USB-PWM10

User Manual

Version 1.1

DAQ SYSTEM
Measurement & Automation

Contents

1. Introduction

USB-PWM10 is a board with 4 channels of PWM (Pulse Width Modulation), isolated 6-bit digital input, and 8-bit digital output. It is perfectly compatible with industrial PCs and uses a Full Speed (12Mb/s) USB 1.0 interface. am. Since the USB-PWM10 operates by receiving power from the USB cable, it does not use a separate external power supply. All control of this board is designed with FPGA (Field Programmable Gate Array), so function enhancement or modification is free, and it can be easily upgraded according to the user's needs.

➢ 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

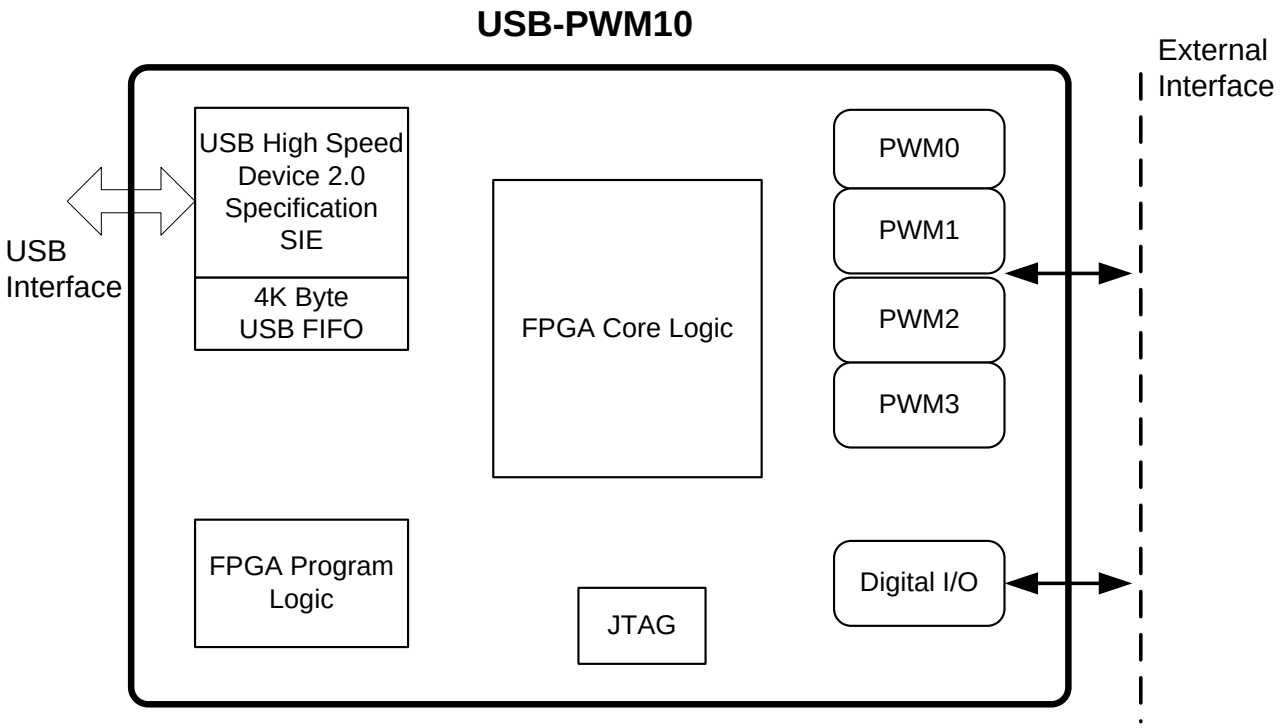
1-1 Product Features

Item	Description	Remark
Hardware		
PC Interface	USB2.0 High Speed	480Mbps
Operating Power	+5VDC at 250mA typical	
Input/Output Terminal	D-Sub37	Plug Type
Feature	4Ch PWM, 6/8bit Digital I/O	
PWM Output	Number of Channels : 4 Number of Trigger Input : 4 Resolution : 1us Timer : 22bit Output Level : 12V(External)	
Isolated Digital Input	Number of Channels : 6 Number of Common Input : 1 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 : 8 Output type : Open collector Supply Voltage : 5V PCI or Isolated 5V(inside equipped) Isolation Voltage : 5000Vrms Data Transfer : Programmed I/O	
Number of boards used simultaneously		
Operating temperature range	0 ~ 70℃	
Storage temperature range	-20 ~ 80℃	
Humidity range	20 ~ 80%	Non-condensing
Board size	160mm X 100mm	PCB Board Size
Software		
Operating	Windows 2000/XP/7/8/10 (32/64bit)	
API	Windows Client DLL API	
Development	Windows Application by User	
Support	Sample Program	VC++

2. USB-PWM10 Block Diagram

In the case of USB-PWM10, as shown in [Figure 2-1], it is composed of 4 digital PWM (Pulse Width Modulation) control blocks to interface with the outside.

PWM is widely used to control the average voltage by changing the duty ratio within a certain period to control the speed of DC motors or to control the amount of light of lighting products such as LEDs.



