

User Manual

USB-5800 Series

Industrial USB 3.0 Isolated I/O
Modules

ADVANTECH

Enabling an Intelligent Planet

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1. Collect all information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an return merchandize authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package. Then ship the package prepaid to your dealer.

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CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Technical Support and Assistance

1. Visit the Advantech web site at <http://support.advantech.com.tw/> to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item is missing or damaged, contact your dealer immediately.

- 1 x USB-5800 module
- 2 x terminal blocks (see Appendix A - Specifications for more details)
- 1 x startup manual
- 1 x USB 3.0 lockable cable (1 m)
- SDK/driver DVD

Safety Precautions - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

1. To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
2. Disconnect the power before implementing any configuration changes. The sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.

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Chapter 1

Introduction

This chapter introduces USB-5800 and its typical applications.

- Features
- Applications
- Installation Guide
- Software Overview
- Roadmap
- Accessories

The USB-5800 series of industrial USB 3.0 isolated I/O modules are compact and equipped with a DIN-rail mount kit for easy cabinet installation. The built-in USB hub supports daisy chaining to ensure convenient expansion and reduced overall costs. Two European-type pluggable terminal blocks and LED indicator are included to assist users with system setup and maintenance. Additionally, all digital input and digital output channels feature 2,500 V_{DC} isolation protection.

1.1 Features

- USB 3.0 SuperSpeed
- Supports daisy chaining via a built-in USB hub
- Digital I/O with 2,500 V_{DC} isolation protection
- Wide input voltage range (10 ~ 30 V_{DC})
- Wide output voltage range (5 ~ 40 V_{DC}) and high output current (350 mA/ch)
- 1500 V_{DC} optical isolation for photoMOS relay outputs
- Quick-removal European-type connector
- LED indicators for I/O status
- Supports Windows XP/7/8/10 operating systems

The USB-5800 series modules offer the following main features:

USB 3.0 SuperSpeed

The USB-5800 series modules support USB 3.0 SuperSpeed for an accelerated response time.

Easy Maintenance

The LED indicators, rotary switch, and terminal blocks are all front-facing for easy access and wiring. The European-type pluggable terminal blocks also simplify maintenance, reducing overall service time.

Compact Size

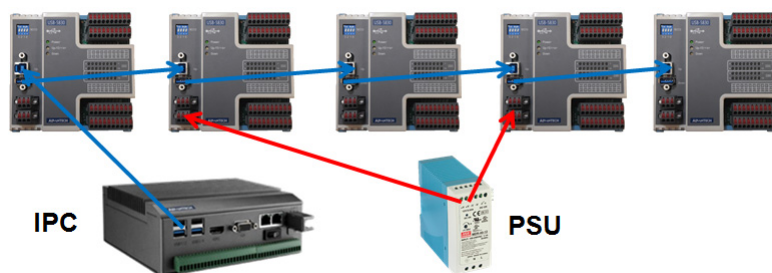
The compact design and high density channel count increases effective space utilization, while the DIN-rail mounting kit ensures easy installation in cabinets.

Built-In USB Hub with Support for Daisy Chaining

The USB-5800 module is equipped with a USB hub that supports daisy chain topologies. This feature frees up the IPC USB ports by enabling more than one USB-5800 module to be integrated into a single system.

Note! *Because USB 3.0 only supplies 1A power, if more than two modules are connected via the hub, an external power unit must also be employed. Please refer to the following image.*





Note! *The USB host (system) can support up to five levels of hubs. If more than five levels are cascaded, the USB modules may malfunction.*



Redundant Power

USB-5800 modules feature two power input terminals, an input power range of +10 to +30 V_{DC}, and power redundancy support. For modules connected to two power input sources, if one source is inactive or interrupted, the other power source is capable of taking over immediately. The USB-5800 modules can operate as normal with only a single power source.

(If not using the USB hub function, the module can be powered via a USB 3.0port.)

BoardID Switch

The USB-5800 series modules feature a built-in DIP switch (BID) that is used to define each module's board ID. When multiple modules are integrated on the same system, the board ID switch is useful for identifying each module's device number.

After setting all the USB-5800 modules, users can identify each module in the system using their device numbers. The default Board ID value is 0.

1.2 Installation Guide

Before USB-5800 module installation, please ensure you have the following necessary components:

- USB-5800 module
- USB-5800 user manual
- Advantech DAQNav driver software (available on the accompanying DVD-ROM)
- Personal computer or workstation with a USB interface (running the Windows 10/8/7/XP operating system)
- 10 ~ 30 V power supply (96PS-A40WDIN optional)

Other optional components are also available for enhanced operation:

- DAQ Navi, LabView, and other third-party software

Once you have the necessary components and any additional accessories for enhanced operation, you can begin installing your USB-5800 module. Figure 1.1 is a flowchart that provides a broad overview of the software and hardware installation procedures.

