User Manual

MIC-3756

3U 64-ch Isolated Digital I/O CPCI 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 you get when the problem occurs.
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3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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

FCC Class A

Note: 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 which case the user will be required to correct the interference at his own expense.

Technical Support and Assistance

1. Visit the Advantech web site 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. 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

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

■ MIC-3756 DAQ Card
■ Companion DVD-ROM with DAQNavi drivers included

Safety Precaution - 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 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.
- 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.

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Chapter 1

Introduction

This chapter introduces the MIC-3756 cards and their typical applications.

Sections include:

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

1.1 Introduction

Thank you for buying the Advantech MIC-3756 which is a 32/32-ch isolated digital input/output card. It complies with PICMG 2.0 R2.1 CompactPCI specifications.. It features a unique circuit design and complete functions for data acquisition and control. The following sections of this chapter will provide further information about features of MIC-3756, a Quick Start for installation, together with some brief information on software and accessories.

1.2 Features

- CPCI bus specification 2.1 compliant CPCI 3U size card
- 32/32 isolated digital input/output channels
- Wide input range (10 ~ 50 V_{DC})
- Either +/- voltage input for DI by group
- Wide output range (5 ~ 40 V_{DC})
- High sink current on isolated output channels (200 mA max./ch)
- High over-voltage protection (70 V_{DC})
- High-voltage isolation (2,500 V_{DC})
- 2,000 V_{DC} ESD protection
- Output status read-back
- Keeps the output settings and values after system hot reset
- Interrupt handling capability
- Channel-freeze function
- Board ID
- One independent 16-bit UP Counter

MIC-3756 offers the following main features:

Robust Protection

The MIC-3756 features a robust isolation protection for applications in industrial, lab and machinery automation. The MIC-3756 can durably withstand a voltage up to 2,500 V_{DC}, preventing your host system from any incidental harms.

Wide Input Range

The MIC-3756 has a wide range of input voltage from 10 to 50 V_{DC}, and it is suitable for most industrial applications with 12 V_{DC} and 24 V_{DC} input voltage. In the mean time, we are also ready to serve your special needs for specific input voltage range. Do not hesitate to ask us about tailoring our standard products to meet your specifications. All these merits make MIC-3756 the best choice for industrial applications.

Wide Output Range

The MIC-3756 also features a wide output voltage range from 5 to 40 V_{DC}, suitable for most industrial applications with 12 V_{DC}/24 V_{DC} output voltage. In the mean time, we are also ready to serve your special needs for specific output voltage range. Do not hesitate to ask us about tailoring our standard products to meet your specifications. All these merits make MIC-3756 the best choice for industrial applications.

Board ID Setting

The MIC-3756 has a built-in DIP switch that helps define each card's ID when multiple cards have been installed on the same PC chassis. The board ID setting function is very useful when users build their system with multiple MIC-3756 cards. With correct Board ID settings, you can easily identify and access each card during hardware configuration and software programming.

Channel-Freeze Function

The MIC-3756 provides Channel-Freeze function, which can be enabled either in dry contact or wet contact mode (selectable by the on-board jumper). When the Channel-Freeze function is enabled, the last status of each digital output channel will be safely kept for emergency use. Moreover, you can enable this function through software as it is useful in software simulation and testing program.

Reset Protection

When the system has undergone a hot reset (i.e. without turning off the system power), the MIC-3756 can either retain outputs values of each channel, or return to its default configuration as open status, depending on its on-board jumper setting. This function protects the system from wrong operations during unexpected system resets.

> *Note!* *For detailed specifications of the MIC-3756, please refer to Appendix A.*

1.3 Applications

- Industrial ON/OFF control
- Switch status sensing
- BCD interfacing
- Digital I/O control
- Industrial and lab automation

1.4 Installation Guide

Before you install your MIC-3756 card, please make sure you have the following necessary components:

- **MIC-3756 DAQ Card**
- **Driver Software** Advantech DAQNavi software (included in DVDROM)
- **Wiring Cable** PCL-10178-1E (optional)
- **Wiring Board** ADAM-3978-AE (optional)

Other optional components are also available for enhanced operation:

- Advantech DAQ tools, LabView or other 3rd-party software

After you get the necessary components and maybe some accessories for enhanced operation for your DA&C card, you can then begin the Installation procedures. Figure 1.1 on the next page provides a concise flow chart to give users a broad picture of the software and hardware installation procedures:

```
┌─────────────────────────────────────┐
│   Install Driver from DVD-ROM        │
│      and turn off computer           │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│  Install hardware and turn on computer│
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│  Use driver utility to configure hardware│
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│    Use test utility to test hardware │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│      Read example & driver manual    │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│   Start to write your own application│
└─────────────────────────────────────┘
```
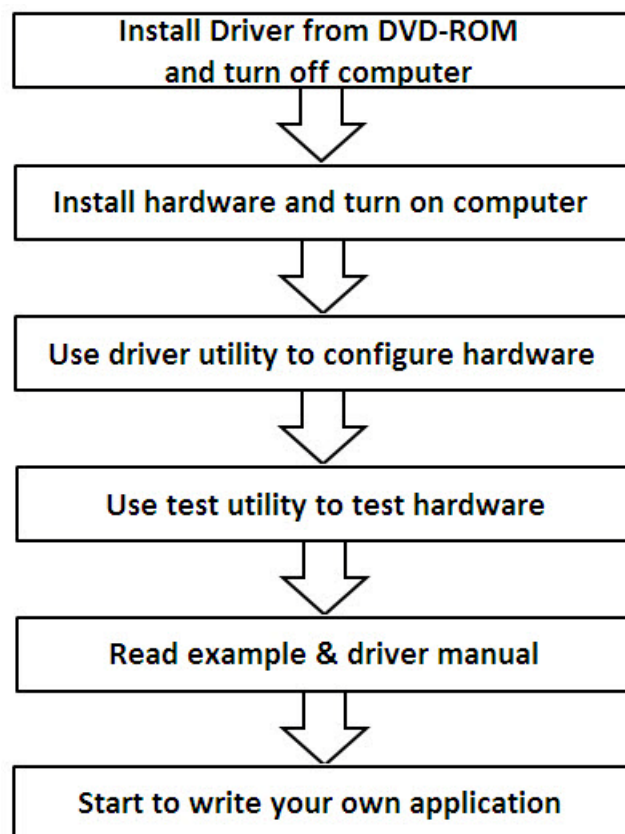
Figure 1.1 Installation Flow Chart

1.5 Software Overview

Advantech offers a rich set of DLL drivers, third-party driver support and application software to help fully exploit the functions of your MIC-3756 card:

- DAQNavi software (on the companion DVD-ROM)
- LabView driver
- Advantech DAQ tools

Programming choices for DA&C cards

You may use Advantech application software such as Advantech DAQNavi software. On the other hand, advanced users can use register level programming, although this is not recommended due to its laborious and time-consuming nature.

