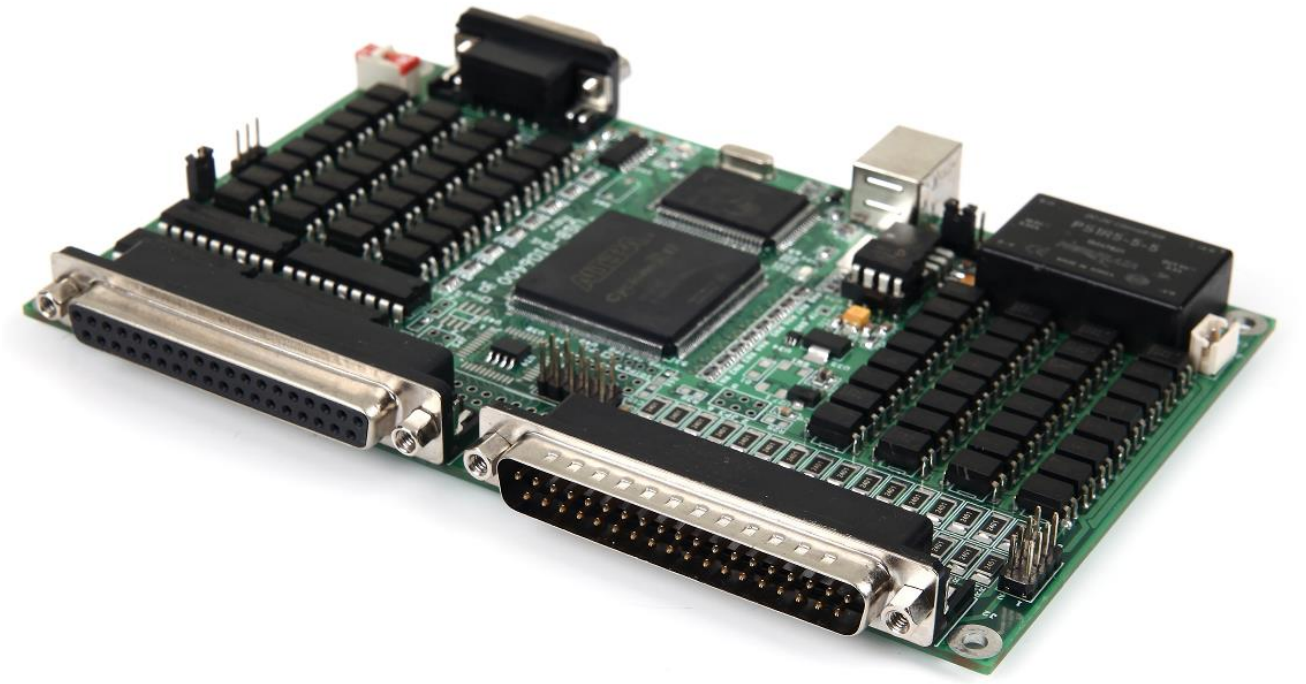
USB-DIO6400

User Manual

Version 1.1



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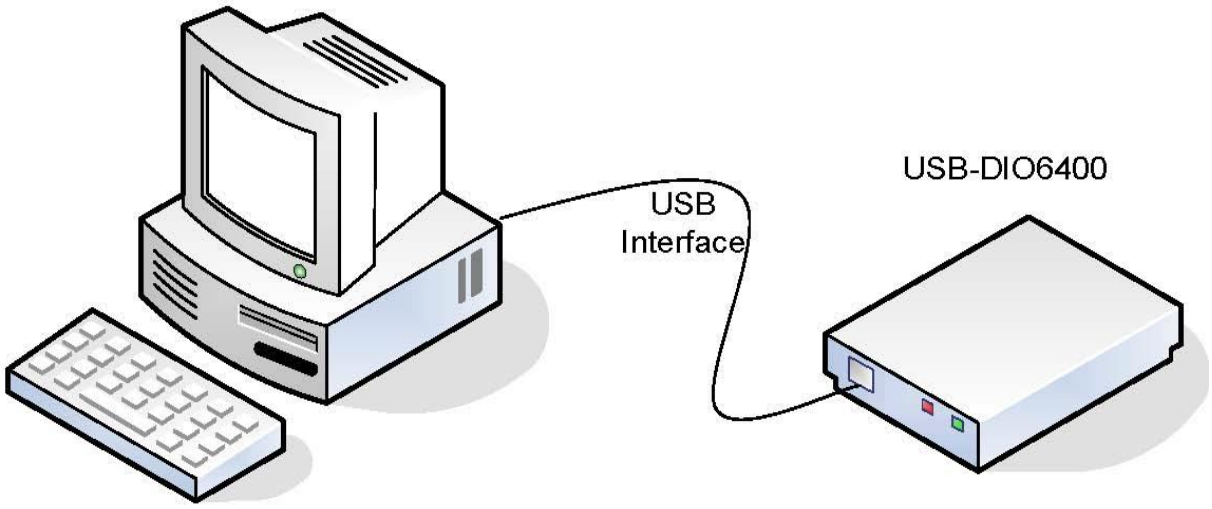
1. Introduction

USB-DIO6400 board is 32-bit isolated digital input / output boards to be fully compatible with industrial PC. It is a board that uses the USB interface Full Speed (12MB/s). USB-DIO6400 does not use a separate external power supply because the operation takes its power from the USB cable. All of the control functions are designed to FPGA (Field Programmable Gate Array) and it is possible to easily upgrade to the user's needs.

USB-DIO6400 board is a device that can perform desired functions by sending and receiving digital signals from PC to external sensors or actuators through USB interface.

It has 32 Digital Inputs and 32 Digital Outputs and can be used in conjunction with various signals. The operation of the product is controlled by the user program API call, and the figure below shows the interworking operation of the product as a figure.



[Figure 1-1. USB-DIO6400 Usage]

Figure 1-1 shows, the USB-DIO6400 don't use an external power separately because power supply to USB cable.

