

PCI-AIO02

User's Manual



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References

UPDATE HISTORY

2010-10-12

API Function Add

ADC_StartBufferedRead()
ADC_StopBufferedRead()
ADC_GetBufferedData()
ADC_GetBufferedDataEx()
ADC_SetAvgCounter()

API Function Explanation

ADC_GetData()

2010-11-05

API Function Add

GetBoardVersion() - It will apply to Board Version2.

2011-06-13

Change Document

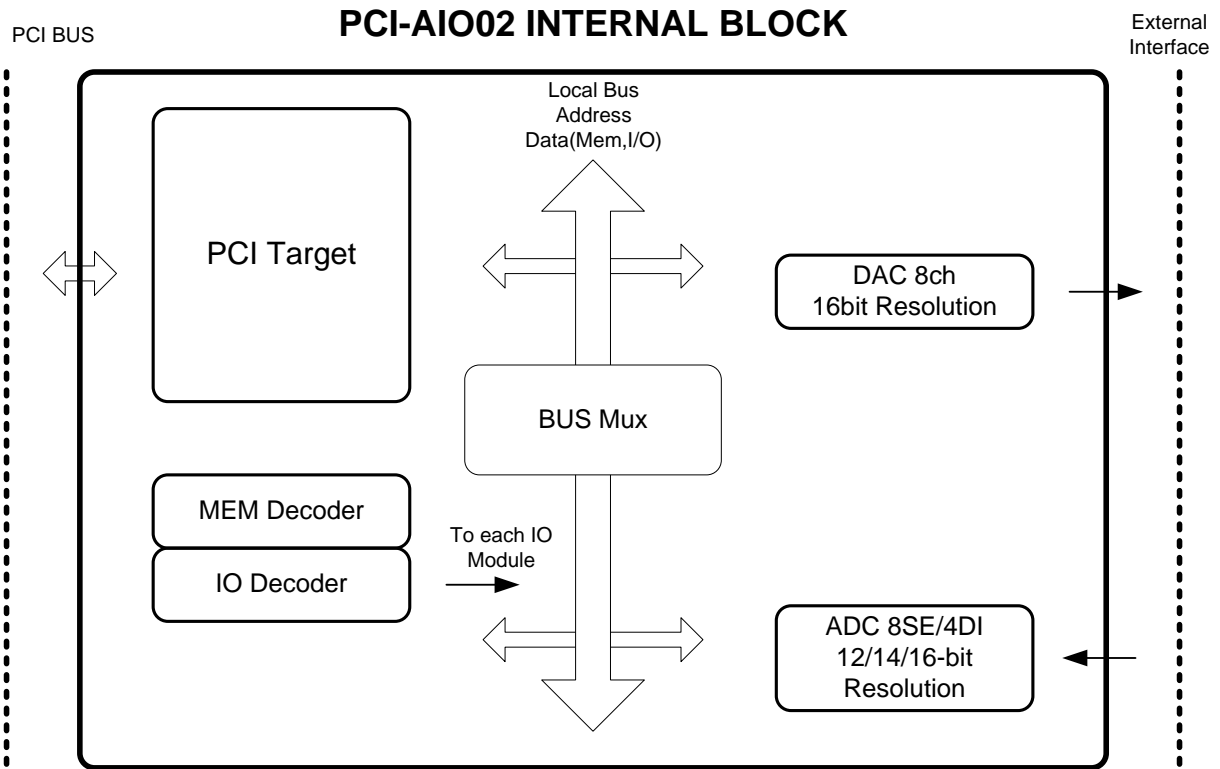
12-Bit ADC -> 12/14/16-Bit ADC

2011-07-04

6. Installation Add

7. Sample Program Add

1. PCI-AIO02 Block Diagram



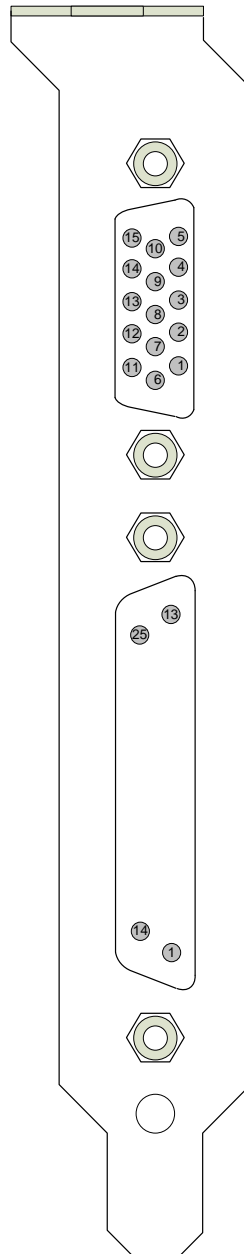
[Figure 1-1. PCI-AIO02 Internal Block Diagram]

The PCI-AIO02 is a board having the functions of analog I/O PCI board with the 16-bit DAC 8 channels, 12/14/16-bit ADC 8 channels.

