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Find the *Contec Bus-PCI(PCI)* at our website: *Click HERE*

BUF-PCI(PC), BUF-PCI(98)

Bus Expansion

User's Guide

CONTEC

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Product Configuration

- BUS-PCI(PCI) Board ... 1
- BUS-PCI(PC) Board or BUS-PCI(98) Board ... 1
- Connecting Cable … 1
- BUF-PCI Driver Install Disk (3.5 inch / 1.44MB) ... 2
- User's Guide (this booklet) ... 1

Unpacking:

This board is specially packed in an anti-static bag to prevent damage in shipping.

Check the contents to make sure that you have everything listed above. If you do not have all the items, contact your distributor or CONTEC group office where you purchased.

Note!

Do not remove the board from its protective packaging until the computer case is open and ready for installation. Electrical static can cause damage to electrical components.

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1. Introduction

About the BUF-PCI(PC) or BUF-PCI(98)

Thank you for purchasing the BUF-PCI(PC) or BUF-PCI(98).

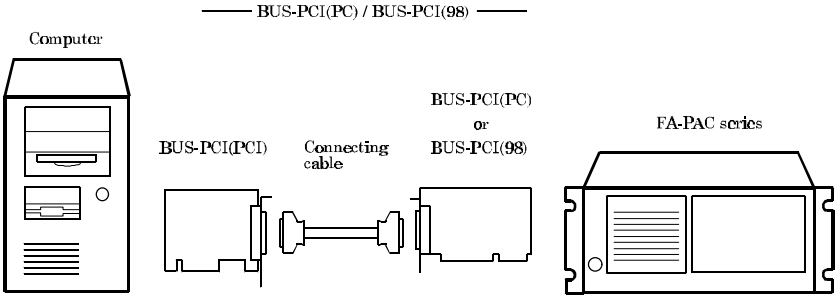
The product is a bus conversion adapter that allows you to add ISA or C bus-equivalent expansion slots by connecting the PCI bus expansion slot in the PC with the CONTEC I/O expansion unit.

Please read this document thoroughly before starting building a system, including creating application programs and connecting with external devices.

This product consists of the following

- BUS-PCI(PCI) board (to be mounted in the PCI bus expansion slot in the PC)
- BUS-PCI(PC) board or BUS-PCI(98) board (to be mounted in CONTEC's I/O expansion unit)
- Cable for connecting the above two products

In order to use the adapter, you need an I/O expansion unit FA-PAC series, which is sold separately, in addition to the above.



Features

- The BUS-PCI(PCI) board is a PCI bus-compliant interface board which can be used with the IBM PC-AT compatibles, NEC PC98-NX series, and PC-9800 series in which a PCI bus expansion slot is available.
- Allows you to add I/O-accessible ISA or C bus-equivalent expansion slots.
- Verifies an interrupt request from the interface board mounted in the I/O expansion unit to accomplish the interrupt process.
- Driver software for control of the interface board mounted in the I/O expansion unit is available for Windows XP, Windows 2000, Windows NT, Windows Me, Windows 98 and Windows 95.
- The I/O access wait and the refresh signal for the I/O expansion unit can be enabled or disabled.
- Comes with a self-diagnostic feature.

Functions

General-purpose I/O accessing

Allows you to access an added expansion slot for I/O. The I/O wait can be specified with software.

Interruption

An interrupt can be generated with an interrupt request signal from the added expansion slot. The status of the interrupt request signal can also be verified.

Control of the refresh signal

Enabling or disabling of the refresh signal for the added expansion slot can be specified with software.

Self-testing

Allows self-testing using a dedicated register mounted on the board.

Limited Three-Year Warranty

CONTEC Interface boards are warranted by CONTEC CO., LTD. to be free from defects in material and workmanship for up to three years from the date of purchase by the original purchaser.

Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.

This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original boards. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization Number (RMA) from the CONTEC group office where you purchased before returning any product.

*** No product will be accepted by CONTEC group without the RMA number.**

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

Restrictions

The expansion slot this product adds to the I/O expansion unit is not fully compatible with the expansion slot in the PC. For this reason, a board that can be mounted and used in the expansion unit is subject to some restrictions.

A board that operates only with I/O accessing (I/O instructions) can be mounted and used in the expansion unit. A board that requires specialized operations might not function properly even if it operates with I/O accessing. Before using therefore, be sure to verify the specifications of the board you will be mounting in the I/O expansion unit.

The following boards cannot be used.

- A board that uses specific I/O port addresses (a board that does not allow its I/O port addresses to be reset, such as a PnP board)
- A board that uses memory accessing (a memory expansion board or a board that uses an extended ROM area)
- A board that uses DMA
- A board that outputs control signals to the PC, such as an external CPU board
- A board that is used to add another I/O expansion unit
- A board specifically mentioned that it cannot be used in the manual of a PC which uses an I/O expansion unit
- A board that requires an I/O wait of more than one microsecond
- A board that uses I/O port address lower 8 bits F8h-FFh

Handling Precautions

Be aware of the following precautions when handling this board:

- To prevent the board from being damaged, avoid shock and vibration and do not bend the board.
- Do not modify the board. CONTEC is not responsible for modified boards.
- Do not touch gold-plated terminals (edge connectors) on the board. Touching the terminals causes poor contact. If you accidentally touch a terminal, wipe it off with industrial alcohol.
- The board has switches which you need to set. Be sure to verify these switches before mounting the board in the slot.
- Set the switches and jumpers on the board as designated. Setting them otherwise will cause failures.
- Connect only designated signals to the connectors on the board. Connecting otherwise will cause failures.
- Mount the board only in the designated expansion slot.
- Do not insert or remove the board with the PC or the I/O expansion unit turned on. Inserting or removing the board with either power turned on will cause failures. Be sure to turn the PC or the I/O expansion unit off.
- The total current consumption of the board to be mounted in the expansion slot of the PC or I/O expansion unit must not exceed the power capacity allowed for the PC or the I/O expansion unit. Exceeding the limit will cause failures.

About the Manual

This manual consists of the following chapters:

Chapter 1	Introduction
Chapter 2	Setup Explains product setup procedures and switch setting procedures for using this product.
Chapter 3	Programming Explains programming procedures needed to use this product.
Chapter 4	System Reference Explains the specifications of this product.
Chapter 5	Troubleshooting Refer to this chapter when you have trouble with setting up the product or when it does not function normally.
Chapter 6	Index

2. Setup

This chapter explains how to set up the environment that allows this product to be used.

Setup Procedure

Set up the product following these steps.

(1) Setting up and mounting the BUS-PCI(PCI) board

(2) Setting up and mounting the BUS-PCI(PC) or BUS-PCI(98) board

(3) Connecting the PC to the I/O expansion unit

(4) Turning power on

(5) Installing the BUF-PCI driver

(6) Mounting a board to be used in the I/O expansion unit

Setting Up and Mounting the BUS-PCI(PCI) Board

DIP switch SW1 allows you to set whether or not to use interrupt resources and the board ID. Figure 2.1 shows its factory settings.

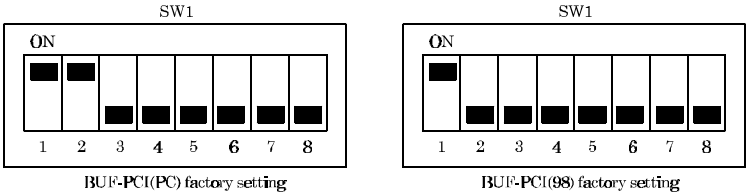


Figure 2.1. DIP Switch SW1

Setting Whether or not to Use Interrupt Resources

Specify whether or not to use interrupt resources with DIP switch SW1-1.

When using the interrupt function of the board mounted in the I/O expansion unit, set SW1-1 to ON. This allows an interrupt request to be sent to the PC through the PCI bus using one interrupt resource assigned to the BUS-PCI(PCI) board.

If SW1-1 is set to OFF, no interrupt resource is assigned from the PC to the BUS-PCI(PCI) board.

Table 2.1. Specifying Whether or not to Use Interrupt Resources

SW1-1	Interrupt function
OFF	Disabled
ON	Enabled

Setting the Board ID

A board ID is the number by which a BUS-PCI(PCI) board is identified. When several of these boards are used with one PC, board IDs allow each BUS-PCI(PCI) board to be distinguished.

Specify a different value for each board ID.

To specify a board ID, use SW1-5, 6, 7, and 8. Board IDs can be set in a range of 0-15 for a maximum of 16 boards.

When using just one board, use its factory setting (board ID=0).

Table 2.2. Setting Board IDs

SW1-5	SW1-6	SW1-7	SW1-8	BOARD ID
OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	ON	1
OFF	OFF	ON	OFF	2
OFF	OFF	ON	ON	3
OFF	ON	OFF	OFF	4
OFF	ON	OFF	ON	5
OFF	ON	ON	OFF	6
OFF	ON	ON	ON	7

SW1-5	SW1-6	SW1-7	SW1-8	BOARD ID
ON	OFF	OFF	OFF	8
ON	OFF	OFF	ON	9
ON	OFF	ON	OFF	10
ON	OFF	ON	ON	11
ON	ON	OFF	OFF	12
ON	ON	OFF	ON	13
ON	ON	ON	OFF	14
ON	ON	ON	ON	15

Notes!

- For the BUF-PCI(PC), set SW1-2 to ON.
- For the BUF-PCI(98), set SW1-2 to OFF.
- Set SW1-3 and SW1-4 to OFF.

Mounting the BUS-PCI(PCI) Board

After making sure that the PC is turned off, disconnect the PC power plug from the socket on the equipment.

Next, mount the BUS-PCI(PCI) board in the PCI expansion slot in the PC. For information about mounting the board, see mounting instructions in the PC manual.

Note!

Before mounting the BUS-PCI(PCI) board, be sure to disconnect the PC power plug from the socket on the equipment.

Setting Up and Mounting the BUS-PCI(PC) or BUS-PCI(98) Board

Setting Up I/O Expansion Unit Power Control

CN2 is the connector to be connected to a power supply source in compliance with ATX specifications.

When using with an I/O expansion unit having an ATX power supply source, connecting each terminal to 5VSB, PS-ON, and GND of the ATX power supply source allows you to interlock the I/O expansion unit power with the turning ON/OFF of the PC.

CN3 on the BUS-PCI(PC) board is the connector that connects to the power LED on the I/O expansion unit.

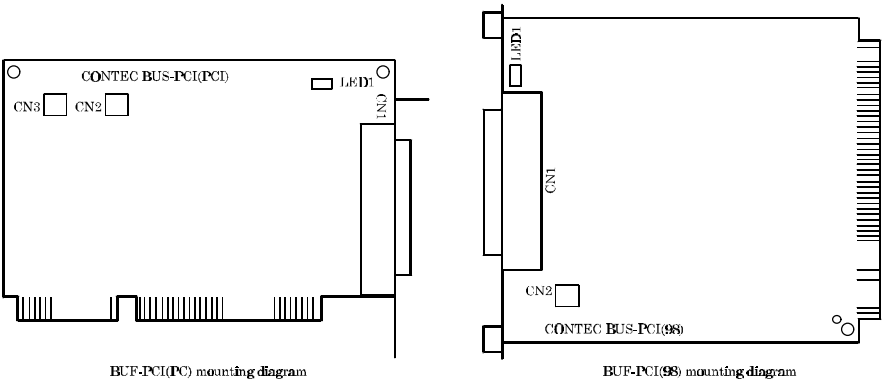


Figure 2.2. Mounting Diagrams

Mounting the BUS-PCI(PC) or BUS-PCI(98) Board

After making sure that I/O expansion unit is turned off, disconnect its power plug from the socket on the equipment.

Next, mount the BUS-PCI(PC) or BUS-PC(98) board in the I/O expansion unit. For information about mounting either board, follow instructions in the manual that came with the expansion unit.

Note!

Before mounting the BUS-PCI(PC) or BUS-PC(98) board, be sure to disconnect the I/O expansion unit power plug from the socket on the equipment.

Connecting the PC to the I/O Expansion Unit

After mounting the board, connect the BUS-PCI(PCI) to the BUS-PCI(PC) or BUS-PCI(98) using the cable that came with the product. A connector of the identical model is attached to either end of the cable. Connect the cable firmly to each connector.