1-1 Product Features

Items	Description	Remark
Hardware		
PC Interface	USB1.1	Full Speed(12Mb/s)
Operation Power	+5VDC/ 500mA	USB Power
I/O Port	D-Sub37	Plug/Socket Type
Feature	32/32bit Digital I/O	
Isolated Digital Input	Number of Channels : 32 Number of Common Input : 4 Maximum Input Range(Non-polarity) : 24V Digital Logic Levels : Input High level 5 ~24V Input Low voltage 0 ~ 1.5V Input Resistance : 4.7Kohm@1.2W Isolation Voltage : 2500Vrms Isolated input voltage up to 24V Interrupt Sources : Programmed I/O	
Isolated Digital Output	Number of Channels : 32 Output type : Open collector Darlington transistor Sink Current : 25mA for one channel @ 100% duty 500mA for all channels @ 20% duty Power dissipation : Max 2.36W per chip Supply Voltage : 5V USB or Isolated 5V(inside equipped) Isolation Voltage : 5000Vrms Data Transfer : Programmed I/O	
Simultaneous use of boards	Max. 4	
Operating temperature range	0 ~ 60℃	
Storage temperature range	-20 ~ 80℃	
Humidity range	5 ~ 95%	Non-condensing
Board size	160mm X 100mm	PCB Board Size
Software		
OS	Windows 2000/XP/7/8/10 (32/64bit)	
API	Windows Client DLL API	
Development	Windows Application by User	
Support	Sample Program	VC++

1-2 Product Applications

- ◆ Data acquisition
- ◆ Laboratory instrumentation
- ◆ Process control systems
- ◆ Factory automation

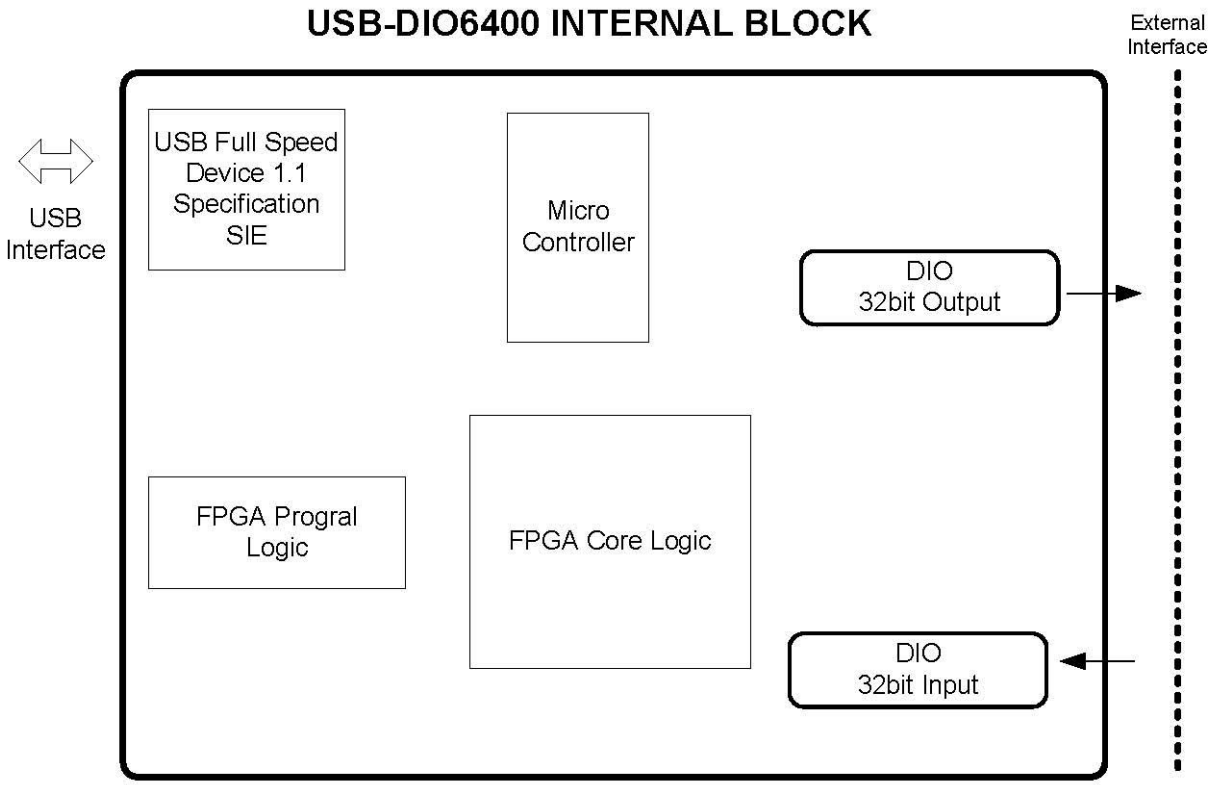
➢ DAQ System Digital I/O Products

Product	No. In/Out	Timer/Counter	Specification
cPCI-DIO6400	32/32		Isolated Input/Output
cPCI-DIO02	128 channels Software Configurable		Read/Write in 8 Groups in 16-bit Units
PCI(e)-DIO6400	32/32		Isolated Input/Output
PCI-DIO6401	64/None		Isolated Input
PCI-DIO6402	None/64		Isolated Output
PCI-DIO01	32/32 Software Configurable	1/1	TTL Level Input/Output 32bit Counter/Timer
PCI-DIO02	128 channels Software Configurable	1/1	Read/Write in 8 Groups in 16-bit Units
PCI-DIO12	16/16 or 32/32 Software Configurable		128Mbyte DDR SDRAM Data transfer rate up to 400Mb/s
PCI-MOT01	24/24 (Isolated)		1 Channel PWM, 2 Channel Encoder, 1 Channel ADC
PCI-PWM02	6/12(Isolated)		4 Channel Triggered PWM outputs
PCI(e)-TC03	16/16	8/8	32bit resolution Differential Counter/Timer
PCI-EK01	24(shared)	1/1(32bit)	12bit 8 Channel A/D Input 12bit 8 Channel D/A Output
PCIe-DIO05	32/32		TTL Level Input/Output
USB-AIO10	24/24(Isolated)		4-Ch Analog Input and Output RS-232 115,200bps Interface
USB-DIO12800	128 channels Software Configurable		Read/Write in 8 Groups in 16-bit Units
USB-DIO6400	32/32		Isolated Input/Output 12Mbps
USB-MULTI	2/None		Isolated Input/Output 16bit Counter In & Timer Out
USB-PWM10	6/8(Isolated)		4 Channel Triggered PWM outputs

2. USB-DIO6400 Block Diagram

The USB communication control takes charge of the Micro Controller and the rest such as I/O control takes charge of the FPGA. Main function is a Digital Input/Output.

These functions perform to use the API at PC through USB interface. The product gets from 5V power supply through USB connector.



