

PCIE-1753

96-Ch Digital I/O PCI Express Card

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.
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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.

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 user 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.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. 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

Warnings, Cautions, and Notes

Warning! *Warnings indicate conditions that if not observed can cause personal injury!*



Caution! *Cautions are included to help prevent hardware damage and data losses. For example,*



“Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.”

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 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.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated the equipment.
 - The equipment has been exposed to moisture.
 - The equipment is malfunctioning, or does not operate according to the user manual.
 - The equipment has been dropped and damaged.
 - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -20 °C (-4 °F) or above 60 °C (140 °F) as this may damage the components. The equipment should be kept in a controlled environment.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position should not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Wichtige Sicherheitshinweise

1. Bitte lesen Sie sich diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie keine Flüssig- oder Aerosolreiniger. Am besten dient ein angefeuchtetes Tuch zur Reinigung.
4. Die Netzanschlusssteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Verletzungen hervorrufen.
7. Die Belüftungsöffnungen dienen zur Luftzirkulation, die das Gerät vor Überhitzung schützt. Sorgen Sie dafür, dass diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim Anschluss an das Stromnetz die Anschlusswerte.
9. Verlegen Sie die Netzanschlussleitung so, dass niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen, die sich an den Geräten befinden, sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen Sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von autorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten, ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
 - Netzkabel oder Netzstecker sind beschädigt.
 - Flüssigkeit ist in das Gerät eingedrungen.
 - Das Gerät war Feuchtigkeit ausgesetzt.
 - Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
 - Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
 - Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
15. **VORSICHT:** Explosionsgefahr bei unsachgemäßen Austausch der Batterie. Ersatz nur durch denselben oder einem vom Hersteller empfohlenen ähnlichen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.
16. **ACHTUNG:** Es besteht die Explosionsgefahr, falls die Batterie auf nicht fachmännische Weise gewechselt wird. Verfangen Sie die Batterie nur gleicher oder entsprechender Type, wie vom Hersteller empfohlen. Entsorgen Sie Batterien nach Anweisung des Herstellers.
17. Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weniger.

Haftungsausschluss: Die Bedienungsanleitungen wurden entsprechend der IEC-704-1 erstellt. Advantech lehnt jegliche Verantwortung für die Richtigkeit der in diesem Zusammenhang getätigten Aussagen ab.

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Chapter 1

Overview

1.1 Introduction

The PCIE-1753 is a 96-ch DI/O card with PCI Express bus. It provides 96 channels of parallel digital input/output compatible with 5V/TTL. It emulates mode 0 of the 8255 PPI chip, but the buffered circuits offer a higher driving capability than the 8255.

The I/O channels are divided into twelve 8-bit ports. Each port can be divided into two nibbles (bits 0 ~ 3 belong to the low nibble, while bits 4 ~ 7 belong to the high nibble). You can configure each nibble as either input or output via software. The interrupt handling capability provides users the flexibility to generate interrupts to a PC. This card uses a high-density SCSI 100-pin connector for easy and reliable connections to field devices.

Two other features give the PCIE-1753 practical advantages in an industrial setting. When the system is hot reset (the power is not turned off) PCIE-1753 retains the last I/O port settings and output values if the user has set jumper JP1 to enable this feature. Otherwise, port settings and output values reset to their default state, or to the state determined by other jumper settings. The PCIE-1753's other useful feature is it supports both wet and dry contacts for digital input channels, allowing it to interface with other devices more easily.

The following sections of this chapter will provide further information about features, an installation guide, and some brief information on software and accessories for the PCIE-1753 card.

1.2 Features

- 96 TTL digital I/O lines
- Interrupt handling capability
- Supports both dry and wet contact for digital input channels
- Keeps the I/O port settings and DO state after a hot reset
- BoardID switch
- Pattern match interrupt function for DI
- "Change of state" interrupt function for DI
- Programmable digital filter function for DI (available for bit 0 of every port)

The Advantech PCIE-1753 offers the following main features:

Plug-and-Play Function

The PCIE-1753 is a Plug-and-Play device, which fully complies with PCI Express Specifications. During card installation, there is no need to set jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug-and-Play function.

Board ID

The PCIE-1753 has a built-in DIP Switch that helps define each card's ID when multiple PCIE-1753 cards have been installed on the same PC chassis. The board ID setting function is very useful when users build their system with multiple PCIE-1753 cards. With correct Board ID settings, you can easily identify and access each card during hardware configuration and software programming.

Digital Filter for Digital Input Channels

The PCIE-1753 includes a programmable digital filter on channel 0 (bit 0) on each port to eliminate the unexpected signal or noise from the card's inputs. When the digital filter is enabled, the state of the corresponding input channel will not update immediately until the signal is stable for a period of time which is programmed by the user.

Interrupt Function Ensures Faster System Response

The PCIE-1753 provides a “Pattern Match” interrupt function for the digital input channels. It monitors the state of some or all of the input channels and compares it with a preset pattern. When the received state matches the preset pattern, PCIE-1753 will generate an interrupt signal to the system. The “Change of Input State” interrupt function means PCIE-1753 monitors the state of the input channels. When any input changes its state, the card interrupts the system to handle this event. The “Triggering Edge” interrupt can be triggered by a rising edge or a falling edge of the digital input signal.

1.3 Applications

- Industrial AC/DC I/O device monitoring and control
- Relay and switch monitoring and control
- Parallel data transfer
- Sensing TTL, DTL, CMOS signal logic
- Driving indicator LEDs

1.4 Installation Guide

Before installing the PCIE-1753 card, please make sure you have the following necessary components:

- PCIE-1753 card
- PCIE-1753 Startup Manual
- Accessories (optional)
 - PCL-10268-1E: SCSI-100 to 2*SCSI-68 ribbon-type cable, 1 m
 - PCL-10268-2E: SCSI-100 to 2*SCSI-68 ribbon-type cable, 2 m
 - ADAM-3968-AE: 68-pin DIN-rail SCSI wiring board
 - ADAM-39100-BE: 100-pin DIN-rail SCSI wiring board
 - PCL-101100R-1E: SCSI-100 shielded cable with ribbon type, 1 m

After you get the necessary components and chosen accessories for enhanced operation of your card, you can begin the installation procedures.

