

# **MIC-3753/3753R**

**72-ch Digital I/O Card /  
Rear I/O Support**

**User Manual**

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

## **Declaration of Conformity**

### **CE**

The MIC-3753/3753R, developed by ADVANTECH CO., LTD., has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

## **Technical Support and Assistance**

- Step 1. Visit the Advantech web site at **[www.advantech.com/support](http://www.advantech.com/support)** where you can find the latest information about the product.
- Step 2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
  - Product name and serial number
  - Description of your peripheral attachments
  - Description of your software (operating system, version, application software, etc.)
  - A complete description of the problem
  - The exact wording of any error messages

## **Safety Instructions**

1. Read these safety instructions carefully.
2. Keep this User's Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it 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. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.

9. Position the power cord so that people cannot step on it. 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 by transient overvoltage.
12. Never pour any 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 one of the following situations arises, get the equipment checked by service personnel:
  - a. The power cord or plug is damaged.
  - b. Liquid has penetrated into the equipment.
  - c. The equipment has been exposed to moisture.
  - d. The equipment does not work well, or you cannot get it to work according to the user's manual.
  - e. The equipment has been dropped and damaged.
  - f. The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW - 20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

**DISCLAIMER:** This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

## **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**

Sections include:

- Introduction
- Features
- Applications
- Specifications
- Pin Assignments

# Chapter 1 Introduction

## 1.1 Introduction

---

The MIC-3753/3753R is a 72-ch Digital I/O card for the CompactPCI bus. The card emulates mode 0 of the 8255 PPI chip, but the buffered circuits offer a higher driving capability than the 8255. The 72 I/O lines are divided into nine 8-bit I/O ports: A0, B0, C0, A1, B1, C1, A2, B2, C2. You can configure each port as input or output via software.

### **Easy to Install: Plug & Play**

The MIC-3753/3753R uses a PCI controller to interface the card to the CompactPCI bus. The controller fully implements the PCI bus specification Rev 2.1. All bus relative configurations, such as base address and interrupt assignment, are automatically controlled by software.

### **Dry Contact Support for Digital Input**

Each digital input channel at the MIC-3753/3753R accepts either 0 ~5 V<sub>DC</sub> wet contact or dry contact inputs. This dry contact capability allows the channel to respond to changes in external circuitry (e.g., the closing of a switch in the external circuitry) when no voltage is present in the external circuit.

### **Reset Protection Fulfills Industrial Application Requirements**

When the system is hot reset (the power is not turned off), the MIC-3753/3753R can either retain the last I/O port settings and outputs value, or return to its default configuration, depending on the jumper setting. This function protects the system from wrong operations during unexpected system resets.

### **Interrupt Functions Ensure Faster System Response**

Two lines of each port C (i.e., ports C0, C1 and C2) are connected to an interrupt circuit. The “Interrupt Control Register” of the MIC-3753/3753R controls how these signals generate an interrupt. More than one interrupt request signals can be generated at the same time, and then the software can process these request signals by ISR. The multiple interrupt sources provide the card with more capability and flexibility.

The MIC-3753/3753R also provides a “Pattern Match” interrupt function for port A0. The card monitors the states of port A0 and compares them with a pre-set pattern. When the received state matches the pre-set pattern, the MIC-3753/3753R generates an interrupt signal to the system.

The “Change of State” interrupt function is provided at port B0. When any signal line of port B0 changes its state, the card generates an interrupt to the system to handle this event.

These interrupt functions release the CPU from the burden of polling all I/O points, enabling a PC to handle more I/O points with higher performance.

## 1.2 Features

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- 72 TTL digital I/O lines
- Emulates mode 0 of 8255 PPI
- Buffered circuits for higher driving capacity than 8255
- Multiple-source interrupt handling
- Interrupt output pin for simultaneously triggering external devices with the interrupt
- Output status read-back
- “Pattern match” and “Change of state” interrupt functions for critical I/O monitoring
- Keeps I/O setting and digital output values when hot system reset
- Supports dry contact and wet contact
- High-density 78-pin D\_SUB connector
- Rear I/O Module (MIC-3753R only)

## 1.3 Applications

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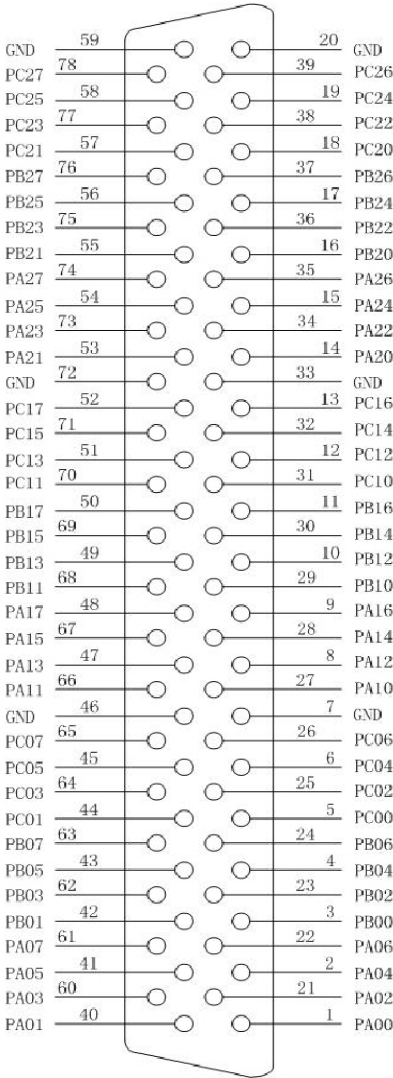
- Industrial AC/DC I/O devices monitoring and controlling
- Relay and switch monitoring and controlling
- Parallel data transfer
- TTL, DTL and CMOS logic signal sensing
- Indicator LED driving

