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USER MANUAL

iD1232-14

PCI High Speed Digital Isolated 16-Ch Input & 16-Ch Output Card

9701-174/192/193/194

Rev. 03| 04.09.2018

Thanks you for using ViE Products.

This manual is designed to help you using the iD1232-14 board.

Be sure that you have read and understood its contents before using the product.

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2. Contact us for technical support if you need additional assistance.
   ViE Technologies Sdn. Bhd.
   Email : care@vie.com.my
   Telephone :+604-5459988
   Fax :+604-5459987
   Address : 746, Persiaran Cassia Selatan 3, Batu Kawan Industrial Park, 14110 Bandar Cassia, Penang, Malaysia.

3. Please have the following information ready before you email or call:
   - ✔ Product name and serial number
   - ✔ Description of your peripheral attachments
   - ✔ Description of your software (operating system, version, application software, etc.)
   - ✔ A complete description of the problem
   - ✔ The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*



Caution! *Cautions are included to help you avoid damaging hardware or losing data. e.g.*



There is a danger of a new battery exploding if it is incorrectly installed.
Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: care@vie.com.my

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient over-voltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:

a. The power cord or plug is damaged.
b. Liquid has penetrated into the equipment.
c. The equipment has been exposed to moisture.
d. The equipment does not work well, or you cannot get it to work according to the user manual.
e. The equipment has been dropped and damaged.
f. The equipment has obvious signs of breakage.

15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.
16. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.
17. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. ViE disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution – Static Electricity



Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

Table of Contents

1 INTRODUCTION 1

1.1 Features 1
1.2 Specifications 1
1.3 Optional Accessories 2
1.4 Others PCI Data Acquisition Board 2

2 INSTALLATION 3

2.1 Package Contents 3
2.2 Board Layout 3
2.3 Hardware Installation References 4
2.4 Connector Pins Assignment 5
2.5 Principles Of Operations 6
2.6 Termination Board Connection 9

3 I/O REGISTER FORMAT 10

3.1 I/O Address Mapping 10
3.2 Digital Input Register 11
3.3 Digital Output Register 12

4 I/O DEVICES TESTER 13

4.1 Software Operation Requirement 13
4.2 I/O Devices Tester Software Introduction 14
4.2.1 I/O Devices Tester Interface and Description 14
4.2.2 I/O Triggering Interface and Description 15

5 VTioDLL FUNCTION LIBRARY 16

1 INTRODUCTION

iD1232-14 has 32 channel Isolated digital I/O (16 Digital Input, 16 Digital Output). The high isolation voltage ($3750V_{DC}$) can protect the user system and host computer against damage caused by high external voltage and different ground-loop problem. The isolated digital input comes with high-speed change of state detection. Every Darlington NPN transistor at digital output comes with integral diode for inductive loads.

1.1 Features

- PCI Bus
- 16 Isolated Digital Input Channels
- 16 Isolated Digital Output Channels
- Build in DC-DC converter
- High output driving capability
- $3750V_{DC}$ high isolation voltage
- Small size, SMD, power saving
- 37-pins D-type connector
- Input Latching features

1.2 Specifications

Optical Isolated Digital Input Channels

- Total Channels: 16 digital Inputs
- Input Voltage: 12V – $30V_{DC}$
- Isolation Voltage: $3750V_{DC}$
- Input Impedance: 1.2KΩ @ 1W
- Response time:

Based on 5V input voltage	OFF to ON: 19µs
	ON to OFF: 71µs
Based on 12V input voltage	OFF to ON: 9µs
	ON to OFF: 71µs

Optical Isolated Digital Output Channels

- Total Channels: 16 digital Output
- Output Voltage: open collector 12V – 30V_{DC}
- Current Sinking: 500mA (Max)
- Response Time:

Based on 5V output voltage	OFF to ON: 0.54µs
	ON to OFF: 38µs
Based on 12V output voltage	OFF to ON: 0.56µs
	ON to OFF: 37µs

General Specification

- Connector: 37 pins D-type
- Operating Temperature: 0 - 55 °C
- Storage Temperature: 0 - 55 °C
- Dimensions: 136mm(L) x 85mm(H)
- Power Consumption: 600mA

1.3 Optional Accessories

- DAQ-DB16IO: 16 Input, 16 Output Termination Board.
- DAQ-DB16Din: DIN Rail PCB holder.

