

# **MIC-3723/3723R**

**16-bit, 8-ch Non-isolated  
Analog Output CompactPCI  
Card / Rear I/O support**

## **User Manual**

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Part No. 2003372310

Printed in Taiwan

2<sup>nd</sup> Edition

March 2006

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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.

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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.
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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. Please contact your 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 (OS, version, 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.

- CompactPCI Communication Interface Card
- Rear I/O Module (for MIC-3723R only)
- 1 x Companion CD-ROM (DLL driver included)
- 1 x User Manual (this manual)

## **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.

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## Introduction

This chapter gives background information on the MIC-3723/3723R and shows how to configure the card to match your application and prepare it for installation on your system.

Sections include:

- Features
- Applications
- Installations Guide
- Software Overview
- Device Drivers Programming
- Accessories

# Chapter 1 Introduction

Thank you for buying the Advantech MIC-3723/3723R. MIC-3723/3723R is a non-isolated analog output card for CompactPCI systems. Each analog output channel is equipped with a 16-bit, double-buffered DAC. It also features auto-calibration function and a BoardID switch.

MIC-3723/3723R is an ideal solution for industrial applications where multiple analog output channels are required.

The following sections of this chapter will provide further information about features of the multifunction cards, a Quick Start for installation, together with some brief information on software and accessories for the MIC-3723/3723R card.

## 1.1 Features

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- Auto calibration function
- Each analog output channel is equipped with a 16-bit DAC
- Flexible output range:  $\pm 10V$ , 0~20 mA, 4~20 mA
- Synchronized output function
- Output values retained after system hot reset
- 2-port (16-channel) user-defined digital input/output
- BoardID switch
- Rear I/O Module (for MIC-3723R only)

MIC-3723/3723R offers the following main features:

### **Auto-calibration Function**

MIC-3723/3723R provides an auto-calibration function by using a calibration utility. The built-in calibration circuitry of MIC-3723/3723R corrects gain and offset errors in analog output channels, thereby eliminating the need for external equipment and user adjustments.



## Flexible Voltage Output Range

MIC-3723/3723R provides a fixed voltage output range at  $\pm 10\text{V}$  to fulfill the flexible range needed for various applications. You can define a specific voltage output range and output the data format via the enclosed software utility and driver.

## Keep Output Values after System Reset

You can independently set the eight outputs to different ranges:  $\pm 10\text{V}$ ,  $0\sim 20\text{mA}$  or  $4\sim 20\text{mA}$ , and all the ranges are software selectable. When the system is hot reset (power not shut off), MIC-3723/3723R can either retain the last analog output values, or return to its default configuration, depending on jumper settings. This practical function eliminates danger caused by operation errors after unexpected system resets.

## BoardID Switch

MIC-3723/3723R has a built-in DIP Switch that helps define each card's unique identifier when multiple MIC-3723/3723R cards have been installed in the same PC chassis. The BoardID switch setting function is very useful when you build a system with multiple MIC-3723/3723R cards. With correct BoardID settings, you can easily identify and access each card during hardware configuration and software programming.

*Note: For detailed specifications of the MIC-3723/3723R, please refer to Appendix A, Specifications.*

## 1.2 Applications

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- Process control
- Programmable voltage sources
- Programmable current sink
- Servo control
- Multiple loop PID control

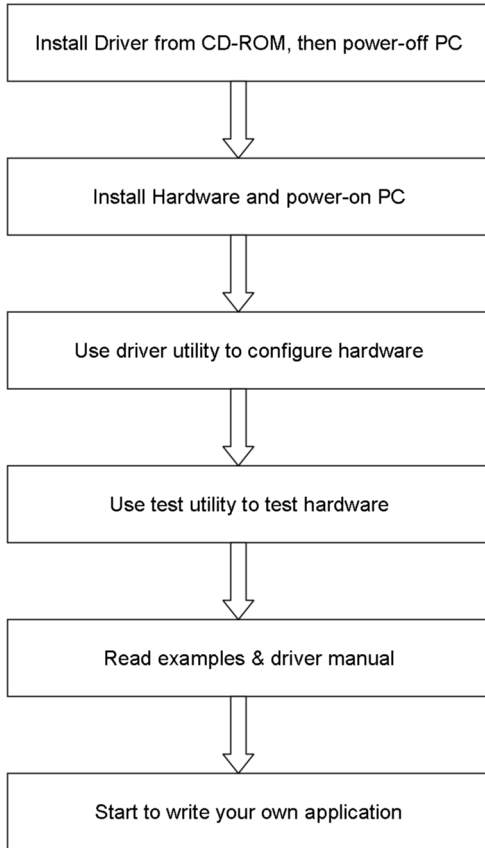
## 1.3 Installation Guide

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Before you install your MIC-3723/3723R card, please make sure you have the following necessary components:

- MIC-3723/3723R DA&C card
- MIC-3723/3723R User Manual
- Advantech DLL drivers (included in the companion CD-ROM)
- Wiring cable PCL-10168 (optional)
- Wiring board ADAM-3968 (optional)
- CompactPCI enclosure with a CompactPCI bus slot (Win 2000/XP)

