

**User Manual**

# **USB-4751/4751L**

**48/24-channel Digital Input/  
Output USB Module**

**ADVANTECH**

*Enabling an Intelligent Planet*

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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.

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# Declaration of Conformity

## FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this event, users are required to correct the interference at their own expense.

## 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](http://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](mailto:support@advantech.com).

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## 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-4751/4751L data acquisition module. The Advantech USB-4751/4751L 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-4751/4751L features excellent measurement & control functions:

- 48/24 digital input/output channels
- 50-pin box header
- Interrupt handling
- Programmable Counter/Timer
- Supports both dry and wet contact
- Compatible with USB 1.1/2.0
- Bus-powered

**Note!** You can install up to sixteen USB-4751/4751L'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-4751/4751L requires 500mA (Max.). This means that if an USB hub is used, it will need an external power supply to support more than one USB-4751/4751L device.



**Note!** For detailed specifications of USB-4751/4751L, 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/DAQNavi/ 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-4751/4751L package, please inspect its contents first. The package should contain the following items:

- USB-4751/4751L Module
- Shielded USB 2.0 Cable (1.72 m)
- User Manual

The USB-4751/4751L 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-4751/4751L 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.

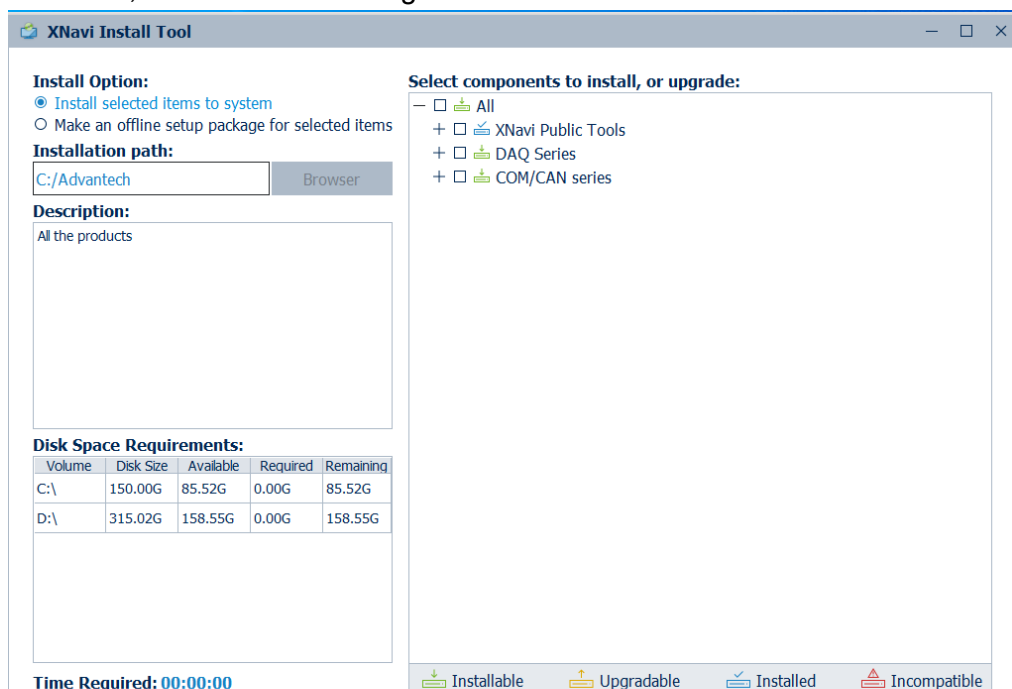


Figure 2.1 XNavi Installer

### 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

After the driver installation is completed, you can now go on to install the USB-4751/4751L 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.

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



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 uninstallation 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 USB-4751/4751L Device". Then select the "Uninstall" to remove the USB-4751/4751L.

