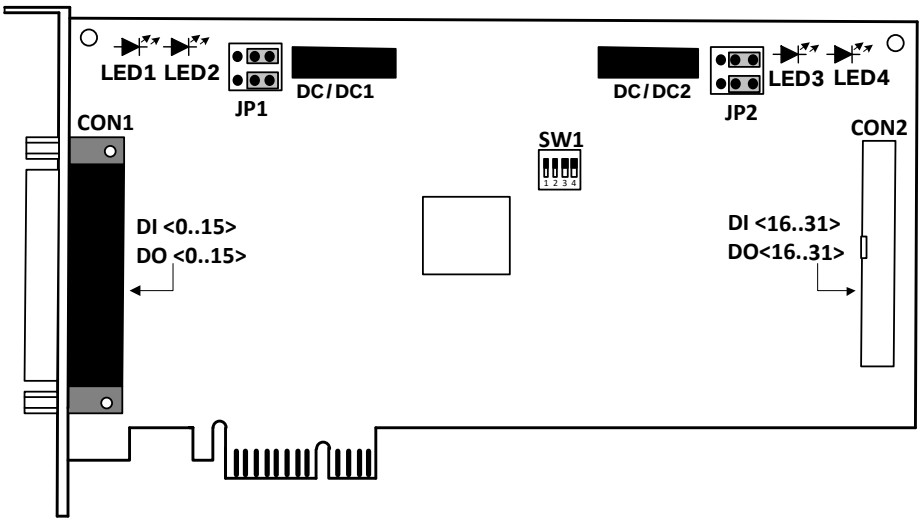
2.1 Appearance

2.1.1 PEX/PISO-P32C32/P32A32 Series

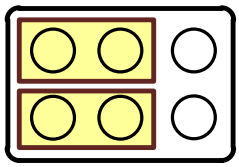
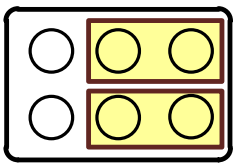
- The following is an overview of the board layout for each of the PISO-P32C32/P32A32 and PISO-P32C32U(-5V)/P32A32U(-5V).



- The following is an overview of the board layout for each of the PEX-P32C32/P32A32.



➢ JP1 and JP2 Jumpers:

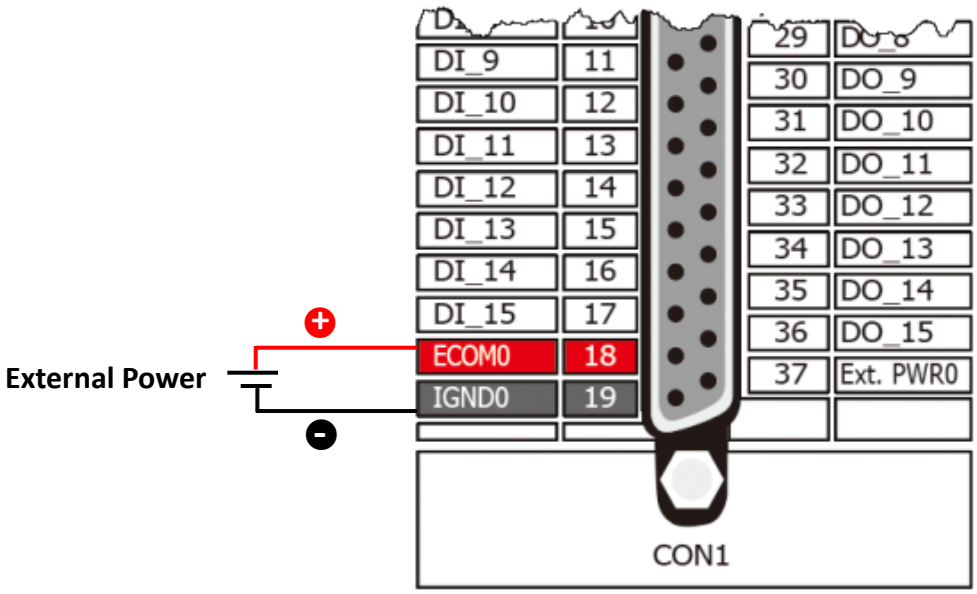
Jumper	Internal/External DI Power Selection	
JP1 DI<0…15> (3000 V isolation)	**INT** 	 **EXT**
JP2 DI<16…31> (3000 V isolation)	Internal Power	**External Power (Default)**

➢ DI and DO LEDs Indicator:

Power Indicator	I/O Port		
	PISO-P32C32/P32A32 Rev 4.0 and prior	PISO-P32C32U/P32A32U Rev 4.1 and later	PEX-P32C32/P32A32
LED1	DO<0…15>	**DI<0…15>**	**DI<0… 15>**
LED2	**DI<0…15>**	DO<0…15>	DO<0…15>
LED3	DO<16…31>	**DI<16…3 1>**	**DI<16…31>**
LED4	**DI<16…31>**	DO<16…31>	DO<16…31>

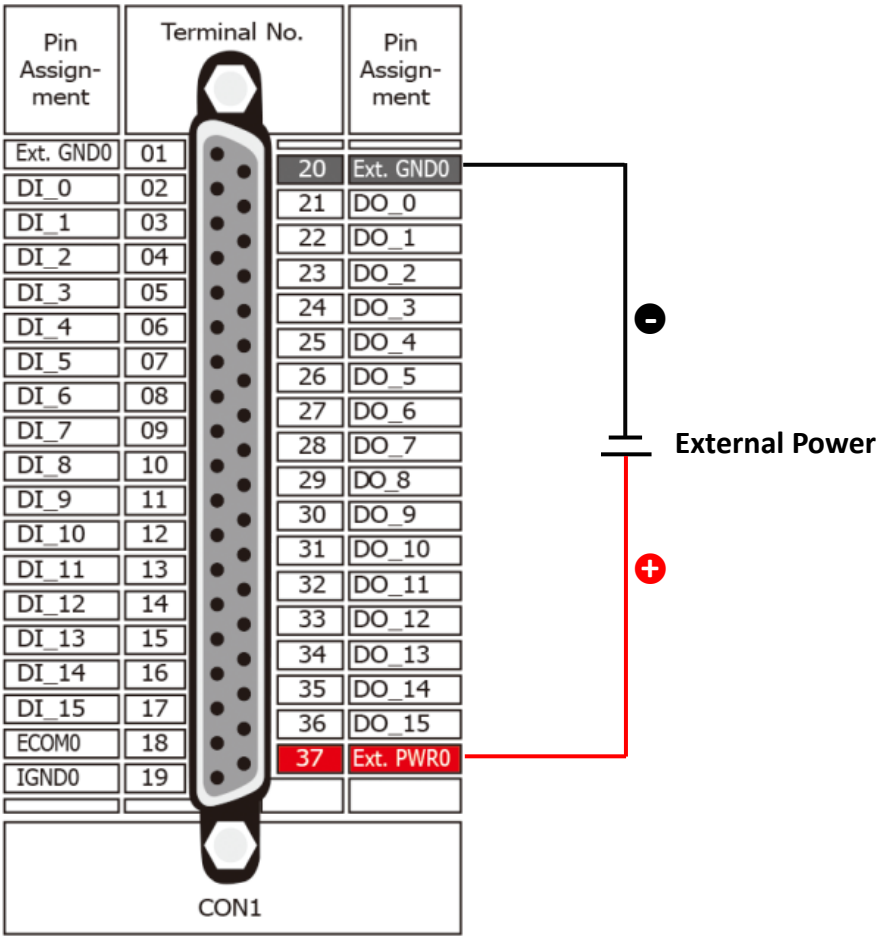
The power indicators LED for DI ports are turned on when:

- JP1/JP2 jumpers are configured as **"Internal DI Power" ("INT")**.
- JP2/JP2 jumpers are configured as **"External DI Power" ("EXT")**, and supplies external power to the ECOM and IGND pins. (For example, the power indicator LED1 is turned on.)



The power indicators LED for DO ports are turned on when:

- Supplies external power to the EXT.GND and EXT.PWR pins. (For example, the power indicator LED2 is turned on.) Note: This does not related to the JP1/JP2 settings.



➢ Isolation Bank:

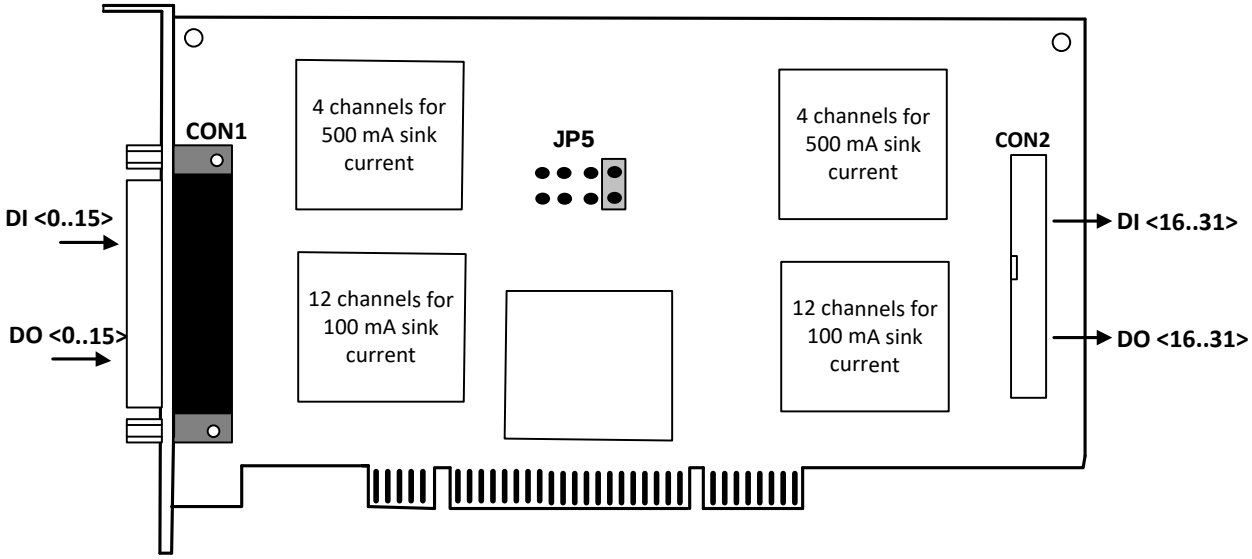
Isolation Bank	I/O Port	Power	Ground
Isolation Bank 1	DI<0…15>	(CON1, Pin18)	(CON1, Pin19)
Isolation Bank 2	DO<0…15>	(CON1, Pin37)	(CON1, Pin1 & 20)
Isolation Bank 3	DI<16…31>	(CON2, Pin18)	(CON2, Pin19)
Isolation Bank 4	DO<16…31>	(CON2, Pin37)	(CON2, Pin1 & 20)

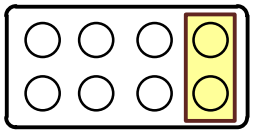
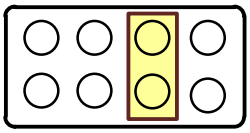
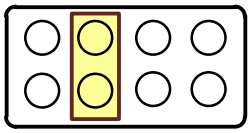
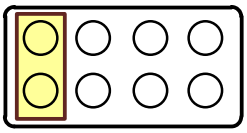
Notes:

1. All four banks are fully isolated from each other when using four isolated external power supplies.
2. For detailed information about the wiring note, refer to Section 2.3 “Isolated DI Architecture”.
3. For detailed information about the SW1 switch (Card ID function), refer to Section 2.2 “Card ID Switch (SW1)”.

2.1.2 PISO-P32S32WU

➢ The following is an overview of the board layout for each of the PISO-P32S32WU.



Card ID Jumper Setting (JP5)			
			
Device 0 (Default)	Device 1	Device 2	Device 3

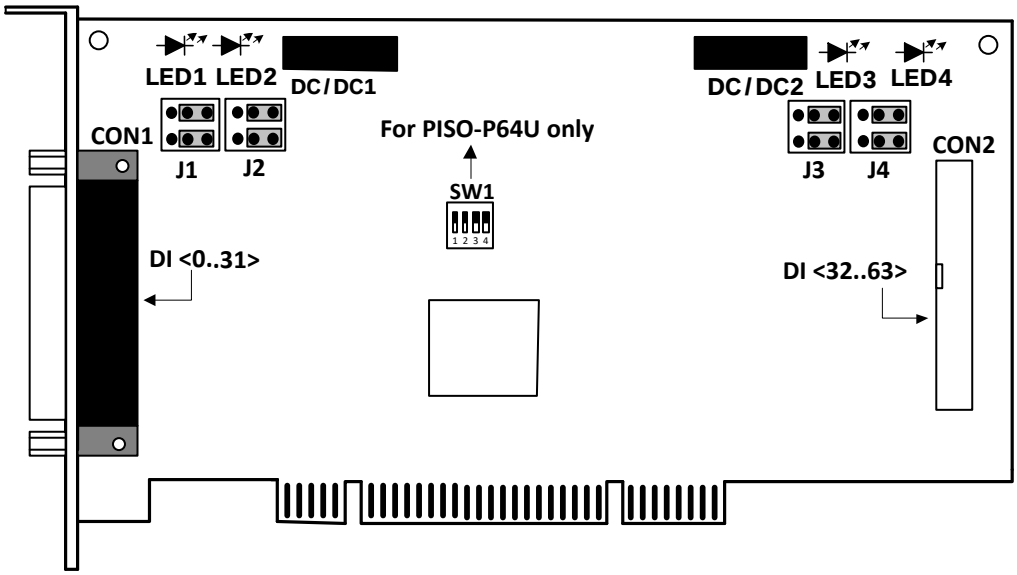
Isolation Bank	I/O Port	Power	Ground
Isolation Bank 1	DI <0…15>	(CON1,Pin37)	
Isolation Bank 2	DO <0…3> High drive for 500 mA sink current, NPN		(CON1,Pin18/Pin19)
	DO <4…15> Low drive for 100 mA sink current, NPN		(CON1,Pin1/Pin20)
Isolation Bank 3	DI<16…31>	(CON2,Pin37)	
Isolation Bank 4	DO<16…19> High drive for 500 mA sink current, NPN		(CON2,Pin18/Pin19)
	DO<20…31> Low drive for 100 mA sink current, NPN		(CON2,Pin1/Pin20)

Note:

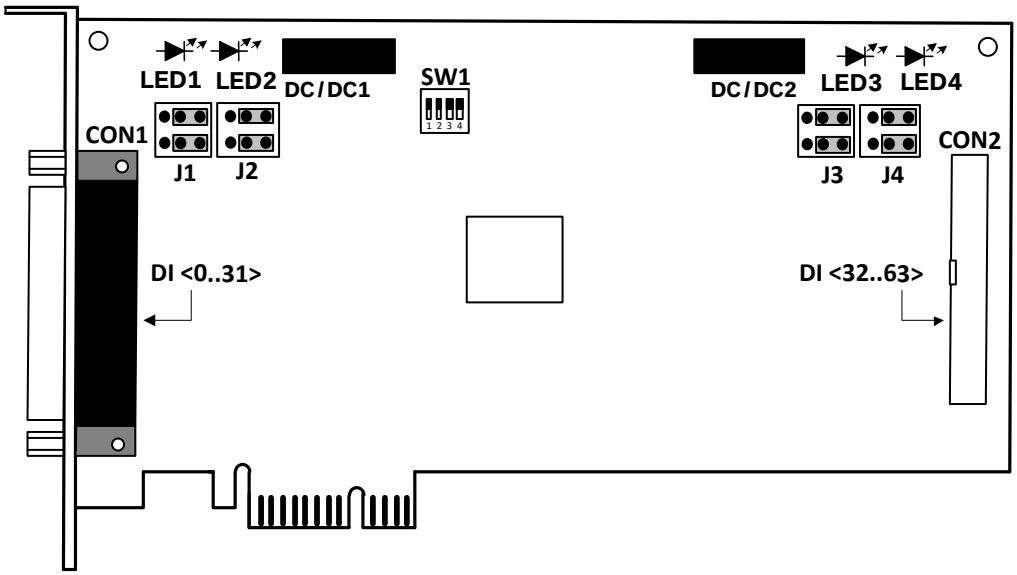
To prevent the board damaged forever by overload, the GND pins (CON1: pin 1/18/19/20, CON2: pin 1/18/19/20) all must be connected with GND of External Power.

2.1.3 PEX/PISO-P64 Series

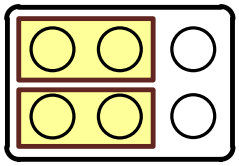
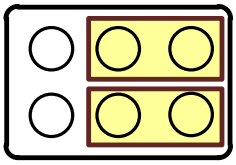
➢ The following is an overview of the board layout for each of the PISO-P64(U).



➢ The following is an overview of the board layout for each of the PEX-P64.



➢ J1/J2/J3/J4 Jumpers:

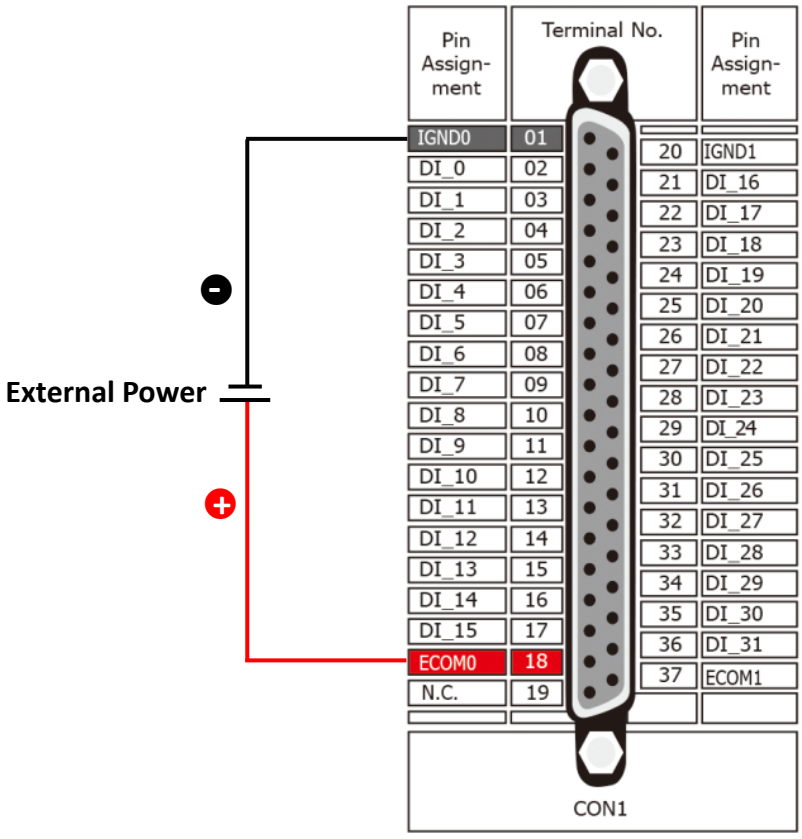
Internal/External DI Power Selection (J1/J2/J3/J4)	
INT 	 EXT
Internal Power	**External Power (Default)**

➢ DI LEDs Indicator and Isolation Bank:

Power Indicator	DI Port	Jumper	Isolation Bank	Power	Ground
LED1	DI<0…15>	**J1**	**Isolation Bank 1**	(CON1, Pin18)	(CON1, Pin1)
LED2	DI<16…31>	**J2**	**Isolation Bank 2**	(CON1, Pin37)	(CON1, Pin20)
LED3	DI<32…47>	**J3**	**Isolation Bank 3**	(CON2, Pin18)	(CON2, Pin1)
LED4	DI<48…63>	**J4**	**Isolation Bank 4**	(CON2, Pin37)	(CON2, Pin20)

The power indicators LED for DI ports are turned on when:

- J1/J2/J3/J4 jumpers are configured as **"Internal DI Power" ("INT")**.
- J1/J2/J3/J4 jumpers are configured as **"External DI Power" ("EXT")**, and supplies external power to the ECOM and IGND pins. (For example, the power indicator LED1 is turned on.)

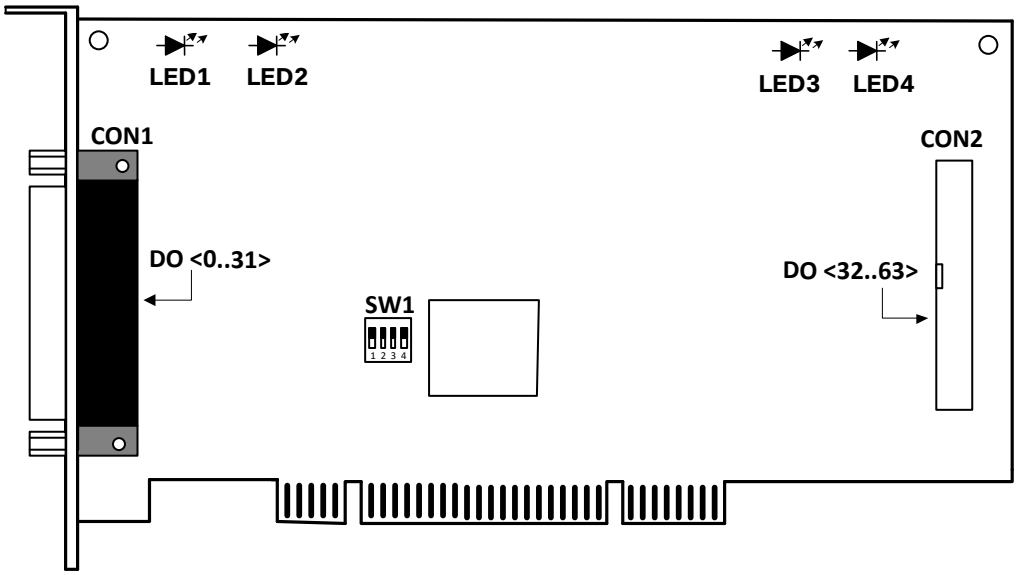


Notes:

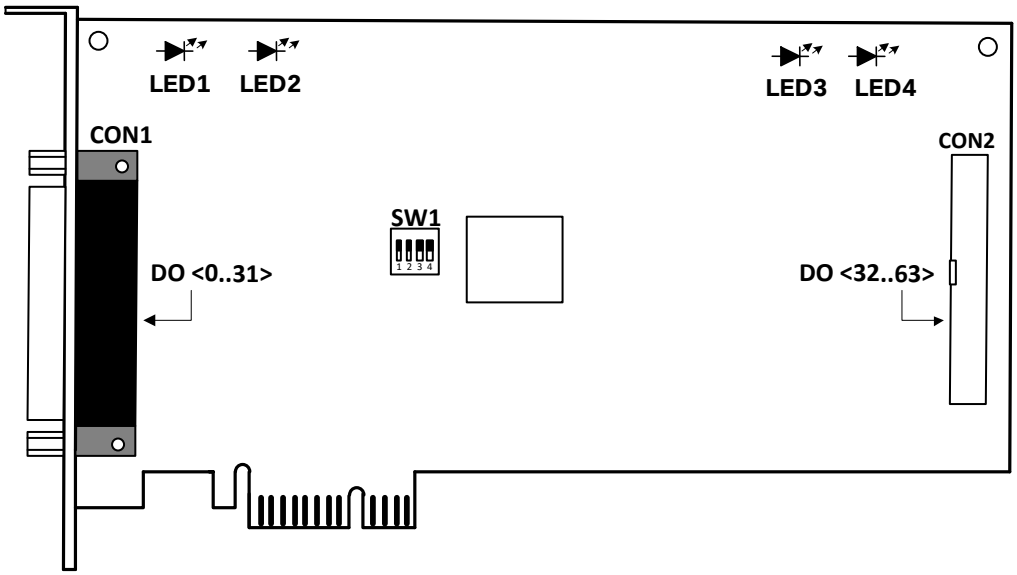
1. The DC/DC1 provides the internal power supply for banks 1 and 2.
2. The DC/DC2 provides the internal power supply for banks 3 and 4.
3. All four banks are fully isolated from each other when using four isolated external power supplies.
4. For detailed information about the **wiring note**, refer to Section 2.3 “Isolated DI Architecture”.
5. For detailed information about the **SW1 switch (Card ID function)**, refer to Section 2.2 “Card ID Switch (SW1)”.

2.1.4 PEX/PISO-C64 and PISO-A64 Series

➢ The following is an overview of the board layout for each of the PISO-C64(U)/A64(U).



➢ The following is an overview of the board layout for each of the PEX-C64.

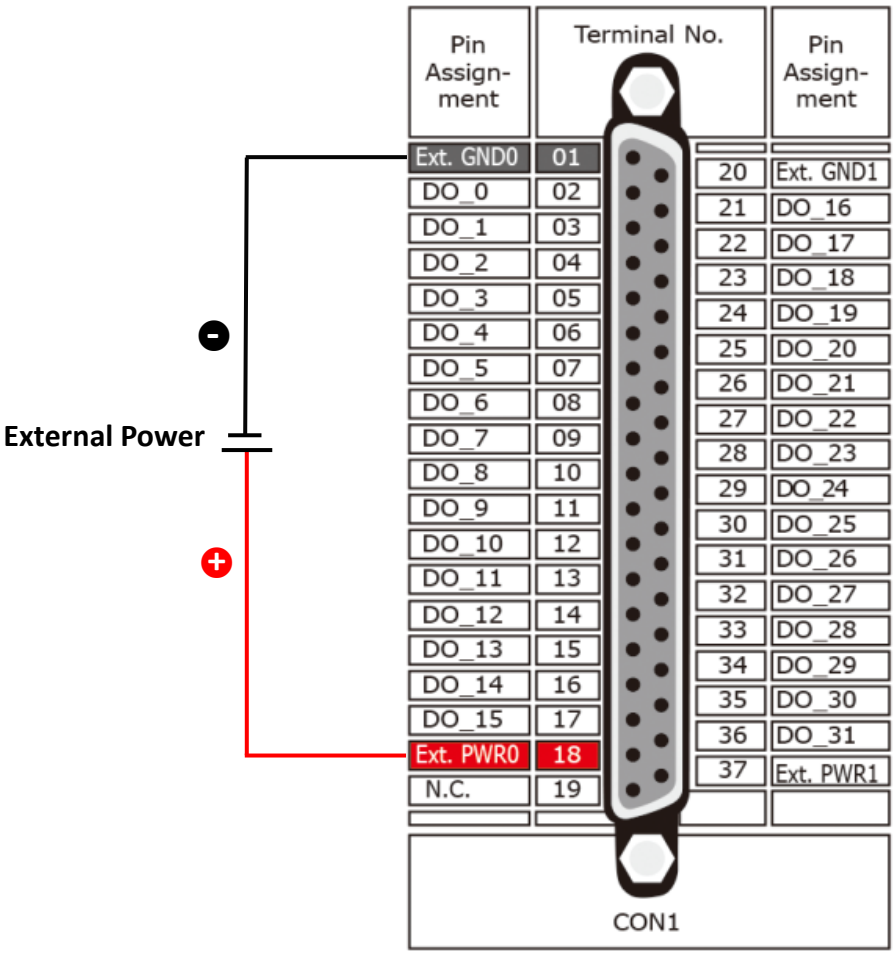


➢ DO LEDs Indicator and Isolation Bank:

Power Indicator	DO Port	Isolation Bank	Power	Ground
LED1	DO<0…15>	**Isolation Bank 1**	(CON1, Pin18)	(CON1, Pin1)
LED2	DO<16…31>	**Isolation Bank 2**	(CON1, Pin37)	(CON1, Pin20)
LED3	DO<32…47>	**Isolation Bank 3**	(CON2, Pin18)	(CON2, Pin1)
LED4	DO<48…63>	**Isolation Bank 4**	(CON2, Pin37)	(CON2, Pin20)

The power indicators LED for DO ports are turned on when:

- Supplies external power to the EXT.GND and EXT.PWR pins. (For example, the power indicator LED1 is turned on.)

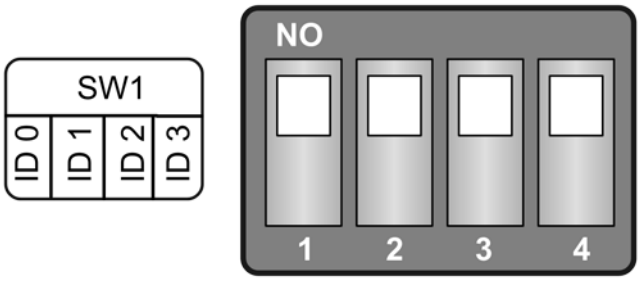


Notes:

1. All four banks are fully isolated from each other when using four isolated external power supplies.
2. For detailed information about the SW1 switch (Card ID function), refer to Section 2.2 "Card ID Swtich (SW1)".