After you get the necessary components and maybe some of the accessories for enhanced operation of your MIC-3723/3723R multifunction card, you can then begin the installation procedures. Figure 1.1 on the next page provides a concise flow chart to give a broad picture of the software and hardware installation procedures:



***Figure 1.1: Installation flow chart***

## 1.4 Software Overview

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Advantech offers a rich set of DLL drivers, third-party driver support and application software to help fully exploit the functions of your MIC-3723/3723R card:

- Device Drivers (on the companion CD-ROM)
- LabVIEW driver

### Programming Choices for DA&C Cards

You may use Advantech application software such as Advantech Device Drivers or if you are an advanced user, you can also choose register-level programming, although this is not recommended due to its laborious and time consuming nature.

### Device Drivers

Advantech Device Drivers software is included on the companion CD-ROM that comes with all Advantech DA&C cards. Advantech's Device Drivers features a complete I/O function library to help boost your application performance. The Advantech Device Drivers for Windows 2000/98/ME/XP works seamlessly with development tools such as Visual C++, Visual Basic, Borland C++ Builder and Borland Delphi.

### Register-level Programming

Register-level programming is reserved for experienced programmers who find it necessary to write codes directly at the level of device registers. Since register-level programming requires much effort and time, we recommend that you use the Advantech Device Drivers instead. However, if register level programming is indispensable, you should refer to the relevant information in *Appendix C, Register Structure and Format*, and to the example codes included on the companion CD-ROM.

## 1.5 Device Drivers Programming

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This section provides a roadmap to demonstrate how to build an application from scratch using Advantech Device Drivers with your favorite development tools such as Visual C++, Visual Basic, Delphi and C++ Builder. The step-by-step instructions on how to build your own applications using each development tool will be given in the *Device Drivers Manual*. Moreover, a rich set of example source codes are also given for your reference.

### Programming Tools

Programmers can develop application programs with their favorite development tools:

- Visual C++
- Visual Basic
- Delphi
- C++ Builder

For instructions on how to begin programming in each development tool, Advantech offers a *Tutorial Chapter* in the *Device Drivers Manual* for your reference. Please refer to the corresponding sections in this chapter in the *Device Drivers Manual* to begin your programming. You can also see example source code provided for each programming tool.

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

*Start/Programs/Advantech Automation/Device Manager/Device Drivers Manual*

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

*C:\Program Files\Advantech\ADSAPI\Examples*

## **Programming with Device Drivers Function Library**

Advantech Device Drivers offer a rich function library to be utilized in various application programs. This function library consists of numerous APIs that support many development tools, such as Visual C++, Visual Basic, Delphi and C++ Builder.

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

- Analog Output Function Group
- Digital Input/Output Function Group
- Counter Function Group
- Port Function Group (direct I/O)
- Event Function Group

## **Troubleshooting 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 zero, it means the function has failed to perform its designated function. To troubleshoot the Device Drivers error, you can pass the error code to *DRV\_GetErrorMessage* function to return the error message. Or you can refer to the *Device Drivers Error Codes* Appendix in the *Device Drivers Manual* for a detailed listing of the Error Code, Error ID and the Error Message.

## 1.6 Accessories

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Advantech offers a complete set of accessories to support the MIC-3723/3723R card. These accessories include:

### **Wiring Cable: PCL-10168**

The PCL-10168 shielded cable is specially designed for MIC-3723/3723R 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 analog and digital lines are separately sheathed and shielded to neutralize EMI/EMC problems.

### **Wiring Boards: ADAM-3968**

ADAM-3968 is a 68-pin SCSI wiring terminal module for DIN-rail mounting. This terminal module can be readily connected to the Advantech PC-Labcard products and allow easy yet reliable access to individual pin connections for MIC-3723/3723R.





## Installation

This chapter has a package item checklist, proper instructions about unpacking and step-by-step procedures for card installation..

Sections include:

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

# Chapter 2 Installation

## 2.1 Unpacking

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After receiving your MIC-3723/3723R package, please inspect its contents first. The package should contain the following items:

- MIC-3723/3723R card
- Companion CD (Device Drivers included)
- User Manual
- Rear I/O Module (for MIC-3723R only)

MIC-3723/3723R card 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 card 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. 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 out of the bag.

After taking out the card, first you should:

- 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 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 PC or transport it elsewhere.*

## 2.2 Driver Installation

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We recommend you install the driver before you install the MIC-3723/3723R card into your system, since this will guarantee a smooth installation process.