1.5 Accessories

Advantech offers a complete set of accessory products to support the PCIE-1753 card. These accessories include:

Wiring Cable

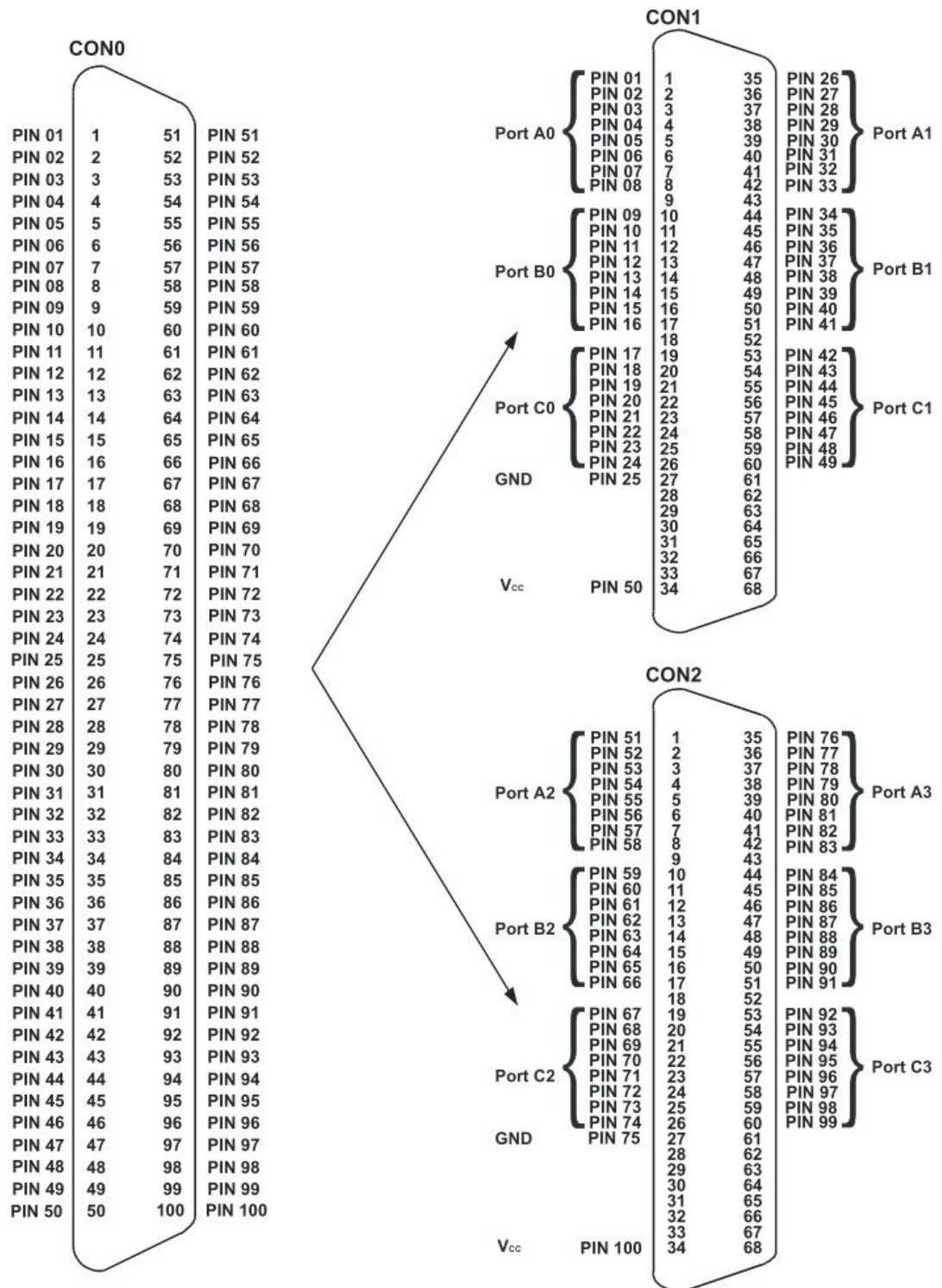
The PCL-10268 shielded cable is specially designed for PCIE-1753 cards to provide high resistance to noise. To achieve better signal quality, the signal wires are twisted in such a way as to form a “twisted-pair cable”, reducing cross-talk and noise from other signal sources. Furthermore, its digital lines are separately sheathed and shielded to neutralize EMI/EMC problems.

Wiring Boards

The ADAM-3968 is a 68-pin D-type wiring terminal module for DIN-rail mounting. This terminal module can be readily connected to the Advantech cards and allow easy yet reliable access to individual pin connections for the PCIE-1753 card.

See the pin assignments to find how the signals from the 100-pin connector of the PCIE-1753 are divided and delivered to the two 68-pin connectors of the Advantech wiring modules.

CON0 is the female connector of the PCIE-1753 corresponding to the 100-pin SCSI male connector of the PCL-10268. CON1 and CON2 are also female connectors corresponding to the two 68-pin SCSI male connectors of the PCL-10268.



Chapter 2

Installation

2.1 Installation

This chapter gives users a package item checklist, proper instructions about unpacking, and step-by-step procedures for both the driver and card installation.

2.2 Packing List

After receiving your PCIE-1753 package, please first inspect its contents. The package should contain the following items:

- PCIE-1753 card
- Startup Manual

The PCIE-1753 card harbors certain electronic components vulnerable to electrostatic discharge (ESD). ESD could easily damage the integrated circuits and certain components beyond the scope of preventive measures.

Before removing the card from the antistatic plastic bag, you should take the 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. Or one can also use a grounding strap.
- Touch the anti-static bag to a metal part of your computer chassis before opening the bag.
- Take hold of the card only by the metal bracket when removing it from the bag.

After taking out the card, you should first:

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

Also pay extra caution to the following to ensure proper installation:

- Avoid physical contact with materials that could hold static electricity such as plastic, vinyl, or Styrofoam.
- Whenever you handle the card, grasp it only by its edges. DO NOT TOUCH the exposed metal pins of the connector or the electronic components.

