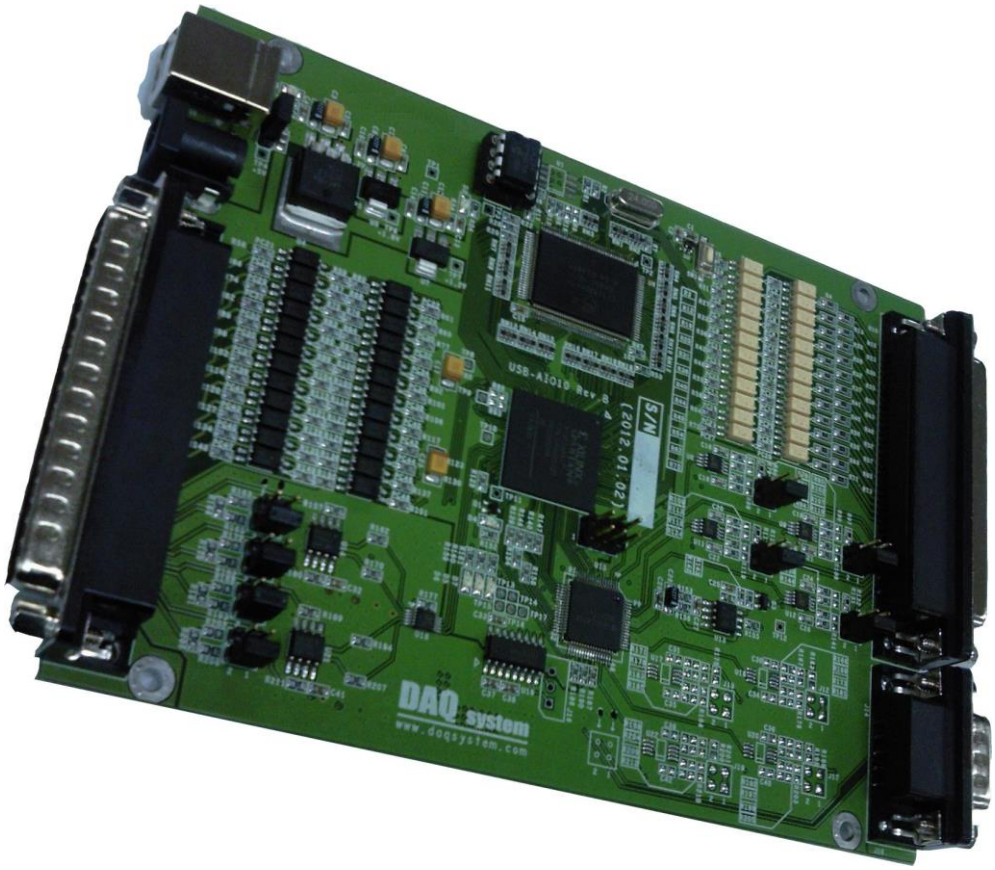
USB-AIO10

User's Manual



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References

(Caution)

- ★ **The board and external input/output signals of the device have to connect the common ground(Frame) to protect the board and peripheral devices.**
- ★ **The board operates in a safe location, in a clean environment.**
- ★ **External connection is completed before board power connection, the function should be run by the rated power.**

1. Introduction

USB-AIO10 is the function board to support Analog Input·Output, Digital Input·Output, USB 2.0 High Speed, RS-232 communication interface.

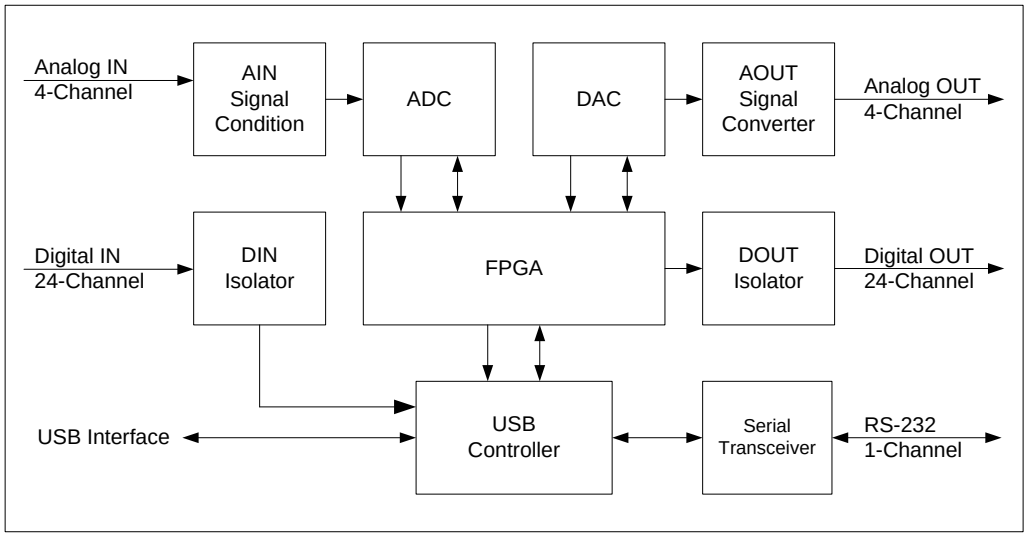
It supports the voltage, current Input/Output mode for Analog signals, shield the Digital Interface.

Basically, the board operation can use 5VDC external power, and optionally you can use USB power.