The Advantech Device Drivers Setup program for the MIC-3723/3723R card is included on the companion CD that is shipped with your DA&C card package. Please follow the steps below to install the driver software:

**Step 1:** Insert the companion CD into your CD-ROM drive.

**Step 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'll see the following Setup Screen.

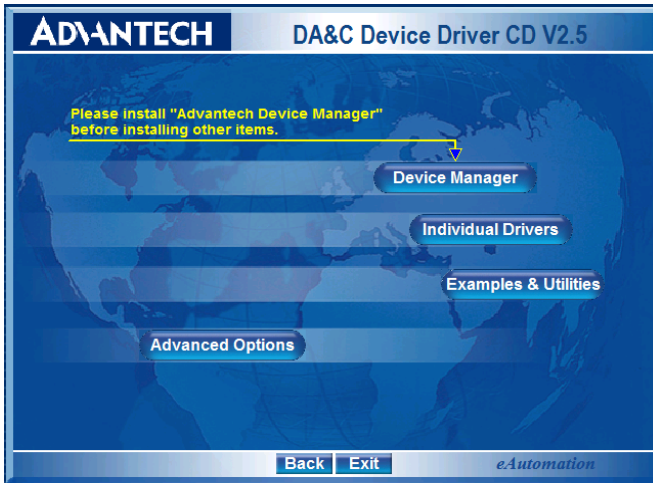
*Note: If the autoplay function is not enabled on your computer, use Windows Explorer or Windows Run command to execute SETUP.EXE on the companion CD*



**Step 3:** Please click 'CONTINUE' to proceed to the next step.



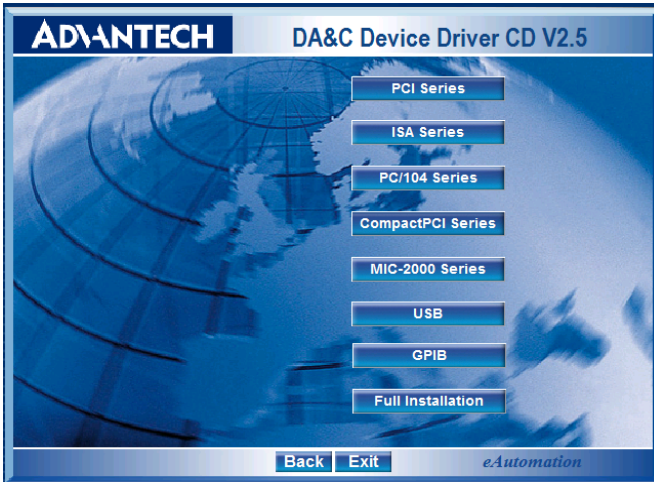
**Step 4:** Please select 'Installation' to proceed to the next step. A list of items will be shown on the screen: 'Device Manager', 'Individual Driver', 'Example & Utility', and 'Advance Options'.



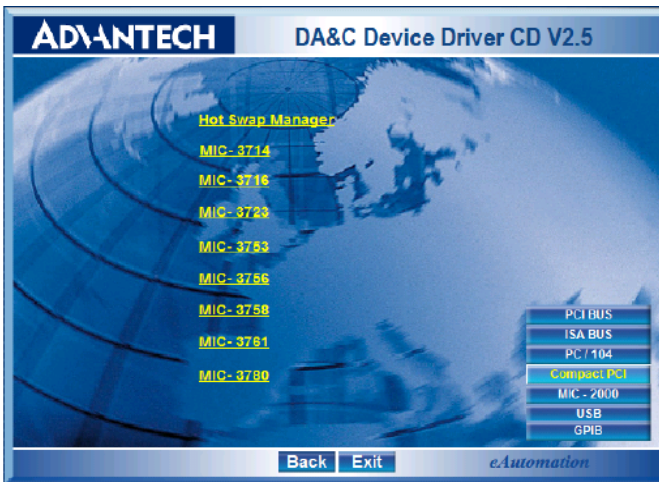
**Step 5:** Please install the ‘Device Manager’ first. For details on how to install the ‘Device Manager’ step by step, please see the software manual.



**Step 6:** When you’re finished installing the ‘Device manager’, you can install the driver of the corresponding card. Please click the 'Individual Drivers'.



**Step 7:** Select ‘CompactPCI Series’.



**Step 8:** Select ‘MIC-3723’ to install its driver. For more information about the software installation, please read the software manual.

## 2.3 Hardware Installation

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

Once the Device Driver installation is complete, you can install the MIC-3723/3723R card in any CompactPCI slot in your enclosure. You should refer to the computer user manual or related documentation if you have any doubts. Please follow the steps below to install the card on your system.

**Step 1:** Remove a cover of an unused slot on your CompactPCI system.

**Step 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.

**Step 3:** Hold the lower handle and pull it down to unlock the card.

**Step 4:** Insert the MIC-3723/3723R card into the CompactPCI chassis carefully by sliding the lower edges of the card into the card guides.