DAQNavi Software

Advantech DAQNavi software includes device drivers and SDK which features a complete I/O function library to help boost your application performance. This software is included in the companion DVD-ROM at no extra charge and comes with all Advantech DA&C cards. The Advantech DAQNavi software for Windows 7/8/10 and Linux works seamlessly with development tools such as Visual Studio .Net, Visual C++, Visual Basic, LabVIEW and Borland Delphi.

Register-level Programming

Register-level programming is available for experienced programmers who find it necessary to write code directly at the level of the device register. Since register-level programming requires much effort and time, we recommend that you use the Advantech DAQNavi software instead. However, if register-level programming is indispensable, please contact the technical support team to request the relative information.

1.6 DAQNavi Device Driver Programming Roadmap

This section will provide you a roadmap to demonstrate how to build an application from scratch using Advantech DAQNavi device drivers with your favorite development tools such as Visual Studio.Net, Visual C++, Visual Basic, LabVIEW and Borland Delphi. The step-by-step instructions on how to build your own applications using each development tool will be given in the DAQNavi SDK Manual. Moreover, a rich set of example source code is also given for your reference.

1.6.1 Programming Tools

Programmers can develop application programs with their favorite development tools:

- Visual Studio.Net
- Visual C++ and Visual Basic
- Borland Delphi
- LabVIEW

For instructions on how to begin programming works in each development tool, Advantech offers Tutorial Chapter in the DAQNavi SDK Manual for your reference. Please refer to the corresponding sections in this chapter on the DAQNavi SDK 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 DAQNavi SDK Manual can be found on the companion DVD-ROM. Alternatively, if you have already installed the DAQNavi SDK on your system, the DAQNavi SDK Manual can be readily accessed through the Start button:

\Advantech\DAQNavi\Manuals

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

\Advantech\DAQNavi\Examples

For information about using other function groups or other development tools, please refer to the Using DAQNavi SDK chapter in the DAQNavi SDK Manual, or the video tutorials in the Advantech Navigator.

1.6.2 Programming with DAQNavi Device Drivers Function Library

Advantech DAQNavi device drivers offer a rich function library that can be utilized in various application programs. This function library consists of numerous APIs that support many development tools, such as Visual Studio .Net, Visual C++, Visual Basic, LabVIEW and Borland Delphi.

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

- Analog Input Function Group
- Analog Output Function Group
- Digital Input/Output Function Group
- Counter Function Group

For the usage and parameters of each function, please refer to the Using *DAQNavi SDK chapter in the DAQNavi SDK Manual.*

1.6.3 Troubleshooting DAQNavi Device Drivers Error

Driver functions will return a status code when they are called to perform a certain task for the application. When a function returns a code that is not success, it means the function has failed to perform its designated function. To troubleshoot the device

drivers error, you can check the error code and error description within the Error Control of each function in the *DAQNavi SDK Manual.*

1.7 Accessories

Advantech offers a complete set of accessory products to support the MIC-3756 card. These accessories include:

Wiring Cables

■   **PCL-10178-1E** DB-78 cable assembly, 1 m

Wiring Boards

■   **ADAM-3978-AE** DB-78 wiring terminal for DIN-rail mounting

Chapter 2

Installation

This chapter provides a packaged item checklist, proper instructions for unpacking and step-by-step procedures for both driver and card installation.

Sections include:

- Unpacking
- Driver Installation
- Hardware Installation
- Device Setup & Configuration

2.1 Unpacking

After receiving your MIC-3756 package, please inspect its contents first. The package should contain the following items:

■ MIC-3756 DAQ Card
■ Companion DVD-ROM with DAQNavi drivers included.

The MIC-3756 card harbor certain electronic components vulnerable to electrostatic discharge (ESD). ESD can easily damage the integrated circuits and certain components if preventive measures are ignored.

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 the static electricity accumulated on your body. Alternatively, 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 out of 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.
■ Do not install a damaged card into your system.

Also, pay extra caution to the following aspects during installation:

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

2.2 Driver Installation

We recommend you install the driver before you install the MIC-3756 card into your system, since this will guarantee a smooth installation process.

The Advantech DAQNavi Device Drivers Setup program for the MIC-3756 card is included in the companion DVD-ROM that is shipped with your DA&C card package. Please follow the steps below to install the driver software:

1. Insert the companion DVD-ROM into your DVD-ROM drive.
2. The Setup program will be launched automatically if you have the autoplay function enabled on your system. When the Setup Program is launched, you will see the following Setup Screen.

