

User Manual

USB-4750

32-Channel Isolated Digital I/O USB Module

ADVANTECH

Enabling an Intelligent Planet

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This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the 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. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise 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 clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

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.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support 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

Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all feedback in writing to support@advantech.com.

Safety Precautions - Static Electricity

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

- 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.
- Disconnect the power before making any configuration changes. A sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.

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Chapter 1

Introduction

Sections include:

- Introduction
- Features
- Specifications

1.1 Introduction

Thank you for buying the Advantech's USB-4750 data acquisition module. The Advantech USB-4750 is a powerful data acquisition (DAS) module for the USB port. It features a unique circuit design and complete functions for data acquisition and control.

1.2 Hardware Features

USB-4750 features excellent measurement & control functions:

- 32 isolated digital input/output channels
- High-voltage isolation up to 2,500 V_{DC} on all channels
- Dry/wet contact support
- Interrupt handling capability
- High-sink current for isolated output channels (200mA max./Channel)
- Digital output value retained after hot system reset
- Programmable Power-Up States for output channels
- Wiring terminals on module
- Compatible with USB 1.1/2.0 (Supports USB 1.1 data transfer rate)
- Bus powered

Note! You can install up to sixteen USB-4750's to a system because of the maximum number limit of the device BoardID.



Note! The power output of an USB port is 500 mA, while the USB-4750 requires 350 mA (Max.). This means that if an USB hub is used, it will need an external power supply to support more than one USB-4750 device.



Note! For detailed specifications of USB-4750, please refer to Appendix A, Specifications.



1.3 Software Overview

Advantech offers device drivers, SDKs, third-party driver support and application software to help fully exploit the functions of your DAQ devices. All these software packages are available on Advantech website: <http://www.advantech.com/>.

The Advantech Navigator is a utility that allows you to set up, configure and test your device, and later stores your settings in a proprietary database.

1. To set up the I/O device for your card, you could first run the Advantech Navigator program (by accessing Start/Programs/Advantech Automation/DAQNav/ Advantech Navigator). The settings could also be saved to XML file, that can be loaded in the applications using LoadProfile API.
2. You can then view the device(s) already installed on your system (if any) on the Installed Device tree view. If the software and hardware installation are completed, you will see the device in the Installed Devices list.

Chapter 2

Installation

Sections include:

- Unpacking
- Driver Installation
- Hardware Installation
- Hardware Uninstallation

2.1 Unpacking

After receiving your USB-4750 package, please inspect its contents first. The package should contain the following items:

- USB-4750 Module
- Shielded USB 2.0 Cable (1.72 m)
- User Manual

The USB-4750 Module harbors certain electronic components vulnerable to electrostatic discharge (ESD). ESD could easily damage the integrated circuits and certain components if preventive measures are not carefully paid attention to. *Before removing the module from the anti-static plastic bag, you should take following precautions to ward off possible ESD damage:*

- Touch the metal part of your computer chassis with your hand to discharge static electricity accumulated on your body. One can also use a grounding strap.
- Make contact between the anti-static bag and ground before opening.

After taking out the module, you should first:

Inspect the module for any possible signs of external damage (loose or damaged components, etc.). If the module is visibly damaged, please notify our service department or our local sales representative immediately. Avoid using a damaged module with your system.

- Avoid physical contact with materials that could hold static electricity such as plastic, vinyl and Styrofoam.

2.2 Driver Installation

The driver package could be found on Advantech Support Portal (<https://www.advantech.com/support>). Search for USB-4750 on the support portal, then the corresponded driver/SDK package could be found. You'll get the XNavi installer after the download session finishes.

Execute the installer, then it will guide you through the session. You can choose the device and software components you'd like to install in the system (Figure 2.1). After the selection, click on "start" to begin the installation.