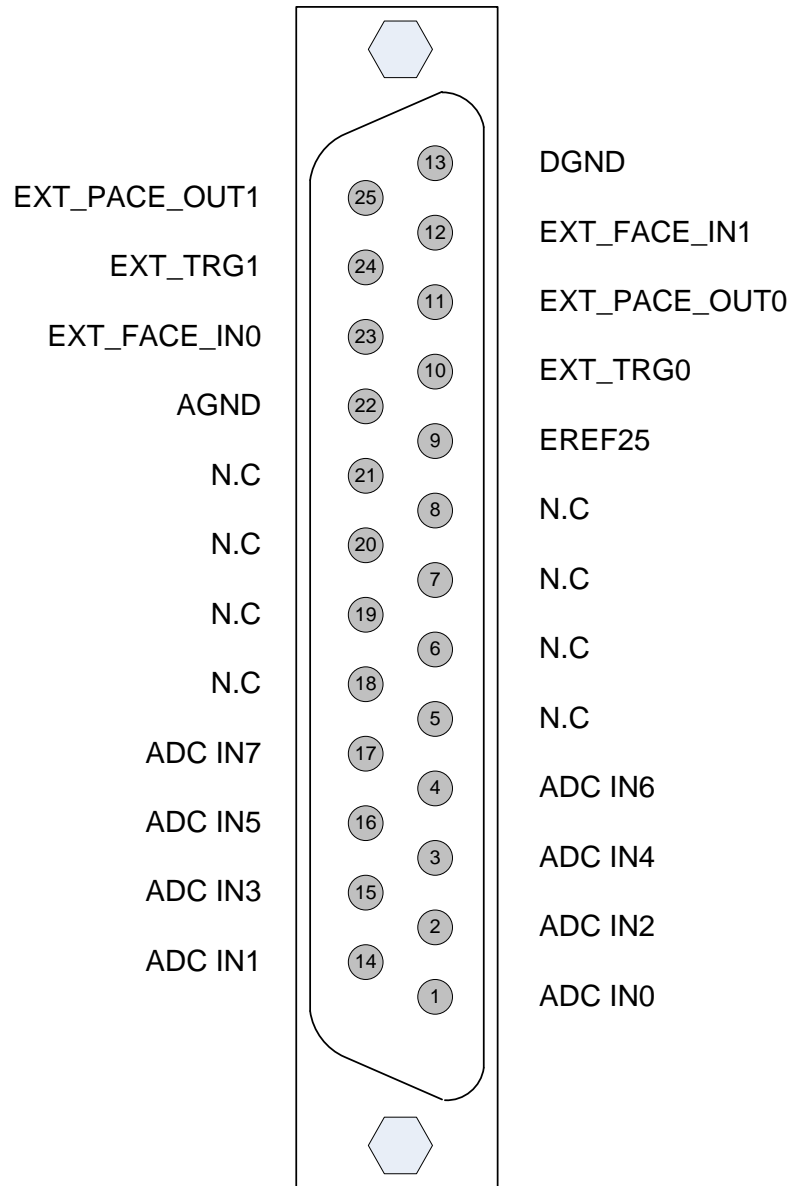
- **PCI 32-bit, 33MHz 5/3.3V Compatible Target Board**
- **8-Ch Input 12/14/16-bit ADC(8-Ch SE or 4-Ch DI)**
- **Support various ADC Input Range (+5V, +10V, ±5V, ±10V)**
- **Support 10usec Settling time 8-Ch DAC**
- **Support various DAC Output Range (+5V, +10V, +10.8V, ±5, ±10, ±10.8V)**

2. Connector Pin Map

The D-SUB 15pin and 25pin connector which was fixed to standard PCI Bracket is used for Analog signal Input/Output.



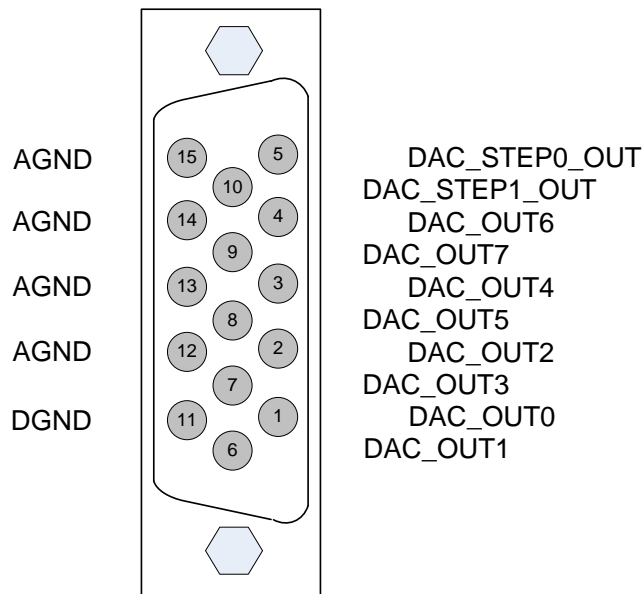
[Figure 2-1. PCI-AIO02 PCI Bracket]



[Figure 2-2. PCI-AIO02 D-sub25 Connector Pin]

[Table 1. PCI-AIO02 D-sub 25 Pin Connector Description]