2.2 Card ID Switch (SW1)

The PEX-P32C32/P32A32/P64/C64 and PISO-P32C32U/P32A32U/P64U/C64U/A64U includes an onboard Card ID switch (SW1) that enables the board to be recognized via software if two or more boards are installed in the same computer. The default Card ID is 0x0. For more details regarding the SW1 Card ID settings, refer to the table below.



(Default Settings)

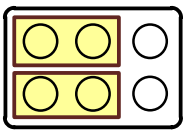
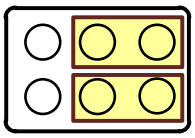
(*) Default Settings; OFF → 1; ON → 0

Card ID (Hex)	1 ID0	2 ID1	3 ID2	4 ID3
(*) 0x0	ON	ON	ON	ON
0x1	**OFF**	ON	ON	ON
0x2	ON	**OFF**	ON	ON
0x3	**OFF**	**OFF**	ON	ON
0x4	ON	ON	**OFF**	ON
0x5	**OFF**	ON	**OFF**	ON
0x6	ON	**OFF**	**OFF**	ON
0x7	**OFF**	**OFF**	**OFF**	ON
0x8	ON	ON	ON	**OFF**
0x9	**OFF**	ON	ON	**OFF**
0xA	ON	**OFF**	ON	**OFF**
0xB	**OFF**	**OFF**	ON	**OFF**
0xC	ON	ON	**OFF**	**OFF**
0xD	**OFF**	ON	**OFF**	**OFF**
0xE	ON	**OFF**	**OFF**	**OFF**
0xF	**OFF**	**OFF**	**OFF**	**OFF**

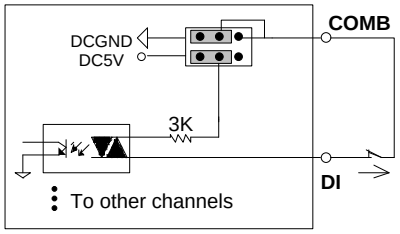
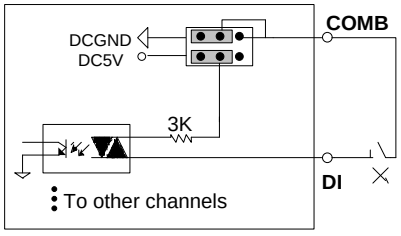
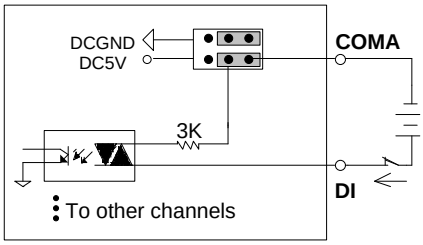
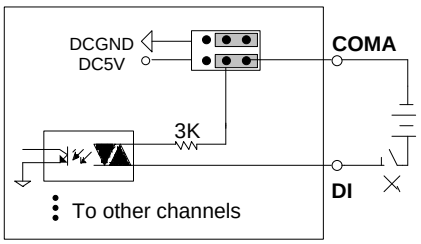
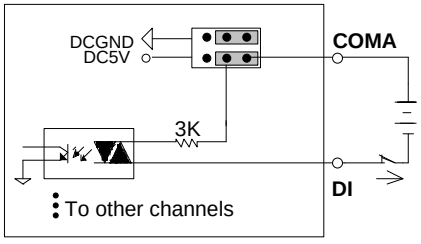
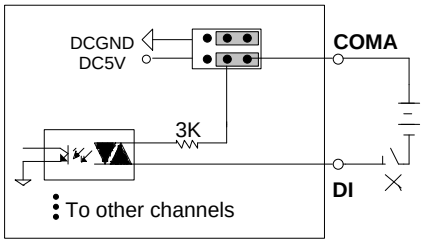
2.3 Isolated DI Architecture

The DI architecture of the PEX-P32C32/P32A32/P64 and PISO-P32C32/P32A32/P32S32WU/P64 series boards is the same. Select either internal or external power to supply photo-couple Digital Input power. **Note that the PISO-P32S32WU only supports external power mode.** Here are diagrams for the various configurations:

➢ **Jumper Settings:**

Internal/External Power Selection (JP1/JP2)	
INT 	 EXT
Internal Power	**External Power (Default)**

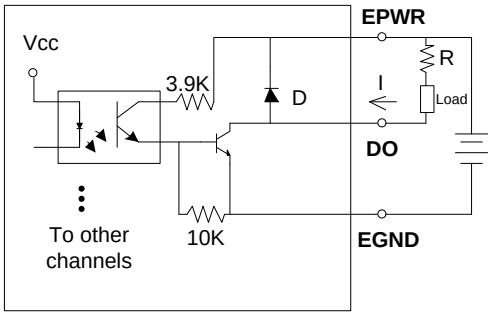
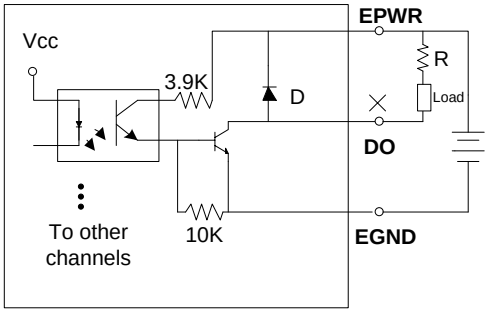
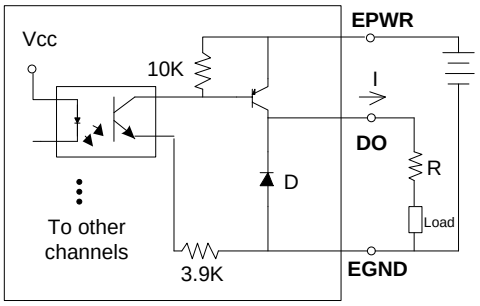
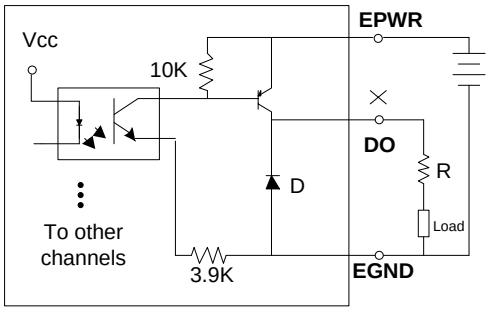
➢ **Input Wiring for the PEX-P32C32/P32A32/P64 and PISO-P32C32/P32A32/P32S32WU/P64 Series:**

Input Type	ON State as 0	OFF State as 1
Dry Contact (No Support: PISO-P32S32WU)	Close to GND 	Open 
Wet Contact (Sink)	+(5)/+10 ~ +30 VDC 	+4 VDC Max. 
Wet Contact (Source)	+(5)/+10 ~ +30 VDC 	+4 VDC Max. 

2.4 Isolated DO Architecture

Here are block diagrams related to the DO.

➢ **Output Wiring for PEX-P32C32/P32A32/C64 and PISO-P32C32/P32A32/P32S32WU/C64/A64 Series:**

DO Group	ON State Readback as 1	OFF State Readback as 0
DO **(Sink, NPN)**	+(5)/+10 ~ +30 VDC	Open
		
DO **(Source, PNP)**	+(5)/+10 ~ +30 VDC	Open
		

Notes:

1. For PEX-P32C32/P32A32/C64 and PISO-P32C32/P32A32/C64/A64 boards, the maximums current is 100 mA on each DO channel.
   For PISO-P32S32WU board, the maximums current is total 500 mA on DO channel 1 to 4 and channel 17 to 20, while the maximums current is 100 mA on each other channel.
2. Installing external current-limit resistors are required if the current values are larger than the limitation of the board specification. Please refer to the "V = I * R" to calculate an appropriate resistor value.
3. The board has built-in freewheeling diodes for protecting the DO chips.
   They are helpful when using switching inductive loads, such as relay drivers, hammer drivers, lamp drivers, display drivers, line drivers and logic buffers.

2.5 Pin Assignments

2.5.1 PEX/PISO-P32C32/P32A32 Series

Pin Assign-ment (CON2)	Pin Assign-ment (CON1)	Terminal No.	Pin Assign-ment (CON1)	Pin Assign-ment (CON2)
Ext.GND1	Ext.GND0	01	20	Ext.GND0	Ext.GND1
DI_16	DI_0	02	21	DO_0	DO_16
DI_17	DI_1	03	22	DO_1	DO_17
DI_18	DI_2	04	23	DO_2	DO_18
DI_19	DI_3	05	24	DO_3	DO_19
DI_20	DI_4	06	25	DO_4	DO_20
DI_21	DI_5	07	26	DO_5	DO_21
DI_22	DI_6	08	27	DO_6	DO_22
DI_23	DI_7	09	28	DO_7	DO_23
DI_24	DI_8	10	29	DO_8	DO_24
DI_25	DI_9	11	30	DO_9	DO_25
DI_26	DI_10	12	31	DO_10	DO_26
DI_27	DI_11	13	32	DO_11	DO_27
DI_28	DI_12	14	33	DO_12	DO_28
DI_29	DI_13	15	34	DO_13	DO_29
DI_30	DI_14	16	35	DO_14	DO_30
DI_31	DI_15	17	36	DO_15	DO_31
COM2A	COM1A	18	37	Ext.PWR0	Ext.PWR1
COM2B	COM1B	19			

CON1/CON2 (Female DB-37)

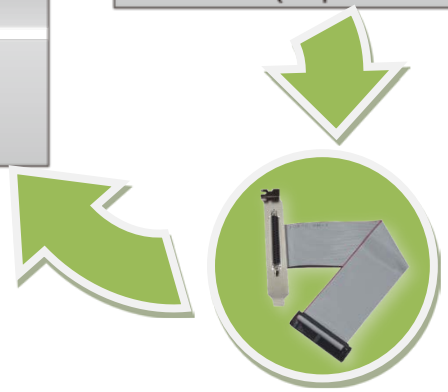
Pin Assign-ment	Terminal No.		Pin Assign-ment
Ext.GND1	01	02	Ext.GND1
DI_16	03	04	DO_16
DI_17	05	06	DO_17
DI_18	07	08	DO_18
DI_19	09	10	DO_19
DI_20	11	12	DO_20
DI_21	13	14	DO_21
DI_22	15	16	DO_22
DI_23	17	18	DO_23
DI_24	19	20	DO_24
DI_25	21	22	DO_25
DI_26	23	24	DO_26
DI_27	25	26	DO_27
DI_28	27	28	DO_28
DI_29	29	30	DO_29
DI_30	31	32	DO_30
DI_31	33	34	DO_31
COM2A	35	36	Ext.PWR1
COM2B	37	38	N.C.
N.C.	39	40	N.C.

CON2 (40-pin box header)

Note:

Ext.GND: External Power Ground

Ext.PWR: External Power Input



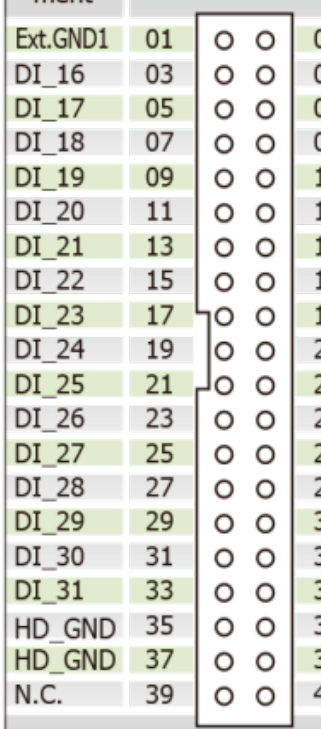
Extension Cable (CA-4037B):
DB-40-Pin conversion DB-37-Pin

2.5.2 PISO-P32S32WU

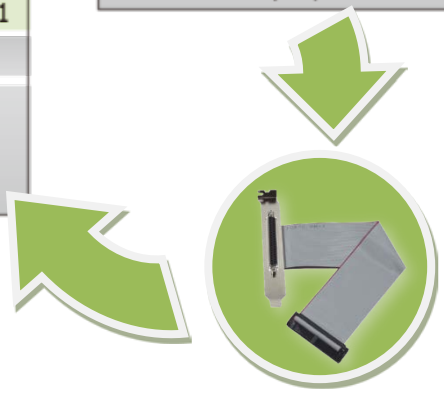
Pin Assign-ment (CON2)	Pin Assign-ment (CON1)	Terminal No.		Pin Assign-ment (CON1)	Pin Assign-ment (CON2)
Ext.GND0	Ext.GND0	01	20	Ext.GND0	Ext.GND0
DI_16	DI_0	02	21	HDO_0	HDO_16
DI_17	DI_1	03	22	HDO_1	HDO_17
DI_18	DI_2	04	23	HDO_2	HDO_18
DI_19	DI_3	05	24	HDO_3	HDO_19
DI_20	DI_4	06	25	DO_4	DO_20
DI_21	DI_5	07	26	DO_5	DO_21
DI_22	DI_6	08	27	DO_6	DO_22
DI_23	DI_7	09	28	DO_7	DO_23
DI_24	DI_8	10	29	DO_8	DO_24
DI_25	DI_9	11	30	DO_9	DO_25
DI_26	DI_10	12	31	DO_10	DO_26
DI_27	DI_11	13	32	DO_11	DO_27
DI_28	DI_12	14	33	DO_12	DO_28
DI_29	DI_13	15	34	DO_13	DO_29
DI_30	DI_14	16	35	DO_14	DO_30
DI_31	DI_15	17	36	DO_15	DO_31
HD_GND	HD_GND	18	37	Ext.PWR1	Ext.PWR1
HD_GND	HD_GND	19			

CON1/CON2 (Female DB-37)

Pin Assign-ment	Terminal No.		Pin Assign-ment
Ext.GND1	01	02	Ext.GND1
DI_16	03	04	HDO_16
DI_17	05	06	HDO_17
DI_18	07	08	HDO_18
DI_19	09	10	HDO_19
DI_20	11	12	DO_20
DI_21	13	14	DO_21
DI_22	15	16	DO_22
DI_23	17	18	DO_23
DI_24	19	20	DO_24
DI_25	21	22	DO_25
DI_26	23	24	DO_26
DI_27	25	26	DO_27
DI_28	27	28	DO_28
DI_29	29	30	DO_29
DI_30	31	32	DO_30
DI_31	33	34	DO_31
HD_GND	35	36	Ext.PWR1
HD_GND	37	38	N.C.
N.C.	39	40	N.C.



CON2 (40-pin box header)



Extension Cable (CA-4037B):
DB-40-Pin conversion DB-37-Pin

Note:

Ext.GND: External Power Ground

Ext.PWR: External Power Input

HDO: DO for high drive

HD_GND: GND for High drive

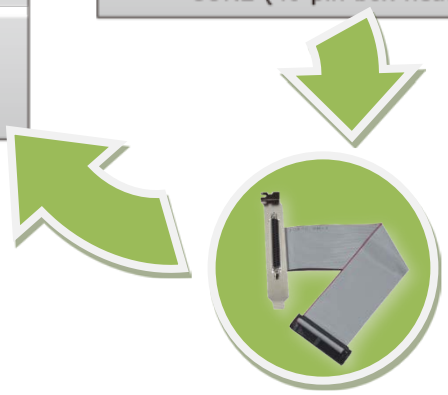
2.5.3 PEX/PISO-P64 Series

Pin Assign-ment (CON2)	Pin Assign-ment (CON1)	Terminal No.	Pin Assign-ment (CON1)	Pin Assign-ment (CON2)
COM3B	COM1B	01		
DI_32	DI_0	02	20	COM2B	COM4B
DI_33	DI_1	03	21	DI_16	DI_48
DI_34	DI_2	04	22	DI_17	DI_49
DI_35	DI_3	05	23	DI_18	DI_50
DI_36	DI_4	06	24	DI_19	DI_51
DI_37	DI_5	07	25	DI_20	DI_52
DI_38	DI_6	08	26	DI_21	DI_53
DI_39	DI_7	09	27	DI_22	DI_54
DI_40	DI_8	10	28	DI_23	DI_55
DI_41	DI_9	11	29	DI_24	DI_56
DI_42	DI_10	12	30	DI_25	DI_57
DI_43	DI_11	13	31	DI_26	DI_58
DI_44	DI_12	14	32	DI_27	DI_59
DI_45	DI_13	15	33	DI_28	DI_60
DI_46	DI_14	16	34	DI_29	DI_61
DI_47	DI_15	17	35	DI_30	DI_62
COM3A(+)	COM1A	18	36	DI_31	DI_63
COM3A(-)	N.C.	19	37	COM2A	COM4A

CON1/CON2 (Female DB-37)

Pin Assign-ment	Terminal No.		Pin Assign-ment
COM3B	01	02	COM4B
DI_32	03	04	DI_48
DI_33	05	06	DI_49
DI_34	07	08	DI_50
DI_35	09	10	DI_51
DI_36	11	12	DI_52
DI_37	13	14	DI_53
DI_38	15	16	DI_54
DI_39	17	18	DI_55
DI_40	19	20	DI_56
DI_41	21	22	DI_57
DI_42	23	24	DI_58
DI_43	25	26	DI_59
DI_44	27	28	DI_60
DI_45	29	30	DI_61
DI_46	31	32	DI_62
DI_47	33	34	DI_63
COM3A(+)	35	36	COM4A
COM3A(-)	37	38	N.C.
N.C.	39	40	N.C.

CON2 (40-pin box header)



Extension Cable (CA-4037B):
DB-40-Pin conversion DB-37-Pin

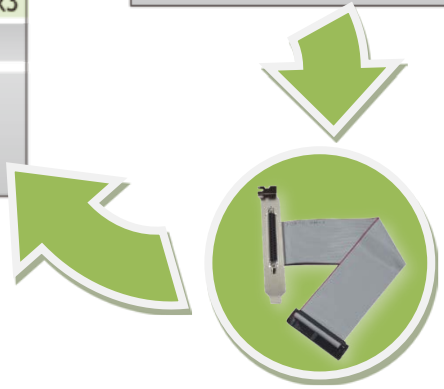
2.5.4 PEX/PISO-C64 and PISO-A64 Series

Pin Assign-ment (CON2)	Pin Assign-ment (CON1)	Terminal No.		Pin Assign-ment (CON1)	Pin Assign-ment (CON2)
Ext. GND2	Ext. GND0	01	20	Ext. GND1	Ext. GND3
DO_0	DO_0	02	21	DO_16	DO_16
DO_1	DO_1	03	22	DO_17	DO_17
DO_2	DO_2	04	23	DO_18	DO_18
DO_3	DO_3	05	24	DO_19	DO_19
DO_4	DO_4	06	25	DO_20	DO_20
DO_5	DO_5	07	26	DO_21	DO_21
DO_6	DO_6	08	27	DO_22	DO_22
DO_7	DO_7	09	28	DO_23	DO_23
DO_8	DO_8	10	29	DO_24	DO_24
DO_9	DO_9	11	30	DO_25	DO_25
DO_10	DO_10	12	31	DO_26	DO_26
DO_11	DO_11	13	32	DO_27	DO_27
DO_12	DO_12	14	33	DO_28	DO_28
DO_13	DO_13	15	34	DO_29	DO_29
DO_14	DO_14	16	35	DO_30	DO_30
DO_15	DO_15	17	36	DO_31	DO_31
Ext. PWR2	Ext. PWR0	18	37	Ext. PWR1	Ext. PWR3
N.C.	N.C.	19			

CON1/CON2 (Female DB-37)

Pin Assign-ment	Terminal No.		Pin Assign-ment
Ext. GND2	01	02	Ext. GND3
DO_32	03	04	DO_48
DO_33	05	06	DO_49
DO_34	07	08	DO_50
DO_35	09	10	DO_51
DO_36	11	12	DO_52
DO_37	13	14	DO_53
DO_38	15	16	DO_54
DO_39	17	18	DO_55
DO_40	19	20	DO_56
DO_41	21	22	DO_57
DO_42	23	24	DO_58
DO_43	25	26	DO_59
DO_44	27	28	DO_60
DO_45	29	30	DO_61
DO_46	31	32	DO_62
DO_47	33	34	DO_63
Ext. PWR2	35	36	Ext. PWR3
N.C.	37	38	N.C.
N.C.	39	40	N.C.

CON2 (40-pin box header)



Extension Cable (CA-4037B):
DB-40-Pin conversion DB-37-Pin

Note:

Ext.GND: External Power Ground

Ext.PWR: External Power Input

3. Hardware Installation

Note:

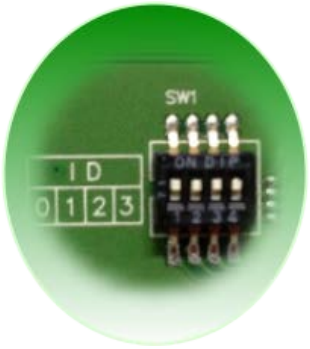
It is recommended that the driver is installed before installing the hardware as the computer may need to be restarted once the driver is installed in certain operating systems, such as Windows 2000 or Windows XP, etc. Installing the driver first helps reduce the time required for installation and restarting the computer.

To install your PEX/PISO-P32x32/x64 Series board, follow the procedure described below:

Step 1: Install the driver for your board on Host computer.

For detailed information about the driver installation, refer to Chapter 4 "Software Installation".

Step 2: Configure the Card ID using the DIP Switch (SW1).

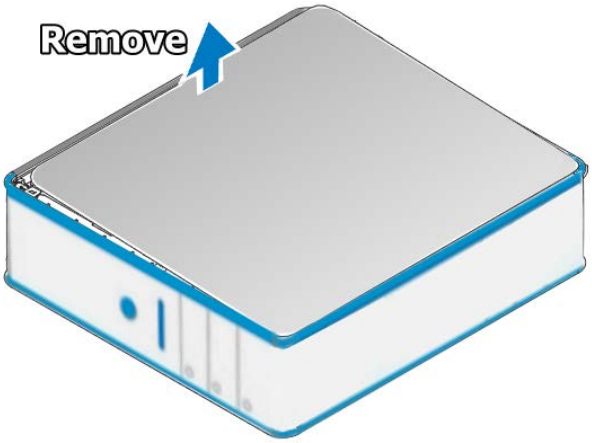


For detailed information about the card ID (SW1), refer to Section 2.2 "Card ID Switch (SW1)".

Note:

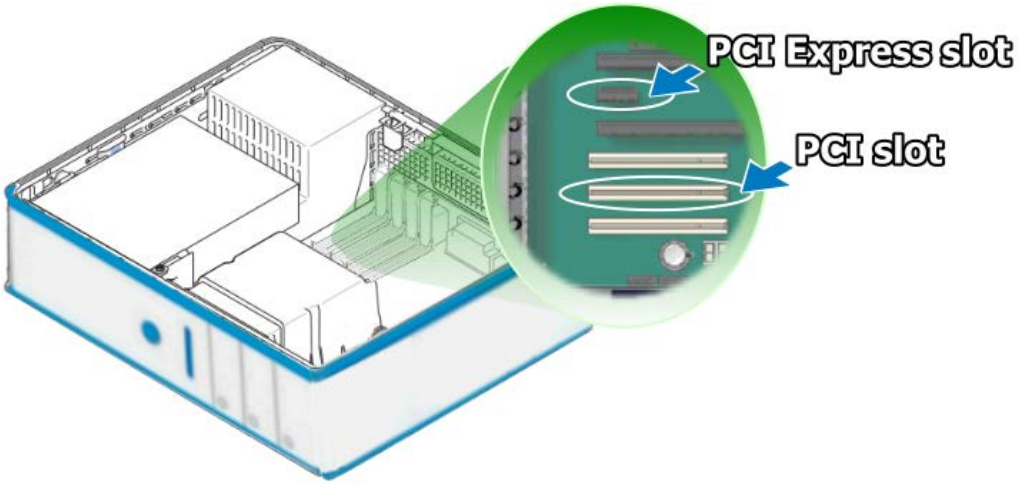
The PISO-P32C3/P32A32/P32S32WU and PISO-A64/C64/P64 boards do not support Card ID function, so please skip this step.

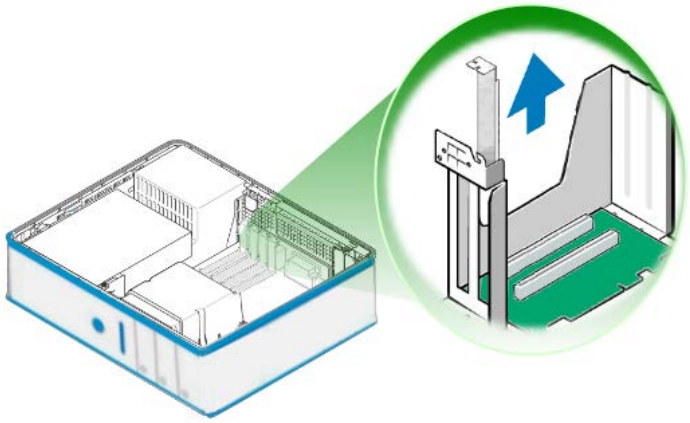
Step 3: Shut down and switch off the power to the computer, and then disconnect the power supply.



Step 4: Remove the cover from the computer.

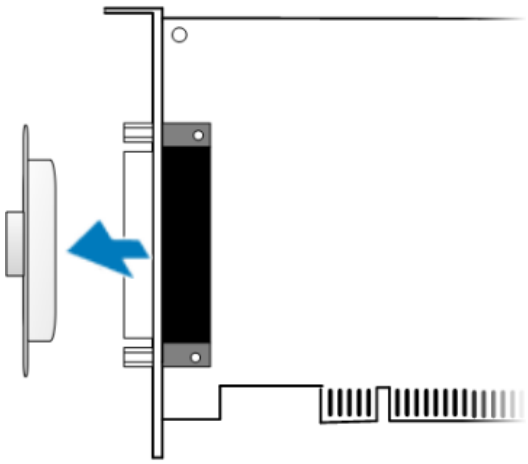
Step 5: Select a vacant PCI/PCI Express slot.



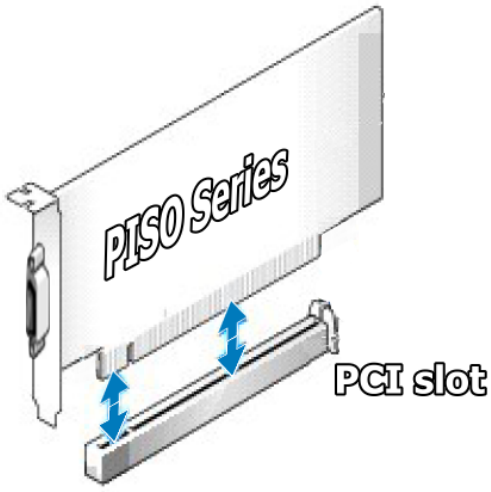


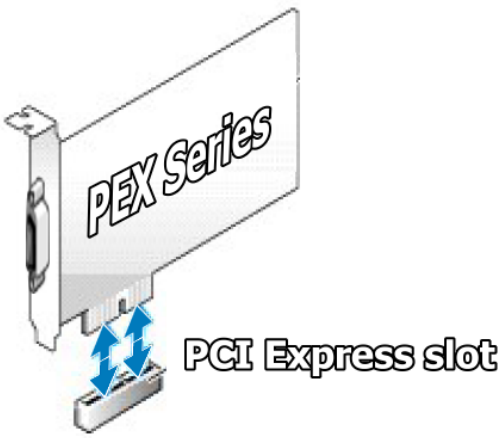
Step 6: Unscrew and remove the PCI slot cover from the computer case.

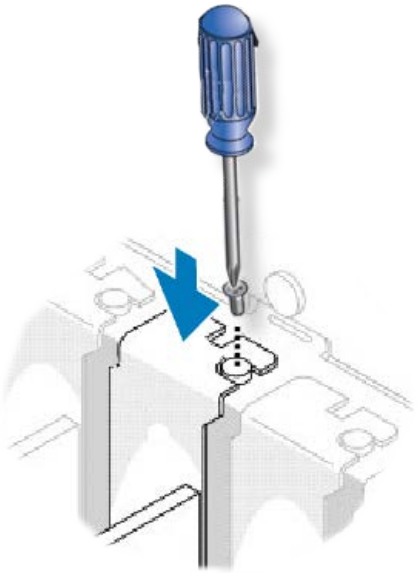
Step 7: Remove the connector cover from your board.