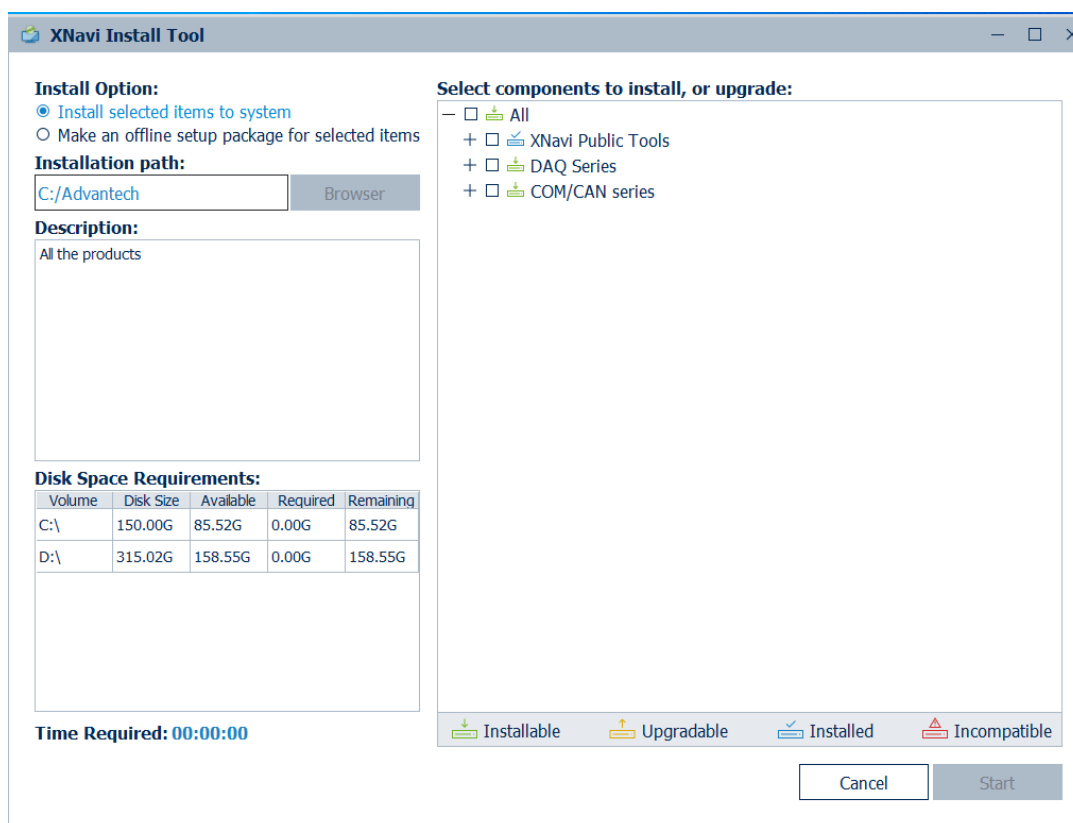


Figure 2.1 XNavi Installer

2.2.1 Software Development Using DAQNav SDK

DAQNav SDK is the software development kit for programming applications with Advantech DAQ products. The necessary runtime DLL, header files, software manual and tutorial videos could be installed via XNavi installer. They could be found under C:\Advantech\DAQNav (default directory) after the finishing the installation.

2.3 Hardware Installation

Note! *Make sure you have installed the software driver before you install the module (please refer to Section 2.2 Driver Installation).*



After the driver installation is completed, you can now go on to install the USB-4750 module in any USB port that supports the USB 1.1/2.0 standard, on your computer. It is suggested that you refer to the computer's user manual if you have any doubts. Please follow the steps below to install the module on your system.

1. Touch the metal part on the surface of your computer to neutralize the static electricity that might be in your body.
2. Plug your USB module into the selected USB port. Use of excessive force must be avoided; otherwise the module might get damaged.

Note! *In case you installed the module without installing the driver first, operating systems will recognize your module as an "unknown device" after reboot, and will prompt you to provide necessary driver. You should ignore the prompting messages (just click the Cancel button) and set up the driver according to the steps described in Section 2.2 Driver Installation.*



2.4 Hardware Uninstallation

Though the Advantech USB modules are hot swappable, we still recommend you to follow the hardware un-installation procedure to avoid any unpredictable damage to your device or your system.