[Figure 2-1. USB-PWM10 Internal Block Diagram]

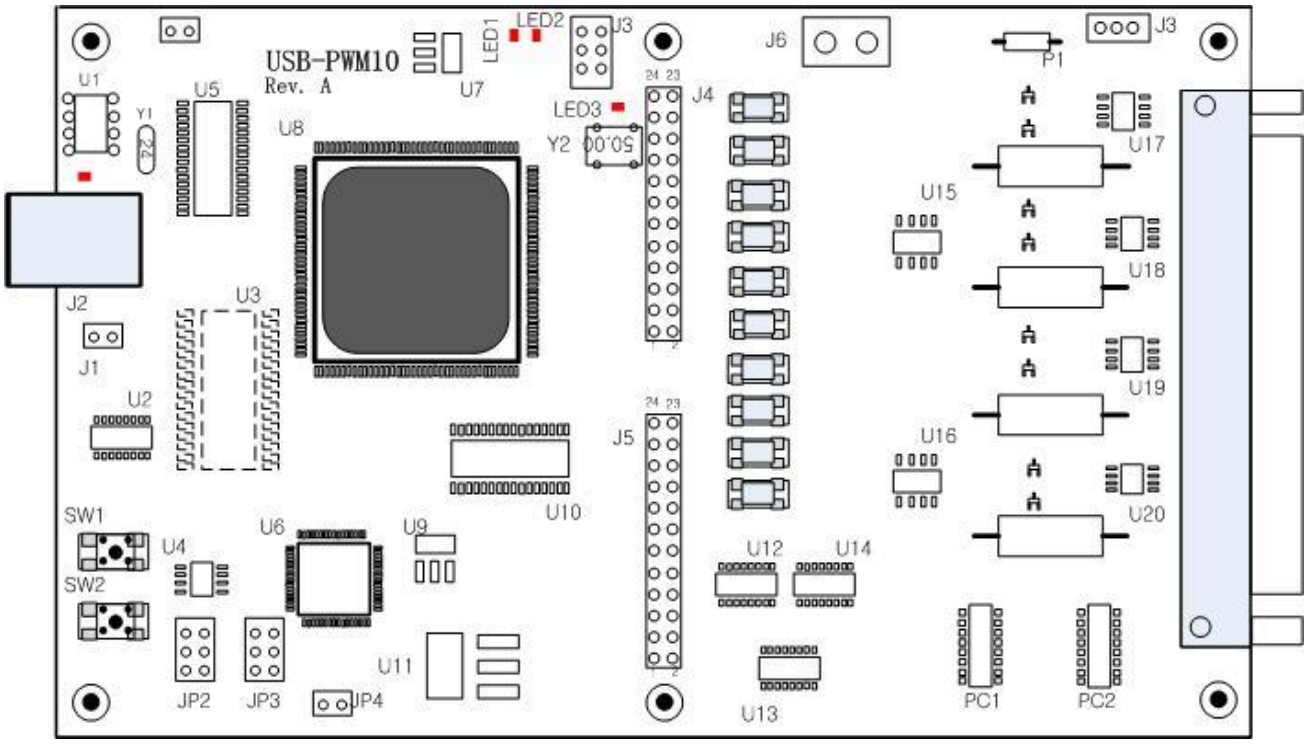
GENERAL DESCRIPTION

- **USB2.0 Device Specification**
- **High Speed device 480Mbps**
- **4-Ch Triggered PWM output**
- **Digital I/O 4 channels**
- **Isolated input voltage up to 24V**
- **Compact, half-size PCB**

3. USB-PWM10 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-PWM10 Layout]

3-2 Device Features

(1) **FPGA : U13**

All functions of the board are controlled through this FPGA Logic.

(2) **Photo-coupler : PC1, PC2, U12 ~ U138**

Photo-coupler chipset.

(3) **Regulator : U7, U9, U11**

It supplies the power used by the board.

(4) **USB Chipset : U5, U10**

PCI Control Signal

(5) **CPLD : U6**

In-system programming for general purpose logic integration is provided.

(6) **Oscillator : Y1, Y2**

It supplies 24, 50 MHz to the board.

(7) **N-Channel Field Effect Transistor : U17 ~ U20**

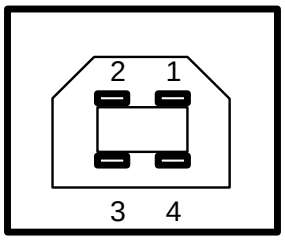
PWM Output Stage.

3-3 Connector Pin Map

This section describes the connectors and jumpers used in USB-PWM10. The main connectors include a USB-B type connector for USB connection, a PWM output, and a D-Sub 37Pin connector for external I/O input/output.

3-3-1 USB Connector

[Figure 3-2] shows the PIN of the USB-B type connector when viewed from the front where the cable is connected.