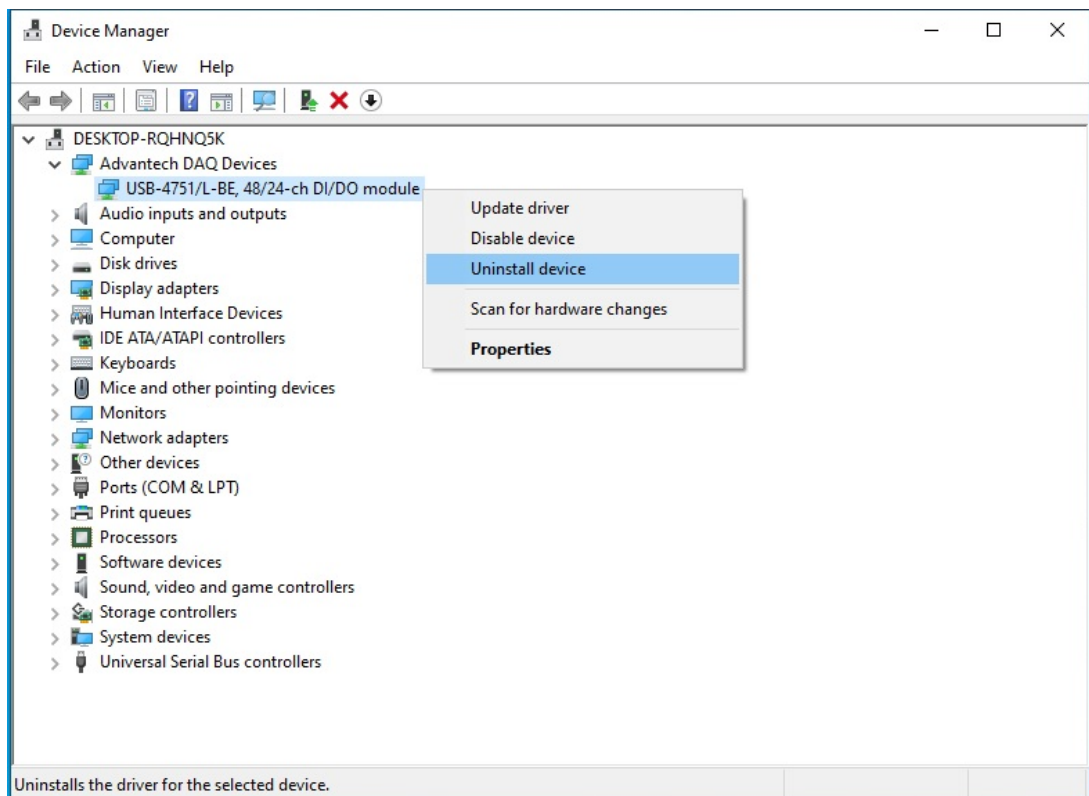


Figure 2.2 Uninstalling USB-4751/4751L

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
- 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-4751/4751L is equipped with plug-in screw-terminal connectors that facilitate connection to the module without terminal boards or cables.