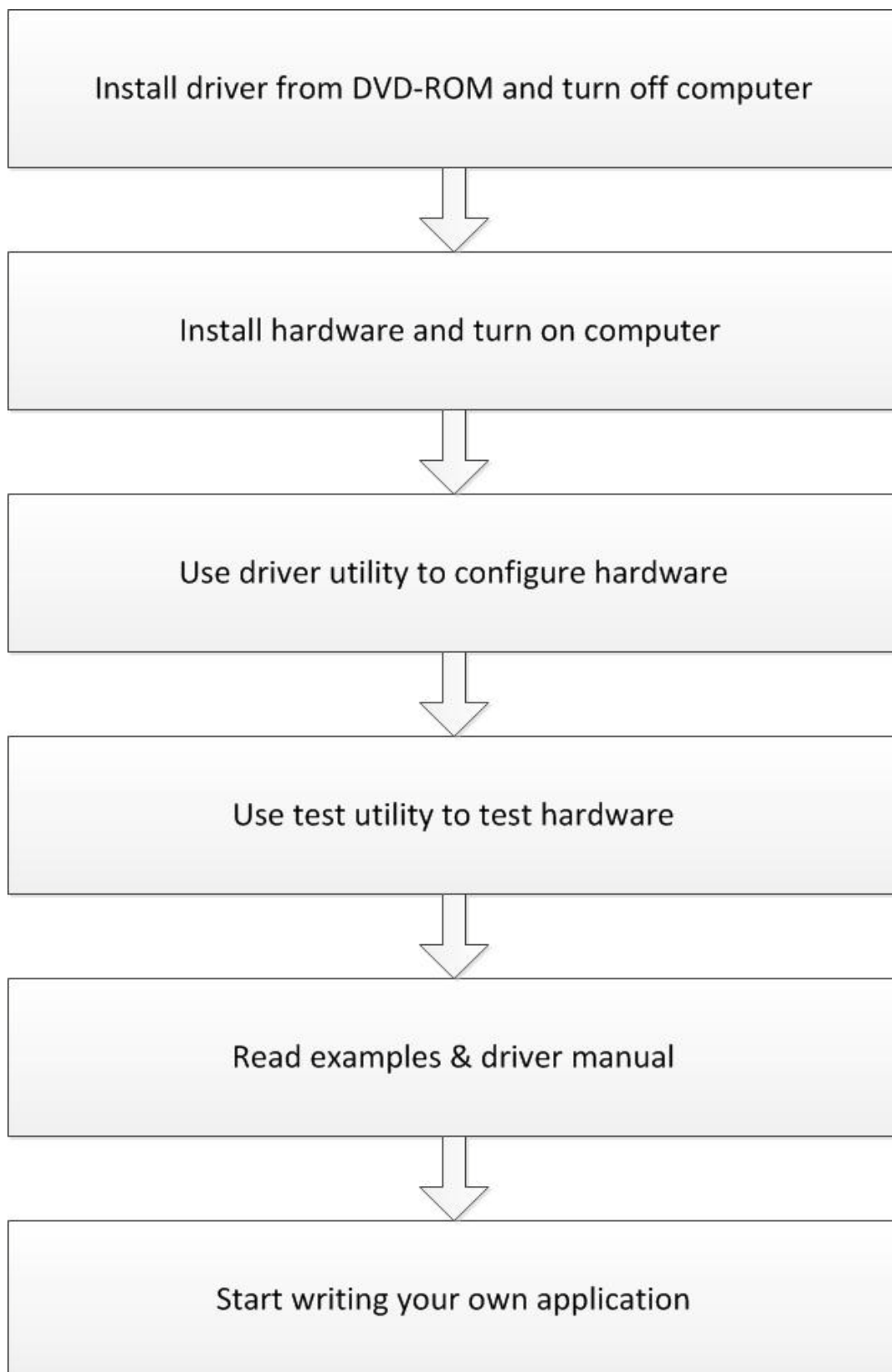


Figure 1.1 Installation flowchart

1.3 Software Overview

Advantech offers a wide range of DLL drivers, third-party driver support, and application software for fully exploiting the functions of your USB-5800 module:

- Device drivers (located on the accompanying DVD-ROM)
- Advantech DAQNav

DAQNav Software

Advantech's DAQNav software includes device drivers and a software development kit (SDK), which features a comprehensive I/O function library to boost application performance. This software is provided on the accompanying DVD-ROM at no extra cost and comes with all Advantech DA&C cards. The Advantech DAQNav software for Windows XP/7/8/10 (desktop mode) works seamlessly with development tools such as Visual Studio.NET, Visual C++, Visual Basic, and Borland Delphi.

1.4 DAQNav Device Driver Programming Roadmap

This section provides a roadmap for building an application from scratch using Advantech's DAQNav Device Driver with a range of development tools such as Visual Studio.NET, Visual C++, Visual Basic, Delphi, and C++ Builder. Step-by-step instructions for application development using each tool are provided in the device driver manual. A large library of example source code is also provided for your reference.

Programming Tools

Programmers can develop application programs using their preferred development tools.

- Visual Studio.NET
- Visual C++ and Visual Basic
- Delphi
- C++ Builder

For instructions on programming using each development tool, Advantech offers a tutorial chapter in the DAQNav SDK manual for your reference. Please refer to the corresponding sections in the DAQNav SDK manual to begin programming. You can also look at the example source codes provided for each programming tool. The examples can help jump start a project.

The DAQNav SDK manual can be found on the accompanying DVD-ROM. Alternatively, if you have already installed the device drivers on your system, the DAQNav SDK manual can be readily accessed via the Start button:

Start/Programs/Advantech Automation/DAQNav/DAQNav Manuals/DAQNav SDK Manual

The example source code can be found under the corresponding installation folder/default installation path:

Advantech\DAQNav\Examples

For information about using other function groups or other development tools, refer to chapter titled "Using DAQNav SDK" in the DAQNav SDK manual, or watch the video tutorials in the Advantech Navigator.

Programming with DAQNav Device Drivers Function Library

Advantech DAQNav device drivers offer a comprehensive function library that can be utilized in various application programs. This function library consists of numerous

APIs that support many development tools, such as Visual Studio.NET, Visual C++, Visual Basic, Delphi and C++ Builder.