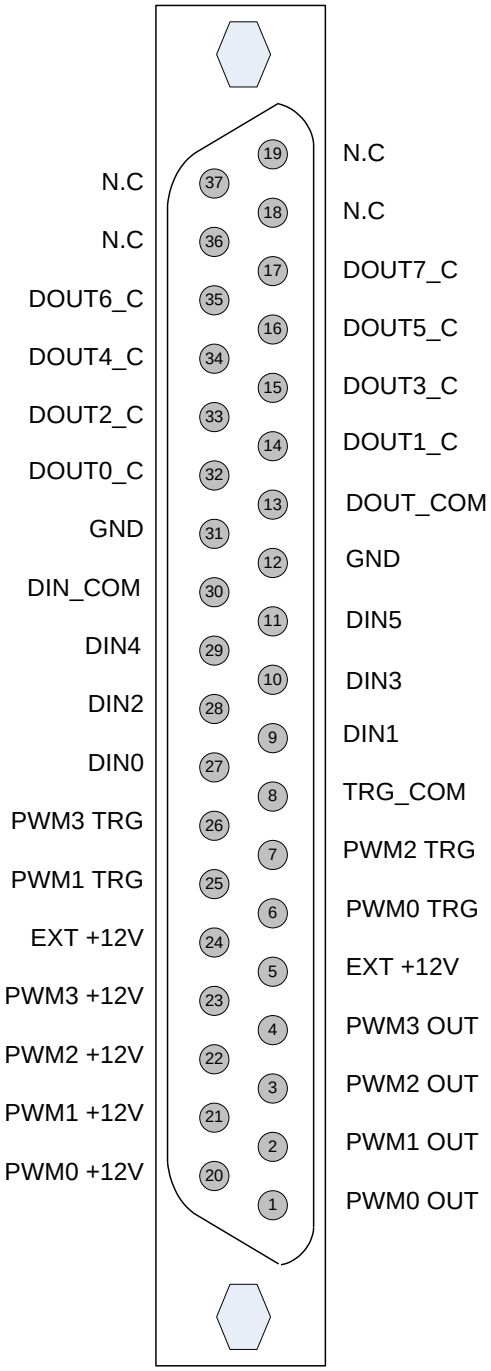


[Figure 3-2. J1 Connector (USB-B type Front View)]

[Table 1. USB-B Connector]

No.	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	

3-3-2 D-Sub 37Pin



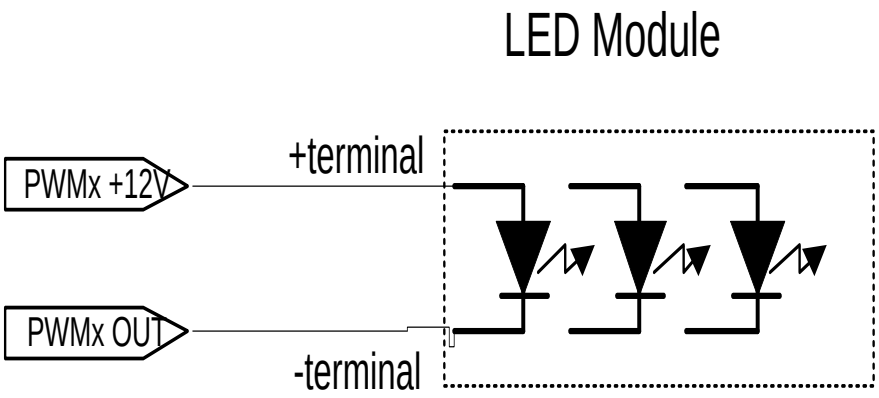
[Figure 3-3. USB-PWM10 Connector]

[Table 2. USB-PWM10 37Pin Connector]

Pin#	Name	Description	Remark
1	PWM0 OUT	PWM Channel 0 Output	
2	PWM1 OUT	PWM Channel 1 Output	
3	PWM2 OUT	PWM Channel 2 Output	
4	PWM3 OUT	PWM Channel 3 Output	
5	EXT +12V	External Power +12V Input	
6	PWM0 TRG	PWM Channel 0 Trigger Input	
7	PWM2 TRG	PWM Channel 2 Trigger Input	
8	TRG_COM	Trigger Input Common	
9	DIN1	Digital input 1 Input	
10	DIN3	Digital input 3 Input	
11	DIN5	Digital input 5 Input	
12	GND	Power GROUND	
13	DOUT_COM	Digital Output Common	
14	DOUT1_C	Digital Output1 Collector Output	
15	DOUT3_C	Digital Output3 Collector Output	
16	DOUT5_C	Digital Output5 Collector Output	
17	DOUT7_C	Digital Output7 Collector Output	
18	N.C	No Connection	
19	N.C	No Connection	
20	PWM0 +12V	PWM Channel 0 Output +12V	
21	PWM1 +12V	PWM Channel 1 Output +12V	
22	PWM2 +12V	PWM Channel 2 Output +12V	
23	PWM3 +12V	PWM Channel 3 Output +12V	
24	EXT +12V	External Power +12V Input	
25	PWM1 TRG	PWM Channel 1 Trigger Input	
26	PWM3 TRG	PWM Channel 3 Trigger Input	
27	DIN0	Digital input 0 Input	
28	DIN2	Digital input 2 Input	
29	DIN4	Digital input 4 Input	
30	DIN_COM	Digital input Common	
31	GND	Power GROUND	
32	DOUT0_C	Digital Output0 Collector Output	
33	DOUT2_C	Digital Output2 Collector Output	
34	DOUT4_C	Digital Output4 Collector Output	
35	DOUT6_C	Digital Output6 Collector Output	
36	N.C	No Connection	
37	N.C	No Connection	

4. Circuit Connection

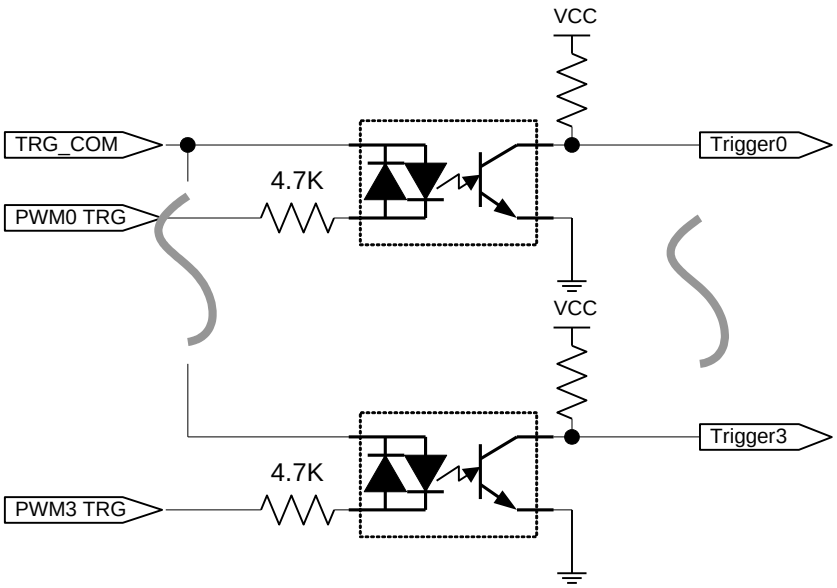
4-1 PWM Output Circuit Connection



[Figure 4-1. PWM Output Connection Circuit]

The above figure shows the figure where the PWM output is connected to the LED module. Connect +12V of PWM0-4 to the "+" side of the LED module, and connect PWM0-4 OUT to the "–" side of the LED module..