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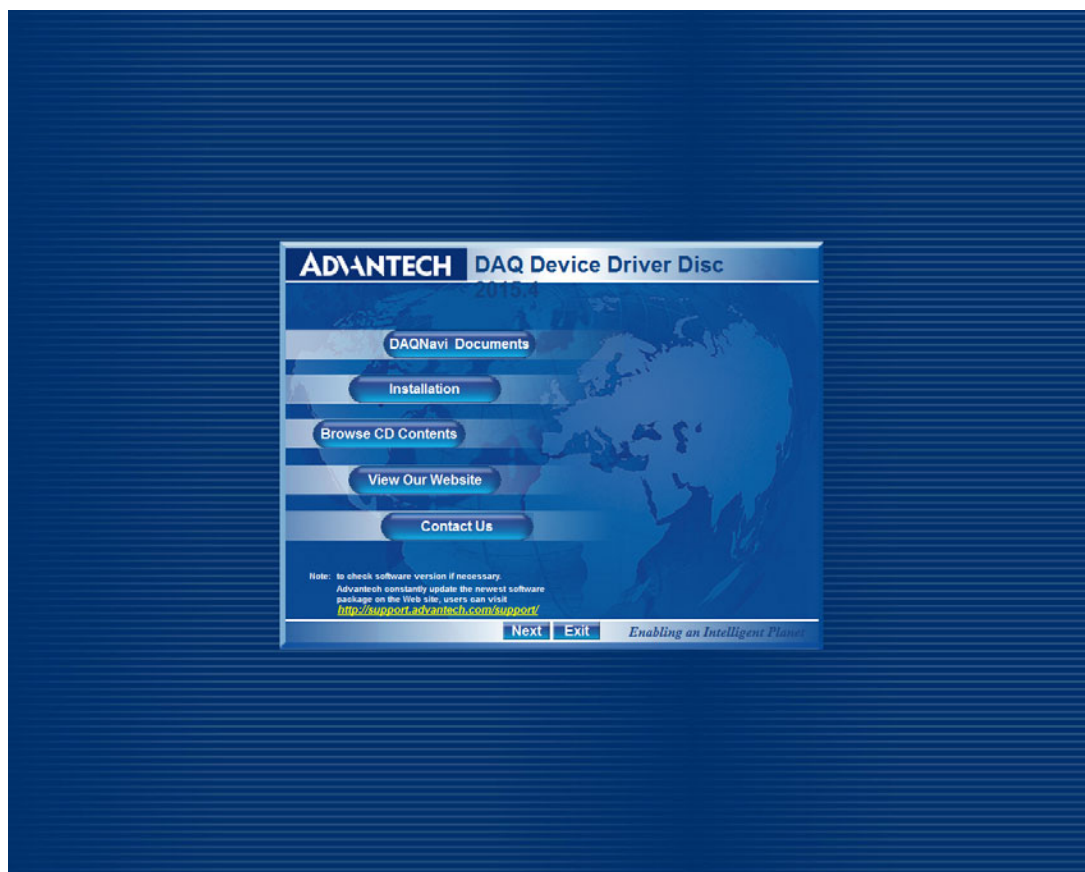

Figure 2.1 Setup Screen of Advantech Automation Software

3. Select the DAQNavi option to install.
4. Select the Individual Driver option.
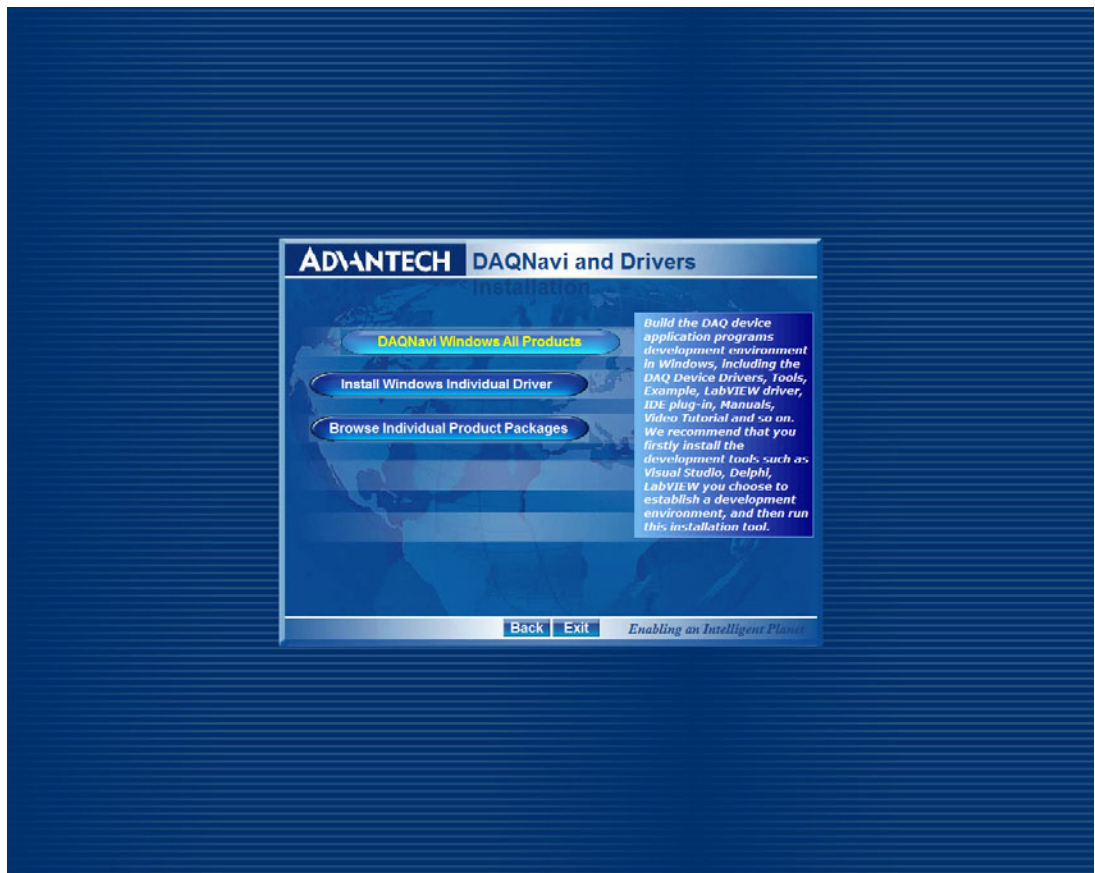5. Back and select the DAQNavi SDK to install the Advantech Navigator.

Figure 2.2 DAQNavi Installation Setup Screen

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

\Advantech\DAQNavi\Manuals

2.3 Hardware Installation

Note! *Make sure you have installed the driver before you install the card (please refer to Chapter 2.2 Driver Installation)*

When installing the MIC-3756 Card, Please make sure the DLL driver of MIC-3756 installation is completed, you can now go on to install the MIC-3756 card in your CompactPCI system. If you have any doubt, please consult the user's manual or related documentation.

Please follow the following steps to install the card on your system.

1. Remove one cover on the unused slot of your CompactPCI computer slot.
2. Hold the Card Vertically. Be sure that the card is pointing in the correct direction. The components of the card should be pointing to the right-hand side and the black handle of the card should be pointing to the lower edge of the backplane.
3. Hold the lower handle and pull the handle down to unlock it.
4. Insert the MIC-3756 card into the CompactPCI chassis carefully by sliding the lower edges of the card into the card guides.
5. Push the card into the slot gently by sliding the card along the card guide until J1 meets the long needle on the backplane, then the Blue LED on the front panel of the card will lit.

Note! *If your card is correctly positioned and has slid all the way into the chassis, the handle should match the rectangular holes. If not, re move the card from the card guide and repeat step 3 again. Do not try to install a card by forcing it into the chassis.*

6. Now push the card into the right place, and the Blue LED will turn off.
7. After the Blue LED is off, push the handle to secure the card and lock it into place.
8. Because the CompactPCI system can "Hot-Swap", if your CompactPCI computer power is on the system can configure the card automatically. Once the system finished configuration, you can find the card information in the Device Manager.
9. Plug in the power cord and turn on the computer.

