

# **USB-4750**

**32-Channel Isolated  
Digital I/O USB Module**

**User Manual**

## **Copyright**

The documentation and the software included with this product are copyrighted 2009 by Advantech Co., Ltd. All rights are reserved. Advantech Co., Ltd. reserves the right to make improvements in the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated or transmitted in any form or by any means without the prior written permission of Advantech Co., Ltd. Information provided in this manual is intended to be accurate and reliable. However, Advantech Co., Ltd. assumes no responsibility for its use, nor for any infringements of the rights of third parties, which may result from its use.

## **Acknowledgements**

Intel and Pentium are trademarks of Intel Corporation.

Microsoft Windows and MS-DOS are registered trademarks of Microsoft Corp.

All other product names or trademarks are properties of their respective owners.

Part No. 2003M750004750

1st Edition

Printed in Taiwan

July 2009

## **Product Warranty (2 years)**

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which 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 of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

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 you get 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 an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

## **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 kind of cable is available from Advantech. Please contact your local supplier for ordering information.

## **Technical Support and Assistance**

Step 1. Visit the Advantech web site at **[www.advantech.com/support](http://www.advantech.com/support)** where you can find the latest information about the product.

Step 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 you call:

- 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 in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: [support@advantech.com](mailto:support@advantech.com)

## **Safety Precaution - 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 your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
2. Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

# Contents

<b>Chapter 1</b>	<b>Introduction .....</b>	<b>2</b>
1.1	Hardware Features.....	2
1.2	Software Overview.....	3
1.2.1	More on the CD .....	3
<b>Chapter 2</b>	<b>Installation .....</b>	<b>6</b>
2.1	Unpacking .....	6
2.2	Driver Installation .....	7
2.3	Hardware Installation .....	9
2.4	Hardware Uninstallation .....	9
	Figure 2.1:Unplug or Eject Hardware Dialog .....	10
	Figure 2.2:Stop a Hardware device dialog box .....	10
<b>Chapter 3</b>	<b>Signal Connections .....</b>	<b>12</b>
3.1	Overview .....	12
3.2	I/O Connectors .....	12
3.2.1	Pin Assignments .....	12
	Figure 3.1:I/O Connector Pin Assignment .....	12
3.2.2	I/O Connector Signal Description .....	13
	Table 3.1:I/O Connector Signal Descriptions .....	13
3.2.3	LED Indicator Status Description .....	13
	Table 3.2:LED Indicator Status Description .....	13
3.3	Isolated Digital I/O Connections.....	14
3.3.1	Dry/Wet Contact Support for Digital Input .....	14
	Figure 3.2:Isolated Digital Input Connections .....	14
3.3.2	Isolated Digital Output Connections .....	15
	Figure 3.3:Isolated Digital Output Connections .....	15
3.4	Field Wiring Considerations .....	16
<b>Appendix A</b>	<b>Specifications .....</b>	<b>18</b>
A.1	Isolated Digital Input.....	18
A.2	Isolated Digital Output.....	18
A.3	Optically-Isolated Counter .....	18
A.4	General .....	18



## **Introduction**

Sections include:

- Hardware Features
- Software Overview

# Chapter 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.

## 1.1 Hardware Features

---

USB-4750 features excellent measurement & control functions:

- 32 isolated digital input/output channels
- High-voltage isolation up to 2,500 VDC on all channels
- Dry/wet contact support
- Interrupt handling capability
- High-sink current for isolated output channels (100mA max./Channel)
- Digital output value retained after hot system reset
- Programmable Power-Up States for output channels
- Wiring terminals on module

*Note: You can install up to sixteen USB-4750's to a system because of the restriction of 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.*



## 1.2 Software Overview

---

Advantech offers a rich set of DLL drivers, third-party driver support and application software on the companion CD-ROM to help fully exploit the functions of your device. Advantech's Device Drivers feature a complete I/O function library to help boost your application performance and work seamlessly with development tools such as Visual C++, Visual Basic, Inprise C++ Builder, and Inprise Delphi.

### 1.2.1 More on the CD

For instructions on how to begin programming in each development tool, Advantech offers some tutorial chapters in the Device Drivers Manual for your reference. Please refer to the corresponding sections in these chapters on the Device Drivers Manual to begin your programming efforts. You can also look at the example source code provided for each programming tool, since they can get you very well oriented.

The Device Drivers Manual can be found on the companion CD-ROM. Alternatively, if you have already installed the Device Drivers on your system, The Device Drivers Manual can be readily accessed through the Start button:

**Start/Programs/Advantech Automation/Advantech Device Manager / Device Driver's Manual**

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

**\Program Files\Advantech\ADSAPI\Examples**



## **Installation**

Sections include:

- Unpacking
- Driver Installation
- Hardware Installation
- Hardware Uninstallation

# Chapter 2 Installation

## 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 (1.8 m)
- Companion CD-ROM (DLL driver included)
- 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 antistatic 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 antistatic 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.