1.1 Function

- **4-Ch 16-Bit Analog Input**
- **4-Ch 16-Bit Analog Output**
- **Support Analog Voltage/Current Mode**
- **Isolated 24-Bit Digital Input/Output**
- **USB 2.0 High Speed Interface**
- **RS-232 Interface**

1.2 Internal Block Diagram



[Figure 1-1. Internal Block Diagram]

2. Product Features

[Table 1. Specification]

List	Specification
External Interface Connector	USB B-type Connector Output D-SUB Connector for Analog/Digital Input/ RS-232 D-SUB Connector 5VDC Power Connector
Analog Input(AD)	Channel : 4 Maximum Input Range : 0~+5V, 0~20mA Resolution : 16-bit, Simultaneous ADC Maximum Sampling : 52,734 Sample/sec Voltage, Current Mode Setup
Analog Output(DA)	Channel : 4 Maximum Output Range : 0~+5V, 0~20mA Resolution : 16-bit DAC Maximum Set Time : 10usec Voltage, Current Mode Setup
Digital Input	Channel : 24 Input Input Signal Level: 12/24VDC Isolated No-polarity Input
Digital Output	Channel : 24 Output Output Signal Level: 12/24VDC Isolated Polarity Output
Data Interface	USB 2.0 High Speed(480Mbps) RS-232 115,200bps 8-bit data, 1-bit parity
Board Size	151x110mm(Except Connector)
Operation Temperature	
Operation Humidity	
Operation Power	5VDC±10%, 200~400mA
Application	Kernel mode WDM Driver/User mode DLL
OS	Windows 2K/XP/7 32-bit
Basic Components	USB-AIO10 Card, USB A-B Cable, Installation CD(Driver/Manual/Sample Source etc.)
Related Products	Base-DB37 Extension Board(Separately)
Etc.	**To use a USB-powered, and a stable analog input and**

	output for external power supply (5VDC, over 500mA) is required.

3. Installation

Explains how to install the USB-AIO10 to PC and check the device.

3.1 Package Contents

After unpacking, inspect the board carton to make sure there are no damages on the board.

- USB-AIO10 Board
- USB(A-B) Cable
- Installation CD (Driver/Manual/API/Sample Source etc.)

3.2 Installation Sequence

To install USB-AIO10 board in your environment, do the following steps. The USB-AIP10 board is completely Hot-Plug and Plug & Play. Therefore, you can install it easily.

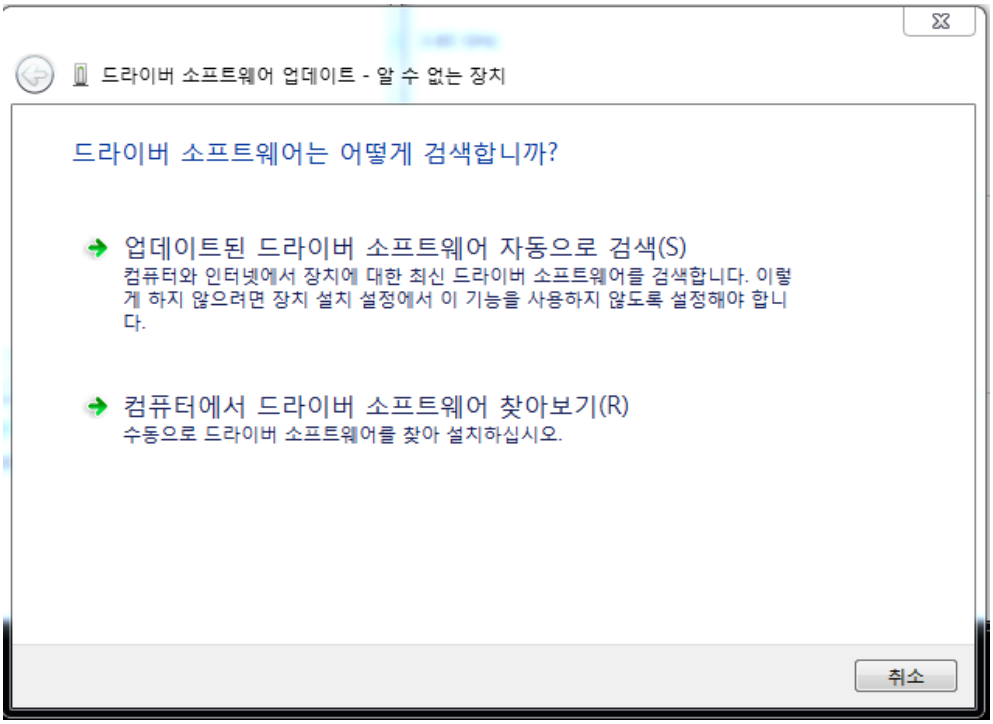
The required PC operating system for the USB-AIO10 is Windows 2000 SP4 or Windows XP/7/10.

(1) Install the USB-AIO10 board into your system.