1.4 Others PCI Data Acquisition Board

PCI-BUS Series, Isolated Digital boards are:

- iD1234-74: PCI High Speed Digital Isolated 18-Ch Input and 16-Ch Output Card
- iD1234-77: PCI High Speed Digital Isolated 18-Ch Input and 16-Ch Output Card with male connector
- iD1234-87: PCI High Speed Digital Isolated 18-Ch Input and 16-Ch Output Card with 3W 5V and 12V Power
- iD1132-14: PCI 32-Ch High Speed Digital Isolated Input Card
- iD1032-14: PCI 32-Ch High Speed Digital Isolated Output Card
- DAQ-PCI32IO: PCI Digital 32-Channel I/O Card

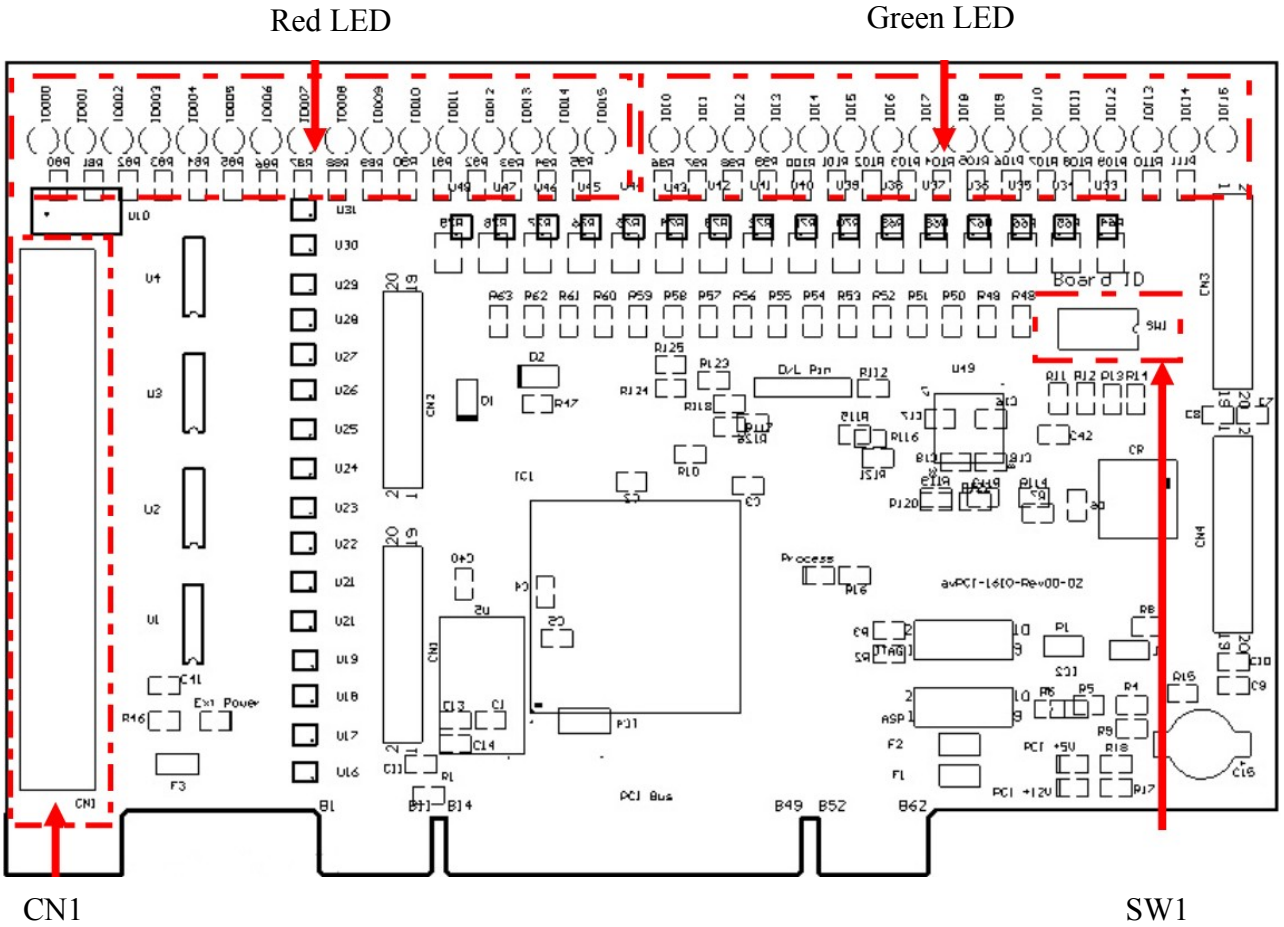
2 INSTALLATION

2.1 Package Contents

This package should includes the following items:

- iD1232-14 PCI I/O Board
- Software Installer (Upon request by user)
- User manual (Upon request by user)

2.2 Board Layout



- CN1 : 37 pins D-Type Connector
- Red LED : 16 Channels Isolated Digital Output (IDO0 – IDO15)
- Green LED : 16 Channels Isolated Digital Input (IDI0 – IDI15)
- SW1 : DIP Switch (reserved)

2.3 Hardware Installation References

This board is equipped with plug and play PCI controller where PCI vendor ID and device ID (0x0001) shall be assigned by default. PC system BIOS will install the system resources based on the PCI boards' configuration registers and system parameters.

