

PC-HELPER

Digital Output Board  
with Relay-Isolation for PCI  
**RRY-16C(PCI)H**  
**RRY-32(PCI)H**  
User's Guide

CONTEC CO.,LTD.

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# Check Your Package

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Thank you for purchasing the CONTEC product.

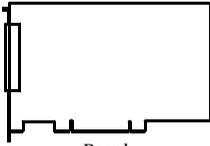
The product consists of the items listed below.

Check, with the following list, that your package is complete. If you discover damaged or missing items, contact your retailer.

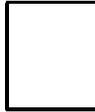
## Product Configuration List

- Board (One of the following)  
[RRY-16C(PCI)H or RRY-32(PCI)H] ...1
- First step guide ...1
- CD-ROM\*1 [API-PAC(W32)] ...1

\*1 The CD-ROM contains the driver software and User's Guide (this guide).



Board



First step guide



CD-ROM  
[API-PAC(W32)]

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# Copyright

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Regardless of the foregoing statement, CONTEC assumes no responsibility for any errors that may appear in this document nor for results obtained by the user as a result of using this product.

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# 1. Before Using the Product

This chapter provides information you should know before using the product.

## About the Boards

The < RRY-16C(PCI)H > and < RRY-32(PCI)H > are PCI bus-compliant interface boards that output signals to lead relay contacts.

The < RRY-16C(PCI)H > provides up to 16 relay outputs.

The < RRY-32(PCI)H > provides up to 32 relay outputs.

Using the bundled driver library [API-PAC(W32)], you can create Windows application software for this board in your favorite programming language supporting Win32 API functions, such as Visual Basic or Visual C/C++.

### RRY-16C(PCI)H Features

- Up to 16 reed relays with independently make contact output
- High-capacity output rating designed to be a maximum of 125 VAC/30 VDC, 2 A per channel

### RRY-32(PCI)H Features

- 32 reed relays with a single make contact are implemented. These relays are classified into four groups, each group (eight relays) sharing a minus common pin.
- Output ratings are designed for a maximum of 100VAC/100VDC and 500 mA per channel, a maximum of 1A for each group (one group of eight channels share a minus common). Relay contactor rating is 10VA(10W) maximum.

## Support Software

You should use CONTEC support software according to your purpose and development environment.

### Driver Library **API-PAC(W32)** (Bundled)

API-PAC(W32) is the library software that provides the commands for CONTEC hardware products in the form of Windows standard Win32 API functions (DLL). It makes it easy to create high-speed application software taking advantage of the CONTEC hardware using various programming languages that support Win32 API functions, such as Visual Basic and Visual C/C++.

It can also be used by the installed diagnosis program to check hardware operations.

CONTEC provides download services to supply the updated drivers and differential files.

For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

< Operating environment >

OS	Windows XP, 2000, NT, Me, 98, etc..
Adaptation language	Visual C/C++, Visual Basic, Delphi, Builder, etc..
Others	Each piece of library software requires 50 MB of free hard disk space.

### Linux version of analog I/O driver **API-DIO(LNX)** (Supplied: Stored on the API-PAC(W32) CD-ROM)

This driver is used to control CONTEC digital I/O boards (PC Cards) from within Linux.

You can control CONTEC I/O boards easily using the shared library used by gcc and Kylix, the device driver (module) for each kernel version, and the board (PC Card) configuration program (config).

CONTEC provides download services to supply the updated drivers and differential files.

For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

< Operating environment >

OS	RedHatLinux, TurboLinux, etc.. (For details on supported distributions, refer to Help available after installation.)
Adaptation language	gcc, Kylix, etc..
Others	Requires 3 MB of free hard disk space.

### Data acquisition VI library for LabVIEW **VI-DAQ** (Free download)

This is a VI library to use in National Instruments LabVIEW.

VI-DAQ is created with a function form similar to that of LabVIEW's Data Acquisition VI, allowing you to use various devices without complicated settings.

See <http://www.contec.co.jp/vidaq/> for details and download of VI-DAQ.

