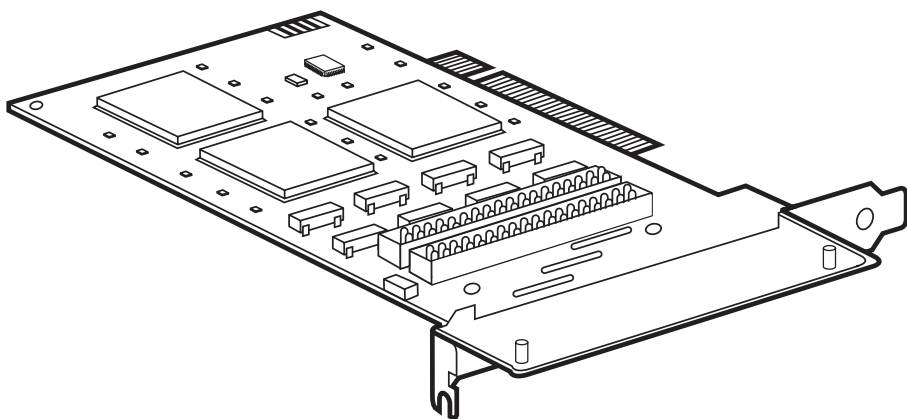




## Relay/Digital I/O Card PCI— 48 Inputs or Outputs



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**CUSTOMER  
SUPPORT  
INFORMATION**

Order **toll-free** in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)  
FREE technical support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**  
Mailing address: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018  
Web site: [www.blackbox.com](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto:info@blackbox.com)

**FEDERAL COMMUNICATIONS COMMISSION  
AND  
INDUSTRY CANADA  
RADIO FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

*This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.*

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.*

**EUROPEAN UNION DECLARATION OF CONFORMITY**

This equipment complies with the requirements of the European EMC Directive 89/336/EEC.



**NORMAS OFICIALES MEXICANAS (NOM)  
ELECTRICAL SAFETY STATEMENT**

**INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

### TRADEMARKS USED IN THIS MANUAL

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Windows® and Windows NT® are registered trademarks of Microsoft Corporation.

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# 1. Specifications

**Channels:** (48) input or output

**Current (Maximum):** 24 mA DC

**Signal:** TTL compatible address, data, and control

**Throughput (Maximum):** 600 Hz

**MTBF:** >150,000 hours (calculated)

**Temperature Range:** Operating: 32 to 122°F (0 to 50°C); Storage: -4 to +158°F (-20 to 70°C)

**Relative Humidity:** Operating and Storage: 10 to 90% noncondensing;

**Connectors:** (2) 50-pin IDC

**Power:** From the bus; Consumption: Supply line: +5 VDC; Rating: 270 mA

**Size:** 3.3"H x 4.7"W (8.4 x 11.9 cm)

**Shipping Weight:** 0.3 lb. (0.1 kg)

## 2. Introduction

### 2.1 Overview

The Relay/Digital I/O Card PCI—48 Inputs or Outputs provides two 8255 mode 0 compatible ports providing four 8-bit ports and four 4-bit ports. Each can be individually configured as inputs or outputs. When configured as outputs, each bit of the 4-bit ports may be set or reset individually.

### 2.2 What the Package Includes

Your package should contain the following items:

- Relay/Digital I/O Card PCI—48 Inputs or Outputs
- (1) CD-ROM containing SeaI/O software
- This users' manual

If anything is missing or damaged, please contact Black Box at 724-746-5500.



## 3. Installation

### 3.1 Overview

The Relay/Digital I/O Card PCI is a fully compliant PCI plug-and-play adapter. All card resources (I/O address, IRQ selection) are auto-assigned by either your system BIOS or your plug-and-play operating system.

### 3.2 Software Installation

#### 3.2.1 WINDOWS USERS

Choose **Install Software** at the beginning of the CD and select the **Digital I/O** software drivers and install **SeaI/O**.

#### 3.2.2 LINUX USERS

Refer to the installation instructions at the beginning of the CD for details on installing the digital I/O cards in Linux®.

### 3.3 System Installation

The Relay/Digital I/O Card PCI can be installed in any of the PCI expansion slots.