## 1.4 Specifications

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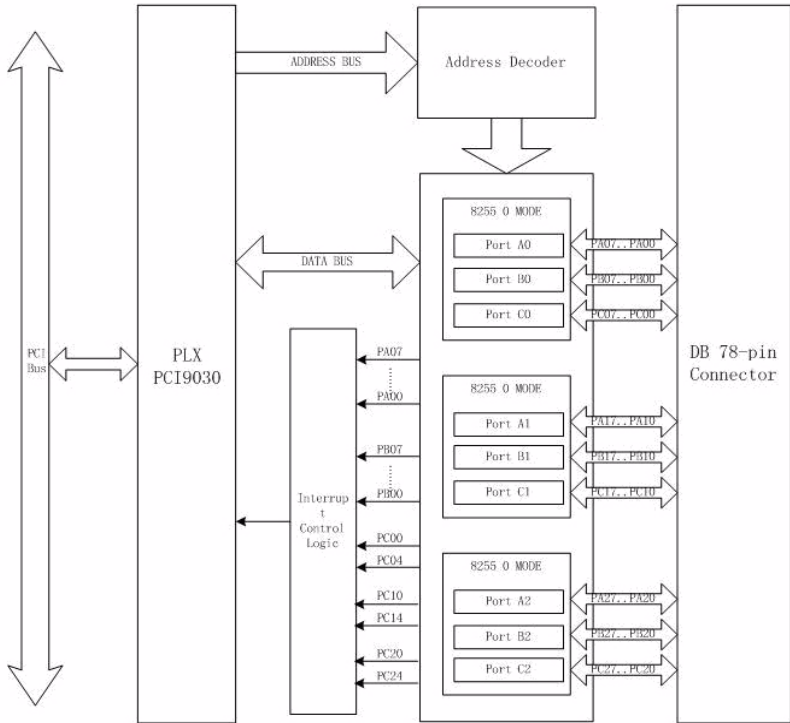
- **I/O Channels:** 72 digital I/O lines
- **Programming Mode:** 8255 PPI mode 0
- **Input Signal:** Logic level 0: 0.8 V max.  
Logic level 1: 2.0V min.
- **Output Signal:** Logic level 0: 0.44V max. @ 24 mA (sink)  
Logic level 1: 3.76V min. @ 24mA (source)
- **Power Consumption:** +5 V @ 350mA (typical)  
+5 V @ 2A (max.)
- **Operating Temperature:** 0~60° C (32~140° F) (IEC 68-2-1, 2)
- **Storage Temperature:** -20 ~ 70° C (-4 ~ 158° F)
- **Operating Humidity:** 5 ~ 95% RH (non-cond.) (refer to IEC 68-2-3)  
Connector: 78 DB connector
- **Dimensions:** 160 x 100 mm

# 1.5 Pin Assignment



PA00 ~ PA07 : I/O pins of Port A0  
 PA10 ~ PA17 : I/O pins of Port A1  
 PA20 ~ PA27 : I/O pins of Port A2  
 PB00 ~ PB07 : I/O pins of Port B0  
 PB10 ~ PB17 : I/O pins of Port B1  
 PB20 ~ PB27 : I/O pins of Port B2  
 PC00 ~ PC07 : I/O pins of Port C0  
 PC10 ~ PC17 : I/O pins of Port C1  
 PC20 ~ PC27 : I/O pins of Port C2  
 GND: Ground

**Figure 1.1: DB 78 Female Connector Pin Assignment**



**Figure 1.2: Block Diagram**

## **Hardware Installation**

Sections include:

- Unpacking
- Software Installation
- Hardware Installation
- Board Layout: Dimensions
- Jumper & Switch Settings

# Chapter 2 Hardware Installation

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

## 2.1 Unpacking

---

After receiving your MIC-3753/3753R package, please inspect its contents first. The package should contain the following items:

- MIC-3753/3753R card
- Companion CD-ROM (DLL driver included)
- User's Manual

The MIC-3753/3753R card has 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 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, 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 the local sales representative immediately. Avoid installing a damaged card into your system.

Also, pay extra caution to the following aspects 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 the PC or transport it elsewhere.*

## 2.2 Software Installation

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Advantech offers a complete range of device driver and software support for Windows programming developers. You can apply the Windows device drivers to the most popular Windows Programming tools, such as Visual C++, Visual Basic, Inprise C++ Builder and Inprise Delphi. The Advantech DLL for Windows 98/2000/XP drivers are based on the Windows 98/2000 kernel technology.