## Cable & Connector (Option)

Flat cable with both-ends 37-pin D-SUB connector	: PCB37P-1.5 (1.5m)
	: PCB37P-3 (3m)
	: PCB37P-5 (5m)
Shield cable with both-ends 37-pin D-SUB connector	: PCB37PS-0.5P (0.5m)
	: PCB37PS-1.5P (1.5m)
	: PCB37PS-3P (3m)
	: PCB37PS-5P (5m)
Flat cable with one-ends 37-Pin D-SUB connector	: PCA37P-1.5 (1.5m)
	: PCA37P-3 (3m)
	: PCA37P-5 (5m)
Shield cable with one-end 37-pin D-SUB connector	: PCA37PS-0.5P (0.5m)
	: PCA37PS-1.5P (1.5m)
	: PCA37PS-3P (3m)
	: PCA37PS-5P (5m)
37pin D-SUB(male) connector Five-piece set	: CN5-D37M



### CAUTION

The maximum current rate of each flat cable line (PCB37P-\* and PCA37P-\*) is 1 A; and the maximum current rate of each shield cable line (PCB37PS-\*P and PCA37PS-\*P) is 0.4 A.

Should the boards be connected to devices that require larger current value than the above rates, you should prepare connecting cables yourself, instead of ordering our option cables.

## Accessories (Option)

Screw terminal	: EPD-37A *1
Screw terminal (Screw Up type)	: EPD-37 *1
Terminal unit for solderless terminal (M3)	: DTP-3(PC)
Terminal unit for leads	: DTP-4(PC)

\*1 Optional cable PCB37P or PCB37PS is required separately.

\* Check the CONTEC's Web site for more information on these options.

## Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

### Web Site

Japanese <http://www.contec.co.jp/>  
English <http://www.contec.com/>  
Chinese <http://www.contec.com.cn/>

Latest product information

CONTEC provides up-to-date information on products.

CONTEC also provides product manuals and various technical documents in the PDF.

Free download

You can download updated driver software and differential files as well as sample programs available in several languages.

Note! For product information

Contact your retailer if you have any technical question about a CONTEC product or need its price, delivery time, or estimate information.

## Limited Three-Years Warranty

CONTEC Interface products 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 products. 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.

# Safety Precautions

Understand the following definitions and precautions to use the product safely.

## Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Understand the meanings of these labels to operate the equipment safely.

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

## Handling Precautions

### DANGER

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Do not use the product where it is exposed to flammable or corrosive gas. Doing so may result in an explosion, fire, electric shock, or failure.

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### CAUTION

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- There are switches and jumpers on the board that need to be set in advance.  
Be sure to check these before installing the board.
  - Only set the switches and jumpers on the board to the specified settings.  
Otherwise, the board may malfunction, overheat, or cause a failure.
  - Do not strike or bend the board.  
Otherwise, the board may malfunction, overheat, or cause a failure or breakage.
  - Do not touch the board's metal plated terminals (edge connector) with your hands.  
Otherwise, the board may malfunction, overheat, or cause a failure.  
If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
  - Do not install or remove the board to or from the expansion slot while the PC or expansion unit power is turned on.  
Otherwise, the board may malfunction, overheat, or cause a failure.  
Be sure that the PC power is turned off.
  - Make sure that your PC or expansion unit can supply ample power to all the boards installed.  
Insufficiently energized boards could malfunction, overheat, or cause a failure.
  - The specifications of this product are subject to change without notice for enhancement and quality improvement.  
Even when using the product continuously, be sure to read the manual and understand the contents.
  - Do not modify the product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this product.
  - Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.
-

## Environment

Use this product in the following environment. If used in an unauthorized environment, the board may overheat, malfunction, or cause a failure.