**Step 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 be lit.

**Step 6:** Now push the card into the right place, and the Blue LED will turn off.

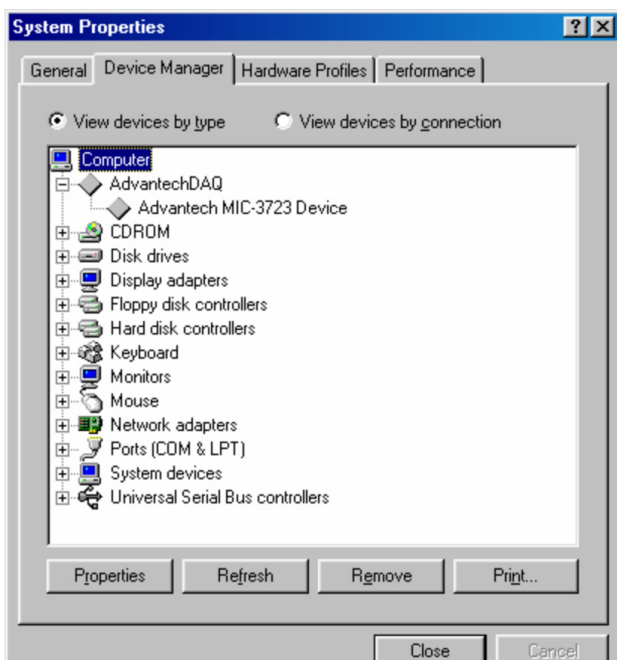
**Step 7:** After the Blue LED is off, push the handle to secure the card and lock it into place.

**Step 8:** Because Advantech's CompactPCI cards support hot-swapping, the card can be automatically configured if your CompactPCI computer power is on. Once the system has finished configuration, you can find the card information in Device Manager.

**Note:** *In case you installed the card without installing the Device Driver first, Windows 98/ME will recognize your card as an “unknown device” after rebooting, and will prompt you to provide the necessary driver. You should ignore the prompting messages (just click the Cancel button) and set up the driver according to the steps described in 2.2 Driver Installation.*

After the MIC-3723/3723R card is installed, you can verify whether it is properly installed on your system in *Device Manager*:

1. Access Device Manager by Control Panel/System/Device Manager.
2. The device name of the MIC-3723/3723R should be listed on the Device Manager tab on the System Property Page.



**Figure 2.1: Device Name Listed on Device Manager**



If your card is properly installed, you should see the device name of your card listed on the Device Manager tab. If you see your device name listed on it but marked with an exclamation sign “!”, 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. Then you must restart your computer.

After your card is properly installed on your system, you can now configure your device using the Advantech Device Manager 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

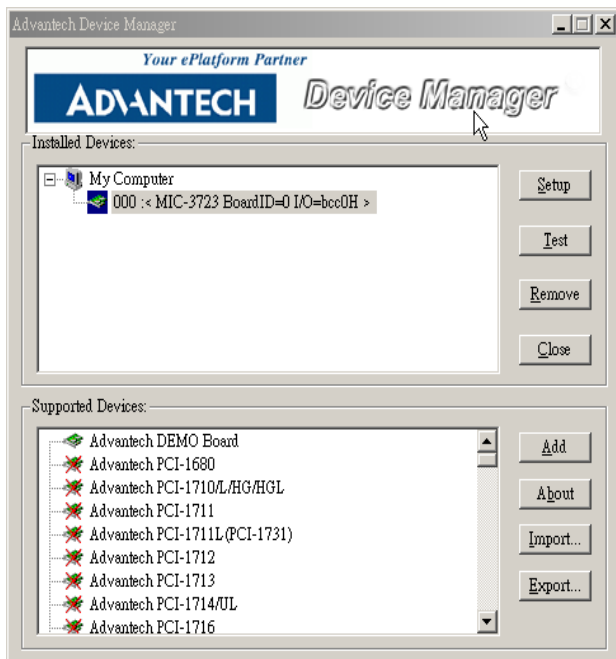
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The *Advantech Device Manager* program is a utility that allows you to set up, configure and test your device, and later stores your settings on the system registry. These settings will be used when you call the APIs of Advantech Device Drivers.

### 2.4.1 Setting up the Device

**Step 1:** To setup the I/O device for your card, you must first run the *Device setup* program (by accessing *Start/Programs/Advantech Automation/Device Manager/Advantech Device Manage*).

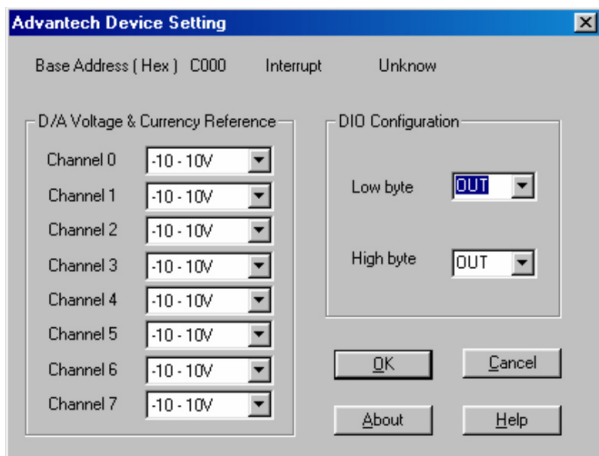
**Step 2:** You can then view the device(s) already installed on your system (if any) on the Installed Devices list box.