Note! *If the system power is on, the Blue LED on the front panel details the installation status of the card while the system is active. In Step 5, when J1 meets the long needle on the backplane, the Blue LED will be lit.*

After Step 6, the system can configure the card automatically, and the Blue LED turns off when the system finishes the device configuration.

After your card is properly installed on your system, you can now configure your device using the Advantech Navigator Program that has itself already been installed on your system during driver setup. A complete device installation procedure should include device setup, configuration and testing. The following sections will guide you through the Setup, Configuration and Testing of your device.

2.4 Device Setup & Configuration

The Advantech Navigator program is a utility that allows you to setup, configure and test your device, and later stores your settings on the system registry. These settings will be used when you call the APIs of DAQNavi device drivers. It also provides the programming reference, user guides and video tutorials.

Setting Up the Device

1. To install the I/O device for your card, you must first run the Advantech Navigator program (by accessing Start/Programs/ Advantech Automation/DAQNavi/ Advantech Navigator).

2. You can then view the device(s) already installed on your system (if any) on the Installed Devices list. If the software and hardware installation are completed, you will see MIC-3756 card in the Installed Devices list.
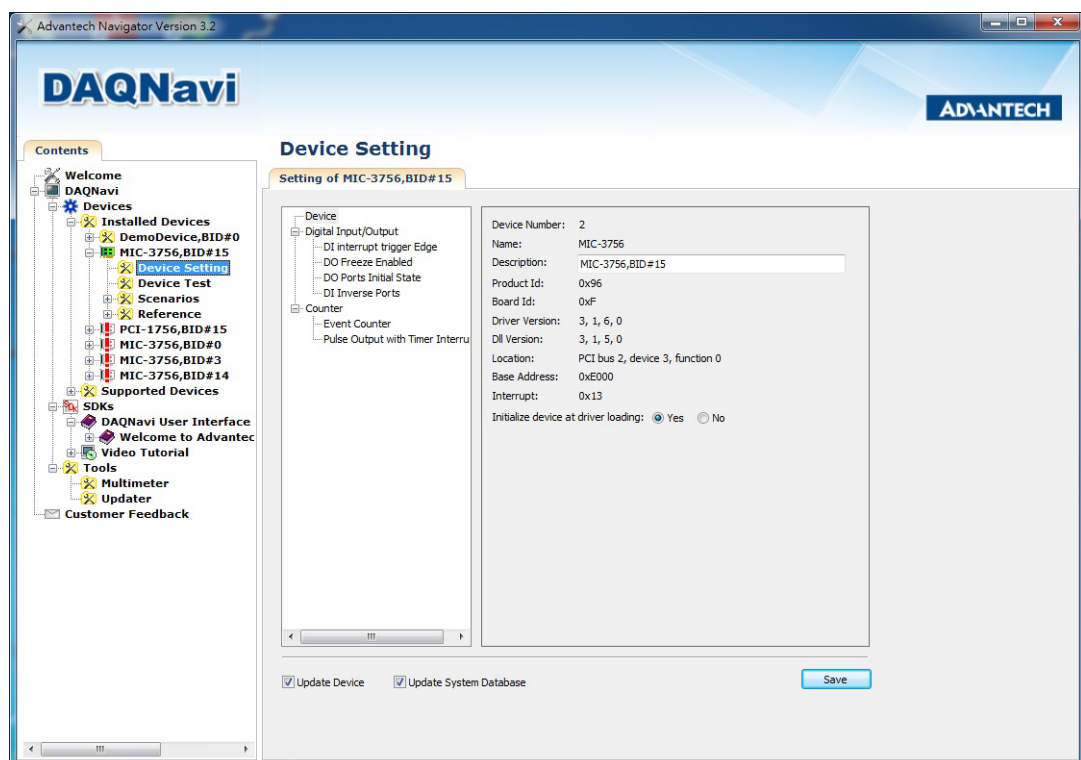

Figure 2.3 The Device Setting of MIC-3756

Configuring the Device

3. Please go to the Digital Input/Output page to configure your device. Here you can set the DI interrupt trigger edge, enable/disable the Channel-Freeze function and also the DO ports initial status of MIC-3756.
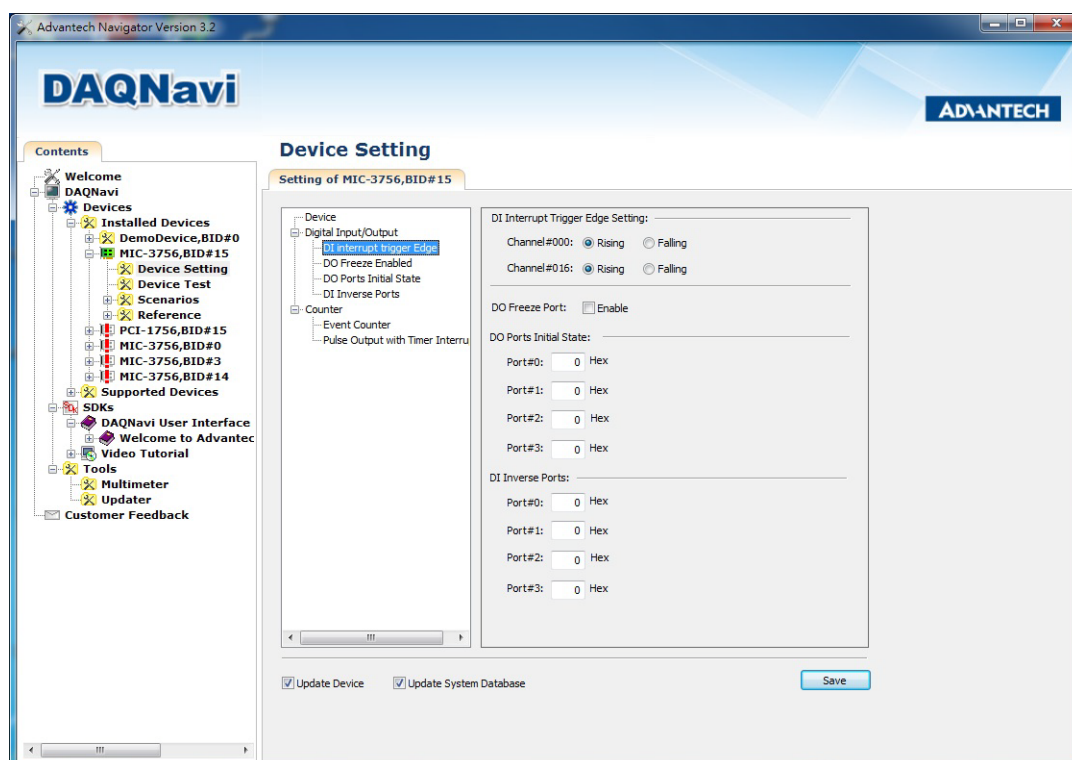