1. Close the applications of the USB module.
2. Open the Windows Device Manager and right click on the Advantech USB4750 Device". Then select the "Uninstall" to remove the USB-4750.

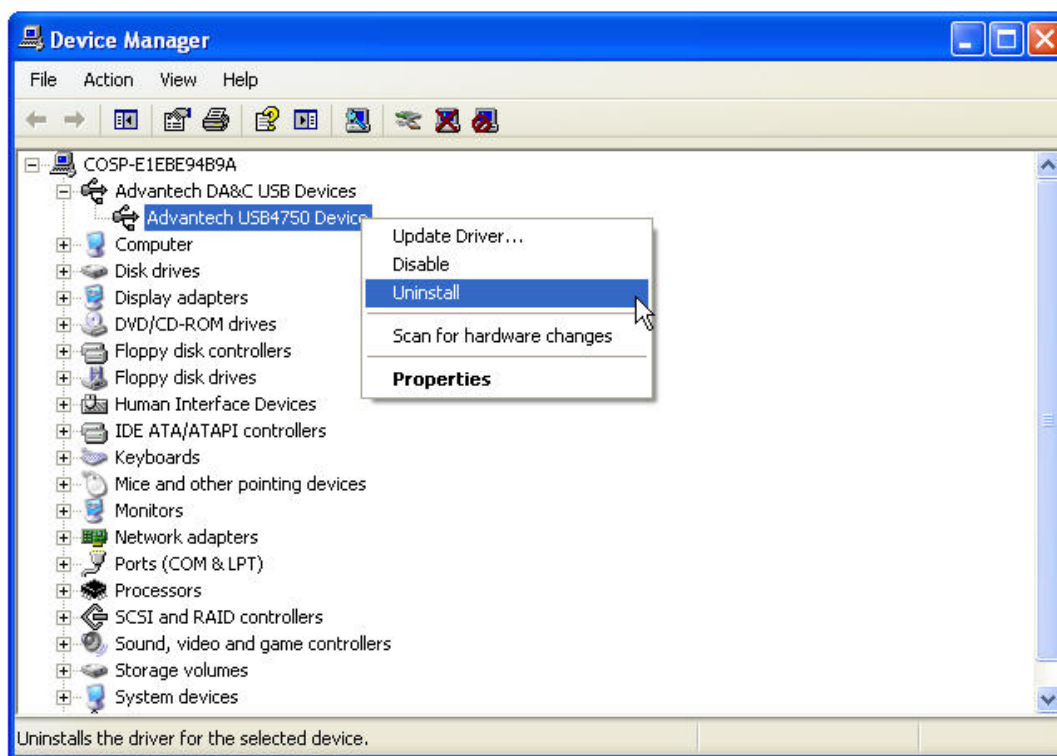


Figure 2.2 Uninstalling USB-4750

3. Unplug your USB device from the USB port.

Note! Please make sure that you have closed the application before unplugging the USB device, otherwise unexpected system error or damage may occur.



Chapter 3

Signal Connections

Sections include:

- Overview
- Isolated Digital I/O Connections
- Field Wiring Considerations

3.1 Overview

Maintaining good 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 avoid unnecessary and costly damage to your PC and other hardware devices.

3.2 I/O Connectors

USB-4750 is equipped with plug-in screw-terminal connectors that facilitate connection to the module without terminal boards or cables.