Pin#	Pin Name	Description	Remark
1	ADC IN0	Analog Input Channel 0	+/- 10V Input
2	ADC IN2	Analog Input Channel 2	+/- 10V Input
3	ADC IN4	Analog Input Channel 4	+/- 10V Input
4	ADC IN6	Analog Input Channel 6	+/- 10V Input
5	NC	No Connection	
6	NC	No Connection	
7	NC	No Connection	
8	NC	No Connection	
9	EREF25	2.5V Analog Reference Output	2.5V Output
10	EXT_TRG0	Trigger External Input	It will be upgraded in the future.
11	EXT_PACE_OUT0	Digital External Output	It will be upgraded in the future.
12	EXT_FACE_IN1	Digital External Input	It will be upgraded in the future.
13	DGND	Digital GROUND	0V GROUND
14	ADC IN1	Analog Input Channel 1	+/- 10V Input
15	ADC IN3	Analog Input Channel 3	+/- 10V Input
16	ADC IN5	Analog Input Channel 5	+/- 10V Input
17	ADC IN7	Analog Input Channel 7	+/- 10V Input
18	NC	No Connection	
19	NC	No Connection	
20	NC	No Connection	
21	NC	No Connection	
22	AGND	Analog Input GROUND	0V GROUND
23	EXT_FACE_IN0	Digital External Input	It will be upgraded in the future.
24	EXT_TRG1	Trigger External Input	It will be upgraded in the future.
25	EXT_PACE_OUT1	Digital External Output	It will be upgraded in the future.



[Figure 2-3. PCI-AIO02 D-sub15 Connector Pin]

[Table 2. PCI-AIO02 D-sub 15 Pin Connector Description]

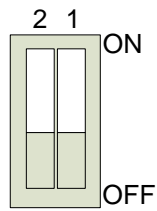
Pin#	Pin Name	Description	Remark
1	DAC_OUT0	Analog Output Channel 0	Max. +/- 10.8V Output
2	DAC_OUT2	Analog Output Channel 2	Max. +/- 10.8V Output
3	DAC_OUT4	Analog Output Channel 4	Max. +/- 10.8V Output
4	DAC_OUT6	Analog Output Channel 6	Max. +/- 10.8V Output
5	DAC_STEP0_OUT	Digital Output 0	It will be upgraded in the future.
6	DAC_OUT1	Analog Output Channel 1	Max. +/- 10.8V Output
7	DAC_OUT3	Analog Output Channel 3	Max. +/- 10.8V Output
8	DAC_OUT5	Analog Output Channel 5	Max. +/- 10.8V Output
9	DAC_OUT7	Analog Output Channel 7	Max. +/- 10.8V Output
10	DAC_STEP1_OUT	Digital Output 1	It will be upgraded in the future.
11	AGND	Analog GROUND	0V GROUND
12	AGND	Analog GROUND	0V GROUND
13	AGND	Analog GROUND	0V GROUND
14	AGND	Analog GROUND	0V GROUND
15	DGND	Digital GROUND	0V GROUND

3. Board Address Setup

If mounting works in one system that a lot of I/O ports are required, several AIO series boards are classified according to each board address.

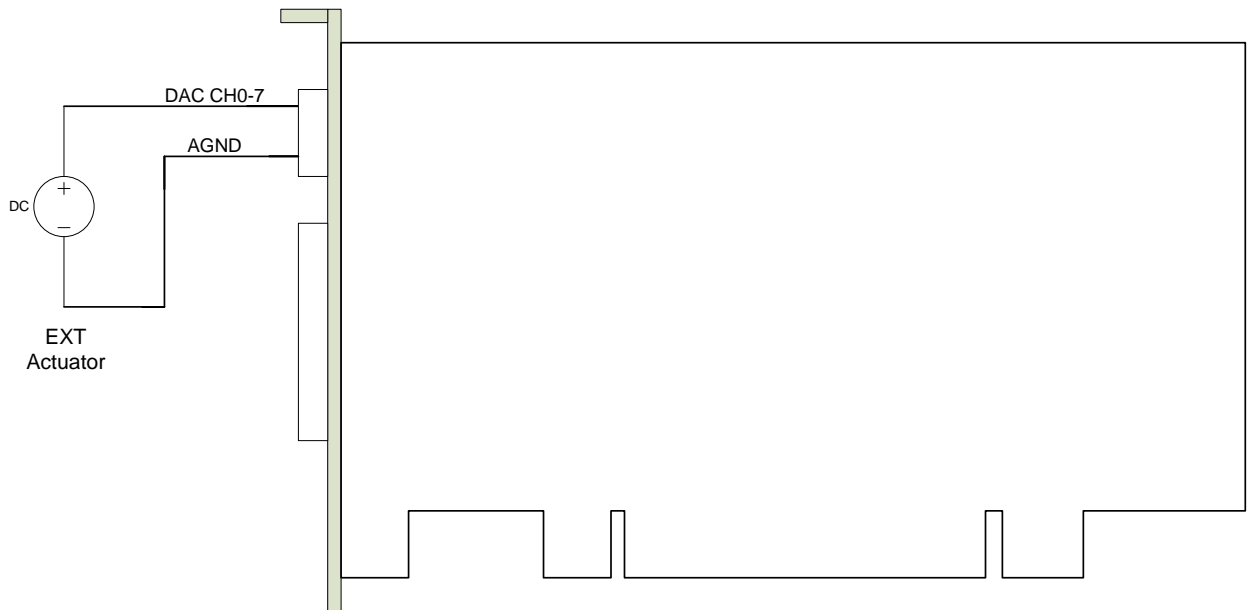
Distribution of each board sets it up through 4 pin DIP switch (SW1). A system is designed of maximum four boards at the same time so as usable.