This board can be inserted to any PC PCI slot. The installation procedures are as following:

1. Turn off computer.
2. Remove the computer casing.
3. Select a 32-bits PCI slot. (PCI slot are shorter then ISA or EISA).
4. **Important:** Discharge your body static charge by touching the metal case of the computer. When handling the board, hold the edge and do not touch the components.
5. Plug in the board in to the selected PCI slot.
6. Screw the board at the rear panel of the computer.

2.4 Connector Pins Assignment

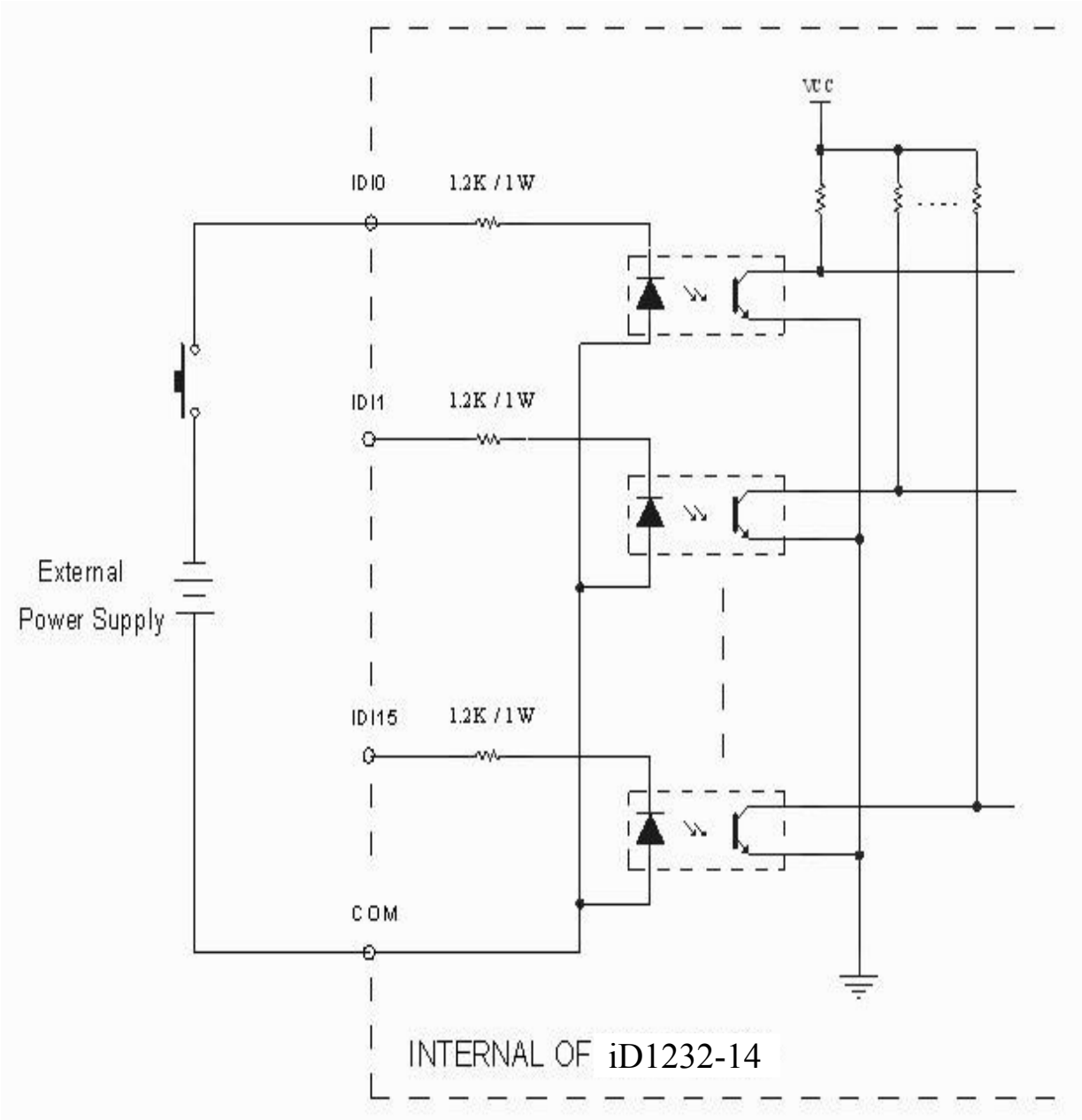
37 pins D-Type female connector (CN1)