1. Turn off the PC's power. Disconnect the power cord.
2. Remove the PC's case cover.
3. Locate an available PC slot and remove the blank metal slot cover.
4. Remove the clamping portion of the bracket from the card.
5. Gently insert the Card into the slot. Make sure that the Card is seated properly.
6. Feed the two 50-pin ribbon cables through the cutout bracket and connect them to the card.
7. Replace the bracket retaining screw.
8. Install the clamping portion of the bracket.
9. Replace the computer cover.

10. Connect the power cord.

Installation is complete.

# 4. Technical Description

The Relay/Digital I/O Card PCI provides 48 channels of digital I/O configurable as inputs or outputs. Use the channels for PC-based control and automation including sensors, switches, satellite antenna control systems, video and audio studio automation, security control systems, and other industrial automation systems.

## 4.1 Pull-Ups

Nine or ten pin bussed resistor packs are installed to provide pull-ups to input ports. These are installed on all ports. The pull-up resistor packs are rated 10 K ohms.

Bussed Resistor	Corresponding Port	Bussed Resistor	Corresponding Port
RP4	Port A1	RP1	Port A2
RP5	Port B1	RP2	Port B2
RP6	Port C1	RP3	Port C2

## 4.2 Software

The Relay/Digital I/O Card PCI comes with the SeaI/O suite of Windows® 98, Me, 2000, and Windows NT® drivers. SeaI/O provides a consistent and straightforward applications program interface (API), allowing the developer to concentrate on the details of the application as opposed to low-level driver development. Popular development environments, including Visual C++, Visual Basic, and Delphi, are supported for application development. SeaI/O includes a utility for configuring the driver parameters under Windows, further simplifying installation.

## 4.3 Linux Users

The Relay/Digital I/O Card PCI ships with software for Linux, including a kernel-mode driver, API, and the SeaIOTst diagnostic tool. The kernel-mode driver is provided as a module, so future driver upgrades may be performed with minimal (usually zero) downtime. The Linux API is identical to the Windows counterpart, facilitating quick and easy ports of existing SeaI/O-aware applications to the Linux operating system. All source code for the Linux software suite is provided under the GNU Public License (GPL v2.0).

## 4.4 Register Description

Address		Mode	D7	D6	D5	D4	D3	D2	D1	D0
Base+0	Port A1	RD/WR	PA1D7	PA1D6	PA1D5	PA1D4	PA1D3	PA1D2	PA1D1	PA1D0
Base+1	Port B1	RD/WR	PB1D7	PB1D6	PB1D5	PB1D4	PB1D3	PB1D2	PB1D1	PB1D0
Base+2	Port C1	RD/WR	PC1D7	PC1D6	PC1D5	PC1D4	PC1D3	PC1D2	PC1D1	PC1D0
Base+3	Control Word Port 1	WR	CW1D7	0	0	CW1D4	CW1D3	CW1D2	CW1D1	CW1D0
Base+4	Interrupt configuration Port 1	RD/WR	0	0	0	0	0	IRQEN1	IRQC11	IRQC10
Base+5	Interrupt status for Port 1 and 2	RD	0	0	0	IRQST2	0	0	0	IRQST1
Base+8	Port A2	RD/WR	PA2D7	PA2D6	PA2D5	PA2D4	PA2D3	PA2D2	PA2D1	PA2D0
Base+9	Port B2	RD/WR	PB2D7	PB2D6	PB2D5	PB2D4	PB2D3	PB2D2	PB2D1	PB2D0
Base+A (10)	Port C2	RD/WR	PC2D7	PC2D6	PC2D6	PC2D4	PC2D3	PC2D2	PC2D1	PC2D0
Base+B (11)	Control Word Port 2	WR	CW2D7	0	0	CW2D4	CW2D3	CW2D2	CW2D1	CW2D0
Base+C (12)	Interrupt configuration Port 2	RD/WR	0	0	0	0	0	IRQEN2	IRQC21	IRQC20