SW1 Setup



1	2	Board No.
OFF	OFF	0
ON	OFF	1
OFF	ON	2
ON	ON	3

4. Analog Output Connection Diagram

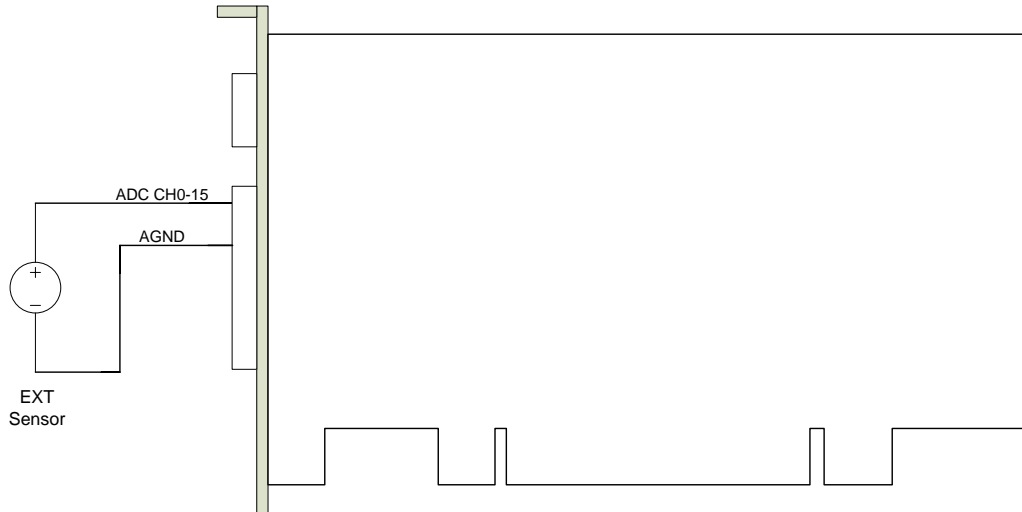


[Figure 4-1. Analog Output Connection]

An analog output goes out through D-sub 15 pin connector like Figure 4-1. The eight analog channel outputs are making it with bases of channel0 ~ channel 7 by AGND. Always AGND and DAC channel shall be connected outside with pairs.

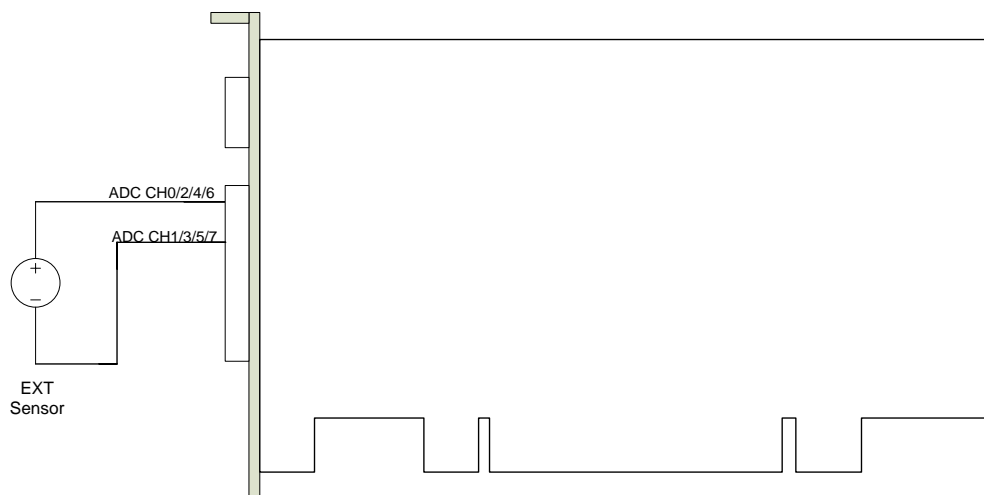
5. Analog Input Connection Diagram

An analog input supports SE (Single Ended) Input and DI (Differential Input) method.



[Figure 5-1. Analog SE (Single Ended) Input Connection]

A common analog GROUND(AGND) works input basis for the SE connection. At this time, the input channel has total 8 channels.



[Figure 5-2. Analog DI (Differential Input) Connection]

An analog DI connection is a difference between two input channel pairs. At this time, the input pairs connect according (CH0 <-> CH1), (CH2 <-> CH3), (CH4 <-> CH5), (CH6 <-> CH7). So, in case of DI connection have total 4 input channels.