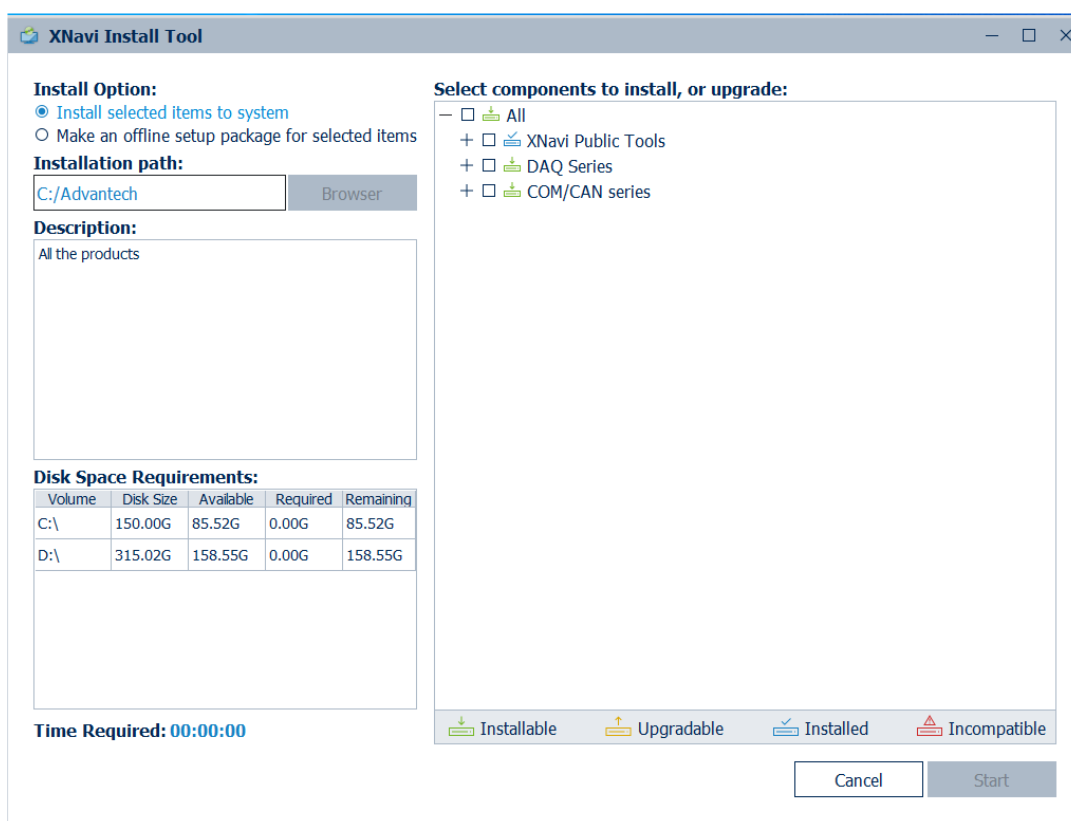
Note! *Keep the anti-static bag for future use. You might need the original bag to store the card if you have to remove the card from a PC or transport it elsewhere.*



2.3 Driver Installation

The driver package can be found on the Advantech Support Portal (<https://www.advantech.com/support>). Search for PCIE-1753 on the support portal to locate the corresponding driver/SDK package for download. You'll be able to install the Navigator 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. After selecting, click on "Start" to begin the installation.

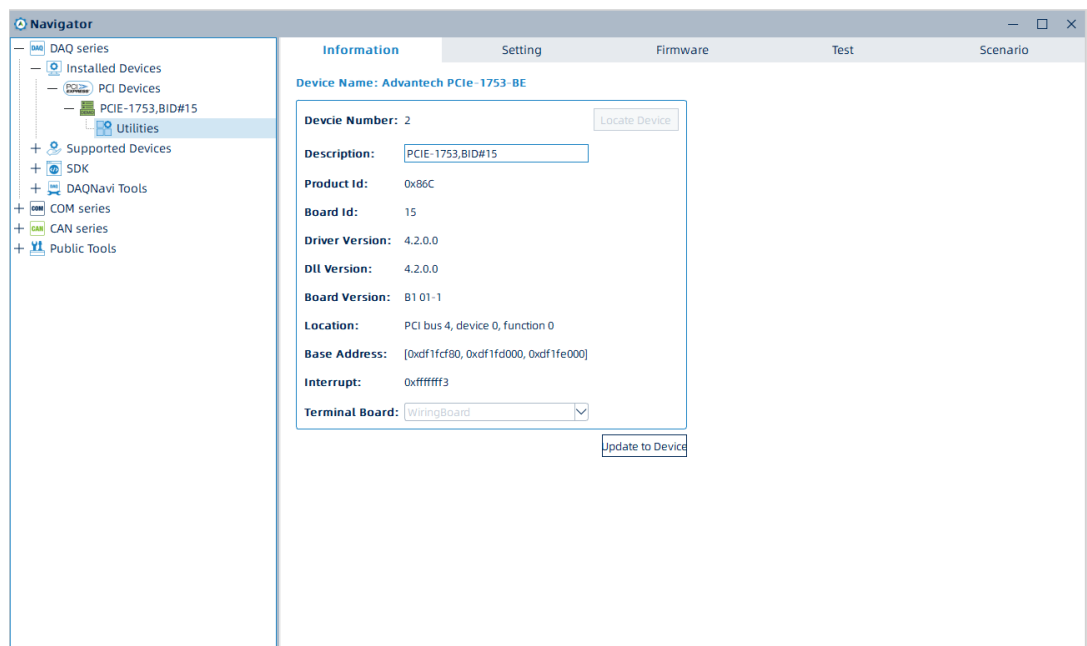


2.4 Software Utility

Advantech offers device drivers, SDKs, third-party driver support and application software to help fully exploit the functions of your PCIE-1753 system. All these software packages are available on the 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 can first run the Advantech Navigator program (by accessing Start/Programs/Advantech XNavi/Navigator.exe). The settings can also be saved.
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 PCIE-1753 modules in the Installed Devices list.



2.5 Software Development Using DAQNavi SDK

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

2.6 FPGA Code Update

The FPGA can also be updated via the interface in Navigator. However, it isn't normal to make an FPGA update. Advantech strongly suggests you consult your technical support before starting an FPGA update.

2.7 Hardware Installation

Note! Make sure you have first installed the driver before you install the card.



After the device driver installation is completed, you can proceed to install the PCIE-1753 card in any PCI Express slot on your computer. Follow the steps below to install the card on your system.

1. Turn off your computer and unplug the power cord and cables. TURN OFF your computer before installing or removing any components on the computer.
2. Remove the cover of your computer.
3. Remove the slot cover on the back panel of your computer.
4. Touch the metal part on the surface of your computer to neutralize the static electricity that might be on your body.
5. Insert the PCIE-1753 card into a PCI Express slot. Hold the card only by its edges and carefully align it with the slot. Insert the card firmly into place. Use of excessive force must be avoided, otherwise the card might be damaged.
6. Fasten the bracket of the PCI Express card on the back panel of the computer.
7. Connect appropriate accessories to the PCI Express card.
8. Replace the cover of your computer chassis. Re-connect the cables you removed in step 1.
9. Plug in the power cord and turn on the computer.