Step 8: Carefully insert your board into the PCI/PCI Express slot by gently pushing down on both sides of the board until it slides into the PCI connector.

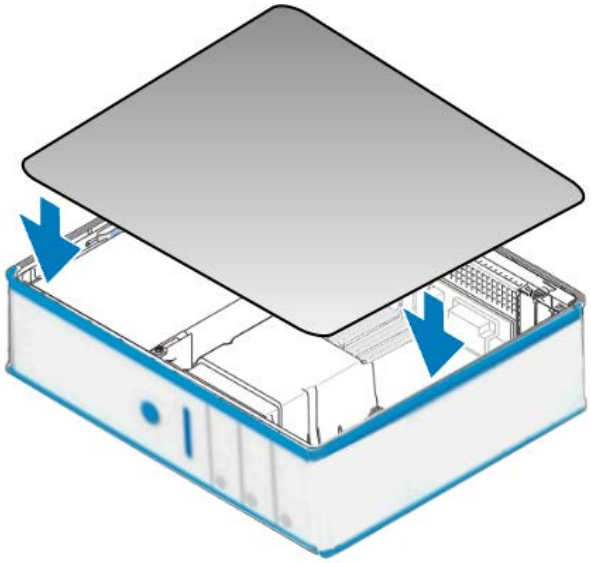






Step 9: Confirm that the board is correctly inserted in the motherboard, and then secure your board in place using the retaining screw that was removed in **Step 6.**

Step 10: Replace the covers on the computer.



Step 11: Re-attach any cables, insert the power cord and then switch on the power to the computer.

Once the computer reboots, follow any message prompts that may be displayed to complete the Plug and Play installation procedure. Refer to Chapter 4 "Software Installation" for more information.

4. Software Installation

This chapter provides a detailed description of the process for installing the driver for the PEX/PISO-P32x32/x64 Series board as well as how to verify whether your board was properly installed. PEX/PISO-P32x32/x64 Series can be used on DOS, Linux and 32/64-bit versions of Windows XP/2003/2008/7/8/10 based systems, and the drivers are fully Plug and Play compliant for easy installation.

4.1 Obtaining/Installing the Driver Installer Package

The driver installation package for PEX/PISO-P32x32/x64 Series board can be found on the companion CD-ROM, or can be obtained from the ICP DAS FTP web site. Install the appropriate driver for your operating system. The location and website addresses for the installation package are indicated below.

- **UniDAQ Driver/SDK** (It is recommended to install this driver for new user.)

Operating System	32/64-bit Windows XP, 32/64-bit Windows 2003, 32/64-bit Windows 7, 32/64-bit Windows 2008, 32/64-bit Windows 8 and 32/64-bit Windows 10
Driver Name	UniDAQ Driver/SDK (unidaq_win_setup_xxxx.exe)
CD-ROM	CD:\\ NAPDOS\PCI\UniDAQ\DLL\Driver\
Web site	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/dll/driver/
Installing Procedure	To install the UniDAQ driver, follow the procedure described below. Step 1: Double-click the UniDAQ_Win_Setupxxx.exe icon to begin the installation process.

Installation Procedure	Step 2: When the "Welcome to the ICP DAS UniDAQ Driver Setup Wizard" screen is displayed, click the "Next>" button to start the installation. Step 3: On the "Information" screen, verify that the DAQ board is included in the list of supported devices, then click the "Next>" button. Step 4: On the "Select Destination Location" screen, click the "Next>" button to install the software in the default folder, C:\ICPDAS\UniDAQ. Step 5: On the "Select Components" screen, verify that the DAQ board is in the list of device, and then click the "Next>" button to continue. Step 6: On the "Select Additional Tasks" screen, click the "Next>" button to continue. Step 7: On the "Download Information" screen, click the "Next>" button to continue. Step 8: Once the installation has completed, click "No, I will restart my computer later", and then click the "Finish" button. For more detailed information about how to install the UniDAQ driver, refer to Section 2.2 "Install UniDAQ Driver DLL" of the UniDAQ Software Manual, which can be found in the \NAPDOS\PCI\UniDAQ\Manual\ folder on the companion CD, or can be downloaded from: http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/manual/

➢ **PISO-DIO Series Classic Driver** (Recommended to install this driver for have been used PISO-DIO series boards of regular user)

Operating System	Windows 95/98/ME, Windows NT, Windows 2000, 32-bit Windows XP, 32-bit Windows 2003, 32-bit Windows Vista, 32-bit Windows 7 and 32-bit Windows 8
Driver Name	PISO-DIO Series Classic Driver (PISO-DIO_win_xxxx.exe)
CD-ROM	CD:\\NAPDOS\PCI\PISO-DIO\DLL_OXC\Driver\
Web site	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-dio/dll_ocx/driver/
Installing Procedure	Please follow the following steps to setup software: Step 1: Double click the PISO-DIO Series Classic Driver to setup it. Step 2: When the Setup Wizard screen is displayed, click the Next> button. Step 3: Select the folder where the drivers are to install. The default path is C:\DAQPro\PISO-DIO. But if you wish to install the drivers to a different location , click the "Browse..." button and select the relevant folder and then click the Next> button. Step 4: Click the Install button to continue. Step 5: Select the item "No, I will restart my computer later", press the Finish button. For detailed information about how to install the PISO-DIO Classic Driver, refer to the PISO-DIO Series Classic Driver DLL Software, which can be found in the \NAPDOS\PCI\PISO-DIO\Manual\ folder on the companion CD, or can be downloaded from: http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-dio/manual/

4.2 PnP Driver Installation

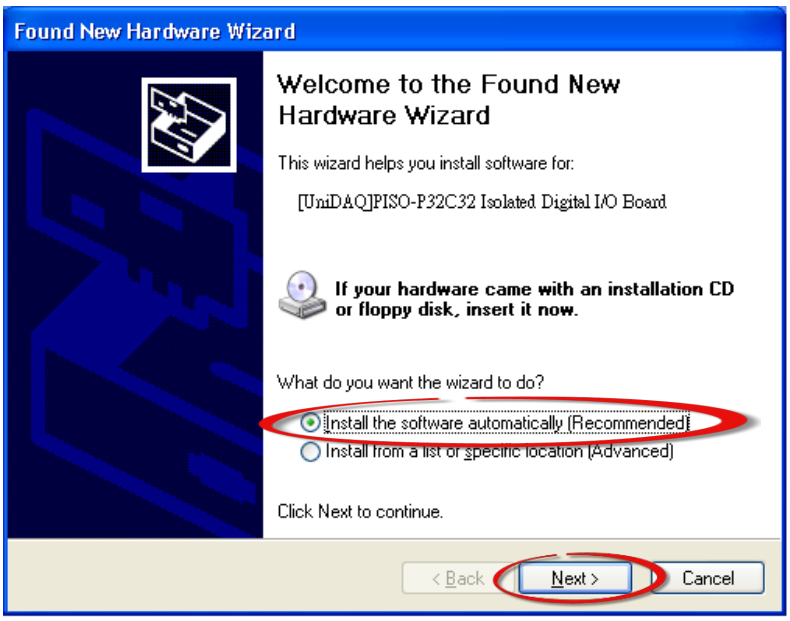
Step 1: Correctly shut down and power off your computer and disconnect the power supply, and then install your board into the computer. For detailed information about the hardware installation of PEX/PISO-P32x32/x64 Series board, refer to Chapter 3 "Hardware Installation".

Step 2: Power on the computer and complete the Plug and Play installation**.**

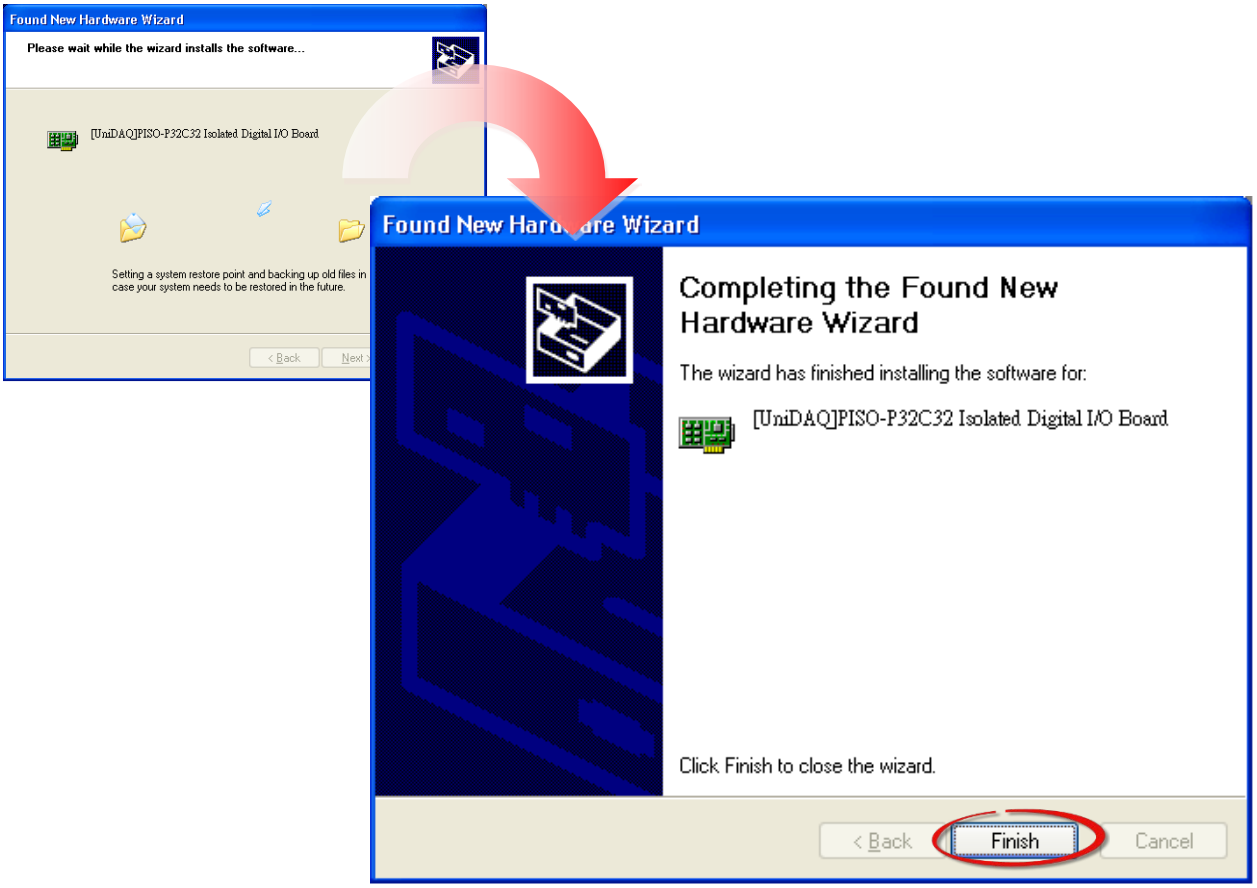
Note:

More recent operating systems, such as Windows 7/8/10 will automatically detect the new hardware and install the necessary drivers etc., so Steps 3 to 5 can be skipped.

Step 3: Select **"Install the software automatically [Recommended]"** and click the **"Next>"** button.



Step 4: Click the **"Finish"** button.



Step 5: Windows pops up **"Found New Hardware"** dialog box again.

4.3 Verifying the Installation

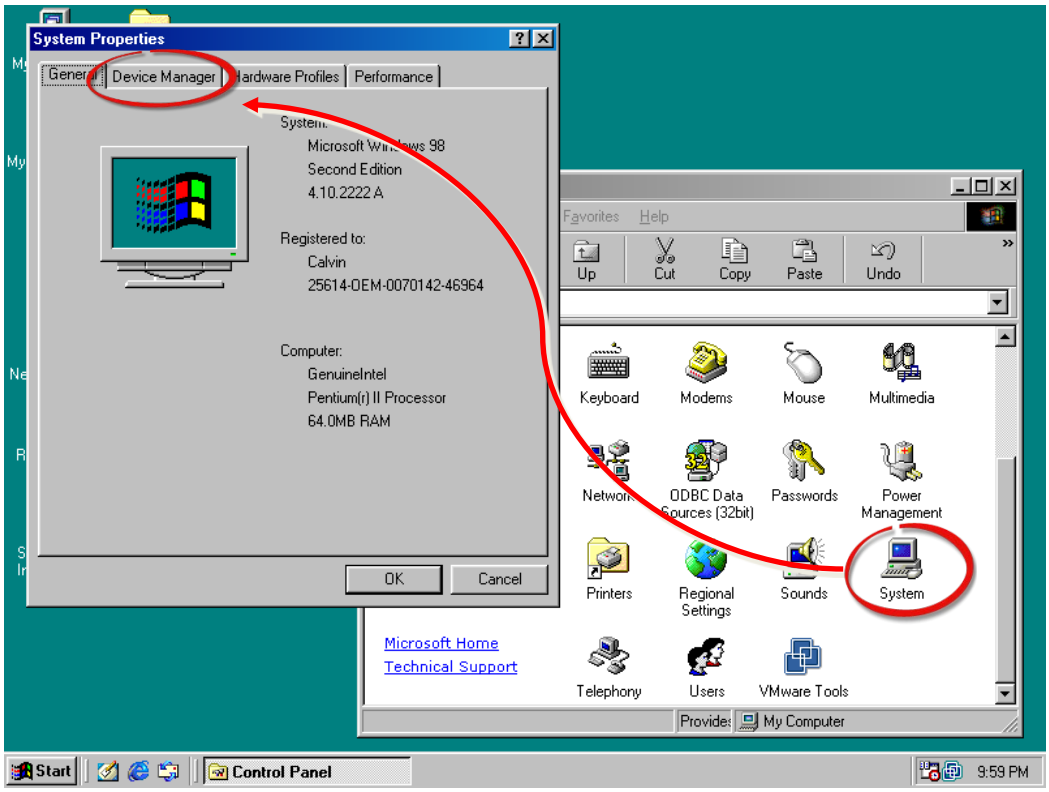
To verify that the driver was correctly installed, use the Windows **Device Manager** to view and update the device drivers installed on the computer, and to ensure that the hardware is operating correctly. The following is a description of how access the Device Manager in each of the major versions of Windows. Refer to the appropriate description for the specific operating system to verify the installation.

4.3.1 Accessing Windows Device Manager

- **Windows 95/98/ME**

Step 1: Either right-click the **"My Computer"** icon on the desktop and then click **"Properties"**, or open the **"Control Panel"** and double-click the **"System"** icon to open the System Properties dialog box.

Step 2: In the **System Properties** dialog box, click the "**Device Manager**" tab.



➢ Windows 2000/XP

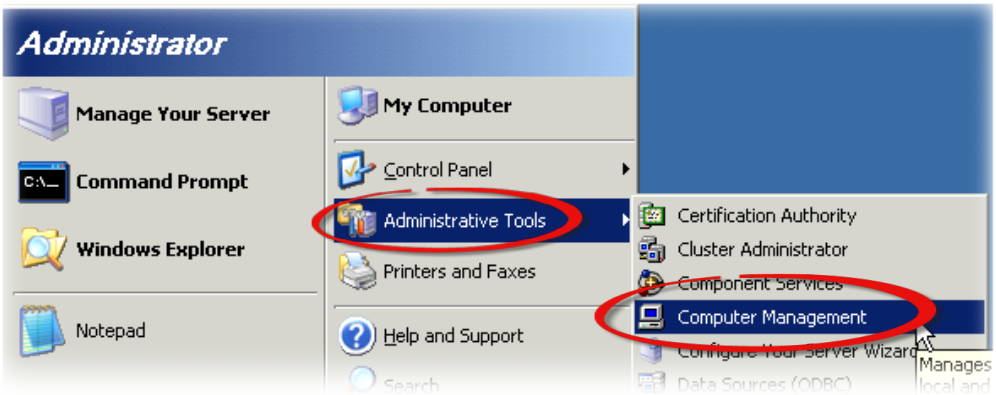
Step 1: Click the "**Start**" button and then point to "**Settings**" **and click** "**Control Panel**". Double-click the "**System**" icon to open the **"System Properties"** dialog box.

Step 2: Click the "**Hardware**" tab and then click the "**Device Manager**" button.

➢ Windows Server 2003

Step 1: Click the **"Start"** button and point to **"Administrative Tools"**, and then click the **"Computer Management"** option.

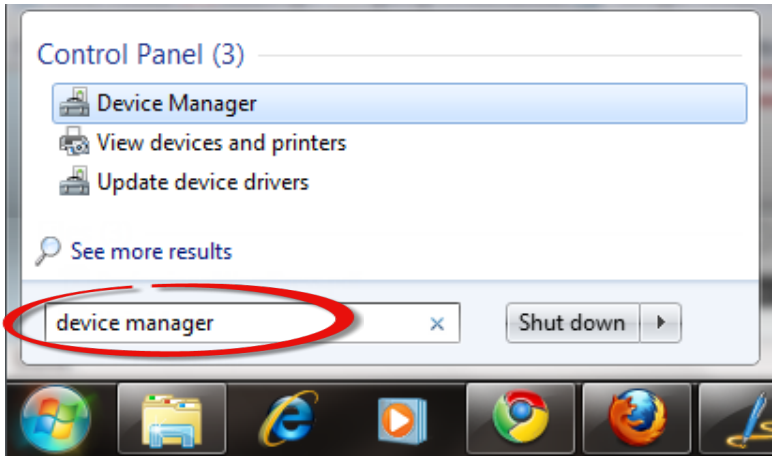
Step 2: Expand the **"System Tools"** item in the console tree, and then click **"Device Manager"**.



➢ Windows 7/10

Step 1: Click the **"Start"** button, and then click **"Control Panel"**.
Step 2: Click **"System and Maintenance"**, and then click **"Device Manager"**.

Alternatively,
Step 1: Click the **"Start"** button.
Step 2: In the **Search field,** type **Device Manager** and then press Enter.



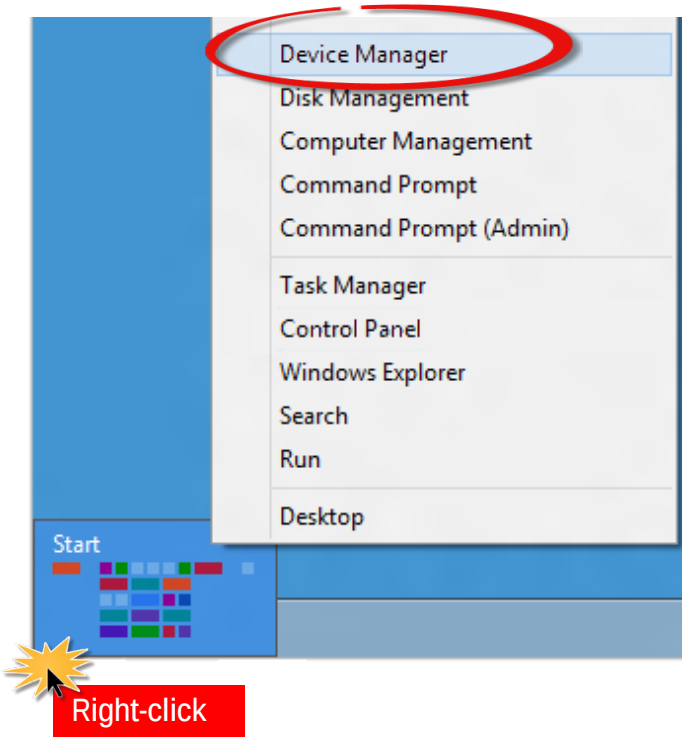
Note:

Administrator privileges are required for this operation. If you are prompted for an administrator password or confirmation, enter the password or provide confirmation by clicking the "Yes" button in the User Account Control message.

➢ Windows 8

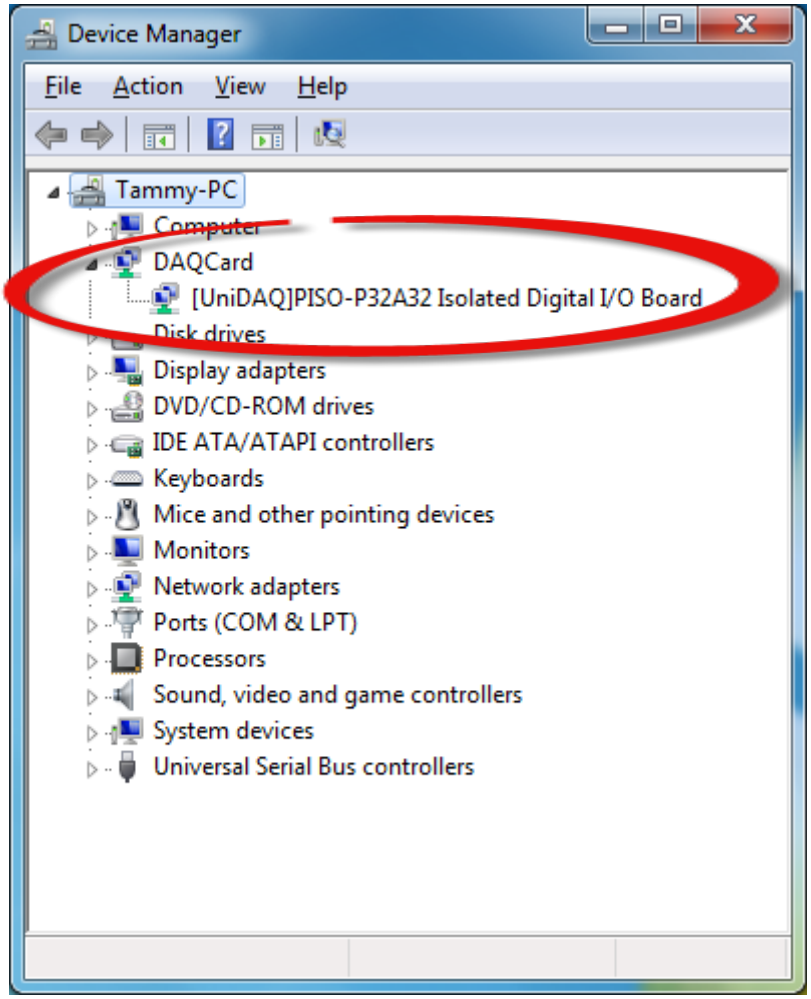
Step 1: To display the **Start screen icon** from the desktop view, hover the mouse cursor over the **bottom-left corner** of screen.
Step 2: **Right-click** the Start screen icon and then click "**Device Manager**".

Alternatively, press **[Windows Key] +[X]** to open the Start Menu, and then select Device Manager from the options list.



4.3.2 Check the Installation

Check that the PEX/PISO-P32x32/x64 Series board is correctly listed in the **Device Manager** window, as illustrated below.



5. Board Testing

This chapter provides detailed information about the **"Self-Test"** process, which is used to confirm that the PEX/PISO-P32x32/x64 Series board is operating correctly. Before beginning the **"Self-Test"** process, ensure that both the hardware and driver installation procedures are fully completed. For detailed information about the hardware and driver installation, refer to Chapter 3 "Hardware Installation" and Chapter 4 "Software Installation".

5.1 Self-Test Wiring

The following is a description of how to configure the wiring in order to perform the "Self-Test" procedures for the Digital Input or/and Digital Output. Refer to the appropriate descriptions for PEX/PISO-P32x32/x64 Series board in Sections 5.1.1 to 5.1.6 for more detailed information.

Before beginning the **"Self-Test"** procedure, ensure that the following items are available:

☑ A CA-3710 Cable
(Optional, Website: http://www.icpdas.com/products/Accessories/cable/cable_selection.htm)

☑ A DN-37 Terminal Board
(Optional, Website:
http://www.icpdas.com/root/product/solutions/pc_based_io_board/daughter_boards/dn-37.html)

☑ An External power supply device, such as the DIN-KA52F or DP-660
(Optional, Website:
http://www.icpdas.com/root/product/solutions/accessories/power_supply/ka52f.html
http://www.icpdas.com/root/product/solutions/accessories/power_supply/dp-660.html)

5.1.1 PEX/PISO-P32C32 Series

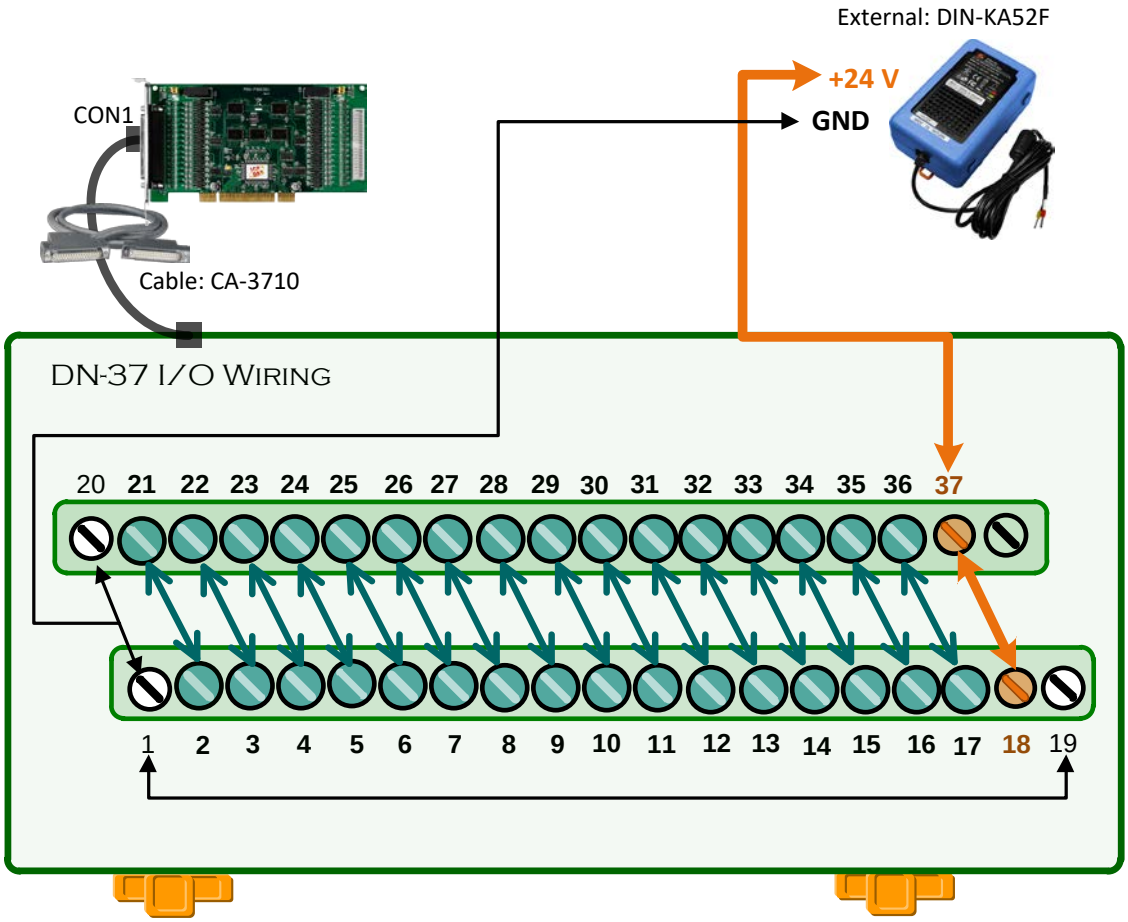
Step 1: Connect the DN-37 to the CON1 connector on your board using the CA-3710 cable.
Step 2: Keep set the **JP1 jumper to External Power** (For more details regarding the JP1 jumper settings, refer to the Section 2.1.1 "PEX/PISO-P32C32/P32A32 Series")
Step 3: Connect the **DI<0…15> (Pin2…17)** on the terminal board to **DO<0…15> (Pin21…36)**. (i.e., Connect the **DI0 (Pin2) to DO0 (Pin21)** … Connect the **DI15 (Pin17) to DO15 (Pin36)**)

➢ **The External Power Wiring for PEX-P32C32/PISO-P32C32(U):**

Step 4: Connect the **External Power Supply +24 V** to **COM1A (Pin18) and Ext.PWR0 (Pin37).**
Step 5: Connect the **External Power Supply GND** to **COM1B (Pin19) and Ext.GND0 (Pin1/Pin20).**

Note:

The PEX-P32C32/PISO-P32C32(U) suggests input voltage range as follow:
Logic high: +9 ~ +24 V; (Higher voltage over the limitation will cause the hardware damage.)