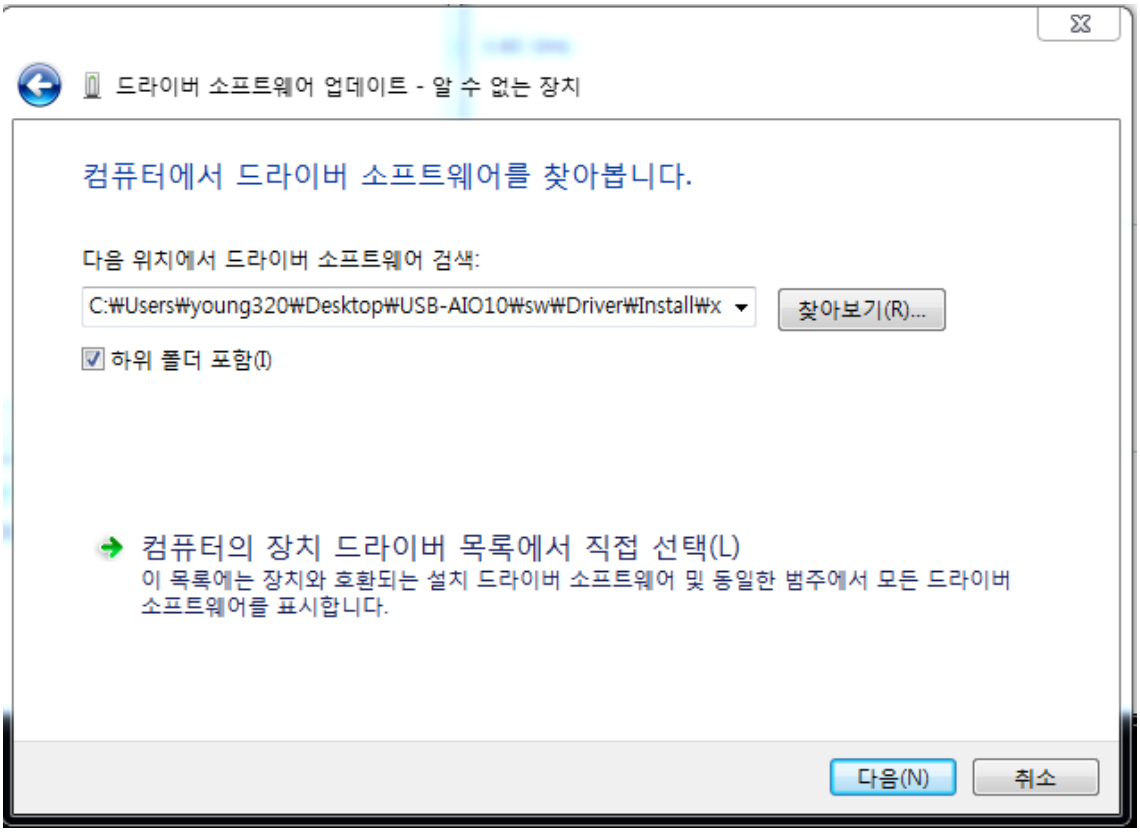
(2) Connect USB A-B cable between the case and your PC.

The Add New Hardware Wizard will appear in order to install the driver for new hardware.

(3) The Add new Hardware Wizard will install the driver in the following process. The following install process is explained based on Windows 7 operating system.



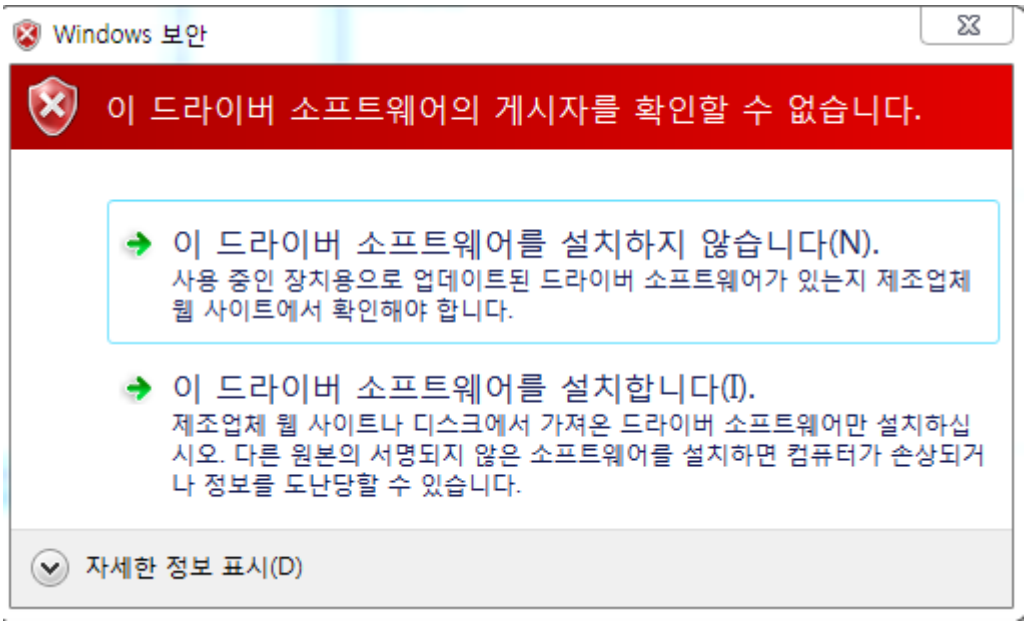
(4) If new hardware is found, Wizard will ask you to install the corresponding driver. To install the driver in the above figure, select "Browse the driver software on your computer (R)" and press the Next button. The following driver search screen will appear.