Pin No.	Description	Pin No.	Description
1	IDI0	20	IDI1
2	IDI2	21	IDI3
3	IDI4	22	IDI5
4	IDI6	23	IDI7
5	IDI8	24	IDI9
6	IDI10	25	IDI11
7	IDI12	26	IDI13
8	IDI14	27	IDI15
9	EI.COM1	28	EI.COM2
10	EO.COM1	29	IGND
11	IDO0	30	IDO1
12	IDO2	31	IDO3
13	IDO4	32	IDO5
14	IDO6	33	IDO7
15	IDO8	34	IDO9
16	IDO10	35	IDO11
17	IDO12	36	IDO13
18	IDO14	37	IDO15
19	EO.COM2		

2.5 Principles of Operations

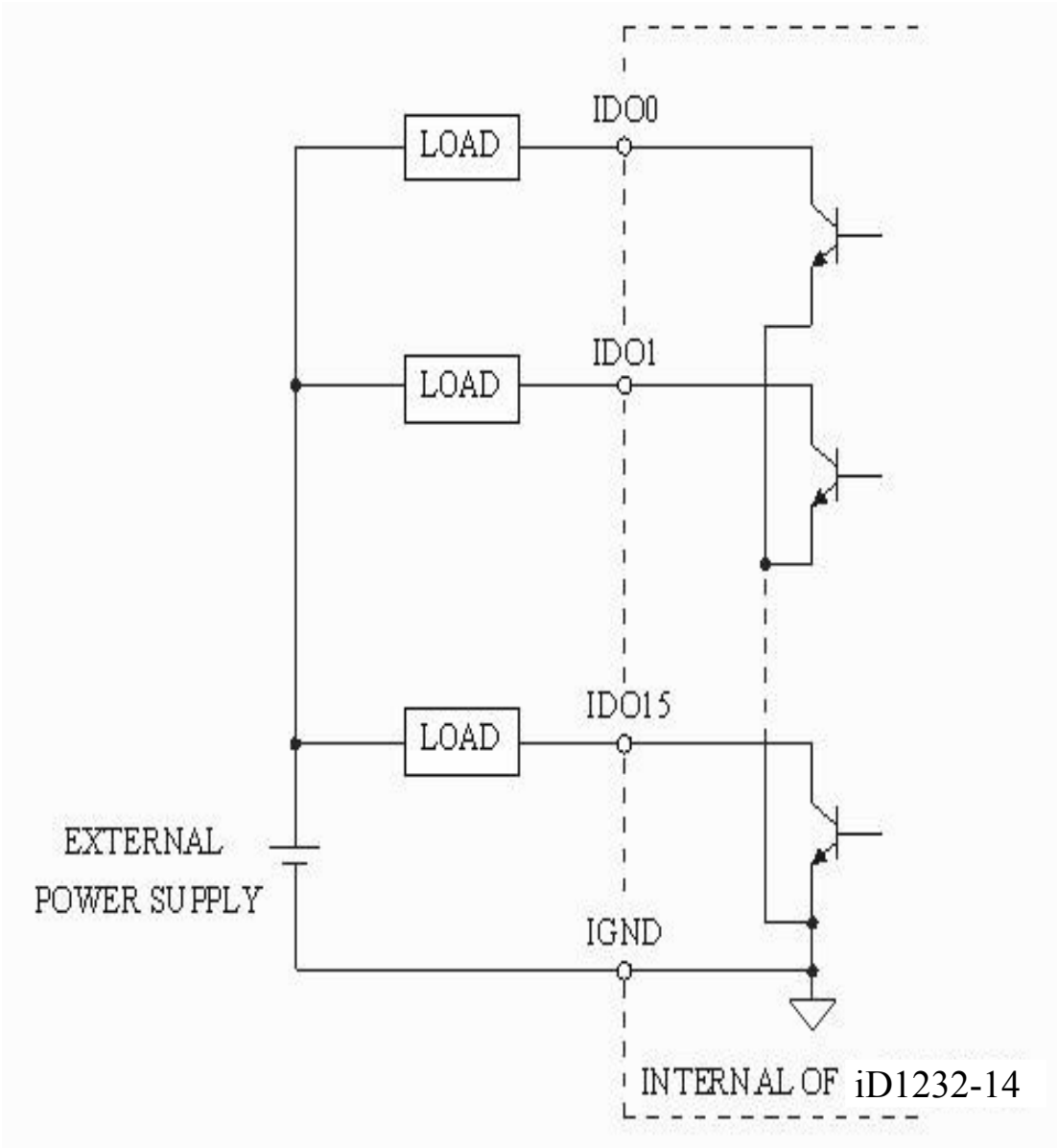
Isolated Digital Input

Each bi-directional photo-coupler can accept the input voltage up to $30V_{DC}$ Eight isolated digital input (IDI0 ~ IDI7) shares EI.COM1. Another eight isolated digital input (IDI8 ~ IDI15) shares EI.COM2. One 1.2KΩ/1W resistor are used as input resistor.