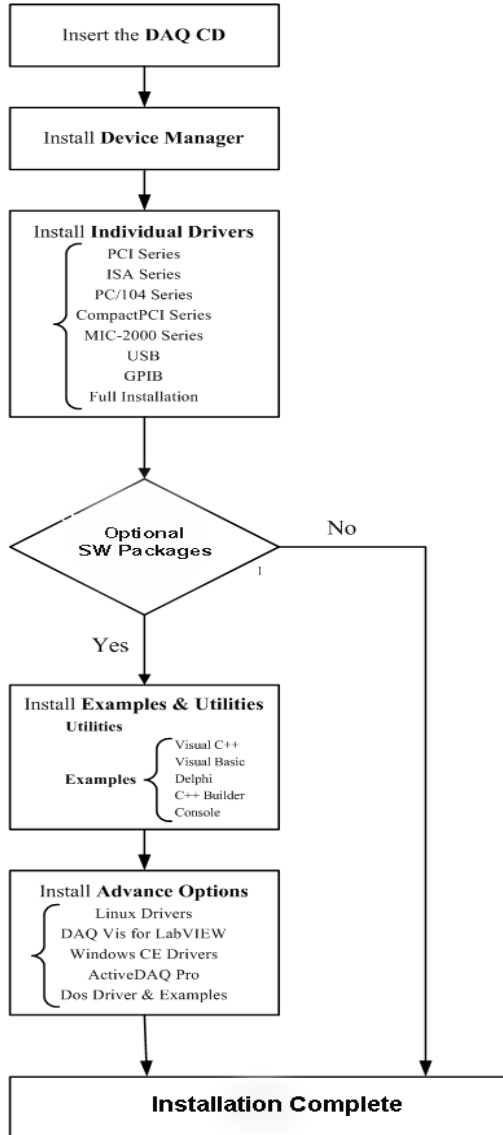
- Avoid physical contact with materials that could hold static electricity such as plastic, vinyl and Styrofoam.

## 2.2 Driver Installation

---

We recommend you install the software driver before you install the USB-4750 module into your system, since this will guarantee a smooth installation process.

The 32-bit DLL driver Setup program for the USB-4750 module is included on the companion CD-ROM that is shipped with your module package. Please follow the steps on the following page to install the driver software:



For further information on driver-related issues, an online version of the Device Drivers Manual is available by accessing the following path:

**Start\Programs\Advantech Automation**

**\Device Manager\Device Driver's Manual**

## 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 DLL 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.

**Step 1:** Touch the metal part on the surface of your computer to neutralize the static electricity that might be in your body.

**Step 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 DLL driver first, Windows 2000/XP 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.*

After your module is installed, you can configure it using the Advantech Device Manager. The Device Driver's Manual can be found at:

*Start\Programs\Advantech Automation\Advantech Device Manager\Device Driver's Manual*

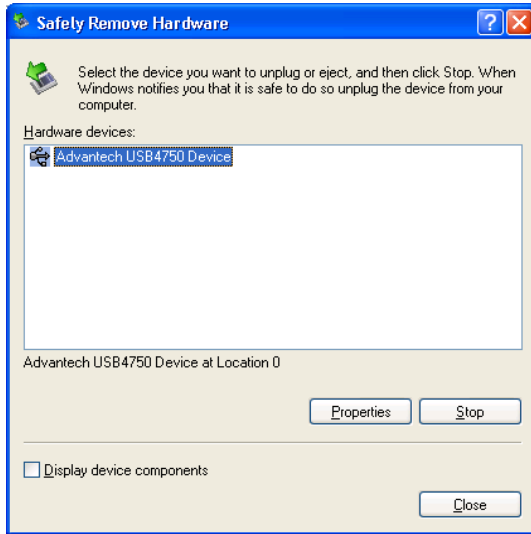
## 2.4 Hardware Uninstallation

---

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

**Step1:** Close the applications of the USB module.

**Step2:** Right click the “Unplug or Eject Hardware” icon on your task bar.



**Figure 2.1:** *Unplug or Eject Hardware Dialog*

**Step3:** Select “Advantech USB-4750 Device” and press “Stop” Button.



**Figure 2.2:** *Stop a Hardware device dialog box*

**Step4:** 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.*



## **Signal Connections**

Sections include:

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

# Chapter 3 Signal Connections

## 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

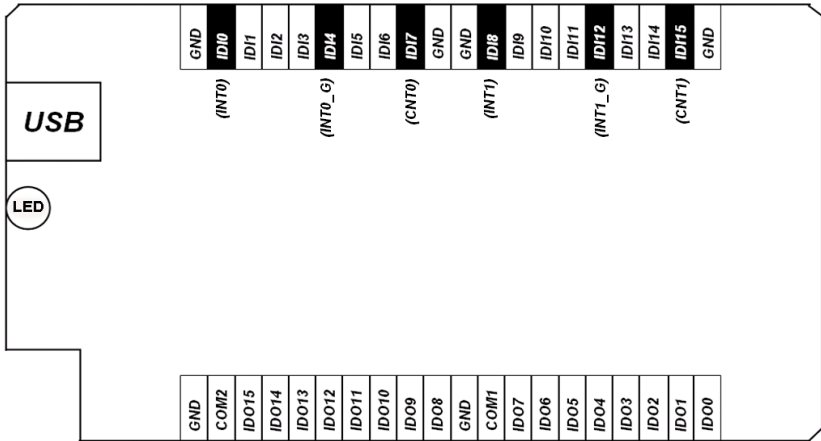


Figure 3.1: I/O Connector Pin Assignment

- 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	-	-	Ground 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 VDC 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 3-1 shows external circuitry with both wet and dry contact components, connected as an input source to one of the card's digital input channels.

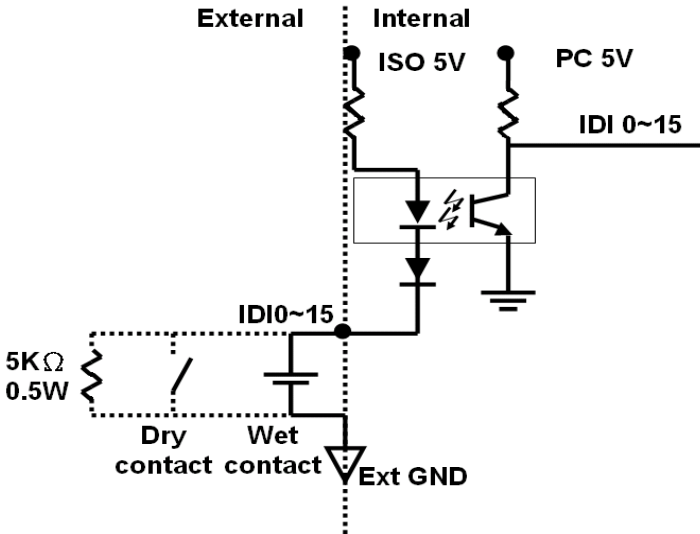
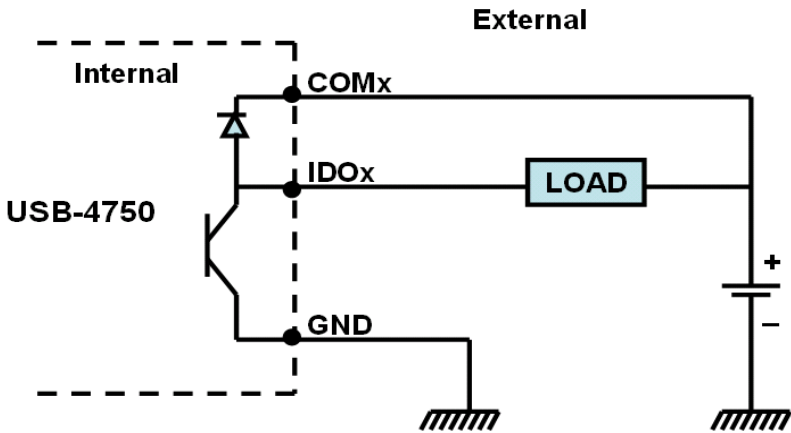


Figure 3.2: Isolated Digital Input Connections

### 3.3.2 Isolated Digital Output Connections

Each of 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 100 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**

# Appendix A Specifications

## A.1 Isolated Digital Input

---

<b>Channels</b>	16
<b>Interrupt Inputs</b>	DI0, DI8
<b>Optical Isolation</b>	2500 VDC
<b>Opto-isolator ResponseTime</b>	25 $\mu$ s
<b>Input Voltage</b>	Dry contact or 0 ~ 5 V for logic 0 5 ~ 60 V for logic 1

## A.2 Isolated Digital Output

---

<b>Channels</b>	16
<b>Optical Isolation</b>	2500 VDC
<b>Opto-isolatorResponse Time</b>	25 $\mu$ s
<b>Output Voltage</b>	5 ~ 40 VDC
<b>Sink Current</b>	100mA/ch. Max. 1.1A/total Max.

## A.3 Optically-Isolated Counter

---

<b>Channels</b>	2 independent		
<b>Resolution</b>	32-bit counters (low 16bit by hardware and high 16bit by firmware)		
<b>Base Clock</b>	Internal	20MHz max.	2 independent program- mable clock sources
<b>Frequency Measurement</b>	Input frequency from 0.1Hz to 8Mhz		
<b>External Input Divide</b>	2 to 65535		

## A.4 General

---

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