According to their functions or services, APIs can be categorized into several function groups:

- Analog Input Function Group
- Analog Output Function Group
- Digital Input/Output Function Group
- Counter Function Group
- Port Function Group (direct I/O)
- Event Function Group

For the usage and parameters of each function, refer to the chapter “Using DAQNav SDK” in the DAQNav SDK manual.

Troubleshooting DAQNav Device Drivers Error

Driver functions return a status code when called to perform a certain task for an application. When a function returns a code that is not zero, it means the designated function has failed to perform. To troubleshoot the device drivers error, you can pass the error or check the error code and error description within the Error Control of each function in the DAQNav SDK manual.

1.5 Accessories

Advantech offers accessories to support the USB-5800 module. These accessories are as follows:

Power supply unit

- **96PS-A40WDIN** 40 W, 24 V DIN-rail power supply

Chapter 2

Installation

This chapter includes a packing checklist, instructions for unpacking, and step-by-step procedures for both driver and card installation.

- Unpacking Instructions
- Driver Installation
- Hardware Installation
- Device Setup and Configuration

2.1 Unpacking Instructions

After receiving your USB-5800 module, inspect the package contents. The package should include the following items:

- 1 x USB-5800 module
- 2 x Terminal blocks (see Specifications for more details)
- 1 x Startup manual
- 1 x USB 3.0 lockable cable (1 m)
- 1 x SDK/Driver DVD

The USB-5800 module harbors contains electronic components that are vulnerable to electrostatic discharge (ESD). ESD can easily damage the integrated circuits and components if preventive measures are not carefully implemented. Before removing the module from the antistatic plastic bag, take the following precautions to prevent possible ESD damage:

- Touch the metal part of your computer chassis with your hand to discharge any static electricity accumulated on your body. You can also use a grounding strap.
- Make contact between the antistatic bag and ground before opening. After removing the module from the packaging, first inspect the module for any signs of external damage (loose or damaged components, etc.). If the module is visibly damaged, notify our service department or a local sales representative immediately. Avoid using a damaged module with your system.
- Avoid physical contact with materials that may hold static electricity, such as plastic, vinyl, and styrofoam.

2.2 Driver Installation

We recommend installing the driver *before* installing the USB-5800 module to guarantee a problem-free installation process.

The Advantech DAQNavi Device Drivers setup program for the USB-5800 module is included in the accompanying DVD-ROM. Follow the steps outlined below to install the driver software:

1. Insert the accompanying DVD-ROM into the DVD-ROM drive.
2. The setup program should launch automatically if the system's autoplay function is enabled. When the setup program is launched, a setup screen (see Figure 2.1) will be displayed.

Note! *If the autoplay function is not enabled on your computer, use Windows Explorer or Windows Run commands to execute autorun.exe on the DVD-ROM.*



Figure 2.1 Advantech automation software setup screen

3. Select the “Installation” option.
4. Select the “Legacy SDK” and “Drivers” options for installation.
5. Select the “Individual Drivers” option.
6. Select the USB series and the specific device then follow the installation instructions step by step to complete device driver installation and setup.
7. Click the back button and select the “Windows SDK” and “Drivers” options and install the Advantech Navigator.

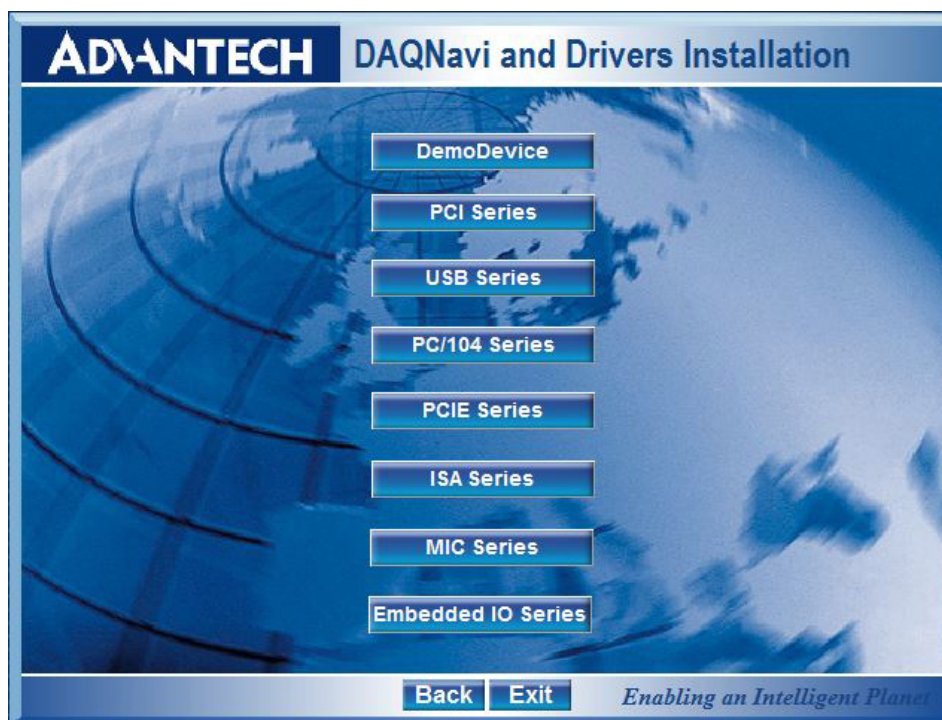


Figure 2.2 Driver setup options

For further information on driver-related issues, an online version of the DAQNav SDK manual can be accessed using the following path:

Start/Programs/Advantech Automation/DAQNav/DAQNav Manuals/DAQNav SDK Manual

2.3 Hardware Installation

Note! *Ensure that the driver is installed before installing the card (refer to 2.2 Driver Installation)*



After the device drivers are installed, the USB-5800 module can be installed in your computer. We recommend referring to the computer user manual or related documentation if you have any concerns. Follow the steps outlined below for module installation.