3.2.1 Pin Assignments

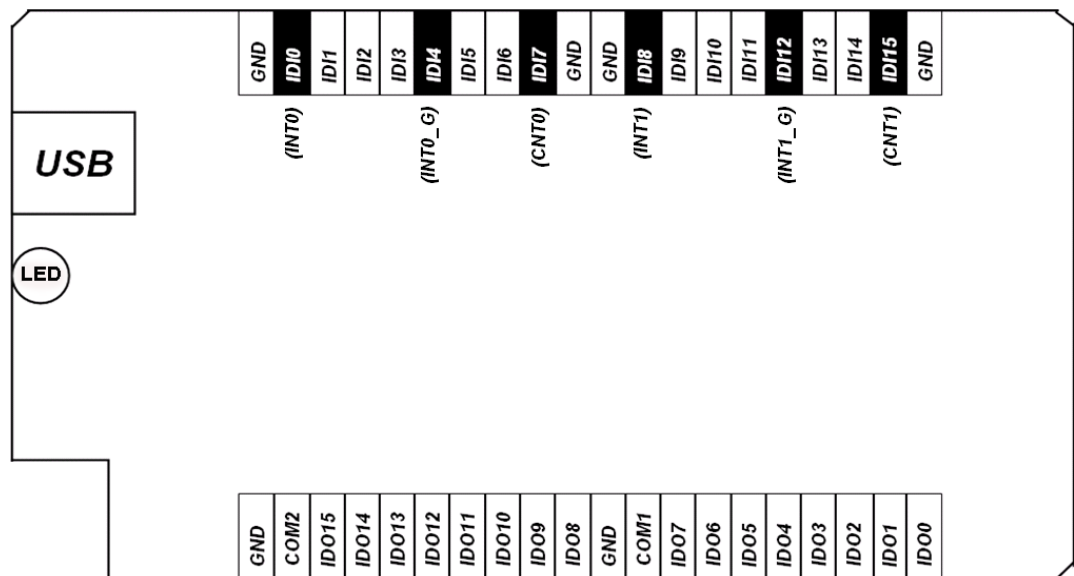



Figure 3.1 I/O Connector Pin Assignment

Note! *IDI0 shares the same pin with INT0.*
 *IDI4 shares the same pin with INT0_G.*
IDI7 shares the same pin with CNT0.
IDI8 shares the same pin with INT1.
IDI12 shares the same pin with INT1_G.
IDI15 shares the same pin with CNT1.

3.2.2 I/O Connector Signal Description

Table 3.1: I/O Connector Signal Descriptions

Signal	Reference	Direction	Description
IDI<0~15>	GND	Input	Isolated digital input channels
INT<0,1>	INT_G	Input	Interrupt trigger sources.
INT<0,1>_G	-	-	Gate for Interrupt pins.
CNT<0,1>	GND	Input	Isolated input counters
IDO<0~15>	GND	Output	Isolated digital output channels
COM<0,1>	-	-	Common pins for connecting inductive loads of isolated output channels
GND	-	-	Ground

3.2.3 LED Indicator Status Description

The USB Module is equipped with a LED indicator to show the current status of the device. When you plug the USB device into the USB port, the LED indicator will blink five times and then stay lit to indicate that it is on. Please refer to the following table for detailed LED indicator status information.

Table 3.2: LED Indicator Status Description

LED Status	Description
ON	Device ready for work
Off	Device not ready to work
Slow Blinking (5 times)	Device Initialization
Fast Blinking (Depends on data transfer speed)	Device working

3.3 Isolated Digital I/O Connections

3.3.1 Dry/Wet Contact Support for Digital Input

Each digital input channel accepts either dry contact or 0 ~ 60 V_{DC} wet contact inputs. Dry contact capability allows the channel to respond to changes in external circuitry (e.g., the closing of a switch in the external circuitry) when no voltage is present in the external circuit. Figure 3.2 shows external circuitry with both wet and dry contact components, connected as an input source to one of the card's digital input channels.