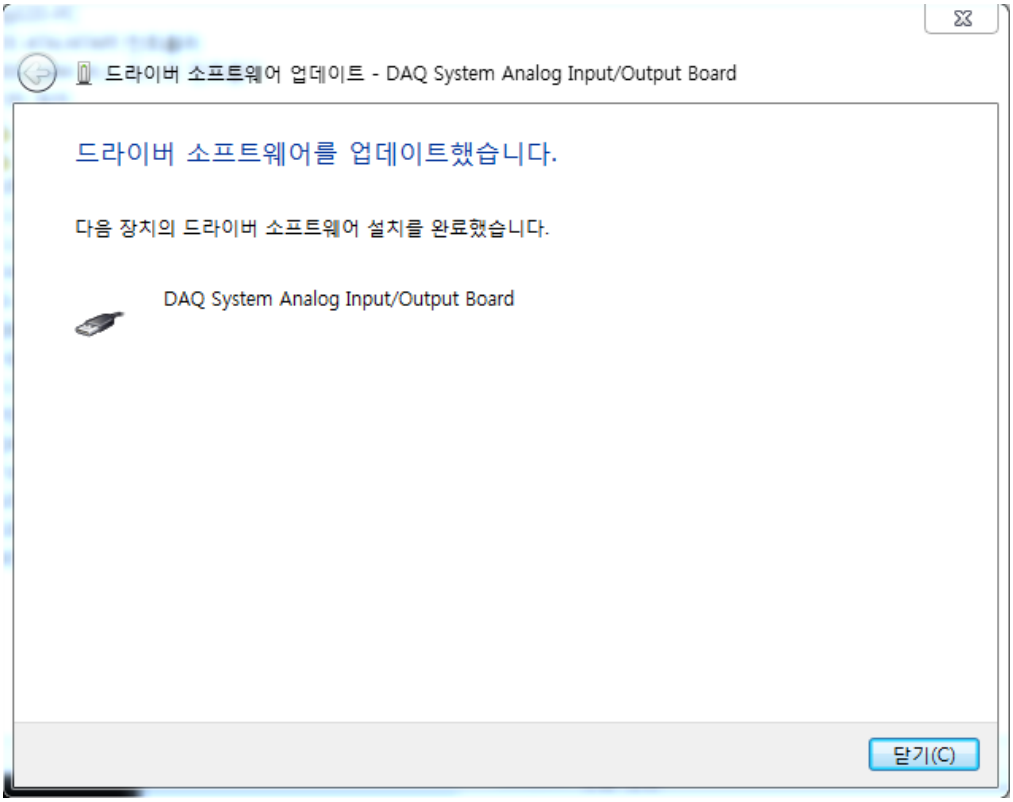
In the figure above, click the Browse button on the Driver folder of the CD that contains the driver, specify the 32/64 bit of the operating system to be used, and then click the "Next" button. Select the folder where the drivers are located. Click “OK”. Click “Next”.

The necessary files are **“usb_aio10.inf”** and **“usb_aio10.sys”** in the driver folder.

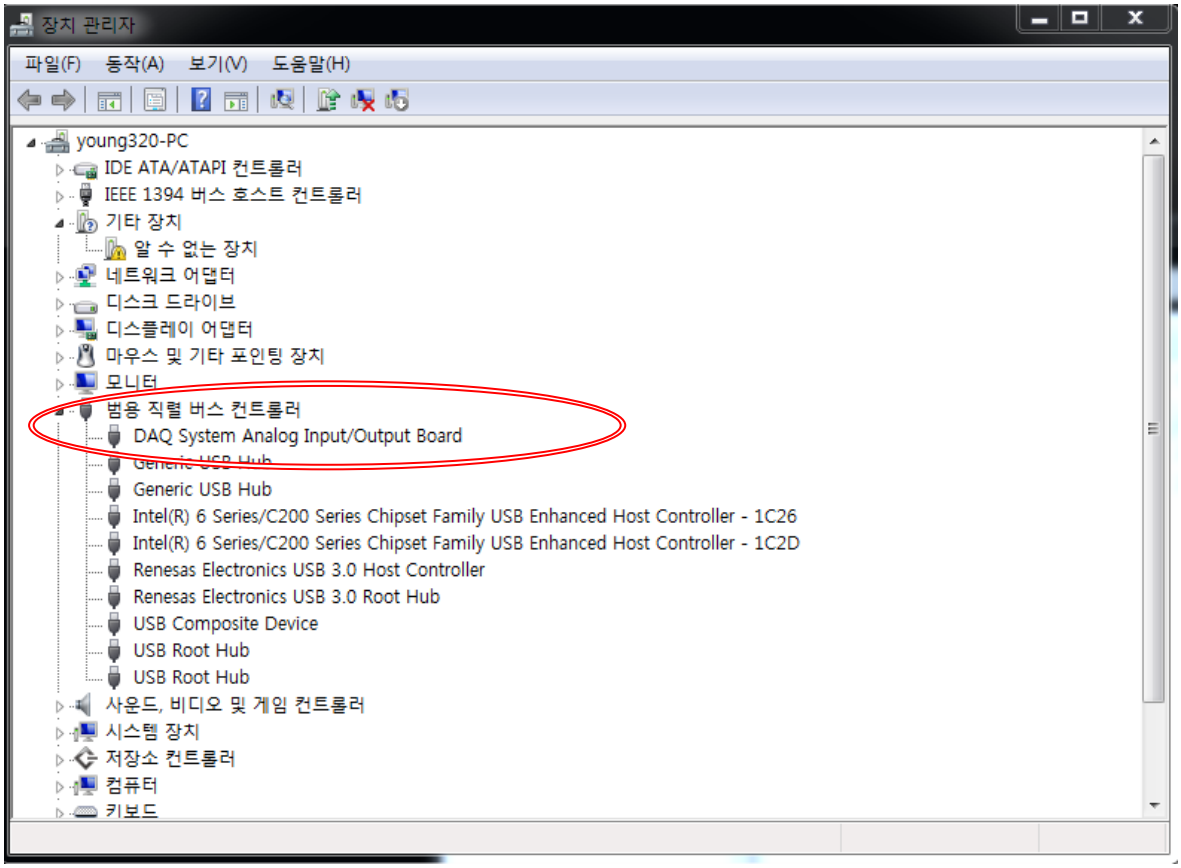
(5) If the board that is found has the appropriate driver, click "Install this driver software" to start the installation.



(6) When the installation is completed normally, the following message window appears.