After the PCIE-1753 card is installed, you can verify whether it is properly installed on your system through the Device Manager:

1. Access the Device Manager through Control Panel/System/Device Manager.
2. The device name of the PCIE-1753 should be listed on the Device Manager tab as follows.

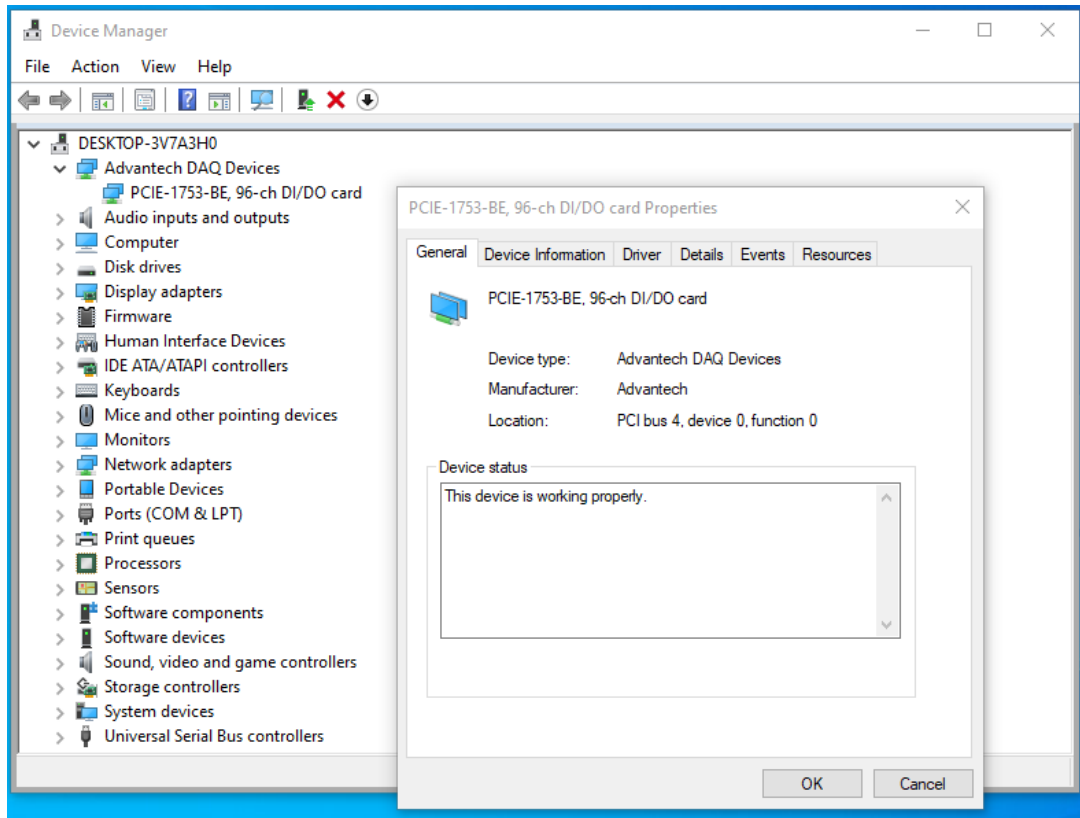



Figure 2.1 Device Manager

Note!  If your card is properly installed, you should see the device name of your card listed on the Device Manager tab. If you do see your device name listed on it but marked with an exclamation mark “!”, it means your card has not been correctly installed. In this case, remove the card device from the Device Manager by selecting its device name and press the Remove button. Then go through the driver installation process again.

After your card is properly installed on your system, you can then configure your device using the Advantech Navigator after you install XNavi on your computer.

Chapter 3

Signal Connections

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 avoid 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 PCIE-1753 via the I/O connector.

