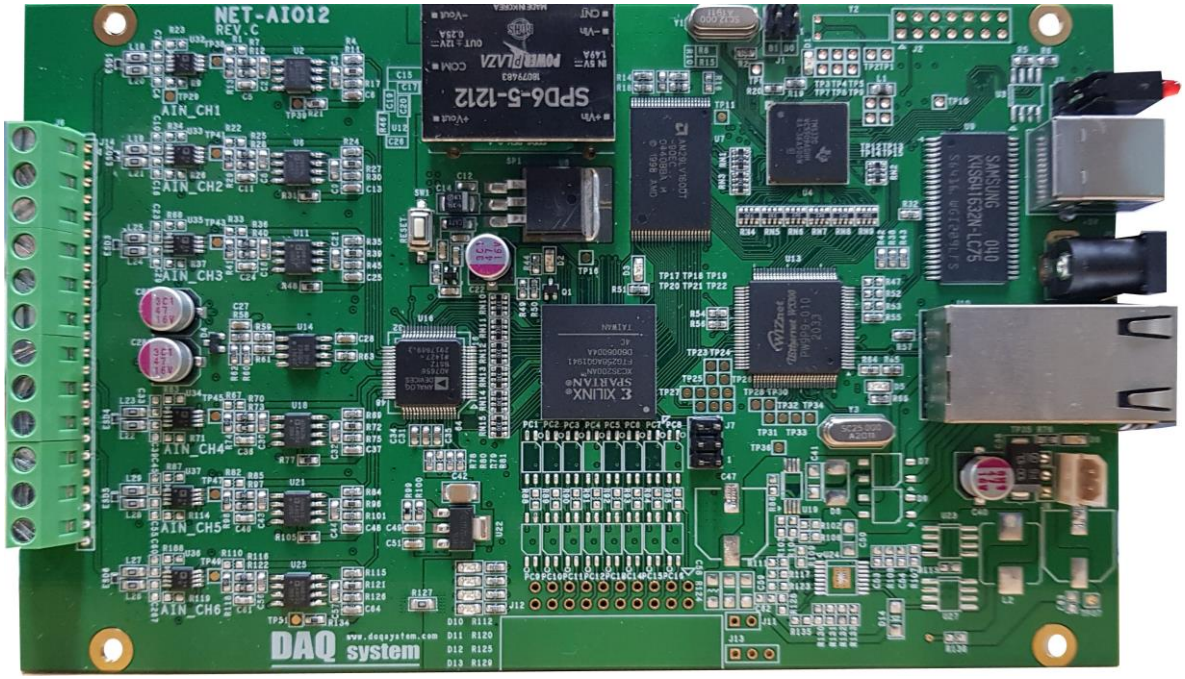
NET-AIO12

User Manual

Version 1.2



DAQ SYSTEM
Measurement & Automation

Contents

1. Summary

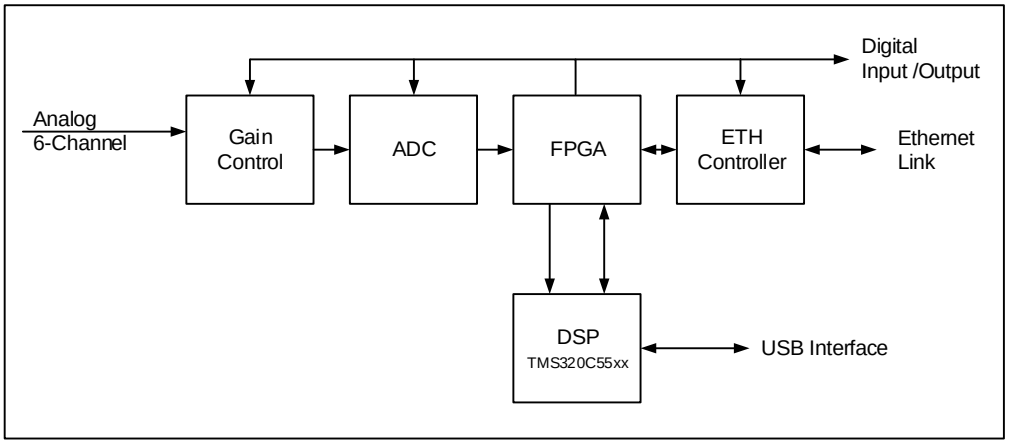
NET-AIO12 board is a high-performance signal processing board with analog input and digital output functions. By applying the TI TMS320C55xx DSP chip, it is possible to acquire high-speed data through the USB 2.0 interface and Ethernet interface of A/D-converted data of 6-channel analog signal.

It can be used as a Powered Device (PD) device of Power over Ethernet (PoE) that receives power through an Ethernet cable (UTP). Power is supplied through an injector or PoE hub, so there is no need for a separate power supply.

1-1 Function

- **6-Ch 16-Bit Simultaneous ADC**
- **8-Bit Digital Input/Output**
- **USB 2.0 FS Interface**
- **10/100Mbps Ethernet TCP/IP Interface**
- **Supports PoE (Power over Ethernet) PD**

1-2 Block Diagram



[Figure 1. Internal Block Diagram]

1-3 Operation Mode

1-3-1 Continuous Mode

Continuous mode refers to a mode that continuously collects data from the board.