(7) If the installation is completely finished, you confirm it in the following ways. Do the following steps to show up the "Device Manager" window. [My Computer -> properties -> Hardware -> Device Manager -> Universal Serial Bus Controller -> **"DAQ System Analog Input/Output Board"**]

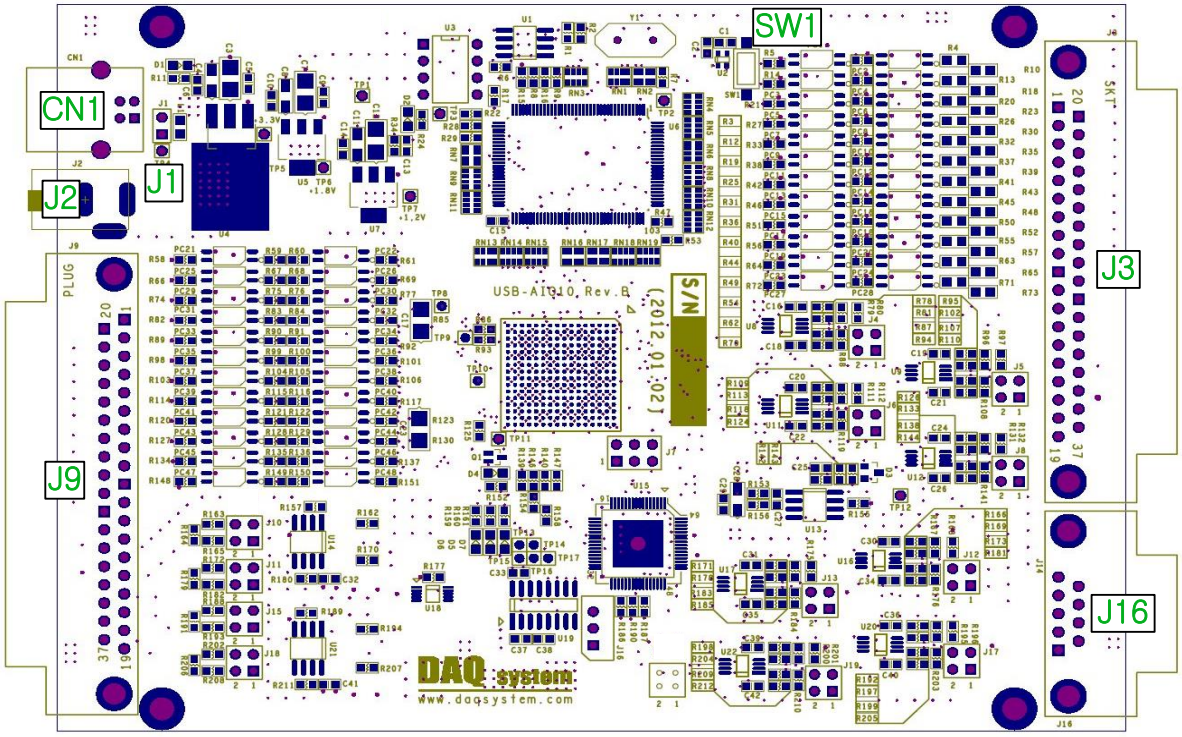


If you can see the "DAQ System USB2.0 Multi-Function Board" at Universal Serial Bus Controller, the driver installation is to have been over. (Check the red circle)

Notice : After installation, you should re-boot the system for the proper operation.

4. Hardware Device

Explains the board connectors and jumpers for interface to PC or other device.



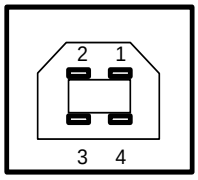
[Figure 4-1. Layout]

4.1 Reset Switch(SW1)

The board initialization switch is done to reconnect USB, initialize the functional behavior.

4.2 USB Connector(CN1)

B-type USB connector is connected to a PC as data transmission and reception.



[Figure 4-2. CN1 Connector (Front View)]

[Table 2. CN1 Connector Pin-Out]

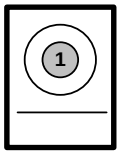
Pin No.	Name	Description	Remark
1	VCC	USB Power +5V	
2	D-	USB Signal Minus(Negative)	
3	D+	USB Signal Plus(Positive)	
4	GND	USB Power GND	

4.3 Power Selection Connector(J1)

It is the jumper connector to connect power selection of board. When the jumper is "ON", you can use USB power, when the jumper is "OFF", you can use the external power 5VDC input from the J2 connector. Be careful not to connect USB power and external power at the same time.

4.4 External Power Connector(J2)

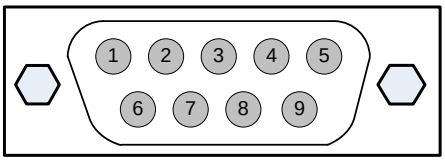
DC jack is for external power(+5Vdc) input, the number 1 is "+" polarity.



[Figure 4-3. J2 External Power Connector (Front View)]

4.5 RS-232 Connector(J16)

It is a D-Sub Connector is for RS-232 interface data transmission. The format is 115,200bps, 8-bit Data, 1-bit Stop, Flow Control NONE.