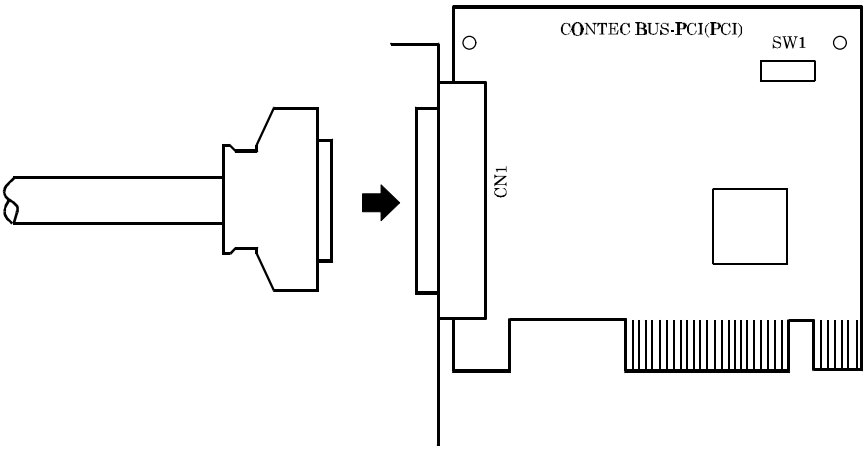


Figure 2.3. Connection Diagram

Note!

When connecting, do not apply excessive force to prevent failures.

Turning Power On

After you are finished with connecting, turn the power on following these steps.

(1) Connect the receptacle on the I/O expansion unit.

(2) Connect the receptacle on the PC.

(3) Turn the I/O expansion unit on. At this time, be sure that the LED is lit on the BUS-PCI(PC) or BUS-PCI(98) board.

(4) Turn the PC on.
At this time, be sure that the LED is lit on the BUS-PCI(PC). Be also sure that the PC starts up normally. If it does not, see troubleshooting described later in this manual.

Next, install the BUF-PCI driver software.

Installing the BUF-PCI Driver Software

Install software, such as the BUF-PCI driver, and verify operations using the self-diagnostic program. This product supports the Windows XP, Windows 2000, Windows NT, Windows 98, Windows 95, and MS-DOS environment. Install the software according to the OS you are using.

Installing for Windows XP

Install the software for Windows XP following these steps.

(1) Install the BUS-PCI(PCI) board hardware.

(2) Install the BUF-PCI driver software.

(3) Restart the system.

(4) Run the BUF-PCI self-diagnostic program.

Installing the BUS-PCI(PCI) board hardware

Before the BUS-PCI(PCI) board can be used under Windows XP, the OS must recognize the I/O address and interrupt level(IRQ) to be used for BUS-PCI(PCI) board. Use the appropriate procedure to install the BUS-PCI(PCI) board.

(1) Start Windows XP with Administrator.

(2) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(3) Windows XP will come up with the [New Hardware] detection dialog box.

(4) In the [Welcome to the Found New Hardware Wizard] dialog box. Check [Install the software automatically [recommended]] and select [Next>].

Notes!

- *In Windows XP, the Hardware Wizard displays the following alert dialog box when you have located the INF file. This dialog box appears, only indicating that the relevant driver has not passed Windows Logo testing, and it can be ignored without developing any problem with the operation of the board.*
  In this case, click on the [Continue Anyway] button.

(5) The [Completing the Found New Hardware Wizard] appears, then select [Finish]. This completes installation of the BUS-PCI(PCI) board.

Method of Installing Two of More BUS-PCI(PCI) Boards:

Following the procedure below to install two BUS-PCI(PCI) boards for use under Windows XP.

(1) Check that the first BUS-PCI(PCI) board has been setup correctly. as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.

(2) Exit Windows XP and turn the personal computer off.

(3) Check the board ID of the second BUS-PCI(PCI) board , then plug it into a PCI bus slot. Assigned ID to the second board a board ID that is different from the ID assigned to the first board.

(4) Turn the personal computer on again and start up Windows XP with Administrator.

(5) Windows XP will come up with "Insert Disk" dialog box. Insert the disk and select [OK]. This completes installation of the BUS-PCI(PCI) board. After finishing installing the board , be sure to check the assigned resource again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third or additional boards, all BUS-PCI(PCI) board that are already installed must be in PCI bus slots.

Notes!

- *A second BUS-PCI(PCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) to be used for the board can be allocated. Before attempting to install a second board, first determine which PC resources are free.*

- *The resources used for each BUS-PCI(PCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more BUS-PCI(PCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, check the resource settings again.*

Installing the BUF-PCI driver software

Install the BUF-PCI driver software following these steps.

(1) Start Windows XP with Administrator.

(2) Exit all other running applications.

(3) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(4) Start Explorer.

(5) Click the disk drive into which BUF-PCI Driver Install Disk 1 is inserted.

(6) Select and double-click the SETUP.EXE file.

(7) Follow the instructions displayed on the screen by the setup program.

(8) When the setup program ends, the installation of the BUF-PCI driver software is complete.

Note!

If you need to uninstall the BUF-PCI driver software, uninstall it using [Add/Remove Programs] in [Control Panel].

Restarting the system

Restart your system.

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) From the Windows XP Start button, select Programs.

(2) Select BUF-PCI self-test (VC) in CONTEC BUF-PCI.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *The IRQ Level item is not displayed if you disable the use of interrupt resources with DIP switch SW1 on the BUS-PCI(PCI) board.*
- *DOSST.EXE as the self-diagnostic program for DOS cannot run under the Command prompt.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Checking Resources

Follow the steps below to check the assigned resources managed by the OS.

(1) Open [Control Panel] from [My Computer].

(2) Double-click on the [System] to open the [System Properties] property sheet.

(3) Select [Hardware] tab and select [Device Manager...] to open the Device Manager.

(4) Click on the [Multifunction adapters] folder.

(5) Click on the [CONTEC Co.,Ltd.-BUS-PCI(PCI)] folder to display its properties.

(6) Select the [Resources] tab to check the resource settings and the conflicting device list.

Installing for Windows 2000

Install the software for Windows 2000 following these steps.

(1) Install the BUS-PCI(PCI) board hardware.

(2) Install the BUF-PCI driver software.

(3) Restart the system.

(4) Run the BUF-PCI self-diagnostic program.

Installing the BUS-PCI(PCI) board hardware

Before the BUS-PCI(PCI) board can be used under Windows 2000, the OS must recognize the I/O address and interrupt level(IRQ) to be used for BUS-PCI(PCI) board. Use the appropriate procedure to install the BUS-PCI(PCI) board.

(1) Start Windows 2000 with Administrator.

(2) Windows 2000 will come up with the [New Hardware] detection dialog box. In the [Welcome to the Found New Hardware Wizard] that appears next, select [Next>].

(3) In the [Install Hardware Device Driver] dialog box. Check [Search for a suitable driver for my device [recommended]] and select [Next>].

(4) In the [Locate Driver Files] dialog box, check [Floppy disk drives] and select [Next>].

(5) In the [Driver Files Search Results] dialog box, select [Next>].

(6) The [Completing the Found New Hardware Wizard] appears, then select [Finish]. This completes installation of the BUS-PCI(PCI) board.

Method of Installing Two of More BUS-PCI(PCI) Boards:

Following the procedure below to install two BUS-PCI(PCI) boards for use under Windows 2000.

(1) Check that the first BUS-PCI(PCI) board has been setup correctly. as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.

(2) Exit Windows2000 and turn the personal computer off.

(3) Check the board ID of the second BUS-PCI(PCI) board , then plug it into a PCI bus slot. Assigned ID to the second board a board ID that is different from the ID assigned to the first board.

(4) Turn the personal computer on again and start up Windows 2000 with Administrator.

(5) Windows 2000 will come up with "Insert Disk" dialog box. Insert the disk and select [OK]. This completes installation of the BUS-PCI(PCI) board. After finishing installing the board , be sure to check the assigned resource again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third or additional boards, all BUS-PCI(PCI) board that are already installed must be in PCI bus slots.

Notes!

- *A second BUS-PCI(PCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) to be used for the board can be allocated. Before attempting to install a second board, first determine which PC resources are free.*
- *The resources used for each BUS-PCI(PCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more BUS-PCI(PCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, check the resource settings again.*

Installing the BUF-PCI driver software

Install the BUF-PCI driver software following these steps.

(1) Start Windows 2000 with Administrator.

(2) Exit all other running applications.

(3) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(4) Start Explorer.

(5) Click the disk drive into which BUF-PCI Driver Install Disk 1 is inserted.

(6) Select and double-click the SETUP.EXE file.

(7) Follow the instructions displayed on the screen by the setup program.

(8) When the setup program ends, the installation of the BUF-PCI driver software is complete.

Note!

If you need to uninstall the BUF-PCI driver software, uninstall it using [Add/Remove Programs] in [Control Panel].

Restarting the system

Restart your system.

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) From the Windows 2000 Start button, select Programs.

(2) Select BUF-PCI self-test (VC) in CONTEC BUF-PCI.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *The IRQ Level item is not displayed if you disable the use of interrupt resources with DIP switch SW1 on the BUS-PCI(PCI) board.*
- *DOSST.EXE as the self-diagnostic program for DOS cannot run under the Command prompt.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Checking Resources

Follow the steps below to check the assigned resources managed by the OS.

(1) Open [Control Panel] from [My Computer].

(2) Double-click on the [System] to open the [System Properties] property sheet.

(3) Select [Hardware] tab and select [Device Manager...] to open the Device Manager.

(4) Click on the [Multifunction adapters] folder.

(5) Click on the [CONTEC Co.,Ltd.-BUS-PCI(PCI)] folder to display its properties.

(6) Select the [Resources] tab to check the resource settings and the conflicting device list.

Installing for Windows NT

Install the software for Windows NT following these steps.

(1) Verify PC settings.

(2) Install the BUF-PCI driver software.

(3) Restart the system.

(4) Run the BUF-PCI self-diagnostic program.

Verifying PC settings

Be sure that [PnP OS] is either [disabled] or set to [not to use] in the PC's BIOS setup. If this is set to [Windows 95], for example, the BUS-PCI(PCI) might not be recognized properly.

Installing the BUF-PCI driver software

Install the BUF-PCI driver software following these steps.

(1) Start Windows NT with Administrator.

(2) Exit all other running applications.

(3) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(4) Start Explorer.

(5) Click the disk drive into which BUF-PCI Driver Install Disk 1 is inserted.

(6) Select and double-click the SETUP.EXE file.

(7) Follow the instructions displayed on the screen by the setup program.

(8) When the setup program ends, the installation of the BUF-PCI driver software is complete.

Note!

If you need to uninstall the BUF-PCI driver software, uninstall it using [Add/Remove Programs] in [Control Panel].

Restarting the system

Restart your system.

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) From the Windows NT Start button, select Programs.

(2) Select BUF-PCI self-test (VC) in CONTEC BUF-PCI.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *The IRQ Level item is not displayed if you disable the use of interrupt resources with DIP switch SW1 on the BUS-PCI(PCI) board.*
- *DOSST.EXE as the self-diagnostic program for DOS cannot run under the Command prompt.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Checking Resources

Follow the steps below to check the assigned resources managed by the OS.

(1) Open [Windows NT Diagnostic Program] from [Management Tools].

(2) Select [Resources] (IRQ/port settings). Check the types and settings of resources assigned to the relevant driver and the corresponding device list.

Installing for Windows Me

Install the software for Windows Me following these steps.

(1) Install the BUS-PCI(PCI) board hardware.

(2) Install the BUF-PCI driver software.

(3) Run the BUF-PCI self-diagnostic program.

Installing the BUS-PCI(PCI) board hardware

Before the BUS-PCI(PCI) board can be used under Windows Me, the OS must recognize the I/O addresses and interrupt level (IRQ) to be used for the BUS-PCI(PCI) board. Use the appropriate procedure to install the BUS-PCI(PCI) board.
In Windows Me, keep in mind that it takes about 5-10 minutes to detect the hardware.

(1) Turn the personal computer ON to start up Windows Me.

(2) Windows Me will come up with the [New Hardware] detection dialog box. After making sure that "PCI Multimedia Device" is displayed, insert the floppy disk into the drive, select "Automatic search for a better driver. (Recommended)," and press [Next>].

(3) The wizard will automatically detect the INF file on the floppy disk and complete the registration.