If you select the interface (USB/NET) and set the sampling rate required for collection, you can continuously collect data.

1-3-2 Delay Mode

Delay mode is a function that stores a total of 524,288 (512k) data in the board memory at a set sampling rate after a certain period of time and reads the data at a desired time.

2. Features

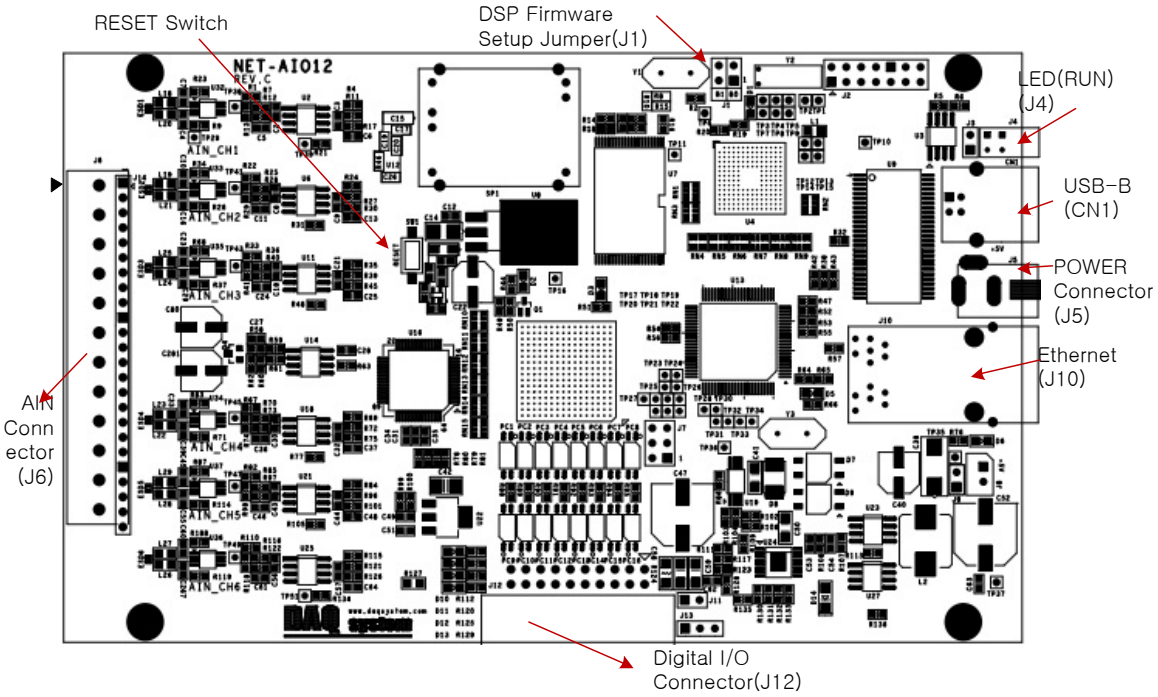
[Table 1. NET-AIO12 Features]

List	Specifications
Interface	USB B-type Connector RJ-45 Wthernet Connector Header Pin Connector for Analog Input Header Pin Connector for Digital Input/Output 5VDC Power Connector
Analog Input(ADC)	Channel No. : 6 Max. Input Range : ±5V, ±10V(Software selection) Resolution : 16-bit Conversion error: within ±2.5% of input level Sampling : Mimimum 256sps(sampling per sec) TCP/IP Up to 230Ksps with 1 or 2-channel selection Up to 220Ksps with 3-channel selection Up to 180Ksps with 4-channel selection Up to 155.5Ksps with 5-channel selection Up to 135Ksps with 6-channel selection USB Up to 45Ksps with 1-channel selection (USB2.0) Up to 33.5Ksps with 2-channel selection Up to 26.7Ksps with 3-channel selection Up to 22.1Ksps with 4-channel selection Up to 19Ksps with 5-channel selection Up to 16.6Ksps with 6-channel selection
Digital Input/Output	Channel No.: 8 Inputs, 8 Outputs Input and output signal level: 12/24VDC, Isolated
USB	USB 2.0 Full Speed(12Mbps) 지원
Ethernet	10/100Mbps support Automatic cable detection function Configurable board network information (IP, etc.) Support static IP only
DSP	TI TMS320C55xx Main Function : On-Chip USB 2.0
Optional	PoE PD, Case
Board Size	164 x 100mm
Operating temperature range	0 ~ 60℃
Operating humidity range (non-condensing)	
Operating power	5VDC±5%, 700~850mA
Support software	Kernel mode WDM Driver/User mode DLL
OS Support	Windows XP/7/8/10 32/64-bit

Components	NET-AIO12 board, installation CD (including sample program)

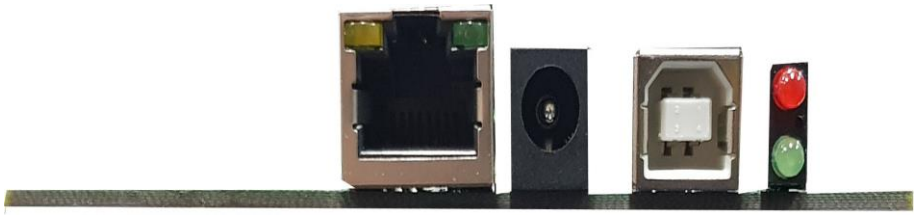
3. Hardware

Describes how to set board jumpers and connectors to interface equipment from a PC or other operating equipment.