### 3.2.1 Pin Assignments

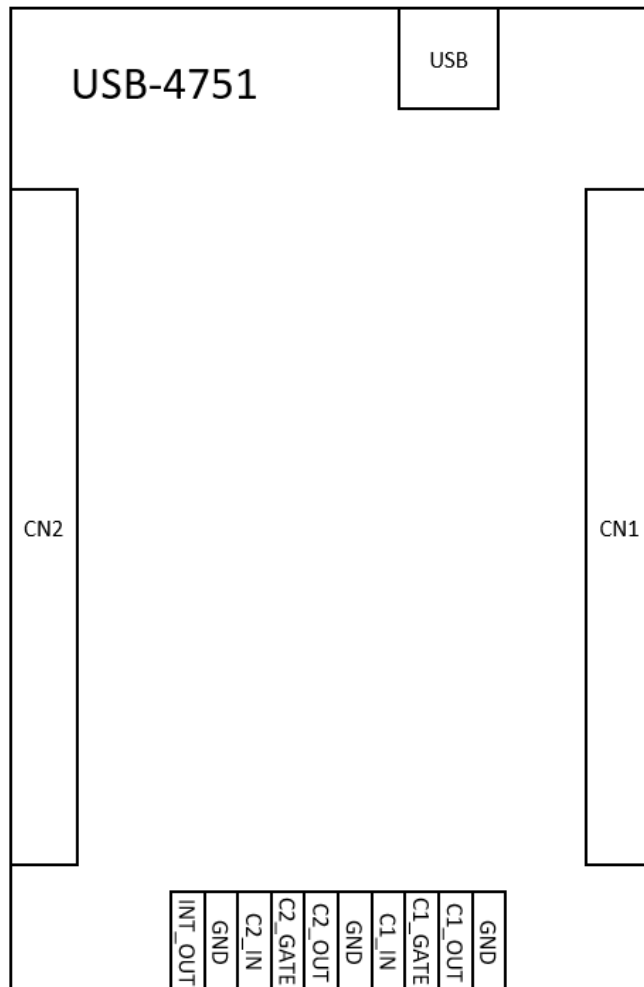


Figure 3.1 I/O Connector Pin Assignment

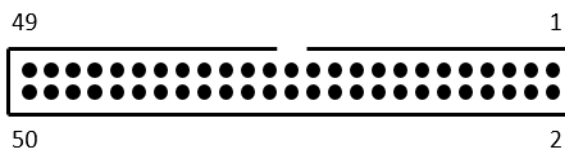


Figure 3.2 CN1/CN2

### 3.2.2 Pin Assignments CN1

**Table 3.1:**

CN1		
Pin Number	Pin Name	Description
1	PC07	Digital input/output port C0 channel 7
3	PC06	Digital input/output port C0 channel 6
5	PC05	Digital input/output port C0 channel 5
7	PC04	Digital input/output port C0 channel 4
9	PC03	Digital input/output port C0 channel 3
11	PC02	Digital input/output port C0 channel 2
13	PC01	Digital input/output port C0 channel 1
15	PC00	Digital input/output port C0 channel 0
17	PB07	Digital input/output port B0 channel 7
19	PB06	Digital input/output port B0 channel 6
21	PB05	Digital input/output port B0 channel 5
23	PB04	Digital input/output port B0 channel 4
25	PB03	Digital input/output port B0 channel 3
27	PB02	Digital input/output port B0 channel 2
29	PB01	Digital input/output port B0 channel 1
31	PB00	Digital input/output port B0 channel 0
33	PA07	Digital input/output port A0 channel 7
35	PA06	Digital input/output port A0 channel 6
37	PA05	Digital input/output port A0 channel 5
39	PA04	Digital input/output port A0 channel 4
41	PA03	Digital input/output port A0 channel 3
43	PA02	Digital input/output port A0 channel 2
45	PA01	Digital input/output port A0 channel 1
47	PA00	Digital input/output port A0 channel 0
49	+5V_OUT	+5V DC Power
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50	GND	Ground

### 3.2.3 Pin Assignments CN2

**Table 3.2:**

CN2 (USB-4751 only)		
Pin Number	Pin Name	Description
1	PC17	Digital input/output port C1 channel 7
3	PC16	Digital input/output port C1 channel 6
5	PC15	Digital input/output port C1 channel 5
7	PC14	Digital input/output port C1 channel 4
9	PC13	Digital input/output port C1 channel 3
11	PC12	Digital input/output port C1 channel 2
13	PC11	Digital input/output port C1 channel 1
15	PC10	Digital input/output port C1 channel 0

**Table 3.2:**

17	PB17	Digital input/output port B1 channel 7
19	PB16	Digital input/output port B1 channel 6
21	PB15	Digital input/output port B1 channel 5
23	PB14	Digital input/output port B1 channel 4
25	PB13	Digital input/output port B1 channel 3
27	PB12	Digital input/output port B1 channel 2
29	PB11	Digital input/output port B1 channel 1
31	PB10	Digital input/output port B1 channel 0
33	PA17	Digital input/output port A1 channel 7
35	PA16	Digital input/output port A1 channel 6
37	PA15	Digital input/output port A1 channel 5
39	PA14	Digital input/output port A1 channel 4
41	PA13	Digital input/output port A1 channel 3
43	PA12	Digital input/output port A1 channel 2
45	PA11	Digital input/output port A1 channel 1
47	PA10	Digital input/output port A1 channel 0
49	+5V_OUT	+5VDC Power
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50	GND	Ground