(4) In the next dialog box, you will find a message of “Windows has finished installing the new hardware device.” Then you click [Finish] to complete the installation of the board. After finishing installing the board, confirm the assigned resources. The "Checking resources" part of this section explains you how to do it.

Method of Installing Two or More BUS-PCI(PCI) Boards :

Follow the procedure below to install two BUS-PCI(PCI) boards for use under Windows Me.

(1) Check that the first BUS-PCI(PCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.

(2) Exit Windows Me and turn the personal computer off.

(3) Check the board ID of the second BUS-PCI(PCI) board, then plug it into a PCI bus slot. Assign ID to the second board a board ID that is different from the ID assigned to the first board.

(4) Turn the personal computer on again to start up Windows Me.

(5) Windows Me will come up with the [New Hardware] detection dialog box. After making sure that "CONTEC CO., LTD.-BUS-PCI(PCI)" is displayed, insert the floppy disk into the drive, select "Automatic search for a better driver. (Recommended)," and press [Next>].

(6) The wizard will automatically detect the INF file and complete the registration.

(7) In the next dialog box, you will find a message of “Windows has finished installing the new hardware device.” Then you click [Finish] to complete the installation of the board. This completes installation of the BUS-PCI(PCI) board. After finishing installing the board, confirm the assigned resources again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third board or additional boards, all BUS-PCI(PCI) boards that are already installed must be in PCI bus slots.

Notes!

- *The second BUS-PCI(PCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the second board, first determine what PC resources are free.*
- *The resources used for each BUS-PCI(PCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more BUS-PCI(PCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, re-check the resource settings.*

Installing the BUF-PCI driver software

Install the BUF-PCI driver software following these steps.

(1) Exit all other running applications.

(2) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(3) Start Explorer.

(4) Click the disk drive into which BUF-PCI Driver Install Disk 1 is inserted.

(5) Select and double-click the SETUP.EXE file.

(6) Follow the instructions displayed on the screen by the setup program.

(7) When the setup program ends, the installation of the BUF-PCI driver software is complete.

Note!

If you need to uninstall the BUF-PCI driver software, uninstall it using [Add/Remove Programs] in [Control Panel].

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) From the Windows Me Start button, select Programs.

(2) Select BUF-PCI self-test (VC) in CONTEC BUF-PCI.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *The IRQ Level item is not displayed if you disable the use of interrupt resources with DIP switch SW1 on the BUS-PCI(PCI) board.*
- *If your personal computer does not support the MS-DOS OS, DOSST.EXE as the self-diagnostic program for DOS might not run correctly under the MS-DOS prompt.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Checking Resources

Follow the steps below to check the assigned resources managed by the OS.

(1) Double-click on the [System] option in [Control Panel] to open the [System Properties] property sheet. Select the [Device Manager] tab.

(2) Click on the [Multi-function adapters] folder.

(3) Click on the [CONTEC Co., Ltd.-BUS-PCI(PCI)] folder to display its properties.

(4) Select the [Resources] tab to check the device type, resource settings, and the conflicting device list.

(5) If you want to change a resource setting, uncheck the [Use automatic settings] option in advance. To change the I/O address range (Input/Output Range), change the configuration name in the [Setting based on:] field. Since the interrupt level (Interrupt Request) cannot be changed, use the assigned IRQ.

Installing for Windows 98

Install the software for Windows 98 following these steps.

(1) Install the BUS-PCI(PCI) board hardware.

(2) Install the BUF-PCI driver software.

(3) Run the BUF-PCI self-diagnostic program.

Installing the BUS-PCI(PCI) board hardware

Before the BUS-PCI(PCI) board can be used under Windows 98, the OS must recognize the I/O addresses and interrupt level (IRQ) to be used for the BUS-PCI(PCI) board. Use the appropriate procedure to install the BUS-PCI(PCI) board.

(1) Turn the personal computer ON to start up Windows 98.

(2) Windows 98 will come up with the [New Hardware] detection dialog box. In the [Add New Hardware Wizard] that appears next, check that "Multimedia Device" has been listed, then select [Next>].

(3) In the next dialog box, select a radio button of [Search for the best driver for your device. (Recommended).], then select [Next>].

(4) In the next dialog box, select two check box both of [Floppy disk drives] and [Specify Location:], then enter the drive name: \Win95 in the [Location] field. Insert BUF-PCI Driver Install Disk 1 into the disk drive, then select [Next>].

(5) In the [Windows driver file search for the device] dialog box, check that "CONTEC Co., Ltd.-BUF-PCI(PCI)" and "BUF_PI0.INF" in the [Location of driver] has been listed, then select [Next>].

(6) In the next dialog box, check the "Windows has finished installing the software that your new hardware device requires." message, then select [Finish]. This completes installation of the BUS-PCI(PCI) board.
After finishing installing the board, confirm the assigned resources. The "Checking resources" part of this section explains you how to do it.

Method of Installing Two or More BUS-PCI(PCI) Boards :

Follow the procedure below to install two BUS-PCI(PCI) boards for use under Windows 98.

(1) Check that the first BUS-PCI(PCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.

(2) Exit Windows 98 and turn the personal computer off.

(3) Check the board ID of the second BUS-PCI(PCI) board, then plug it into a PCI bus slot. Assign ID to the second board a board ID that is different from the ID assigned to the first board.

(4) Turn the personal computer on again to start up Windows 98.

(5) Windows 98 will come up with the [New Hardware] detection dialog box. In the [Add New Hardware Wizard] that appears next, check that "CONTEC Co., Ltd.-BUS-PCI(PCI)" has been listed, then select [Next>].

(6) In the next dialog box, select a radio button of [Display a list of all the drivers in a specific location, so you can select the driver you want.], then select [Next>].

(7) In the next dialog box, select "CONTEC Co., Ltd.-BUS-PCI(PCI)" from [Models], then select [Next>].

(8) In the [Windows driver file search for the device] dialog box, check that "CONTEC Co., Ltd.-BUF-PCI(PCI)" and "CONTEC~*.INF" in the [Location of driver] has been listed, then select [Next>]. (* is a number which the OS assigned.)

(9) In the next dialog box, check the "Windows has finished installing the software that your new hardware device requires." message, then select [Finish]. This completes installation of the BUS-PCI(PCI) board. After finishing installing the board, confirm the assigned resources again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third board or additional boards, all BUS-PCI(PCI) boards that are already installed must be in PCI bus slots.

Notes!

- *The second BUS-PCI(PCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the second board, first determine what PC resources are free.*
- *The resources used for each BUS-PCI(PCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more BUS-PCI(PCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, re-check the resource settings.*

Installing the BUF-PCI driver software

Install the BUF-PCI driver software following these steps.

(1) Exit all other running applications.

(2) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(3) Start Explorer.

(4) Click the disk drive into which BUF-PCI Driver Install Disk 1 is inserted.

(5) Select and double-click the SETUP.EXE file.

(6) Follow the instructions displayed on the screen by the setup program.

(7) When the setup program ends, the installation of the BUF-PCI driver software is complete.

Note!

If you need to uninstall the BUF-PCI driver software, uninstall it using [Add/Remove Programs] in [Control Panel].

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) From the Windows 98 Start button, select Programs.

(2) Select BUF-PCI self-test (VC) in CONTEC BUF-PCI.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *The IRQ Level item is not displayed if you disable the use of interrupt resources with DIP switch SW1 on the BUS-PCI(PCI) board.*
- *If your personal computer does not support the MS-DOS OS, DOSST.EXE as the self-diagnostic program for DOS might not run correctly under the MS-DOS prompt.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Checking Resources

Follow the steps below to check the assigned resources managed by the OS.

(1) Double-click on the [System] option in [Control Panel] to open the [System Properties] property sheet. Select the [Device Manager] tab.

(2) Click on the [Multi-function adapters] folder.

(3) Click on the [CONTEC Co., Ltd.-BUS-PCI(PCI)] folder to display its properties.

(4) Select the [Resources] tab to check the device type, resource settings, and the conflicting device list.

(5) If you want to change a resource setting, uncheck the [Use automatic settings] option in advance. To change the I/O address range (Input/Output Range), change the configuration name in the [Setting based on:] field. Since the interrupt level (Interrupt Request) cannot be changed, use the assigned IRQ.

Installing for Windows 95

Install the software for Windows 95 following these steps.

(1) Install the BUS-PCI(PCI) board hardware.

(2) Install the BUF-PCI driver software.

(3) Run the BUF-PCI self-diagnostic program.

Installing the BUS-PCI(PCI) board hardware

Before the BUS-PCI(PCI) board can be used under Windows 95, the OS must recognize the I/O addresses and interrupt level (IRQ) to be used for the BUS-PCI(PCI) board. Use the appropriate procedure to install the BUS-PCI(PCI) board.

Checking the OS version :

Note that the procedure for installing the BUS-PCI(PCI) board depends on which version of Windows 95 you are using. Check the version of Windows 95 on your system as follows before installing the BUS-PCI(PCI) board.

(1) Open [Control Panel] from [My Computer].

(2) Double-click on the [System] option to open the [System Properties] property sheet.

(3) Check the "System:" number displayed on the [General] page.

System : Microsoft Windows 95
4.00.950

The version numbers of Windows 95 include 4.00.950, 4.00,950a, 4.00.950B and 4.00.950C. The BUS-PCI(PCI) board setup depends on the version number of Windows 95 that is being used.

Procedure for Use under Windows 95 Version 4.00.950 or 4.00.950a :

(1) Turn the personal computer ON to start up Windows 95.

(2) Windows 95 will come up with the [New Hardware] detection dialog box. Select [Multimedia Device: Select which driver you want to install for your new hardware.] and then [Driver from disk provided by hardware manufacturer].

(3) In the [Install From Disk] dialog box, insert BUF-PCI Driver Install Disk 1 into the disk drive, enter the drive name: \Win95 in the [Copy Distributed File From] field, then click on [OK]. This completes installation of the BUS-PCI(PCI) board.
The "Checking resources" part of this section explains you how to do it.

Procedure for Use under Windows 95 Version 4.00.950B or 4.00.950C :

(1) Turn the personal computer on to start up Windows 95.

(2) Windows 95 will come up with the [New Hardware] detection dialog box. In the [Device Driver Wizard] that appears next, check that "CONTEC Co., Ltd. - Multimedia Device" has been listed, then select [Next>].

(3) In the next dialog box, select [Specify Location...].

(4) Insert BUF-PCI Driver Install Disk 1 into the disk drive, enter the drive name: \Win95 in the [Location] field, then click on [OK].

(5) In the next dialog box, check the "Updated driver found for this device" message, then select [End]. This completes installation of the BUS-PCI(PCI) board.
After finishing installing the board, confirm the assigned resources.
The "Checking resources" part of this section explains you how to do it.

Method of Installing Two or More BUS-PCI(PCI) Boards (For Use under Windows 95 Version 4.00.950 or 4.00.950a) :

Follow the procedure below to install two BUS-PCI(PCI) boards for use under Windows 95 version 4.00.950 or 4.00.950a.

(1) Check that the first BUS-PCI(PCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.

(2) Exit Windows 95 and turn the personal computer off.

(3) Check the board ID of the second BUS-PCI(PCI) board, then plug it into a PCI bus slot. Assign ID to the second board a board ID that is different from the ID assigned to the first board.

(4) Turn the personal computer on again to start up Windows 95.

(5) Windows 95 will come up with the [New Hardware] detection dialog box. In [Multimedia Device: Select which driver you want to install for your new hardware.], select [Select from List].

(6) The [Select Hardware Type] dialog box will then appear. In [Select Hardware Type to Install], select [Other Devices].

(7) In the [Select Device] dialog box that appears, select [CONTEC] from [Manufacturers] and select [CONTEC Co., Ltd. -BUS-PCI(PCI)] from [Models].

(8) The [Change System Settings] dialog box appears. Follow the messages to restart the computer.

(9) When Windows 95 is restarted, installation of the second BUS-PCI(PCI) board is completed. Confirm the assigned resources again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third board or additional boards, all BUS-PCI(PCI) boards that are already installed must be in PCI bus slots.

Notes!