[Figure 4-4. J16 D-Sub Connector(Front View)]

[Table 3. J16 Connector Pin-Out]

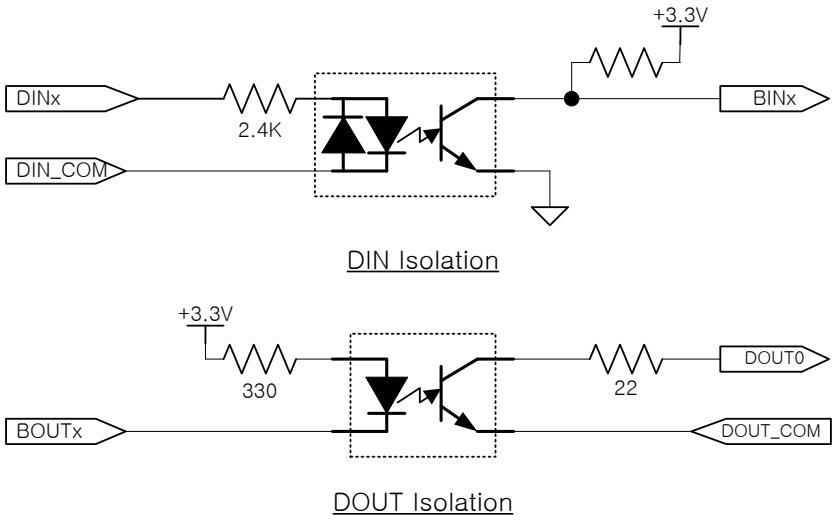
Pin No.	Name	Description	Remark
1	N.C.	No Connection	
2	RxD	Receive Data	RS232C Level
3	TxD	Transmit Data	RS232C Level
4	N.C.	No Connection	
5	DGND	Digital Ground	Board Ground
6	N.C.	No Connection	
7	N.C.	No Connection	
8	N.C.	No Connection	
9	N.C.	No Connection	

4.6 Digital Input·Output Circuit

The digital signals consist a shielded circuit by Photo Coupler as like Fig 4-5.

The Input signal consists the common input signal DIN_COM and 24 DIN signals and flow the proper current by both ends 12V/24V.

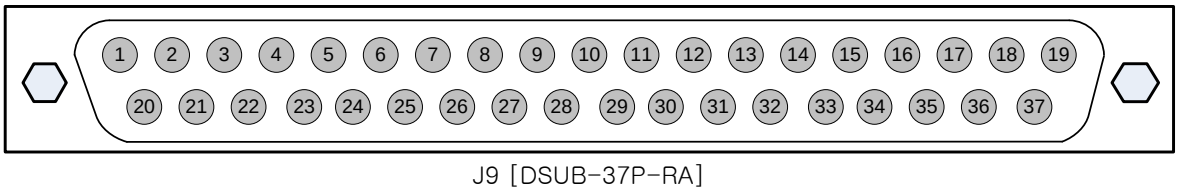
The output signal DOUTx is connected the Cathod signal of Photocoupler TR and common signal DOUT_COM is connected the Emitter. 12V/24V input voltage controls the current to less than 20mA.



[Figure 4-5. Digital IO Circuit]

4.7 Output Signal Connector(J9)

It is for Analog, Digital signal output connector.



[Figure 4-6. J9 Output Signal Connector(Front View)]

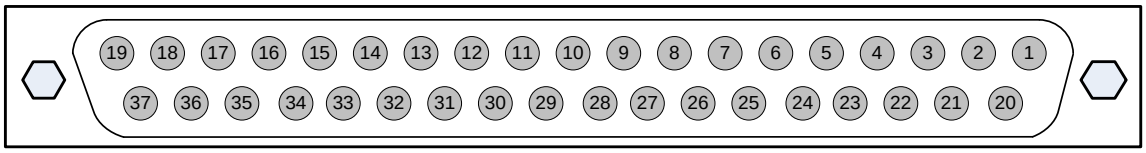
[Table 4. J9 Connector Pin-Out]

Pin No.	Name	Description	Remark
1	DOUT_COM	Common Output Signal	Power
2	DOUT1	Digital Out 1	O
3	DOUT3	Digital Out 3	O
4	DOUT5	Digital Out 5	O

5	DOUT7	Digital Out 7	O
6	DOUT9	Digital Out 9	O
7	DOUT11	Digital Out 11	O
8	DOUT13	Digital Out 13	O
9	DOUT15	Digital Out 15	O
10	DOUT17	Digital Out 17	O
11	DOUT19	Digital Out 19	O
12	DOUT21	Digital Out 21	O
13	DOUT23	Digital Out 23	O
14	AGND	Analog Ground	Power
15	AOUT0_N	Analog Output 0, Negative	O
16	AOUT1_N	Analog Output 1, Negative	O
17	AOUT2_N	Analog Output 2, Negative	O
18	AOUT3_N	Analog Output 3, Negative	O
19	AGND	Analog Ground	Power
20	DOUT0	Digital Out 0	O
21	DOUT2	Digital Out 2	O
22	DOUT4	Digital Out 4	O
23	DOUT6	Digital Out 6	O
24	DOUT8	Digital Out 8	O
25	DOUT10	Digital Out 10	O
26	DOUT12	Digital Out 12	O
27	DOUT14	Digital Out 14	O
28	DOUT16	Digital Out 16	O
29	DOUT18	Digital Out 18	O
30	DOUT20	Digital Out 20	O
31	DOUT22	Digital Out 22	O
32	DGND	Digital Ground	Power
33	AOUT0_P	Analog Output 0, Posiative	O
34	AOUT1_P	Analog Output 1, Posiative	O
35	AOUT2_P	Analog Output 2, Posiative	O
36	AOUT3_P	Analog Output 3, Posiative	O
37	+5V	+5V Power	Power

4.8 Input Signal Connector(J3)

It is for Analog, Digital signal input connector.