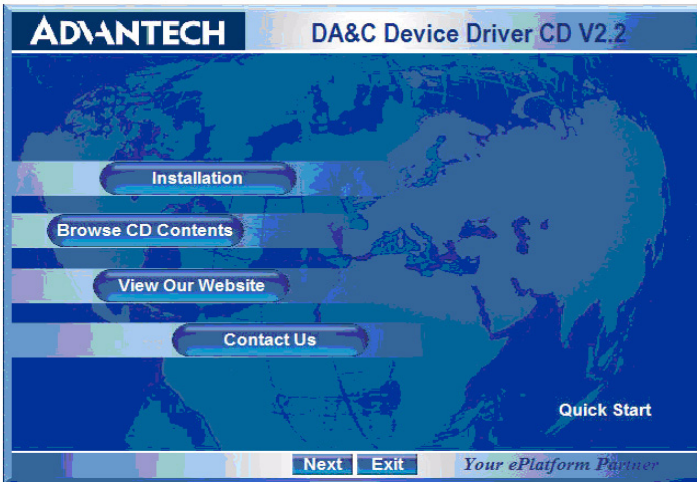
For more information about the software installation for Windows 98/2000/XP, please refer to the MIC-3753/3753R Software Manual.

**Note:**            *Make sure you have firstly installed the driver before installing the card. We strongly recommend that you install the software driver before installing the hardware into your system, since this will guarantee a smooth and trouble-free installation process.*

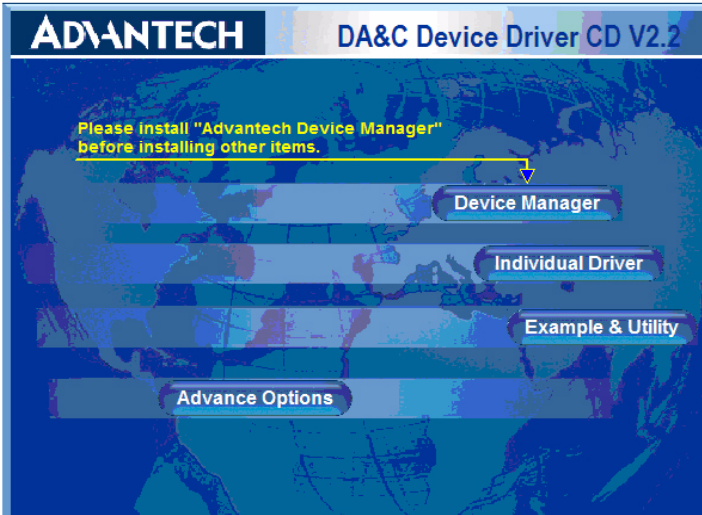
In your CD-ROM, double click to run the “autorun.exe” on your computer, and you will see the figure below on the computer screen.



Please click ‘CONTINUE’ to proceed to the next step.



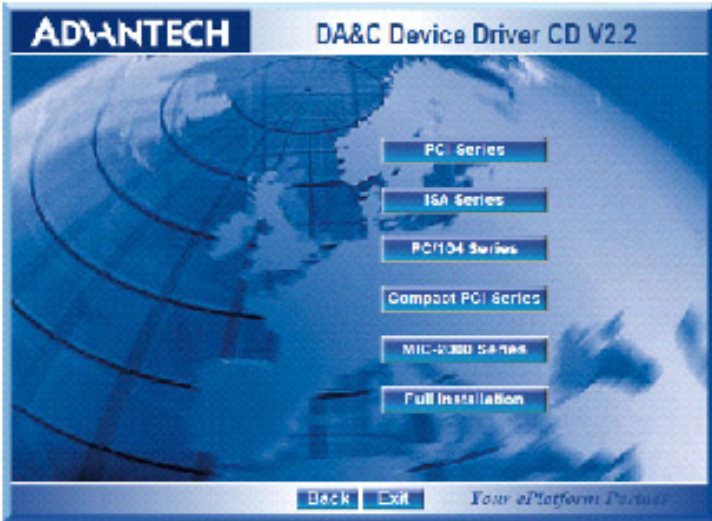
Please select ‘Installation’ to proceed to the next step. A list of items will be shown on the screen: ‘Device Manager’, ‘Individual Driver’, ‘Example & Utility’, and ‘Advance Options’.



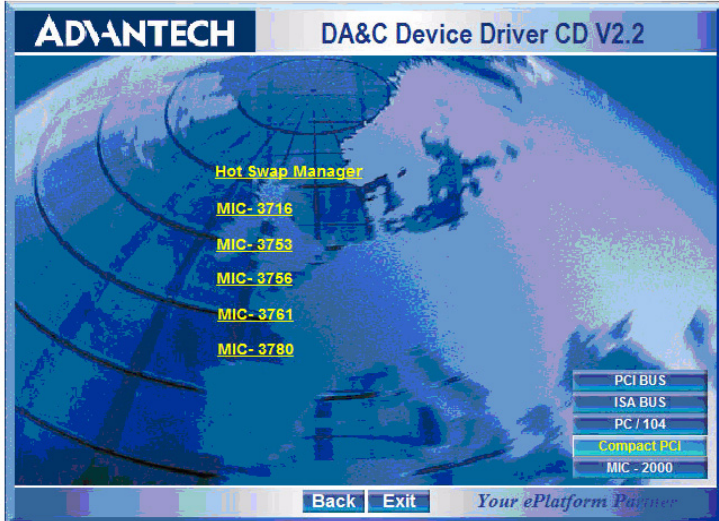
Please install the ‘Device Manager’ first. For details on how to install the ‘Device Manager’ step by step, please see the software manual.