[Figure 2. Connector, switch layout]

[Figure 3. AIN Connector]



[Figure 4. LAN/Power/USB-B/LED]

3-1 DSP Firmware Setup Jumper (J1)

The board's execution mode includes USB boot mode and flash boot mode. Flash boot mode is a general board operation, while USB boot mode is used when frequent updates are required when developing flash memory programs or firmware.

3-2 USB-B Connector (CN1)

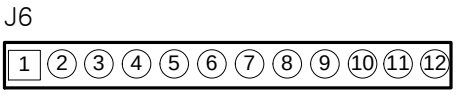
As a B-type USB connector, it is connected to a PC for data transmission/reception.

3-3 LED(RUN) (J4)

Displays the operation status of the board. Lights up when data collection is in progress.

3-4 AIN Connector (J6)

The analog input signal accepts a single-ended input signal in the range of ±5/10V. For input signal connection, connect signal to AIN_CH pin and ground to AGND.



Terminal block, BR-5001C, 5mm-pitch

[Table2. AIN Connector Description]

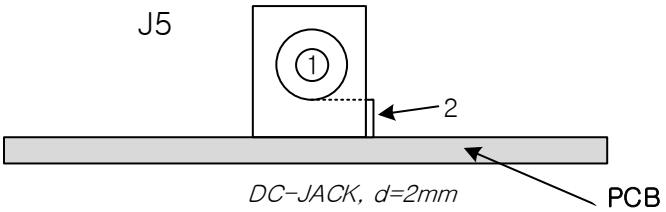
Pin No.	Pin Name	Description	Remark
1	AGND	Analog Ground, GROUND	
2	AIN_CH1	Analog Input Channel 1	
3	AGND	Analog Ground, GROUND	
4	AIN_CH2	Analog Input Channel 2	
5	AGND	Analog Ground, GROUND	
6	AIN_CH3	Analog Input Channel 3	
7	AGND	Analog Ground, GROUND	
8	AIN_CH4	Analog Input Channel 4	
9	AGND	Analog Ground, GROUND	
10	AIN_CH5	Analog Input Channel 5	
11	AGND	Analog Ground, GROUND	
12	AIN_CH6	Analog Input Channel 5	

3-5 Ethernet Connector (J10)

Connect to an Ethernet hub or an Ethernet adapter. Automatically detects the type of cross/direct cable.

3-6 POWER Connector (J5)

As the board power connector, input power of +5VDC, 1A or more.

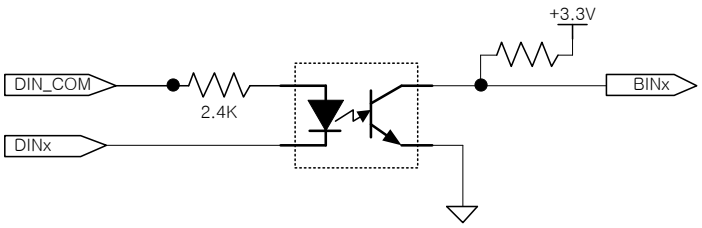


[Table 3. POWER Connector Description]

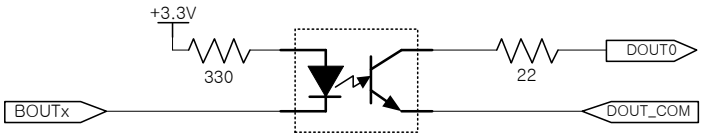
Pin No.	Pin Name	Description	Remark
1	+5VDC	Power 5V	
2	GND	Power Ground	

3-7 Digital Input/Output Connector (J12)

Each 8-bit digital input/output signal is connected. Input and output the isolated 12/24VDC signal. The circuit diagram is shown in [Figure 5].

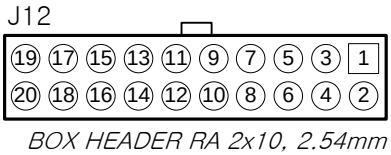


Input Circuit



Output Circuit

[Figure 5. Digital I/O Circuits]



[Table 4. Digital I/O Connector Description]

Pin No.	Pin Name	Description	Remark
1	DIN_COM	Digital Input Common Terminal,	
2	DOUT_COM	Digital Output	

3	DIN0	Digital Input 0	
4	DOUT0	Digital Output 0	
5	DIN1	Digital Input 1	
6	DOUT1	Digital Output 1	
7	DIN2	Digital Input 2	
8	DOUT2	Digital Output 2	
9	DIN3	Digital Input 3	
10	DOUT3	Digital Output 3	
11	DIN4	Digital Input 4	
12	DOUT4	Digital Output 4	
13	DIN5	Digital Input 5	
14	DOUT5	Digital Output 5	
15	DIN6	Digital Input 6	
16	DOUT6	Digital Output 6	
17	DIN7	Digital Input 7	
18	DOUT7	Digital Output 7	
19	EGND	External ground, External Ground	
20	+12V	External Input Power	+12VDC