1. Touch the metal part on the surface of your computer to discharge any static electricity that might be on your body.
2. Plug the USB module into the selected USB port. Avoid using excessive force to prevent damage to the module.

After the module is installed, you can configure your device using the Advantech Navigator Program that is automatically installed during driver setup. A complete device installation procedure should include device setup, configuration, and testing. Information is provided in the following sections to guide users through the device setup, configuration, and testing.

2.4 Device Setup and Configuration

The Advantech Navigator program is a utility that allows users to setup, configure, and test the device, and later stores the system settings in the system registry. These settings are used when you call Advantech's device driver APIs. Consider the device details for USB-5830 shown in Figure 2.3 as an example.

Setting Up the Device

1. To install an I/O device into the module, first run the Advantech Navigator program (by accessing *Start/Programs/Advantech Automation/Navigator for DN4*).
2. Users can view the device(s) already installed on the system (if any) in the Installed Devices list box. Once the software/hardware installation is complete, you will see the USB-5830 module in the Installed Devices list.

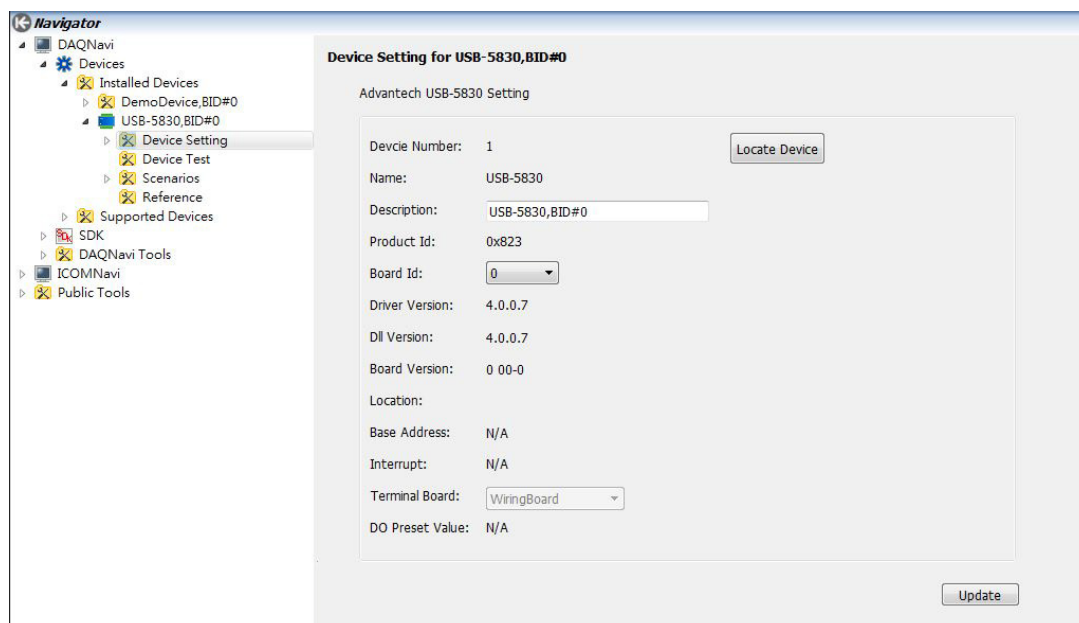


Figure 2.3 USB-5830 device settings

Configuring the Device

3. Go to the Device Setting page to configure the device. Here you can configure the USB-5830 modules' digital input/output.

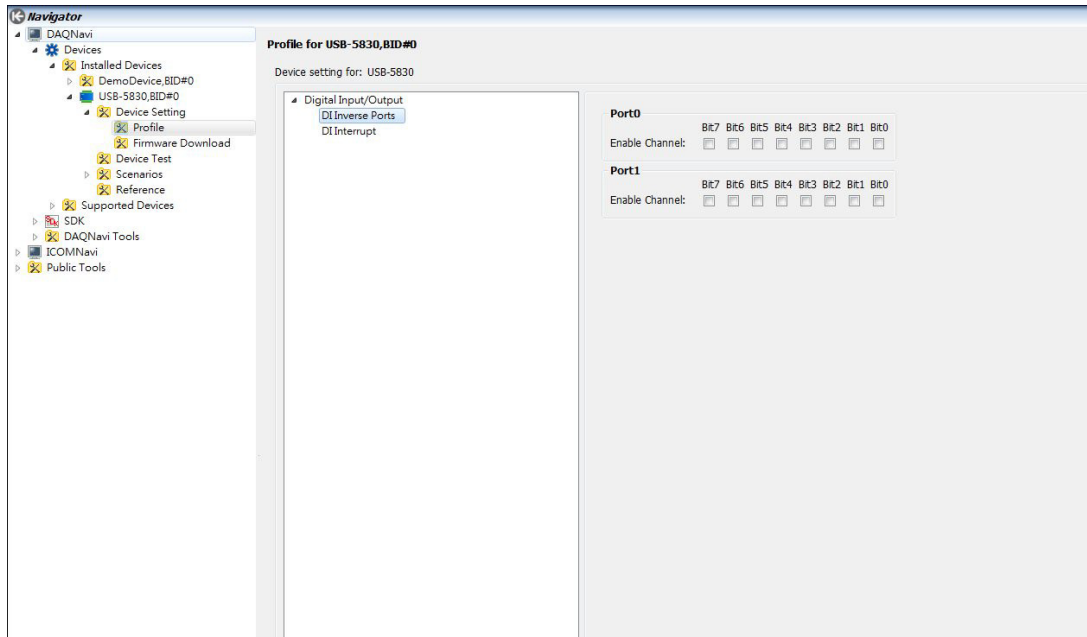


Figure 2.4 Device settings page

4. After the module is properly installed and configured, go to the Device Test page to test the hardware using the testing utility provided.