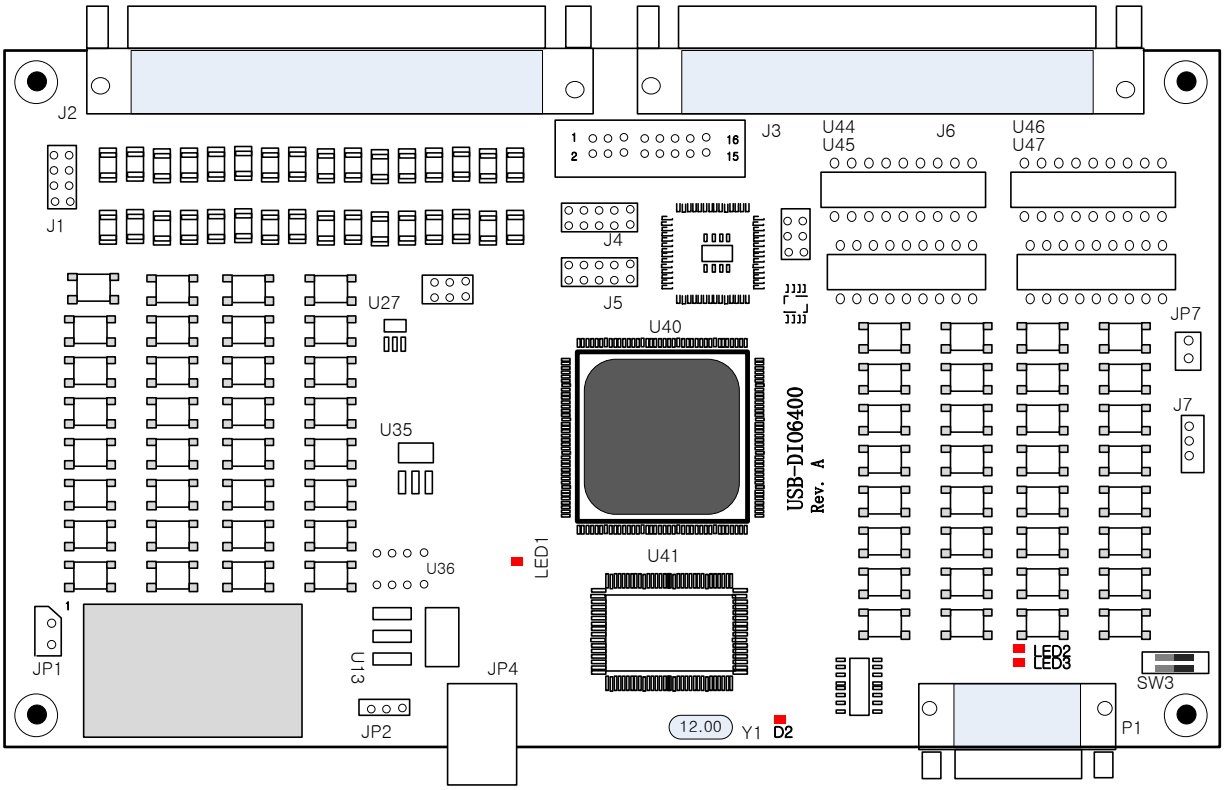
[Figure 2-1. USB-DIO6400 Internal Block Diagram]

The USB-DIO6400 is a board having the function of external interface with the isolated 32-Ch input ports and output ports like figure 2-1.

3. USB-DIO6400 Board Description

Each important board function is briefly described. For detailed function information, please refer to the parts specification.

3-1 Board Layout



[Figure 3-1. USB-DIO6400 Layout]

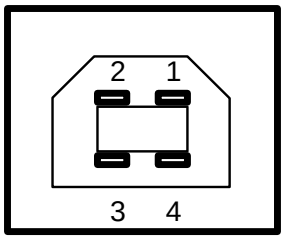
There is a USB-B type connector at the bottom side to supply power and USB signals. It can be 32 channels Digital Input through 37PIN D-SUB (PLUG : J2) connector at the left top side. Also, it can use 32 channels Digital Output through 37PIN D-SUB (SOCKET : J6) connector at the right top side.

3-2 Connector Pin Map

3-2-1 USB Connector (JP4)

This section describes the connectors used in USB-DIO6400. The main connectors include a USB-B type connector for USB connection, a D-sub 37pin (j2, J6) for external I/O input/output, and a D-sub 9pin connector (P1) for RS232 communication.

First, the PIN of the USB-B type connector on the board is shown in [Figure 4] when viewed from the front where the cable is connected.



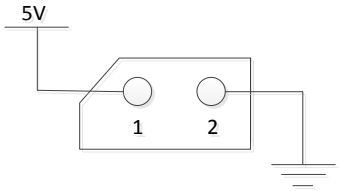
[Figure 3-2. JP4 Connector (USB-B type Front View)]

[Table 1. USB-B Connector]

Pin#	Name	Description	Remark
1	VCC	USB Power +5V	
2	D-	USB Signal Minus(Negative)	
3	D+	USB Signal Plus(Positive)	
4	GND	USB Power GND	

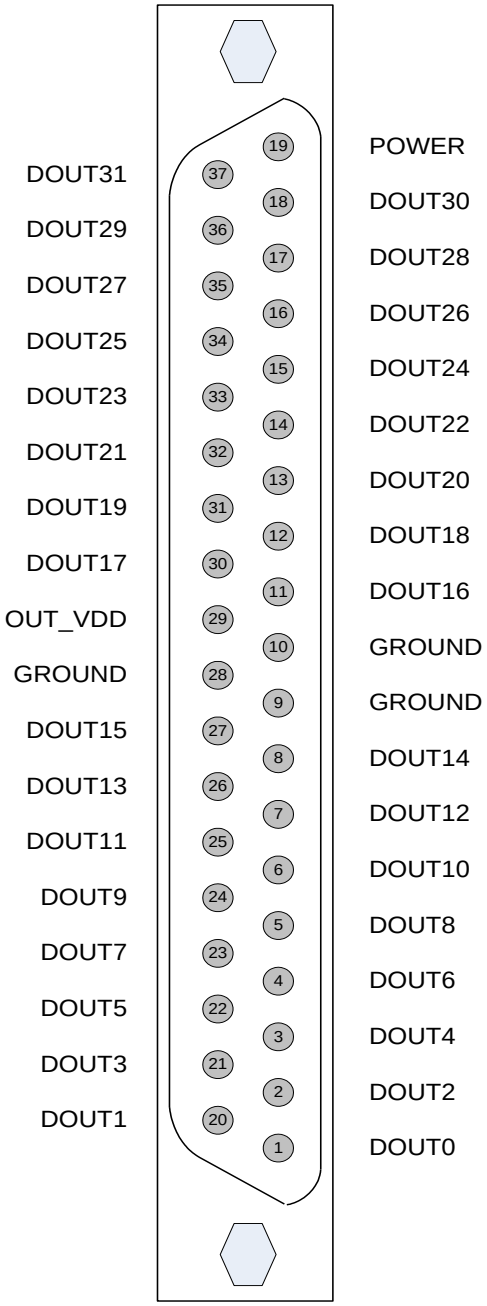
3-2-2 JP1 Connector

It is a Molex 2-pin connector that can connect an external power source.



3-2-3 D-SUB 37Pin Socket (J6)

The digital output of USB-DIO6400 performs through 37Pin D-Sub connector (socket type), and it isolates from internal board.