➢ **The External Power Wiring for PISO-P32C32U-5V:**

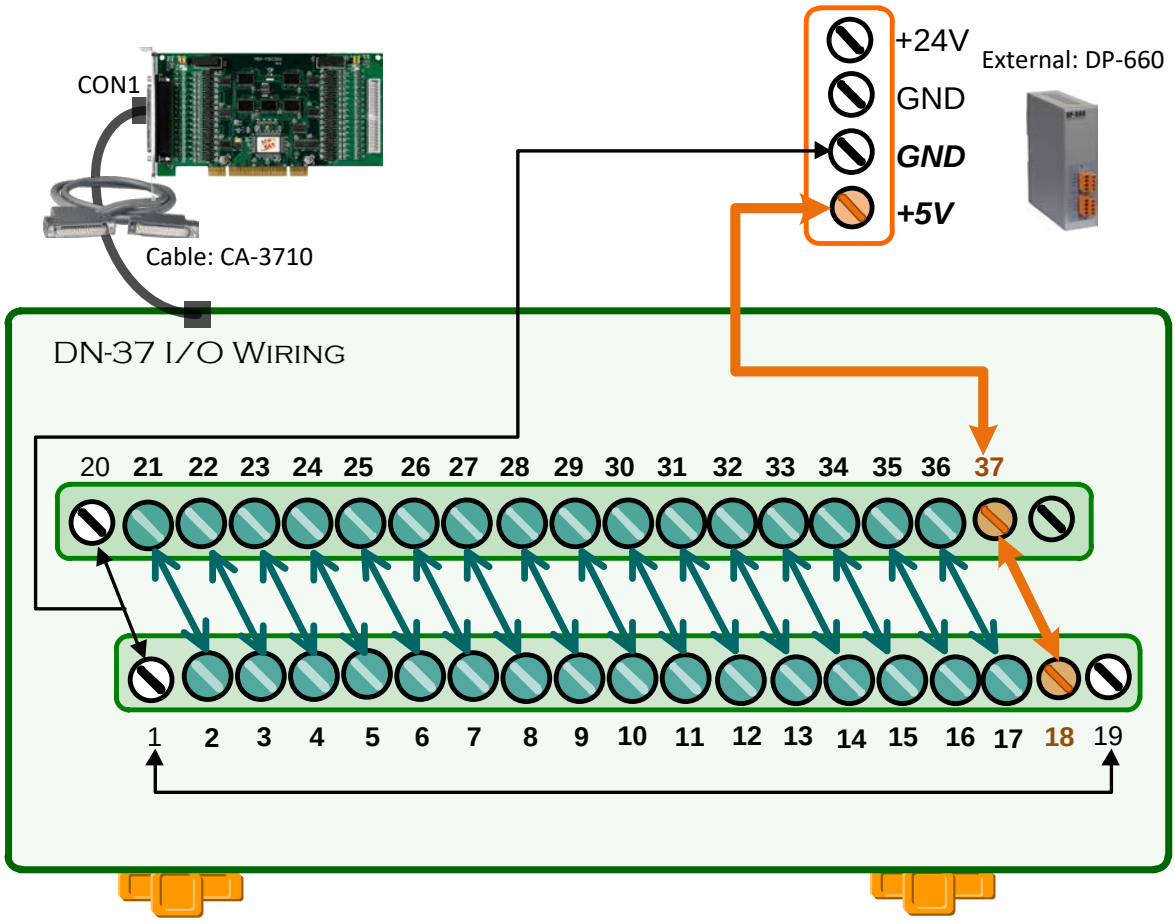
Step 4: Connect the **External Power Supply +5 V** to **COM1A (Pin18) and Ext.PWR0 (Pin37).**

Step 5: Connect the **External Power Supply GND** to **COM1B (Pin19) and Ext.GND0 (Pin1/Pin20).**

Note:

The PISO-P32C32U-5V suggests input voltage range as follow:

Logic high: +5 ~ +12 V; (Higher voltage over the limitation will cause the hardware damage.)



5.1.2 PEX/PISO-P32A32 Series

Step 1: Connect the DN-37 to the CON1 connector on your board using the CA-3710 cable.

Step 2: Keep set the **JP1 jumper to External Power** (For more details regarding the JP1 jumper settings, refer to the Section 2.1.1 "PEX/PISO-P32C32/P32A32 Series")

Step 3: Connect the **DI<0…15> (Pin2…17)** on the terminal board to **DO<0…15> (Pin21…36)**. (i.e., Connect the **DI0 (Pin2) to DO0 (Pin21)** … Connect the **DI15 (Pin17) to DO15 (Pin36)**)

➢ The External Power Wiring for PEX-P32A32/PISO-P32A32(U) Series:

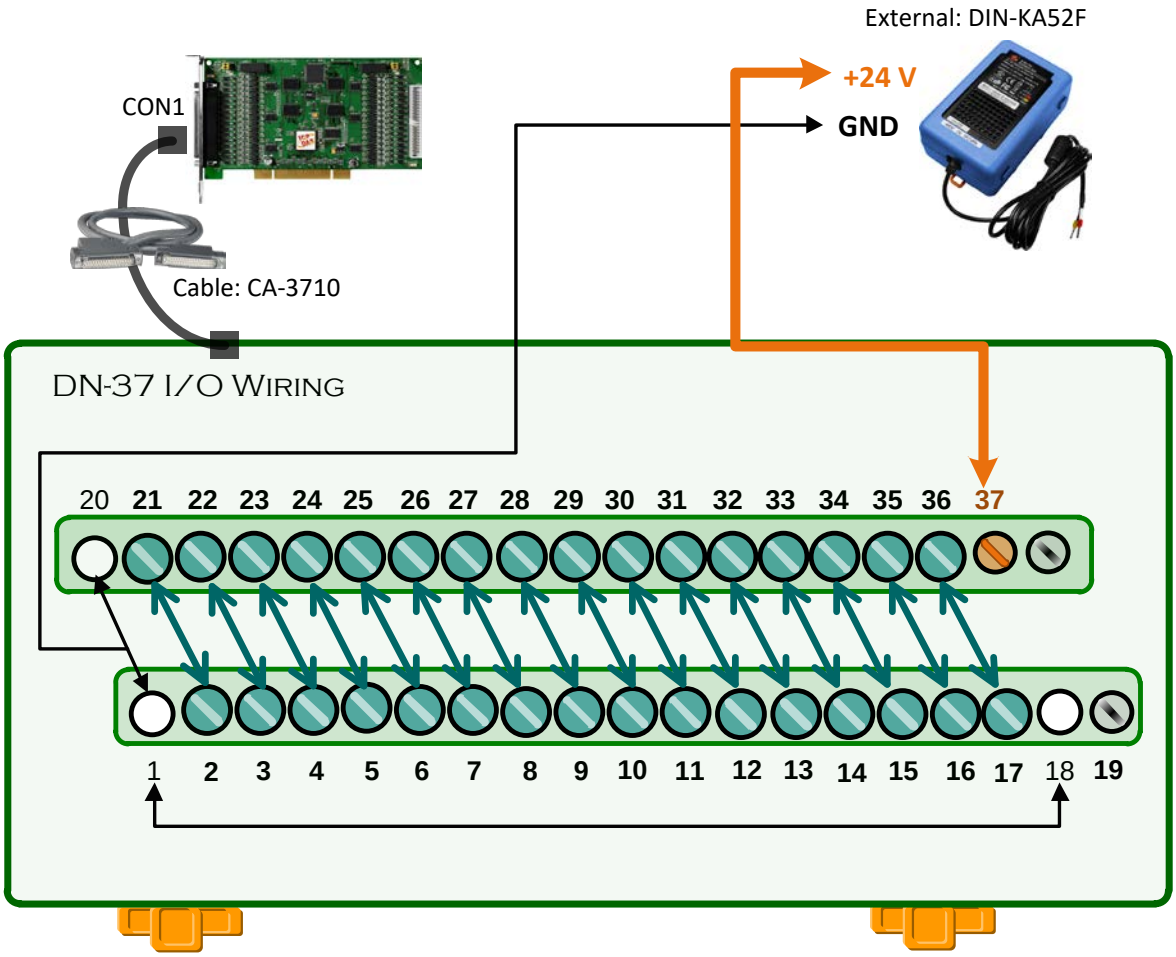
Step 4: Connect the **External Power Supply +24 V** to **Ext.PWR0 (Pin37).**

Step 5: Connect the **External Power Supply GND** to **COM1A (Pin18) and Ext.GND0 (Pin1/Pin20).**

Note:

The PEX-P32A32/PISO-P32A32(U) suggests input voltage range as follow:

Logic high: +9 ~ +24 V; (Higher voltage over the limitation will cause the hardware damage.)



➢ The External Power Wiring for PISO-P32A32U-5V:

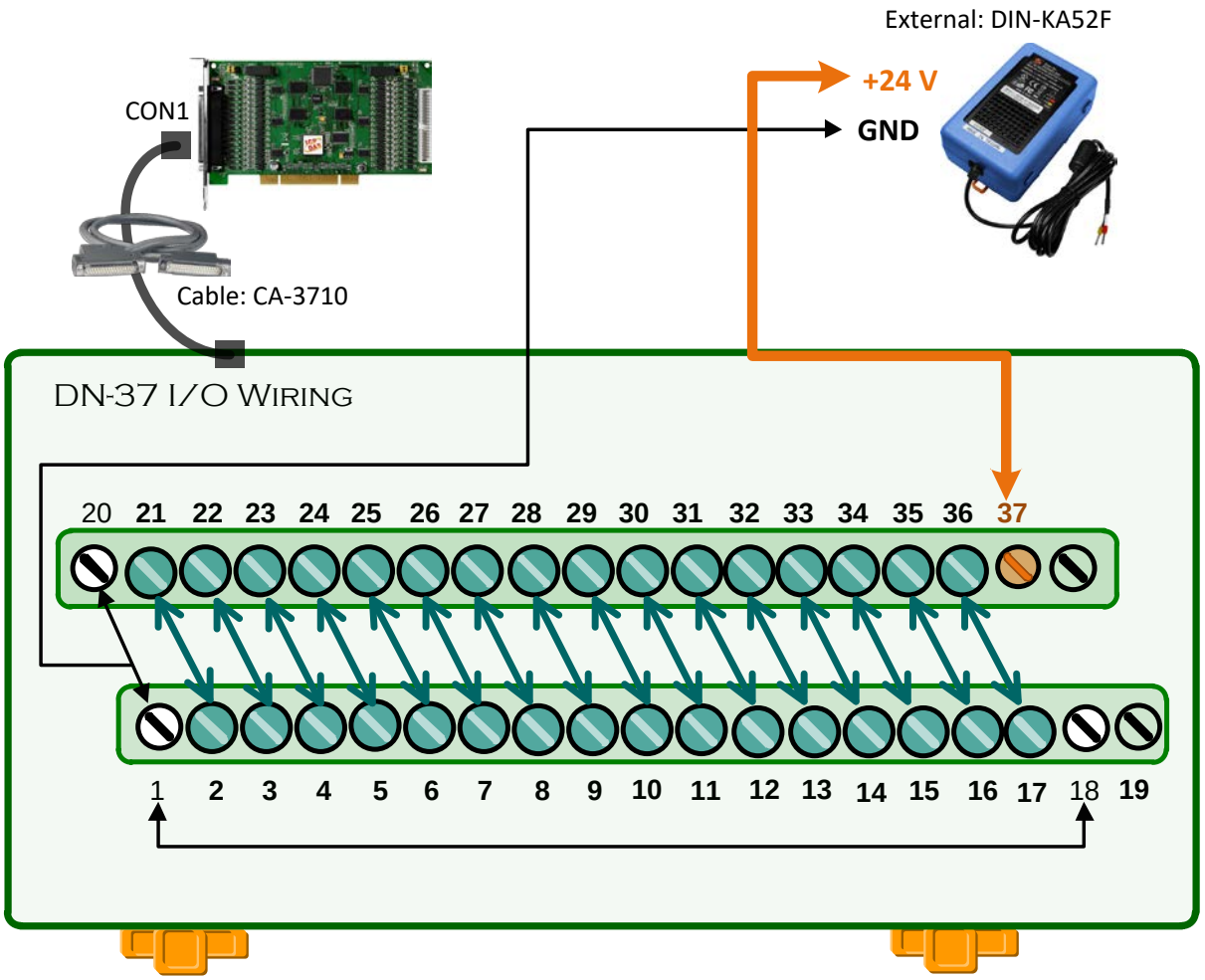
Step 4: Connect the **External Power Supply +5 V** to **Ext.PWR0 (Pin37).**

Step 5: Connect the **External Power Supply GND** to **COM1A (Pin18) and Ext.GND0 (Pin1/Pin20).**

Note:

The PISO-P32A32U-5V suggests input voltage range as follow:

Logic high: +5 ~ +12 V; (Higher voltage over the limitation will cause the hardware damage.)



5.1.3 PISO-P32S32WU Series

Step 1: Connect the DN-37 to the CON1 connector on your board using the CA-3710 cable.

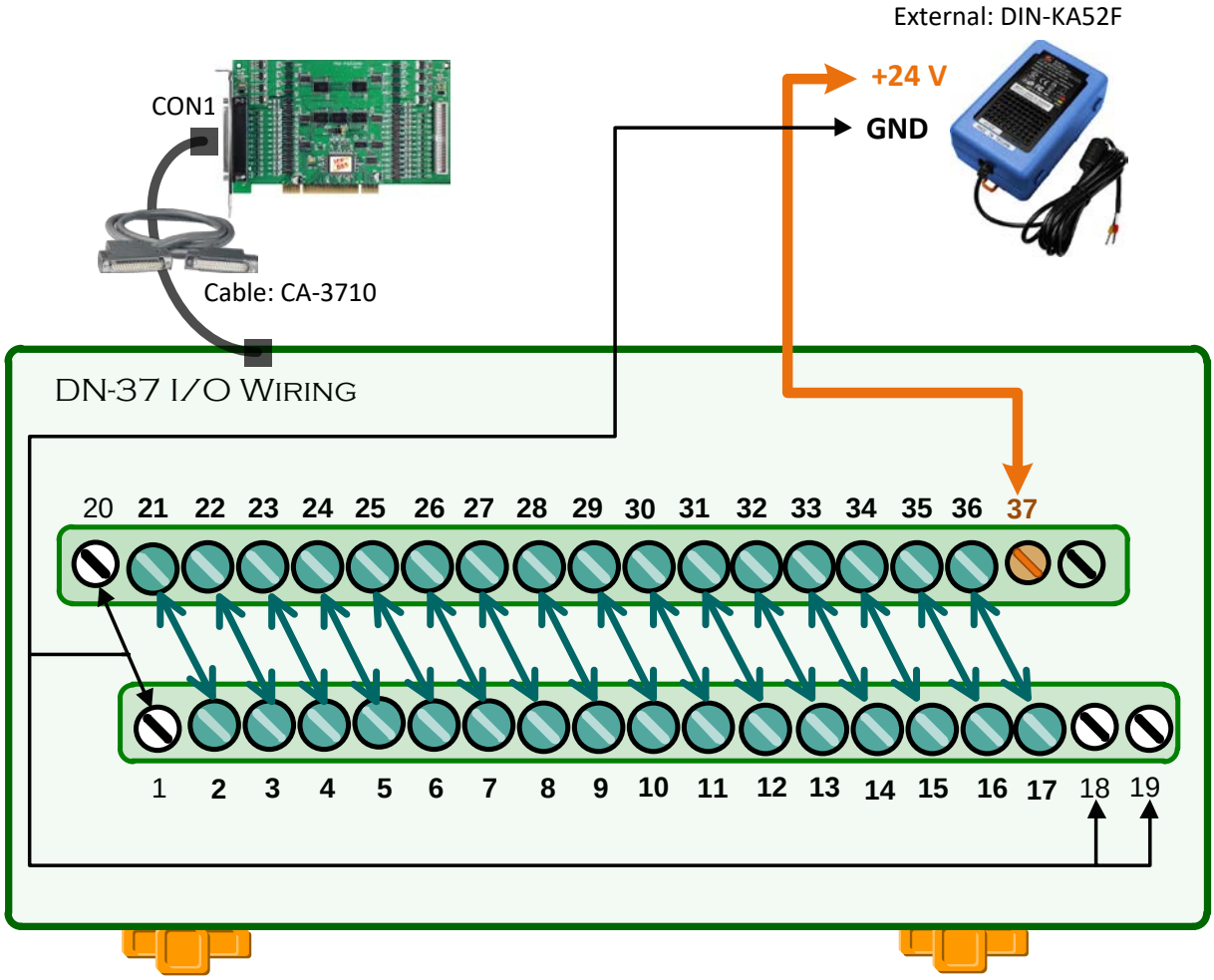
Step 2: Connect the **DI<0…15> (Pin2…17)** on the terminal board to **DO<0…15> (pin21…36)**.
(i.e., Connect the **DI0 (Pin2) to DO0 (Pin21)** … Connect the **DI15 (Pin17) to DO15 (Pin36)**)

Step 3: Connect the **External Power Supply +24 V** to **Ext.PWR1 (Pin37).**

Step 4: Connect the **External Power Supply GND** to **Ext.GND0 (Pin1/Pin20) and HD_GND (Pin18/Pin19).**

Note:

Suggested that use external power for upwards of +12 V.



5.1.4 PEX/PISO-P64 Series

Step 1: Connect the DN-37 to the CON1 connector on your board using the CA-3710 cable.

Step 2: Keep set the **J1 jumper to External Power**.

(For more details regarding the J1 jumper settings, refer to the Section 2.1.3 "PEX/PISO-P64 Series")

➢ **The External Power Wiring for PEX-P64/PISO-P64(U) Series:**

Step 3: Connect the **COM1B (Pin1)** on the terminal board to **DI7 (Pin9)**.

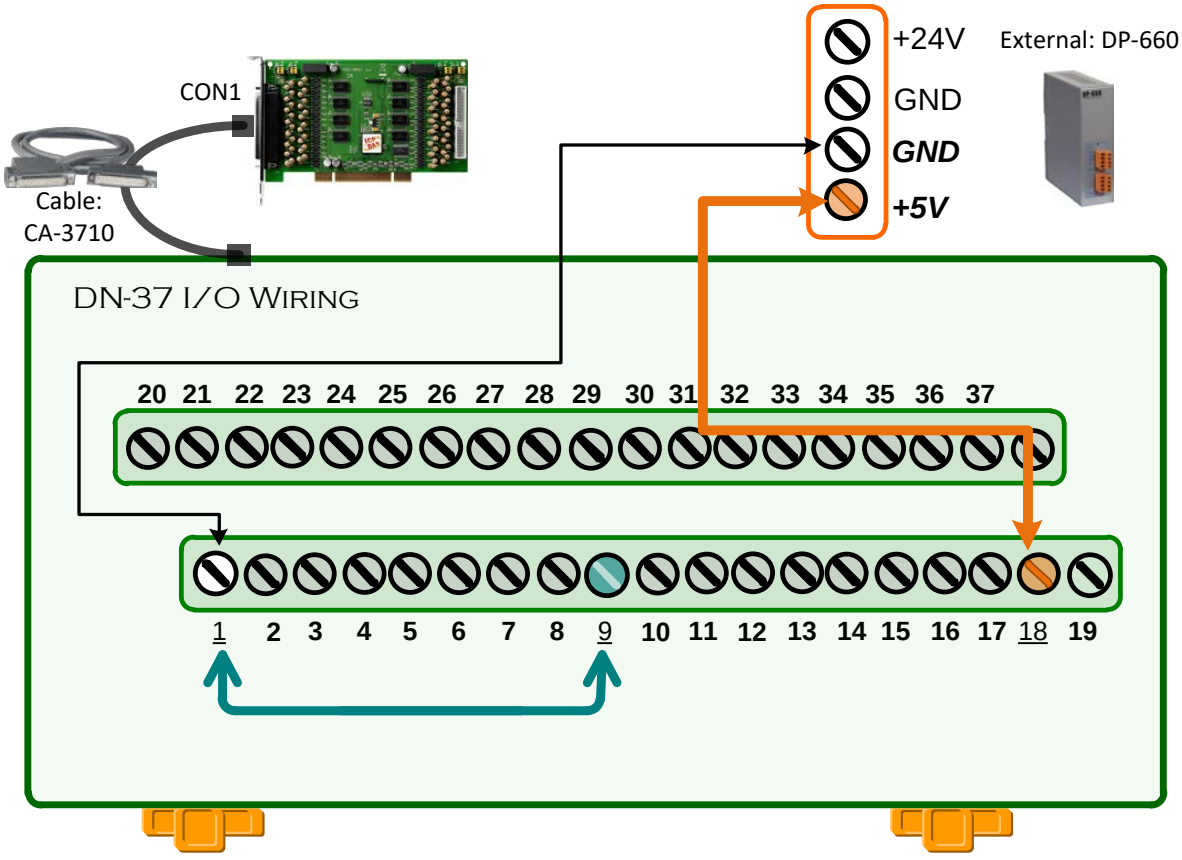
Step 4: Connect the **External Power Supply GND** to **COM1B (Pin1).**

Step 5: Connect the **External Power Supply +5 V** to **COM1A (Pin18).**

Note:

The PEX-P64/PISO-P64(U) suggests input voltage range as follow:

Logic high: +5 ~ +15 V; (Higher voltage over the limitation will cause the hardware damage.)



➢ The External Power Wiring for PEX-P64(U)-24V Series:

Step 3: Connect the **COM1B (Pin1)** on the terminal board to **DI7 (Pin9)**.

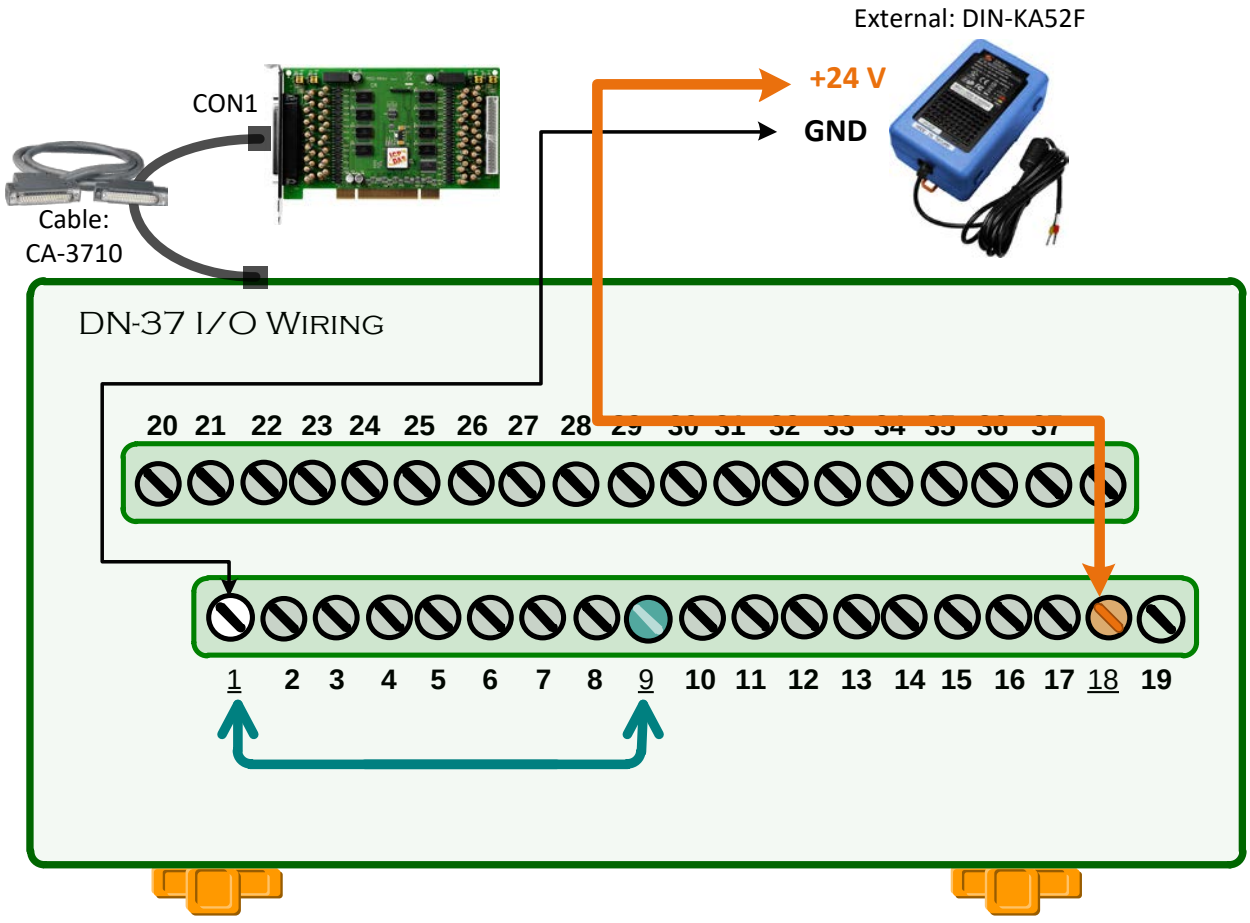
Step 4: Connect the **External Power Supply GND** to **COM1B (Pin1).**

Step 5: Connect the **External Power Supply +24 V** to **COM1A (Pin18).**

Note:

The PEX-P64-24V/PISO-P64U-24V suggests input voltage range as follow:

Logic high: +20 ~ +28 V; (Higher voltage over the limitation will cause the hardware damage.)