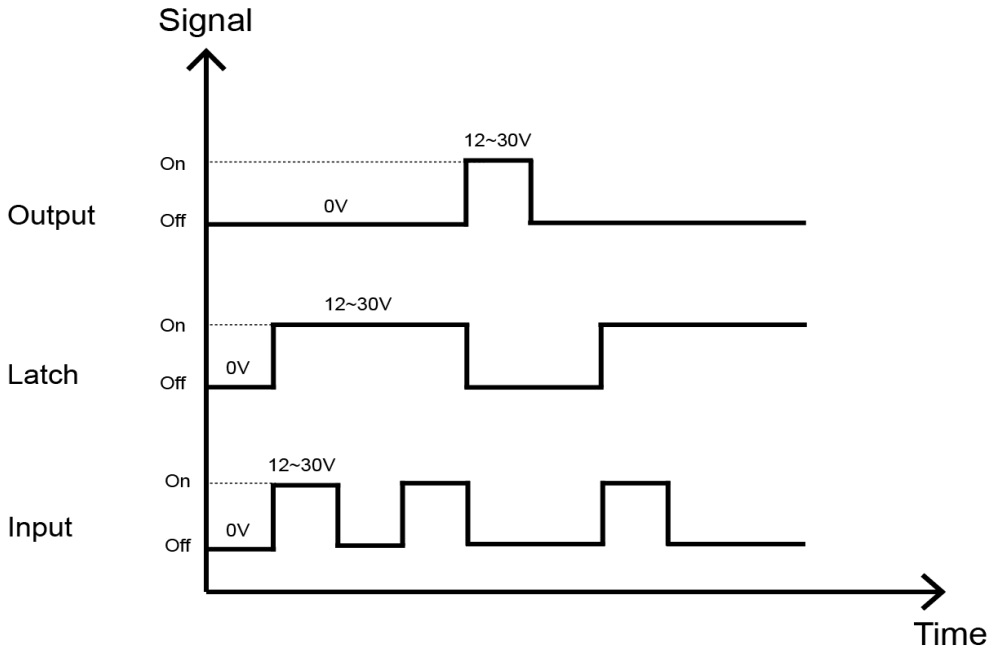


Isolated Digital Output

The isolated digital output channels (current sinking) are connected as the following diagram. Eight open collector channels (IDO0 ~ IDO7) shares EO.COM1. Another eight open collector channels (IDO8 ~ IDO15) shares EO.COM2. An external power supply (10 ~ 30V_{DC}) is connected to the EO.COM1 and EO.COM2. Each 'fly-wheel' diode is connected parallel to the EO.COM1, 2 to protect the driver from the inductive load such as relay, motor and solenoid.



Input Latching Features (optional)



Input latching feature is a logic circuit that creating memory device. The function of this circuit is to transfer the value created by the input signal to the device and hold that value until a signal to clear the input status is triggered.

Product Model

- iD1232-14 (IO-0007)
  - Standard version without latching feature

- iD1232-14 (IO-0047)
  - Signal latching at Input 3 (IDI3),
  - Clear signal latch through Output 8 (IDO8)

- iD1232-14 (IO-0048)
  - Signal latching at Input 0 (IDI0) & Input 4 (IDI4),
  - Clear signal latch through Output 3 (IDO3)

- iD1232-14 (IO-0049)
  - Signal latching at Input 0 (IDI0),
  - Clear signal latch through Output 11 (IDO11)

2.6 Termination Board Connection

The iD1232-14 is equipment with the 37 pins D-type connector. A termination board is available for the purpose of easy connection with the input signal from sensor, switch or the output signal to drive the relay, solenoid and etc. The available termination boards include:

1. DAQ-DB16IO: 16 Input, 16 Output Termination Board.
    - A general purposed 32 channels screw terminal.
    - 16 Digital input channels and 16 Digital Output channels.
    - Support active high or active low type digital input signal.

2. DAQ-DB16Din: DIN Rail PCB holder for easily installation.

3 I/O Register Format

This section provides some important information that needs to know before starts program the card.

I/O Register is the address of respective I/O Channel which allow user to read/write digital data from/to the I/O devices.

For read or write digital data of the I/O devices, it is required to know the Input and Output offset register of the device.

User can access the I/O channel of device with VTioDLL libraries, by passing the appropriate base address and the offset register of the device.

Note1: VTioDLL library sample program, kindly refer to <setup_path>\ViE Technologies\D1232-14 (DAQ-EsPCI16IO)\Sample Program

Note2: For VTioDLL function libraries explanation, kindly refer to <setup_path>\ViE Technologies\VTioDLL Library\Library Manual

3.1 I/O Address Mapping

Base address (dwBaseAddr) of each board is assigned automatically by the computer main board ROM BIOS.