**Figure 2.2:** Device Manager Dialog Box

## 2.4.2 Configuring the Device

**Step 3:** Click "Setup" to show the Device Setting dialog box (Fig. 2.3), then you can specify the voltage output range for 8 D/A channels.



**Figure 2.3: Device Setting Dialog Box**

**Note:** You can select the output voltage range. When selecting voltage source as Internal, users have three options for the output voltage ranges and current ranges: -10 ~ 10 V, 0~20 mA and 4~20 mA.

**Note:** As we have noted, the device name “000:MIC-3723 BoardID=0 I/O=bcc0H” begins with a device number “000”, which is specifically assigned to each card. The device number is passed to the driver to specify which device you wish to control.

After your card is properly installed and configured, you can click the ‘**Test**’ button to test your hardware by using the testing utility we supplied. For more detailed information, please refer to Chapter 2 of the *Device Drivers Manual*.

You can also find rich examples on the CD-ROM to speed up your programming.



## Signal Connections

This chapter provides advice on settings and connections for the MIC-3723/3723R.

Sections include:

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

# Chapter 3 Signal Connections

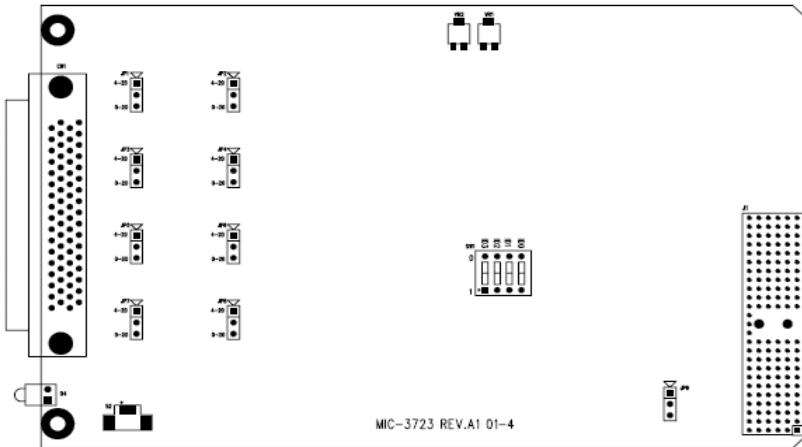
## 3.1 Overview

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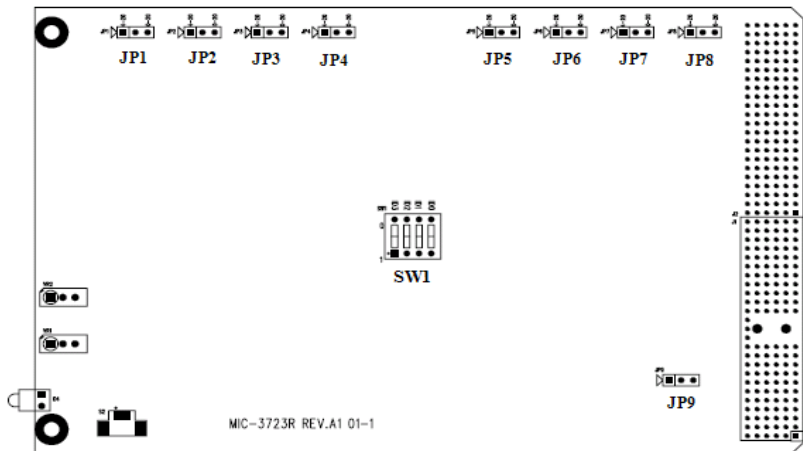
Maintaining signal connections is one of the most important factors in ensuring that your system is sending and receiving data correctly. A good signal connection can avoid unnecessary and costly damage to your PC and other hardware devices. This chapter provides useful information about how to connect input and output signals to MIC-3723/3723R via the I/O connector.

## 3.2 Switch & Jumper Settings

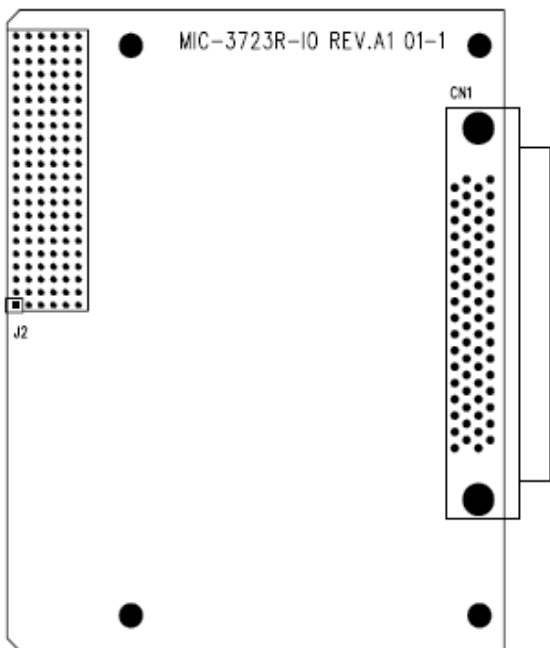
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*Figure 3.1: MIC-3723 Connectors, Jumpers & Switch*