4. Installation

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

4.1 Product Contents

① NET-AIO12 Board

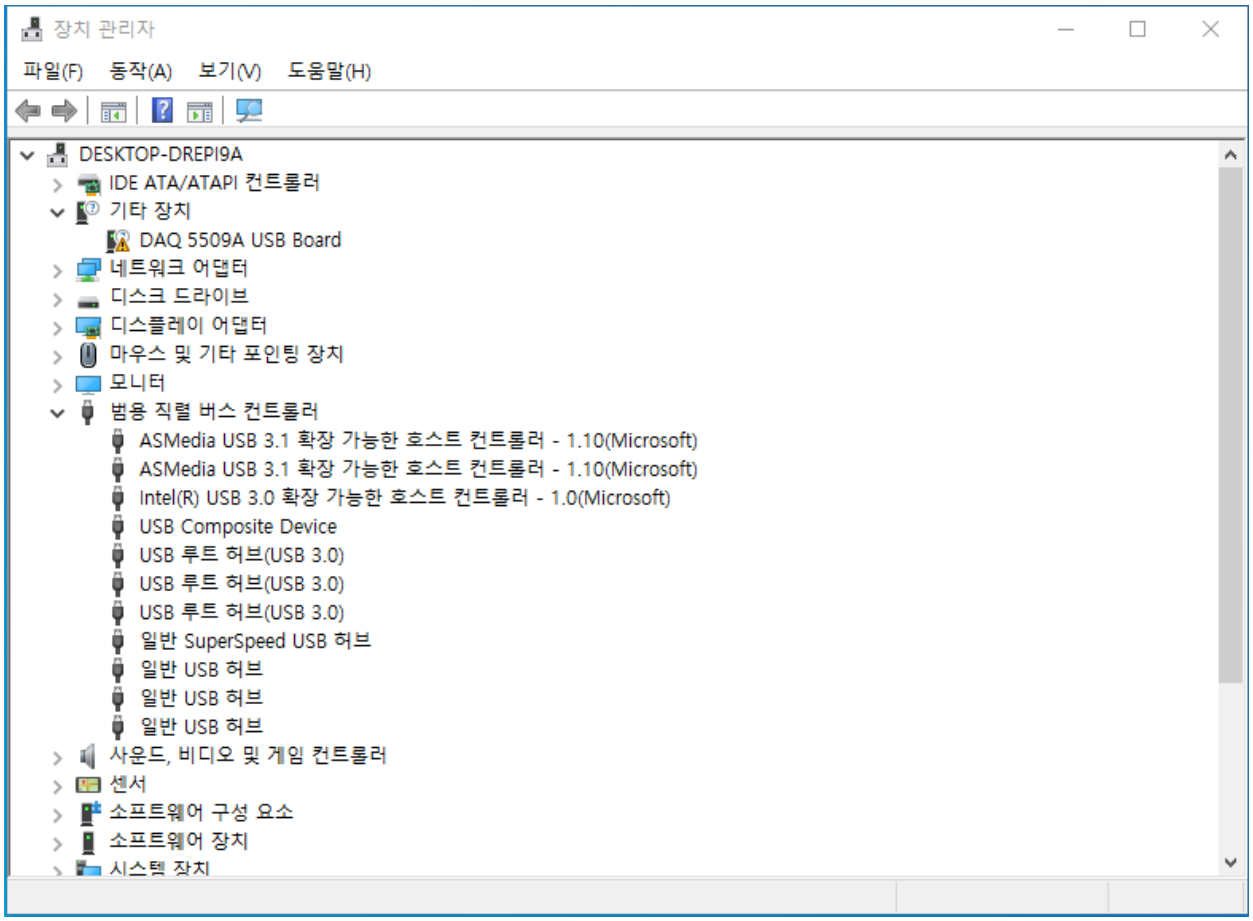
② CD (Driver/Manual/API/Sample Source etc.)