### 3.2.4 I/O Connector Signal Description

**Table 3.3: I/O Connector Signal Descriptions**

Pin Name	Description
C<1...2>_IN	Counter input terminals
C<1...2>_GATE	Counter gate input terminals
C<1...2>_OUT	Counter output terminals
INT_OUT	Interrupt output terminal
GND	Ground

### 3.2.5 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 3.4: Table 3.2: LED Indicator Status Description**

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

## 3.3 Digital I/O Connections

### 3.3.1 Digital Input Signal Connection (TTL DI/O, Pull-Up)

A digital input/output (DI/O) channel can be configured by software to perform digital input measurement, which is the power-on default configuration, or digital output generation. When performing digital input measurement, the voltage logic level between the digital input (DI) terminal and the digital ground (DGND) terminal is measured. To prevent undetermined or fluctuating results when input is floating, the digital input channel is internally pulled-up. This is shown in Figure 3.3.

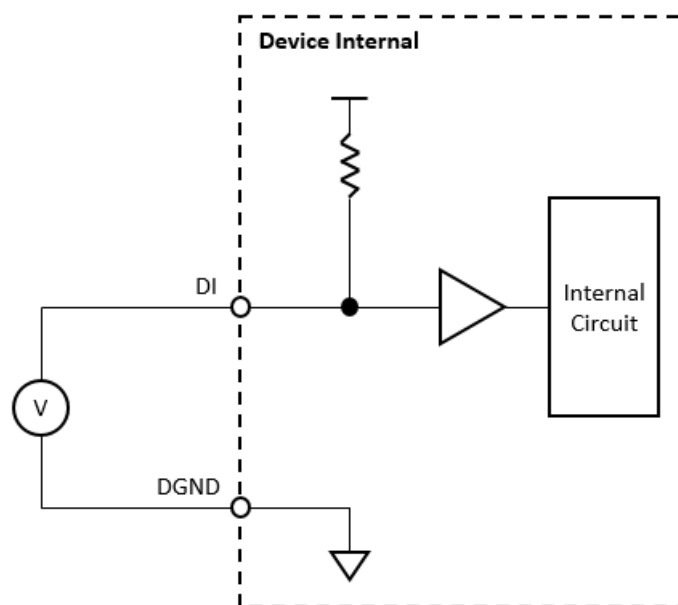


Figure 3.3 Digital input signal connection

### 3.3.2 Digital Output Signal Connection (TTL DI/O)

A digital input/output (DI/O) channel can be configured by software to perform digital input measurement, which is the power-on default configuration, or digital output generation. When performing digital output generation, a voltage logic level is generated between the digital output (DO) terminal and the digital ground (DGND) terminal. This is shown in Figure 3.4.