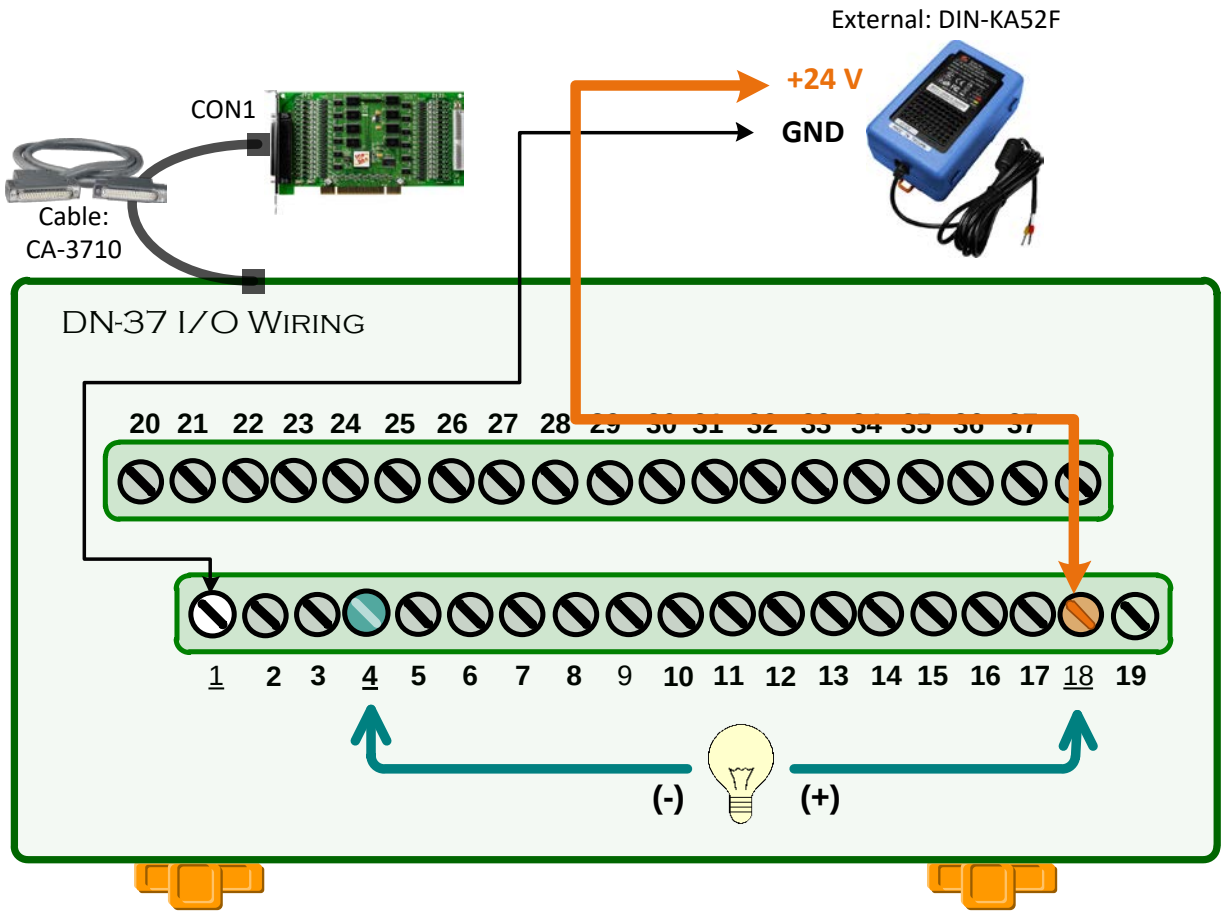


5.1.5 PEX/PISO-C64 Series

Step 1: Connect the DN-37 to the CON1 connector on your board using the CA-3710 cable.
Step 2: Use output LED to connect the **DO2 (Pin4)** and **Ext.PWR0 (Pin18).**
Step 3: Connect the **External Power Supply +24 V** to **Ext.PWR0 (Pin18).**
Step 4: Connect the **External Power Supply GND** to **Ext.GND0 (Pin1).**

Note:

For detailed information about the wiring note and pin assignments, refer to Section 2.4 "Isolated DO Architecture" and Section 2.5.4 "PEX/PISO-C64 and PISO-A64 Series")

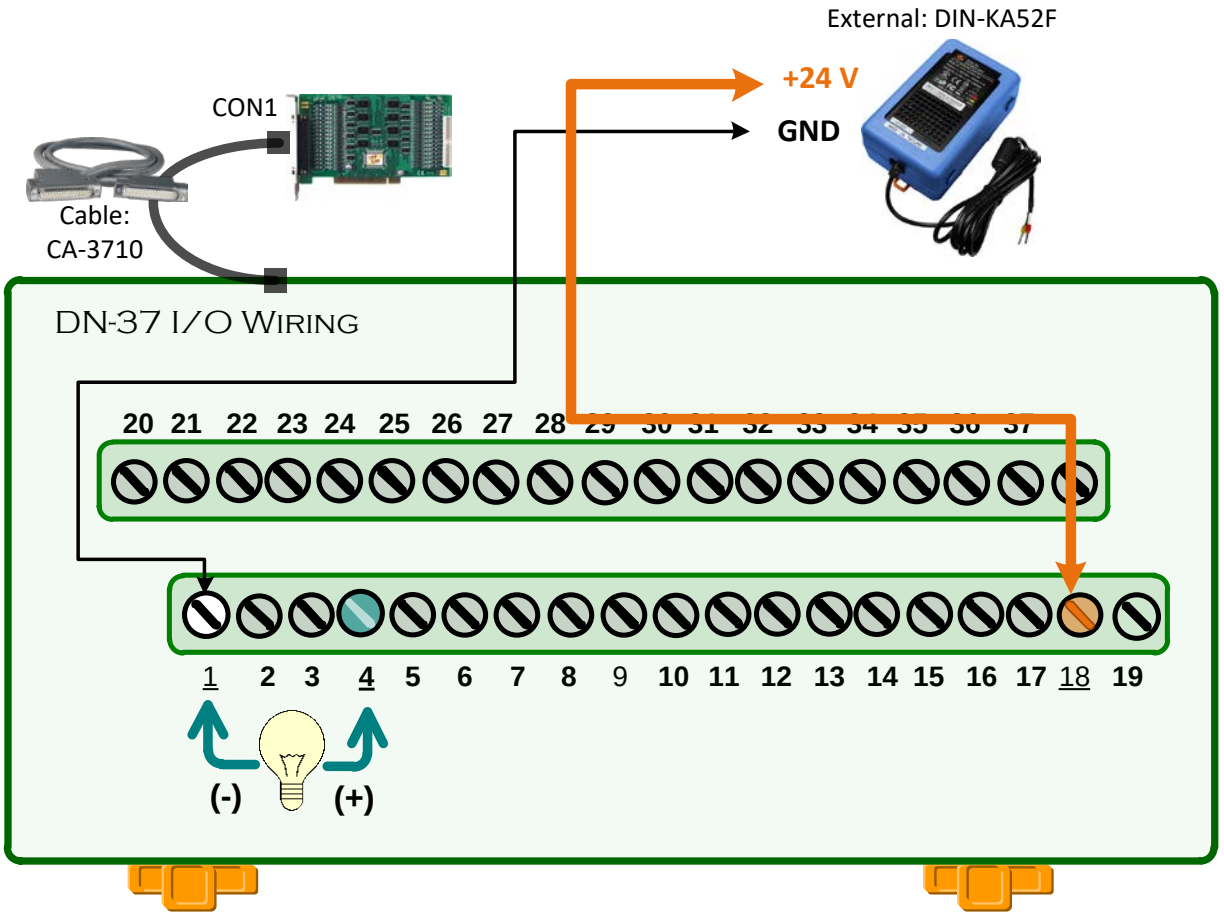


5.1.6 PISO-A64 Series

Step 1: Connect the DN-37 to the CON1 connector on your board using the CA-3710 cable.
Step 2: Use output LED to connect the **DO2 (Pin4)** and **Ext.GND0 (Pin1).**
Step 3: Connect the **External Power Supply GND** to **Ext.GND0 (Pin1).**
Step 4: Connect the **External Power Supply +24 V** to **Ext.PWR0 (Pin18).**

Note:

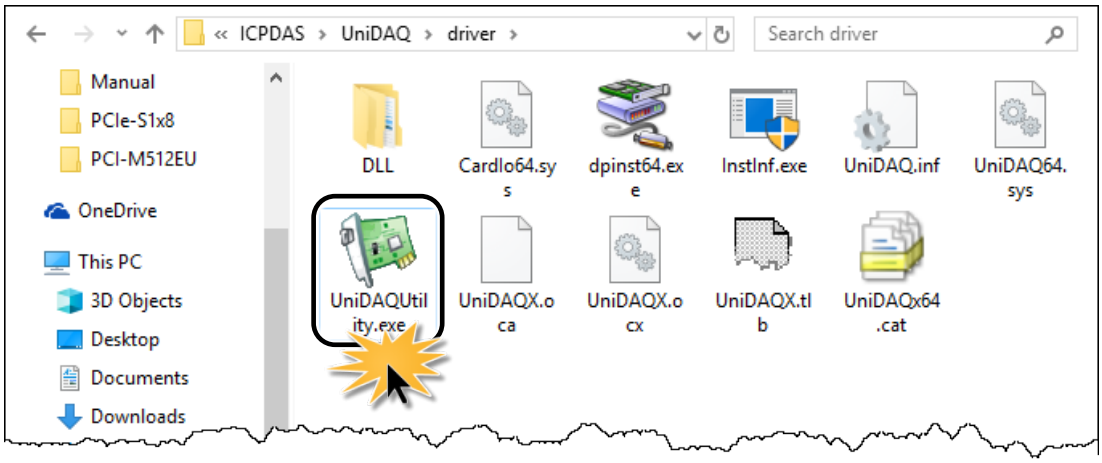
For detailed information about the wiring note and pin assignments, refer to Section 2.4 "Isolated DO Architecture" and Section 2.5.4 "PEX/PISO-C64 and PISO-A64 Series")



5.2 Launch the Test Program

The following example use UniDAQ driver to perform self-test. If you install the PISO-DIO series classic driver, refer to Quick Start Guide of the PISO-P32x32/x64 series (http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-dio/manual/quickstart/classic/) to execute the self-test.

Step 1: Double-click the **UniDAQ Utility** software. The UniDAQ Utility will be placed in the **default path "C:\ICPDAS\UniDAQ\Driver"** after completing installation.



Step 2: Confirm that your board has been successfully installed in the Host system. **Note that the device number starts from 0**.

Step 3: Click the **"TEST"** button to start the test.

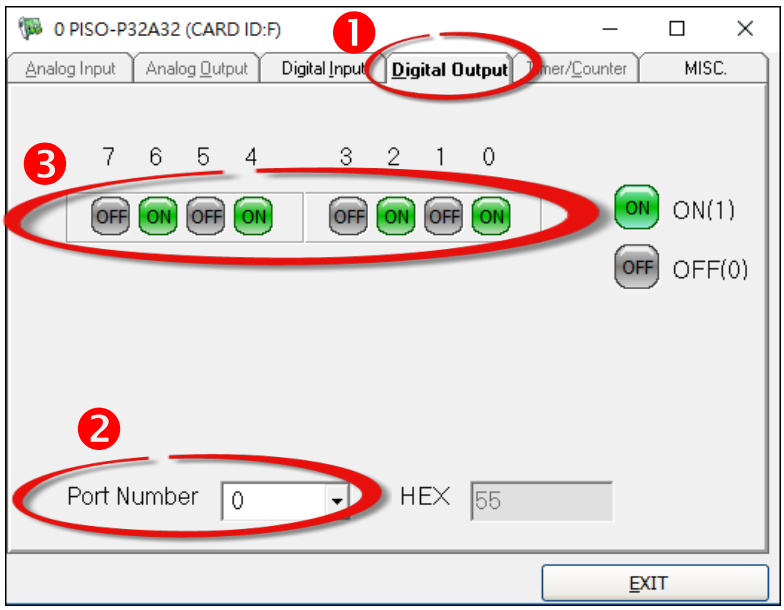
Note:

The PEX-P32C32/P32A32/P64/C64 software is fully compatible with the PISO-P32C32/P64/C64 series software.

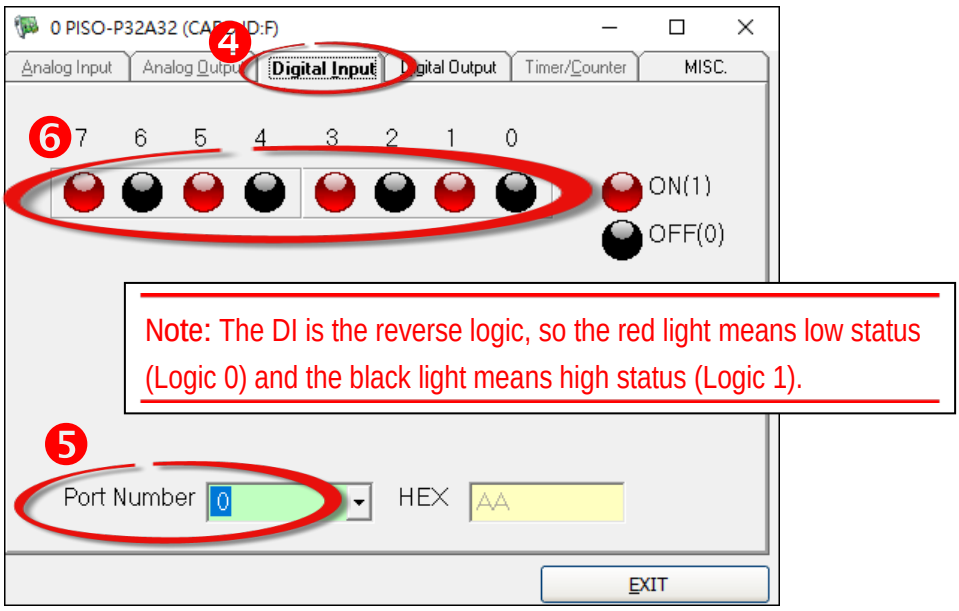
5.2.1 PEX/PISO-P32C32, PEX/PISO-P32A32 and PISO-P32S32WU Series

Step 4: Check the results of the **Digital Input and Digital Output** functions test.

1. Click the **"Digital Output"** tab.
2. Select **"Port 0"** from the **"Port Number"** drop-down menu.
3. Check the checkboxes for **channels 0, 2, 4 and 6**.



4. Click the **"Digital Input"** tab.
5. Select **"Port 0"** from the **"Port Number"** drop-down menu.
6. The DI indicators will turn **black** when the corresponding DO channels 0, 2, 4 and 6 are **ON**.

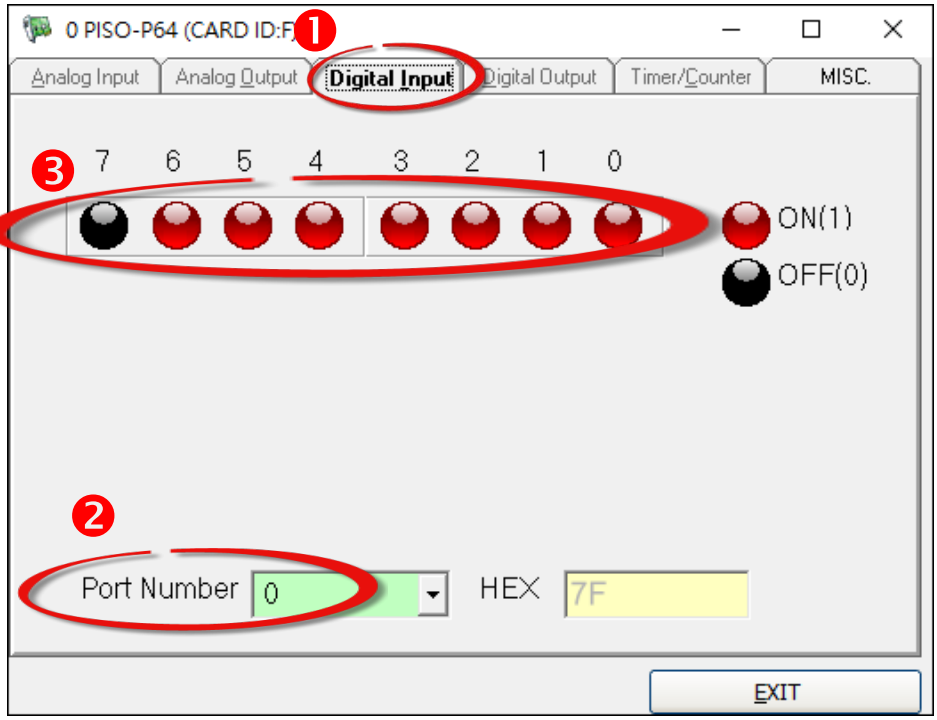


5.2.2 PEX/PISO-P64 Series

Step 4: Check the results of the **Digital Input** functions test.

1. Click the **"Digital Input"** tab.
2. Select **"Port0"** from the **"Port Number"** drop-down menu.
3. The corresponding DI becomes **black** for **channel 7 of DI_7 is ON**.

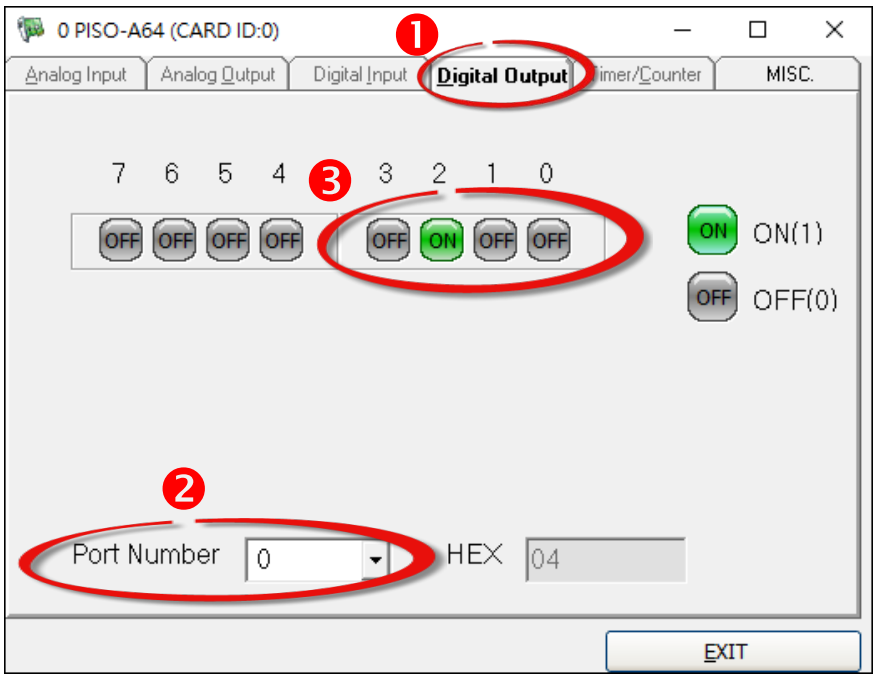
Note: The DI is the reverse logic, so the red light means low status (Logic 0) and the black light means high status (Logic 1).



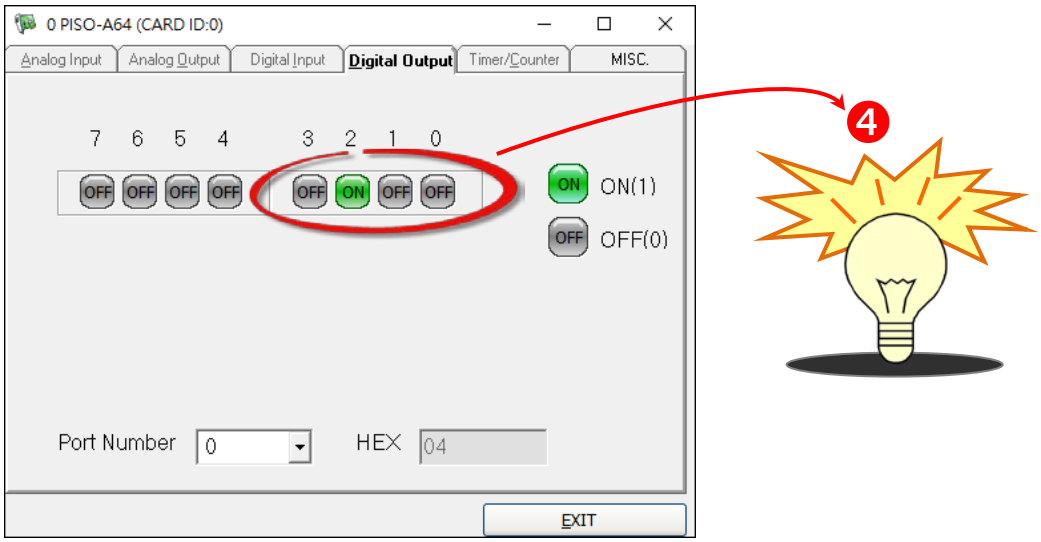
5.2.3 PEX/PISO-C64 and PISO-A64 Series

Step 4: Check the results of the **Digital Output** functions test.

1. Click the **"Digital Output"** tab.
2. Select **"Port 0"** from the **"Port Number"** drop-down menu.
3. Check the checkboxes for **channel 2**.



4. Check the **specified LED** should be **ON**.



6. I/O Control Register

6.1 How to Find the I/O Address

During the power-on stage, the Plug and Play BIOS will assign an appropriate I/O address to each PEX/PISO-P32x32 and PEX/PISO-x64 Series board installed in the system. Each board includes four fixed ID numbers that are used to identify the board, and are indicated below:

Table 6-1:

OLD Version (Vendor ID= 0xE159, Device ID= 0x02)				
Model Name	Sub-Vender	Sub-Device	Sub-Aux	Version
PISO-C64(U)	0x80	0x08	0x00	1.0 ~ 3.0
PISO-P64(U)	0x80	0x08	0x10	1.0 ~ 3.0
PISO-P64U-24V				
PISO-P32C32(U)	0x80	0x08	0x20	1.0 ~ 4.0 1.4
PISO-P32C32U-5V				
PISO-P32S32WU				
PISO-A64	0x80	0x08	0x50	1.0 ~ 2.0
PISO-P32A32(U)	0x80	0x08	0x70	1.0 ~ 2.0
PISO-P32A32U-5V				

Table 6-2:

News Version (Vendor ID= 0xE159, Device ID= 0x01)				
Model Name	Sub-Vender	Sub-Device	Sub-Aux	Version
PISO-C64(U)	0x0280	0x00	0x00	4.0
PEX-C64				
PISO-P64(U) (-24V)	0x4280	0x00	0x10	4.4
PEX-P64				
PISO-P32C32(U) (-5V)	0x4280	0x00	0x20	5.5 1.4
PEX-P32C32				
PISO-P32S32WU				
PISO-A64	0x8280	0x00	0x50	3.0
PISO-A64U				
PISO-P32A32(U)	0xC280	0x00	0x70	4.0 and later
PEX-P32A32				
PISO-P32A32U-5V				

➢ PIO_PISO.EXE Utility for the Windows

The PIO_PISO.EXE utility program will detect and present all information for ICPDAS I/O boards installed in the PC, as shown in the following Figure 6-1. Details of how to identify the PEX/PISO-P32x32 and PEX/PISO-x64 Series board of ICPDAS data acquisition boards based on the **Sub-vendor**, **Sub-device** and **Sub-Aux ID** are given in Tables 6-1 to 6-2.

The **PIO_PISO.exe** utility is located on the CD as below and is useful for all PISO-DIO series boards. (CD:\NAPDOS\PCI\Utility\Win32\PIO_PISO\)
http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/utility/win32/pio_piso/

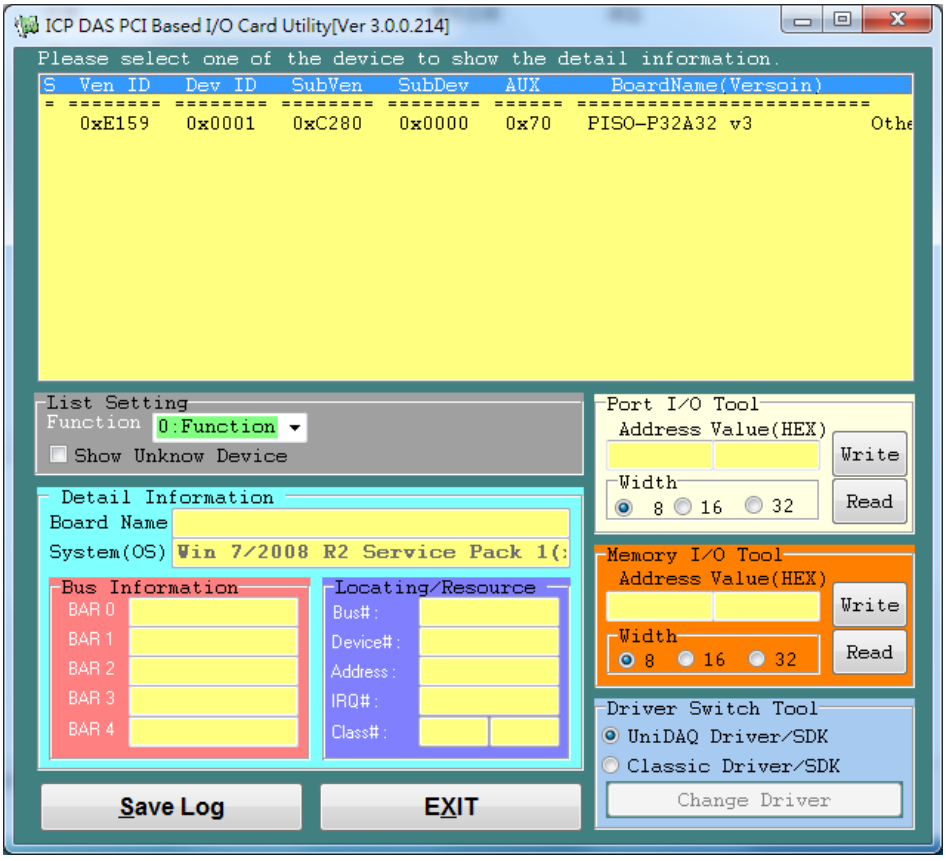


Figure 6-1

We provide all necessary functions as follows:

1. **PIO_DriverInit**(&wBoard, wSubVendor, wSubDevice, wSubAux)
2. **PIO_GetConfigAddressSpace**(wBoardNo,*wBase,*wIrq, *wSubVendor,*wSubDevice, *wSubAux, *wSlotBus, *wSlotDevice)
3. **Show_PIO_PISO**(wSubVendor, wSubDevice, wSubAux)

All functions are defined in PISODIO.H. Refer to Section 6.4 "The I/O Address Map" for more information. The important driver information is given as follows:

Allocated resource information:

- **wBase :** BASE address mapping in this PC
- **wIrq:** Allocated IRQ channel number of this board in this PC

PIO/PISO identification information:

- **wSubVendor:** subVendor ID of this board
- **wSubDevice:** subDevice ID of this board
- **wSubAux:** subAux ID of this board

PC's physical slot information:

- **wSlotBus:** The bus number of the slot used by this board.
- **wSlotDevice:** The device number of the slot used by this board.

6.1.1 PIO_DriverInit

PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux)

wBoards=0 to N	→	Number of boards found in this PC
wSubVendor	→	SubVendor ID of board you are seeking
wSubDevice	→	SubDevice ID of board you are seeking
wSubAux	→	SubAux ID of board to you are seeking

This function can detect all PIO/PISO series boards with your system. Implementations are based on the PCI plug and play mechanism-1. It will find all PIO/PISO series boards installed in this system and save all their resource in the library.

- **Find all PIO/PISO boards in this PC:**

```
/* Step 1: Detect all PIO/PISO series boards in this PC */
wRetVal=PIO_DriverInit(&wBoards, 0xff, 0xff, 0xff);        /*Find all PIO_PISO*/
printf("\nThere are %d PIO_PISO Cards in this PC",wBoards);

if (wBoards==0 ) exit(0);

/* Step2: Save resources for all PIO/PISO boards installed in this PC */
printf("\n-----------------------------------------------------");

for(i=0; i<wBoards; i++)
  {
    PIO_GetConfigAddressSpace(i, &wBase, &wIrq, &wSubVendor, &wSubDevice,
     &wSubAux, &wSlotBus, &wSlotDevice);

     printf("\nCard_%d:wBase=%x,wIrq=%x,subID=[%x,%x,%x],
                  SlotID=[%x,%x]",i,wBase,wIrq,wSubVendor,wSubDevice,
                  wSubAux,wSlotBus,wSlotDevice);

    printf(" --> ");

    ShowPioPiso(wSubVendor,wSubDevice,wSubAux);
  }
```

➢ **Find all PEX-P32C32/P32A32 and PISO-P32C32/P32S32WU/P32A32 series boards in this PC:**

```
/* Step1: Detect all PISO-P32C32/P32A32 boards first */
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x20; /* for PISO_P32C32 */
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x70; /* for PISO_P32A32 */

wRetVal=PIO_DriverInit(&wBoards, wSubVendor, wSubDevice, wSubAux);
printf("There are %d PISO-P32C32 Cards in this PC\n",wBoards);

/* Step2: Save resource of all PISO-P32C32/P32S32WU/P32A32 boards installed in this PC */
for (i=0; i<wBoards; i++)
{
    PIO_GetConfigAddressSpace(i, &wBase, &wIrq, &wID1, &wID2, &wID3, &wID4, &wID5);
    printf("\nCard_%d: wBase=%x, wIrq=%x", i, wBase, wIrq);
    wConfigSpace[i][0]=wBaseAddress;        /* save all resource of this board */
    wConfigSpace[i][1]=wIrq;                /* save all resource of this board */
}
```

➢ **Find all PEX-P64 and PISO-P64 series boards in this PC:**

```
/* Step1: Detect all PISO-P64 boards first */
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x10;  /* for PISO_P64 */

wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
printf("There are %d PISO-P64 Cards in this PC\n",wBoards);

/* Step2: save resource of all PISO-P64 boards installed in this PC */
for (i=0; i<wBoards; i++)
{
    PIO_GetConfigAddressSpace(i,, &wBase, &wIrq, &wID1, &wID2, &wID3, &wID4, &wID5);
     printf("\nCard_%d: wBase=%x, wIrq=%x", i, wBase, wIrq);
     wConfigSpace[i][0]=wBaseAddress;          /* save all resource of this board */
     wConfigSpace[i][1]=wIrq;                  /* save all resource of this board*/
}
```

➢ **Find all PEX-C64 and PISO-C64/A64 series boards in this PC:**

```
/* Step1: Detect all PISO-C64 boards first */
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x00;  /* for PISO-C64 */
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x50;  /* for PISO-A64 */

wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
printf("There are %d PISO-C64 Cards in this PC\n",wBoards);

/* Step2: save resource of all PISO-C64/A64 boards installed in this PC */
for (i=0; i<wBoards; i++)
{
      PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&wID1,&wID2,&wID3,&wID4, &wID5);
       printf("\nCard_%d: wBase=%x, wIrq=%x", i, wBase, wIrq);
       wConfigSpace[i][0]=wBaseAddress;                    /* save all resource of this board */
     wConfigSpace[i][1]=wIrq;                              /* save all resource of this board*/
}
```

6.1.2 PIO_GetConfigAddressSpace

PIO_GetConfigAddressSpace(wBoardNo,*wBase,*wIrq,
*wSubVendor,*wSubDevice, *wSubAux, *wSlotBus,*wSlotDevice)

wBoardNo=0 to N	→	Totally N+1 boards found by PIO_DriveInit(...)
wBase	→	Base address of the board control word
wIrq	→	Allocated IRQ channel number of this board
wSubVendor	→	The subVendor ID of this board
wSubDevice	→	The subDevice ID of this board
wSubAux	→	The subAux ID of this board
wSlotBus	→	The bus number of the slot used by this board
wSlotDevice	→	The device number of the slot used by this board

The user can use this function to save resource information of all PIO/PISO boards installed in this system. Then the application program can directly control all functions of the PIO/PISO series board.