When you’re finished installing the ‘Device manager’, you can install the driver of the corresponding card. Please click the individual Driver



Select 'Compact PCI Series'.



Select 'MIC-3753' to install its driver. For more information about the software installation, please read the corresponding software manual.

## 2.3 Hardware Installation

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**Note:** *Make sure you have installed the driver before you install the card. We strongly recommend that you install the software driver before you install the hardware into your system, since this will guarantee a smooth and trouble-free installation process.*

For more information about the driver installation, configuration and removal procedures for Windows 98, Windows 2000 and Windows XP, please see the Device Driver manual.

When you install the MIC-3753/3753R Card, please make sure the installation of the DLL for MIC-3753/3753R is completed. You can then go on to install the MIC-3753/3753R card in your CompactPCI system. It is suggested that you refer to the user manual or related documentation if you have any doubt. Please follow the steps below to install the card on your system.

### **To install a card:**

**Step 1:** Remove the cover of an unused slot of your CompactPCI computer slot.

**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 lower edge of the backplane.

**Step 3:** Holding the lower handle, pull the handle down to unlock it.

**Step 4:** Insert the MIC-3753/3753R 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, and the **Blue LED** on the front panel of the card lights up.

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

**Step 6:** Now push the card into place rightly, and the **Blue LED** is going to be turned off.

**Step 7:** Secure the card by pushing in the handle to lock it into place, after the **Blue LED** has been turned off.

**Step 8:** If your CompactPCI computer power is on, the system can now configure the card automatically. After the system has finished the device configuration, you can find the card information in the **Device Manager**.

**Note:** If your card is properly installed, you should see the device name of your card listed on the Device Manager tab.

#### **To remove a card:**

**Step 1:** Push the handle down to unlock the card, and the CompactPCI system will uninstall the card configuration automatically.

**Step 2:** After the system has finished the device configuration, the **Blue LED** on the card is lit. Now you can slide the card out.

**Note:** *Because of the card's hot swap capability, the steps above are for removing a card when the system is on*

If system power is off, please do **step1** and **step2** without attending the **Blue LED's** state.

## 2.4 Board Layout: Dimensions

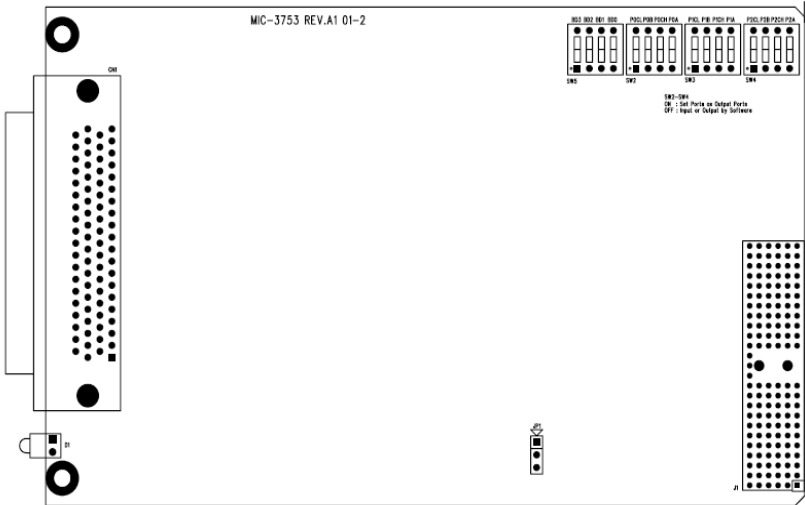


Figure 2.1: MIC-3753 Board Layout

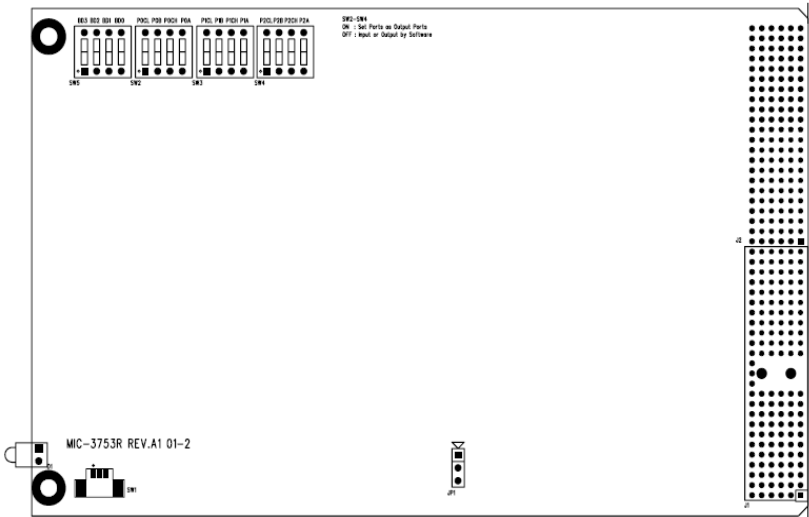
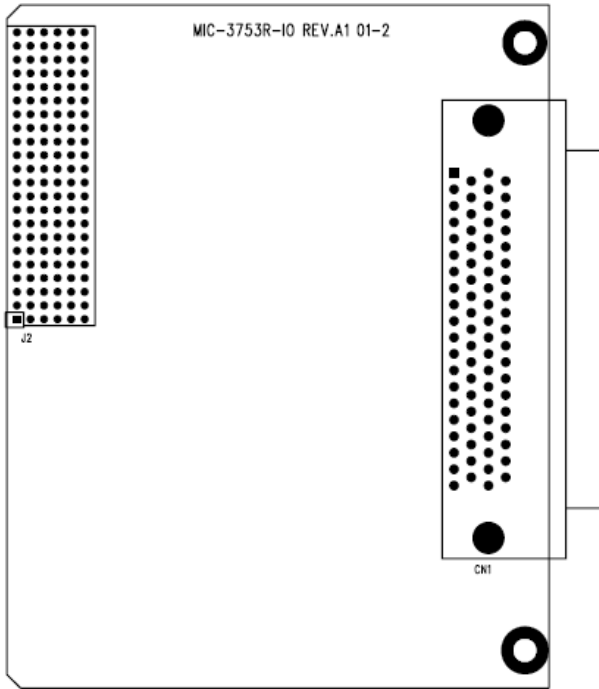