4-2 Trigger Input Circuit



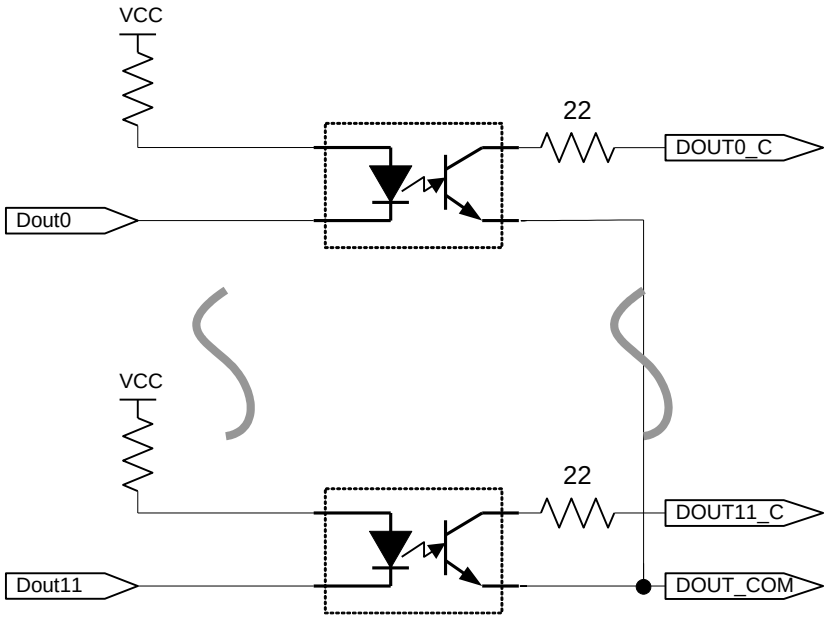
[Figure 4-2. Trigger Input Circuit]

The above figure shows a circuit that receives a trigger input when the output of each PWM is operated in trigger mode.

There are A/B trigger inputs, and if input 12V to 24V is input to each pin, trigger operation is made.

There is no power polarity of the input, so there is no need to distinguish +/-.

4-3 Digital Output Circuit

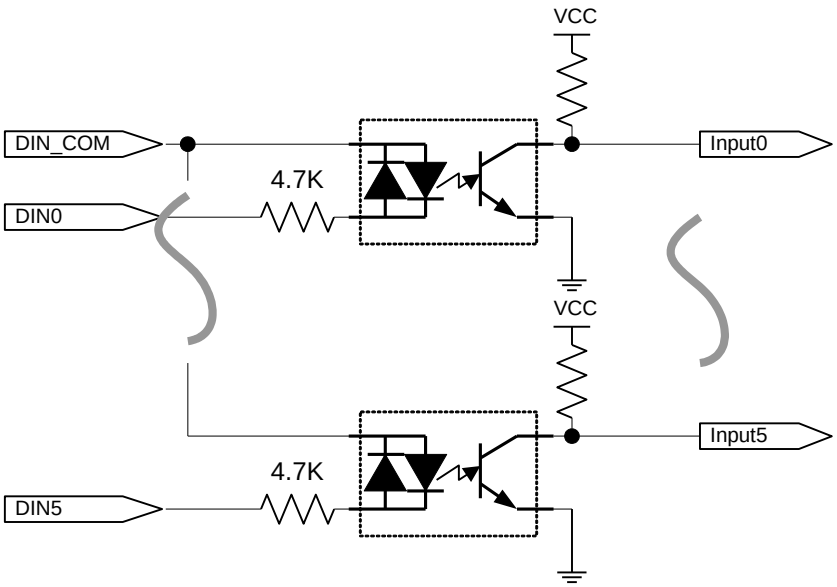


[Figure 4-3. Isolated Digital Output Circuit]

As shown in the figure, each digital output is output insulated by a photo coupler. Each output has overcurrent protection with a resistance of 22 ohms, and a common output terminal is used.

In general, in the case of the common output terminal DOUT_COM, it is connected to the external GROUND and used as an open-collector output.