- **Find the configure address space for PEX/PISO-P32C32/P32S32WU/P32A32 series card:**

```
/* Step1: Detect all PISO-P32C32/P32S32WU boards first */
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x20;    /* for PISO_P32C32/ P32S32WU*/
wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x70;    /* for PISO_P32A32*/
wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
printf("There are %d PISO-P32C32 Cards in this PC\n",wBoards);

/* Step2: Save resources for all PISO-P32C32/P32S32WU/P32A32 boards installed in this PC */
for (i=0; i<wBoards; i++)
 {
      PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&t1,&t2,&t3,&t4,&t5);
      printf("\nCard_%d: wBase=%x, wIrq=%x", i,wBase,wIrq);
      wConfigSpace[i][0]=wBaseAddress;          /* save all resource of this board */
      wConfigSpace[i][1]=wIrq;                  /* save all resource of this board*/
}
 /* Step3: Control the PISO-P32C32/P32S32WU/P32A32 directly */
 wBase=wConfigSpace[0][0];          /* get base address the card_0 */
 outport(wBase,1);                  /* enable all D/I/O operation of card_0 */
 wBase=wConfigSpace[1][0];          /* get base address the card_1 */
 outport(wBase,1);                  /* enable all D/I/O operation of card_1 */
```

➢ **Find the configure address space of PEX/PISO-P64 series board:**

```
/* Step1: Detect all PISO-P64 boards first */
 wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x10;  /* for PISO_P64 */
 wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
 printf("There are %d PISO-P64 Cards in this PC\n",wBoards);

 /* Step2: Save resource of all PISO-P64 boards installed in this PC */
 for (i=0; i<wBoards; i++)
 {
      PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&t1,&t2,&t3,&t4,&t5);
      printf("\nCard_%d: wBase=%x, wIrq=%x", i,wBase,wIrq);
      wConfigSpace[i][0]=wBaseAddress;          /* save all resource of this board*/
      wConfigSpace[i][1]=wIrq;                  /* save all resource of this board*/
   }
 /* Step3: Control the PISO-P64 directly */
 wBase=wConfigSpace[0][0];          /* get base address the card_0 */
 outport(wBase,1);                  /* enable all D/I/O operation of card_0 */
 wBase=wConfigSpace[1][0];          /* get base address the card_1 */
outport(wBase,1);                   /* enable all D/I/O operation of card_1 */
```

➢ **Find the configure address space of PEX/PISO-C64 and PISO-A64 series board:**

```
 /* Step1: Detect all PISO-C64 boards first */
 wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x00;  /* for PISO_C64 */
 wSubVendor=0x80; wSubDevice=0x08; wSubAux=0x50;  /* for PISO_A64 */
 wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
 printf("There are %d PISO-C64 Cards in this PC\n",wBoards);

 /* Step2: Save resource of all PISO-C64/A64 boards installed in this PC */
 for (i=0; i<wBoards; i++)
{
      PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&t1,&t2,&t3,&t4,&t5);
      printf("\nCard_%d: wBase=%x, wIrq=%x", i,wBase,wIrq);
      wConfigSpace[i][0]=wBaseAddress;          /* save all resource of this board*/
      wConfigSpace[i][1]=wIrq;                  /* save all resource of this board*/
 }
 /* Step3: Control the PISO-C64/A64 directly */
 wBase=wConfigSpace[0][0];          /* get base address the card_0 */
 outport(wBase,1);                  /* enable all D/I/O operation of card_0 */
 wBase=wConfigSpace[1][0];          /* get base address the card_1 */
 outport(wBase,1);                  /* enable all D/I/O operation of card_1 */
```

6.1.3 Show_PIO_PISO

Show_PIO_PISO(wSubVendor, wSubDevice, wSubAux)

wSubVendor	→	subVendor ID of board you are seeking
wSubDevice	→	subDevice ID of board you are seeking
wSubAux	→	subAux ID of board you are seeking

This function will show a text string for these special subIDs. This text string is the same as defined in PISODIO.H

The demo program is as follows:

```
wRetVal=PIO_DriverInit(&wBoards,0xff,0xff,0xff);    /* find all PIO_PISO series board*/
 printf("\nThere are %d PIO_PISO boards in this PC",wBoards);
 if (wBoards==0 ) exit(0);

 printf("\n-----------------------------------------------------");

 for(i=0; i<wBoards; i++)
 {
     PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&wSubVendor,
                    &wSubDevice,&wSubAux,&wSlotBus,&wSlotDevice);

     printf("\nCard_%d:wBase=%x,wIrq=%x,subID=[%x,%x,%x],
                    SlotID=[%x,%x]",i,wBase,wIrq,wSubVendor,wSubDevice,
                    wSubAux,wSlotBus,wSlotDevice);

     printf(" --> ");
     ShowPioPiso(wSubVendor,wSubDevice,wSubAux);
  }
```

6.2 The Assignment of I/O Address

The Plug and Play BIOS will assign the proper I/O address to a PIO/PISO series card. If there is only one PIO/PISO board, the user can identify the board as card_0. If there are two PIO/PISO boards in the system, it is very difficult to identify which board is card_0. The software driver can support a maximum of 16 boards. Therefore, the user can install 16 PIO/PSIO series cards onto one PC system. The methods used to find and identify card_0 and card_1 is demonstrated below.

The simplest way to identify which card is card_0 is to use wSlotBus and wSlotDevice in the following manner:

Step 1: Remove all PEX/PISO-P32x32/x64 Series board from the PC.

Step 2: Install one PEX/PISO-P32x32/x64 Series board into the PC's PCI_slot1, run **PIO_PISO.EXE**. Then record the **"wSlotBus1"** and **"wSlotDevice1"** information in the **"Locating/Resource"** area.

Step 3: Remove all PEX/PISO-P32x32/x64 Series board from the PC.

Step 4: Install one PEX/PISO-P32x32/x64 Series board into the PC's PCI_slot2 and run PIO_PISO.EXE. Then record the **"wSlotBus1"** and **"wSlotDevice1"** information in the **"Locating/Resource"** area.

Step 5: Repeat **Steps(3) and (4)** for every PCI_slot and record all information from **"wSlotBus1"** and **"wSlotDevice1"**.

The records may look similar to the table follows:

Table 6-3

PC's PCI Slot	Locating/Resource	
	wSlotBus (Bus#)	wSlotBus (Device#)
Slot_1	0	0x07
Slot_2	0	0x08
Slot_3	0	0x09
Slot_4	0	0x0A
PCI-BRIDGE		
Slot_5	1	0x0A
Slot_6	1	0x08
Slot_7	1	0x09
Slot_8	1	0x07

The above procedure will record all the "wSlotBus" and "wSlotBus" information on a PC. These values will be mapped to this PC's physical slot and this mapping will not be changed for any PIO/PISO cards. Therefore, this information can be used to identify the specified PIO/PISO card by following steps:

Step1: Using the "wSlotBus" and "wSlotDevice" information from Table 6-4.

Step2: Enter the board number into PIO_GetConfigAddressSpace(…) function to get the information for a specific card, especially the "wSlotBus" and "wSlotDevice" details.

Step3: Identify the specific PIO/PISO card by comparing the data of the "wSlotBus" and "wSlotDevice" from Step1 and Step2.

Note:

Normally the card installed in slot 0 is card0 and the card installed in slot1 is card1 for PIO/PISO series cards.

6.3 Enabling I/O Operation

When the PC is first powered-on, DI/DO operations are disabled. The enable/disable of DI/DO is controlled by the RESET\ signal. The powered-on states are given as follows:

- All DI/DO operations are disabled
- All DO latch registers are clear

The DI/DO ports must be enabled by program before using. For example:

Step 1: Enable all DI/DO operation.

Step 2: Read from DI or write to DO

Refer to DEMO1.C for DOS demo program.

6.4 The I/O Address Map

The I/O address of the PIO/PISO series board is automatically assigned by the main board ROM BIOS. The I/O address can also be re-assigned by the user, but it is strongly recommended that the I/O address is not changed by user. The Plug and Play BIOS will assign an appropriate I/O address to each PIO/PISO series board. The I/O addresses of the PEX/PISO-P32x32 and PEX/PISO-x64 Series board are as follows, and are based on the base address of each board.

6.4.1 I/O Mapping for the PISO-P32x32 Series

The I/O addresses are mapped for PISO-P32C32(U)(-5V)/P32S32WU/P32A32(U)(-5V) and PEX-P32C32/P32A32 Series board, as follows:

Address	Read	Write
Wbase+0	-	RESET\ control register
Wbase+2	Same	Aux control register
Wbase+3	Same	Aux data register
Wbase+5	Same	INT mask control register
Wbase+7	Aux pin status register	-
Wbase+0x2a	Same	INT polarity control register
Wbase+0xc0	Read data from DI_0 ~ DI_7	Write data to DO_0 to DO_7
Wbase+0xc4	Read data from DI_8 ~ DI_15	Write data to DO_8 to DO_15
Wbase+0xc8	Read data from DI_16 ~ DI_23	Write data to DO_16 to DO_23
Wbase+0xcc	Read data from DI_24 ~ DI_31	Write data to DO_24 to DO_31
Wbase+0xe0	Read DO_0 to DO_7 Readback	-
Wbase+0xe4	Read DO_8 to DO_15 Readback	-
Wbase+0xe8	Read DO_16 to DO_23 Readback	-
Wbase+0xec	Read DO_24 to DO_31Readback	-
Wbase+0xd0	Read the Card ID	-

Note:

Refer to Section 6.1 "How to Find the I/O Address" for more information about wBase.

➢ Digital Output/Digital Input:

```
outportb(wBase+0xc0,Val);          /* write to DO 0~7          */
outportb(wBase+0xc4,Val);          /* write to DO 8~15         */
outportb(wBase+0xc8,Val);          /* write to DO 16~23        */
outportb(wBase+0xcc,Val);          /* write to DO 24~31        */

Val=inportb(wBase+0xc0);           /* read from DI 0~7         */
Val=inportb(wBase+0xc4);           /* read from DI 8~15        */
Val=inportb(wBase+0xc8);           /* read from DI 16~23 */
Val=inportb(wBase+0xcc);           /* read from DI 24~31 */
```

➢ DO Readback Register:

```
Val=inportb(wBase+0xe0);           /* read DO Readback from DO 0~7 */
Val=inportb(wBase+0xe4);           /* read DO Readback from DO 8~15 */
Val=inportb(wBase+0xe8);           /* read DO Readback from DO 16~23 */
Val=inportb(wBase+0xec);           /* read DO Readback from DO 24~31 */
```

➢ Card ID Register:

```
wCardID = inportb(wBase+0xD0);     /* read Card ID(0x0~0x15)    */
```

Note:

The Card ID function supports the following models:
PEX-P32C32, PISO-P32C32U(-5V) (Ver1.1 or above), PISO-P32S32WU (Ver 1.5 or above), PEX-P32A32 and PISO-P32A32U(-5V).

6.4.2 I/O Mapping for the PISO-P64 Series

The I/O addresses are mapped for PISO-P64(U)(-24V) and PEX-P64 Series board, as follows:

Address	Read	Write
wBase+0	-	RESET\ control register
wBase+2	Same	Aux control register
wBase+3	Same	Aux data register
WBase+5	Same	INT mask control register
Wbase+7	Aux pin status register	-
Wbase+0x2a	Same	INT polarity control register
Wbase+0xc0	Read data from DI_0 ~ DI_7	Reserved
Wbase+0xc4	Read data from DI_8 ~ DI_15	Reserved
Wbase+0xc8	Read data from DI_16 ~ DI_23	Reserved
Wbase+0xcc	Read data from DI_24 ~ DI_31	Reserved
WBase+0xd0	Read data from DI_32 ~ DI_39	Reserved
WBase+0xd4	Read data from DI_40 ~ DI_47	Reserved
WBase+0xd8	Read data from DI_48 ~ DI_55	Reserved
WBase+0xdc	Read data from DI_56 ~ DI_63	Reserved
WBase+0xf0	Read the Card ID	-

Note:

Refer to Section 6.1 "How to Find the I/O Address" for more information about wBase.

➢ Digital Input:

```
Val=inportb(wBase+0xc0);          /* read from DI 0~7        */
Val=inportb(wBase+0xc4);          /* read from DI 8~15       */
Val=inportb(wBase+0xc8);          /* read from DI 16~23 */
Val=inportb(wBase+0xcc);          /* read from DI 24~31 */

Val=inportb(wBase+0xd0);          /* read from DI 32~39    */
Val=inportb(wBase+0xd4);          /* read from DI 40~47    */
Val=inportb(wBase+0xd8);          /* read from DI 48~55    */
Val=inportb(wBase+0xdc);          /* read from DI 56~63    */
```

➢ Card ID Register:

```
CardID = inportb(wBase+0xF0);          /* read Card ID(0x0~0x15)    */
```

Note:

The PEX-P64 and PISO-P64U(-24V) (Ver1.0 or above) supports the Card ID function.

6.4.3 I/O Mapping for the PISO-C64/A64 Series

The I/O addresses are mapped for PEX-C64 and PISO-C64(U)/A64(U) Series board, as follows:

Address	Read	Write
wBase+0	-	RESET\ control register
wBase+2	Same	Aux control register
wBase+3	Same	Aux data register
wBase+5	Same	INT mask control register
wBase+7	Aux pin status register	-
wBase+0x2a	Same	INT polarity control register
wBase+0xc0	Read DO_0 to DO_7 Readback	Write data to DO_0 to DO_7
wBase+0xc4	Read DO_8 to DO_15 Readback	Write data to DO_8 to DO_15
wBase+0xc8	Read DO_15 to DO_23 Readback	Write data to DO_16 to DO_23
wBase+0xcc	Read DO_24 to DO_31 Readback	Write data to DO_24 to DO_31
wBase+0xd0	Read DO_32 to DO_39 Readback	Write data to DO_32 to DO_39
wBase+0xd4	Read DO_40 to DO_47 Readback	Write data to DO_40 to DO_47
wBase+0xd8	Read DO_48 to DO_55 Readback	Write data to DO_48 to DO_55
wBase+0xdc	Read DO_56 to DO_63 Readback	Write data to DO_56 to DO_63
WBase+0xf0	Read the Card ID	-

Note:

Refer to Section 6.1 "How to Find the I/O Address" for more information about wBase.

➢ Digital Output:

```
outportb(wBase+0xc0,Val);          /* write to DO 0~7     */
outportb(wBase+0xc4,Val);          /* write to DO 8~15    */
outportb(wBase+0xc8,Val);          /* write to DO 16~23 */
outportb(wBase+0xcc,Val);          /* write to DO 24~31 */

outportb(wBase+0xd0,Val);          /* write to DO 32~39 */
outportb(wBase+0xd4,Val);          /* write to DO 40~47 */
outportb(wBase+0xd8,Val);          /* write to DO 48~55 */
outportb(wBase+0xdc,Val);          /* write to DO 56~63 */
```

➢ DO Readback Register:

```
Val=inportb(wBase+0xc0);          /* read DO Readback from DO 0~7 */
Val=inportb(wBase+0xc4);          /* read DO Readback from DO 8~15 */
Val=inportb(wBase+0xc8);          /* read DO Readback from DO 16~23 */
Val=inportb(wBase+0xcc);          /* read DO Readback from DO 24~31 */

Val=inportb(wBase+0xd0);          /* read DO Readback from DO 32~39 */
Val=inportb(wBase+0xd4);          /* read DO Readback from DO 40~47 */
Val=inportb(wBase+0xd8);          /* read DO Readback from DO 46~55 */
Val=inportb(wBase+0xdc);          /* read DO Readback from DO 56~63 */
```

➢ Card ID Register:

```
CardID = inportb(wBase+0xF0);          /* read Card ID(0x0~0x15)    */
```

Note:

The PEX-C64, PISO-C64U and PISO-A64U (Ver1.0 or above) supports the Card ID function.

6.4.4 RESET\ Control Register

(Read/Write): wBase+0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	RESET\

When the PC is first powered-on, the RESET\ signal is in Low-state. **This will disable all DI/DO operations.** The user has to set the RESET\ signal to High-state before any DI/DO commands are given.

```
outportb(wBase,1);      /*  RESET\ = High → all DI/DO are enabled now */
outportb(wBase,0);      /*  RESET\ = Low → all DI/DO are disabled now */
```

6.4.5 AUX Control Register

(Read/Write): wBase+2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Aux7	Aux6	Aux5	Aux4	Aux3	Aux2	Aux1	Aux0

Aux?=0→ this Aux is used as a DI
Aux?=1→ this Aux is used as a DO

When the PC is first powered-on, All Aux? signals are in Low-state. All Aux? are designed as DI for all PIO/PISO series boards. Please set all Aux? to DI state.

6.4.6 AUX Data Register

(Read/Write): wBase+3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Aux7	Aux6	Aux5	Aux4	Aux3	Aux2	Aux1	Aux0

When the Aux? is used as DO, the output state is controlled by this register. This register is designed for future applications, Please do not change this register.

6.4.7 INT Mask Control Register

(Read/Write): wBase+5

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	0	0

This register is designed for future applications, Please do not change this register.

6.4.8 AUX Status Register

(Read): wBase+7

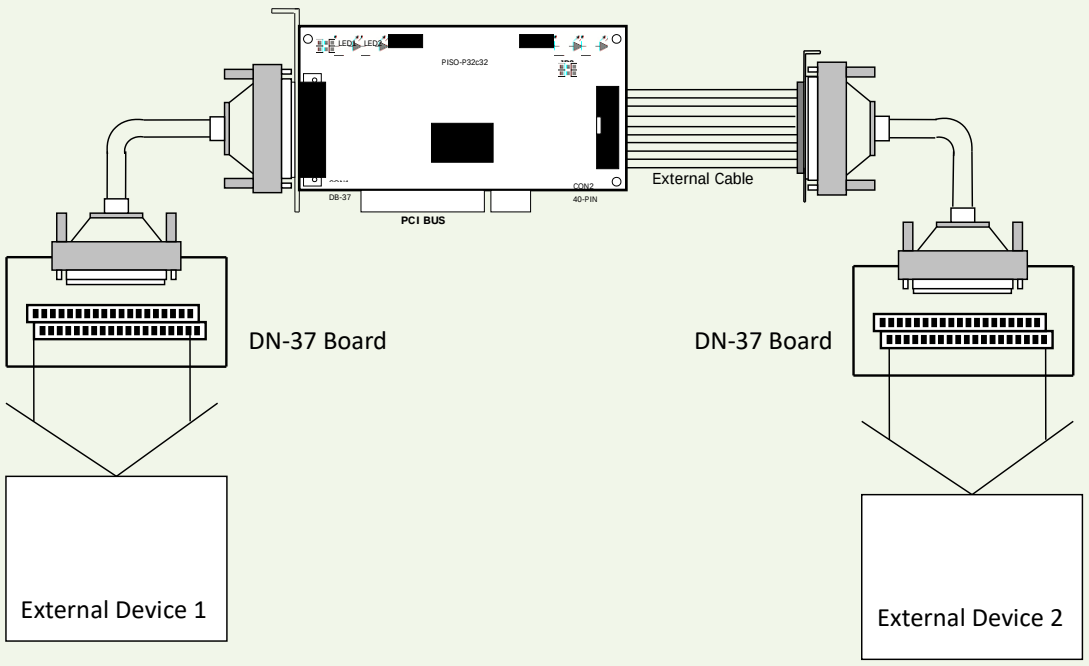
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Aux7	Aux6	Aux5	Aux4	Aux3	Aux2	Aux1	Aux0

Aux0-3=reserved, aux4-7=Aux-ID.

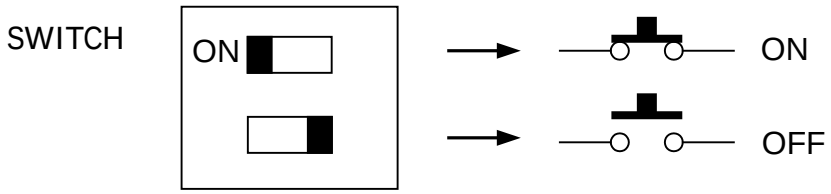
7. The Digital I/O Applications

7.1 PISO-P32x32 Series Board

Figure 7-1-1: Digital Inputs/Outputs for PEX-P32C32/P32A32 and PISO-P32C32/P32S32WU/P32A32.



- Figure 7-1-2 (P32C32/P32S32WU) shows the circuit diagram of external device 1
- Figure 7-1-3 (P32A32) shows the circuit diagram of external device 1
- Figure 7-1-4 (P32C32/P32S32WU) shows the circuit diagram of external device 2
- Figure 7-1-5 (P32A32) shows the circuit diagram of external device 2



7.1.1 The Circuit Diagram of Digital Output

➢ **Here's the circuit diagram for external device 1:**

Figure 7-1-2: The circuit diagram of external device 1 for the digital outputs of PEX-P32C32 and PISO-P32C32/P32S32WU series board.

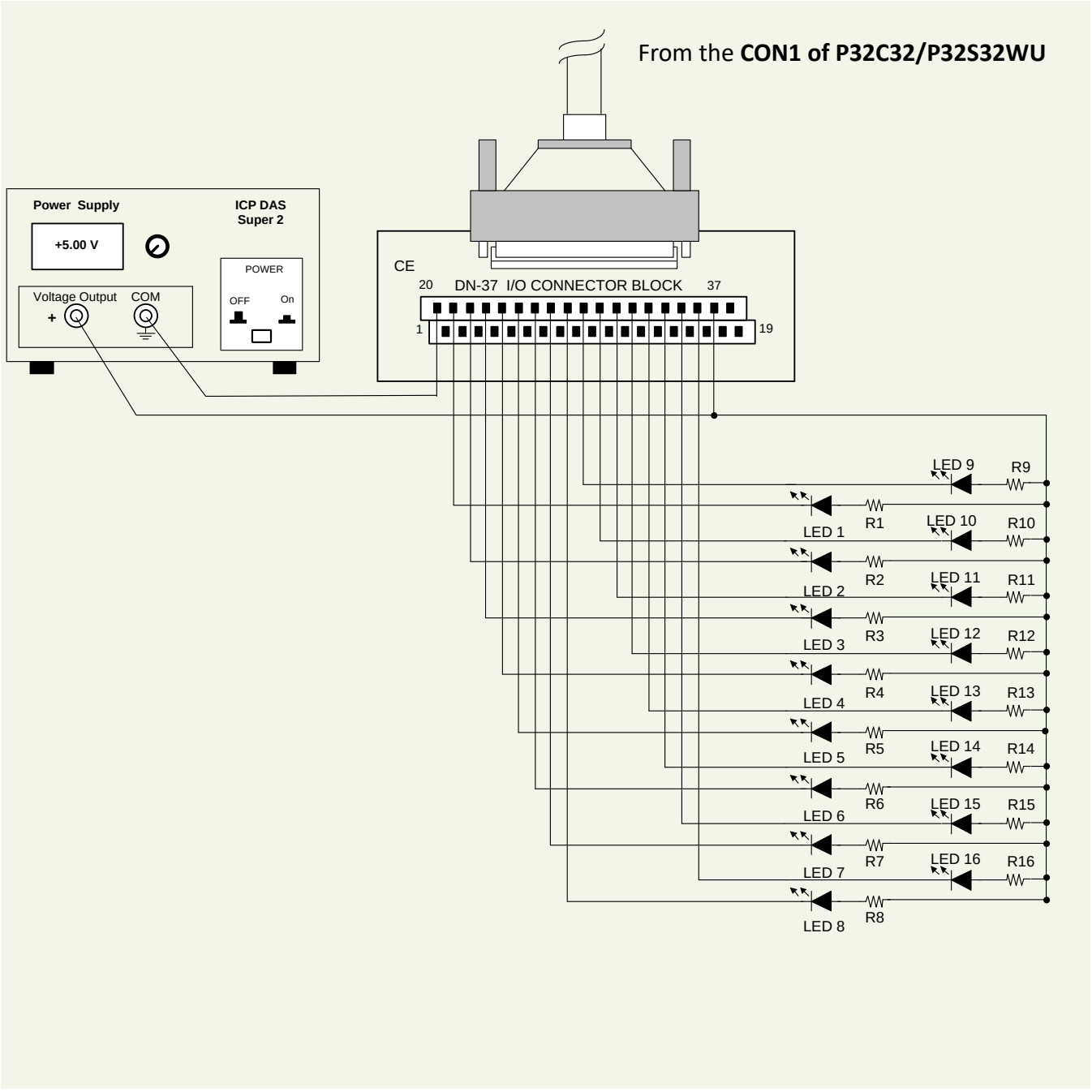
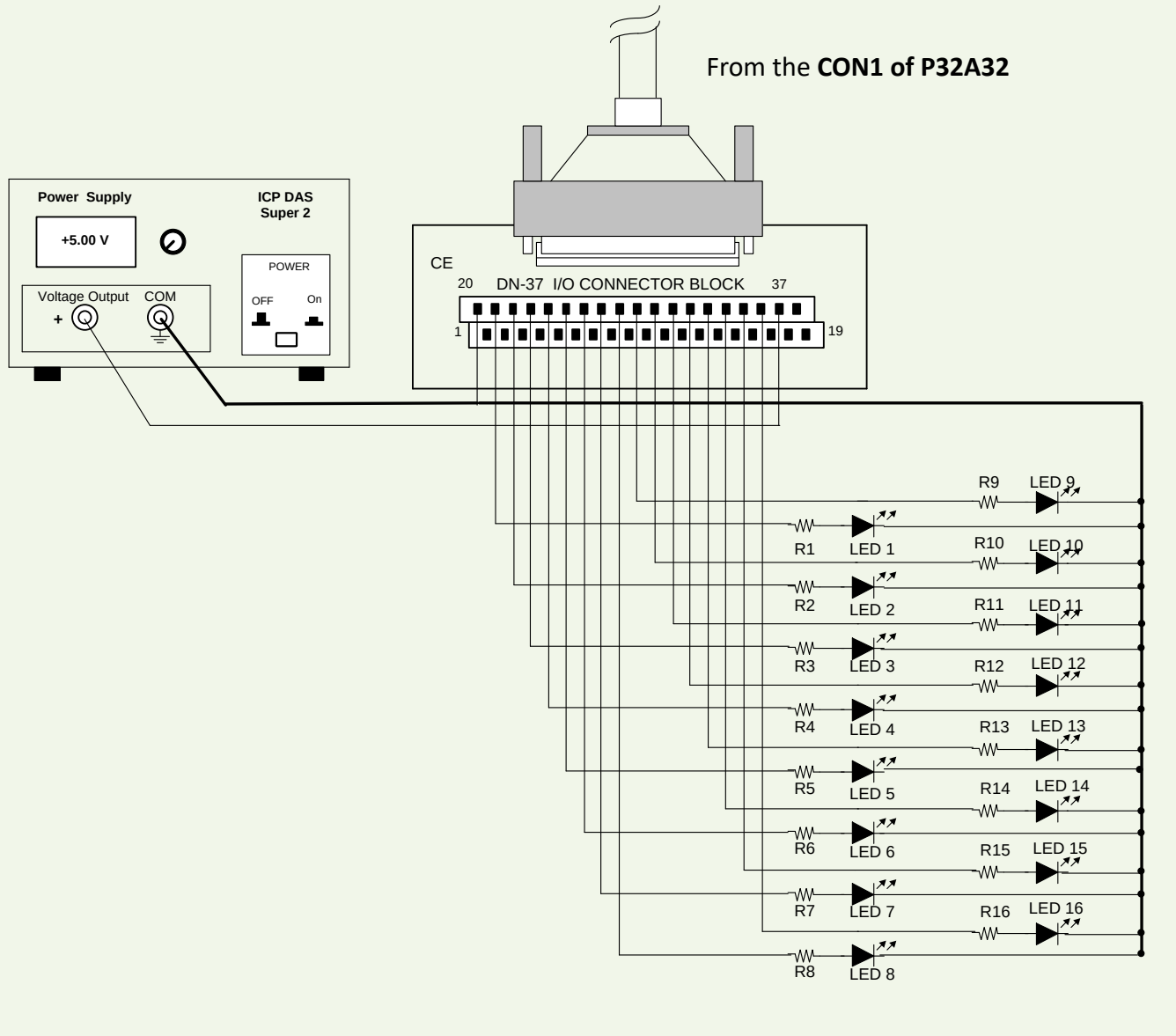


Figure 7-1-3: The circuit diagram of external device 1 for the digital outputs of PEX-P32A32 and PISO-P32A32 series board.