Figure 2.2: MIC-3753R Board Layout



*Figure 2.3: MIC-3753R Rear I/O Board Layout*

## 2.5 Jumper & Switch Settings

---

The MIC-3753/3753R has been designed with ease-of-use in mind. It is a "plug and play" card, i.e. the system BIOS assigns the system resources such as base address and interrupt automatically. There are only two functions with one jumper and four switches on the MIC-3753/3753R. The following section describes how to configure the card. You may want to refer to the figure below for help in identifying card components.

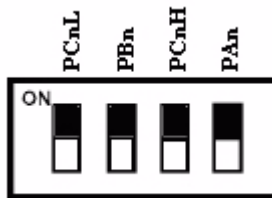


### Switch (SW2, SW3, SW4) Settings

When the switch of JPA0, JPB0, JPC0L, JPC0H, JPA1, JPB1, JPC1L, JPC1H, JPA2, JPB2, JPC2L or JPC2H are all “OFF” (i.e., by setting the switch), the corresponding ports are set to be configurable as input or output ports by software (PA0 means switch pin for port A0, PB0 means switch pin for port B0, etc. See Table 2-1).



By Setting the switches of PA0, PB0, PC0L, PC0H, PA1, PB1, PC1L, PC1H, PA2, PB2, PC2L or PC2H “ON”, a user sets the corresponding ports to be output ports. (PA0 means switch pin for port A0, PB0 means switch pin for port B0, etc.) The initial state of each of these ports after system power on or reset will be logic 0 (voltage low), unless jumper JP1 determines otherwise. (See Jumper JP1 below.)



**Table 2.1: Switch Setting**

Switch		Set port as Output	Set port I/O by software
SW2	PC0L	ON	OFF
	PB0	ON	OFF
	PC0H	ON	OFF
	PA0	ON	OFF
SW3	PC1L	ON	OFF
	PB1	ON	OFF
	PC1H	ON	OFF
	PA1	ON	OFF
SW4	PC2L	ON	OFF
	PB2	ON	OFF
	PC2H	ON	OFF
	PA2	ON	OFF

### Setting the BoardID via switch SW5

The MIC-3753/3753R has a built-in DIP switch (SW5) that is used to define the card's BoardID. The BoardID switch removes common installation problems when using several I/O cards in the same system. With a built-in DIP switch, each card is given a unique identifier, which is recognized by the OS so that you can easily match the physical card with its software. BoardID switches makes installation a breeze.

The MIC-3753/3753R BoardID was set to 0 at the factory. If you need to change the BoardID, set SW5 according to Table 2.2, BoardID Settings.

**Table 2.2: BoardID Settings**

SW5	Position 1	Position 2	Position 3	Position 4
Board ID	ID3	ID2	ID1	ID0
<b>0*</b>	ON	ON	ON	ON
<b>1</b>	ON	ON	ON	OFF
:	:	:	:	:
<b>14</b>	OFF	OFF	OFF	ON
<b>15</b>	OFF	OFF	OFF	OFF

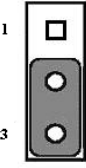
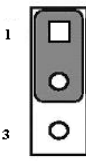
## Jumper JP1 Restores Ports to Their Condition Prior to Reset

Jumper JP1 gives the MIC-3753/3753R a new and valuable capability. With JP1 enabled (i.e., by shorting the lower two pins of JP1), the MIC-3753/3753R "memorizes" all port I/O 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 reset. This feature applies to both ports set by software, and to ports configured as output ports via a jumper. Depending on the application, this capability 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 chip clears chip memory. Thus, even if JP1 is enabled, if the power to the card is disconnected, the card's initial power-on state will be the state of an input port with voltage high input (for software-set ports) or the state of an output port with voltage low output (for jumper-set ports).