J3 [DSUB-37S-RA]

[Figure 4-7. J3 Input Signal Connector (Front View)]

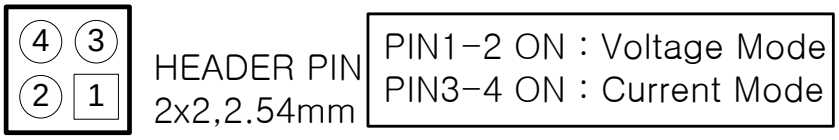
[Table 5. J3 Connector Pin-Out]

Pin No.	Name	Description	Remark
1	DIN_COM	Common Input Signal	Power
2	DIN1	Digital In 1	I
3	DIN3	Digital In 3	I
4	DIN5	Digital In 5	I
5	DIN7	Digital In 7	I
6	DIN9	Digital In 9	I
7	DIN11	Digital In 11	I
8	DIN13	Digital In 13	I
9	DIN15	Digital In 15	I
10	DIN17	Digital In 17	I
11	DIN19	Digital In 19	I
12	DIN21	Digital In 21	I
13	DIN23	Digital In 23	I
14	AGND	Analog Ground	Power
15	AIN0_N	Analog Input 0, Negative	I
16	AIN1_N	Analog Input 1, Negative	I
17	AIN2_N	Analog Input 2, Negative	I
18	AIN3_N	Analog Input 3, Negative	I
19	AGND	Analog Ground	Power
20	DIN0	Digital In 0	I
21	DIN2	Digital In 2	I
22	DIN4	Digital In 4	I
23	DIN6	Digital In 6	I
24	DIN8	Digital In 8	I
25	DIN10	Digital In 10	I
26	DIN12	Digital In 12	I

27	DIN14	Digital In 14	I
28	DIN16	Digital In 16	I
29	DIN18	Digital In 18	I
30	DIN20	Digital In 20	I
31	DIN22	Digital In 22	I
32	DGND	Digital Ground	Power
33	AIN0_P	Analog Input 0, Posiative	I
34	AIN1_P	Analog Input 1, Posiative	I
35	AIN2_P	Analog Input 2, Posiative	I
36	AIN3_P	Analog Input 3, Posiative	I
37	+5V	+5V Power	Power

4.9 Analog Signal Selection Connector

Explains the voltage and current mode selection the jumper connector of Analog Input/Output. **In case of connection input/output all pin 1-2, it is a voltage mode. In case of connection pin 3-4, it is a current mode.**

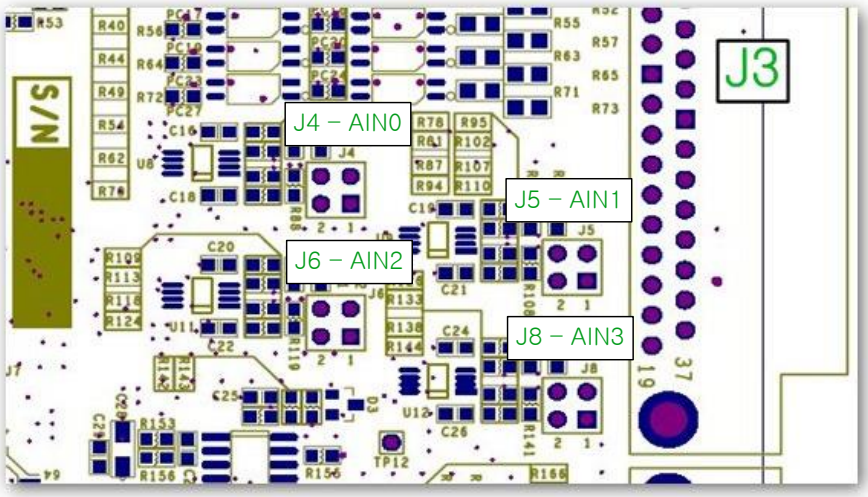


[Figure 4-8. Mode Selection Jumper Connector(Top View)]

4.9.1 Analog Input Mode Selection

Analog Input Signal Voltage/Current Mode selection jumper connector location is shown in Fig 4-9, it displays the connector and corresponding channel number.

Initially it is set to voltage mode.

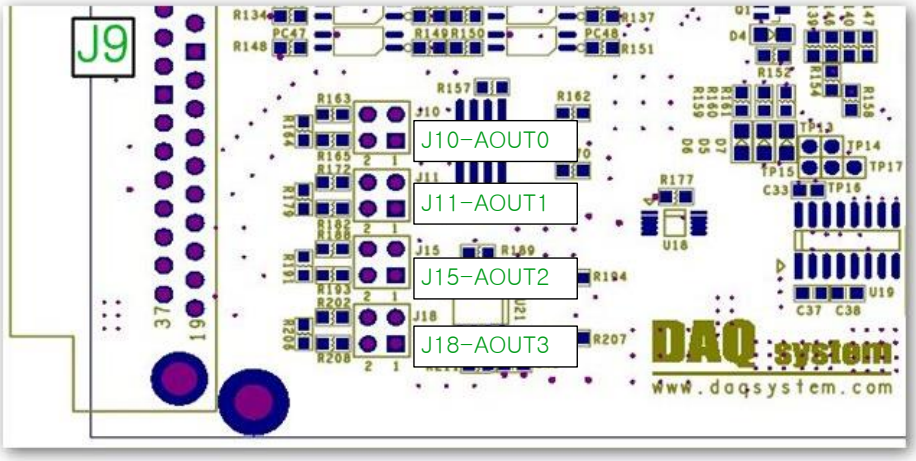


[Figure 4-9. Analog Input Mode Selection Connector]

4.9.2 Analog Output Mode Selection

Analog Output Signal Voltage/Current Mode selection jumper connector location is shown in Fig 4-10, it displays the connector and corresponding channel number.

Initially it is set to voltage mode.