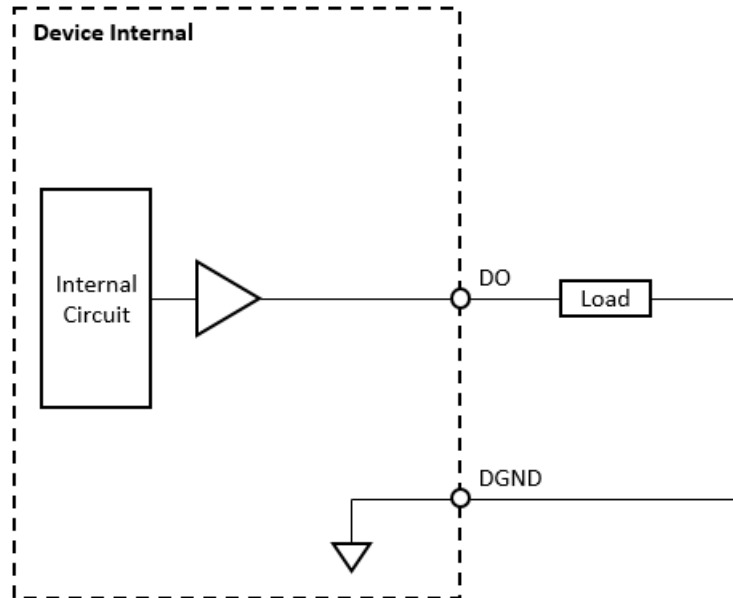


Figure 3.4 Digital output signal connection

Each digital output channel can source or sink only finite amount of current. If this limit is exceeded, the output voltage will not stay in the specified voltage logic level. Refer to the device specifications for the maximum source and skin current values.

### 3.3.3 Counter Input Signal Connection (TTL, Pull-Up)

The voltage logic level between the counter input (counter clock, counter gate, counter arm, and sample clock) terminals and the digital ground (DGND) terminal is measured. To prevent undetermined or fluctuating results when input is floating, the counter input signals are internally pulled-up. This is shown in Figure 3.5.

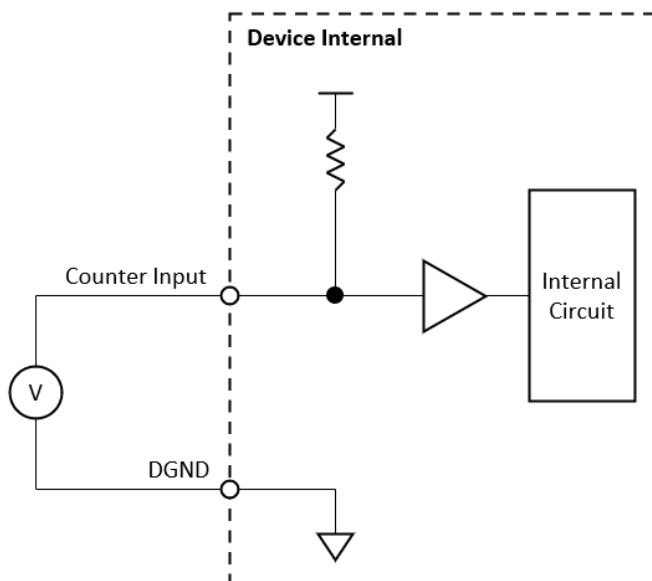


Figure 3.5 Counter input signal connection

### 3.3.4 Counter Output Signal Connection (TTL)

A voltage logic level is generated between the counter output terminal and the digital ground (DGND) terminal. This is shown in Figure 3.6.