When jumper JP1 is not enabled (i.e., by shorting the upper two pins of JP1), both power-off and reset results in ports returning to the state of an input port with voltage high input (for software-set ports) or returning to the state of output port with voltage low output (for jumper-set ports)

**Table 2.3: JP1 Setting**

Jumper		Function description
JP1	 <p>Diagram showing a 3-pin jumper. Pin 1 is at the top with a square symbol. Pin 2 is in the middle with a circle symbol. Pin 3 is at the bottom with a circle symbol. A shaded rectangular area covers pins 2 and 3, indicating they are shorted.</p>	Enables the reset protection function. All ports return to the state held just prior to reset
	 <p>Diagram showing a 3-pin jumper. Pin 1 is at the top with a square symbol. Pin 2 is in the middle with a circle symbol. Pin 3 is at the bottom with a circle symbol. A shaded rectangular area covers pins 1 and 2, indicating they are shorted.</p>	Disables the reset protection function. All ports return to the default state (for software-set) or to output port, output low (for jumper-set ports) <b>(default)</b>

## **Operation**

Sections include:

- Overview
- Digital I/O Ports
- Interrupt Functions

# Chapter 3 Operation

## 3.1 Overview

---

This chapter describes the operating characteristics of the MIC-3753/3753R. The driver software bundled with this card allows a user to access all of the card's functions without register level programming. Please see the User's Manual included on the driver CD-ROM for more information. For users who prefer to implement their own bit-level programming to drive the card's functions, information useful for making such a program is included in this chapter.

## 3.2 Digital I/O Ports

---

### Introduction

The MIC-3753/3753R each emulates three 8255 programmable peripheral interface (PPI) chips in mode 0, but with higher driving capability than a standard 8255 chip. Each of these 8255 chip emulators has 24 programmable I/O pins that are divided into three 8-bit ports. The total 72 digital I/O pins on either the MIC-3753/3753R are divided into 9 ports, designated PA0, PB0, PC0, PA1, PB1, PC1, PA2, PB2 and PC2. Each port can be programmed as an input or an output port. The I/O pins in port A0 are designated PA00, PA01, ..., PA07; the pins in port B0 are designated PB00, PB01, ..., PB07, etc. These port names are used both in this manual and in the software library. Please refer to Section 1.5, Pin Assignments.

### 8255 Mode 0

The basic 8255 mode 0 features included on the MIC-3753/3753R cards are:

- 8-bit I/O ports - port A (PA) and port B (PB)
- Port C is divided into two nibble-wide (4-bit) I/O ports - PC upper and PC lower
- Any port can be used for either input or output.
- Output status can be read back.

## Input/Output Control

A control word can be written to a port's configuration register (Base+3, 7 and 11 respectively for ports 0, 1 and 2 on the MIC-3753/3753R) to set the port as an input or an output port, unless the ports are set as output ports via a switch (refer to Section 2.5, Jumper & Switches Settings).

Table 3-1 shows the format of a control word.

**Table 3.1: Bit map of port configuration register**

D7	D6	D5	D4	D3	D2	D1	D0
Not read	Not read	Not read	Port A 0:output 1:input	Port C upper bits 0:output 1:input	Not read	Port B 0:output 1:input	Port C low bits 0:output 1:input

*Note:* A control word has no effect if a jumper sets the corresponding port as an output port.

*Warning!* Before setting any port as an output port via software, make sure that a safe output value has also been set. An output voltage will appear at the pins immediately following the control word taking effect. If no output value was specified, the value will be Indeterminate (either 0 or 1), which may cause a dangerous condition.

## Initial Configuration

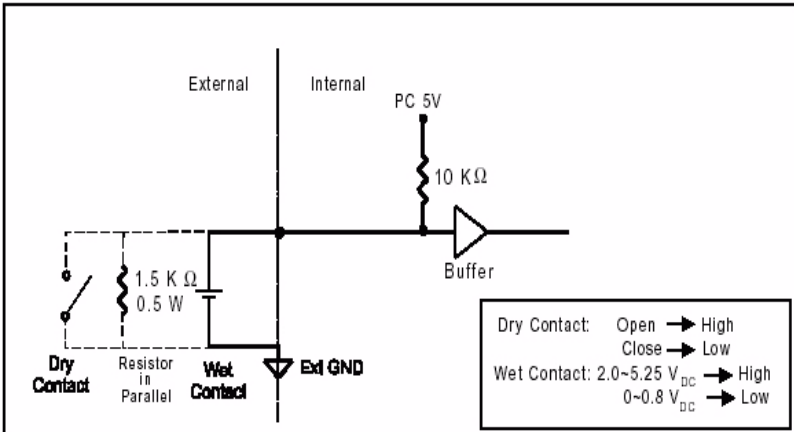
The initial configuration of each port depends on the input/output switches setting of each port, on the setting of the jumper JP1, and on whether the power was actually disconnected or whether the system was hot reset.

If jumper JP1 isn't enabled, all ports configured by software are automatically set as input ports during system start up or reset, with a default signal level of logic 1 (high). All ports set via switches as output ports are set as output ports during system start up or reset, signal level logic 0 (0 V).

If the jumper JP1 is enabled and the initial configuration is caused by a reset, all ports will return to the states they had just prior to the reset. The reset must be a "hot" reset (power not disconnected) for enabled JP1 to return ports to their prior values. Otherwise, the card behaves as though JP1 were not enabled. Please refer to "Jumper & Switch Settings" in **Chapter 2** for more information.