- Resistance for R1 to R16 is 330 Ohm.
- LEDs 1 to 6 are light-emitting diodes.
- Pin-1/20 are the GND signal for DI<0…15> and DO<0…15>.
  Pin-1/18/19/20 are the GND signal for **PISO-P32S32WU** DI<0…15> and DO<0…15>.
- Pin-18/37 are the voltage (+) signal for DI<0…15> and DO<0…15> (input 9 to 24 V_{DC}).
- Pin-37 are the voltage (+) signal for **PISO-P32S32WU** DI<0…15> and DO<0…15> (input 9 to 24 V_{DC}).

➢ **Here's the circuit diagram for external device 2:**

Figure 7-1-4: The circuit diagram of external device 2 for the digital outputs of PEX-P32C32 and PISO-P32C32/P32S32WU series board.

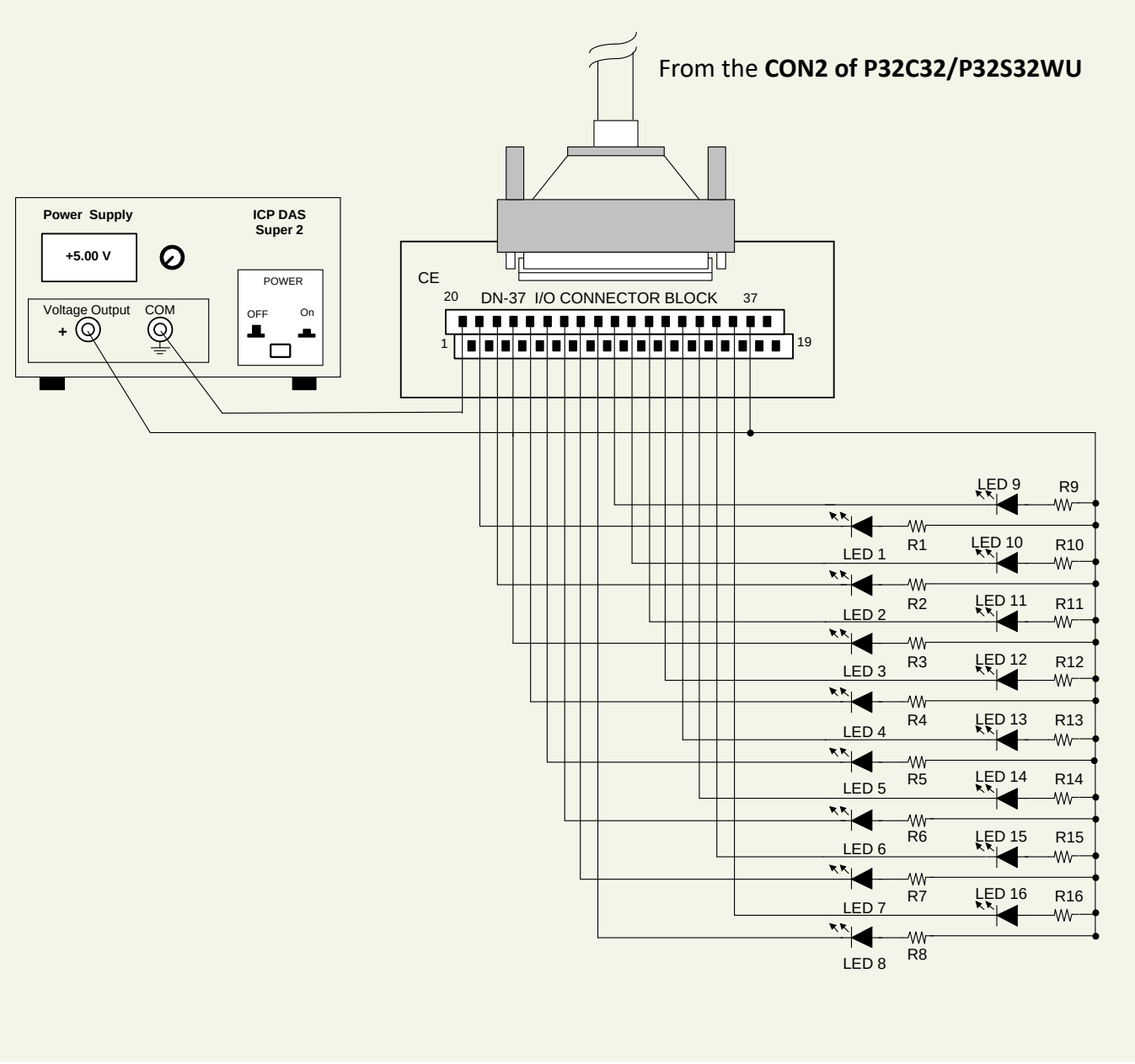
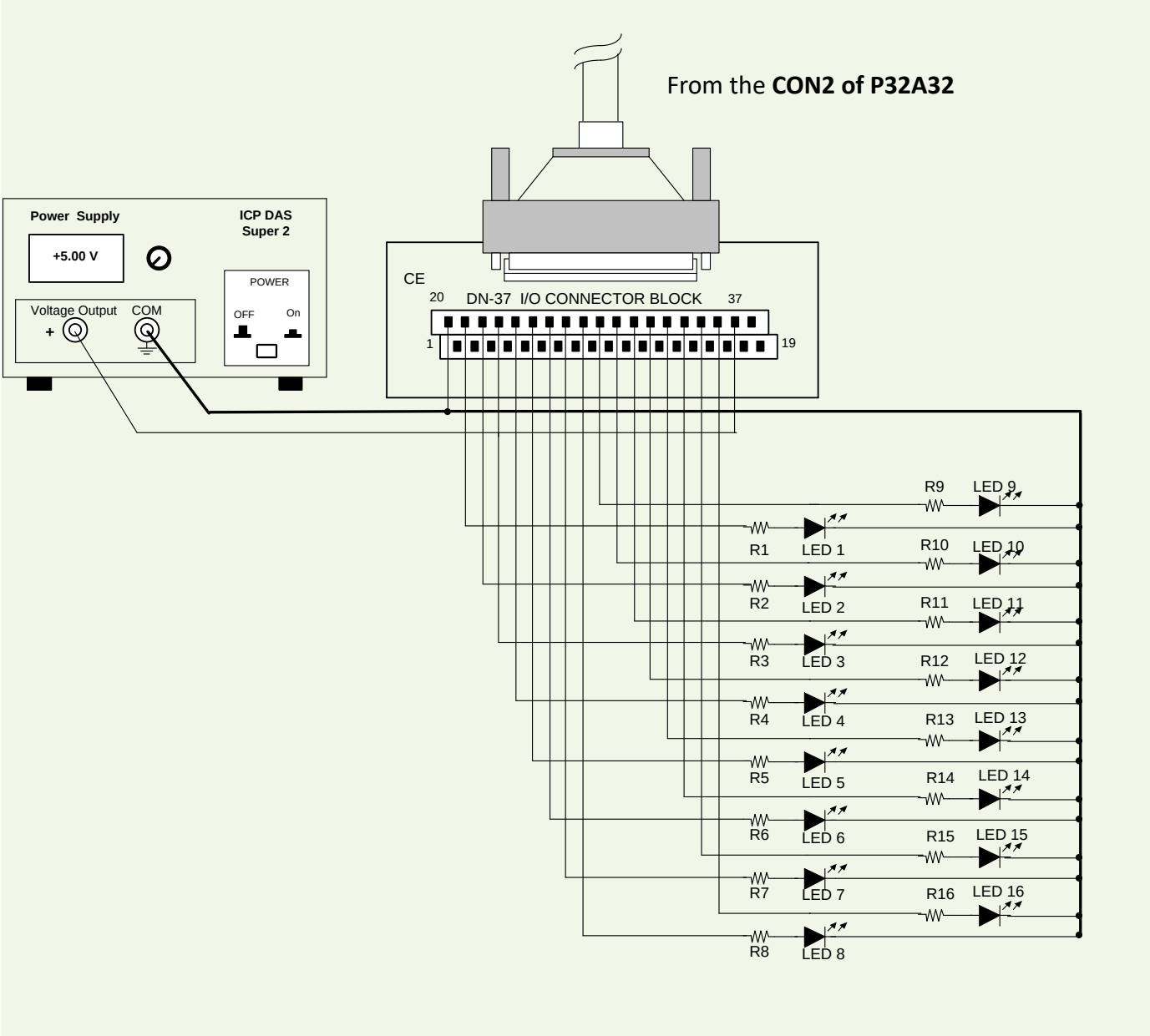


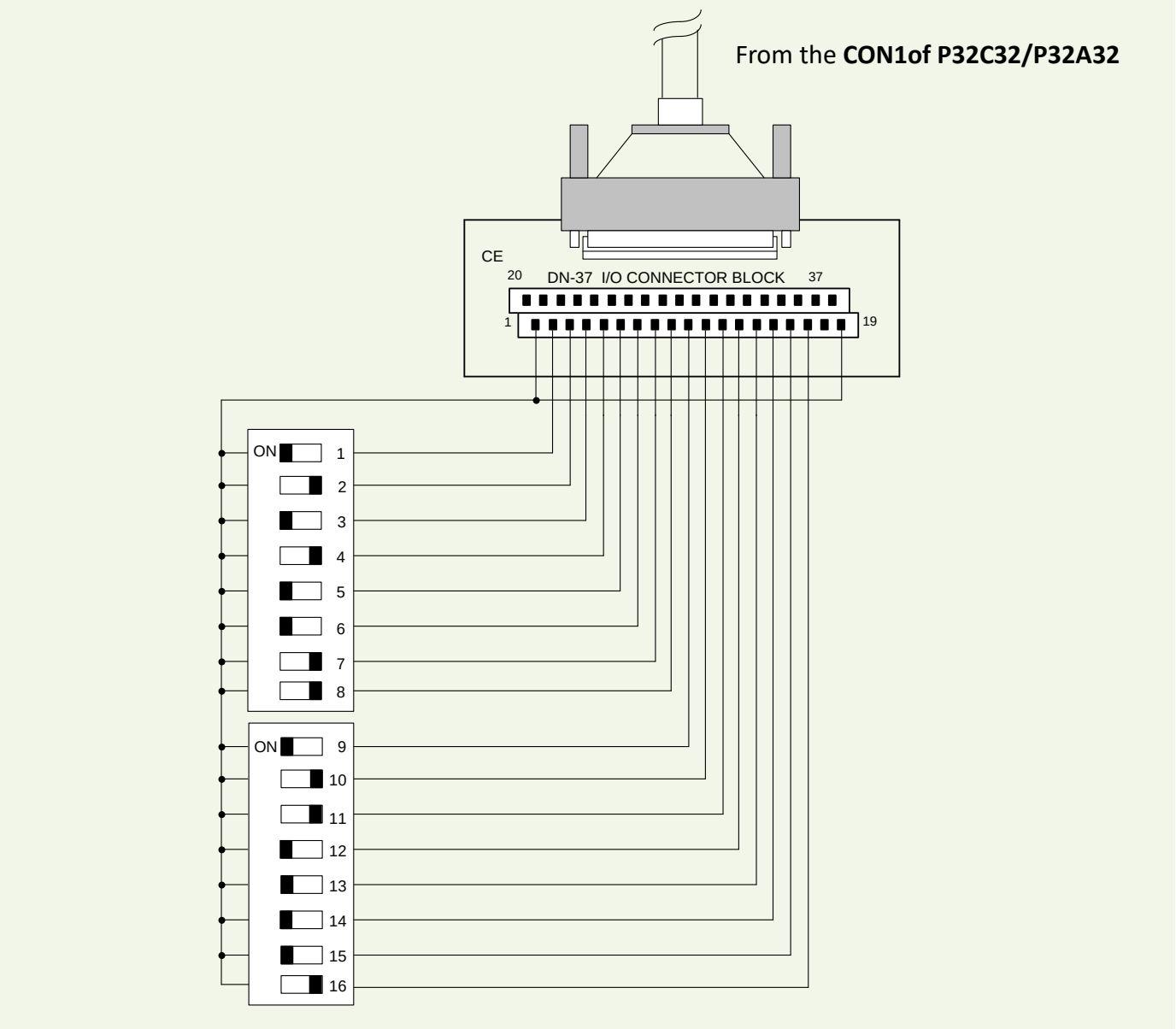
Figure 7-1-5: The circuit diagram of external device 2 for the digital outputs of PEX-P32A32 and PISO-P32A32 series board.



- Resistance for R17 to R32 is 330 Ohm.
- LEDs 17 to 32 are light emitting diodes.
- Pin-1/20 are the GND signal for DI<16…31> and DO<16…31>.
  Pin-1/18/19/20 are the GND signal for **PISO-P32S32WU** DI<16…31> and DO<16…31>.
- Pin-18/37 are the voltage (+) signal for DI<16…31> and DO<16…31> (input 9 ~ 24 V_{DC}).
  Pin-37 are the voltage (+) signal for **PISO-P32S32WU** DI<16…31> and DO<16…31> (input 9 to 24 V_{DC}).

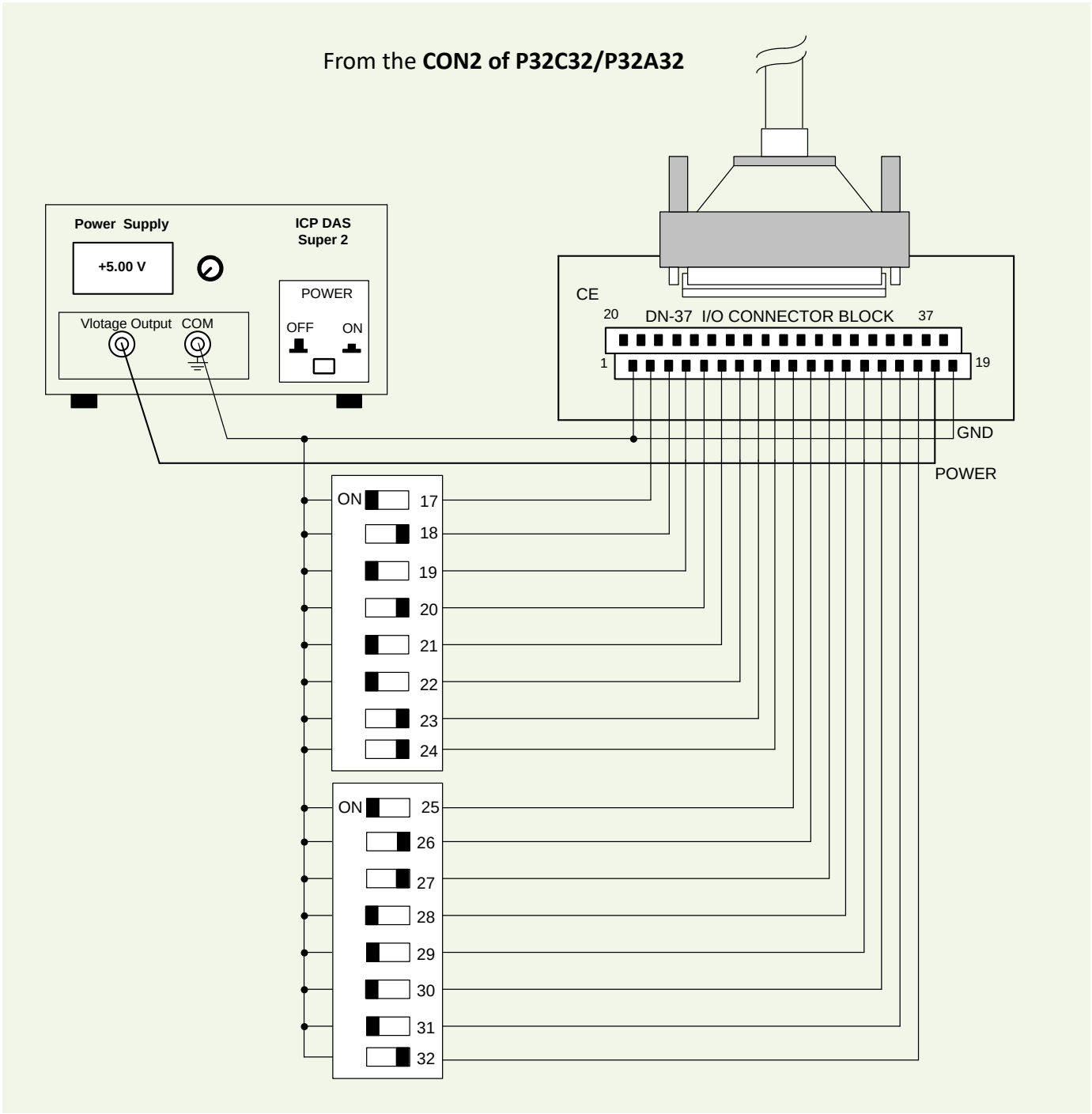
7.1.2 The Circuit Diagram of Digital Input

Figure 7-1-6: The circuit diagram of external device 1 for the DI of PEX-P32C32/P32A32 and PISO-P32C32/P32A32 series board.



- The DI of CON1 for PEX-P32C32/P32A32 and PISO-P32C32/P32A32 is set to **internal power**.
- Pin-19 is the GND signal for DI<0…15>.
- Pin-18 is the voltage (+) signal for DI<0…15> (input 9 to 24 V_{DC}).

Figure 7-1-7: The circuit diagram of external device 2 for the DI of PEX-P32C32/P32A32 and PISO-P32C32/P32A32 series board.

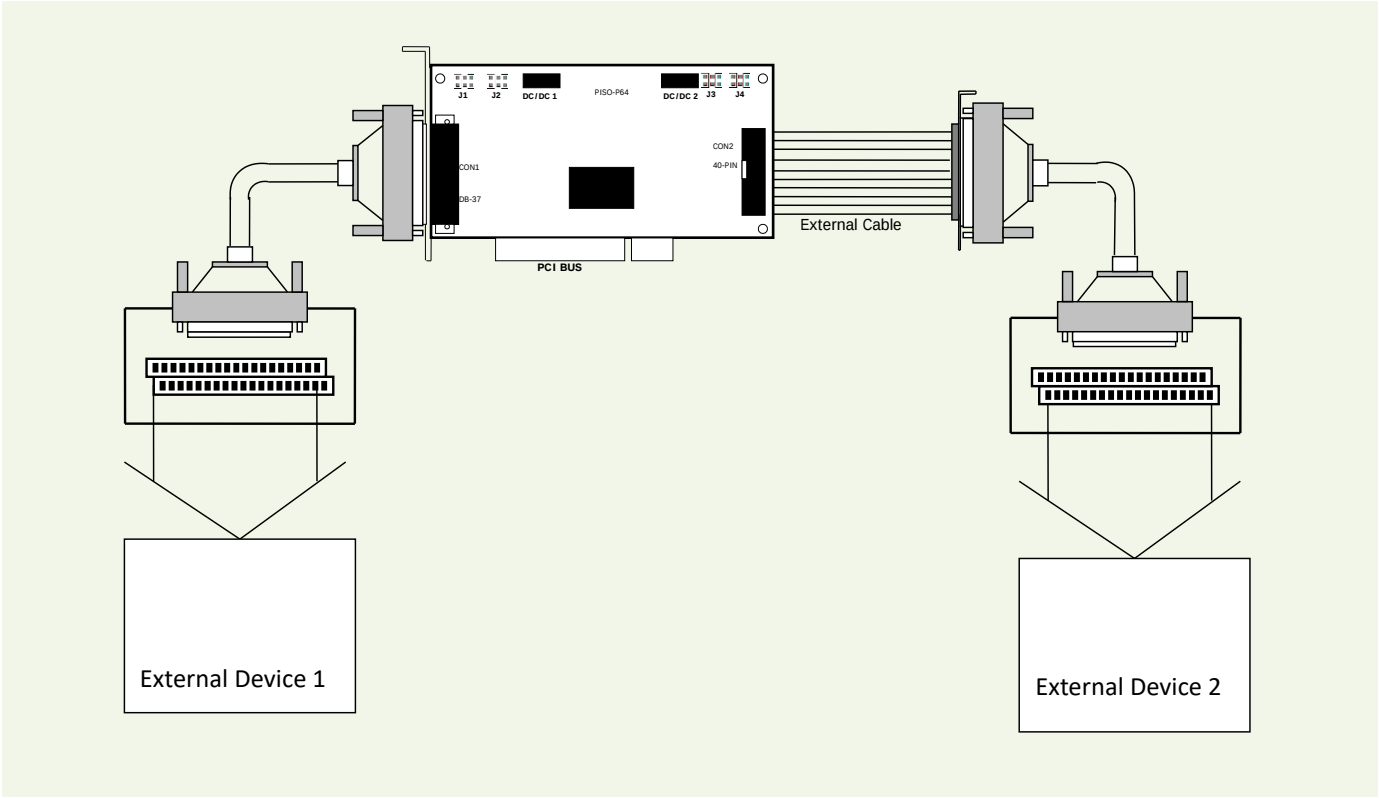


- The DI of CON2 of PEX-P32C32/P32A32 and PISO-P32C32/P32A32 is set to **external power.**
- Pin-19 is the GND signal for DI<16…31>.
- Pin-18 is the voltage (+) signal for DI<16…31> (input 9 to 24 V_{DC}).

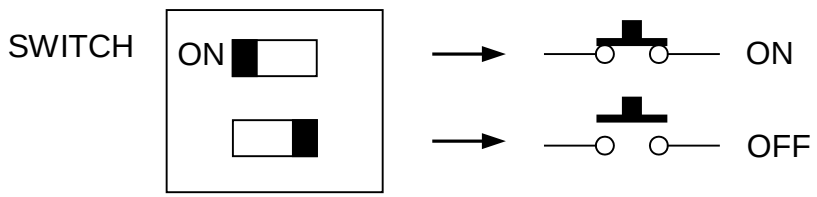
7.2 PEX/PISO-P64 Series

7.2.1 The Circuit Diagram of Digital Input

Figure 7-2-1: Digital inputs for PEX-P64 and PISO-P64 series board.

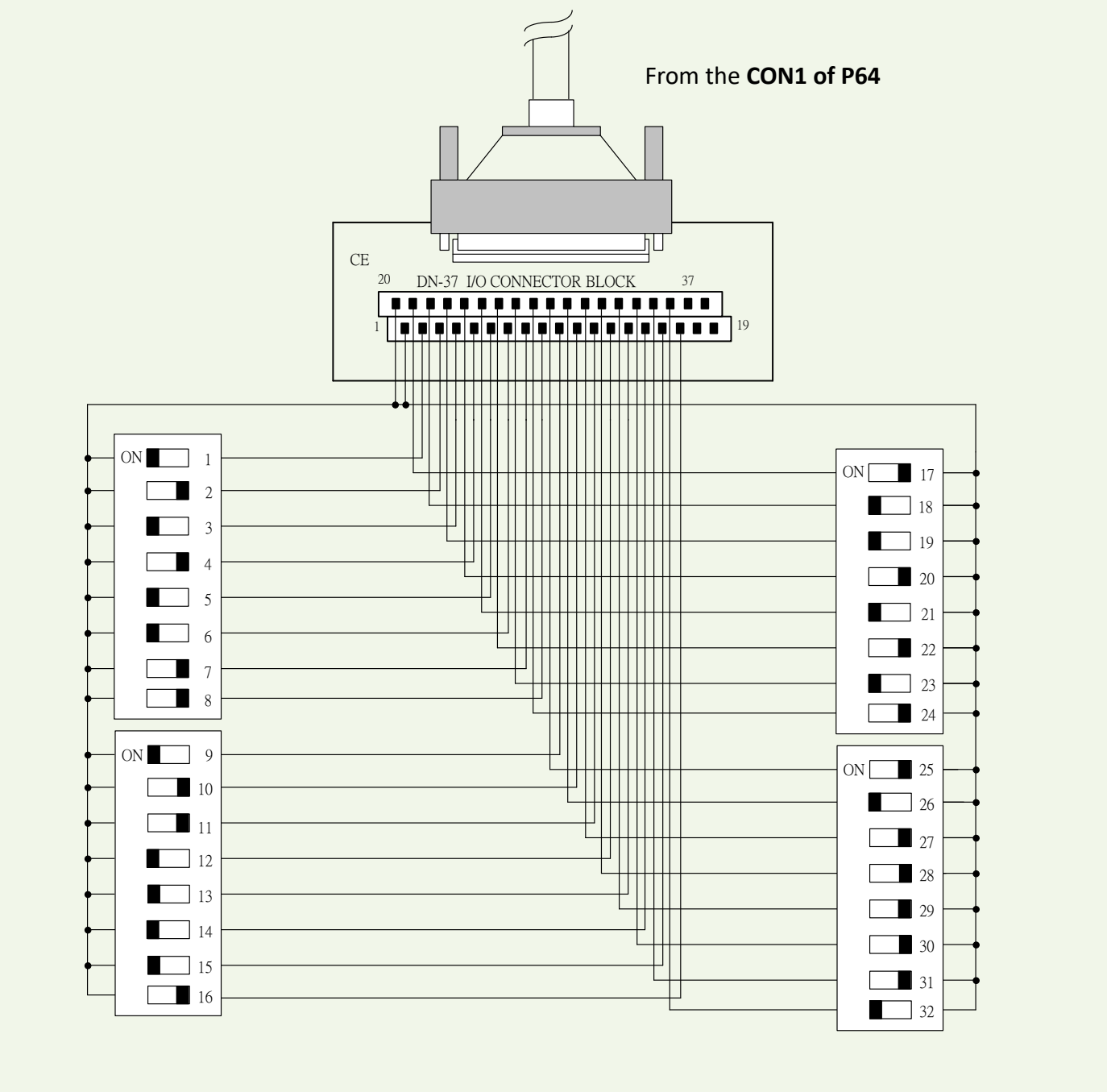


- Refer to Figure 7-2-2 for the circuit diagram of external device 1.
- Refer to Figure 7-2-3 for the circuit diagram of external device 2.