4-4 Digital Input Circuit



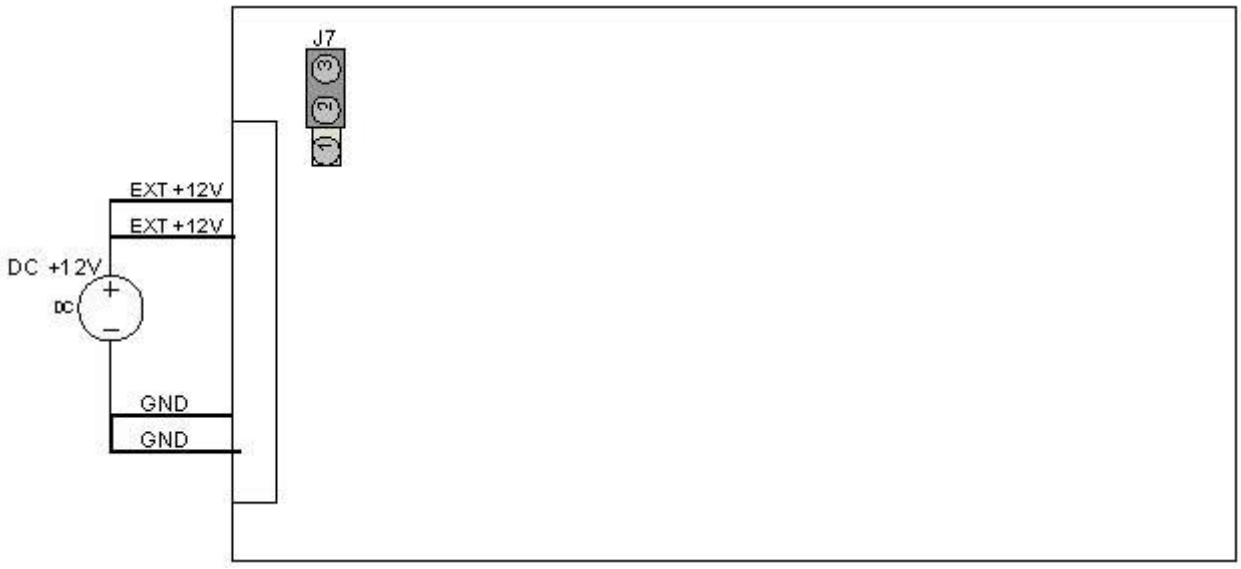
[Figure 4-4. Isolated Digital Input Circuit]

In the figure, each digital input is insulated by a photo coupler, and the input has a common input terminal and each input terminal. Each input has a 4.7K ohm resistor connected in series to accept 12V and 24V inputs.

Since there is no input polarity, "+" voltage or "-" voltage can be applied to the common terminal, and the opposite polarity to the common terminal must be input to each input.

4-5 External Connection

4-5-1 When using an external power source for the D-Sub connector

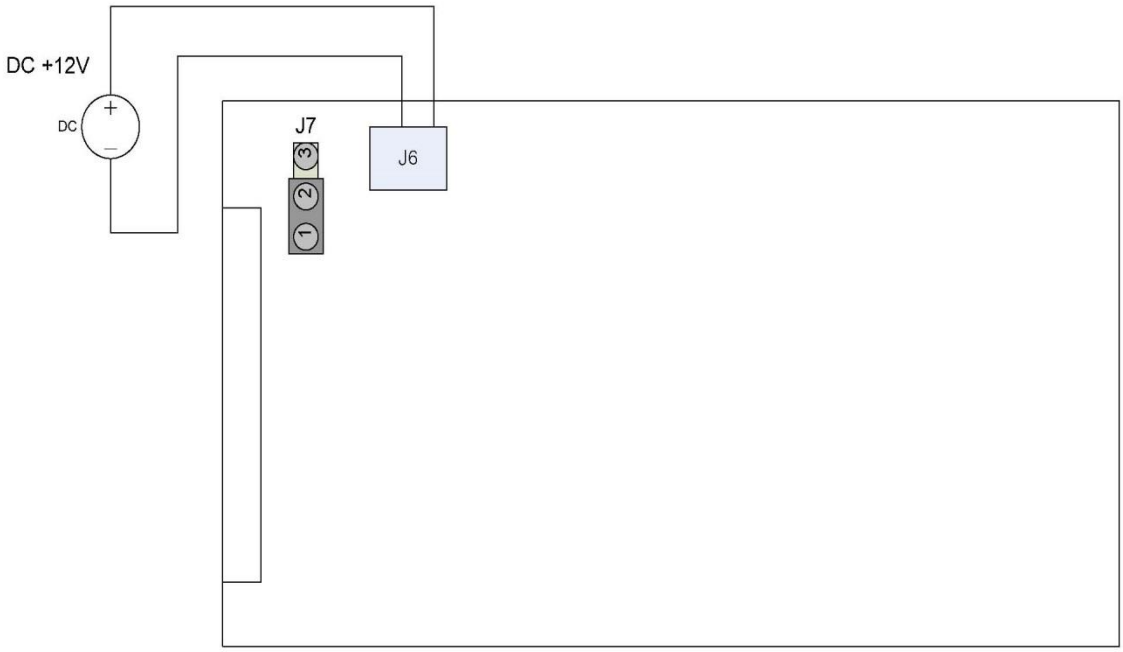


[Figure 4-5. External Connection (D-Sub Connector Connection)]

[Figure 9] shows the connection when using an external power source directly to the power connection pin of the D-Sub connector.

Connect external power to the connector pins "EXT +12" and "GND" pins and connect the J7 jumper in the board to 2-3.

4-5-2 When external power is connected to the internal connector



[Figure 4-6. Internal Connector Connection]

When using an external power supply connected to the terminal (J6) inside the board, connect the jumper to No. 1-2 as shown in [Figure 4-6] above.

5. Installation

Before installing the board, check that the contents of the package are intact.

5-1 Hardware Installation

5-1-1 Product Contents

1. USB-PWM10 Board
2. USB(A-B) Cable
3. CD (Driver/Manual/API/Sample Source etc.)

5-2 Driver Installation

For USB-PWM10 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.