## 4.5 Control Words

n = control word for port 1 or 2

### 4.5.1 I/O CONFIGURATION

CWnD0	Port C1 lower nibble (bits 0–3)	1=input 0=output 1 on power up
CWnD1	Port B1	1=input 0=output 1 on power up
CWnD2		0 or 1 (no effect)
CWnD3	Port C1 upper nibble (bits 4–7)	1=input 0=output 1 on power up
CWnD4	Port A1	1=input 0=output 1 on power up
CWnD5		0 or 1 (no effect)
CWnD6		0 or 1 (no effect)
CWnD7		Always a 1

Control Word (X=0)								Hex Value	Port Setup			
7	6	5	4	3	2	1	0		A	B	C Upper	C Lower
1	X	X	0	0	X	0	0	80	Out	Out	Out	Out
1	X	X	0	0	X	0	1	81	Out	Out	Out	In
1	X	X	0	0	X	1	0	82	Out	In	Out	Out
1	X	X	0	0	X	1	1	83	Out	In	Out	In
1	X	X	0	1	X	0	0	88	Out	Out	In	Out
1	X	X	0	1	X	0	1	89	Out	Out	In	In
1	X	X	0	1	X	1	0	8A	Out	In	In	Out
1	X	X	0	1	X	1	1	8B	Out	In	In	In
1	X	X	1	0	X	0	0	90	In	Out	Out	Out
1	X	X	1	0	X	0	1	91	In	Out	Out	In
1	X	X	1	0	X	1	0	92	In	In	Out	Out
1	X	X	1	0	X	1	1	93	In	In	Out	In
1	X	X	1	1	X	0	0	98	In	Out	In	Out
1	X	X	1	1	X	0	1	99	In	Out	In	In
1	X	X	1	1	X	1	0	9A	In	In	In	Out
1	X	X	1	1	X	1	1	9B	In	In	In	In

## 4.5.2 BIT SET OR RESET PORT C

n = port number

CWnD0	1 = set to +5V	0 = Reset to GND
CWnD4	0 or 1 (no effect)	
CWnD5	0 or 1 (no effect)	
CWnD6	0 or 1 (no effect)	
CWnD7	Always a zero when using Bit set/reset	

### Bit Select

CWnD3	CWnD2	CWnD1	C1 Bit
0	0	0	= 0
0	0	1	= 1
0	1	0	= 2
0	1	1	= 3
1	0	0	= 4
1	0	1	= 5
1	1	0	= 6
1	1	1	= 7

(continued on the next page)

## RELAY/DIGITAL I/O CARD PCI—48 INPUTS OR OUTPUTS

Control Word (X=0)								Hex Value	Port C Bit
7	6	5	4	3	2	1	0		
Reset									
0	X	X	X	0	0	0	0	00	0
0	X	X	X	0	0	1	0	02	1
0	X	X	X	0	1	0	0	04	2
0	X	X	X	0	1	1	0	06	3
0	X	X	X	1	0	0	0	08	4
0	X	X	X	1	0	1	0	0A	5
0	X	X	X	1	1	0	0	0C	6
0	X	X	X	1	1	1	0	0E	7
Set									
0	X	X	X	0	0	0	1	01	0
0	X	X	X	0	0	1	1	03	1
0	X	X	X	0	1	0	1	05	2
0	X	X	X	0	1	1	1	07	3
0	X	X	X	1	0	0	1	09	4
0	X	X	X	1	0	1	1	0B	5
0	X	X	X	1	1	0	1	0D	6
0	X	X	X	1	1	1	1	0F	7

### 4.5.3 INTERRUPT CONTROL

IRQENX	interrupt enable      1=enabled      2=disabled (0 on power up)
IRQCX0	Interrupt mode select (see table in <b>Section 4.5.4</b> )
IRQCX1	Interrupt mode select (see table in <b>Section 4.5.4</b> )

### 4.5.4 INTERRUPT MODE SELECT TABLE

IRQCX1	IRQCX0	INT Type
0	0	Low level
0	1	High level
1	0	Falling edge
1	1	Rising edge

## 4.5.5 INTERRUPT READ

Reading this port clears the interrupt.