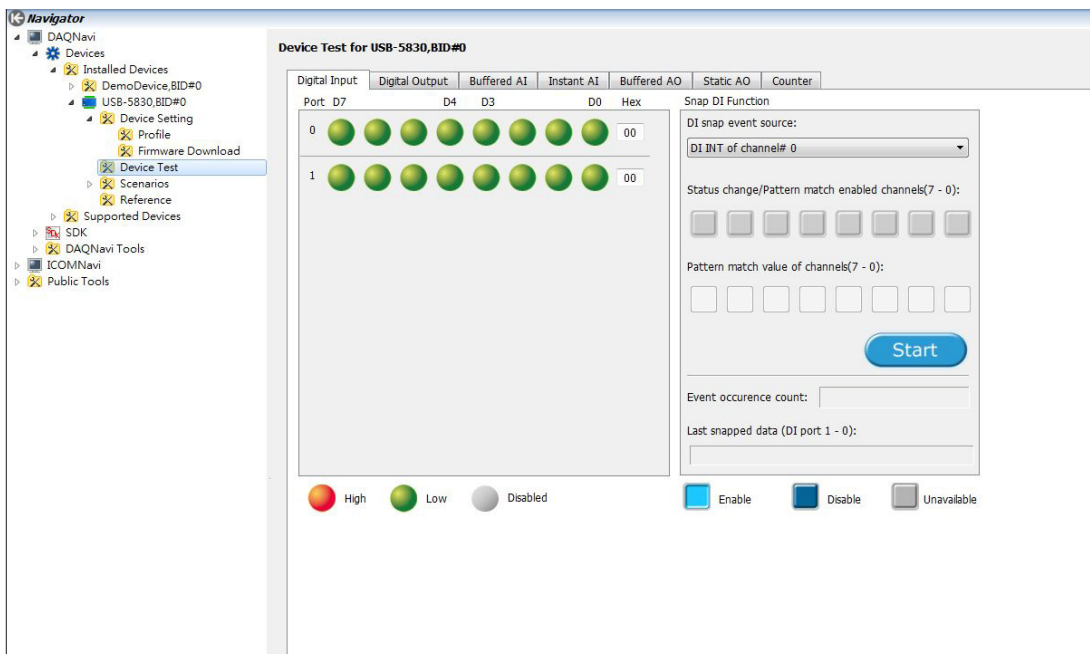


Figure 2.5 USB-5830 device testing

For more detailed information, please refer to the DAQNavigator SDK manual or the user interface manual in Advantech Navigator.

Chapter 3

Signal Connections

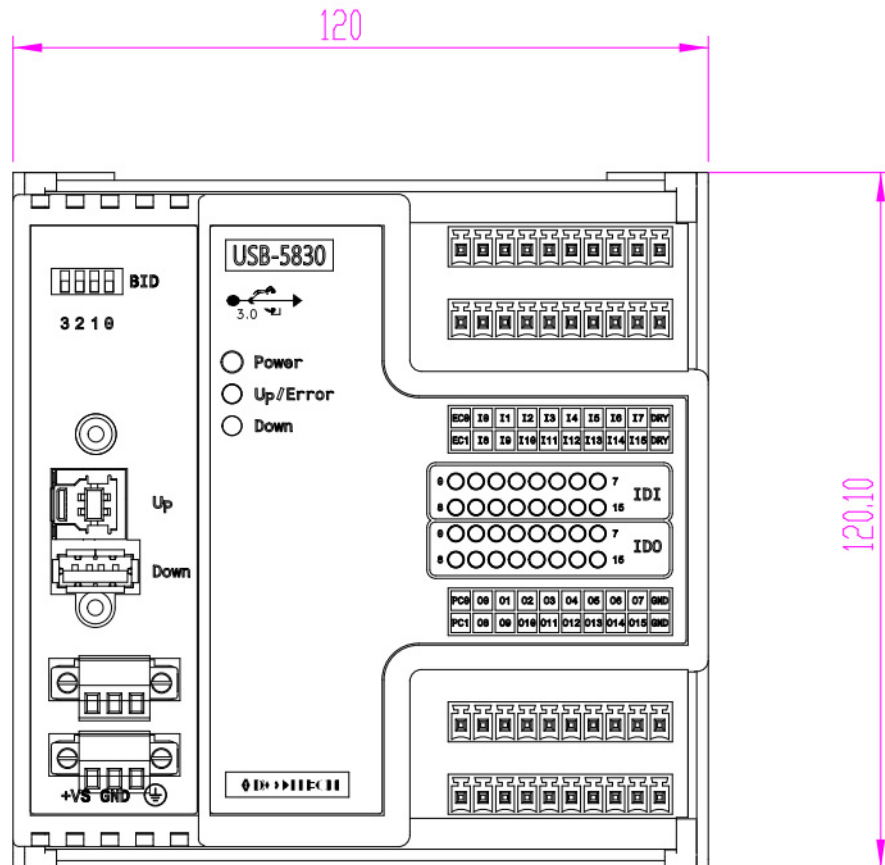
This chapter provides useful information about connecting input and output signals to the USB-5800 module via the I/O connector.