- *The second BUS-PCI(PCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the second board, first determine what PC resources are free.*
- *The resources used for each BUS-PCI(PCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more BUS-PCI(PCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, re-check the resource settings.*

Method of Installing Two or More BUS-PCI(PCI) Boards (For Use under Windows 95 Version 4.00.950B or 4.00.950C) :

Follow the procedure below to install two BUS-PCI(PCI) boards for use under Windows 95 version 4.00.950B or 4.00.950C.

(1) Check that the first BUS-PCI(PCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.

(2) Exit Windows 95 and turn the personal computer OFF.

(3) Check the board ID of the second BUS-PCI(PCI) board. Then plug it into a PCI bus slot. Assign to the second board a board ID different from that assigned to the first board.

(4) Turn the personal computer ON again to start up Windows 95.

(5) The OS will then automatically install the second board. After finishing installing the board, confirm the assigned resources again.

For installing the third board and additional boards, follow the same steps as for installing a second board. Before you can install the third board or additional boards, all BUS-PCI(PCI) boards that are already installed must be in PCI bus slots.

Notes!

- *A second BUS-PCI(PCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) to be used for the board can be allocated. Before attempting to install a second board, first determine which PC resources are free.*
- *The resources used for each BUS-PCI(PCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more BUS-PCI(PCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, check the resource settings again.*

Installing the BUF-PCI driver software

Install the BUF-PCI driver software following these steps.

(1) Exit all other running applications.

(2) Insert BUF-PCI Driver Install Disk 1 into the disk drive.

(3) Start Explorer.

(4) Click the disk drive into which BUF-PCI Driver Install Disk 1 is inserted.

(5) Select and double-click the SETUP.EXE file.

(6) Follow the instructions displayed on the screen by the setup program.

(7) When the setup program ends, the installation of the BUF-PCI driver software is complete.

Note!

If you need to uninstall the BUF-PCI driver software, uninstall it using [Add/Remove Programs] in [Control Panel].

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) From the Windows 95 Start button, select Programs.

(2) Select BUF-PCI self-test (VC) in CONTEC BUF-PCI.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *The IRQ Level item is not displayed if you disable the use of interrupt resources with DIP switch SW1 on the BUS-PCI(PCI) board.*
- *If your personal computer does not support the MS-DOS OS, DOSST.EXE as the self-diagnostic program for DOS might not run correctly under the MS-DOS prompt.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Checking Resources

Follow the steps below to check the assigned resources managed by the OS.

(1) Double-click on the [System] option in [Control Panel] to open the [System Properties] property sheet. Select the [Device Manager] tab.

(2) Click on the [Multi-function adapters] folder.

(3) Click on the [CONTEC Co.,Ltd. -BUS-PCI(PCI)] folder to display its properties.

(4) Select the [Resources] tab to check the device type, resource settings, and the conflicting device list.

(5) If you want to change a resource setting, uncheck the [Use automatic settings] option in advance. To change the I/O address range (Input/Output Range), change the configuration name in the [Setting based on:] field. Since the interrupt level (Interrupt Request) cannot be changed, use the assigned IRQ.

Installing for MS-DOS

Install the software for Windows 98 following these steps.

(1) Copy BUF-PCI sample programs.

(2) Run the BUF-PCI self-diagnostic program.

Copying BUF-PCI sample programs

Copy BUF-PCI sample programs following these steps.

(1) Start MS-DOS.

(2) Insert BUF-PCI Drive Install Disk 1 into the disk drive.

(3) Copy all files in the DOS directory to the hard disk using the COPY command, for example.

(4) When copying is finished, copying sample programs necessary for MS-DOS is complete.

Running the BUF-PCI self-diagnostic program

Run the BUF-PCI self-diagnostic program following these steps.

(1) Move to the hard disk directory the BUF-PCI sample programs have been copied to.

(2) Run DOSST.EXE.

(3) The self-diagnostic program runs and displays self-testing results and resources assigned from the PC to the BUS-PCI(PCI).

Notes!

- *Using DIP switch SW1 on the BUS-PCI(PCI) board, enable or disable the use of interrupt resources. If the use of interrupt resources is disabled, the IRQ Level item is not displayed.*
- *If your personal computer does not support the MS-DOS OS, DOSST.EXE cannot run correctly.*
- *If self-testing results are not OK, see troubleshooting described later in this manual.*

Mounting Boards for Use in the I/O Expansion Unit

Install boards to be used in the I/O expansion unit following the steps listed below. When you start the PC after mounting is finished, each board can be accessed by way of this product.

(1) Verify applicable restrictions and specifications.

(2) Set I/O port addresses.

(3) Set interrupt request levels.

(4) Mount and turn the power on.

Verifying Restrictions and Specifications

The expansion slot added by this product to the I/O expansion unit is not fully compatible with the expansion slot in the PC. For this reason, a board that can be mounted and used in the expansion unit is subject to some restrictions.
A board that operates only with I/O accessing (I/O instructions) can be mounted and used in the expansion unit. A board that requires specialized operations might not operate properly even if it operates with I/O accessing. Before using therefore, be sure to verify the specifications of the board you will be mounting in the I/O expansion unit.
The following boards cannot be used.

- A board that uses specific I/O port addresses (a board that does not allow its I/O port addresses to be reset, such as a PnP board)
- A board that uses memory accessing (a board that uses a memory expansion board or an extended ROM area)
- A board that uses DMA
- A board that outputs control signals to the PC, such as an external CPU board
- A board that is used to add another I/O expansion unit
- A board specifically mentioned that it cannot be used in the manual of a PC which uses an I/O expansion unit
- A board that requires an I/O wait of more than one microsecond
- A board that uses I/O port address lower 8 bits F8h-FFh

Setting I/O Port Addresses

Using the DIP switch of each board, set the I/O port addresses of a board to be mounted and used in the I/O expansion unit.
The following setting restrictions apply.

- Set the lower eight bits of the I/O address to values other than F8h-FFh.
- Do not use an I/O port address dedicated to one board for another board.

Setting Interrupt Request Levels

The Interrupt Requests (IRQ) of a board that can be mounted and used in the I/O expansion unit are as follows.

For BUF-PCI(PC) : IRQ 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15
For BUF-PCI(98) : INT 0, 1, 2, 3, 4, 5, 6

Do not use an IRQ level allocated to one board for another board.

Note!

The IRQ level of a board mounted and used in the I/O expansion unit is not the IRQ level that the PC uses. Any level can be set within the allowed range.

Mounting and Turning the Power On

After making sure that the PC and the I/O expansion unit are turned off, disconnect the I/O expansion unit power plug from the socket on the equipment. Next, mount each board in the I/O expansion unit. For information about mounting, follow instructions included in the manual that came with the I/O expansion unit you are using.

When you are finished with mounting, turn the power on following these steps.

(1) Connect the receptacle on the I/O expansion unit.

(2) Connect the receptacle on the PC.

(3) Turn the I/O expansion unit on.

(4) Turn the PC on.

Notes!

- *Before mounting any board, be sure to disconnect the I/O expansion unit power plug.*
- *At this time, be sure that the PC starts up normally. If it does not, see troubleshooting described later in this manual.*

3. Programming

In order for the boards mounted in the I/O expansion unit to operate, programming is necessary. With Windows XP, Windows 2000, Windows NT, Windows Me, Windows 98 and Windows 95, you can create a program using the functions provided by the BUF-PCI driver software provided with the product.

If you will not use the BUF-PCI Driver, or if your OS is other than Windows XP, Windows 2000, Windows NT, Windows Me, Windows 98 and Windows 95, create a program by referring to the BUS-PCI(PCI) board I/O address and the sample program for MS-DOS or the function reference in the
BUF-PCI Driver software.

The following sections explain the operations of this product and programming information.

Programming with Windows

About the BUF-PCI Driver Software

The purpose of the BUF-PCI driver software is to allow Windows XP, Windows 2000, Windows NT, Windows Me, Windows 98 and Windows 95 to control the boards mounted in the I/O expansion unit, which has been added with this product.

The software provides such functions as one for input and output to and from I/O ports to control the board, and one for describing processes corresponding to interrupt request signals from the board.

Function List

Table 3.1. List of Functions

	Function name	Function
Initialization	BufPciOpen	Initializes.
and termination	BufPciClose	Exits.
Bus signal setup	BufSetBusSignal	Sets up I/O wait and refresh signal.
Input/output to/from I/O ports	BufPciInPortB	Input bytes.
	BufPciInPortW	Inputs words.
	BufPciOutPortB	Output bytes.
	BufPciOutPortW	Output words.
Interruption	BufPciSetIrqEvent	Specifies messages by event.
	BufPciStopEvent	Stops events.
	BufPciRestartEvent	Restarts events.
	BufPciGetIrqStatus	Inputs interrupt request status.
Others	BufSetPciProgramWait	Waits.
	BufPciSelfTest	Self-tests.

Programming Input and Output to and from I/O Ports

The board mounted in the I/O expansion unit can be accessed by replacing general I/O instructions with the I/O port input/output functions of the BUF-PCI driver software.

When you specify enabling or disabling of the I/O wait and the refresh signal after initializing, I/O port input/output functions can be executed.

For a realistic example, see the sample program for Windows.

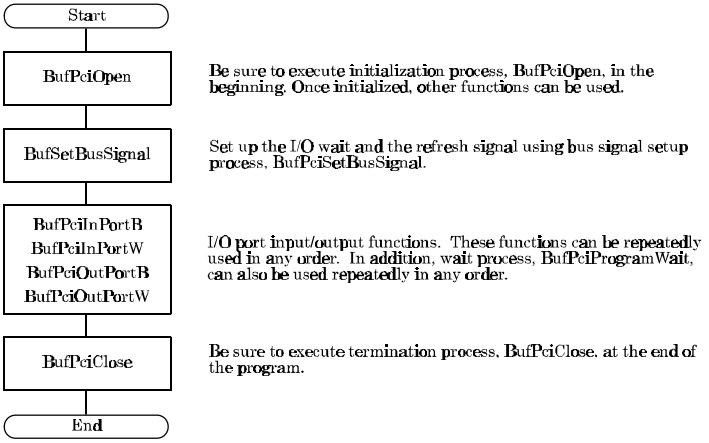


Figure 3.1. Programming I/O Port Input and Output Processes

Notes!

- *Terminating the program without the terminate process may prevent subsequent programs from operating normally.*
- *To reinitialize after executing the initialization process, run the termination process first and then the initialization process. (The initialization and termination processes must exist as a pair.)*

Programming Interruption

This product has its own interrupt signal processing capability, allowing the interrupt request signal within the I/O expansion unit to be used regardless of the interrupt request signal used by the PC.

Processing interrupt request signals within the I/O expansion unit can be programmed in two ways; using the message by an interrupt request event or monitoring the interrupt request status of the BUF-PCI(PCI) board. The features of these two methods and programming procedures are explained below.

Both of these two methods cannot be used in one program. For a realistic example, see the sample programs for Windows.

Using event messages

Entry of an interrupt request is identified using Windows message processing. The program is the same as typical Windows message processing. In this method, response to an interrupt request is slow and the timing by which a message is sent is dependent on the operating state of the system. In some cases, an interrupt request might be missed depending on the operating state of the system.

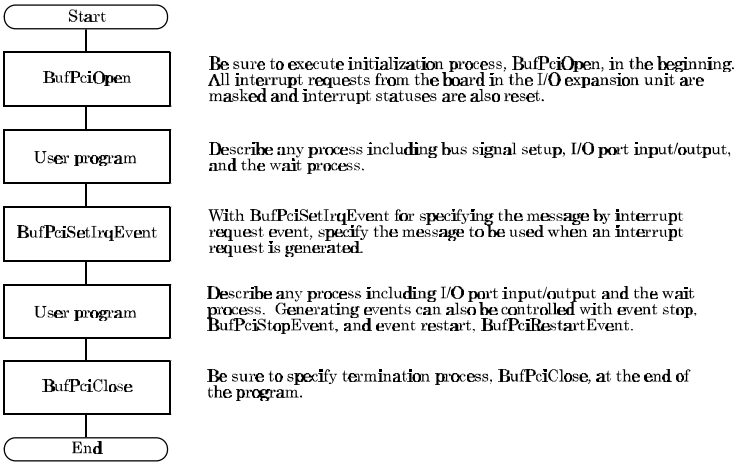


Figure 3.2. Main Routine Programming Procedure

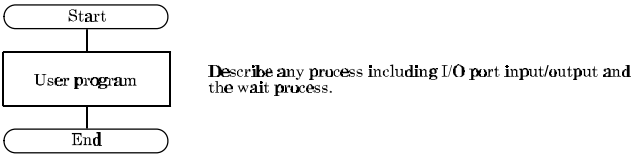


Figure 3.3. Programming Procedure for Message Processing by Event

Monitoring the BUF-PCI interrupt request status

This method is unique to this product.
This method monitors the BUF-PCI interrupt request status using the Windows timer, for example, and implements necessary processes when the interrupt request status is set. Having to use a timer and to process a read status may complicate the program. However, no interrupt request is missed within a specified timing range unlike the method of using event messages.