4.2 Driver Installation

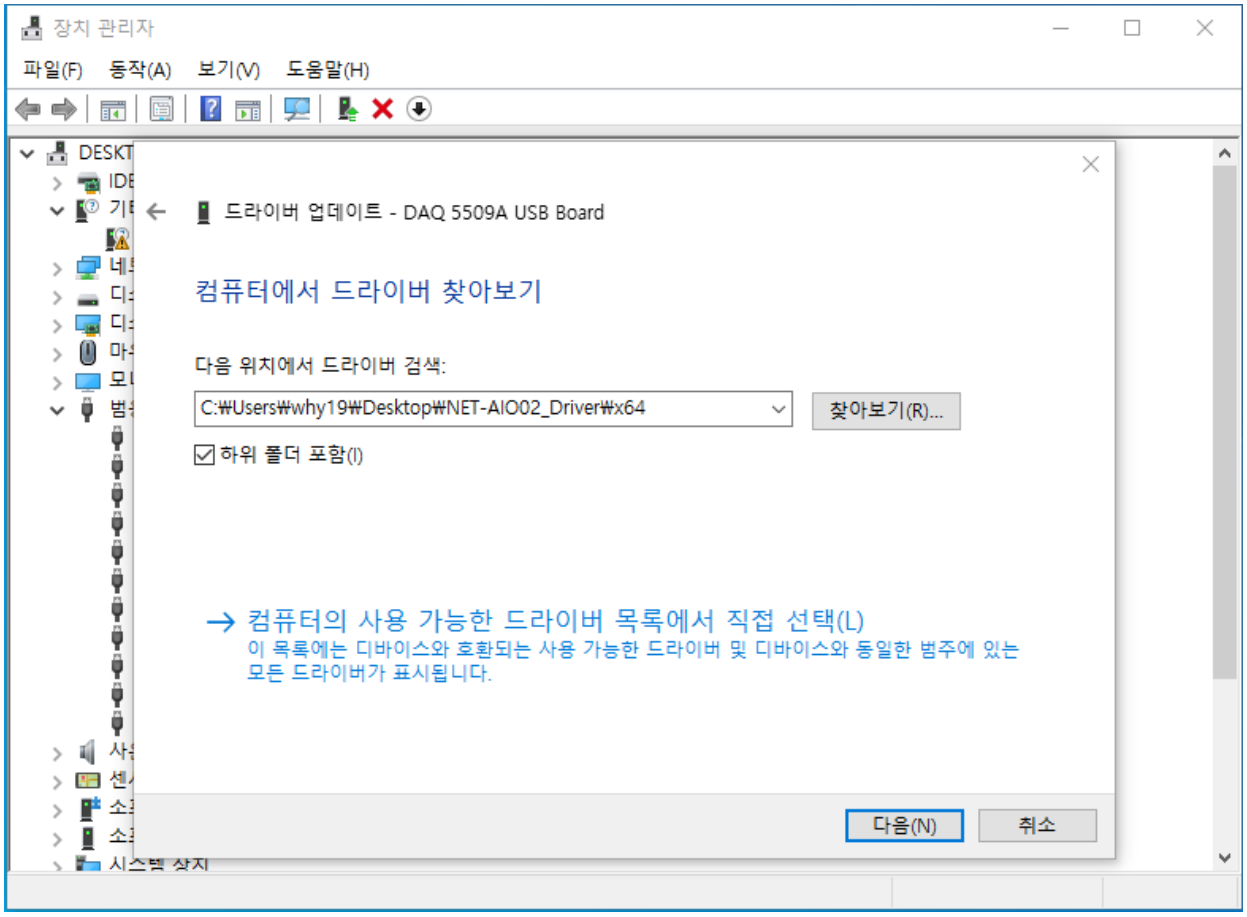
When the board is mounted, install it by referring to the CD provided with the driver and sample application program to drive the board from the PC.

According to Microsoft's certification policy, it must be used with the version that has the **KB3033929** update installed for Window 7 or later.

(1) When the computer has finished booting, it searches for newly installed devices. If a new device is found, the operating system asks you to install a driver for the device.



(2) In the figure below, when you click the "Search for driver software on the computer (R)" button to install the driver, the driver search screen appears. Designate the Driver folder of the CD that contains the driver.
(Choose to install from a list or specific location)
예) C:₩Users₩why19₩Desktop₩NET-AIO12_Driver₩x64