The I/O address (dwIOAddr) that trigger the Input and Output of the board is the summation of the Base Address (dwBaseAddr) of the board and the input/output offset register (wOffset).

i.e. dwIOAddr = dwBaseAddr + wOffset

3.2 Digital Input Register

iD1232-14 consists of 16 digital input channel where user can read the data from two bytes input offset registers.

The digital input data read from the input offset register can be interpreted as following:-

- Digital Input channel of the board is **OFF**, the corresponding bit data that read from the specific input offset register shall be **1**
- Digital Input channel of the board is **ON**, the corresponding bit data that read from the specific input offset register shall be **0**.

Following table shows the Input offset register of the board:-

<table>
<tr><th colspan="9">Byte Number</th><th>Input Offset Register</th></tr>
<tr><td colspan="9">0 (Input Channel: Bit 7 – 0)

<table><tr><th>Data Bit #</th><td>Bit-7</td><td>Bit-6</td><td>Bit-5</td><td>Bit-4</td><td>Bit-3</td><td>Bit-2</td><td>Bit-1</td><td>Bit-0</td></tr><tr><th>Input Channel</th><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table></td><td>0xC0</td></tr>
<tr><td colspan="9">1 (Input Channel: Bit 15 – 8)

<table><tr><th>Data Bit #</th><td>Bit-7</td><td>Bit-6</td><td>Bit-5</td><td>Bit-4</td><td>Bit-3</td><td>Bit-2</td><td>Bit-1</td><td>Bit-0</td></tr><tr><th>Input Channel</th><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td></tr></table></td><td>0xC4</td></tr>
</table>

The following example demonstrate the I/O address with library call:-

Examples:

1. InpLowByte = VTIO_InpByte(dwBaseAddr+0xC0);
   - Read state of byte-0 from I/O Address(Base Address + 0xC0)
   - Assume InpLowByte is 0x03, indicate DI0 and DI1 is OFF and DI2 to DI7 is ON.
2. InpHighByte = VTIO_InpByte(dwBaseAddr+0xC4);
   - Read state of byte-1 from I/O Addr (Base Address + 0xC4)
   - Assume InpHighByte is 0xFE, indicate DI8 is ON and D9 to DI15 is OFF.

3.3 Digital Output Register

iD1232-14 consists of 16 digital output channel where user can write the data with two bytes output offset registers.

The digital output data shall be set to the output offset register as following:-

- Turn **ON** the digital output channel of the board by setting **high (1)** to the corresponding bit of the specific output offset register.
- Turn **OFF** the digital output channel of the board by setting **low (0)** to the corresponding bit of the specific output offset register.

Following table shows the output offset register of the board:-

<table>
<tr><th colspan="9">Byte Number</th><th>Output offset register</th></tr>
<tr><td colspan="9">0 (Output Channel: Bit 7 – 0)

<table><tr><th>Data Bit #</th><td>Bit-7</td><td>Bit-6</td><td>Bit-5</td><td>Bit-4</td><td>Bit-3</td><td>Bit-2</td><td>Bit-1</td><td>Bit-0</td></tr><tr><th>Output Channel</th><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table></td><td>0xC0</td></tr>
<tr><td colspan="9">1 (Output Channel: Bit 15 – 8)

<table><tr><th>Data Bit #</th><td>Bit-7</td><td>Bit-6</td><td>Bit-5</td><td>Bit-4</td><td>Bit-3</td><td>Bit-2</td><td>Bit-1</td><td>Bit-0</td></tr><tr><th>Output Channel</th><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td></tr></table></td><td>0xC4</td></tr>
</table>

The following example demonstrate the I/O address with library call:-

Examples:

1. VTIO_OutpByte(dwBaseAddr+0xC0, 0x03);
   - Write digital output 0x03 to byte-0 (lower byte) I/O address (Base Address + 0xC0) which to turn ON DO0 and DO1 and turn OFF DO2 to DO7.
2. VTIO_OutpByte(dwBaseAddr+0xC4, 0x80);
   - Write digital output 0x80 to byte-1 (upper byte) I/O address (Base Address + 0xC4) which to turn ON DO12 and turn OFF DO8 ,9 ,10, 11, 13, 14 and 15.

4 I/O DEVICES TESTER

I/O Devices Tester is a software tool that detects total number of board connected in the system. It provides link for the respective software that guides user in verifying product setup by triggering I/O and further observation on the software.

I/O Devices Tester can be obtained from iD1232-14 product installer.