Figure 2.4 The Digital I/O Setting Page

4.   After your card is properly installed and configured, you can go to the Device Test page to test your hardware by using the testing utility supplied.
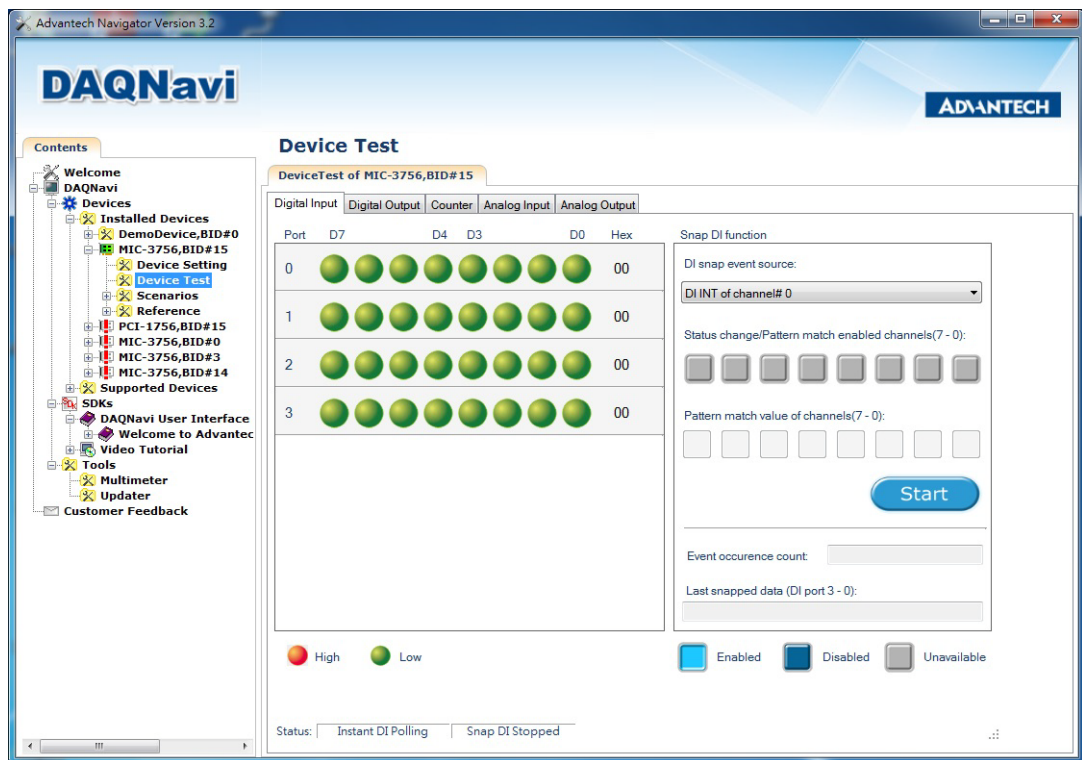

Figure 2.5 The Device Testing of MIC-3756

For more detailed information, please refer to the DAQNavi SDK Manual or the User Interface Manual in the Advantech Navigator.

Chapter 3

Signal Connections

This chapter provides useful information about how to connect input and output signals to the MIC-3756 cards via the I/O connector.

Sections include:

- Overview
- Switch and Jumper Settings
- Signal Connections
- Field Wiring Considerations

3.1 Overview

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly. A good signal connection can 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 MIC-3756 cards via the I/O connector.

3.2 Switch and Jumper Settings

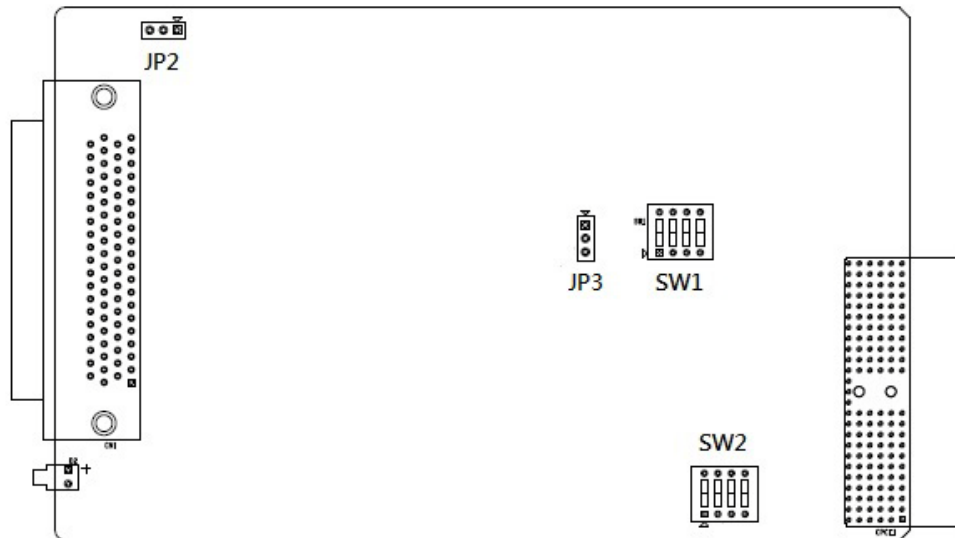Please refer to Figure 3.1 for jumper and switch locations on MIC-3756.

Figure 3.1 Connector and Switch Locations

3.2.1 Board ID (SW1)

The MIC-3756 have a built-in DIP switch (SW1), which is used to define each card's board ID. When there are multiple cards on the same chassis, this board ID switch is useful for identifying each card's device number. After setting for each MIC-3756, you can identify each card in system with different device numbers. The default value of board ID is 0 and if you need to adjust it to other value, please set the SW1 by referring to Table 3.1.