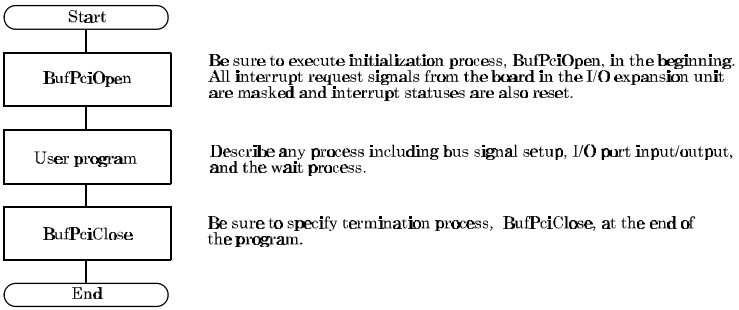


Figure 3.4. Main Routine Programming Procedure

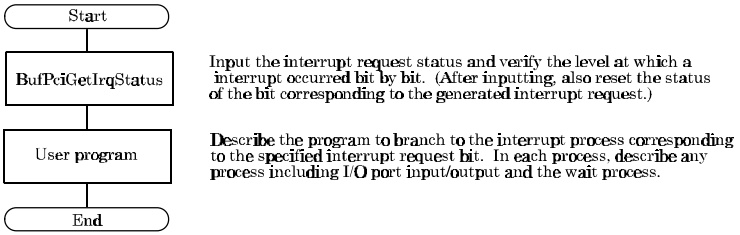


Figure 3.5. Timer Process Programming Procedure

Programming Self-testing

Verify the state of the system using the self-diagnostic feature of this product.
For information about programming procedures, see the self-diagnostic program in the sample program for either Windows or MS-DOS.

Function Reference

The detailed information about each function is explained next.
The program in the section of operations is a description of accessing I/O ports on the BUS-PCI(PCI) board in Microsoft C language. For more information, see the section on I/O port addresses.

BufPciOpen

Function — Implements the initialization process and acquires the device handle.

Format

(C)
```
HANDLE    hDevice;
BYTE      bBoardId;
hDevice = BufPciOpen(bBoardId);
```

(Visual Basic)
```
Dim hDevice As Long
Dim bBoardId As Byte
hDevice = BufPciOpen(bBoardId)
```

Argument

bBoardId	:	Specify the ID of the BUS-PCI(PCI) board.

Return value

hDevice	:	Returns the device handle if the function is successful. Returns INVALID_HANDLE_VALUE(-1) if the function terminates abnormally. To learn about the error, call GetLastError and check the error code. (For more information, see "List of Return Values.")

Supplement

The device handle is a number by which the driver software is identified. When executing another BufPciXxxx function, specify the handle acquired here.

Execute function BufPciOpen only once in one program for one BUS-PCI(PCI) board.

The board ID is the ID number for a BUS-PCI(PCI) board. Specify the ID with the DIP switch on the board.

Up to 16 programs can simultaneously access the board which has been added to the I/O expansion unit from one BUS-PCI(PCI) board.

Description of accessing I/O ports on the BUS-PCI(PCI) board

When executing function BufPciOpen, the BUS-PCI(PCI) board of a specified board ID secures the I/O port address (BufPciIoAddress) and interrupt request level (BufPciIrqLevel) assigned from the PCI BIOS in particular buffers. BufPciIoAddress and BufPciIrqLevel are used for accessing the BUS-PCI(PCI) board with function BufPciXxxx.

If the BUS-PCI(PCI) board for the specified board ID does not exist, return an error.

When executing function BufPciOpen, initialize the bus signal in the I/O expansion unit.

Set the I/O wait to "2 wait" and the refresh signal to "No output." At the initial Open when using with multiple programs, set the interrupt request mask register and reset the interrupt request status.

```
outpw(BufPciIoAddress + 0xf8, 0xffff);
                        Sets interrupt request mask.
outpw(BufPciIoAddress + 0xfa, 0xffff);
                        Resets interrupt request status.
outpw(BufPciIoAddress + 0xfc, 0x0002);
                        Sets I/O wait and refresh signals.
```

For more information, see the section on I/O port addresses.

BufPciClose

Function — Implements the termination process and frees the device handle.

Format

(C)

```
HANDLE    hDevice;
DWORD     dwRet;
dwRet = BufPciClose(hDevice);
```

(Visual Basic)

```
Dim hDevice As Long
Dim dwRet As Long
dwRet = BufPciClose(hDevice)
```

Argument — *hDevice* : Specify the device handle.
Acquire this device handled with BufPciOpen.

Return value — *dwRet* : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement — After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

At the last Close when using with multiple programs, set the interrupt request mask register and reset the interrupt request status.

Use BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows:

```
outpw(BufPciIoAddress + 0xf8, 0xffff);
outpw(BufPciIoAddress + 0xfa, 0xffff);
```

For more information, see the section on I/O port addresses.

BufPciSetBusSignal

Function — Specifies enabling or disabling of the I/O wait and the refresh signal.

Format

(C)

```
HANDLE   hDevice;
BYTE     bIoWait;
BYTE     bRefreshOn;
DWORD    dwRet;
dwRet = BufPciSetBusSignal(hDevice, bIoWai, bRefreshOn);
```

(Visual Basic)

```
Dim hDevice As Long
Dim bIoWait As Byte
Dim bRefreshOn As Byte
Dim dwRet As Long
dwRet = BufPciSetBusSignal(hDevice, bIoWait, bRefreshOn)
```

Argument

hDevice	:	Specify the device handle. Acquire this device handle with BufPciOpen.
bIoWait	:	Specify I/O wait (0-7).
bRefreshOn	:	Specify whether or not to output the refresh signal (TRUE or FALSE).

Return value

dwRet	:	Termination information Normal termination : 0 Error : other than 0 (For more information, see the section, "List of Return Values.")

Supplement

The I/O wait defaults to "2wait" and the refresh signal to "no output."

In the cycle for generating an I/O wait from the board mounted in the I/O expansion unit, the I/O wait is allowed for a maximum period of one microsecond. At the end of that period, the cycle is forced to terminate.

If the I/O wait is set to "0wait," the I/O wait request signal is ignored.

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows:

```
outpw( BufPciIoAddress + 0xfc, ( (bRefreshOn << 4) + bIoWait) );
```

For more information, see the section on I/O port addresses.

BufPciInPortB

Function: Inputs data from a specified port. The data to be input is byte data.

Format:

(C)

```
HANDLE   hDevice;
WORD     wIoAddress;
BYTE     bInData;
DWORD    dwRet;
dwRet = BufPciInPortB(hDevice, bIoWait, wIoAddress, &bInData);
```

(Visual Basic)

```
Dim hDevice As Long
Dim wIoAddress As Integer
Dim bInData As Byte
Dim dwRet As Long
dwRet = BufPciInPortB(hDevice, bIoWait, wIoAddress, bInData)
```

Argument:

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

wIoAddress : Specify the I/O port address to input data to.

bInData : Specify the area to store input data by passing its pointer.

Return value:

dwRet : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement: After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows:

```
outp( BufPciIoAddress + 0xfd, ( wIoAddress >> 8 ) & 0xff );
bInData = inp( BufPciIoAddress + ( wIoAddress & 0xff ) );
```

For more information, see the section on I/O port addresses.

BufPciInPortW

Function: Inputs data from a specified port. The data to be input is word data.

Format:

(C)

```
HANDLE   hDevice;
WORD     wIoAddress;
WORD     wInData;
DWORD    dwRet;
dwRet = BufPciInPortW(hDevice, wIoAddress, &wInData);
```

(Visual Basic)

```
Dim hDevice As Long
Dim wIoAddress As Integer
Dim wInData As Integer
Dim dwRet As Long
dwRet = BufPciInPortW(hDevice, wIoAddress, wInData)
```

Argument

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

wIoAddress : Specify the I/O port address to input data to.

wInData : Specify the area to store input data by passing its pointer.

Return value

dwRet : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement

BufPciInPortW to an odd address is invalid.

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows.

```
if ( !( wIoAddress % 2 ) ) {
  outp( BufPciIoAddress + 0xfd, ( wIoAddress >> 8 ) & 0xff );
  wInData = inpw( BufPciIoAddress + ( wIoAddress & 0xff ) );
}
```

For more information, see the section on I/O port addresses.

BufPciOutPortB

Function: Outputs data to a specified port. The data to be output is byte data.

Format:

(C)

```
HANDLE   hDevice;
WORD     wIoAddress;
BYTE     bOutData;
DWORD    dwRet;
dwRet = BufPciOutPortB(hDevice, bIoWait, wIoAddress, bOutData);
```

(Visual Basic)

```
Dim hDevice As Long
Dim wIoAddress As Integer
Dim bOutData As Byte
Dim dwRet As Long
dwRet = BufPciOutPortB(hDevice, bIoWait, wIoAddress, bOutData)
```

Argument:

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

wIoAddress : Specify the I/O port address to output data to.

bOutData : Specify the output data.

Return value: *dwRet* : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement: After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows.

```
outp( BufPciIoAddress + 0xfd, ( wIoAddress >> 8 ) & 0xff );
outp( BufPciIoAddress + ( wIoAddress & 0xff ), bOutData );
```

For more information, see the section on I/O port addresses.

BufPciOutPortW

Function: Outputs data to a specified port. The data to be output is word data.

Format:

(C)

```
HANDLE   hDevice;
WORD     wIoAddress;
WORD     wOutData;
DWORD    dwRet;
dwRet = BufPciOutPortW(hDevice, wIoAddress, wOutData);
```

(Visual Basic)

```
Dim hDevice As Long
Dim wIoAddress As Integer
Dim wOutData As Integer
Dim dwRet As Long
dwRet = BufPciOutPortW(hDevice, wIoAddress, wOutData)
```

Argument:

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

wIoAddress : Specify the I/O port address to output data to.

wOutData : Specify the output data.

Return value:

dwRet : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement: BufPciInPortW to an odd address is invalid.

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows.

```
if ( !( wIoAddress % 2 ) ) {
  outp( BufPciIoAddress + 0xfd, ( wIoAddress >> 8 ) & 0xff );
  outpw( BufPciIoAddress + ( wIoAddress & 0xff ), wOutData );
}
```

For more information, see the section on I/O port addresses.

BufPciSetIrqEvent

Function — Specifies a message by an interrupt request event. Specifies a message by an interrupt request event and starts generating the event.

Format

(C)

```
HANDLE   hDevice;
HANDLE   hWnd;
DWORD    dwMessage;
DWORD    dwRet;
BYTE     bBufIrqNo;
dwRet = BufPciSetIrqEvent(hDevice, hWnd, dwMessage, bBufIrqNo);
```

(Visual Basic)

```
Dim hDevice As Long
Dim hWnd As Long
Dim dwMessage As Long
Dim dwRet As Long
Dim bBufIrqNo As Byte
dwRet = BufPciSetIrqEvent(hDevice, hWnd, dwMessage, bBufIrqNo)
```

Argument

hDevice	:	Specify the device handle. Acquire this device handle with BufPciOpen.
hWnd	:	Specify the handle of the window for receiving the message by the event.
dwMessage	:	Specify the message number to identify the event with.
bBufIrqNo	:	Specify the numeric value (0-15) representing an interrupt request level in IRQ notation.

Return value

dwRet	:	Termination information Normal termination : TRUE Error : FALSE (For more information, see the section, "List of Return Values.")

Supplement

This function does not work unless the DIP switch on the board of the BUS-PCI(PCI) board is enabled (INT USE set to ON, default setting).

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

BufPciStopEvent

Function: Stops an interrupt request event.