Shortcut of I/O Devices Tester will be created in Start Menu or user may refer to :
[<Installation_path>\Application\IO Devices Tester\]

4.1 Software Operation Requirement

User is required to complete the following actions before using I/O Devices Tester :

- Driver installation
- Software installation
- Hardware installation
- Power up the system

4.2 I/O Devices Tester Software Introduction

4.2.1 I/O Devices Tester Interface and Description

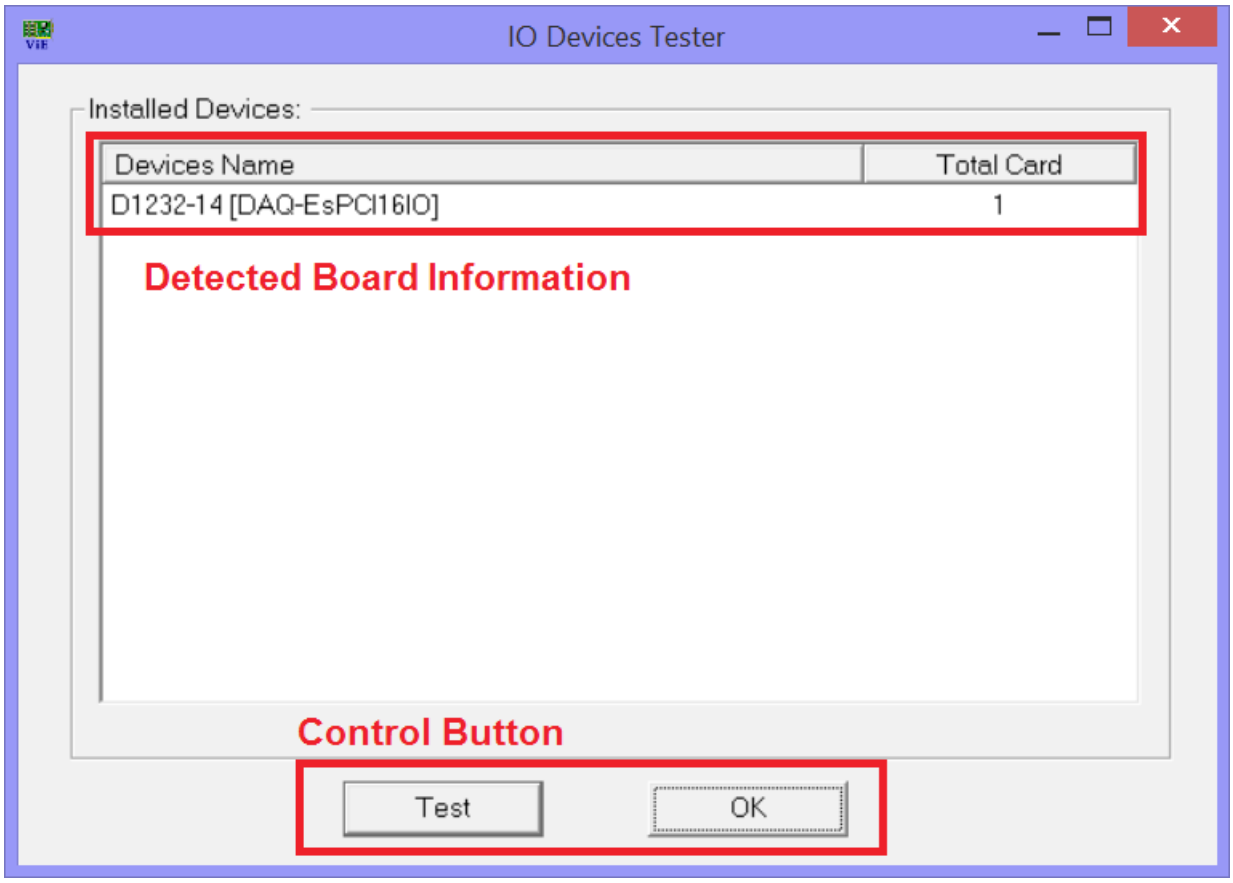


Figure 4.1: I/O Devices Tester Main Interface

Detected Board Information

- Devices Name: Display detected board name
- Total Card: Display total number of board from detected devices

Control Button

- Test: To open the I/O Triggering Interface of the selected device from the detected list.
- OK: To quit from software.