Table 3.1: Board ID Setting (SW1)				
BoardID (dec)		**Switch Position**		
	1 (ID3)	2 (ID2)	3 (ID1)	4 (ID0)
0	ON	ON	ON	ON
1	ON	ON	ON	OFF
2	ON	ON	OFF	ON
3	ON	ON	OFF	OFF
4	ON	OFF	ON	ON
5	ON	OFF	ON	OFF
6	ON	OFF	OFF	ON
7	ON	OFF	OFF	OFF
8	OFF	ON	ON	ON
9	OFF	ON	ON	OFF
10	OFF	ON	OFF	ON
11	OFF	ON	OFF	OFF
12	OFF	OFF	ON	ON
13	OFF	OFF	ON	OFF
14	OFF	OFF	OFF	ON
15	OFF	OFF	OFF	OFF

Default Setting is 0.

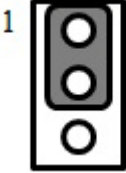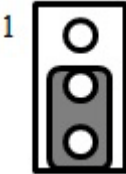> *Note!* *SW2 is only for internal used.*
> *The default setting is OFF.*

3.2.2 Power On Configuration(JP3)

Default configuration after power on, and hardware reset is to set all the isolated output channels to open status (the current of the load can't be sink) so that the external devices will not be damaged when the system starts or resets. When the system is hot reset, then the status of isolated digital output channels are selected by jumper JP1. Table 3.2 shows the configuration of jumper JP3.

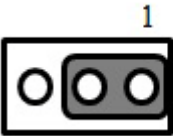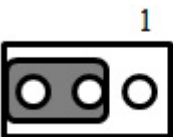| Table 3.2: Power on configuration after hot reset (JP3)	
JP3	**Power on configuration after hot reset**
	Default configuration
	Keep last status after hot reset

3.2.3 Channel-Freeze Function (JP2)

The MIC-3756 provides the channel-freeze function for isolated digital output channels. When Channel-Freeze function is enabled, all ports on the card will be locked so that the data transmitted (from the host PC) to the card won't be transferred to the DO ports. Once the Channel-Freeze function is enabled, each port status is immediately frozen into its last valid value before the Channel-Freeze. Since the value transmitted (from the host PC) to the card is also stored in the buffers on PC, users can call the relative function to read back the DO channel value, this function will determine that:

- If Channel-Freeze function is disabled, it will return the DO value on the port
- If Channel-Freeze function is enabled, it will return the value from the buffers on host PC

Refer to Table 3.3 for setting dry/wet contact of Channel-Freeze function.

Table 3.3: Dry/Wet Contact type of Channel-Freeze Function (CH_FRZ_IN Pin20) JP2	
JP2	**Input Mode**
	Dry contact input mode
	Wet contact input mode (Default setting)

3.3   Signal Connections

Pin Assignment

The I/O connector on the MIC-3756 is a 78-pin DB female connector.

Fig. 3.2 shows the pin assignments for the 78-pin DB connector on the MIC-3756, and Table 3.4 shows its connector signal description
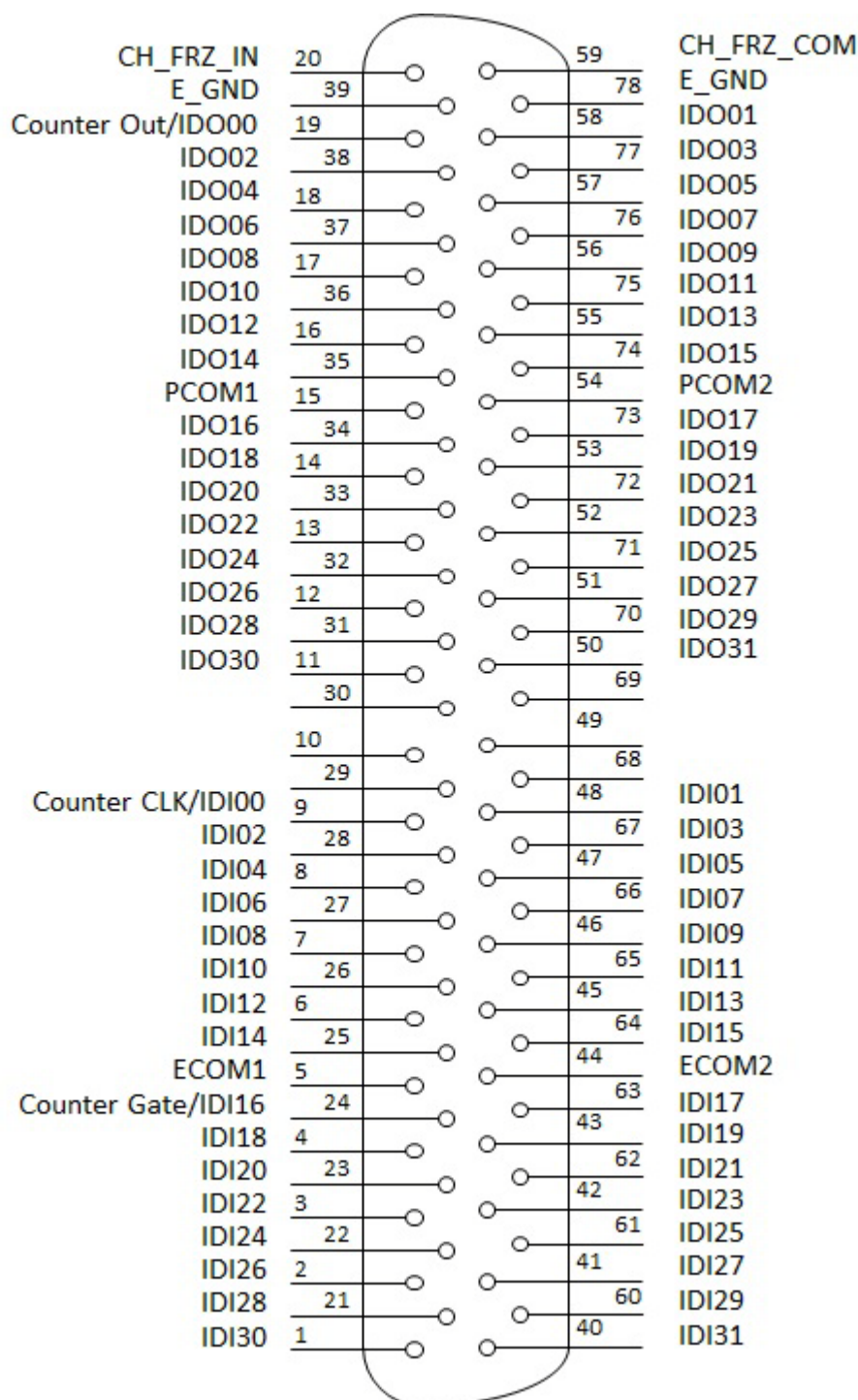