Format:

(C)

```
HANDLE   hDevice;
BYTE     bBufIrqNo;
DWORD    dwRet;
dwRet = BufPciStopEvent(hDevice, bBufIrqNo);
```

(Visual Basic)

```
Dim hDevice As Long
Dim bBufIrqNo As Byte;
Dim dwRet As Long
dwRet = BufPciStopEvent(hDevice, bBufIrqNo)
```

Argument:

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

bBufIrqNo : Specify the numeric value (0-15) representing an interrupt request level in IRQ notation.

Return value:

dwRet : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement: This function stops the event started by BufPciSetIrqEvent. The suspended event can be restarted using BufPciRestartEvent.

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Set the interrupt request mask register of the BUF-PCI(PCI) board.

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows:

```
wIrqMask = inpw( BufPciIoAddress + 0xf8 );
outpw( BufPciIoAddress + 0xf8, ( wIrqMask | (0x01 << bIrqNo)) );
```

For more information, see the section on I/O port addresses.

BufPciRestartEvent

Function: Restarts an interrupt request event.

Format:

(C)

```
HANDLE   hDevice;
BYTE     bBufIrqNo;
DWORD    dwRet;
dwRet = BufPciRestartEvent(hDevice, bBufIrqNo);
```

(Visual Basic)

```
Dim hDevice As Long
Dim bBufIrqNo As Byte
Dim dwRet As Long
dwRet = BufPciRestartEvent(hDevice, bBufIrqNo)
```

Argument:

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

dBufIrqNo : Specify the numeric value (0-15) representing an interrupt request level in IRQ notation.

Return value: *dwRet* : Termination information

Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement: This function restarts the event stopped by BufPciStopEvent.

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Set the interrupt request mask register of the BUF-PCI(PCI) board.

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows:

```
wIrqMask = inpw( BufPciIoAddress + 0xf8 );
outpw( BufPciIoAddress + 0xf8, ( wIrqMask & ~(0x01 << bIrqNo)) );
```

For more information, see the section on I/O port addresses.

BufPciGetIrqStatus

Function — Inputs the interrupt request status of the BUF-PCI(PCI) board.

Format

(C)

```
HANDLE   hDevice;
WORD     wIrqStatus;
WORD     wIrqReset;
DWORD    dwRet;
dwRet = BufPciGetIrqStatus(hDevice, &wIrqStatus, wIrqReset);
```

(Visual Basic)

```
Dim hDevice As Long
Dim wIrqStatus As Integer
Dim wIrqReset As Integer
Dim dwRet As Long
dwRet = BufPciGetIrqStatus(hDevice, wIrqStatus, wIrqReset)
```

Argument

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

wIrqStatus : Specify the area to store the interrupt request status by passing its pointer.
The bit corresponding to the interrupt request (an interrupt request level in the FA-PAC) being set to 1 indicates that an interrupt request has been generated for that request.

wIrqReset : Specify the interrupt request to be reset. When the bit corresponding to the interrupt request is set to 1, that request is reset and, until the next interrupt request comes in, the interrupt request status bit is returned with 0 set.

Return value

dwRet : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement — After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

Input the interrupt request status of the BUF-PCI(PCI) board.

If the interrupt request status register is set, reset that register.

Use the BufPciIoAddress secured during execution of BufPciOpen. Actual operations are as follows:

```
wIrqStatus = inpw( BufPciIoAddress + 0xfa );
outpw( BufPciIoAddress + 0xfa, wIrqReset );
```

For more information, see the section on I/O port addresses.

BufPciSetProgramWait

Function — Inserts a specified waiting period in the program.

Format

(C)

```
HANDLE   hDevice;
DWORD    dwWaitTime;
DWORD    dwRet;
dwRet = BufPciSetProgramWait(hDevice, dwWaitTime);
```

(Visual Basic)

```
Dim hDevice As Long
Dim dwWaitTime As Long
Dim dwRet As Long
dwRet = BufPciSetProgramWait(hDevice, dwWaitTime)
```

Argument

hDevice : Specify the device handle.
Acquire this device handle with BufPciOpen.

dwWaitTime : Specify the duration of the wait (in milliseconds).
Specifiable range : 1-100000

Return value

dwRet : Termination information
Normal termination : TRUE
Error : FALSE
(For more information, see the section, "List of Return Values.")

Supplement — After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

BufPciSelfTest

Function: Acquires information for self-testing.

Format:

(C)

```
BYTE    bBoardId;
WORD    wIoAddress;
BYTE    bIrqNo;
WORD    wStatus;
DWORD   dwRet;
dwRet = BufPciSelfTest(bBoardId, &wIoAddress, &bIrqNo, &wStatus);
```

(Visual Basic)

```
Dim bBoardId As Byte
Dim wIoAddress As Integer
Dim bIrqNo As Byte
Dim wStatus As Integer
Dim dwRet As Long
dwRet = BufPciSelfTest(bBoardId, wIoAddress, bIrqNo, wStatus)
```

Argument:

bBoardId : Specify the BUS-PCI(PCI) board ID.

wIoAddress : Specify the area to store the BUS-PCI(PCI) board I/O port address by passing its pointer.

bIrqNo : Specify the area to store the BUS-PCI(PCI) board interrupt request level by passing its pointer.

wStatus : Specify the area to store the statuses of BUS-PCI I/O wait input register, self-test IOCS16EN input register, Refresh Enable input register, bus type input register, target type input register, target type input register, and target power input register by passing their pointers.

Return value:

dwRet : Termination information
Normal termination : 0
Error : other than 0
(For more information, see the section, "List of Return Values.")

Supplement

If the resource is not acquired for wIoAddress and bIrqNo, return FFFFH and FFH respectively. For information about wStatus, see the section on I/O port addresses.

After implementing the termination process, each function of the BUF-PCI driver software cannot be run until reinitialized.

Description of accessing I/O ports on the BUS-PCI(PCI) board

See the sample self-diagnostic program for MS-DOS.

For more information, see the section on I/O port addresses.

List of Return Values

If the return value is 0, the function has been executed normally.

A return value of other 0 indicates that there was an error and the function process is aborted. You can acquire detailed information about the error by verifying the function's return value or by executing function GetLastError. Function GetLastError is a Win32 API function.

ex) Visual C

```
hDevice = BufPciOpen(bBoardId);
if( hDevice == INVALID_HANDLE_VALUE ){
      wsprintf( szBuffer, "BufPciOpen Error = %x", GetLastError() );
      MessageBox( hWnd, szBuffer, " Error information ",
                                          MB_ICONEXCLAMATION );
}
```

ex) Visual Basic

```
hDevice = BufPciOpen(bBoardId)
If hDevice = -1 Then
dwErrorStatus = Err.LastDllError
szBuffer = "BufPciOpen Error = " & Hex$(dwErrorStatus)
dwRet = MessageBox(hWnd, szBuffer, " Error information ",
MB_ICONEXCLAMATION)
End If
```

Error code	Message
2C000001H	BUFPCI_ERROR_OPEN
	Two scenarios can be considered; either the BUFPCI.VXD or BUFPCI.SYS file is not installed in the system or the driver is not started in Windows XP, Windows 2000, Windows NT. Be sure that BUFPCI.VXD exists in the \Windows\System folder for Windows 98, Windows 95 or that BUFPCI.SYS exists in the \Windows\System32\Drivers folder for Windows XP, Windows 2000, Windows NT. In the case of Windows NT, be also sure that the BufPci device is started by checking from My Computer, Control Panel, and Device. If the BufPci device is not started in Windows NT, restart the system. If restarting does not start the device, reinstall the driver using Administrator.
2C000002H	BUFPCI_ERROR_PARAMETER
	Indicates that the argument value passed to the function is not within the specified range. Change the value given as an argument in the program. This also applies to odd port word accessing.
2C000003H	BUFPCI_ERROR_RESOURCE
	Indicates either that the I/O port address and interrupt request level assigned from the PCI BIOS cannot be acquired due to no BUS-PCI(PCI) board that corresponds to the ID specified in BufPciOpen or that acquisition of interrupt request resources is not enabled.
2C000004H	BUFPCI_ERROR_SELFCHECK
	Indicates that a self-testing error occurred during initialization. You can obtain detailed information about the error by executing GetLastError after executing BufPciOpen or by executing the self-diagnostic program.
2C000005H	BUFPCI_ERROR_HANDLE
	Indicates that the device handle passed as a parameter was not valid.

2C000006H BUFPCI_ERROR_THREAD

Indicates that function BufPciSetIrqEvent failed to create the thread.

2C000007H BUFPCI_ERROR_POWER

Indicates that the I/O expansion unit is not turned on.

2C000008H BUFPCI_ERROR_BUSTYPE

Indicates that the bus type setting of the BUS-PCI(PCI) board does not match the type on the I/O expansion unit. There are two scenarios to be considered; either the factory DIP switch setting has been changed or the cable is not connected correctly when both BUF-PCI(PC) and BUF-PCI(98) are in use.

2C000009H BUFPCI_ERROR_CONNECTOR

Indicates that either the cable is not connected or that there is a problem with the cable or the connector.

2C00000AH BUFPCI_ERROR_IRQCONFLIC

Indicates that the interrupt request level specified in BufPciSetIrqEvent is already in use.

2C00000BH BUFPCI_ERROR_APLINUM

Indicates that more than 16 applications have been started for one BUS-PCI(PCI) board. The number of applications also includes the self-diagnostic program.

2C00000CH BUFPCI_ERROR_BOARDID

Indicates the BUS-PCI(PCI) board ID is a duplicate. Reset the board ID so that it won't be a duplicate of an ID already assigned to another BUS-PCI(PCI) board.

Sample Program for Windows

Sample programs are available for the following languages:

Visual Basic 5.0
Visual C 5.0

The following sample programs are provided for each language:

- InOut — Input/output (BufPciInPortB, BufPciInPortW, BufPciOutPortB, BufPciOutPortW)
- Event — Interrupt request process (using messages by events) (BufPciSetIrqEvent)
- Polling — Interrupt request process (monitoring interrupt request status)
- SelfTest — Self-diagnostic program

These sample programs are designed to run when you press buttons from the top down in sequence.

Programming in an OS other than Windows

I/O Port Input/Output Procedure

Of 256 I/O port addresses assigned from the PC to BUS-PCI(PCI) boards, 248 ports are used for general-purpose accessing and the remaining 8 ports are used to control signals on the I/O expansion unit.

With the control port of the BUS-PCI(PCI) board, you can specify the value of the eight highest bits of an address used for accessing the I/O expansion unit and enable or disable the I/O wait and the refresh signal.

(1) First, with the control port of the BUS-PCI(PCI) board, enable or disable the I/O wait and the refresh signal for the I/O expansion unit.

(2) Next, with the control port of the BUS-PCI(PCI) board, specify the eight highest bits of the I/O port address on the I/O expansion unit.

(3) Next, access the general-purpose access port. At this time, the eight highest bits of the I/O port address on the I/O expansion unit are set to the value that was specified in step 2 and the low 8 bits are set to the value of the general-purpose access port. Data input/output to/from the general-purpose access port becomes data on the I/O expansion unit.

(4) Repeat steps 2 and 3 to access I/O port addresses xx00h through xxF7h on the I/O expansion unit.

Interrupt Procedure

One interrupt request level is assigned from the PC to the BUS-PCI(PCI) board. For this reason, the BUF-PCI(PCI) board detects multiple interrupt request signals generated on the I/O expansion unit one by one. If there is even just one interrupt request, the interrupt request signal is output to the PCI bus to request the PC for interrupt.

With the control port of the BUS-PCI(PCI) board, you can set the mask to specify enabling or disabling of an interrupt signal generated on the I/O expansion unit. Interrupt can be generated only with an interrupt request signal at a non-masked level.

The PCI bus specifications allow sharing of an interrupt request level with another system. As a result, a program that processes interrupt requests needs to determine whether or not the interrupt request has been issued by the BUS-PCI(PCI) board in the interrupt handler.

In order to allow making this decision and verifying the level at which the interrupt request is generated on the I/O expansion unit, there are a status register to verify whether or not there is an interrupt request signal and a port to reset that status register.

(1) In the main routine, set the interrupt request mask register.

(2) In the main routine, reset the interrupt request status register.

(3) In the main routine, specify PC settings needed to handle interrupts, such as the interrupt handler.