## Dry Contact Support for Digital Input

Each digital input channel accepts either dry contact or 0 ~ 5 V<sub>DC</sub> wet contact inputs. Dry contact capability allows the channel to respond to changes in external circuitry (e.g., the closing of a switch in the external circuitry) when no voltage is present in the external circuit. Figure 3-1 shows external circuitry with both wet and dry contact components, connected as an input source to one of the card's digital input channels.



**Figure 3.1: Wet and dry contact inputs**

**Note:** For wet contact configurations, a malfunction may occur if the internal resistance of the voltage source is significant (>1.5kΩ). It is advisable to connect a 1.5 kΩ resistor in parallel with such a voltage source to avoid a voltage rise inside the voltage source.

### 3.3 Interrupt Functions

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#### Introduction

Two lines of each I/O port C, plus ports A0 and B0, are connected to the interrupt circuitry. The “Interrupt Control Register” of the MIC-3753/3753R controls how the combination of these signals generates an interrupt. Six interrupt request signals can be generated at the same time, and then the software can service these six request signals by IRQ. The multiple interrupt sources provide the card with more capability and flexibility.

#### IRQ Level

The IRQ level is set automatically by the PCI plug-and-play BIOS and is saved in the PCI controller. There is no need for users to set the IRQ level. Only one IRQ level is used by this card, although it has six interrupt sources.

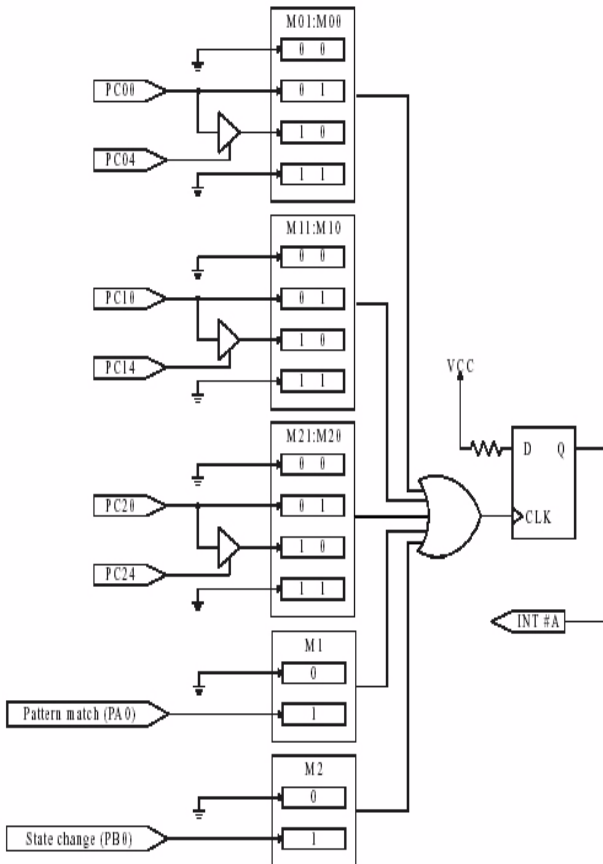
#### Interrupt Control Registers

The “Interrupt Control Registers” (Base + 16, 17 and 18 for the MIC-3753/3753R) control the interrupt signal sources, edges and flags. The following table shows the bit map of each interrupt control register. These registers are readable / writable. When writing to one of them, it is used as a control register, and when reading from it, it is used as a status register.

**Table 3.2: Interrupt control register bit map**

Base + 16	Port0							
Bit#	D7	D6	D5	D4	D3	D2	D1	D0
Abbreviation	F0	E0	M01	M00	F02	M2	F01	M1
Base + 17	Port1							
Bit#	D7	D6	D5	D4	D3	D2	D1	D0
Abbreviation	F1	E1	M11	M10	-	-	-	-
Base + 18	Port2							
Bit#	D7	D6	D5	D4	D3	D2	D1	D0
Abbreviation	F2	E2	M21	M20	-	-	-	-

- Mn0 and Mn1:** “mode bits” of port Cn (n = 0 ~ 2)
- M1:** pattern match port enable control bit of port A0
- M2:** change of state port enable control bit of port B0
- En:** triggering edge control bit (n = 0 ~ 2)
- Fn:** interrupt flag bit of port Cn (n = 0 ~ 2)
- F01:** pattern match interrupt flag bit of port A0
- F02:** change of state interrupt flag bit of port B0



**Figure 3.2: Interrupt sources**

## Interrupt Source Control

The “mode bits” in the interrupt control registers determine the allowable sources of signals generating an interrupt. For the MIC-3753/3753R, bit 4 and bit 5 of Base+16 determine the interrupt source of port C0, bit 4 and bit 5 of Base+17 determine the interrupt source for port C1, and so forth. Please refer the table in Appendix A to find the corresponding address for the interrupt source control of each port C.

The following table shows the relationship between an interrupt source and the values in the mode bits.