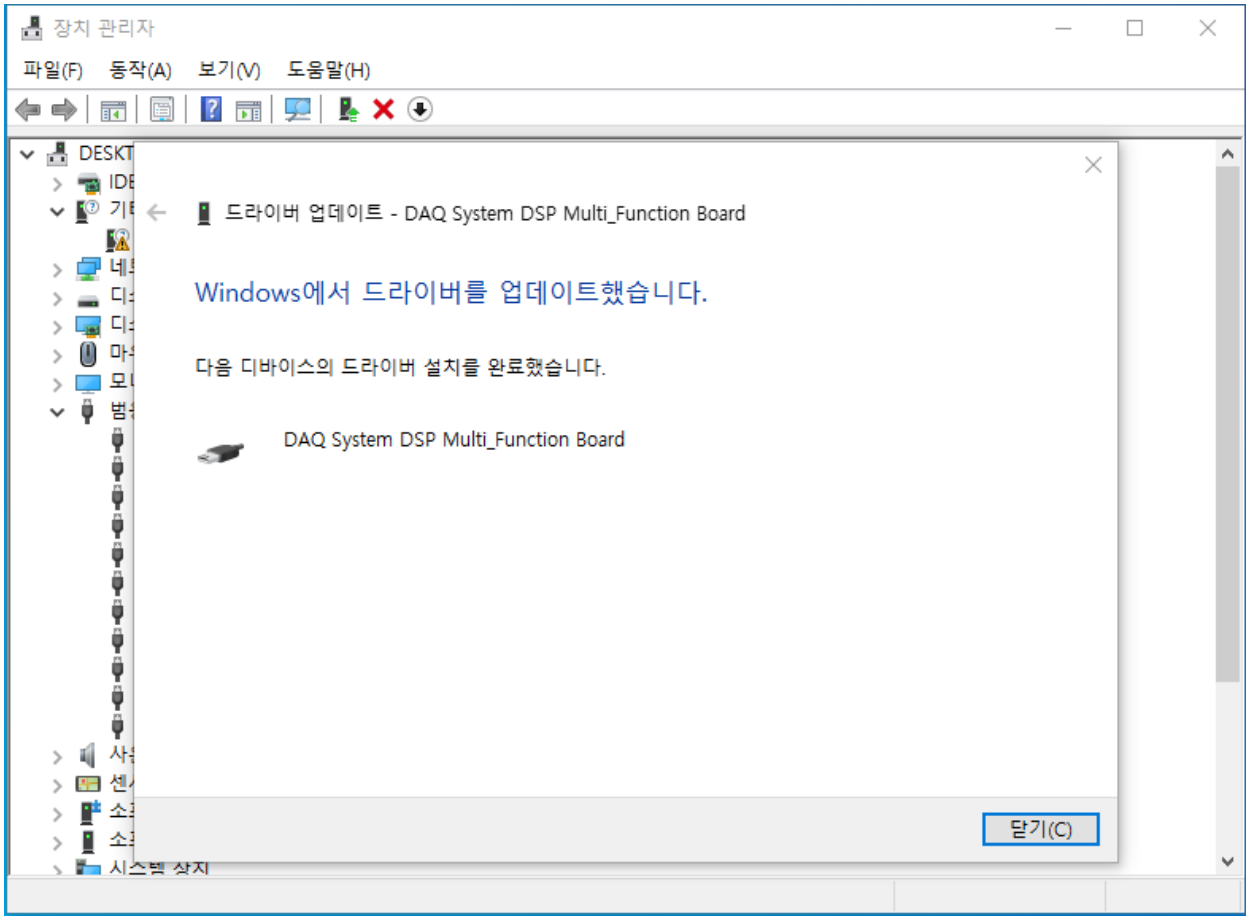


[Figure 6. NET-AIO12 Device search screen]

The driver folder contains **"net_aio10.inf"** and **"net_aio10.sys"** files required for driver installation. (This is indicated by the name of the net_aio10 board due to compatibility with the NET-AIO10 board.)

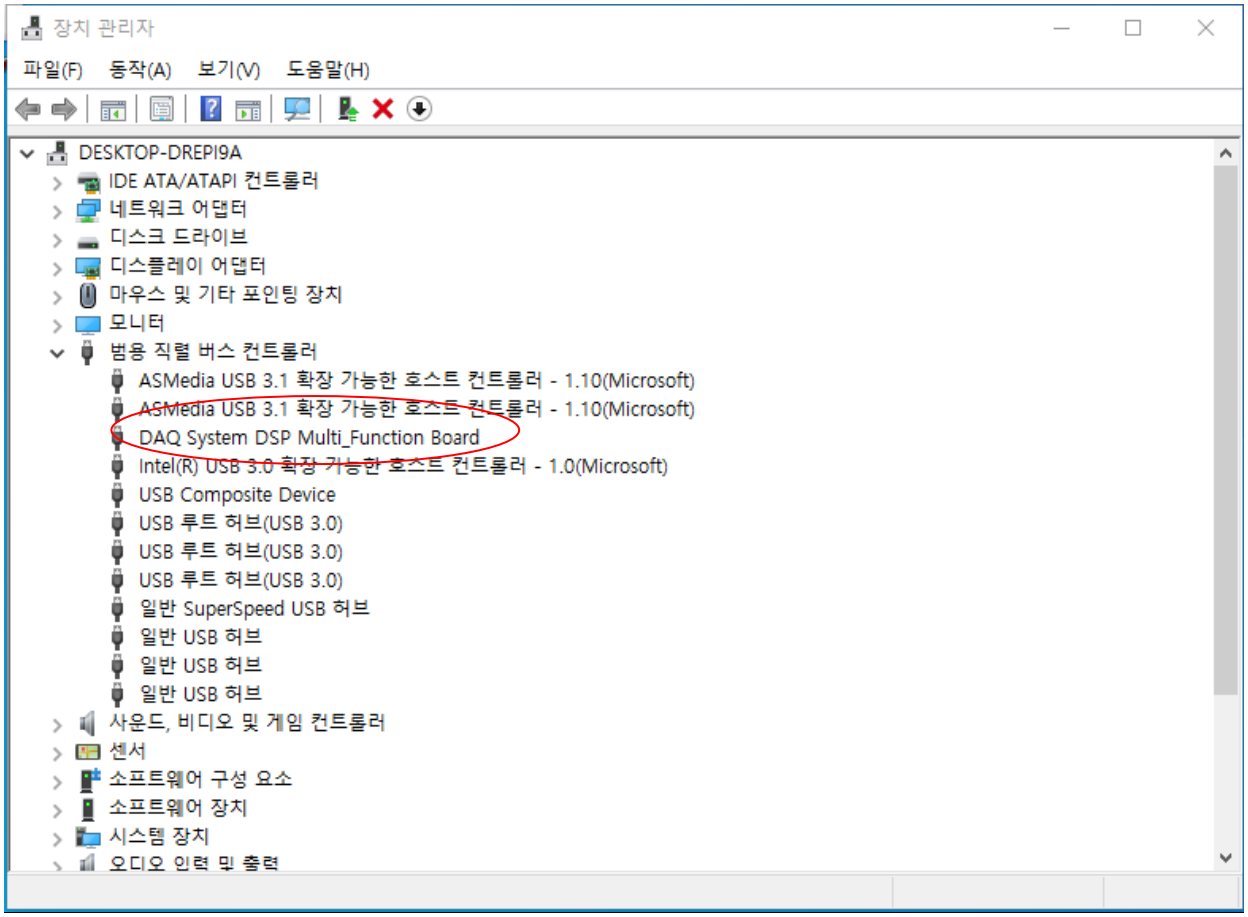
(3) Click Next to install the driver files.