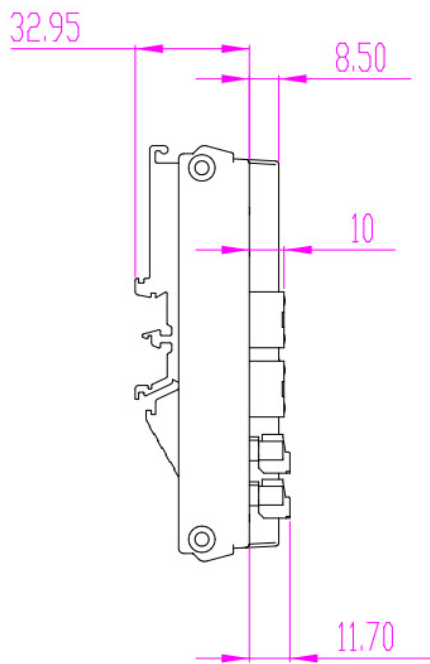
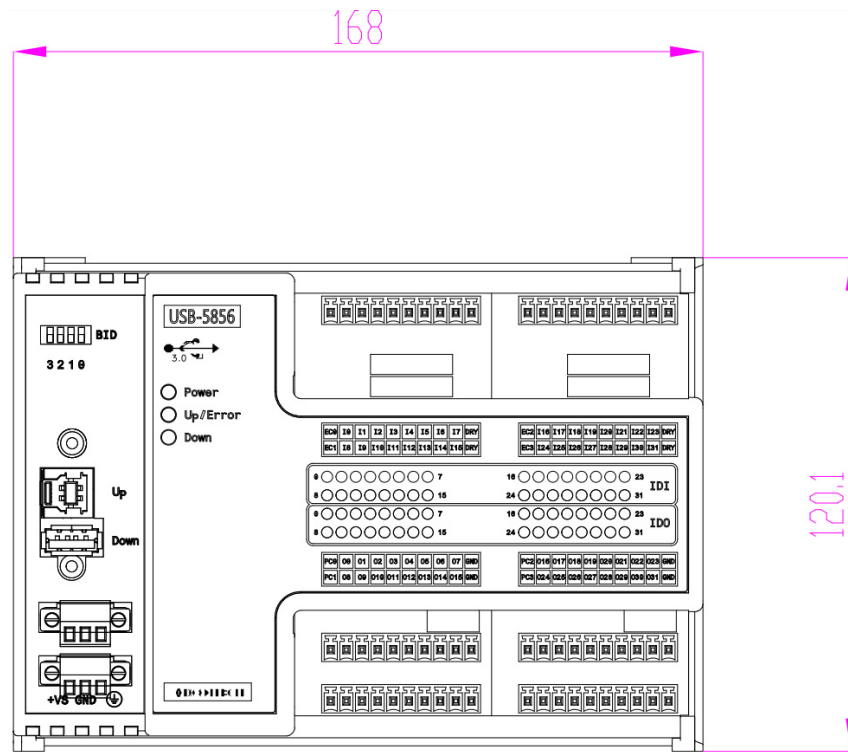
- Overview
- Board ID Settings
- Signal Connections
- Field Wiring Considerations

3.1 Overview

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly. A good signal connection can prevent unnecessary and costly damage to your PC and other hardware devices. This chapter provides useful information about how to connect input and output signals to the USB-5800 module via the I/O connector.

3.2 Dimensions





3.3 Switch and Pin Assignments

Figure 3.1 shows the jumper and switch locations on the USB-5800 module.

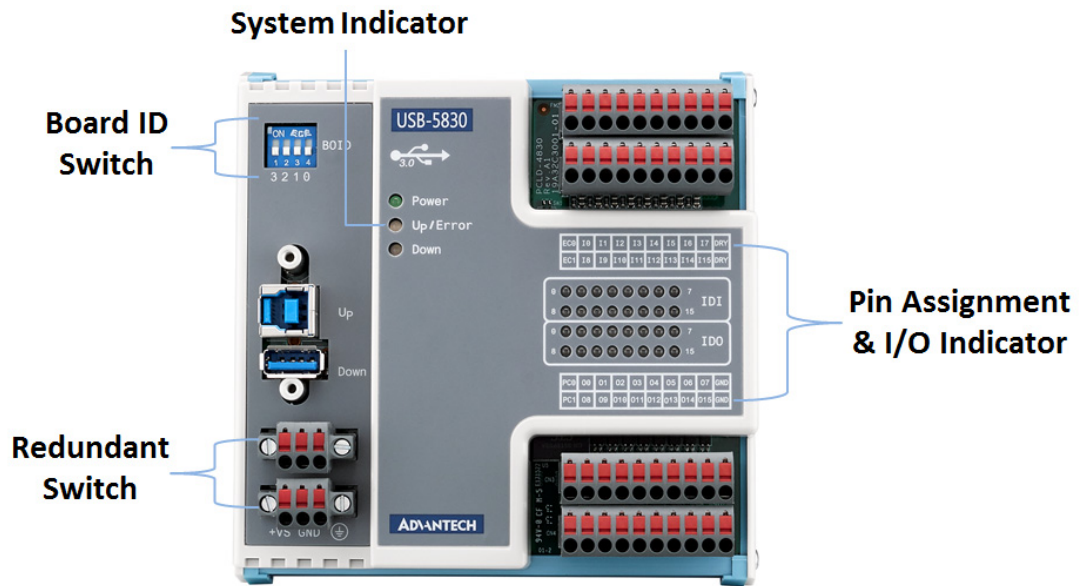


Figure 3.1 Connector and switch Locations

3.3.1 BID

The USB-5800 series modules feature a built-in DIP switch (BID), which is used to define each module's board ID. When multiple modules are installed on the same system, this board ID switch is useful for identifying each module's device number.