4.2.2 iD1232-14 I/O Triggering Interface and Description

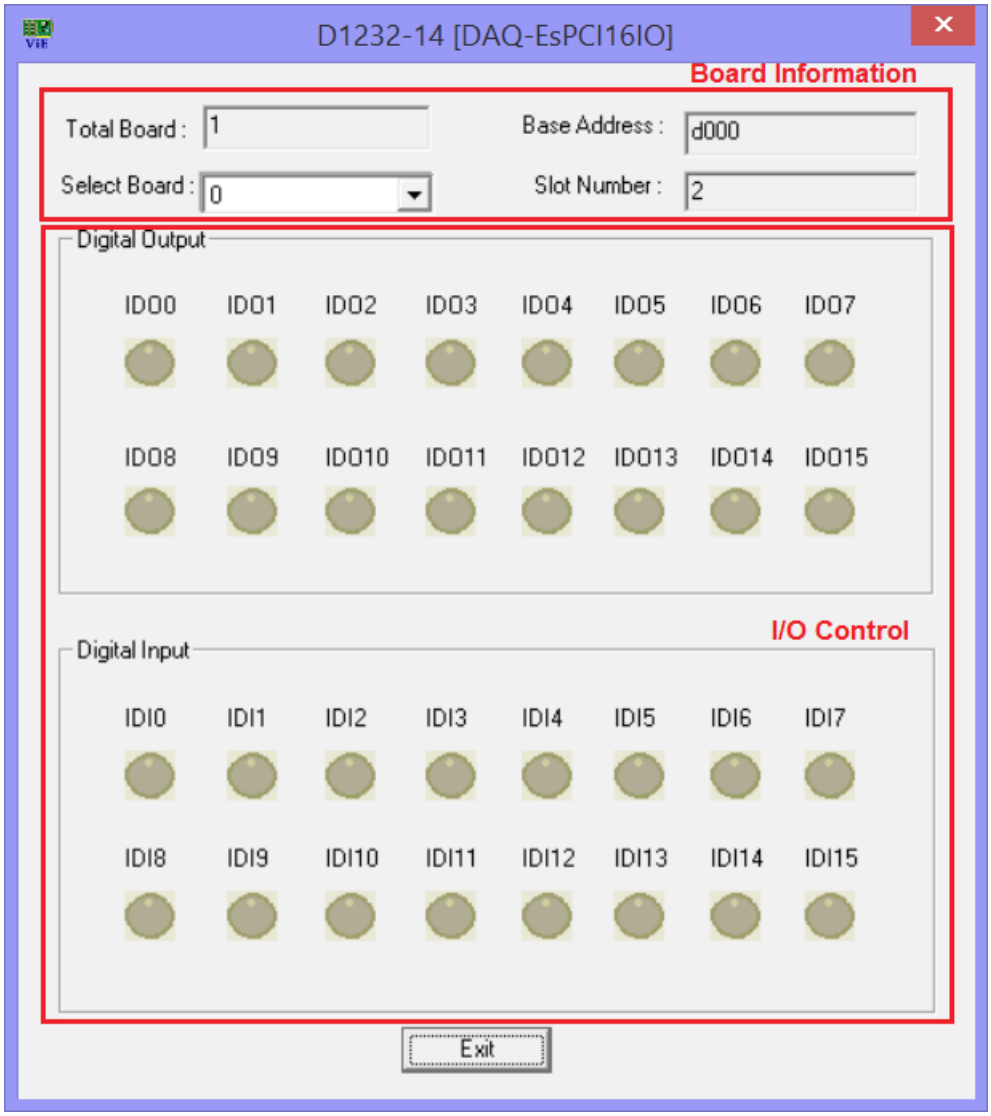


Figure 4.2: I/O Triggering Interface

Board Information

- Total Board: Shows the number of iD1232-14 board detected.
- Select Board: Select the target board to be triggered (when more than one board was detected).
- Base Address: Shows the base address of the selected board.
- Slot Number: Slot number of the selected board.

I/O Control

- Digital Output: To set output bit either high or low of the selected board.
- Digital Input: Display the input channel status of the selected module.

5 VTioDLL FUNCTION LIBRARY

ViE offered a set of library for board assessment. The list of library which is applicable for iD1232-14 is as follows:

Function Name	Description
VTIO_DriverOpen	Initialize the library and driver
VTIO_DriverClose	Terminate the library and driver
VTIO_FindTotalCard	Find the total of cards in the system based on the types that been selected
VTIO_GetDeviceAddress	Retrieve the base address of the board which was automatically assigned by the system (limited to one IO BAR solution)
VTIO_InpByte	To read a byte of digital input from the selected channel
VTIO_OutpByte	To write a byte of digital output from the selected channel
VMIO_GetDeviceInfo	To retrieve the board information
VMIO_GetBARAddress	To retrieve the base address from specific IO BAR of specific board.

Table 5.1: List of VTioDLL Libraries

For more details information of VTioDLL function library, kindly refer to VTioDLL Function Library User Manual.

Revision History

Rev	Release Date	Description
00	27-May-10	New Release.
01	24-June-15	Input Latching Feature Update.
02	12-Apr-18	Part ID & Model name changed.
03	04-Sept-18	Software chapters updates. Addition of Chapter 5.

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