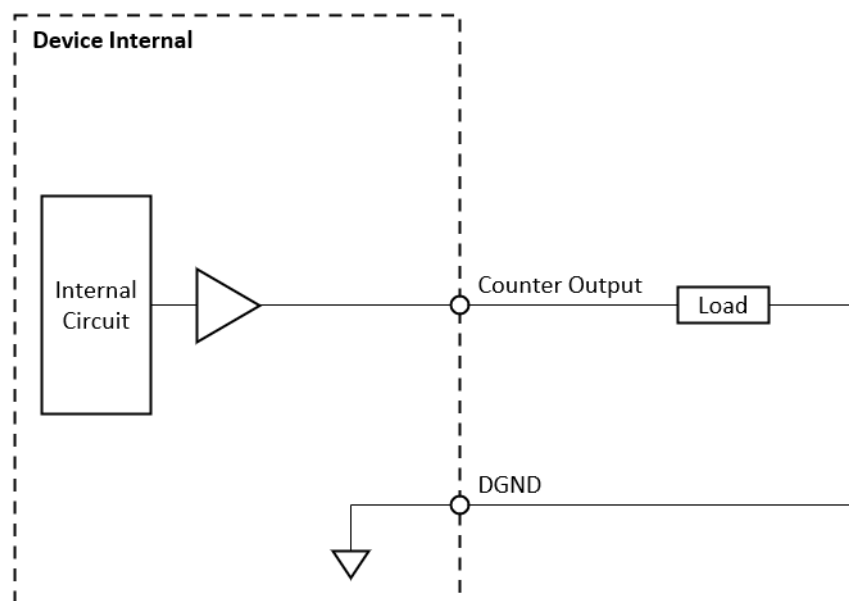


Figure 3.6 Counter output signal connection

Each counter output channel can source or sink only finite amount of current. If this limit is exceeded, the output voltage will not stay in the specified voltage logic level. Refer to the device specifications for the maximum source and skin current values.

## 3.4 Field Wiring Considerations

- When you use USB-4751/4751L 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-4751/4751L.
- 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 Digital Input/Output

<b>Channels</b>	USB-4751	48 (6 Ports)
	USB-4751L	24 (3 Ports)
<b>Power-On State</b>	Input	

## A.2 Digital Input

<b>Input Type</b>	5 V TTL	
<b>Input Logic Value</b>	Logic High	2.0 V min.
	Logic Low	0.8 V max.
	Working Voltage	-0.25 V ~ 5.25 V
<b>Input Protection Voltage</b>	-0.5 V ~ 6.5 V	
<b>Pull-Up Resistor</b>	10 k $\Omega$	
<b>Acquisition Type</b>	Instant	
<b>Interrupt</b>	Supported Channel	PC00 & PC10
	Gate	PC04 gate for PC00 PC14 gate for PC10
	Edge Detection	Rising edge, falling edge, or both edges, software configurable per channel
	Frequency	1 kHz max.
<b>Response Time</b>	120 ns max.	

## A.3 Digital Output

<b>Output Type</b>	5 V TTL	
<b>Power-On State</b>	Logic low	
<b>Output Logic Value</b>	Logic High	3.8 V min. @ 12 mA source/5.2 V max.
	Logic Low	0.5 V max. @ 12 mA sink
<b>Load Current</b>	Per Port Summed	20 mA max.
<b>Update Type</b>	Static	
<b>Response Time</b>	120 ns max.	

## A.4 General-Purpose Counter

<b>Channels</b>	2	
<b>Resolution</b>	32-bits	
<b>Input Type</b>	5 V TTL	
<b>Input Logic Value</b>	Logic High	2.0 V min.
	Logic Low	0.8 V max.
	Working Voltage	-0.25 V ~ 5.25 V
<b>Input Protection Voltage</b>	-0.5 V ~ 6.5 V	
<b>Pull-Up Resistor</b>	10 kΩ	
<b>Output Type</b>	5 V TTL	
<b>Output Logic Value</b>	Logic High	3.8 V min. @ 12 mA source/5.2 V max.
	Logic Low	0.5 V max. @ 12 mA sink
<b>Event Counting</b>	Input Frequency	10 MHz max.
	Measurement Type	Instant
<b>Frequency Measurement</b>	Input Frequency	10 MHz max.
	Accuracy	±0.1%
	Measurement Type	Instant
<b>Counter Output Function</b>	Timer/pulse or pulse width modulation	
	Output Frequency	10 MHz max.
	Accuracy	50 ppm

## A.5 General Specifications

<b>I/O Connector Type</b>	50-pin box header x 2, 10-pin screw terminal x 1	
<b>Dimensions</b>	132 x 80 x 32 mm <sup>3</sup> (5.2 x 3.2 x 1.3 in <sup>3</sup> )	
<b>Power Consumption</b>	500 mW typ./2500 mW max.	
<b>Power Supply Output</b>	+5 V: 100 mA max.	
<b>Temperature</b>	Operation	0 ~ 60° C (32 ~140° F)
	Storage	-20 ~ 70° C (-4 ~ 158° F)
<b>Relative Humidity</b>	Operation	10% to 90% RH, non-condensing
	Storage	5% to 95% RH, non-condensing

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