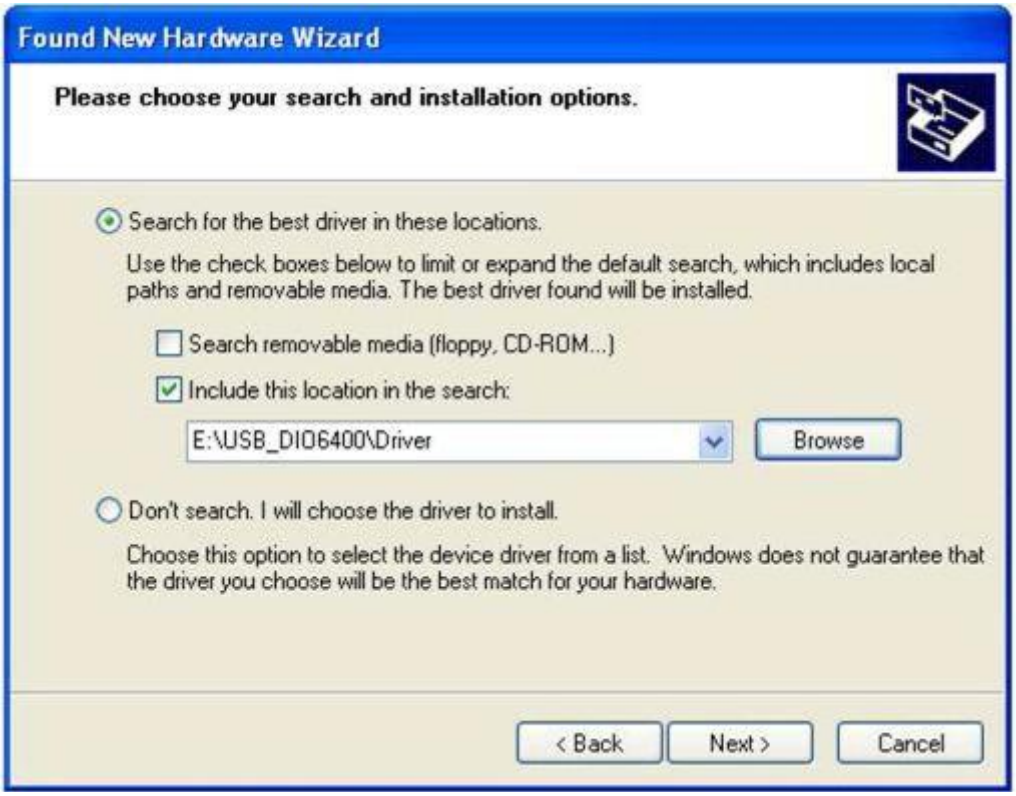
User Environment : Windows 2000 SP4 over, Windows XP SP1 over

(1) First, open the box and put the USB-PWM10 product on safe table.

(2) The USB-PWM10 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.

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-PWM₩driver

The driver folder includes a file of **"usb_pwm10.inf"** and **"usb_pwm10.sys"** that it is necessary fir driver installation.

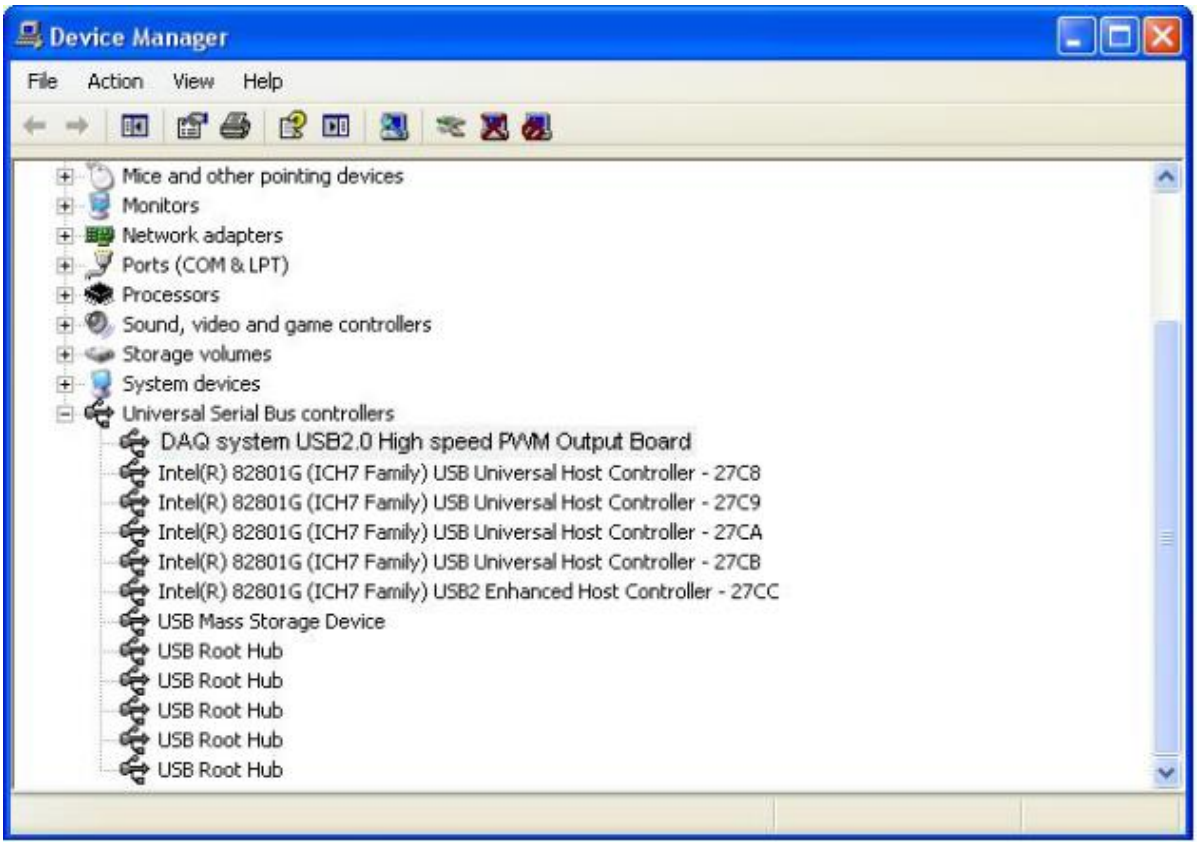
A warning message appears during installation here, press "Continue Anyway" button.