6. Installation

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

6.1 Package Content

Product Contents

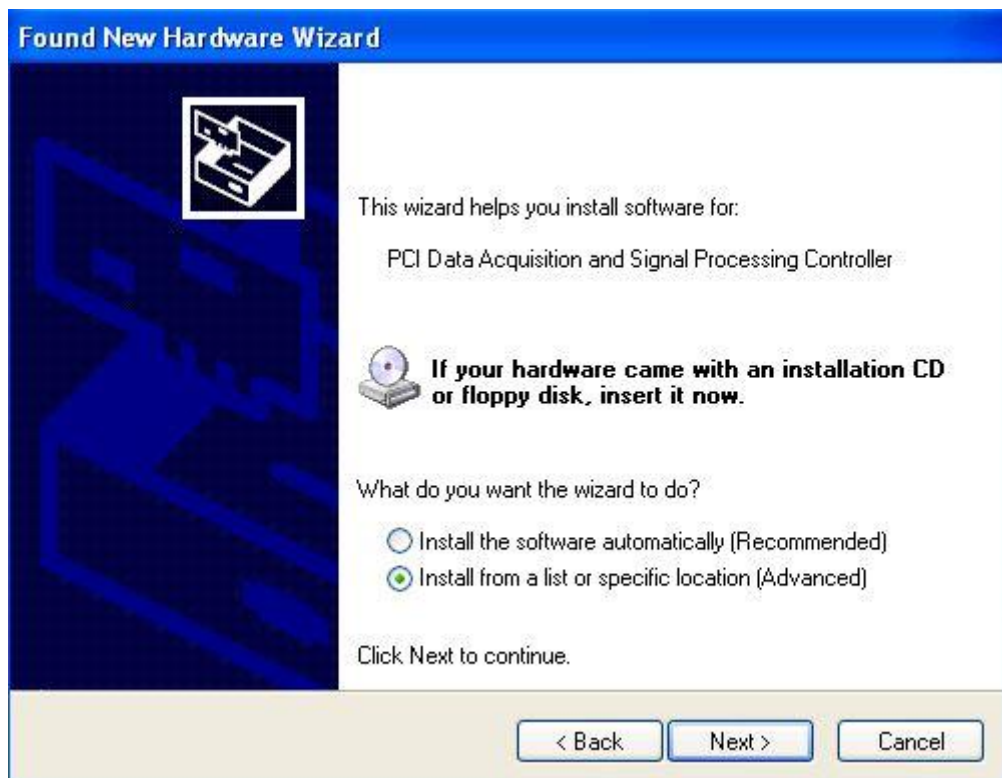
1. PCI-AIO02 Board
2. CD (Driver/Manual/API/Sample Source etc.)

6.2 Installation Sequence

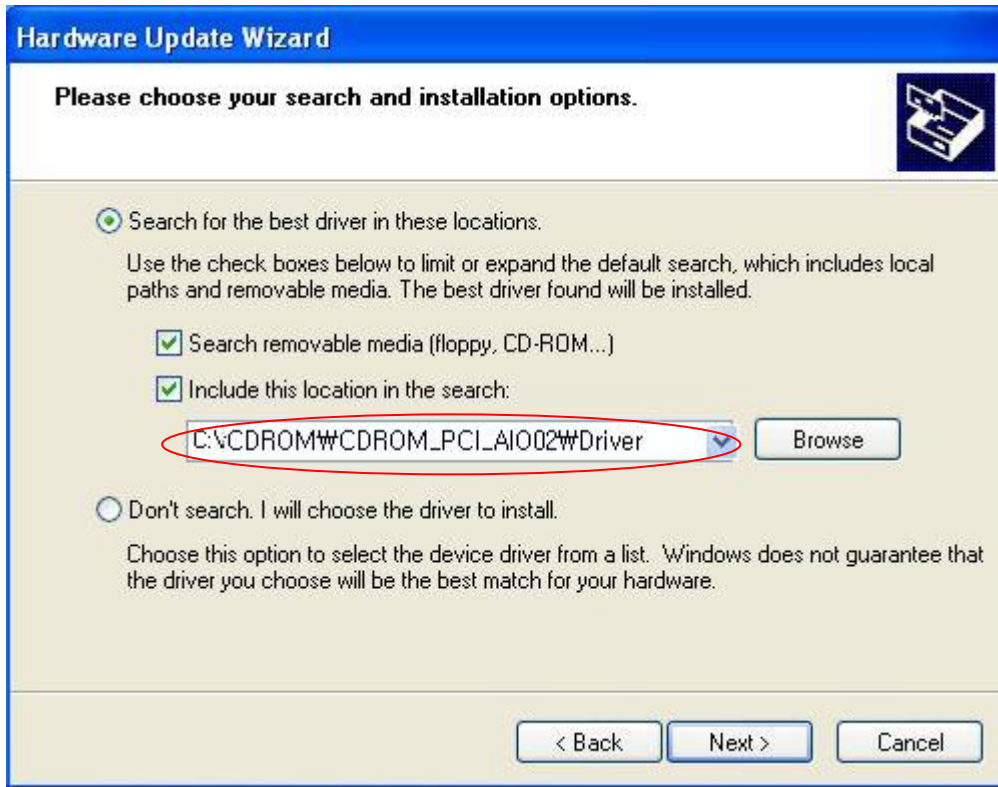
To install your PCI-AIO01 board in your PC, follow the steps described in the document "How to install PCI DAQ Board" provided by DAQ System. If the document is missing, you can get it from www.dagsystem.com. The PCI-AIO02 board is completely Plug & Play. There are no switches or jumpers to set. Therefore you can install it easily.

- Your OS requirement : Windows 2000 SP4 or Windows XP SP1 above

The PCI-AIO02 connects to PCI Card Port. After that you can show the below picture of "Found New Hardware Wizard" window.