3.2 Switch and Jumper Settings

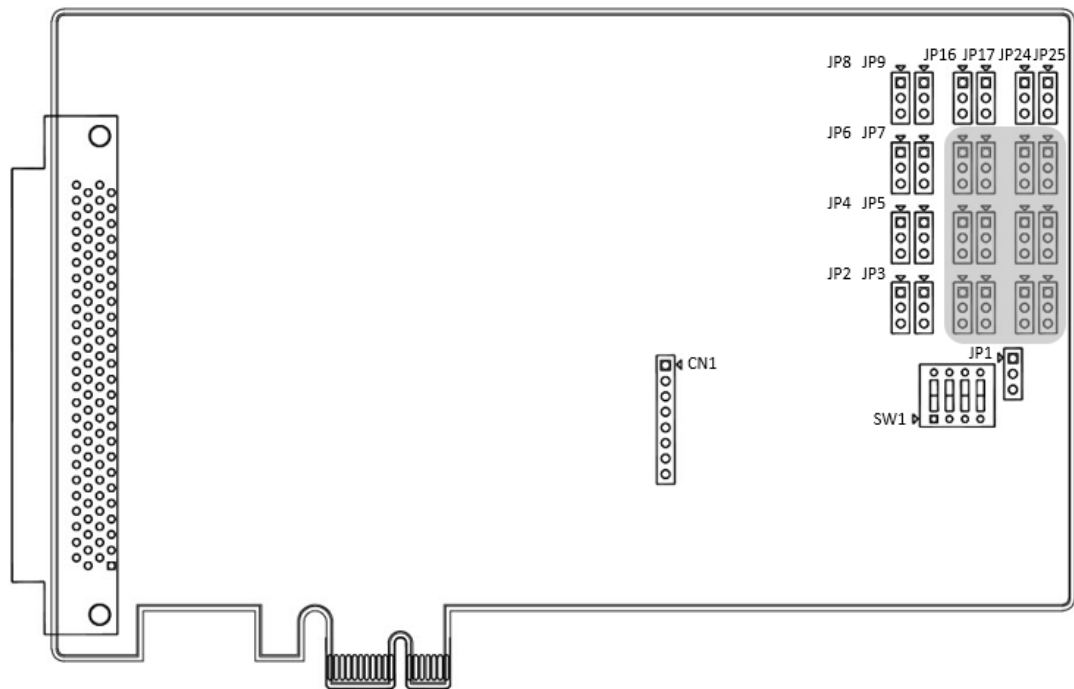


Figure 3.1 Jumper and switch settings

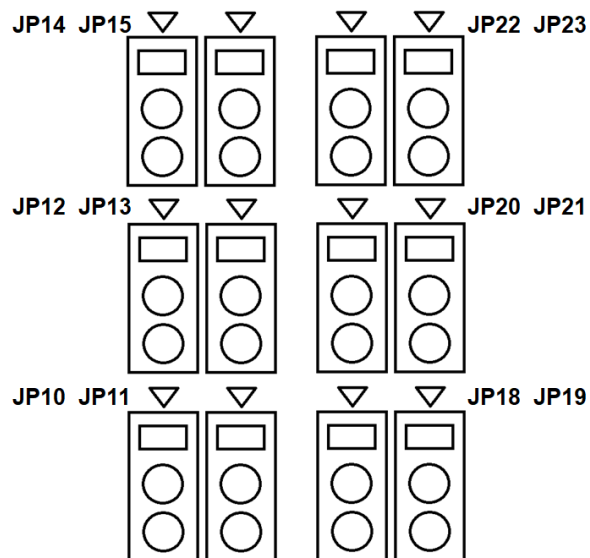




Figure 3.2 Selected jumper and switch settings

3.2.1 Keep Last Status (JP1)



Jumper JP1 gives the PCIE-1753 a new and valuable function. With JP1 enabled, PCIE-1753 “memorizes” all I/O port settings and output values, and, in the event of a “hot” reset, the settings and output values present at the port just prior to reset are restored to each port following the reset. This feature applies to both ports set by software, and to ports configured as output ports via jumper. Depending on the application, this function may allow a card to be reset without requiring a complete shutdown of processes controlled by the card (since port values are left unchanged and are interrupted only momentarily). Complete loss of power to the card clears chip memory. Thus, even if JP1 is enabled, the card’s power-on state will return to the default state or the state of an output port with voltage low output (for jumper-set ports). When jumper JP1 is disabled, power-off or reset results in ports returning to their default state (for software-set ports) or returning to the state of the output port with low voltage output (for jumper-set ports).

Table 3.1: Power-On Configuration (JP1)	
Jumper Setting	Description
	Keep the last status after a hot reset.
	Reset to default status after a hot reset.*

*Default setting.


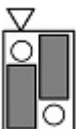


3.2.2 Port Direction Settings (JP2~JP25)

Table 3.2: DI/O Channel Direction Configuration (JP2 ~ JP25)	
Jumpers	Controlled DI/O channels
JP2, JP3	Port 0 DI/O 0 ~ DI/O 7
JP4, JP5	Port 1 DI/O 0 ~ DI/O 7
JP6, JP7	Port 2 DI/O 0 ~ DI/O 7
JP8, JP9	Port 3 DI/O 0 ~ DI/O 7
JP10, JP11	Port 4 DI/O 0 ~ DI/O 7
JP12, JP13	Port 5 DI/O 0 ~ DI/O 7
JP14, JP15	Port 6 DI/O 0 ~ DI/O 7
JP16, JP17	Port 7 DI/O 0 ~ DI/O 7
JP18, JP19	Port 8 DI/O 0 ~ DI/O 7
JP20, JP21	Port 9 DI/O 0 ~ DI/O 7
JP22, JP23	Port 10 DI/O 0 ~ DI/O 7
JP24, JP25	Port 11 DI/O 0 ~ DI/O 7

Jumper Setting	Description
	DI/O channel direction is software configurable.*
	DI/O channels are fixed at output.

*Default setting

Table 3.3: Summary of Jumper Settings

Jumper Name	Operation	Function Description
JPnL n = 0 ~ 11		Set bits 0, 1, 2, 3 of port n as software-configurable input or output (default). Set bits 4, 5, 6, 7 of port n as software-configurable input or output (default).
		Set bits 0, 1, 2, 3 of port n as software-configurable input or output (default). Set bits 4, 5, 6, 7 of port n as output.
		Set bits 0, 1, 2, 3 of port n as output. Set bits 4, 5, 6, 7 of port n as software-configurable input or output (default).
		Set bits 0, 1, 2, 3 of port n as output. Set bits 4, 5, 6, 7 of port n as output.