➢ **Here's the circuit diagram for external device 1:**

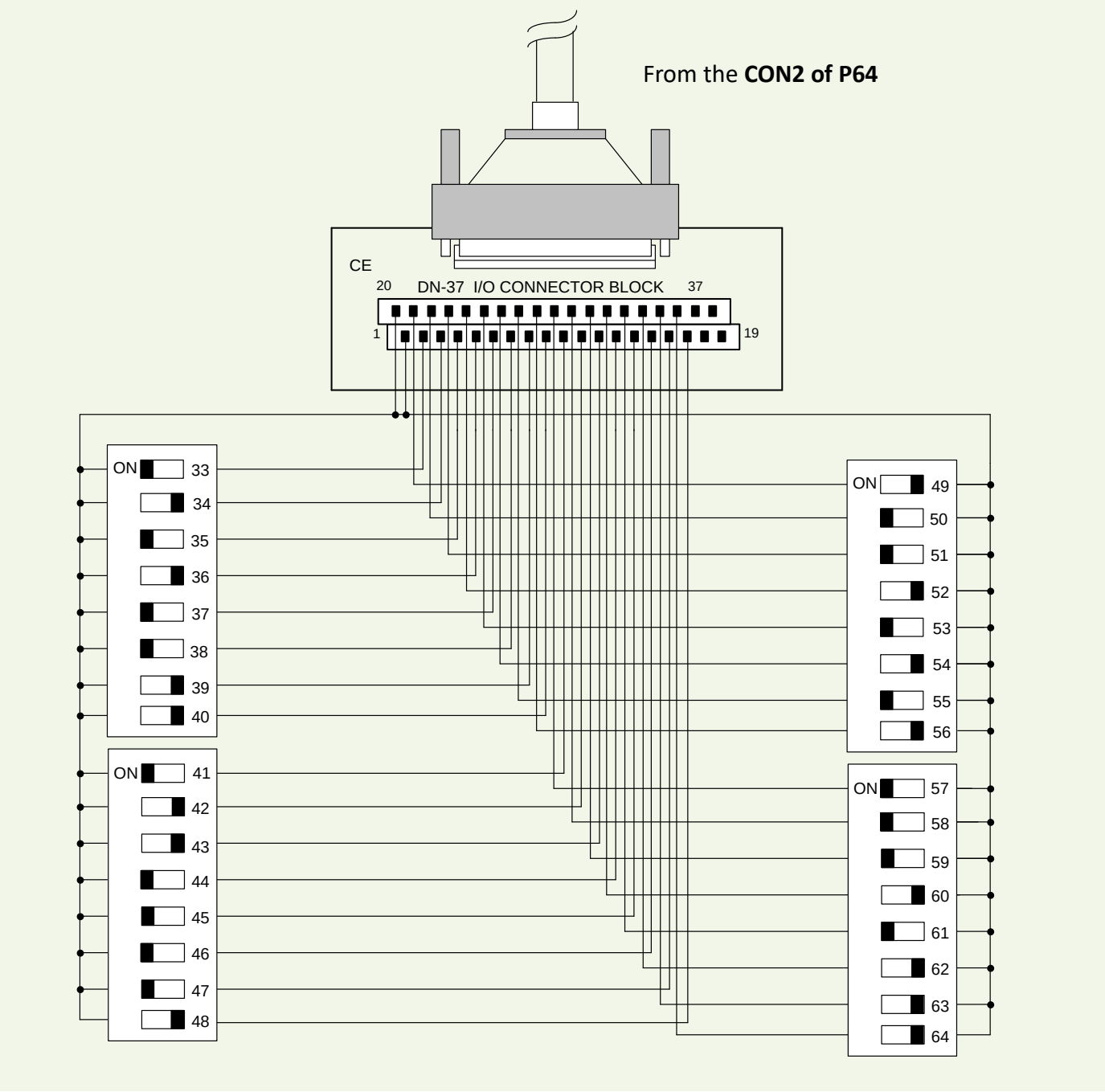
Figure 7-2-2: The circuit diagram of external device 1 for the digital inputs of PEX-P64 and PISO-P64 series board.



- The DI of CON1 of PISO-P64 series is set to **internal power**.

➢ **Here's the circuit diagram for external device 2:**

Figure 7-2-3: The circuit diagram of external device 2 for the digital inputs of PISO-P64 series board.

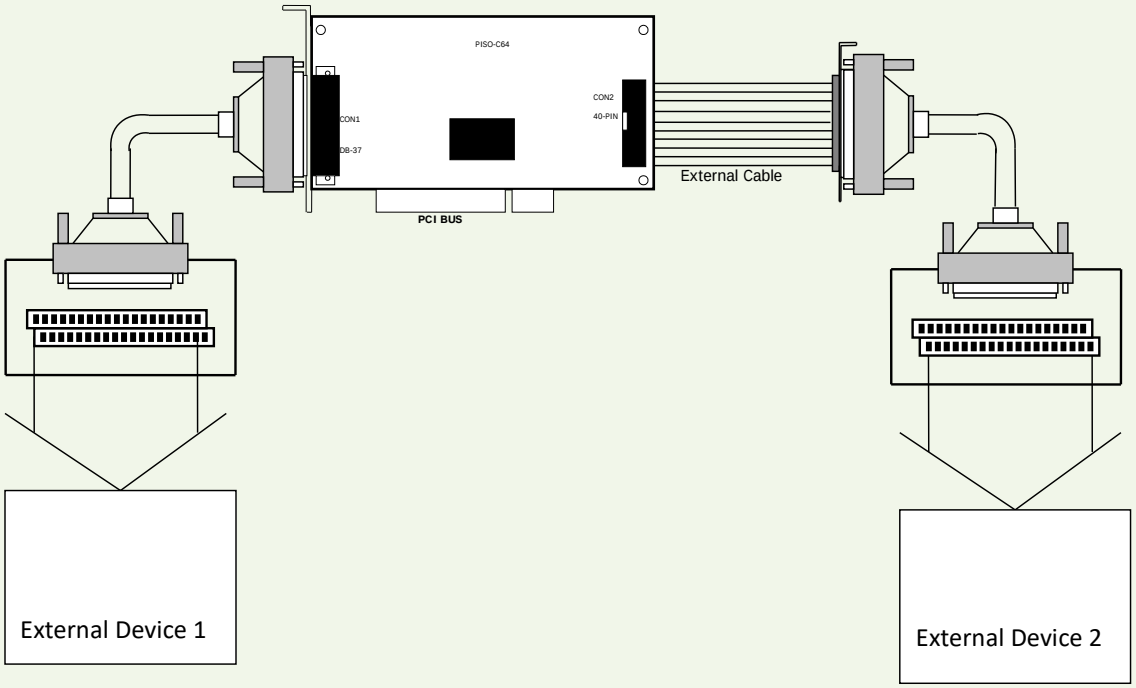


- The DI of CON2 of PISO-P64 series is set to internal power.

7.3 PEX/PISO-C64 and PISO-A64 Series

7.3.1 The Circuit Diagram of Digital Output

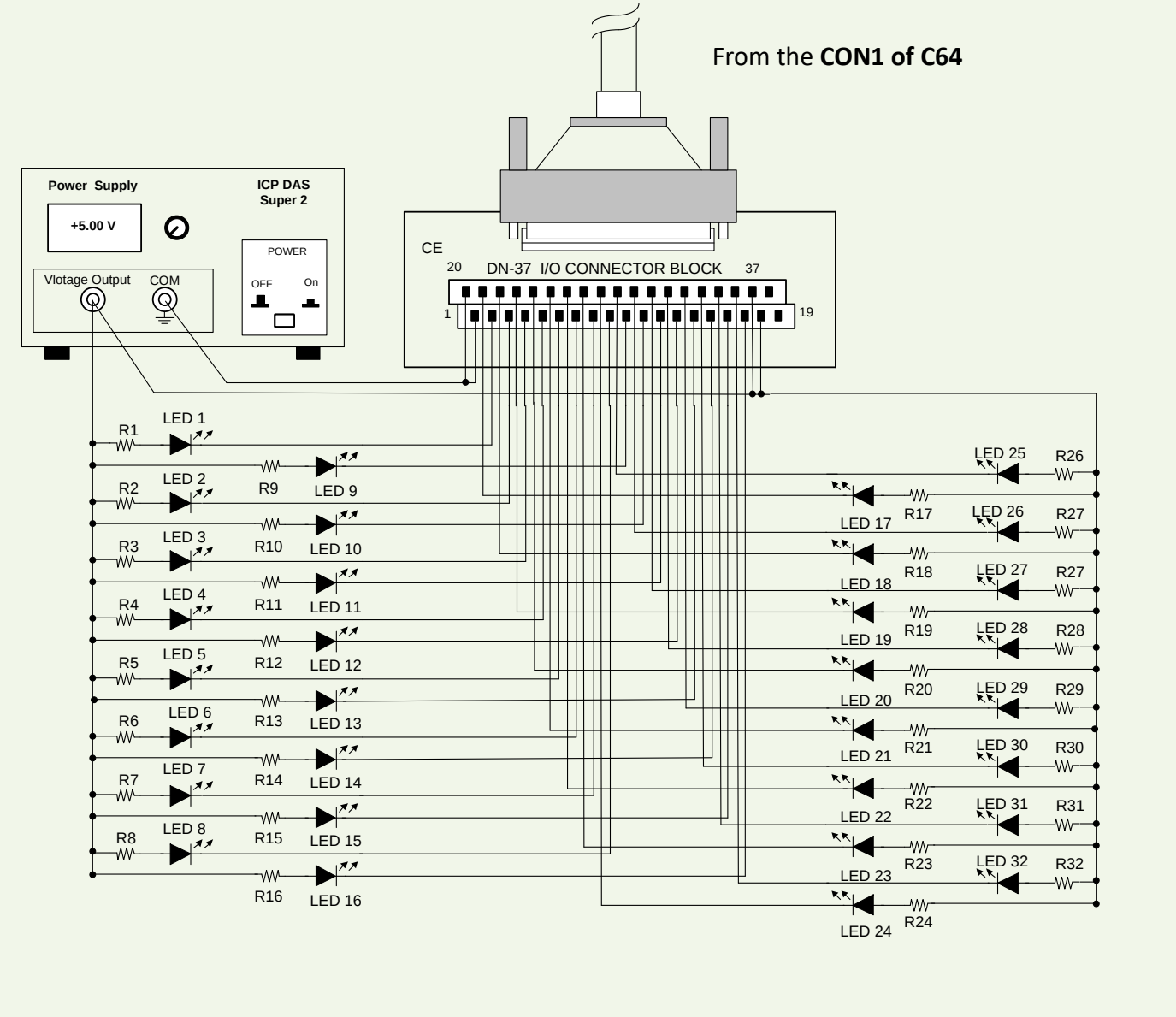
Figure 7-3-1: The example of digital outputs for PEX-C64 and PISO-C64/A64 series board.



- Refer to Figure 7-3-2 (C64 series) for the circuit diagram of external device 1.
- Refer to Figure 7-3-3 (A64) for the circuit diagram of external device 1.
- Refer to Figure 7-3-4 (C64 series) for the circuit diagram of external device 2.
- Refer to Figure 7-3-5 (A64) for the circuit diagram of external device 2.

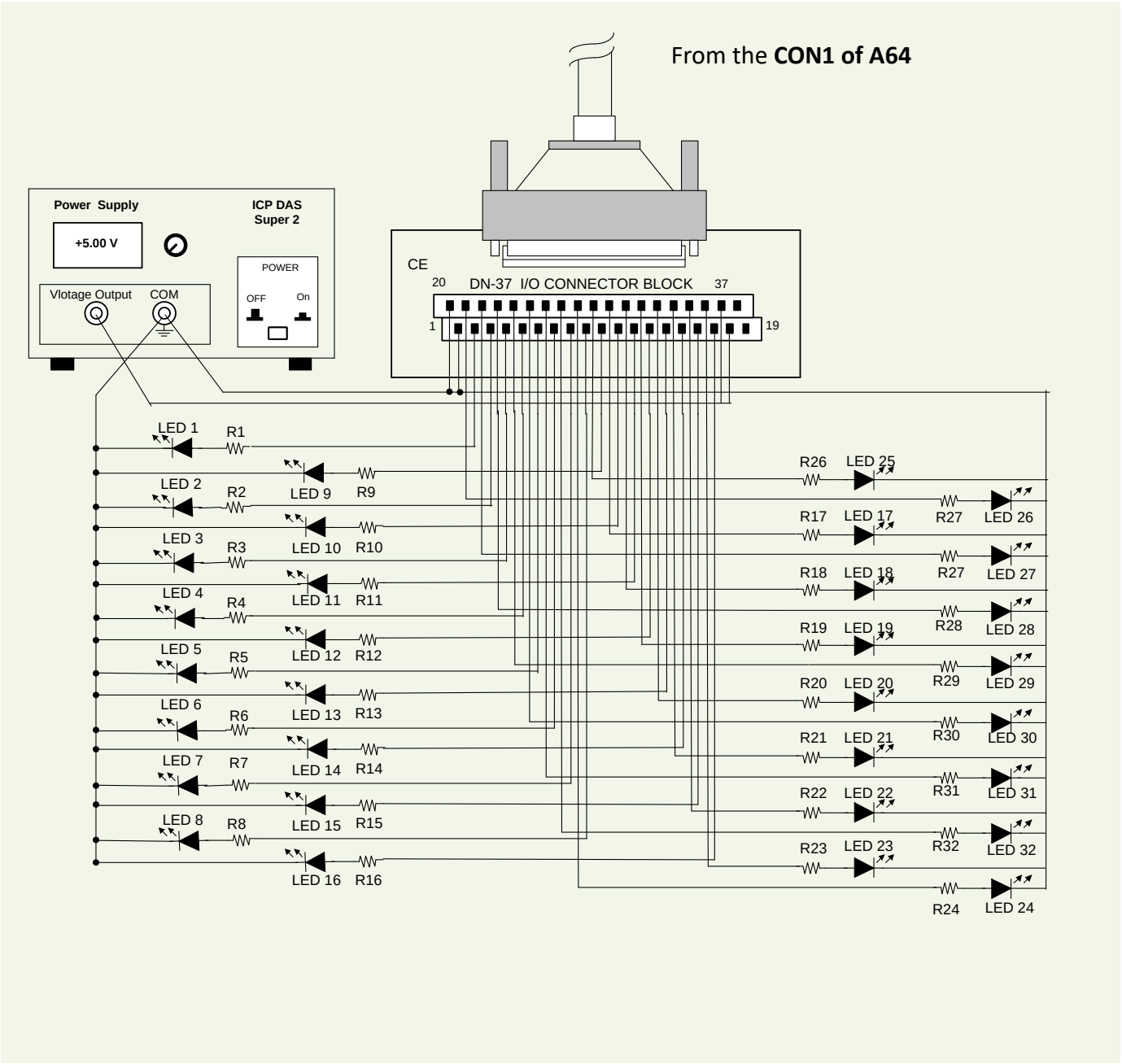
➢ **Here's the circuit diagram for external device 1:**

Figure 7-3-2: The circuit diagram of external device 1 for the digital outputs of PEX-C64 and PISO-C64 series board.



- The resistance of R1 to R32 is 330 Ohm.
- LEDs 1 to 32 are light-emitting diodes.
- Pin-1/20 are GND signal for DO<0…15> and DO<16…31>.
- Pin-18/37 are voltage (+) signal for DO<0…15> and DO<16…31> (input 5 V to 24 V_{DC}).

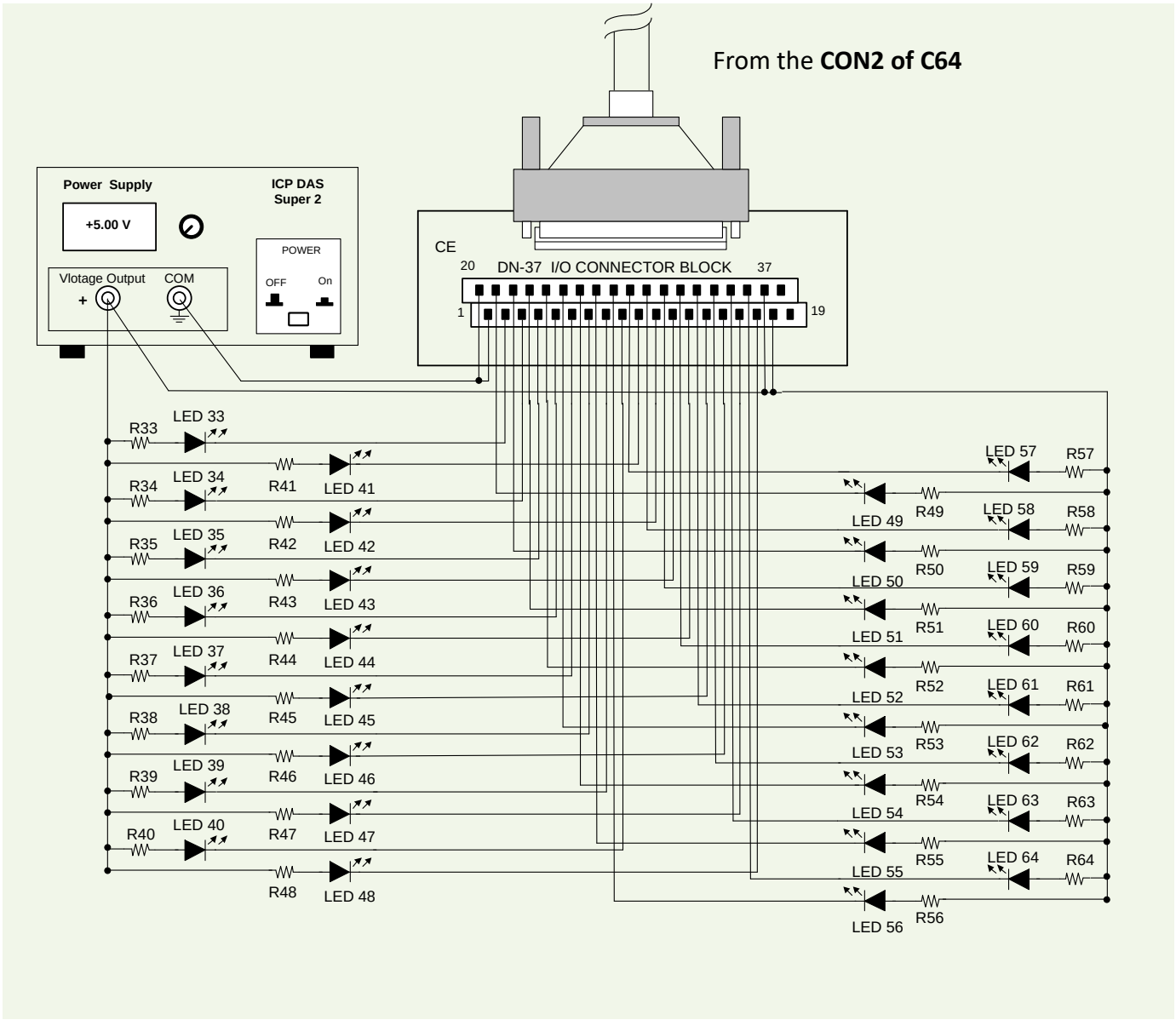
Figure 7-3-3: The circuit diagram of external device 1 for the digital outputs of PISO-A64 board.



- The resistance of R1 to R32 is 330 Ohm.
- LEDs 1 to 32 are light-emitting diodes.
- Pin-1/20 are GND signal for DO<0…15> and DO<16…31>.
- Pin-18/37 are voltage(+) signal for DO<0…15> and DO<16…31> (input 5 to 24 V_{DC}).

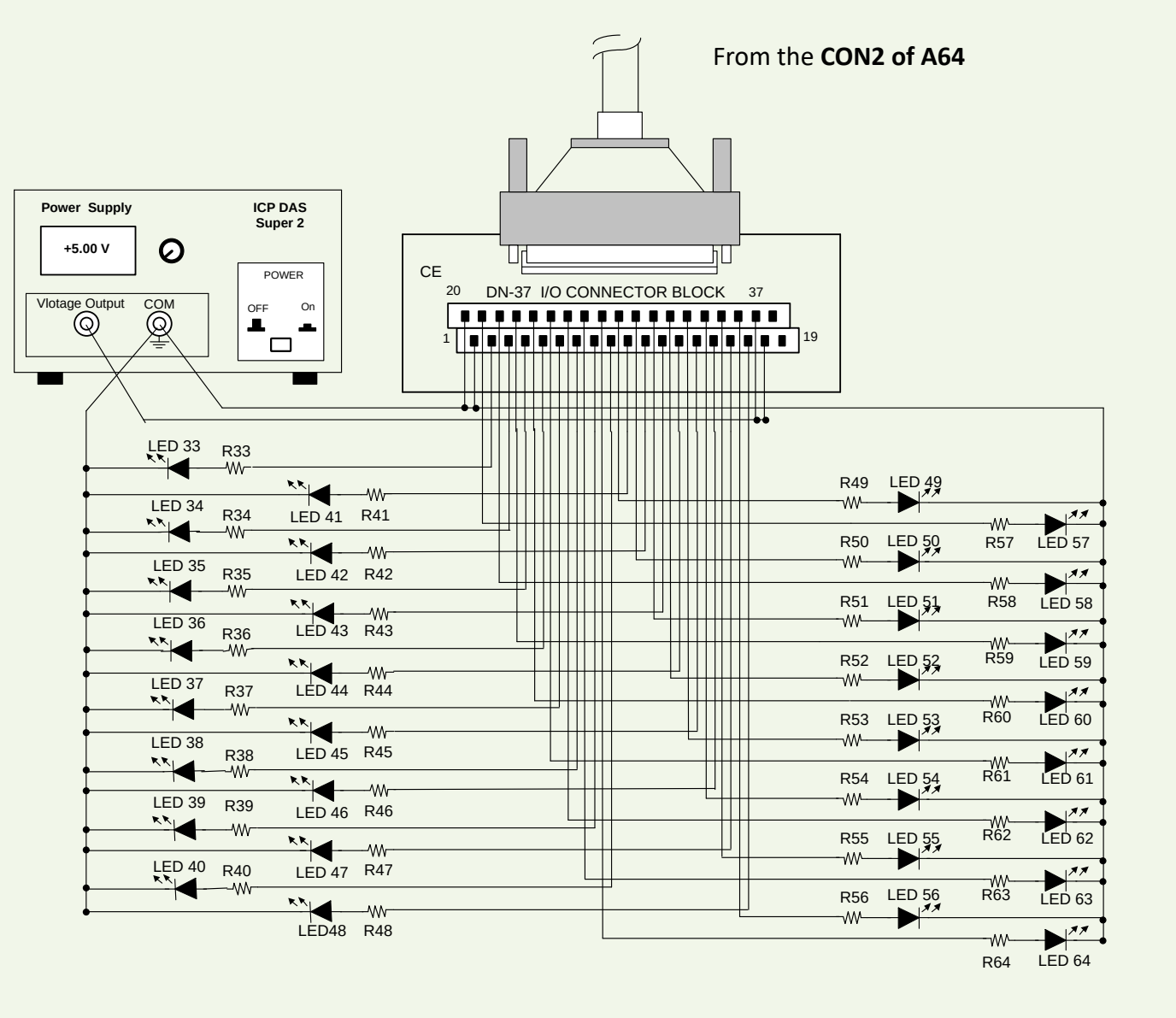
➢ **Here's the circuit diagram for external device 2:**

Figure 7-3-4: The circuit diagram of external device 2 for the digital outputs of PEX-C64 and PISO-C64 series board.



- The resistance of R33 to R64 is 330 Ohm.
- LEDs 33 to 64 are light-emitting diodes.
- Pin-1/20 are GND signal for DO<32…47> and DO<48…63>.
- Pin-18/37 are voltage(+) signal for DO<32…47> and DO<32…63> (input 5 to 24 V_{DC}).

Figure 7-3-5: The circuit diagram of external device 2 for the digital outputs of PISO-A64 board.



- The resistance of R33 to R64 is 330 Ohm.
- LEDs 1 to 32 are light-emitting diodes.
- Pin-1/20 are GND signal for DO<32…47> and DO<48…63>.
- Pin-18/37 are voltage(+) signal for DO<32…47> and DO<48…63> (input 5 to 24 V_{DC}).

8. Demo Program

PEX/PISO-P32x32/x64 Series board provides Digital Input and Digital Output demo programs, together with the source code for the library, that can be used in either a Windows or a DOS environment, based on a variety of programming languages, including TC/BC/MSC (DOS), Borland C++, Delphi, Visual Basic, Visual C, VB.NET 2005, and C#.NET2005, etc. (Windows).

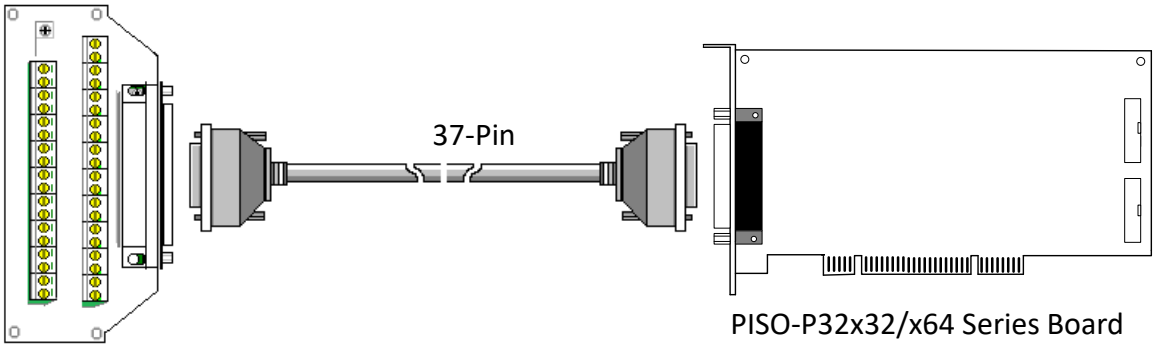
Detailed information about the demo programs is provided below.

Sample Program	UniDAQ SDK/Driver	PISO-DIO Series Class Driver	DOS
TC	-	-	✓
BC	-	-	✓
MSC	-	-	✓
Borland C++ Builder 4	-	✓	-
Borland C++ Builder 6			-
Delphi 4	-	✓	-
Delphi 6	✓	-	-
Visual Basic 6	✓	✓	-
Visual C++ 6	✓	✓	-
VB.NET 2005 (32-bit)	✓	✓	-
VB.NET 2005 (64-bit)	✓	-	-
C#.NET 2005 (32-bit)	✓	✓	-
C#.NET 2005 (64-bit)	✓	-	-
VC.NET 2005 (32-bit)	✓	-	-
VC.NET 2005 (64-bit)	✓	-	-
MATLAB	✓	-	-
LabVIEW	✓	✓	-

Appendix: Daughter Board

A1. DB-37

The DB-37 is a general purpose daughter board for D-sub 37 pins. It is designed for easy wire connection via pin-to-pin.

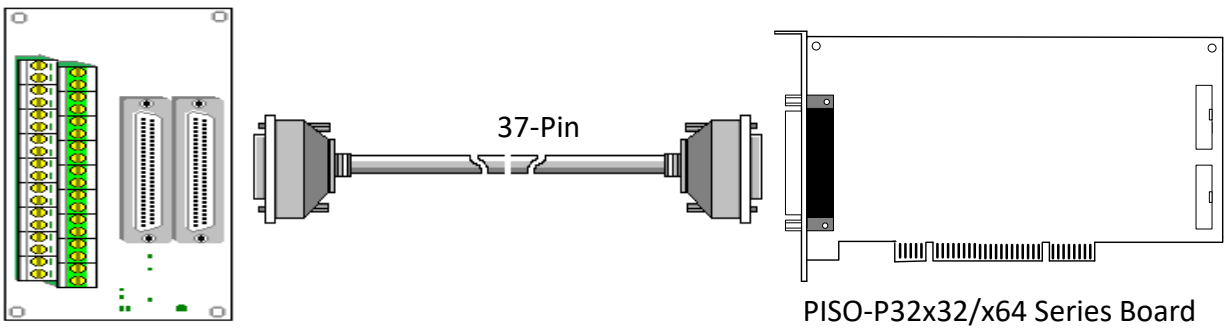


DB-37

PISO-P32x32/x64 Series Board
PEX-P32x32/x64 Series Board

A2. DN-37

The DN-37 is a general purpose daughter board for DB-37 pins with DIN-Rail Mountings. They are also designed for easy wire connection via pin-to-pin.

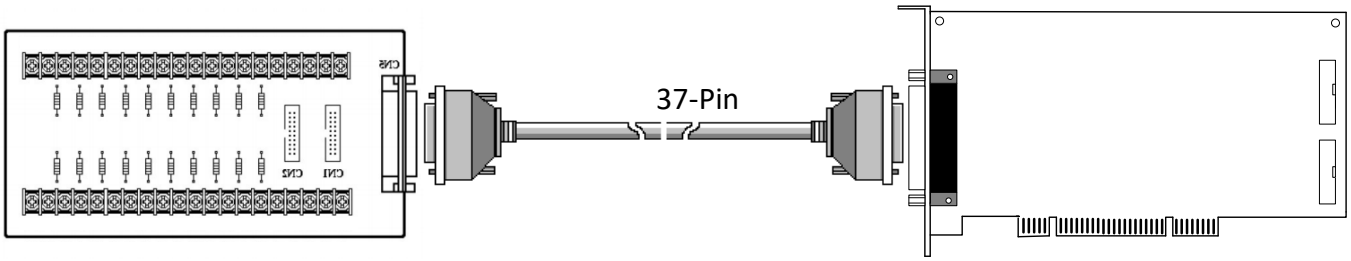


DN-37

PISO-P32x32/x64 Series Board
PEX-P32x32/x64 Series Board

A3.DB-8125

The DB-812 is a general-purpose screw terminal board. It is designed for easy wiring connection. The DB-8125 consists of one DB-37 and two 20-pin flat-cable headers.



DB-8125

PISO-P32x32/x64 Series Board
PEX-P32x32/x64 Series Board