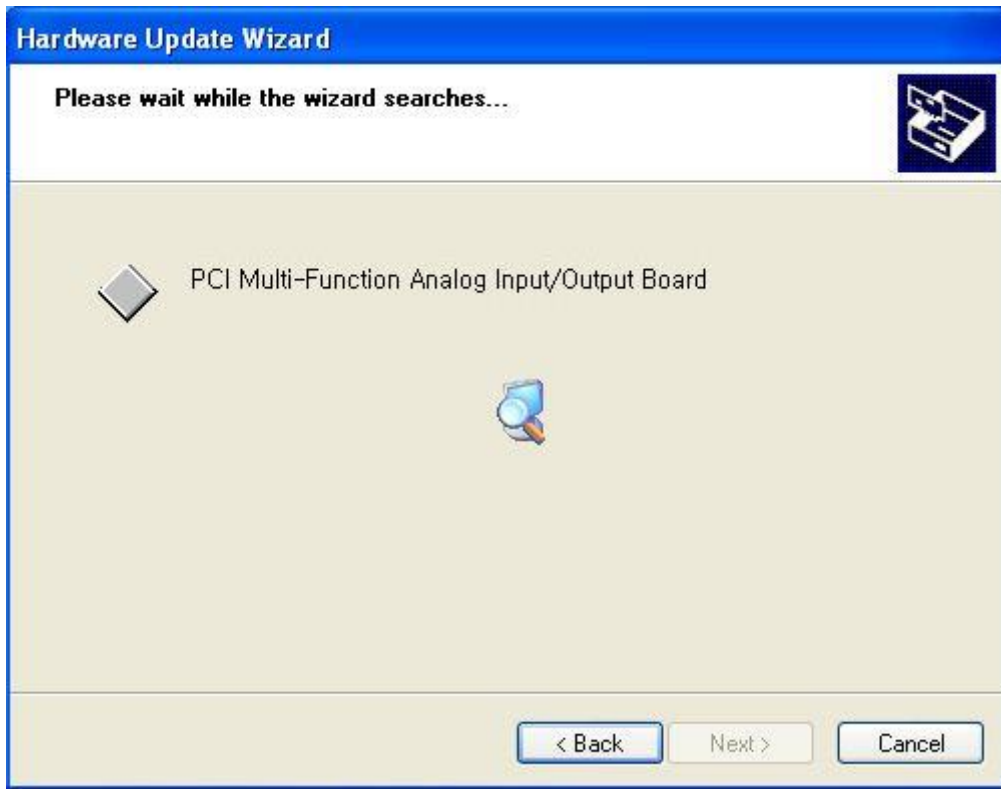


If new hardware is found, Wizard will ask you to install the corresponding driver. For installation of the driver, select the item “Install from a list or specific location (Advanced)” and click “Next” as in the figure.

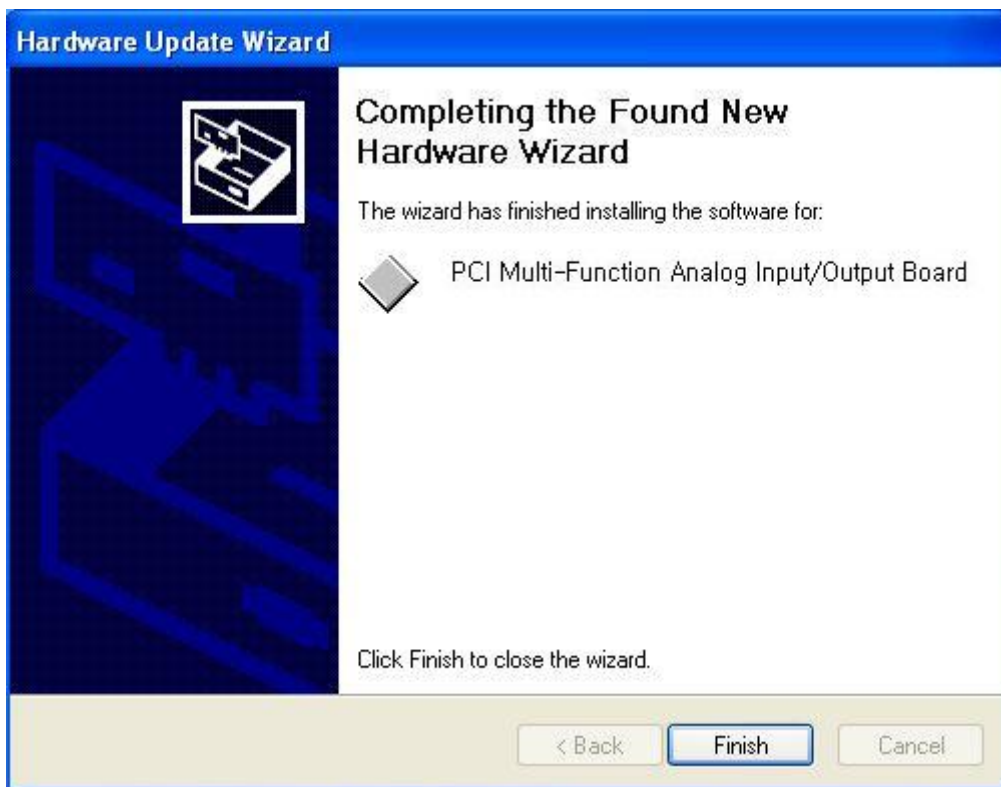


The driver folder includes a file of “**pci_aio02.inf**” and “**pci_aio02.sys**” that it is necessary for driver installation.