**Figure 3.2: MIC-3723R Connectors, Jumpers&Switch**



**Figure 3.3: MIC-3723R Rear I/O Connectors**

### 3.2.1 Jumper Settings

*Table 3.1: Jumper Settings*

Label	Setting	Function description
JP9		Keep last status after hot reset
		Reset status after hot reset (default)
JP1~JP8		0~20mA (default)
		4~20mA

### 3.2.2 Setting the Analog Output Mode After Reset

Some may want the capability of clearing each analog output when the system (or PC) issues a reset signal on the CompactPCI bus. MIC-3723/3723R satisfies both these needs with jumper JP9. Depending on the application, this setting can allow analog outputs to be "ZERO" without requiring a complete shutdown of processes controlled by the card.

Complete loss of power to the chip clears the chip memory. Thus, no matter how JP9 is set, if the power to the MIC-3723/3723R is disconnected, the analog output initial power-on state will be "ZERO".



### 3.2.3 BoardID Switch Settings

ID3	ID2	ID1	ID0	BoardID
OFF	OFF	OFF	OFF	15
OFF	OFF	OFF	ON	14
OFF	OFF	ON	OFF	13
OFF	OFF	ON	ON	12
OFF	ON	OFF	OFF	11
OFF	ON	OFF	ON	10
OFF	ON	ON	OFF	9
OFF	ON	ON	ON	8
ON	OFF	OFF	OFF	7
ON	OFF	OFF	ON	6
ON	OFF	ON	OFF	5
ON	OFF	ON	ON	4
ON	ON	OFF	OFF	3
ON	ON	OFF	ON	2
ON	ON	ON	OFF	1
ON	ON	ON	ON	0*

\*Default configuration

## 3.3 Signal Connections

### 3.3.1 Pin Assignments

Figure 3.4 shows the pin assignments for the 68-pin I/O connector on MIC-3723/3723R.

NC	68	34	NC
Vout0	67	33	Vout1
AGND	66	32	AGND
Iout0	65	31	Iout1
NC	64	30	NC
AGND	63	29	AGND
Vout2	62	28	Vout3
AGND	61	27	AGND
Iout2	60	26	Iout3
NC	59	25	NC
AGND	58	24	AGND
Vout4	57	23	Vout5
AGND	56	22	AGND
Iout4	55	21	Iout5
NC	54	20	NC
AGND	53	19	AGND
Vout6	52	18	Vout7
AGND	51	17	AGND
Iout6	50	16	Iout7
NC	49	15	NC
AGND	48	14	AGND
DIO0	47	13	DIO1
DIO2	46	12	DIO3
DIO4	45	11	DIO5
DIO6	44	10	DIO7
DIO8	43	9	DIO9
DIO10	42	8	DIO11
DIO12	41	7	DIO13
DIO14	40	6	DIO15
DGND	39	5	DGND
NC	38	4	NC
NC	37	3	NC
NC	36	2	NC
+12V	35	1	+5V

**Figure 3.4: I/O Connector Pin Assignments**

### 3.3.2 I/O Connector Signal Descriptions

**Table 3.2: I/O Connector Signal Description**

Signal Name	Reference	Direction	Description
Vout<0~7>	AGND	Output	<b>Voltage Output, Channels 0 ~ 7.</b>
Iout<0~7>	AGND	Output (Sink)	<b>Current Output, Channels 0 ~ 7.</b>
AGND	--	--	<b>Analog Ground.</b> The two ground references (AGND and DGND) are connected together on the MIC-1723 card.
DI0<0~15>	DGND	--	<b>Digital Input/Output Signals.</b> These pins are digital input / Output channel 0 to 15.
DGND	--	--	<b>Digital Ground.</b> The two ground references (AGND and DGND) are connected together on the MIC-1723 card.
+12V	AGND	Output	<b>+12 VDC Source</b> (from PCI bus directly with FUSE protection).
+5V	AGND	Output	<b>+5 VDC Source</b> (from PCI bus directly with FUSE protection)

### 3.3.3 Analog Output Connection

MIC-3723/3723R provides eight D/A output channels,  $V_{out0} \sim V_{out7}$  and the optional  $I_{out0} \sim I_{out7}$ .

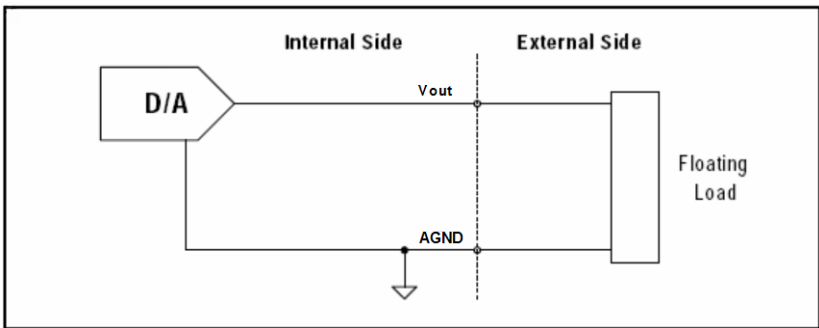
#### D/A Voltage Output Connections

MIC-3723/3723R provides eight D/A output channels,  $V_{out0} \sim V_{out7}$ . The voltage output is referenced to a common ground (AGND).