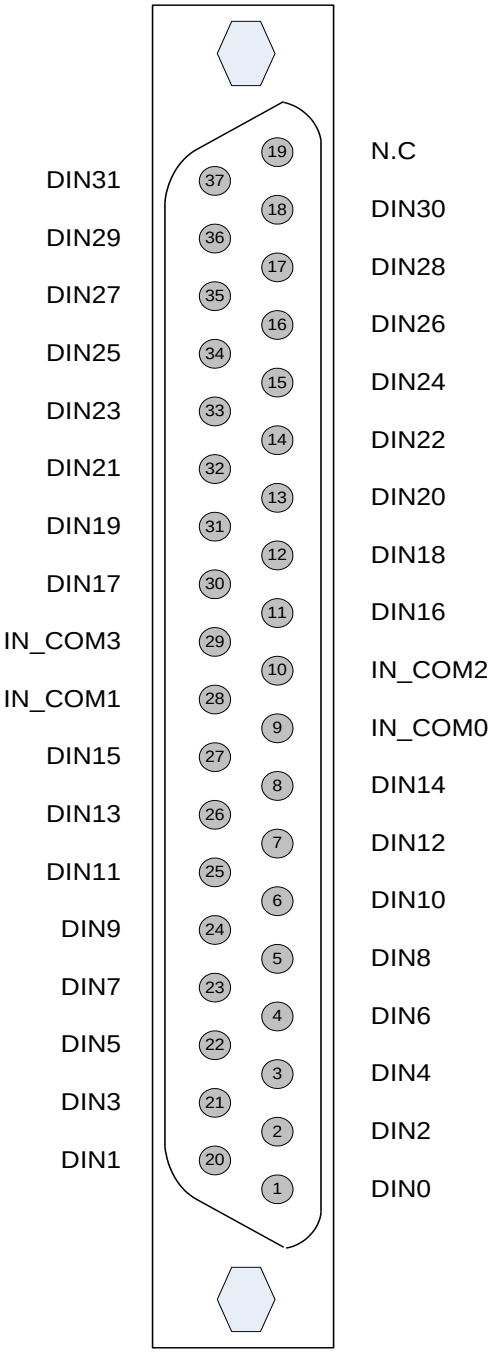
[Figure 3-3. DSUB 37(Socket) J6 Connector]

[Table 2. USB-DIO6400 Digital OUT Connector]

Pin#	Pin Name	Description	Remark
1	DOUT0	Isolated Digital Output 0	
2	DOUT2	Isolated Digital Output 2	
3	DOUT4	Isolated Digital Output 4	
4	DOUT6	Isolated Digital Output 6	
5	DOUT8	Isolated Digital Output 8	
6	DOUT10	Isolated Digital Output 10	
7	DOUT12	Isolated Digital Output 12	
8	DOUT14	Isolated Digital Output 14	
9	GROUND	External Ground	
10	GROUND	External Ground	
11	DOUT16	Isolated Digital Output 16	
12	DOUT18	Isolated Digital Output 18	
13	DOUT20	Isolated Digital Output 20	
14	DOUT22	Isolated Digital Output 22	
15	DOUT24	Isolated Digital Output 24	
16	DOUT26	Isolated Digital Output 23	
17	DOUT28	Isolated Digital Output 28	
18	DOUT30	Isolated Digital Output 30	
19	OUT_POWER	Board Power Output	
20	DOUT 1	Isolated Digital Output 1	
21	DOUT 3	Isolated Digital Output 3	
22	DOUT 5	Isolated Digital Output 5	
23	DOUT 7	Isolated Digital Output 7	
24	DOUT 9	Isolated Digital Output 9	
25	DOUT 11	Isolated Digital Output 11	
26	DOUT 13	Isolated Digital Output 13	
27	DOUT 15	Isolated Digital Output 15	
28	GROUND	External Ground	
29	OUT_VDD	Clamp Diode Common Input Pin	Refer Figure 3-5
30	DOUT 17	Isolated Digital Output 17	
31	DOUT 19	Isolated Digital Output 19	
32	DOUT 21	Isolated Digital Output 21	
33	DOUT 23	Isolated Digital Output 23	
34	DOUT 25	Isolated Digital Output 25	
35	DOUT 27	Isolated Digital Output 27	
36	DOUT 29	Isolated Digital Output 29	
37	DOUT 31	Isolated Digital Output 31	

3-2-4 D-SUB 37Pin Plug : J2

The digital output of USB-DIO6400 performs through 37Pin D-Sub connector (plug type), and it isolates from internal board.



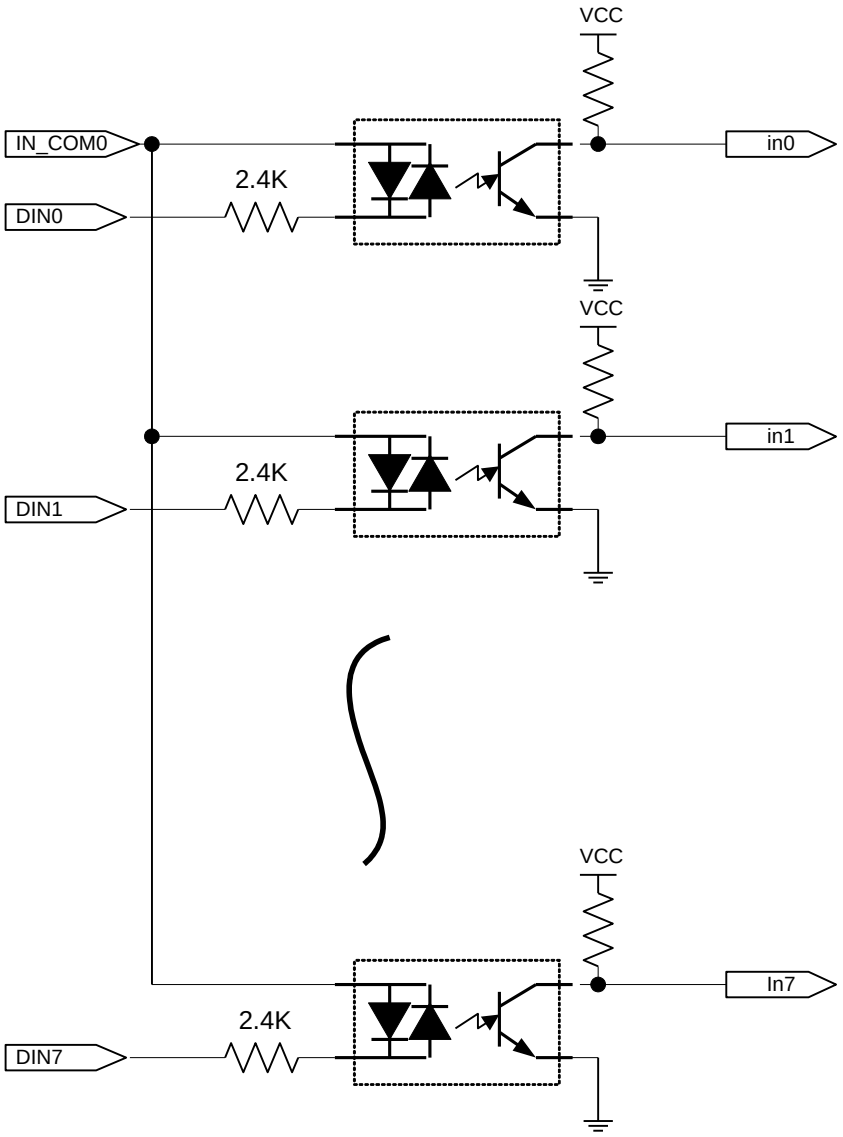
[Figure 3-4. DSUB 37(Plug) J2 Connector]