Figure 3.2 I/O Connector Pin Assignments

3.3.1 I/O Connector Pin Definition

Table 3.4: I/O Connector Signal Descriptions			
Pin Name	Reference	Direction	Description
IDI<00 ~ 15>	ECOM0	Input	Isolated digital input of group 0
IDI<16 ~ 31>	ECOM1	Input	Isolated digital input of group 1
IDO<00 ~ 15>	PCOM0	Output	Isolated digital output of group 0
IDO<16 ~ 31>	PCOM1	Output	Isolated digital output of group 1
ECOM0	-	Input	Common pin for IDI00~IDI15
ECOM1	-	Input	Common pin for IDI16~IDI31
PCOM0	-	Output	Common pin of IDO00~IDO15 for inductive loads
PCOM1	-	Output	Common pin of IDO16~IDO31 for inductive loads
E_GND	-	-	Isolated ground
CH_FRZ_IN	CH_FRZ_COM	Input	Channel-Freeze function input pin
CH_FRZ_COM	-	Input	Common pin for Channel-Freeze function input
Counter_CLK/DI00	ECOM0	Input	Counter Clock Source input & Isolated digital input DI00 of group0
Counter_Gate/DI16	ECOM1	Input	Counter Gate Control Pin & Isolated digital input DI16 of group1
Counter_Output/ DO00	PCOM1	Output	Counter Output & Isolated digital input DO00 of group0

3.3.2 Isolated Digital Input

Each of isolated digital input channels accepts bi-directional 10 ~ 50 V_{DC} voltage inputs. Meaning that you can apply positive or negative voltage to an isolated input pin (V_{IN}). Every 16 input channels share one common pin. Figure 3.3 shows how to connect an external input source to one of the card's isolated input channels.
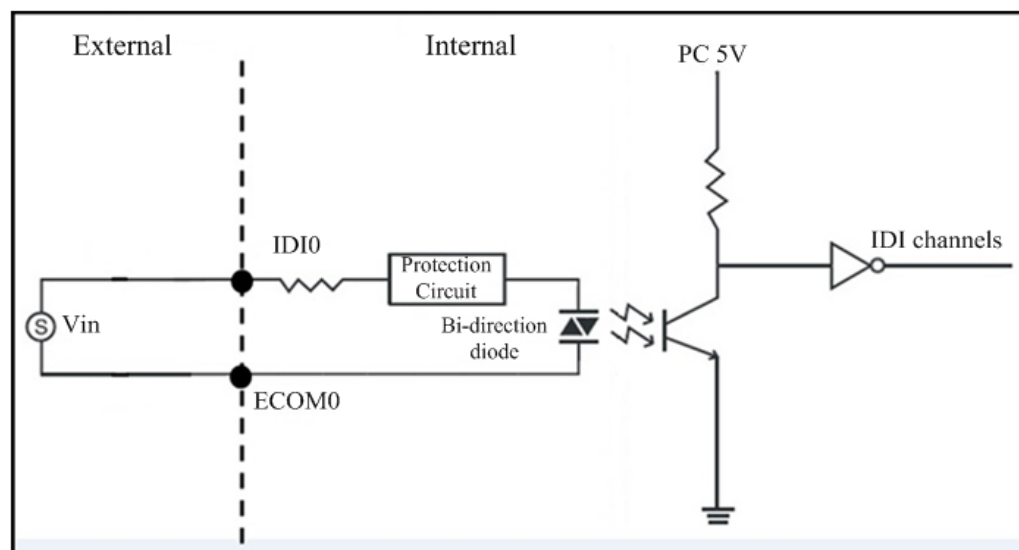

Figure 3.3 Isolated Digital Input Connection

3.3.3 Isolated Digital Output

Each of isolated output channels comes equipped with a MOSFET, polyswitch (for current protection) and flywheel diode for using with inductive loads which can be activated by connecting PCOM to V_{DC}. If an external voltage (5 ~ 40 V_{DC}) is applied to an isolated output channel, the current will flow from the external voltage source to the card. Please note that the current through each IDO channel should not exceed 200 mA.
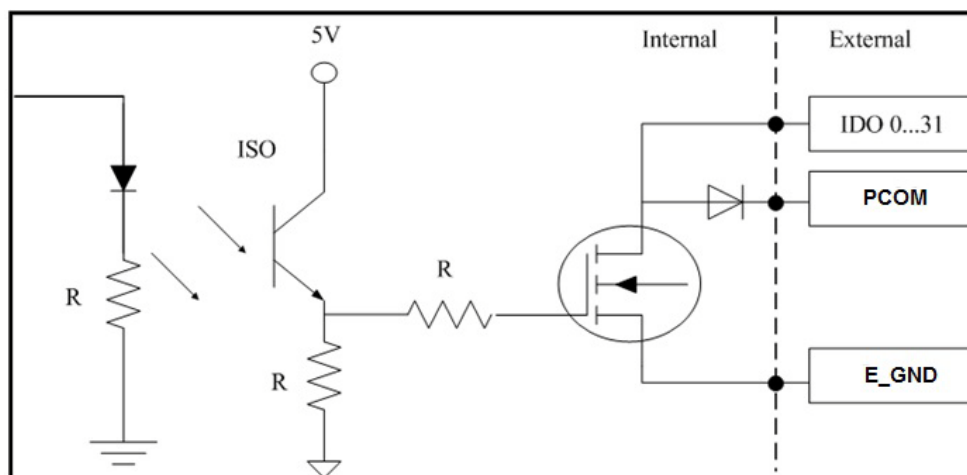
Figure 3.4 Isolated Digital Output Connection

3.3.4 Channel-Freeze Function

The MIC-3756 provides a digital input channel (CH_FRZ_IN) to enable the channel-freeze function. The channel-freeze function acts when the pin CH_FRZ_IN is activated. Moreover, you can setup the input mode of channel-freeze function input channel CH_FRZ_IN as dry contact input mode or wet contact input mode selected by on-board jumper JP2. The wiring in wet contact and dry contact input mode are shown in Figures 3.5 and 3.6.