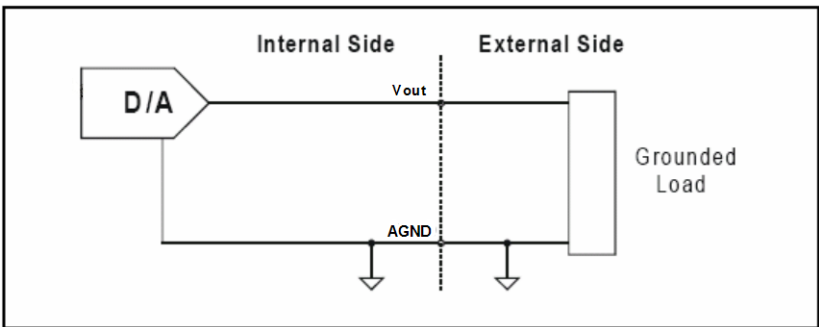
There are three types of voltage output connections:

1. Floating load.
2. Grounded load.
3. Differential load with ground.

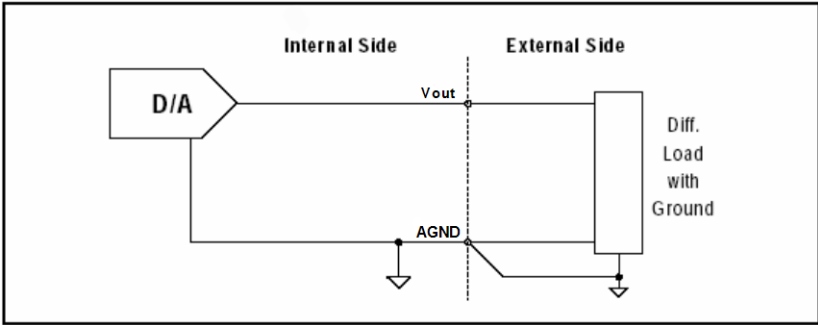
They are shown in the following illustrations.



*Figure 3.5: Floating-load Connections*



*Figure 3.6: Grounded-load Connections*



**Figure 3.7: Differential-load w/Ground Connections**

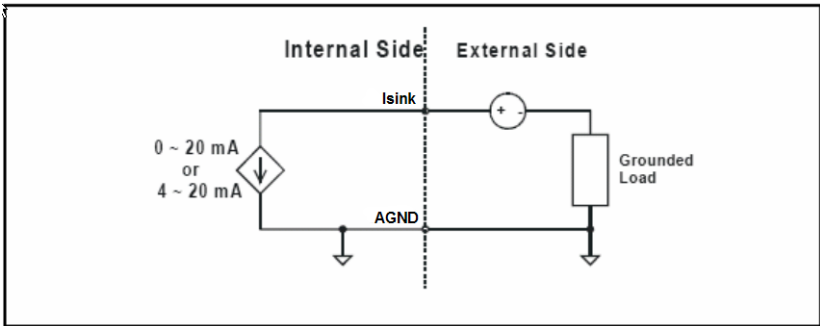
### Current Sink Connections

MIC-3723/3723R's current loop output uses a 0 to +5 V (unipolar) voltage output as each channel's driving source. Current drive circuits consist of a power field-effect transistor (FET). The current output's voltage bias must be less than 50 V for accurate results. The card also provides an internal +12 V power source for current loop excitation.

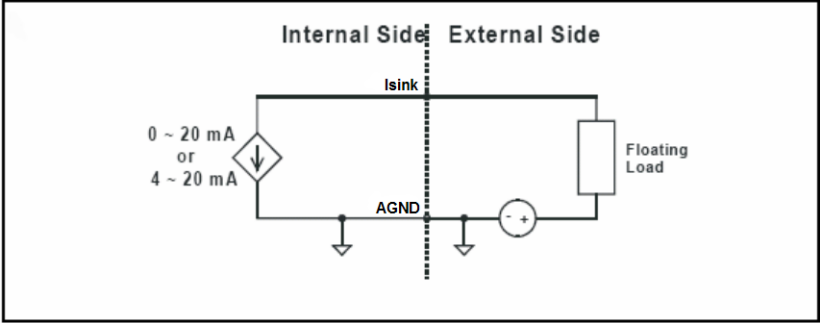
You can use three types of current sink connections:

1. Grounded load with a floating power supply.
2. Floating load with a grounded power supply.
3. Floating load with an internal +12 V power supply.