(4) When an interrupt request generates on the PCI bus, processing moves to the interrupt handler to check the interrupt request status in the non-masked bit and to see if status is set. If it is set, the interrupt request is considered to be of the BUS-PCI(PCI) board and is processed.

(5) If the interrupt request is from the BUS-PCI(PCI) board, reset the interrupt request status register to allow monitoring of the level at which the next interrupt request is generated on the I/O expansion unit.

(6) Next, process the interrupt as necessary, implement the termination process on the interrupt controller of the PC, and exit the interrupt handler.

(7) After all interrupt processes are finished, mask all interrupt request mask registers in the main routine and undo the PC settings as they were.

The interrupt request signal status register can detect/reset per interrupt request signal. Since this register is not dependent on mask settings, all interrupt request signals generated on the I/O expansion unit can be masked to not generate actual interrupts and they can still be processed the same as interrupts by monitoring interrupt request signal statuses.

Note!

Handling of interrupts varies with the PC model and the OS used.

Details of I/O Port Addresses

List of Output Ports

	D7	D6	D5	D4	D3	D2	D1	D0
+0 (+00h)	General-purpose output port 00h							
+1 (+01h)	General-purpose output port 01h							
:	:							
+247 (+F7h)	General-purpose output port F7h							
+248 (+F8h)	IRQ7 Mask	IRQ6(INT2) Mask	IRQ5(INT1) Mask	IRQ4 Mask	IRQ3(INT0) Mask	1	1	1
+249 (+F9h)	IRQ15 Mask	IRQ14 Mask	(INT6) Mask	IRQ12(INT5) Mask	IRQ11 Mask	IRQ10(INT4) Mask	IRQ9(INT3) Mask	1
+250 (+FAh)	IRQ7 Reset	IRQ6(INT2) Reset	IRQ5(INT1) Reset	IRQ4 Reset	IRQ3(INT0) Reset	0	0	0
+251 (+FBh)	IRQ15 Reset	IRQ14 Reset	(INT6) Reset	IRQ12(INT5) Reset	IRQ11 Reset	IRQ10(INT4) Reset	IRQ9(INT3) Reset	0
+252 (+FCh)	0	0	0	Refresh Enable	Self-test IOCS16EN	I/O Wait 2	I/O Wait 1	I/O Wait 0
+253 (+FDh)	I/O Address 15	I/O Address 14	I/O Address 13	I/O Address 12	I/O Address 11	I/O Address 10	I/O Address 09	I/O Address 08
+254 (+FEh)	Self-test Do 07	Self-test Do 06	Self-test Do 05	Self-test Do 04	Self-test Do 03	Self-test Do 02	Self-test Do 01	Self-test Do 00
+255 (+FFh)	Self-test Do 15	Self-test Do 14	Self-test Do 13	Self-test Do 12	Self-test Do 11	Self-test Do 10	Self-test Do 09	Self-test Do 08

List of Input Ports

	D7	D6	D5	D4	D3	D2	D1	D0
+0 (+00h)	General-purpose input port 00h							
+1 (+01h)	General-purpose input port 01h							
:	:							
+247 (+F7h)	General-purpose input port F7h							
+248 (+F8h)	IRQ7 Mask	IRQ6(INT2) Mask	IRQ5(INT1) Mask	IRQ4 Mask	IRQ3(INT0) Mask	1	1	1
+249 (+F9h)	IRQ15 Mask	IRQ14 Mask	(INT6) Mask	IRQ12(INT5) Mask	IRQ11 Mask	IRQ10(INT4) Mask	IRQ9(INT3) Mask	1
+250 (+FAh)	IRQ7 Status	IRQ6(INT2) Status	IRQ5(INT1) Status	IRQ4 Status	IRQ3(INT0) Status	0	0	0
+251 (+FBh)	IRQ15 Status	IRQ14 Status	(INT6) Status	IRQ12(INT5) Status	IRQ11 Status	IRQ10(INT4) Status	IRQ9(INT3) Status	0
+252 (+FCh)	Target Power	Target Type	Bus Type	Refresh Enable	Self-test IOCS16EN	I/O Wait 2	I/O Wait 1	I/O Wait 0
+253 (+FDh)	I/O Address 15	I/O Address 14	I/O Address 13	I/O Address 12	I/O Address 11	I/O Address 10	I/O Address 09	I/O Address 08
+254 (+FEh)	Self-test Di 07	Self-test Di 06	Self-test Di 05	Self-test Di 04	Self-test Di 03	Self-test Di 02	Self-test Di 01	Self-test Di 00
+255 (+FFh)	Self-test Di 15	Self-test Di 14	Self-test Di 13	Self-test Di 12	Self-test Di 11	Self-test Di 10	Self-test Di 09	Self-test Di 08

Detailed Description

Access these ports using either byte access or word access on even ports. Neither word access on odd bytes nor double-word access is allowed. Each port is detailed below.

General-purpose access ports (+00h through +F7h) [input and output]

	D7	D6	D5	D4	D3	D2	D1	D0
+0 (+00h)	General-purpose output port 00h							
+1 (+01h)	General-purpose output port 01h							
:	:							
+247 (+F7h)	General-purpose output port F7h							

These ports are for accessing boards in the I/O expansion unit. Accessing these ports allow input and output to and from xx00h through xxF7h.

Interrupt request mask register (+F8h through +F9h) [input and output]

	D7	D6	D5	D4	D3	D2	D1	D0
+248 (+F8h)	IRQ7 Mask	IRQ6(INT2) Mask	IRQ5(INT1) Mask	IRQ4 Mask	IRQ3(INT0) Mask	1	1	1
+249 (+F9h)	IRQ15 Mask	IRQ14 Mask	(INT6) Mask	IRQ12(INT5) Mask	IRQ11 Mask	IRQ10(INT4) Mask	IRQ9(INT3) Mask	1

Set the mask for an interrupt request signal from a board in the I/O expansion unit. Also, input the mask status of the interrupt request signal which has been set up.

An interrupt request signal whose bit is set to 1 is masked and an interrupt request signal from a board in the I/O expansion unit is disabled. On the other hand, an interrupt request signal whose bit is set to 0 is non-masked. An interrupt request signal from a board in the I/O expansion unit is enabled and an interrupt request is generated. When the power is turned on, all are masked.

Parentheses indicate notation of the C-bus interrupt request signal.

Interrupt request status register (+FAh through +FBh) [input]

	D7	D6	D5	D4	D3	D2	D1	D0
+250 (+FAh)	IRQ7 Status	IRQ6(INT2) Status	IRQ5(INT1) Status	IRQ4 Status	IRQ3(INT0) Status	0	0	0
+251 (+FBh)	IRQ15 Status	IRQ14 Status	(INT6) Status	IRQ12(INT5) Status	IRQ11 Status	IRQ10(INT4) Status	IRQ9(INT3) Status	0

Senses an interrupt request from a board in the I/O expansion unit.

When an interrupt request generates from a board in the I/O expansion unit, the bit that caused the generation is set to 1. The interrupt request status reset register allows resetting bit by bit.

When issuing an interrupt request to the PC, be sure to verify the bit that caused the generation in the interrupt handler.

When the power is turned on, the register is undefined.

Parentheses indicate notation of the C-bus interrupt request signal.

Interrupt request status reset register (+FAh through +FBh) [output]

	D7	D6	D5	D4	D3	D2	D1	D0
+250 (+FAh)	IRQ7 Reset	IRQ6(INT2) Reset	IRQ5(INT1) Reset	IRQ4 Reset	IRQ3(INT0) Reset	0	0	0
+251 (+FBh)	IRQ15 Reset	IRQ14 Reset	(INT6) Reset	IRQ12(INT5) Reset	IRQ11 Reset	IRQ10(INT4) Reset	IRQ9(INT3) Reset	0

Resets the interrupt request status register bit by bit.

The reset interrupt request status register can monitor the next interrupt request.

When issuing an interrupt request to the PC, be sure to reset the bit that caused the generation in the interrupt handler.

Parentheses indicate notation of the C-bus interrupt request signal.

Bus signal set register (+FCh) [output]

	D7	D6	D5	D4	D3	D2	D1	D0
+252 (+FCh)	0	0	0	Refresh Enable	Self-test IOCS16EN	I/O Wait 2	I/O Wait 1	I/O Wait 0

I/O wait 2 - I/O wait 0

Set the I/O wait. Normally, use it set at 2wait [010].

A maximum I/O wait of one microsecond is permitted in the cycle in which an I/O wait is generated from a board mounted in the I/O expansion unit. As the I/O wait reaches one microsecond, the cycle is forced to terminate.

If the I/O wait is set to 0 wait [000], the I/O wait request signal is ignored. When the power is turned on, the I/O wait defaults to 0 wait [000].

Self-test IOCS16EN

This setting is for self-testing of the BUF-PC(PCI). Specify whether the I/O register for self-testing is to be accessed with the 16- or 8-bit cycle. Output of 1 results in the 16-bit cycle. For other than self-testing, use this setting at 8-bit cycle 0. When the power is turned on, the cycle defaults to 0.

For the BUF-PCI(98), set self-testing to 0.

Refresh Enable

Specify whether to enable or disable the refresh signal on the I/O expansion unit side.

Setting to 1 results in output of the refresh signal.

When the power is turned on, the setting defaults to 0 and no refresh signal is output.

Bus signal status register (+FCh) [input]

	D7	D6	D5	D4	D3	D2	D1	D0
+252 (+FCh)	Target Power	Target Type	Bus Type	Refresh Enable	Self-test IOCS16EN	I/O Wait 2	I/O Wait 1	I/O Wait 0

Input current settings.

I/O Wait 2 - I/O Wait 0 : Current setting
Self-test IOCS16EN : Current setting
Refresh Enable : Current setting
Bus Type : BUS-PCI(PCI) board bus setting (1: 98 bus, 0: ISA bus)
Target Type : Bus type on the I/O expansion unit side (1: 98 bus, 0: ISA bus)
Target Power : I/O expansion unit power-on state (1: ON, 0: OFF)

I/O port address set register (+FDh) [input and output]

	D7	D6	D5	D4	D3	D2	D1	D0
+253 (+FDh)	I/O Address 15	I/O Address 14	I/O Address 13	I/O Address 12	I/O Address 11	I/O Address 10	I/O Address 09	I/O Address 08

Set the eight highest bits of the I/O address in the I/O expansion unit. Also, input the setting status.

When the power is turned on, the address defaults to 00h.

Self-test input and output register (+FEh - +FFh) [input and output]

	D7	D6	D5	D4	D3	D2	D1	D0
+254 (+FEh)	Self-test Do 07	Self-test Do 06	Self-test Do 05	Self-test Do 04	Self-test Do 03	Self-test Do 02	Self-test Do 01	Self-test Do 00
+255 (+FFh)	Self-test Do 15	Self-test Do 14	Self-test Do 13	Self-test Do 12	Self-test Do 11	Self-test Do 10	Self-test Do 09	Self-test Do 08

This is the input and output register for self-testing.

The register allows you to verify if the I/O expansion unit is operating normally.

Sample Programs for MS-DOS

The following sample programs in Microsoft C language are available.

- DOSIO Input and output processes
- DOSINT Interrupt process
  (IBM PC-AT compatibles (DOS/V machines) or
  NEC PC98-NX series)
- DOSINT98 Interrupt process (NEC PC-9800 series)
- DOSPOL Interrupt request process
  (interrupt request status monitoring method)
- DOSST Self-testing program

DOSINT runs only on IBM PC-AT compatibles (DOS/V machines) or NEC PC98-NX series.

DOSINT98 runs only on the NEC PC-9800 series.

4. System Reference

Hardware Specifications

System Specifications

Table 4.1. BUF-PCI(PC) System Specifications

Item	Specification
Accessible I/O address	I/O addresses except for lower 8 bits F8h-FFh
I/O wait setting	0wait to 7wait
Accessible memory space	None (memory access not allowed)
Available DMA channel	None (DMA transfer not allowed)
Available interrupt level	IRQ 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15

Note : For a list of available expansion slot signals, see Table 4.7.

Table 4.2. BUF-PCI(98) System Specifications

Item	Specification
Accessible I/O address	I/O addresses except for lower 8 bits F8h-FFh
I/O wait setting	0wait to 7wait
Accessible memory space	None (memory access not allowed)
Available DMA channel	None (DMA transfer not allowed)
Available interrupt level	INT 0, 1, 2, 3, 4, 5, 6

Note : For a list of available expansion slot signals, see Table 4.8.