[Table 3. USB-DIO6400 Digital IN Connector]

Pin#	Pin Name	Description	Remark
1	DIN0	Isolated Digital Input 0	

2	DIN2	Isolated Digital Input 2	
3	DIN4	Isolated Digital Input 4	
4	DIN6	Isolated Digital Input 6	
5	DIN8	Isolated Digital Input 8	
6	DIN10	Isolated Digital Input 10	
7	DIN12	Isolated Digital Input 12	
8	DIN14	Isolated Digital Input 14	
9	IN_COM0	Isolated Digital Input common 0	DIN0~7 Common Input
10	IN_COM2	Isolated Digital Input common 2	DIN16~23 Common Input
11	DIN16	Isolated Digital Input 16	
12	DIN18	Isolated Digital Input 18	
13	DIN20	Isolated Digital Input 20	
14	DIN22	Isolated Digital Input 22	
15	DIN24	Isolated Digital Input 24	
16	DIN26	Isolated Digital Input 26	
17	DIN28	Isolated Digital Input 28	
18	DIN30	Isolated Digital Input 30	
19	N.C	No Connection	
20	DIN1	Isolated Digital Input 1	
21	DIN3	Isolated Digital Input 3	
22	DIN5	Isolated Digital Input 5	
23	DIN7	Isolated Digital Input 7	
24	DIN9	Isolated Digital Input 9	
25	DIN11	Isolated Digital Input 11	
26	DIN13	Isolated Digital Input 13	
27	DIN15	Isolated Digital Input 15	
28	IN_COM1	Isolated Digital Input common 1	DIN8~15 Common Input
29	IN_COM3	Isolated Digital Input common 3	DIN24~31 Common Input
30	DIN17	Isolated Digital Input 17	
31	DIN19	Isolated Digital Input 19	
32	DIN21	Isolated Digital Input 21	
33	DIN23	Isolated Digital Input 23	
34	DIN25	Isolated Digital Input 25	
35	DIN27	Isolated Digital Input 27	
36	DIN29	Isolated Digital Input 29	
37	DIN31	Isolated Digital Input 31	

3-3 Digital Input Circuit



[Figure 3-4. Digital Input Circuit]

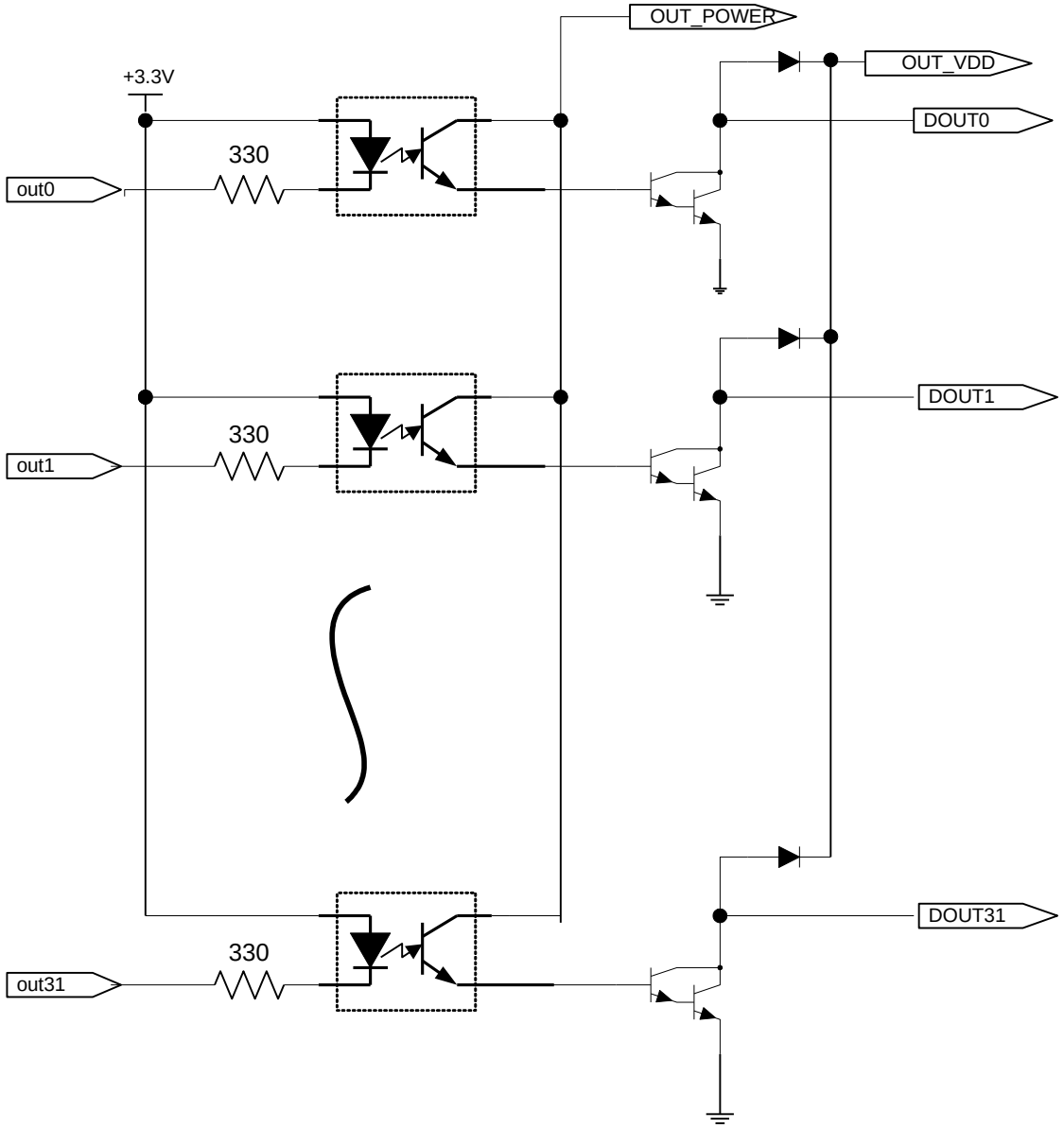
In the figure above, the digital input circuit is insulated by a port coupler. If positive voltage is applied to "IN_COM0" and negative voltage is applied to the digital input (DIN0 ~ DIN7), which is an external signal through the J2 connector, current flows through the diode inside the photo coupler, and according to the current flowing, the output side The transistor is energized.