After setting each USB-5800, you can identify each module in the system using their different device numbers. The board ID default value is 0. Should you need to adjust the BID, refer to the table provided below.

Board ID Setting				
SW1	Position 1	Position 2	Position 3	Position 4
BoardID	ID3	ID2	ID1	ID0
0	ON	ON	ON	ON
1	ON	ON	ON	OFF
2	ON	ON	OFF	ON
3	ON	ON	OFF	OFF
4	ON	OFF	ON	ON
5	ON	OFF	ON	OFF
6	ON	OFF	OFF	ON
7	ON	OFF	OFF	OFF
8	OFF	ON	ON	ON
9	OFF	ON	ON	OFF
10	OFF	ON	OFF	ON
11	OFF	ON	OFF	OFF
12	OFF	OFF	ON	ON
13	OFF	OFF	ON	OFF
14	OFF	OFF	OFF	ON
15	OFF	OFF	OFF	OFF

Default Setting is 0

3.3.2 LEDs

Table 3.1: Power Indicator

Indicator State	Description
Off	The system is not on/power is off
On	The system is on/power is on

Table 3.2: Up/Error Indicator

Indicator State	Condition
Green On	The device is connected to the system
Red On	The device is not connected to the system

Table 3.3: Down Indicator

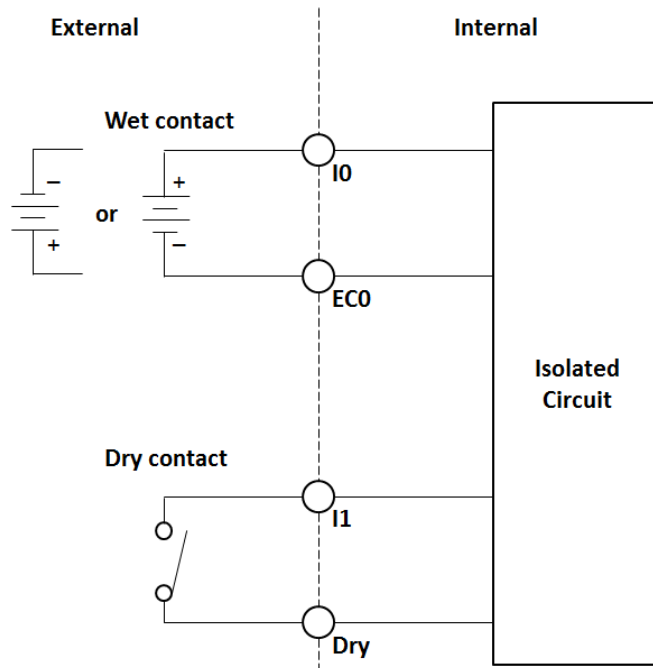
Indicator State	Description
Off	The USB hub is not connected to any device
Blue On	The USB hub is connected to a device

3.4 Connections

3.4.1 Isolated DI Connection

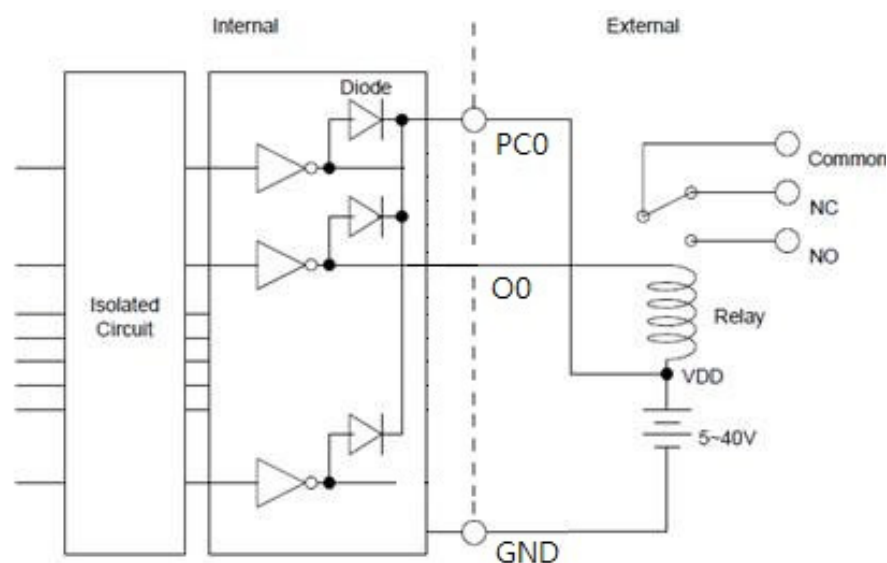
All isolated digital input channels accept voltages ranging from 10 to 30 V.

Additionally, every eight input channels share one external common pin (channels 0 ~ 7 use EC0, channels 8 ~ 15 use EC1). The figure below shows how to connect an external input source to the module's isolated inputs.