3.2.3 Board ID (SW1)

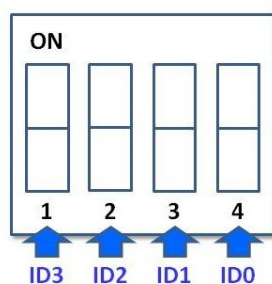


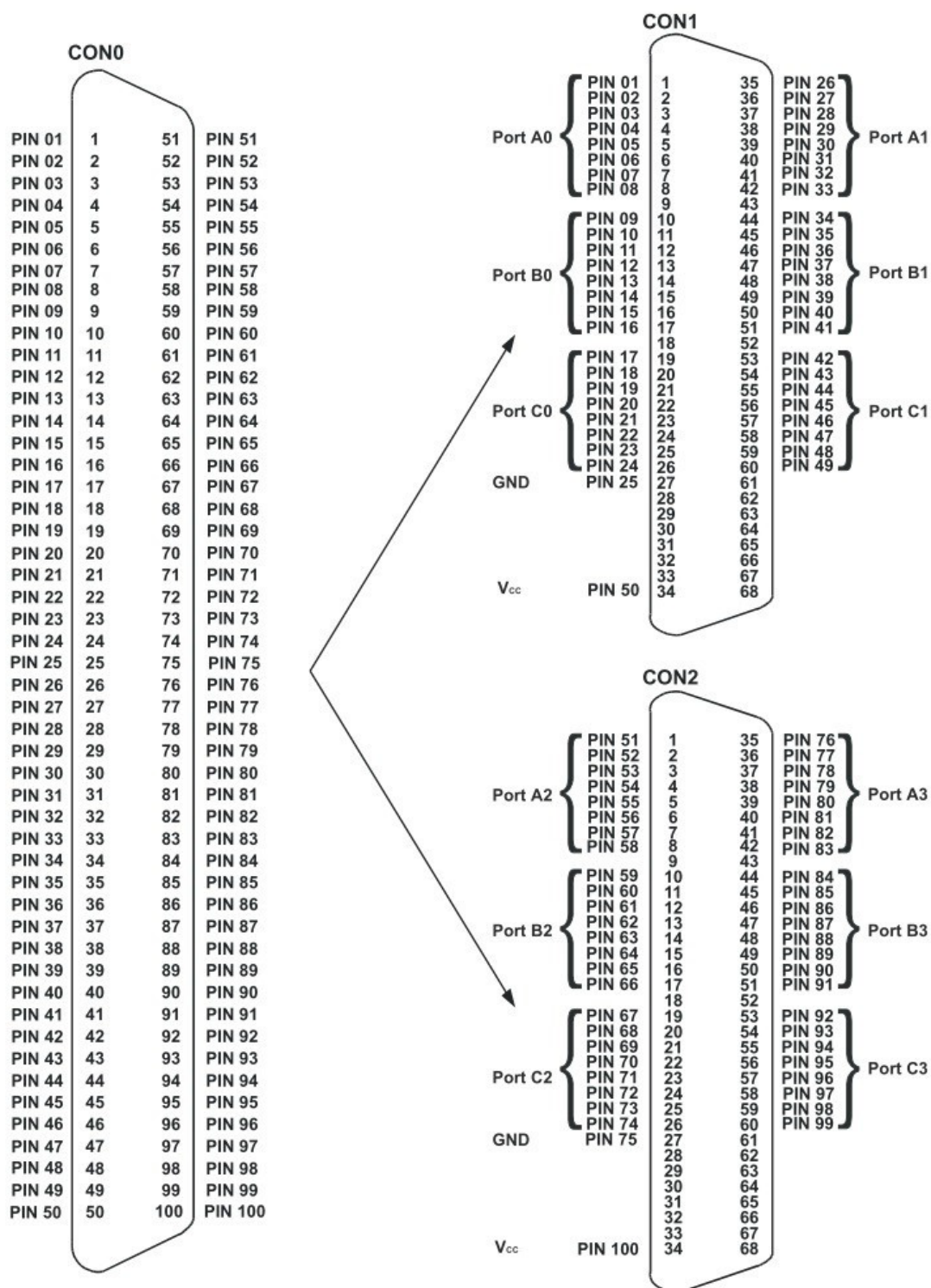
Table 3.4: Board ID

Board ID	Switch Position			
	1	2	3	4
0*	UP	UP	UP	UP
1	UP	UP	UP	DOWN
2	UP	UP	DOWN	UP
3	UP	UP	DOWN	DOWN
4	UP	DOWN	UP	UP
5	UP	DOWN	UP	DOWN
6	UP	DOWN	DOWN	UP
7	UP	DOWN	DOWN	DOWN
8	DOWN	UP	UP	UP
9	DOWN	UP	UP	DOWN
10	DOWN	UP	DOWN	UP
11	DOWN	UP	DOWN	DOWN
12	DOWN	DOWN	UP	UP
13	DOWN	DOWN	UP	DOWN
14	DOWN	DOWN	DOWN	UP
15	DOWN	DOWN	DOWN	DOWN

*Default setting.

3.3 Pin Assignment Connections

P0_0	1	51	P6_0
P0_1	2	52	P6_1
P0_2	3	53	P6_2
P0_3	4	54	P6_3
P0_4	5	55	P6_4
P0_5	6	56	P6_5
P0_6	7	57	P6_6
P0_7	8	58	P6_7
P1_0	9	59	P7_0
P1_1	10	60	P7_1
P1_2	11	61	P7_2
P1_3	12	62	P7_3
P1_4	13	63	P7_4
P1_5	14	64	P7_5
P1_6	15	65	P7_6
P1_7	16	66	P7_7
P2_0	17	67	P8_0
P2_1	18	68	P8_1
P2_2	19	69	P8_2
P2_3	20	70	P8_3
P2_4	21	71	P8_4
P2_5	22	72	P8_5
P2_6	23	73	P8_6
P2_7	24	74	P8_7
GND	25	75	GND
P3_0	26	76	P9_0
P3_1	27	77	P9_1
P3_2	28	78	P9_2
P3_3	29	79	P9_3
P3_4	30	80	P9_4
P3_5	31	81	P9_5
P3_6	32	82	P9_6
P3_7	33	83	P9_7
P4_0	34	84	P10_0
P4_1	35	85	P10_1
P4_2	36	86	P10_2
P4_3	37	87	P10_3
P4_4	38	88	P10_4
P4_5	39	89	P10_5
P4_6	40	90	P10_6
P4_7	41	91	P10_7
P5_0	42	92	P11_0
P5_1	43	93	P11_1
P5_2	44	94	P11_2
P5_3	45	95	P11_3
P5_4	46	96	P11_4
P5_5	47	97	P11_5
P5_6	48	98	P11_6
P5_7	49	99	P11_7
VCC	50	100	VCC



Pin Name	Direction	Description	Pin Number
DI/O Port 0 <0..7>	I/O	Bi-directional digital input/output port 0 terminals.	1 ~ 8
DI/O Port 1 <0..7>	I/O	Bi-directional digital input/output port 1 terminals.	9 ~ 16
DI/O Port 2 <0..7>	I/O	Bi-directional digital input/output port 2 terminals.	17 ~ 24
DI/O Port 3 <0..7>	I/O	Bi-directional digital input/output port 3 terminals.	26 ~ 33
DI/O Port 4 <0..7>	I/O	Bi-directional digital input/output port 4 terminals.	34 ~ 41
DI/O Port 5 <0..7>	I/O	Bi-directional digital input/output port 5 terminals.	42 ~ 49
DI/O Port 6 <0..7>	I/O	Bi-directional digital input/output port 6 terminals.	51 ~ 58
DI/O Port 7 <0..7>	I/O	Bi-directional digital input/output port 7 terminals.	59 ~ 66
DI/O Port 8 <0..7>	I/O	Bi-directional digital input/output port 8 terminals.	67 ~ 74
DI/O Port 9 <0..7>	I/O	Bi-directional digital input/output port 9 terminals.	76 ~ 83
DI/O Port 10 <0..7>	I/O	Bi-directional digital input/output port 10 terminals.	84 ~ 91
DI/O Port 11 <0..7>	I/O	Bi-directional digital input/output port 11 terminals.	92 ~ 99
GND	-	Ground terminals for digital signals.	25, 75
+5V	O	+5 V supply output.	50, 100

3.3.1 Digital Input (TTL DI, Pull-Up/-Down)

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 can be configured as internally pulled-up or pulled-down by software. This is shown in Figure 3.3.