The board has 4 circuits as above. That is, there is an IN_COM signal line for every 8 photo couplers, so there are 4 IN_COM signal lines in total (IN_COM0 ~ IN_COM3).

If you want a completely isolated circuit, it is better to use an external power supply instead of using the board power supply.

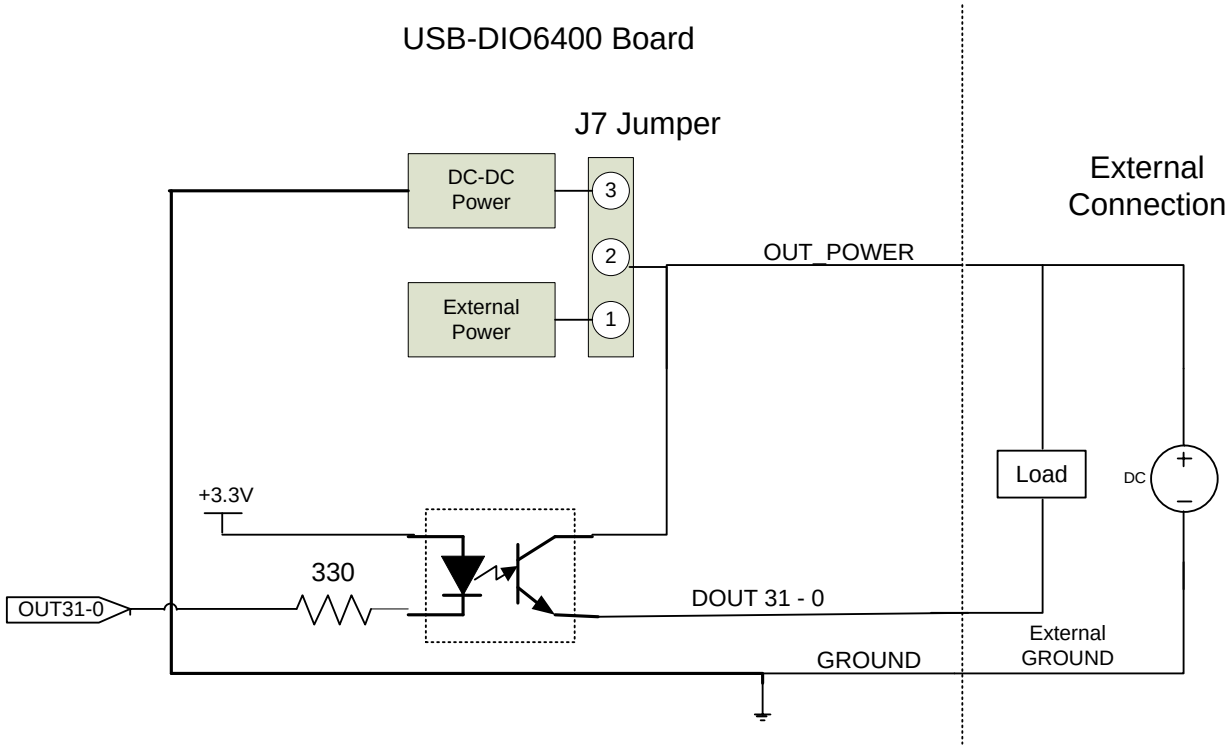
(Note) 1. The power supply voltage range for input is 7 – 24V.

3-4 Digital Output Circuit



[Figure 3-5. Digital Output Circuit]

In the figure above, the digital output circuit is insulated by a port coupler. "OUT_POWER" and "OUT_VDD" are commonly connected to the output circuit. "OUT_POWER" becomes external power or internal 5V PCI or ISO 5V (DC-DC output power) according to the jumper setting of connector JP2. "OUT_VDD" is connected to the anode of the clamp diode for the purpose of protecting the circuit in the board. In general, an external power supply of 5V can be used. DOUT0.31 is the output signal of the J6 connector.



[Figure 3-6. Output Port External Connection]

OUTPUT can be used by selecting external power or internal power. When using an external power source, the J1 jumper must not be connected to become a completely isolated input.

In case of internal power supply, DC-DC converter power can be selected. In case of using DC-DC converter, set J7 jumper (3-2 short).

When using an external 5V power supply, set the J7 jumper (1-2 short) before use.

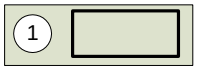
(Note) 1. The power supply voltage range for output use is 5 – 24V.

3-5 Power Option Setup

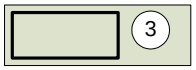
3-5-1 JP2 Jumper Setup

USB 5V can be used for the internal power of the board, or external power input through JP1 (Molex 2Pin Connector) can be used, which can be set with a jumper.

JP2 Jumper Setup



USB Power

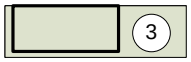


External 5V Power

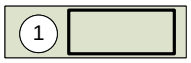
3-5-1 J7 Jumper Setup

When configuring external I/O, if it is not possible to use external power, it can be used by outputting power from the board. At this time, it is possible to set whether to output the power of the DC-DC Converter (optional) insulated to the board or output the power inside the board with a jumper.

J7 Jumper Setup



External Power(5V) Use

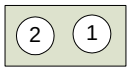


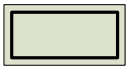
DC-DC converter Power

3-5-2 JP7 점퍼 설정

GROUND can also select whether to output the DC-DC Converter (optional) GROUND or the board GROUND.

JP7 Jumper Setup





Internal GROUND

(Note) In the default option, the jumper is not set at the time of shipment.

4. Installation

You confirm whether or not the packing contents are in good order before installation.