Figure 3.5 Wiring in wet contact input mode

Figure 3.6 Wiring in dry contact input mode

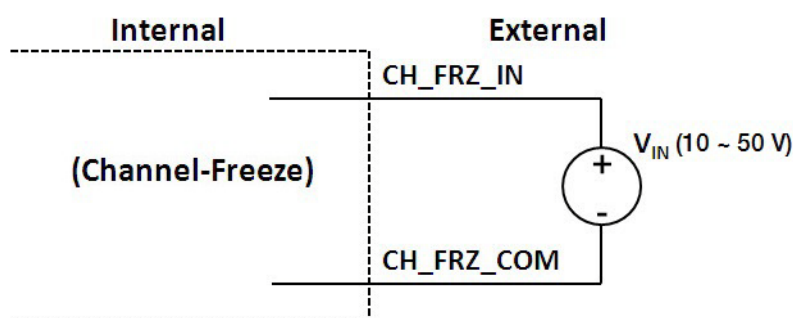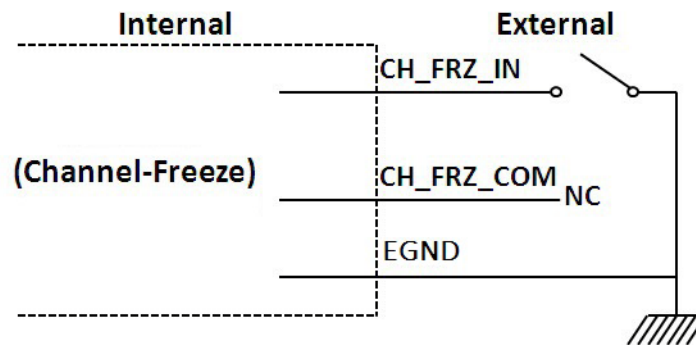## 3.4 Field Wiring Considerations

When you use MIC-3756 cards 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 MIC-3756 card.

- 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. Alternatively, you can place the signal cable at a right angle to the power line to minimize the undesirable effect.

- The signals transmitted on the cable will be directly affected by the quality of the cable. In order to ensure better signal quality, we recommend that you use the PCL-10178-1E shielded cable.

Appendix A

Specifications

A.1 Isolated Digital Input

Number of Input Channel	32	
Interrupt Inputs	2 (IDI0, IDI16)	
Optical Isolation	2500 V_{DC}	
Opto-isolator Response Time	100 µs	
Over-voltage Protect	70 V_{DC}	
Input Resistance	5.2 KΩ	
Input Voltage	VIH (max.)	50 V_{DC}
	VIH (min.)	10 V_{DC}
	VIL (max.)	3 V_{DC}
Input Current	10 V_{DC}	1.70 mA (typical)
	12 V_{DC}	2.10 mA (typical)
	24 V_{DC}	4.40 mA (typical)
	48 V_{DC}	9.00 mA (typical)
	50 V_{DC}	9.40 mA (typical)

A.2 Isolated Digital Output

Number of Output Channel	32
Optical Isolation	2500 V_{DC}
Opto-isolator Response Time	25 µs
Supply Voltage	5 ~ 40 V_{DC}
Sink Current	200 mA max/channel

A.3 Counter

Channels	1 (independent)
Resolution	16-bit
Programmable Clock Source	On board 1MHz clock source or External DI00 input
Gate	Stop counter
	DI16 as GATE high
	DI16 as GATE low
	No Gating

A.4 General

I/O Connector Type	78-pin DB female	
Dimensions	160 mm(L) x 100 mm(W)	
Power Consumption	MIC-3756	+5 V @ 285 mA (typical)
		+5 V @ 475 mA (typical)
Temperature	Operation	0 ~ +60° C (32 ~ 140° F) (refer to IEC 68-2-1,2)
	Storage	-20 ~ +80 °C (-4 ~ 176 °F)
Relative Humidity	5 ~ 95% RH non-condensing (refer to IEC 60068-2-3)	
Certification	CE Class A certified	

A.5 Register Table

Register Format of MIC-3756.

Table A.1: Register Functions

Base Addr.		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	R	Digital Input Group 0															
		DI15	DI14	DI13	DI12	DI11	DI10	DI9	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0
	W	N/A															
2	R	Digital Input Group 0															
		DI31	DI30	DI29	DI28	DI27	DI26	DI25	DI24	DI23	DI22	DI21	DI20	DI19	DI18	DI17	DI16
	W	N/A															
4	R	Digital Output Group 0 Read Back															
		DO15	DO14	DO13	DO12	DO11	DO10	DO9	DO8	DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
	W	Digital Output Group 0															
		DO15	DO14	DO13	DO12	DO11	DO10	DO9	DO8	DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
6	R	Digital Output Group 1 Read Back															
		DO31	DO30	DO29	DO28	DO27	DO26	DO25	DO24	DO23	DO22	DO21	DO20	DO19	DO18	DO17	DOI6
	W	Digital Output Group 1															
		DO31	DO30	DO29	DO28	DO27	DO26	DO25	DO24	DO23	DO22	DO21	DO20	DO19	DO18	DO17	DOI6
8	R	Group 0 Interrupt Control Register										F0	E0	INT0 E	L0/E		
	W	Group 0 Interrupt Control Register										F0*	E0	INT0 E	L0/E		
A	R	Group 1 Interrupt Control Register										F1	E1	INT1 E	L1/E		
	W	Group 1 Interrupt Control Register										F1*	E1	INT1 E	L1/E		

Table A.1: Register Functions

Addr	R/W	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
C	R	N/A															
	W	Control Mode Register										CM5	CM4	CM3	CM2	CM1	CM0
E	R	N/A															
	W	Control Reset Register														D1	D0
10	R	Board ID Register												ID3	ID2	ID1	ID0
	W	N/A															
12	R	Channel Freeze Function Control Register														CFS	CFC
	W	Channel Freeze Function Status Register															CFC
14	R	Counter Read Register															
		CR15	CR14	CR13	CR12	CR11	CR10	CR9	CR8	CR7	CR6	CR5	CR4	CR3	CR2	CR1	CR0
	W	N/A															
16	R	INT State of Counter															INT
	W	Clear INT of Counter															
18	R	N/A															
	W	Set Value Register															
		SE15	SE14	SE13	SE12	SE11	SE10	SE9	SE8	SE7	SE6	SE5	SE4	SE3	SE2	SE1	SE0
1E	R																
	W																

Appendix B

Block Diagrams

B.1 Block Diagrams

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