(4) When the installation is completed normally, a message window as shown below appears.



(5) When the installation is complete, you can use the NET-AIO12 board immediately. Before using it, check if the driver has been installed normally by the following method.

In My Computer -> Properties -> Device Manager screen, check whether Universal Serial Bus Controller **-> "DAQ System DSP Multi_Function Board"** is installed. If it appears as shown in [Figure 7], the installation has been completed normally.



[Figure 7. Device Manager execution screen]

The above figure shows the screen where the NET-AIO12 board is normally installed in the PC. (Check the red circle)

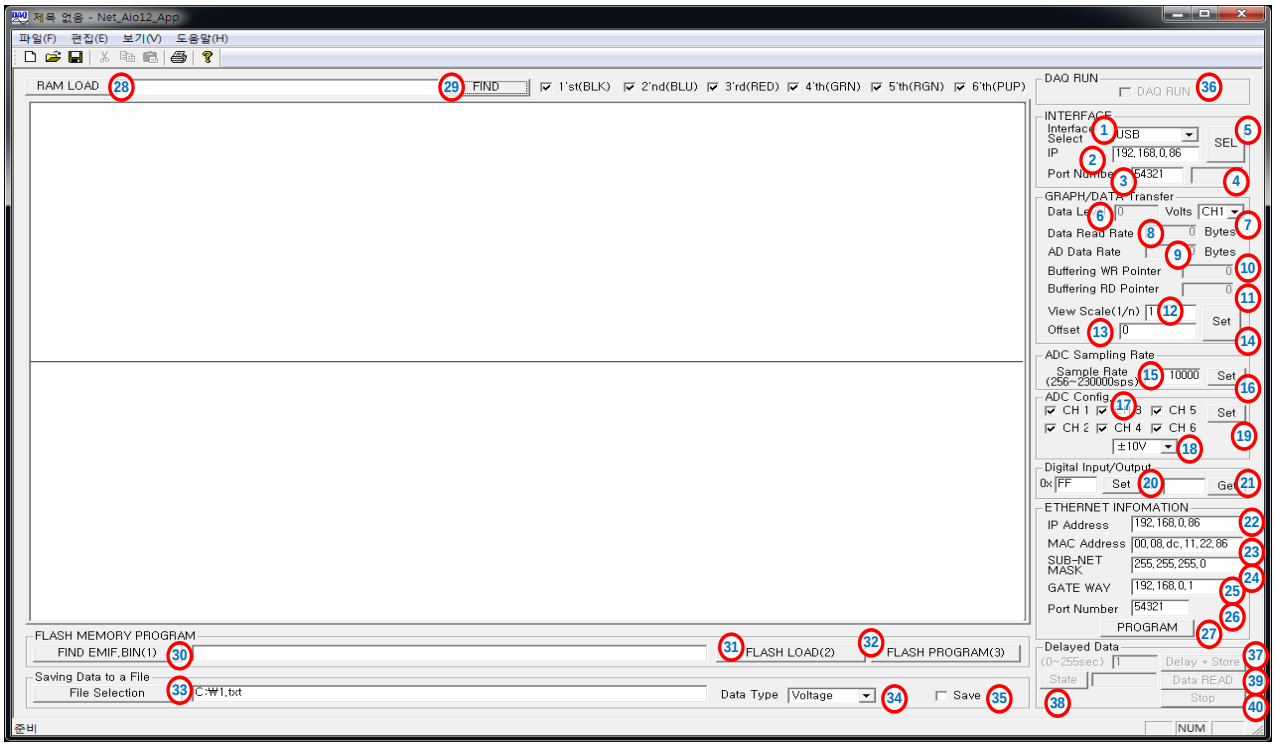
(Note) After initial installation, it is recommended to reboot the PC for normal operation.

5. Software

A standard API library is supported to access various functions of the NET-AIO12 board, and a sample program applied to it is provided to the user.

5-1 Sample Program

It is a program implemented using the library and is composed as follows.