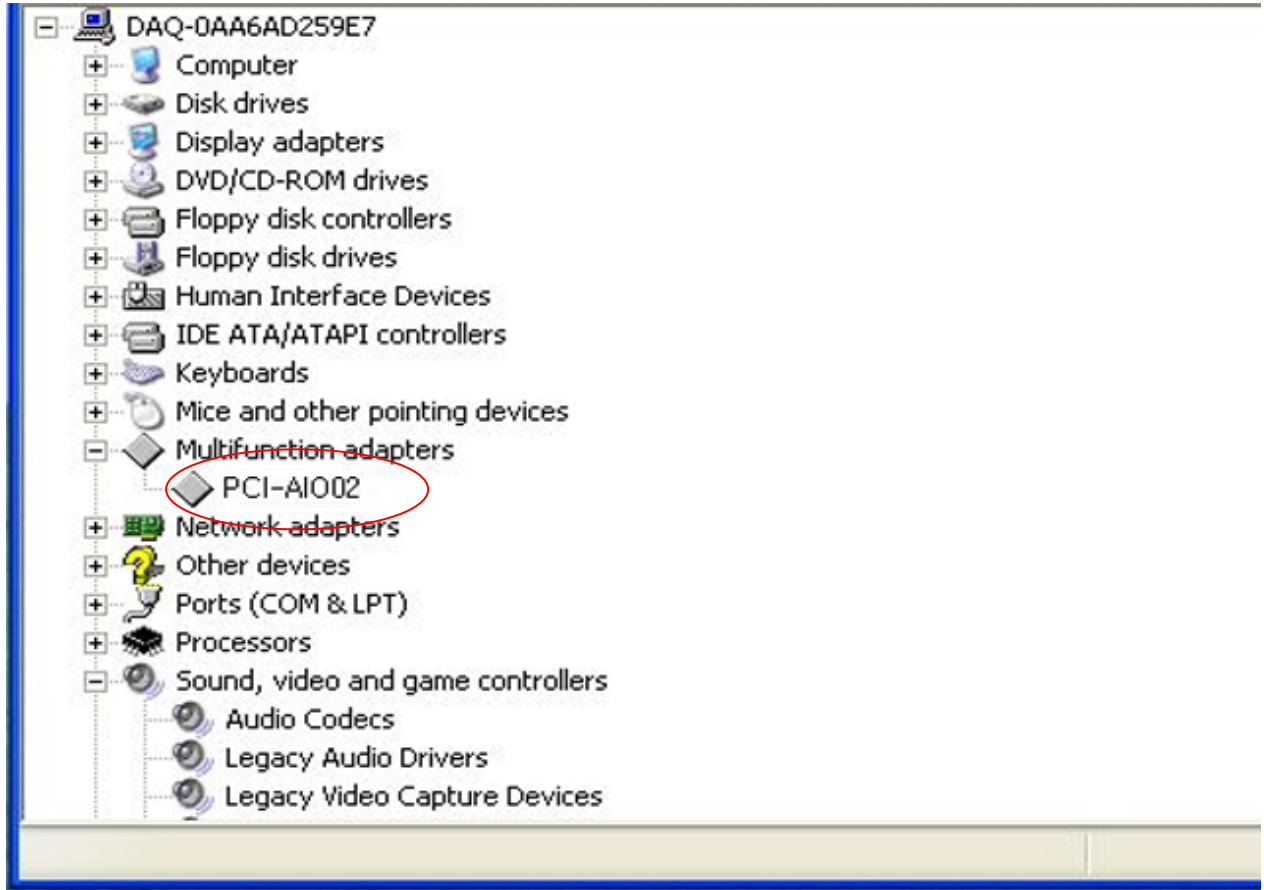
A warning message appears during installation here, press “Continue Anyway” button. You can show below message window. Process progress as follows.



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



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 -> **Multifunction Adaptors -> PCI-AIO02**]