Note! *External 5k Ω resistor is suggested to be added in wet contact context, to maintain the voltage level while the external signal source is set to OFF state.*

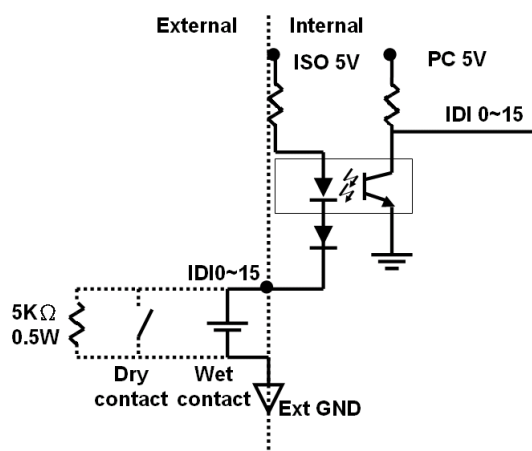


Figure 3.2 Isolated Digital Input Connections

3.3.2 Isolated Digital Output Connections

Each of the 8 isolated digital output channels comes equipped with a Darlington transistor. Every 8 output channels share common collectors and integral suppression diodes for inductive loads. Channels 0 ~ 7 use COM0, and channels 8 ~ 15 use COM1 as a common pin. If an external voltage (5 ~ 40 V) is applied to an isolated output channel (IDO 0 ~ IDO 15) while it is being used as an output channel, the current will flow from the external voltage source to the card. Please take care that the current through each GND pin not exceed 200 mA.

Figure 3.3 shows how to connect an external output load to the card's isolated outputs.

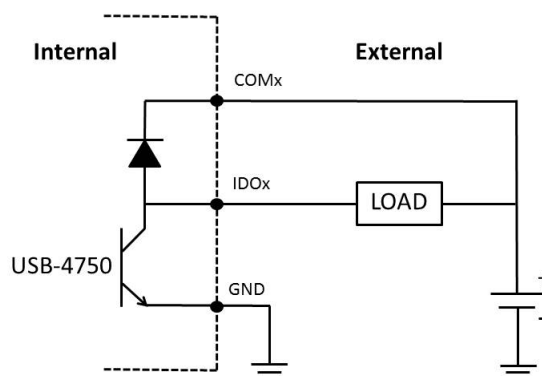


Figure 3.3 Isolated Digital Output Connections

3.4 Field Wiring Considerations

- When you use USB-4750 to acquire data from outside, noises in the environment might significantly affect the accuracy of your measurements if due cautions are not taken. The following measures will be helpful to reduce possible interference running signal wires between signal sources and the USB-4750.
- The signal cables must be kept away from strong electromagnetic sources such as power lines, large electric motors, circuit breakers or welding machines, since they may cause strong electromagnetic interference. Keep the analog signal cables away from any video monitor, since it can significantly affect a data acquisition system.
- If the cable travels through an area with significant electromagnetic interference, you should adopt individually shielded, twisted-pair wires as the analog input cable. This type of cable has its 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 might have power lines in it.
- If you have to 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. Or place the signal cable in a right angle to the power line to minimize the undesirable effect.

Appendix **A**

Specifications

A.1 Isolated Digital Input

Channels	16
Interrupt Inputs	2 (IDI0,IDI8)
Optical Isolation	2500 V _{DC}
Opto-isolator Response Time	100 µs max.
Input Voltage	V _{IH} (max.) = 60 V _{DC} V _{IH} (min.) = 5 V _{DC} V _{IL} (max.) = 2 V _{DC}

A.2 Isolated Digital Output

Channels	16
Optical Isolation	2500 V _{DC}
Opto-isolator Response Time	100 µs max.
Output Voltage	5 ~ 40 V _{DC}
Sink Current	max. 200mA per channel

A.3 Optically-Isolated Counter

Counter/Timer	
Channels	2 independent
Resolution	32-bit counters
Event counting	1 KHz max.
Frequency Measurement	Input frequency from 0.1 Hz to 1 MHz
Frequency Measurement Accuracy	±0.1%

A.4 General

I/O Connector Type	10-pin screw terminal *4	
Dimensions	132 X 80 X 32 mm (5.2" X 3.2" X 1.3")	
Power Consumption	5 V @ 350 mA max.	
Temperature	Operation	0~60 (32~140) (refer to IEC 68-2-1, 2)
	Storage	-20~70 (-4~158)
Relative Humidity	5%~95% RH non-condensing (refer to IEC 68-2-1, 2)	

www.advantech.com

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

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