<b>Table 3.3: Interrupt mode bit values</b>		
Base + 16		Port0
M01	M00	Description
0	0	Disable interrupt
0	1	Source = PC00
1	0	Source = PC00 and PC04
1	1	Disable interrupt
Base + 17		Port1
M11	M10	Description
0	0	Disable interrupt
0	1	Source = PC00
1	0	Source = PC00 and PC04
1	1	Disable interrupt
Base +18		Port2
M11	M10	Description
0	0	Disable interrupt
0	1	Source = PC00
1	0	Source = PC00 and PC04
1	1	Disable interrupt

## Interrupt Triggering Edge Control

The interrupt can be triggered by a rising edge or a falling edge of the interrupt signal, selectable by the value written in the “triggering edge control” bit in the interrupt control register, as shown in following table.

<i>Table 3.4: Triggering edge control bit values</i>	
En (n = 0~2)	Triggering edge of interrupt signal
1	Rising edge trigger
0	Falling edge trigger

## Interrupt Flag Bit

The “interrupt flag” bit is a flag indicating the status of an interrupt. It is a readable and writable bit. Read the bit’s value to find the status of the interrupt; write “1” to this bit to clear the interrupt. This bit must be cleared in the ISR to service the next incoming interrupt.

<i>Table 3.5: Interrupt flag bit values</i>		
F01,F02 and Fn		Interrupt Status
Read	1	Interrupt exists
	0	No interrupt
Write	1	Clear interrupt
	0	Ignore

**F01:** pattern match interrupt flag bit of port A0

**F02:** change of state interrupt flag bit of port B0

**Fn:** interrupt flag bit of port Cn (n = 0 ~ 2)

## Pattern Match Interrupt Function

The MIC-3753/3753R provides a pattern match interrupt function for port A0. It monitors the status of the enabled input channels, which are chosen in Base+24, and compares the received state values with the pre-set state values written in Base+20. When the actual state values match the pre-set state values, the MIC-3753/3753R will deliver an interrupt signal to the system. This function releases the CPU from the burden of polling all of the I/O points, enabling a PC to handle more I/O points with higher performance. The following is an example.

**Example 3.1** Assume that the pattern match function for the I/O channels PA01, PA02, PA06 and PA07 of the MIC-3753/3753R is enabled (i.e. PA00, PA03, PA04 and PA05 on the MIC-3753/3753R are ignored during the pattern match monitoring process). The user can set the pattern match values for the enabled input channels, and these will be compared to the actual channel states of the enabled channels. The following is an example.

a) First, enable the pattern match interrupt function for channels PA01, PA02, PA06 and PA07

Bit#	7	6	5	4	3	2	1	1
Base+24	1	1	0	0	0	1	1	0

b) Write the pre-set pattern-match state of the enabled channels

Bit#	7	6	5	4	3	2	1	1
Base+20	1	0	x	x	x	1	1	x

c) Finally, enable the pattern match function for port A0 of the MIC-3753/3753R by writing a “1” in bit 0 of Base+16.

M1	Description
1	Enable the pattern match interrupt function for port A0
0	Disable the pattern match interrupt function for port A0

d) When the input signals at channels PA01, PA02 and PA07 are high and PA06 is low, an interrupt signal will be generated. This result is not affected by the states of channels PA00, PA03, PA04 and PA05.

### Change of State Interrupt Function

The MIC-3753/3753R also provides the change of state interrupt function for port B0. It monitors the status of the enabled channels of port B0, which are chosen in Base+28. When one of the enabled channels changes its state, the MIC-3753/3753R delivers an interrupt signal to the system to handle this event. The following is an example.

**Example 3.2** Assume that the change of state interrupt function for the I/O channels PB01, PB02, PB06 and PB07 on the MIC-3753/3753R are enabled (i.e. the signals in PB00, PB03, PB04 and PB05 on the MIC-3753/3753R are ignored during the change of state process). When a change of state occurs in either PB01 or PB02 or PB06 or PB07, an interrupt signal will be delivered to the system.

a) First, enable the change of state interrupt function for PB01, PB02, PB06 and PB07 of the MIC-3753/3753R.

Bit#	7	6	5	4	3	2	1	1
Base+28	1	1	0	0	0	1	1	0

M2	Description
1	Enable the change of state interrupt function for port A0
0	Disable the change of state interrupt function for port A0

b) Then, enable the change of state interrupt function for port B0 of the MIC-3753/3753R by writing a “1” in bit 2 of Base+28.

c) When a change of state occurs in PB01 or PB02 or PB06 or PB07 on the MIC-3753/3753RE, an interrupt signal is generated.

APPENDIX  
**A**

**Register Format**

# Appendix A Register Format

## A.1 Register format

Base Address + (Decimal)	Function	
	Read	Write
0	Port A0	Port A0
1	Port B0	Port B0
2	Port C0	Port C0
3		Port 0 Configuration Register
4	Port A1	Port A1
5	Port B1	Port B1
6	Port C1	Port C1
7		Port 1 Configuration Register
8	Port A2	Port A2
9	Port B2	Port B2
10	Port C2	Port C2
11		Port 2 Configuration Register
12	-	-
13	-	-
14	-	-
15	-	-
16	Interrupt Control Register for Port 0	Interrupt Control Register for Port 0
17	Interrupt Control Register for Port 1	Interrupt Control Register for Port 1
18	Interrupt Control Register for Port 2	Interrupt Control Register for Port 2
19	-	-
20	-	Pattern Match Value Register for Port A0
24	-	Pattern Match Enable Register for Port A0
28	-	Change of State Enable Register for Port B0