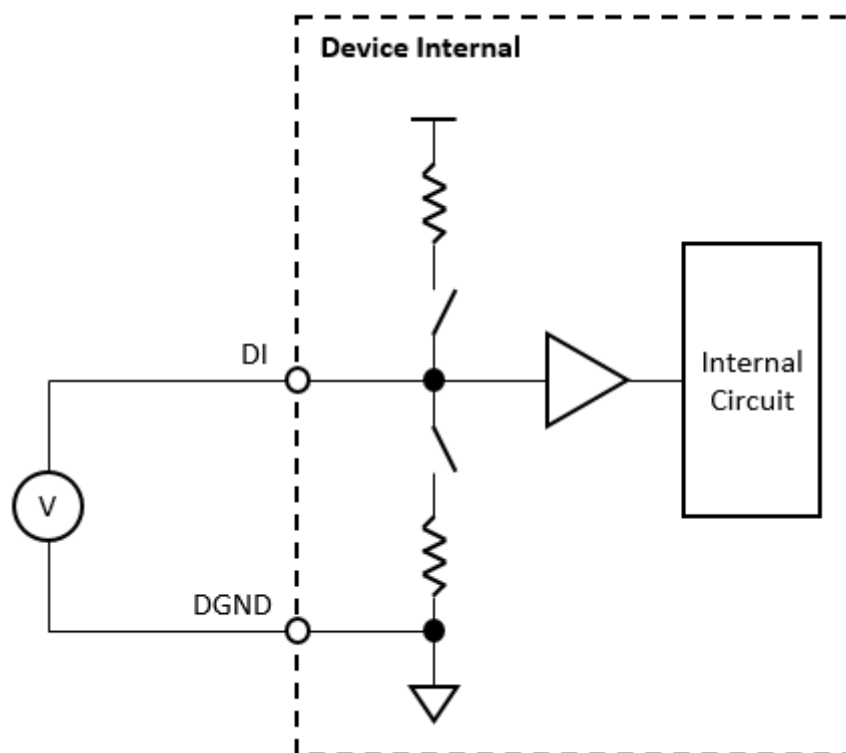


Figure 3.3 Digital input signal connection

The input voltage must be either higher than the minimum value of the ON state or lower than the maximum value of the OFF state for a deterministic result. If the input voltage is between these two values, the result is undetermined, which may be ON or OFF. In addition, do not input a voltage higher than the maximum allowable value of the ON state or lower than the minimum allowable value of the OFF state. The device may be damaged under such circumstances. Refer to the device specifications for ON and OFF state voltage ranges.

The digital input channel can also sense the status of an external switch. When configured as internally pulled-up, the status of an external switch which connects the DI terminal and the DGND terminal is sensed as shown in Figure 3.4. When configured as internally pulled-down, the status of an external switch which is connected between the external source and the DI terminal is sensed as shown in Figure 3.5. Be sure the voltage of the external source is within the allowable range of the ON state as specified in the device specifications.

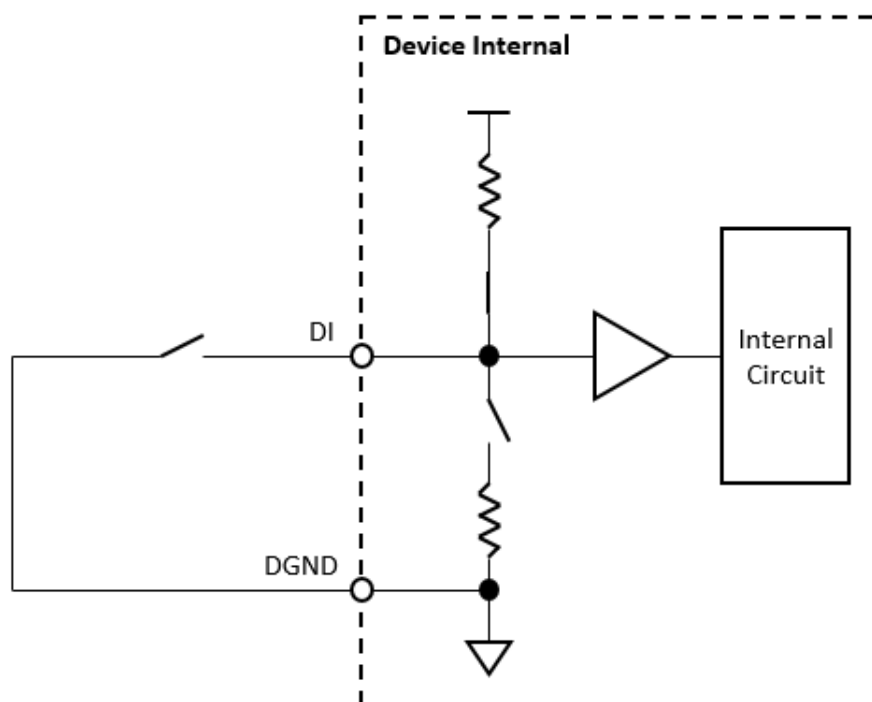


Figure 3.4 Digital input signal connection using a switch as internally pulled-up

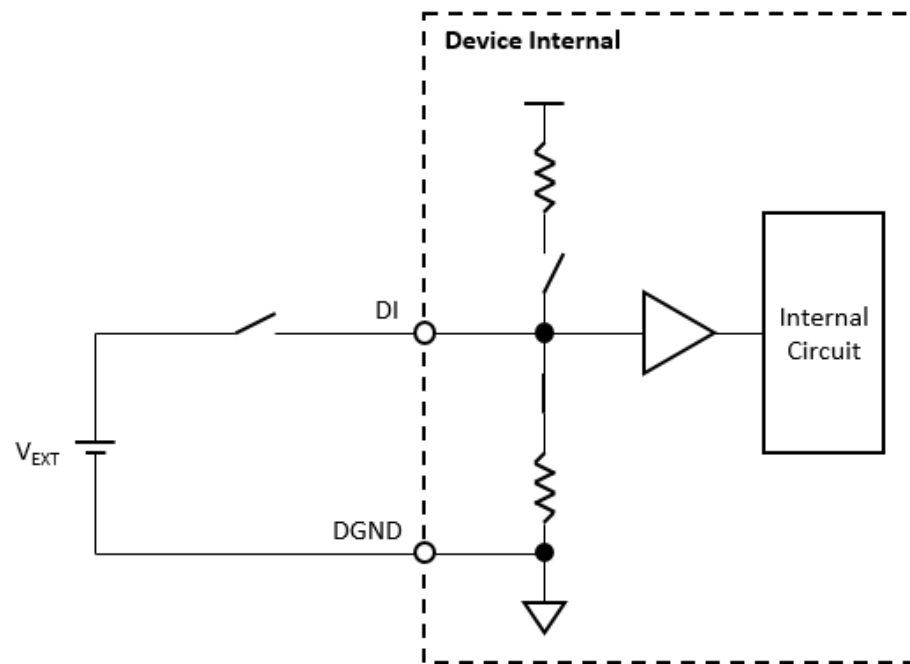


Figure 3.5 Digital input signal connection using a switch as internally pulled-down

3.3.2 Digital Output (TTL DO)

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 3.6.