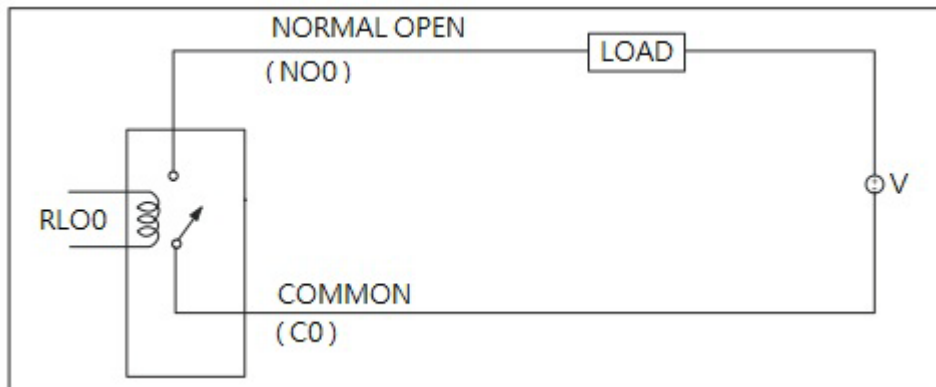
3.4.2 Isolated DO Connection

If an external voltage source (5 ~ 40 V) is connected to each isolated output channel (On) and its isolated digital output is turned on (350 mA max./ch), the module will sink current from the external voltage source. Isolated DO modules provide EGND pins for IDO connection. The following figure shows how to connect an external output load to the module's isolated outputs.



3.4.3 Relay Output

The figure below illustrates the structures and connections of the relay outputs.



3.5 Field Wiring Considerations

When using USB-5800 modules for data collection in an outdoor environment, any noises from the environment can significantly affect the accuracy. The following measures are helpful for reducing possible interference when running signal wires between signal sources and the USB-5800 module.

- Signal cables must be kept away from strong electromagnetic sources, such as power lines, large electric motors, circuit breakers, or welding machines, because they may cause strong electromagnetic interference. Keep analog signal cables away from video monitors because they can significantly affect data acquisition systems.
- If the cable travels through an area with significant electromagnetic interference, users should use individually shielded, twisted-pair wires as the analog input cable. This type of cable features signal wires twisted together and shielded with a metal mesh. The metal mesh should only be connected to one point at the signal source ground.
- Avoid running the signal cables through any conduit that may have power lines running through it.
- If you must place your signal cable parallel to a power line that has a high voltage or high current running through it, try to keep a safe distance between them. Alternatively, you can place the signal cable at a right angle to the power line to minimize undesirable effects.

Appendix **A**

Specifications

A.1 General

Item	Description
Connectors	10-pin terminal block, 3.81 mm *N
	3-pin screw terminal block, 3.81 mm * 2 (power)
	USB 3.0 type A (to PC)
	USB 3.0 type B (hub)
Dimensions	120 x 120 x 40 mm (4.72 x 4.72 x 1.57 in) for USB-5830/5850/5860
	168 x 120 x 40 mm for (6.61 x 4.72 x 1.57) USB-5855/5856/5862
Operating Temperature	0 ~ 60 °C (32 ~ 140 °F)
Storage Temperature	-40 ~ 70 °C (-40 ~ 158 °F)
Storage Humidity	5 ~ 95% RH (non-condensing)
Power Supply	10 ~ 30 VDC
Power Consumption	Typical 240mA @5 V
	Max. 480mA @ 5V for USB-5830/5850/5860
	Max. 720mA @ 5V for USB-5855/5856/5862
Certification	CE, FCC Class A
ESD Protection	8KV (air), 6KV (contact)
DC Surge Protection	2KV

*N

	USB-5830	USB-5850	USB-5855	USB-5856	USB-5860	USB-5862
N	4	4	8	8	3	6

A.2 I/O Channels

Item	USB-5830	USB-5850	USB-5855	USB-5856	USB-5860	USB-5862
Isolated digital input channels	16	16	32	32	8	16
Isolated digital output channels	16	-	-	32	-	-
PhotoMOS relay output channels	-	8	16	-	-	-
Relay output channels	-	-	-	-	8	16

A.3 Isolated Digital Input

Item	Description
Input voltage	Logic 0: 3 V max.
	Logic 1: 10 V min. (30 V max.)
Isolation protection	2,500 V _{DC}

A.4 Isolated Digital Output

Item	Description
Load voltage	5 ~ 40 VDC
Load current	350mA/ch (sink)@25 °C 250mA/ch (sink) @60 °C
Isolation protection	2,500 V _{DC}
Opto-isolator response time	100 us

A.5 PhotoMOS Relay Output

Item	Description
Relay type	PhotoMOS SPST (Form A)
Load voltage	60 V (AC peak or DC)
Load current	1.2A
Peak load current	4A @100 ms (1 pulse)
Isolation protection	1,500 VDC
Turn-on time	1 ms typical
Turn-off time	0.6 ms typical

A.6 Relay Output

Item	Description
Relay type	Form A
Contact rating (resistive)	2A@250 V _{AC} , 2A@30 V _{DC}
Max. switching power	500 V _{AC} , 60W
Max. switching voltage	270 V _{AC} , 125 V _{DC}
Resistance	30 mΩ max.
Operating time	Max. 10 ms
Releasing time	Max. 5ms
Life expectancy	Mechanical 2 x 10 ⁷ ops. at no load. Electrical 3 x 10 ⁴ ops. @2A/250 V _{AC}

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Please verify specifications before quoting. This guide is intended for reference purposes only.

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