Specifications of Each Board

Table 4.3. BUS-PCI(PCI) Board Specifications

Item	Specification
I/O addresses	256 ports occupied
Interrupt	One
Current consumption	5VDC 300 mA (supplied from the PC)
Operating conditions	Temperature : 0 to 50°C
	Humidity : 10 to 90%RH (No condensation)
Interface connector	PCR-E96LMD equivalence
External dimensions	120.0 x 107.0 x 18.5 mm

Table 4.4. BUS-PCI(PC) Board Specifications

Item	Specification
Current consumption	5VDC 300 mA (supplied from I/O expansion unit)
Operating conditions	Temperature : 0 to 50°C
	Humidity : 10 to 90%RH (No condensation)
Interface connector	PCR-E96LMD equivalence
External dimensions	134.2 x 107.0 x 18.5mm

Table 4.5. BUS-PC(98) Board Specifications

Item	Specification
Current consumption	5VDC 300 mA (supplied from I/O expansion unit)
Operating conditions	Temperature : 0 to 50°C
	Humidity : 10 to 90%RH (No condensation)
Interface connector	PCR-E96LMD equivalence
External dimensions	169.4 x 148.7 x 24mm

Cable Specifications

Table 4.6. Cable Specifications

Item	Specification
Cable	96-core shield wire
Interface connector	PCR-E96FA equivalence

List of BUF-PCI(PC) I/O Expansion Slot Signals

Table 4.7. List of BUF-PCI(PC) I/O Expansion Slot Signals

Pin No.	Signal Name	I/O	Note	Pin No.	Signal Name	I/O	Note
A01	IOCHCK*	I	Unconnected	B01	GND	---	FA-PAC GND
A02	SD07	I/O		B02	RESETDRV	O	
A03	SD06	I/O		B03	+5V	---	FA-PAC +5V
A04	SD05	I/O		B04	IRQ9	I	
A05	SD04	I/O		B05	-5V	---	FA-PAC -5V
A06	SD03	I/O		B06	DREQ2	I	Unconnected
A07	SD02	I/O		B07	-12V	---	FA-PAC –12V
A08	SD01	I/O		B08	OWS*	I	Unconnected
A09	SD00	I/O		B09	+12V	---	FA-PAC -5V
A10	IOCHRDY	I	*2	B10	GND	---	FA-PAC GND
A11	AEN	O		B11	SMEMW*	O	Unconnected
A12	SA19	O	Unconnected	B12	SMEMR*	O	Unconnected
A13	SA18	O	Unconnected	B13	IOW*	O	
A14	SA17	O	Unconnected	B14	IOR*	O	
A15	SA16	O	Unconnected	B15	DACK3*	O	Always set to high level
A16	SA15	O		B16	DREQ3	I	Unconnected
A17	SA14	O		B17	DACK1*	O	Always set to high level
A18	SA13	O		B18	DREQ1	I	Unconnected
A19	SA12	O		B19	REFRESH*	O	*1
A20	SA11	O		B20	CLK	O	
A21	SA10	O		B21	IRQ7	I	
A22	SA09	O		B22	IRQ6	I	
A23	SA08	O		B23	IRQ5	I	
A24	SA07	O		B24	IRQ4	I	
A25	SA06	O		B25	IRQ3	I	
A26	SA05	O		B26	DACK2*	O	Always set to high level
A27	SA04	O		B27	TC	O	Always set to low level
A28	SA03	O		B28	BALE	O	
A29	SA02	O		B29	+5V	---	FA-PAC +5V
A30	SA01	O		B30	OSC	O	
A31	SA00	O		B31	GND	---	FA-PAC GND

Pin No.	Signal Name	I/O	Note	Pin No.	Signal Name	I/O	Note
C01	SBHE	O		D01	MEMCS16*	I	Unconnected
C02	LA23	O	Unconnected	D02	IOCS16*	I	
C03	LA22	O	Unconnected	D03	IRQ10	I	
C04	LA21	O	Unconnected	D04	IRQ11	I	
C05	LA20	O	Unconnected	D05	IRQ12	I	
C06	LA19	O	Unconnected	D06	IRQ15	I	
C07	LA18	O	Unconnected	D07	IRQ14	I	
C08	LA17	O	Unconnected	D08	DACK0*	O	Always set to high level
C09	MEMR*	O	Unconnected	D09	DREQ0	I	Unconnected
C10	MEMW*	---	Unconnected	D10	DACK5*	O	Always set to high level
C11	SD08	I/O		D11	DREQ5	I	Unconnected
C12	SD09	I/O		D12	DACK6*	O	Always set to high level
C13	SD10	I/O		D13	DREQ6	I	Unconnected
C14	SD11	I/O		D14	DACK7*	O	Always set to high level
C15	SD12	I/O		D15	DREQ7	I	Unconnected
C16	SD13	I/O		D16	+5V	---	FA-PAC +5V
C17	SD14	I/O		D17	MASTER*	I	Unconnected
C18	SD15	I/O		D18	GND	---	FA-PAC GND

*1 : Remains set to High level if the refresh signal is disabled.

*2 : In the cycle for generating the I/O wait from a board mounted in the I/O expansion unit, the I/O wait is allowed for a maximum period of one microsecond. At the end of that period, the cycle is forced to terminate. If the I/O wait is set to "0wait," the I/O wait request signal is ignored.

*3 : Operates with +5V power supply of the I/O expansion unit.

List of BUF-PCI(98) I/O Expansion Slot Signals

Table 4.8. List of BUF-PCI(98) I/O Expansion Slot Signals

Pin No.	Signal Name	I/O	Note	Pin No.	Signal Name	I/O	Note
A1	GND	---	FA-PAC GND	B1	GND	---	FA-PAC GND
A2	V1	---	Unconnected	B2	V1	---	Unconnected
A3	V2	---	Unconnected	B3	V2	---	Unconnected
A4	AB001	O		B4	DB001	I/O	
A5	AB011	O		B5	DB011	I/O	
A6	AB021	O		B6	DB021	I/O	
A7	AB031	O		B7	DB031	I/O	
A8	AB041	O		B8	DB041	I/O	
A9	AB051	O		B9	DB051	I/O	
A10	AB061	O		B10	DB061	I/O	
A11	GND	---	FA-PAC GND	B11	GND	---	FA-PAC GND
A12	AB071	O		B12	DB071	I/O	
A13	AB081	O		B13	DB081	I/O	
A14	AB091	O		B14	DB091	I/O	
A15	AB101	O		B15	DB101	I/O	
A16	AB111	O		B16	DB111	I/O	
A17	AB121	O		B17	DB121	I/O	
A18	AB131	O		B18	DB131	I/O	
A19	AB141	O		B19	DB141	I/O	
A20	AB151	O		B20	DB151	I/O	
A21	GND	---	FA-PAC GND	B21	GND	---	FA-PAC GND
A22	AB161	O	Unconnected	B22	+12V	---	FA-PAC +12V
A23	AB171	O	Unconnected	B23	+12V	---	FA-PAC +12V
A24	AB181	O	Unconnected	B24	IR31(INT0)	I	
A25	AB191	O	Unconnected	B25	IR51(INT1)	I	
A26	AB201	O	Unconnected	B26	IR61(INT2)	I	
A27	AB211	O	Unconnected	B27	IR91(INT3)	I	
A28	AB221	O	Unconnected	B28	IR101(INT41)	I	
A29	AB231	O	Unconnected	B29	IR121(INT5)	I	
A30	INT0	O	Unconnected	B30	IR131(INT6)	I	
A31	GND	---	FA-PAC GND	B31	GND	---	FA-PAC GND
A32	IOCHK0	I	Unconnected	B32	-12V	---	FA-PAC –12V
A33	IOR0	O		B33	-12V	---	FA-PAC –12V
A34	IOW0	O		B34	RESET0	O	
A35	MRC0	O	Unconnected	B35	DACK00	O	Always set to high level
A36	MWC0	O	Unconnected	B36	DACK30	O	Always set to high level
A37	INTA0	I/O	Unconnected	B37	DREQ00	I	Unconnected
A38	NOWAIT	I	Unconnected	B38	DREQ30	I	Unconnected
A39	SALE1	O	Unconnected	B39	WORD0	I	Unconnected
A40	MACS0	I	Unconnected	B40	EXHRQ10	I	Unconnected
A41	GND	---	FA-PAC GND	B41	GND	---	FA-PAC GND
A42	CPUENB0	O		B42	EXHLA10	O	Unconnected
A43	RFSH0	O	*1	B43	DMATC0	O	Always set to high level
A44	BHE0	O		B44	NMI0	O	Unconnected
A45	IORDY1	I	*2	B45	MWE0	O	Unconnected
A46	SCLK1	O		B46	EXHLA20	O	Unconnected
A47	S18CLK1	O		B47	EXHRQ20	I	Unconnected
A48	POWER0	O	*3	B48	SBUSRQ1	O	Unconnected
A49	+5V	---	FA-PAC +5V	B49	+5V	---	FA-PAC +5V
A50	+5V	---	FA-PAC +5V	B50	+5V	---	FA-PAC +5V

*1 : Remains set to High level if the refresh signal is disabled.

*2 : In the cycle for generating the I/O wait from a board mounted in the I/O expansion unit, the I/O wait is allowed for a maximum period of one microsecond. At the end of that period, the cycle is forced to terminate. If the I/O wait is set to "0wait," the I/O wait request signal is ignored.

*3 : Operates with +5V power supply of the I/O expansion unit.

Notes!

- *Signals in shaded cells are not available for use.*
- *All signals are independent of PC signals.*
- *Power +5V, +12V, and -12V are dependent on power specifications of the I/O expansion unit in use.*

Software (BUF-PCI Driver) Specifications

Table 4.9. Software Specifications

Item	Specification
Compatible OS	Windows XP Professional Windows XP Home Edition Windows 2000 Professional Windows NT Ver. 4.0 Windows Me Windows 98 Second Edition Windows 98 Windows 95
Compatible language	Microsoft Visual C Ver.5.0 or later Microsoft Visual Basic Ver.5.0 or later

5. Troubleshooting

If you have trouble with setting up the product or when it does not operate normally, check items listed below.

The Product cannot be Set Up Properly

The PC and/or the I/O Expansion Unit does not Start Up

(1) Is the power cable connected correctly?

(2) Is the cable connected to the connector correctly?

(3) Is the BUS-PCI(PCI) board mounted correctly?

(4) Is the BUS-PCI(PC) or BUS-PCI(98) board mounted correctly?

The BUF-PCI Driver cannot be Installed

(1) Can the floppy disk be accessed properly?

(2) Did you exit all other applications?

(3) Is each selection item in the setup program specified correctly?

Self-testing does not Result in OK

(1) Is the I/O expansion unit turned on?

(2) Is the cable connected to the connector correctly?

(3) Is the BUS-PCI(PCI) board mounted correctly?

(4) Is the BUS-PCI(PC) or BUS-PCI(98) board mounted correctly?

Board Mounted in the I/O Expansion Unit cannot be Accessed

No Input or Output can be Performed on I/O Ports

(1) Is the board mounted correctly in the I/O expansion unit?

(2) Are the I/O port addresses set for the board you mounted in the I/O expansion unit correct?

(3) Is any I/O port address of the board you mounted in the I/O expansion unit unique?

(4) Is the board you mounted in the I/O expansion unit subject to any of the restrictions that apply to this product?

If multiple boards are mounted in the I/O expansion unit, verify operations with only one board mounted.

Verify simple input and output operations using a sample program, for example.

If more than one board of the same type exists, replace them with one another to verify operations.

No Interruption can be Performed

(1) Is the board mounted correctly in the I/O expansion unit?

(2) Is the interrupt request level set for the board you mounted in the I/O expansion unit correct?

(3) Is any interrupt request of the board you mounted in the I/O expansion unit unique?

(4) Is the board you mounted in the I/O expansion unit subject to any of the restrictions that apply to this product?

If multiple boards are mounted in the I/O expansion unit, verify operations with only one board mounted.

Verify simple input and output operations using a sample program, for example.

If more than one board of the same type exists, replace them with one another to verify operations.

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