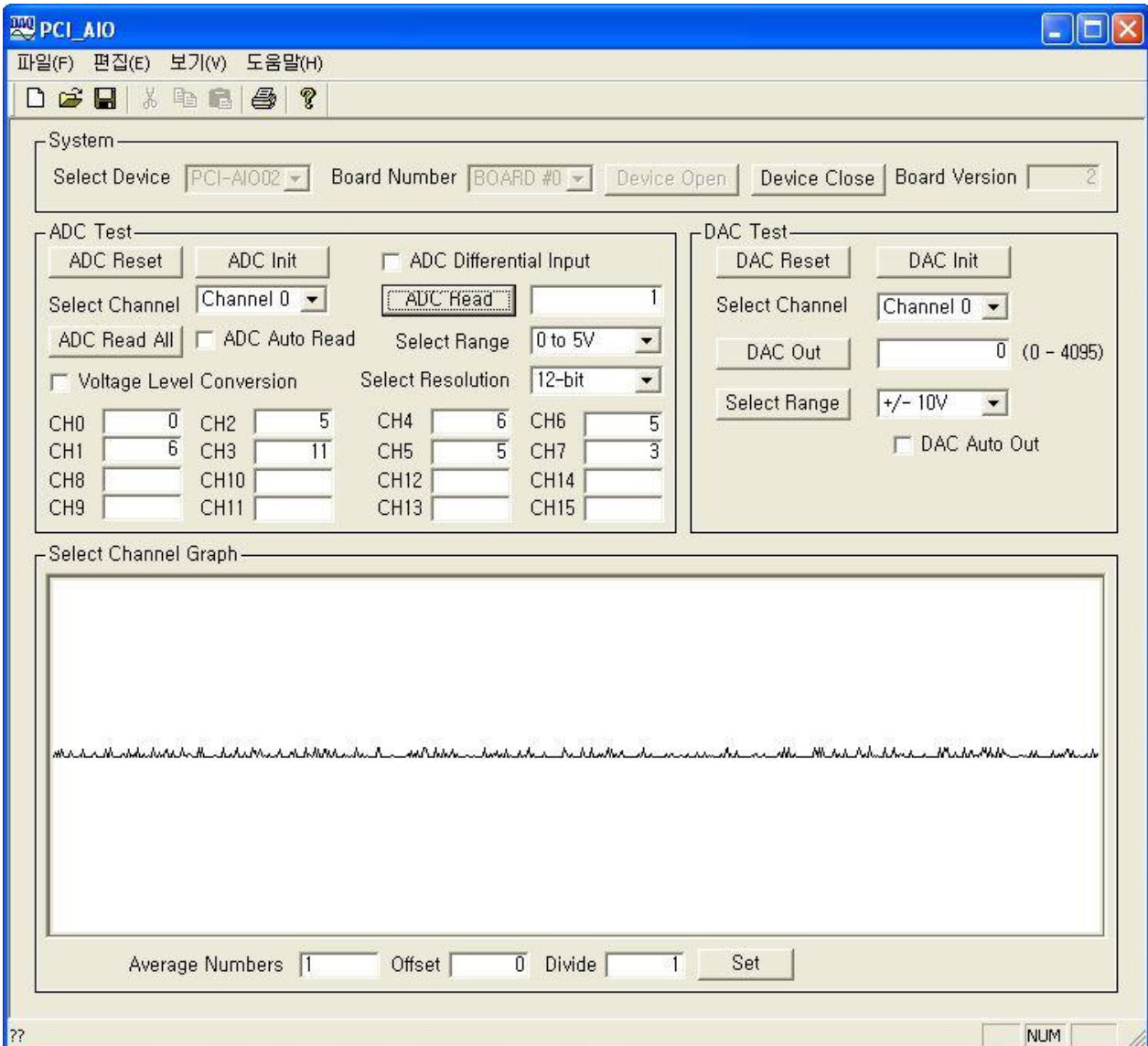
If you can see the “PCI-AIO02” at Multifunction Adaptors, the driver installation is to have been over. (Check the red circle)

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

7. 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. One of the execution file is “**PCI_AIO.exe**”.

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 7-1. When Sample program “PCI_AIO.exe” is executed]]

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 (**PCI_AIO.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.

7.1 System Function

(1) **Select Device**

Open the device PCI-AIO0 ~ AIO05 Board

(2) **Board Number**

Select the board number. (0 ~ 3)

(3) **'Device Open' Button**

When the button clicks, open the selected board.

(4) **'Device Close' Button**

When the button clicks, close the operated board.

(5) **Board Version**

It display a board hardware version.

7.2 ADC (Analogue Digital Converter) Test Function

(1) **'ADC Reset' Button**

Reset the ADC function.

(2) **'ADC Init' Button**

Initialize the ADC function.

(3) **ADC Differential Input**

When the box toggles, get the Differential input.

(4) **Select Channel**

Write the ADC channels. The PCI-AIO01 channel numbers are from 0 to 7.

(5) **'ADC Read' Button**

The ADC input of Select Channel read a data once.

(6) **'ADC Read All' Button**

Read the all current ADC input.

(7) **ADC Auto Read**

Auto read all current ADC value.

(8) Select Range

Set up the ADC input range per channel. (0 to 5, ± 5 , 0 to 10V, $\pm 10V$)

(9) Voltage Level Conversion

Change the data to voltage level.

(10) Select Resolution

Set up AD Data width (bit).

The AD converter of board can support three resolution (12, 14, 16bit).

(11) CH0 ~ CH15

In case of PCI-AIO01, it use only CH0 ~ CH7.

7.3 DAC Test**(1) 'DAC Reset' Button**

Reset the DAC function.

(2) 'DAC Init' Button

Initialize the DAC setup.

(3) Select Channel

Write the DAC channel. The PCI-AIO01 channel number is from 0 to 1.

(4) 'DAC Out' Button

The range is from 0 to 4095 (Refer to API function DAC_GetData() at chapter 8)

Ex) In case of 0 ~ 10V range setup

If output voltage is 5V, the setup value is $(5V/10V) * 4096 = 2048$.

In case of -10 ~ + 10V range setup

If output voltage is 5V, the setup value is $(10+5V/20V) * 4096 = 3072$.

If output voltage is -5V, the setup value is $(10-5V/20V) * 4096 = 1024$.

(5) 'Select Range' Button

Set up the DAC output range per channel. (+5V, +10V, +10.8V, ± 5 , $\pm 10V$, $\pm 10.8V$)

(6) DAC Auto Out

All current DAC value automatically output.

7.4 Select Channel Graph

(1) Average Numbers

It designate the data number that a moving average is applied to 0 ~ 255.

It is not applied to AD data collection by ADC_GetData() function.

(2) Offset

It is an offset to display graph.

As an offset value is added to data collection, it is used if data aren't marked to a graph.

(3) Divide

It is a division value to display graph.

It marks let the data reduction in case of the data aren't marked if the collected data is too large.

(4) 'Set' Button

Set the Average Number, Offset, Divide value.

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 PCI-AIO02 API Programming -- DAQ system