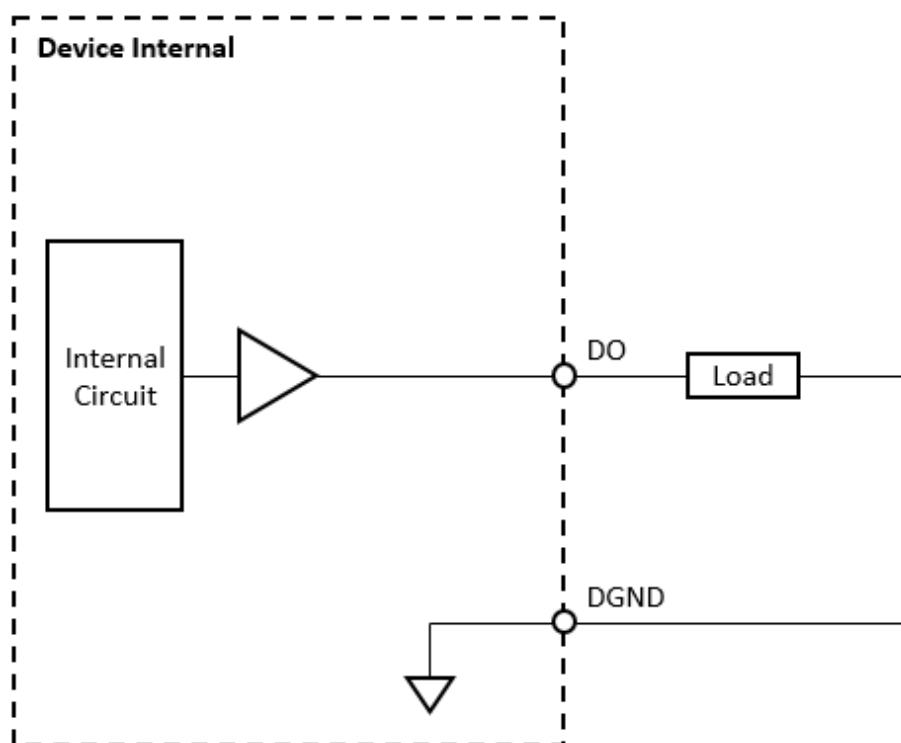


Figure 3.6 Digital output signal connection

Each digital output channel can source or sink only a 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 sink current values.

Appendix **A**

Specifications

A.1 Digital Input

Channels	96 (shared with output)	
Input Type	5 V TTL	
Input Voltage	Logic 0	0.8 V max.
	Logic 1	2.0 V min.
	Working Range	-0.25 V ~ 5.25 V
	Protection Range	-0.5 V ~ 6.5 V
Pull-Up Resistor	10 k Ω	
Response Time	50 ns max.	

A.2 Digital Output

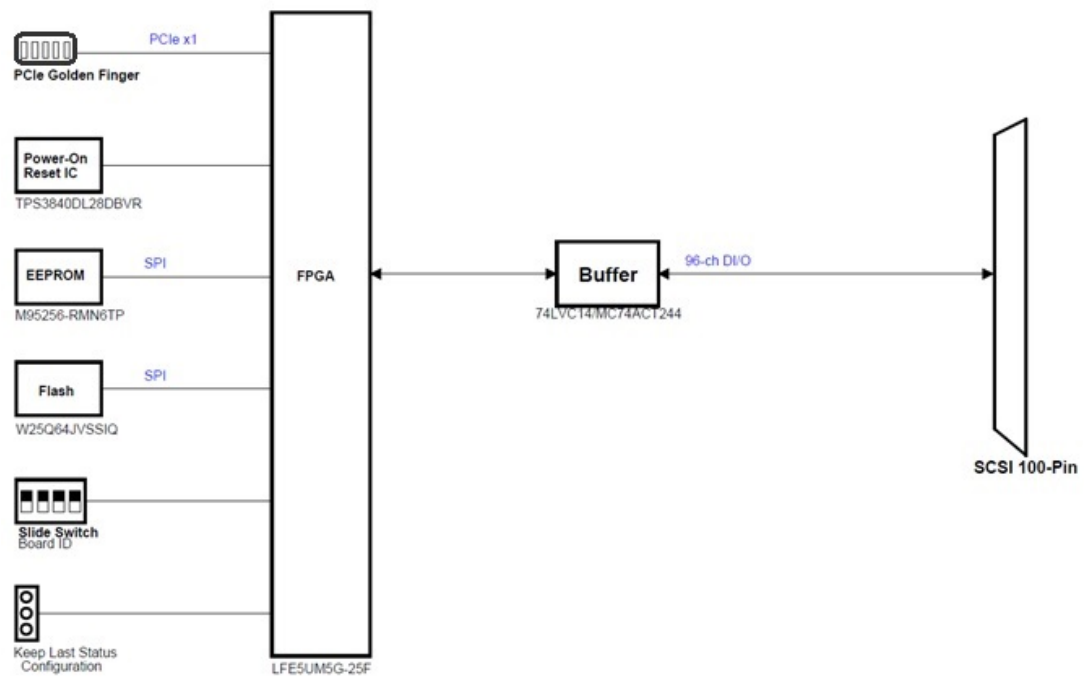
Channels	96 (shared with input)	
Input Type	5 V TTL	
Power-On State	Logic 0	
Output Voltage	Logic 0	0.4 V max. @ 2 mA sink
	Logic 1	4.0 V min. @ 2 mA source/5.2 V max.
	Working Range	-0.25 V ~ 5.25 V
	Protection Range	-0.5 V ~ 6.5 V
Load Current	One Channel	8 mA max.
	Sum of Per Port (8 channels)	20 mA max.
Response Time	50 ns max.	

A.3 General

Power Consumption	+3.3 V	330 mA typ. 400 mA max.
Power Supply Output	+5 V ($\pm 5\%$)	200 mA max.
Form Factor	PCI Express	
Dimensions	175 x 100 x 18 mm ³ (6.9 x 3.9 x 0.7 in ³)	
Weight	113 g	
I/O Connector	100-pin SCSI (ribbon type)	

Appendix **B**

Block Diagram



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

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