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

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

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

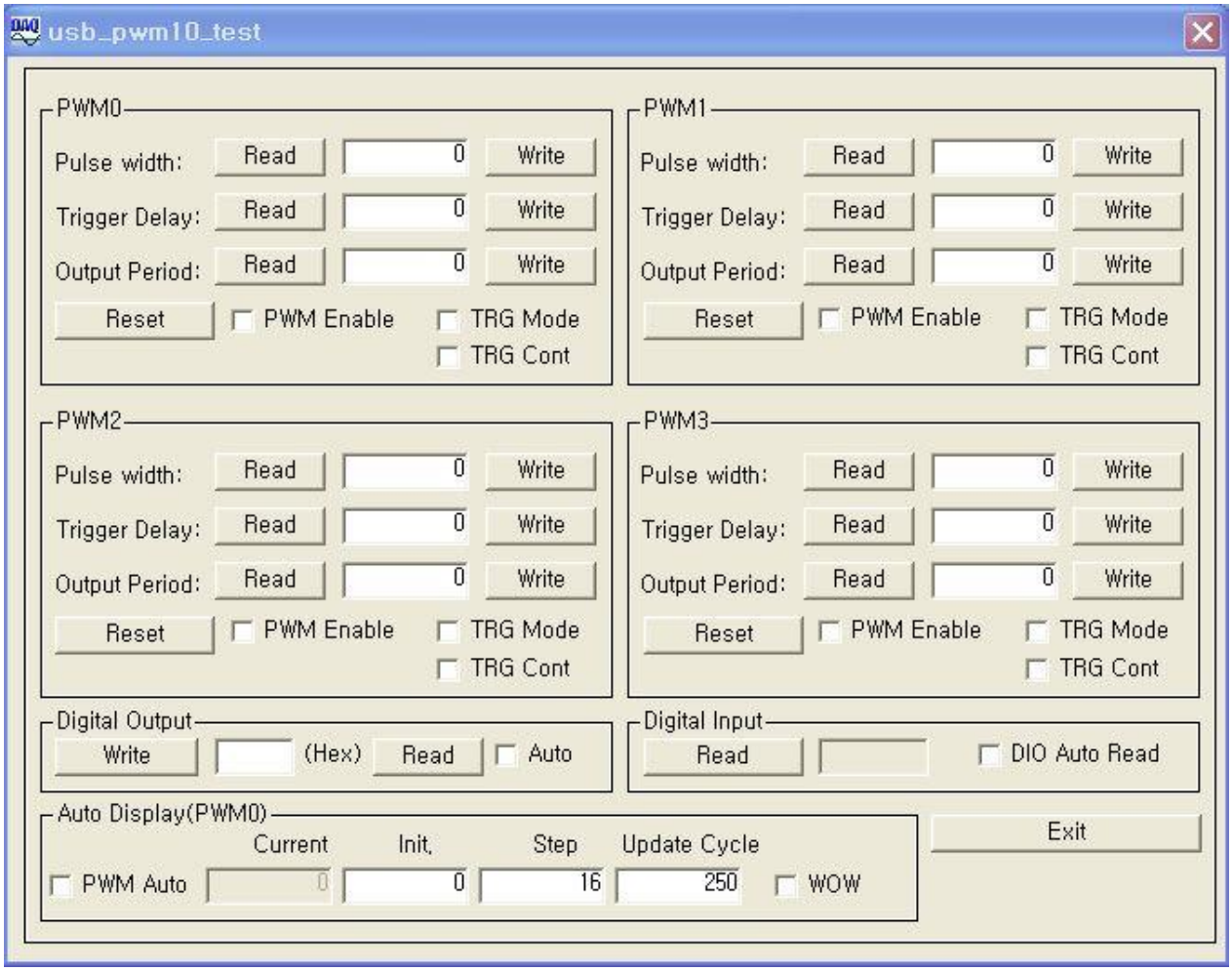
[My Computer -> Properties -> Hardware -> Device Manager -> **Universal serial Bus controllers** -> **"DAQ system USB2.0 High speed PWM Output Board"**]



6. Sample Program

DAQ system provides a sample program to make the user be familiar with the board operation and to make the program development easier. You can find the sample program in the CDROM accompanying with the board.

Sample program is provided in source form in order to show the usage of API(Application Programming Interface) of the board and may be modified for customer's own usage.



[Figure 6-1. Sample Program]

To run the sample application program, you need to use API, it is a form of client DLL. To compile the sample source to make its executable file, you have to use Import Library files and header files. You can find them in the CDROM. To run the .exe file, the API DLL file **(USB_PWM10.DLL)** must be in the same directory with the .exe file or Windows system folder. Another method is to add the directory of API DLL file to PATH environmental variable.