4-1 Confirm Product Contents

Product Contents

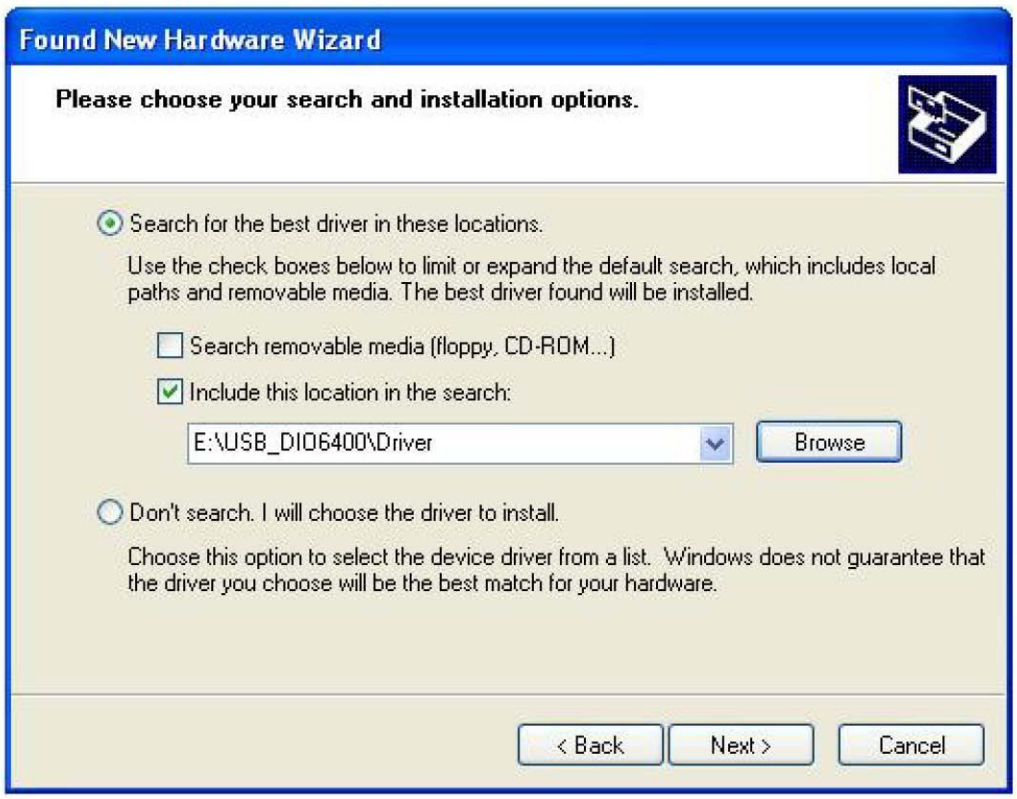
1. USB-DIO6400 Board
2. USB(A-B) Cable
3. CD (Driver/Manual/API/Sample Source etc.)

4-2 Driver Installation

For USB-DIO6400 board installation at PC is as follows. There isn't a jumper especially to set up for board installation because USB board is a Hot Plug and Plug & Play device.
User Environment : Windows 2000 SP4 over, Windows XP SP1 over

(1) First, open the box and put the USB-DIO6400 product on safe table.
(2) The USB-DIO6400 board connects to PC through USB A-B cable.
When the cable connect, it will be install automatically drive searching at Windows Operating system.
(3) The driver installation is as follows. The installation order is as follows, explain Windows XP basis if there isn't special explanation.

(4) If new hardware is found, Wizard will ask you to install the corresponding driver. For installation of the driver, select the item "Install from a list or specific location (Advanced)" and click "Next" as in the below figure.



After find a driver folder of the CD, press "next" button.

ex) F:₩USB-DIO6400₩driver

The driver folder includes a file of **"usb_dio6400.inf"** and **"usb_dio6400.sys"** that it is necessary fir driver installation.

A warning message appears during installation here, press "Continue Anyway" button.

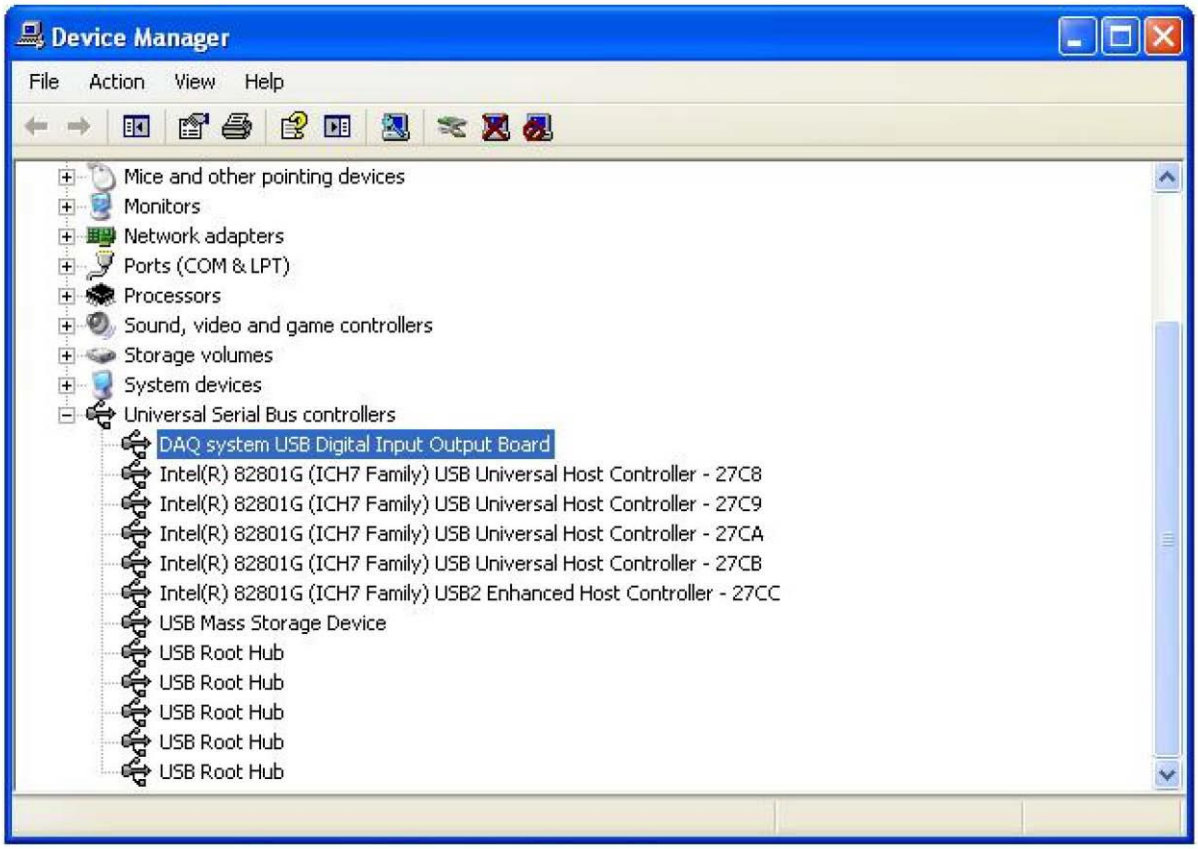
If the installation is completely finished, you can show below message window.