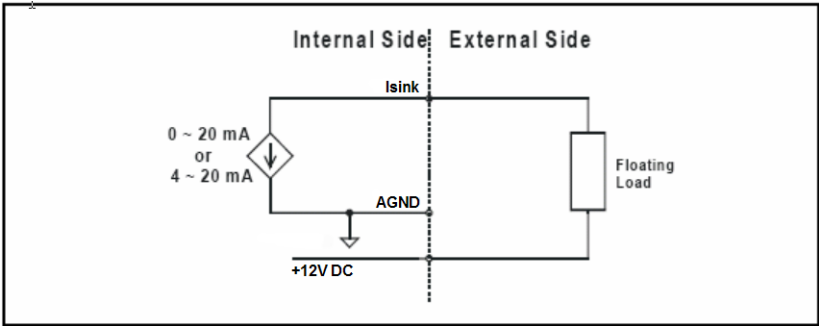
These are shown in the following illustrations.



**Figure 3.8: Grounded-load w/Floating Power**



**Figure 3.9: Floating-load w/Grounded Power**

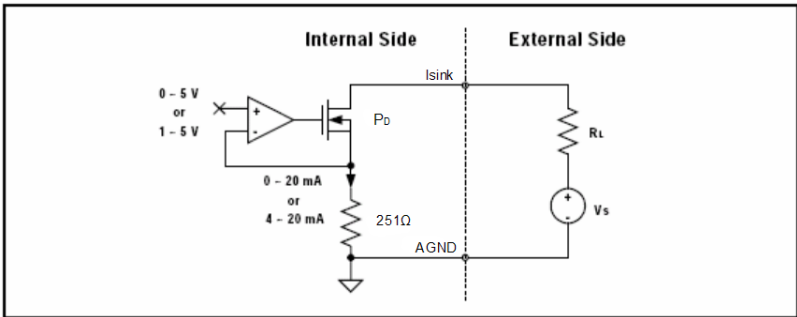


**Figure 3.10: Floating-load w/Internal +12 VDC**

### Current Sink Load and Power Supply

You have to select the current sink load and power supply carefully.

The current sink circuitry of the MIC-3723/3723R is as shown below.



**Figure 3.11: Current Sink Circuitry**

## Where

**VS:** Power supply voltage of current sink.

**RL:** Load of current sink.

**PD:** Power dissipation of FET.

When you determine VS and RL, three conditions must be satisfied.

$$VS > (RL + 251) (0.02)$$

$$PD = (VS - (RL + 251) * 0.02) * 0.02 < 0.2$$

### Example 1

If you use the internal power supply VS = +12 V,

RL must be less than **349 W**. ( $12 / 0.02 - 251 > RL$ ).

Select RL = 200, PD = 0.0696 < 0.2 **OK!**

### Example 2

If you use the external power supply VS = +40 V,

RL must be less than **1.75 kW** ( $40 / 0.02 - 251 > RL$ ).

Select RL = 200 W, PD = 0.62 > 0.2 **fail!**

Reselect RL = 1 kW, PD = 0.3 > 0.2 **fail!**

Reselect RL = 1.5 kW, PD = 0.1 < 0.2 **OK!**

## 3.4 Field Wiring Considerations

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When you use the MIC-3723/3723R to acquire data from external sources, noises in the environment could 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 MIC-3723/3723R.

- 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 output 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, you should 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-10168 shielded cable.



APPENDIX  
**A**

**Specifications**

# Appendix A Specifications

## A.1 Analog Output

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<b>Channels</b>	8	
<b>Resolution</b>	16-bit	
<b>Operation mode</b>	Single output, Synchronized output	
<b>Output Range (Internal Reference only)</b>	-10~+10V, 0~20 mA, 4~20 mA	
<b>Accuracy</b>	Relative	±6 LSB
	Differential Non-linearity	±6 LSB (monotonic)
<b>Offset</b>	< 6 LSB	
<b>Output Impedance</b>	0.1 W max.	
<b>Throughput</b>	PC dependent, Software update (direct AO)	
<b>Settling time</b>	50 μs (to ±6 LSB of FSR)	

## A.2 Digital Input /Output

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<b>Channels</b>	16 (bi-directional)	
<b>Number of Ports</b>	2 (8 channels per port)	
<b>Input Voltage</b>	Low	0.8 V max.
	High	2.0 V min.
<b>Output Voltage</b>	Low	0.5 V max. @ 24 mA (sink)
	High	2.0 V min. @ -15 mA (source)

## A.3 General

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<b>I/O Connector Type</b>	68-pin SCSI-II female	
<b>Dimensions</b>	175 x 100 mm (6.9" x 3.9")	
<b>Power Consumption</b>	Typical	+5 V @ 850 mA, +12 V @ 600 mA
<b>Temperature</b>	Operating	0~60 ° C (32~158° F) (refer to IEC 68-2-1,2)
	Storage	-20~85° C (-4~185° F)
<b>Relative Humidity</b>	5~95% RH non-condensing (refer to IEC 68-2-3)	
<b>Certifications</b>	CE certified	



APPENDIX

# B

## Block Diagram

# Appendix B Block Diagram