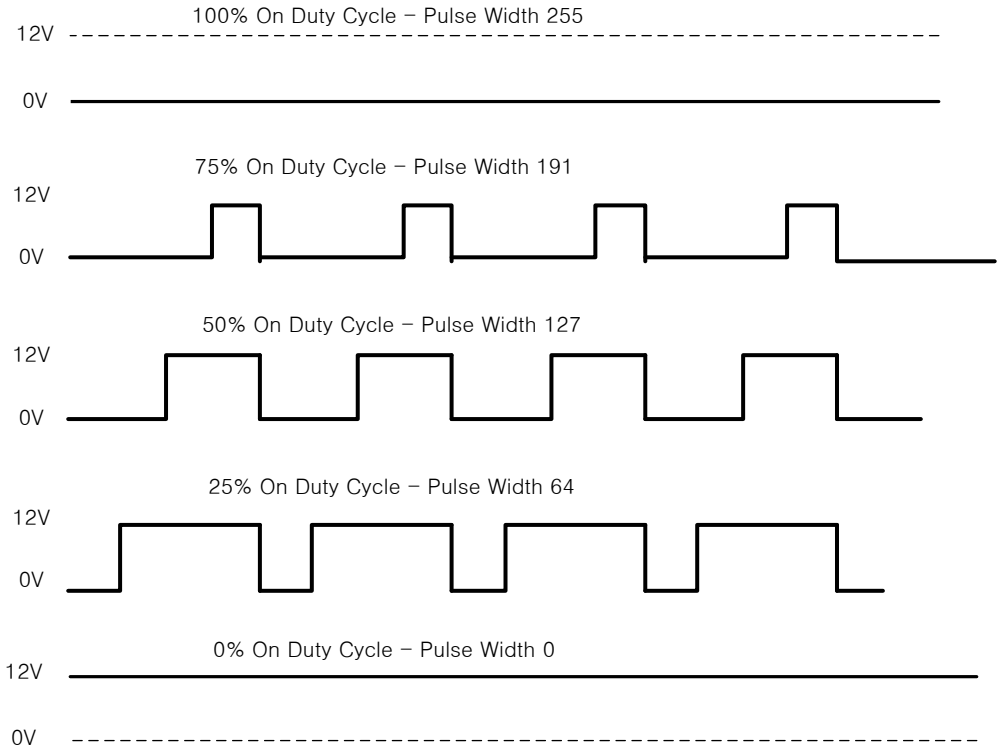
6-1 PWM0 ~ PWM3 Function

(1) Pulse width **'Read'** Button

It reads the currently set PWM operation value.

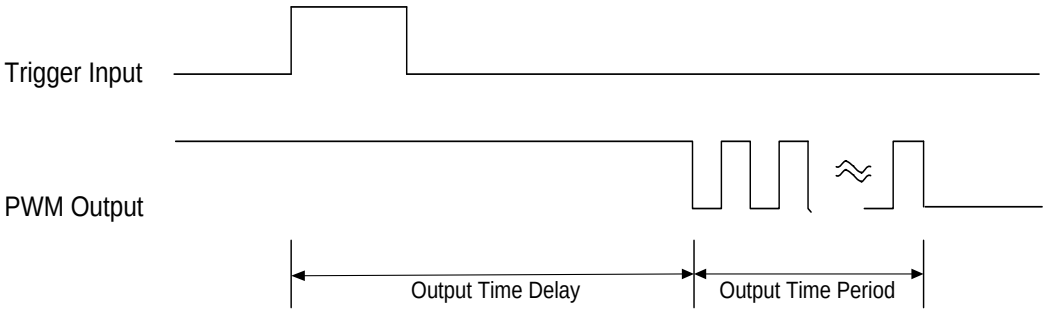
(2) Pulse width **'Write'** Button

It controls the output operation of each PWM. The setting value range is 0 to 255. One time change of the set value is 25ns.



(3) Trigger Delay **'Read'** Button

Find out the currently set PWM output delay value.



The figure shows the trigger operation mode to control the PWM output by an external trigger. In trigger operation, output delay and output period can be set. Each time uses a 22-bit timer in units of 1uSEC, so up to 4,194,303uSEC can be set.

(4) Trigger Delay **'Write'** Button

Controls the output delay operation of each PWM. The setting value range is from 0 to 4194303, and the resolution is in 1uSEC units and up to 4,194,303uSEC.

(5) Output Period **'Read'** Button

Find out the currently set PWM output period value.

(6) Output Period **'Write'** Button

Controls the output period of each PWM. The setting value range is from 0 to 4194303, and the resolution is in 1uSEC units and up to 4194303uSEC.

(7) **'Reset'** Button

Initialize each PWM. After initialization, PWM value becomes 0, PWM Disable, Normal Mode, Delay time are 0, and Period time is 1000mSEC.

(8) **'PWM Enable'**

When selected, PWM operation is performed.

(9) **'TRG Mode'**

When selected, it operates in Trigger Mode. Otherwise, it operates in Normal Mode.

(10) **'TRG Cont'**

When selected, continuous trigger operation is performed. Otherwise, it is performed only once (One Shot).

6-2 Digital Output Function

(1) **'Write'** Button

Assign 8-channel digital output as Hex value.

Outputs the value corresponding to each bit.

(2) **'Read'** Button

Reads the currently set digital output value.

(3) **Auto**

The digital input value is automatically read continuously without pressing the "Read" button.

6-3 Digital Input Function

(1) **'Read Time'** Button

6-channel digital input value is designated as Hex value.

(2) **DIO Auto Read**

The digital input value is automatically read continuously without pressing the "Read" button.

6-4 Auto Display(PWM0) Function

The operation of automatically increasing or decreasing the output operation of PWM0 is repeated.

'PWM Auto' Check: The initial value is added to the increment value, and the current value is output.

Current: current value

Init: Initial value

Step: Increment or Decrement Value

Update Cycle: The setting range is from 0 to 255, with 255 being the maximum value.

'WOW' check: "PWM Auto" Output the value obtained by subtracting the increment value from the maximum value generated during check to the current value.

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. PCI System Architecture

-- MindShare Inc.

2. PCI Local Bus Specification

-- PCI-SIG

3. General information on PCI board API

-- DAQ system

4. AN201 How to build application using APIs

-- DAQ system

5. AN242 USB-PWM10 API Programming

-- DAQ system

MEMO

Contact Point

Web sit : https://www.daqsystem.com

Email : postmaster@daqsystem.com

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