[Figure 4-10. Analog Output Mode Selection Connector]

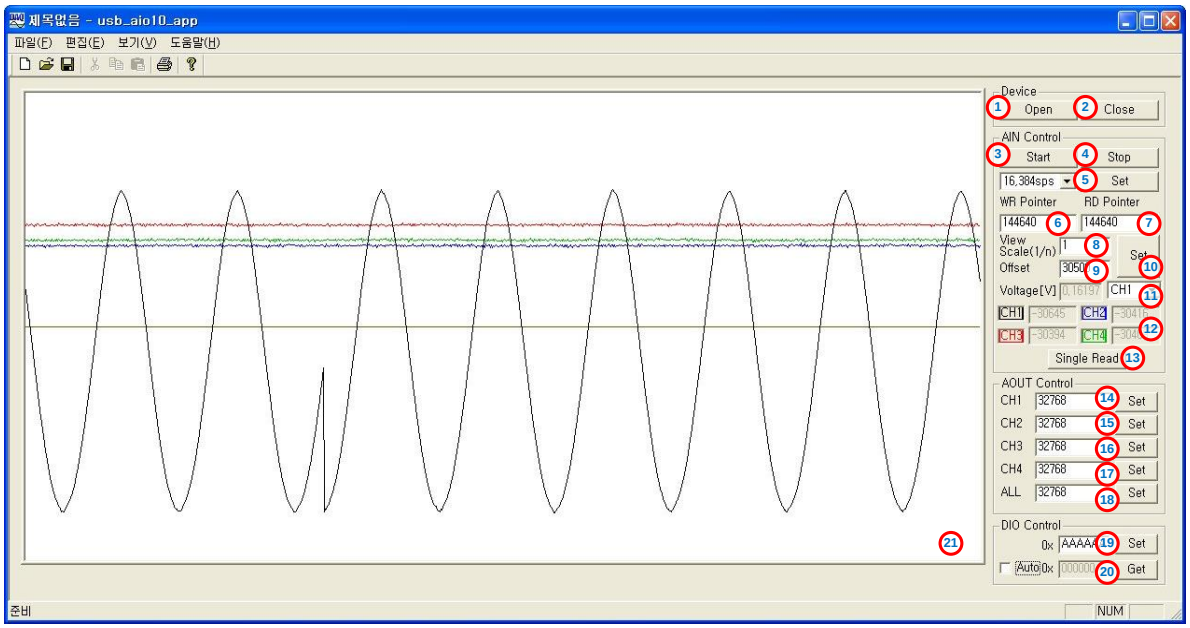
5. Sample Program

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. The execution file is "usb_aio10_app.exe" and "usb_aio10_app2.exe for USB and RS-232 interface.

Sample program is provided in source form(Visual C++ 6.0) in order to show the usage of API (Application Programming Interface) of the board and may be modified for customer's own usage.

5.1 USB Interface Sample Program

The USB-AIO10 should be connected to the system through USB cable. The power can use the USB power or external power. The execution file is "usb_aio10_app.exe".



[Figure 5-1. USB Interface Sample Program]

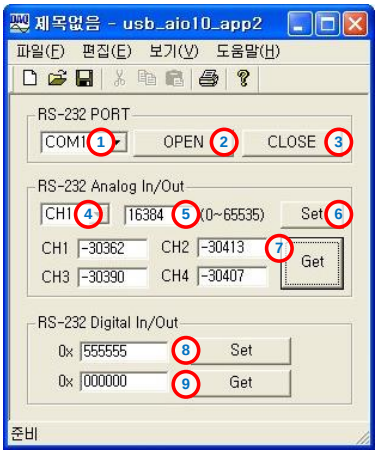
[Table 6. Sample Program Function Description]

No.	Name	Description
1	Open	Open the USB-AIO10 device. When USB device opens, stop the RS-232 data transmission.
2	Close	Close the USB device. You can use the RS-232 interface function.
3	Start	Start the continuous Analog input data acquisition.
4	Stop	Stop the continuous Analog input data acquisition.
5	Set	Set up the selected sampling rate.

6	WR Pointer	Display the buffer pointer of stored in the library to read from the board. 0x800000 is the number of data.
7	RD Pointer	Display the library buffer pointer to read from the application.
8	View Scale	Write a value to attenuate the level of article 19 that displayed in the graph. The range of the Analog Input value is 0~65,535(5V/20mA), it mark by the attenuation because a range of values is larger to display.
9	Offset	Write the value to move the graph level.
10	Set	Set the listed value of the article 8, 9 to analog input data display part.
11	Voltage(CH1)	Display the converted to a voltage level of analog input channel (CH1).
12	-	Display the collected data for each channel.
13	Single Read	Current Analog Input data read once. It can use when the state of continuous data collection stop.
14	CH1	After write the Analog Output value, set that value to CH1. The output value range is 0~65535(5V/20mA).
15	CH2	After write the Analog Output value, set that value to CH2.
16	CH3	After write the Analog Output value, set that value to CH3.
17	CH4	After write the Analog Output value, set that value to CH4.
18	ALL	After write the Analog Output value, set that value to all channel.
19	Set	Set the Digital Output value.
20	Get	Check the Digital Input value.
21	Graph	It is displayed that Analog Input value is calculated by using Scale and Offset.

5.2 RS-232 Interface Sample Program

Must be stopped the USB interface in the program, the USB-AIO10 should be connected to the system through RS-232 cable. The power can use the USB power or external power. The execution file is "usb_aio10_app2.exe".



[Figure 5-2. RS-232 Interface Sample Program]

[Table 7. RS-232 Sample Program Function Description]

No.	Name	Description
1	COM1	Select the number of RS-232 port.
2	OPEN	Open the RS-232 port for USB-AIO10 interface.
3	CLOSE	Close the RS-232 port.
4	Channel	Select the Analog Output Channel.
5	-	Enter the value of the Analog Output Data value.
6	Set	Set the Analog Output Data value to the board.
7	Get	When press this button, display the current Analog Data from the board.
8	Set	Set the left Digital Output value to the board.
9	Get	Display at the left to read the current Digital Input.

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-AIO10 API Programming

-- DAQ system