(5) If the installation is completely finished, you can use the USB-DIO6400 board.

But, it confirm a driver normally installation in the following ways.

Do the following steps to show up the "Device Manager" window.

[My Computer -> Properties -> Hardware -> Device Manager -> **Universal serial Bus controllers** -> **"DAQ system USB Digital Input Output Board"**]

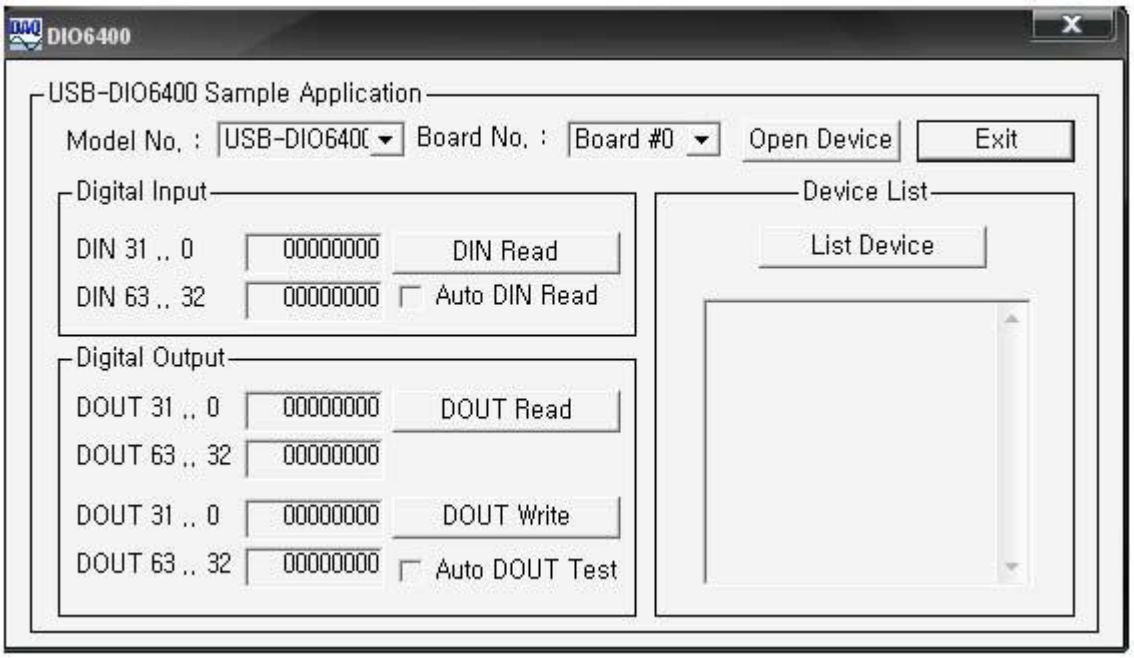


5. Sample Program

5-1 Program Interface

In the APP folder of the CDROM provided with the board, a sample program **"DIO6400.exe"** is provided for easy use of the board. In order to test the sample program, the driver of the board must be installed first.

The sample program is provided in source form so that the API provided to use the board can be tested briefly, so the user can modify it and use it.



[Figure 5-1. Sample Program "DIO6400.exe"]

API (Application Programming Interface) is required to use the above sample program. API is provided in the form of "DLL", and import library and header file are required for compilation.

All files specified above are included on the supplied CDROM. In order to run the sample program normally, the API DLL **(USB_DIO6400.DLL)** must be in the folder of the executable file, or in the Windows system folder or the folder specified by the Path environment variable.

5-2 Function Description

(1) Model No.

Select the Model Name "USB-DIO6400"

(2) Board No.

Select the Board Number (Board #0 ~ #3)

(3) 'Open Device' button

Open the selected Board. This button has to click after changed the board number.

(4) 'Exit' button

Stop the program

(5) 'DIN Read' button

When the button click, a value to read an input port is marked to hex number at a window beside "DIN 31..0".

Example) If it reads a "00008001", the number 15 and 0 get to "On" state.

*** The "DIN 63..32" is a reservation window for future.**

(6) Auto DIN Read

When check "Auto DIN Read", you confirm it right now.

(7) 'DOUT Read' button

When click the button, a value to read an output port is marked to hex number at a window beside "DOUT 31..0".

*** The "DOUT 63..32" is a reservation window for future.**

(8) 'DOUT Write' button

When click this button after a value will be written an output port at a window beside "DOUT 31..0", a value of each bit will be display.

Example) If it reads a "00008001", the number 15 and 0 get to "On" state.

*** The "DOUT 63..32" is a reservation window for future.**

(9) Auto DOUT Test

When check "Auto DOUT Test", from bit 0 to bit 31 get to "On" in turn.

(10) 'List Device' button

It displays a board number which installed in a system.

Appendix

A-1 Repair Regulations

Thank you for purchasing DAQ SYSTEM's product. Please refer to the following regarding Customer Service stipulated by DAQ SYSTEM.

(1) Please read the user's manual and follow the instructions before using the DAQ SYSTEM product.

(2) When returning the product to be repaired, please send it to the head office with the symptoms of the malfunction as well.

(3) All DAQ SYSTEM products have a one-year warranty.
-. The warranty period is counted from the date the product is shipped from DAQ SYSTEM.
-. Peripherals and third-party products not manufactured by DAQ SYSTEM are covered by the manufacturer's warranty.
-. If repair is required, please contact the contact points below.

(4) Even during the free repair warranty period, paid repairs are made in the following cases.
① Failure or damage caused by not following the user's manual
② Failure or damage caused by customer negligence during product transportation after purchase
③ Natural phenomena such as fire, earthquake, flood, lightning, pollution, etc. or power supply exceeding the recommended range malfunction or damage
④ Failures caused by inappropriate storage environment (eg, high temperature, high humidity, volatile chemicals, etc.) damaged
⑤ Failure or damage due to unreasonable repair or modification
⑥ Products whose serial number has been changed or intentionally removed
⑦ In the event that DAQ SYSTEM determines that it is the customer's negligence for other reasons

(5) The customer must bear the shipping cost of returning the repaired product to DAQ SYSTEM.

(6) The manufacturer is not responsible for any problems caused by incorrect use regardless of our Warranty provisions.

References

1. USB 2.0 System Architecture

-- Don Anderson, USB SIG (www.usb.org).

2. Universal Serial Bus Specification

-- Compaq/Intel/Microsoft/NEC/MindShare Inc. (Addison Wesley)

3. AN201 How to build application using APIs

-- DAQ system

4. AN342 USB-DIO6400 API VER1.0

-- DAQ system

MEMO

Contact Point

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