IRQST1	(D0) Interrupt status	1 = interrupt pending, 0 = none
IRQST2	(D4) Interrupt status	1 = interrupt pending, 0 = none

## 4.6 50-Pin Ribbon Cable Pinout

Description	Pin #
<b>Port A</b>	
A0	47
A1	45
A2	43
A3	41
A4	39
A5	37
A6	35
A7	33
<b>Port B</b>	
B0	31
B1	29
B2	27
B3	25
B4	23
B5	21
B6	19
B7	17
<b>Port C</b>	
C0	15
C1	13
C2	11
C3	9
C4	7
C5	5
C6	3
C7	1
GND	All even pins
+5 V	49



# Appendix A. Troubleshooting

## A.1 Tips

Following these simple steps can eliminate most common problems.

1. Install software *first*. After installing the software, add the hardware. This places the required installation files in the correct locations.
2. Identify all I/O cards currently installed in your system. This includes your on-board serial ports, controller cards, sound cards, etc. The I/O addresses used by these cards, as well as the IRQ (if any) should be identified.
3. Make sure that there is no conflict with currently installed cards. No two cards can occupy the same I/O address and may not be allowed to share IRQs.
4. Make sure the Systems card is securely installed in a motherboard slot.

## A.2 Calling Black Box

If you determine that your Relay/Digital I/O Card PCI—48 Inputs or Outputs is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

### **A.3 Shipping and Packaging**

If you need to transport or ship your Relay/Digital I/O Card PCI:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the Relay/Digital I/O Card PCI for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Authorization (RA) number.

# Appendix B. Board Layout

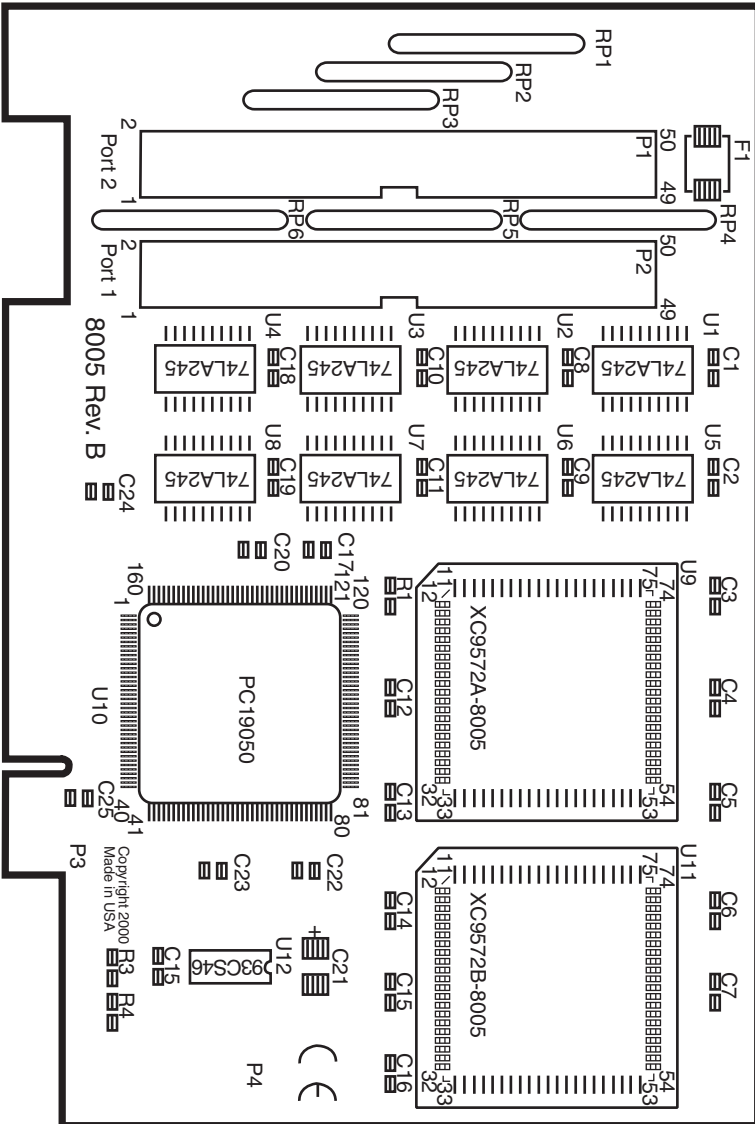


Figure B-1. Board layout.



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