[Figure 8. Sample Program]

5-1-1 Program Description

[Table 5. Sample Program Function Description]

No.	Controll	Function Description
Interface		
1	Interface Select	Select an interface to connect to the host (PC). USB/Ethernet.
2	IP	It is the Ethernet IP of the board for TCP/IP connection in Ethernet selection.
3	Port Number	Port number used for TCP/IP connection.
4	Port Number	It is the port number set on the board obtained by connection by "SEL".
5	SEL	Execute host interface connection.
GRAPH/DATA Transfer		
6	Data Level	Converts and displays the collected selected channel data into decimal voltage.
7	Graph Channel	Select the channel to display the value of 6.

8	Data Read Rate	Displays the number of bytes of data received from the board
9	AD Data Rate	AD data received from the board displays the number of bytes
10	Buffering WR Pointer	Displays the library buffer storage pointer.
11	Buffering RD Pointer	Display library buffer read pointer.
12	View Scale	This is the data reduction factor to be displayed on the graph when the amplitude of the collected data is large and cannot be displayed on the graph. When entering "10", the collected data amplitude is multiplied by 1/10 and displayed on the graph.
13	Offset	It is an offset to change the upper and lower positions to be displayed on the Y-axis of the graph. The input value is summed with the collected data value and displayed on the graph.
14	Set	Apply View Scale and Offset to the graph.
ADC Sampling Rate		
15	Sample Rate	Enter the analog data sampling rate. (256~230,000)
16	Set	Set the sampling rate.
17	ADC Config. Channel Selection	Select ADC channels 1 ~ 6.
18	ADC Range Selection	Select ADC Range from ±5/±10. Perform 16-Bit conversion for the selected input range.
19	Set	Input digital output value.
Digital Input/Output		
20	Digital Input/Output Set	Set digital output value.
21	Digital Input/Output Get	Check 7-Bit digital input value.
ETHERNET INFORMATION		
22	IP Address	Enter the IP address to be saved on the board.
23	MAC Address	Enter the MAC information to be saved on the board.
24	SUB-NET MASK	Enter the MASKING information to be saved on the board.
25	GATE WAY	Enter the network gateway address to be saved on the board.
26	Port Number	Enter the port number to be saved on the board.
27	PROGRAM	Saves items 22~26 to flash memory. The stored information is reflected in the firmware when the board is reset, and be careful not to cause a conflict with the same information setting. This function is information used only in the Ethernet interface, and this save function is used in the state that 1) is changed to "USB" and 5) is executed.
RAM LOAD/FND		
28	RAM LOAD	Load the USB boot binary in the right editor path to the

		device. First, the execution mode selection should be selected as USB.
29	FIND	Retrieve the USB load image.
FLASH MEMORY PROGRAM		
30	FIND EMIF.BIN(1)	Search for an executable image to be saved in flash memory.
31	FLASH LOAD(2)	Loads the retrieved file image to the board memory. Repeat 2-3 times.
32	FLASH PROGRAM(3)	Save the image stored in memory to flash memory.
Saving Data to a File		
33	File Selection	Designate path and file name to save collected AD data.
34	Data Type	Select data as 16-bit Raw or Voltage value.
35	Save	The data is replaced with an integer value and saved as a text file.
DAQ RUN		
36	DAQ RUN	Perform data collection. When the PC interface is connected to the execution in Section 5, the check button is activated and it is ready for execution. If checked, the sampling rate 16 and ADC setting 19 are executed. To save the data in a file, execute paragraphs 33 and 35 and execute collection.
Delayed Data		
37	Delay+Store	Set the waiting time before sampling ADC data in delay mode. (0 ~ 255sec)
38	State	Check the delay waiting status. Wait for the waiting time and check if data collection is finished.
39	Data READ	This is a command to read AD data collected in delay mode.
40	Stop	Stop reading delay mode AD data.

Appendix

A-1. Repair Regulations

Thank you for purchasing the product of DAC System. Please refer to the following regarding customer service regulated by DAC System.

(1) Read the user manual and follow the instructions before using DAC System products.

(2) When returning the product to be repaired, please include the symptoms of the failure and send it to the head office.

(3) The warranty period of free repair of all DAC System products is one year.
-. The warranty period starts from the date the product is shipped from DAC System.
-. The manufacturer's warranty applies to peripheral devices and other products not manufactured by DAC System.
-. If you need repair, please contact the Contact Point below.

(4) Even during the warranty period, repairs will be charged in the following cases.
① Failure or damage caused by use without following the user's manual
② Breakdown or damage caused by customer's negligence during product transportation after purchase
③ Failure or damage due to natural phenomena such as fire, earthquake, flood, lightning, pollution, or power supply exceeding the recommended range
④ Failure or damage caused by inappropriate storage environment (eg, high temperature, high humidity, volatile chemicals, etc.)
⑤ Breakdown or damage due to unfair repair or modification
⑥ Products whose serial number has been changed or deliberately removed
⑦ If DAC System determines that it is the customer's fault due to other reasons

(5) Customers are responsible for the cost of shipping the repaired product to DAC System.

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

MEMO

Contact Point

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

Email : postmaster@daqsystem.com

DAQ SYSTEM
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