Operating temperature

0 - 50°C

Operating humidity

10 - 90%RH (No condensation)

Corrosive gases

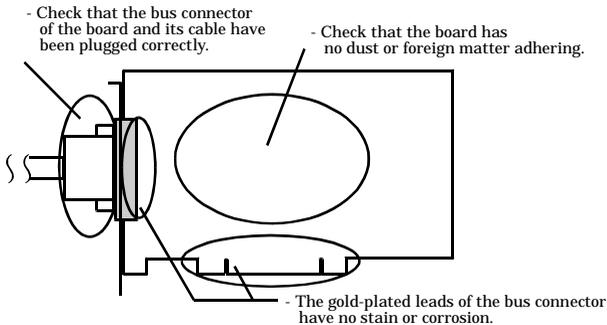
None

Floating dust particles

Not to be excessive

## Inspection

Inspect the product periodically as follows to use it safely.



## Storage

When storing this product, keep it in its original packing form.

- (1) Put the board in the storage bag.
- (2) Wrap it in the packing material, and then put it in the box.
- (3) Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

## Disposal

When disposing of the product, follow the disposal procedures stipulated under the relevant laws and municipal ordinances.



## 2. Setup

This chapter explains how to set up the board.

### What is Setup?

Setup means a series of steps to take before the product can be used.

Different steps are required for software and hardware

The setup procedure varies with the OS and applications used.

### Using the Board under Windows

#### Using the Driver Library API-PAC(W32)

This section describes the setup procedure to be performed before you can start developing application programs for the board using the bundled CD-ROM “Driver Library API-PAC(W32)”.

Taking the following steps sets up the software and hardware. You can use the diagnosis program later to check whether the software and hardware function normally.

**Step 1 Installing the Software**

**Step 2 Setting the Hardware**

**Step 3 Installing the Hardware**

**Step 4 Initializing the Software**

**Step 5 Checking Operations with the Diagnosis Program**

If Setup fails to be performed normally, see the “Setup Troubleshooting” section at the end of this chapter.

### Using the Board under Windows

#### Using Software Other than the Driver Library

#### API-PAC(W32)

For setting up software other than API-PAC(W32), refer to the user’s guide for that software. See also the following parts of this user’s guide as required.

**This chapter Step 2 Setting the Hardware**

**This chapter Step 3 Installing the Hardware**

**Chapter 3 External Connection**

**Chapter 6 About Hardware**

## Using the Board under an OS Other than Windows

For using the board under Linux, see the following parts of this guide.

This chapter Step 2 Setting the Hardware

Chapter 3 External Connection

Chapter 5 About Software

Chapter 6 About Hardware

For using the board under an OS such as MS-DOS other than Windows, see the following parts of this guide.

This chapter Step 2 Setting the Hardware

Chapter 3 External Connection

Chapter 6 About Hardware

## Step 1 Installing the Software

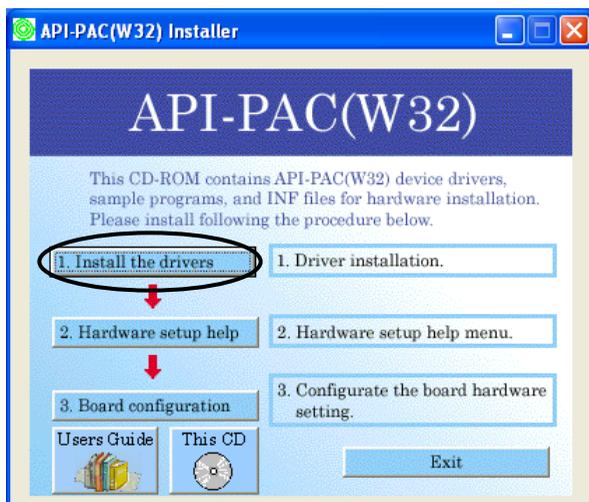
This section describes how to install the Driver libraries.

**Before installing the hardware on your PC, install the Driver libraries from the bundled API-PAC(W32) CD-ROM.**

The following description assumes the operating system as Windows XP. Although some user interfaces are different depending on the OS used, the basic procedure is the same.

### Starting the Install Program

- (1) Load the CD-ROM [API-PAC(W32)] on your PC.
- (2) The API-PAC(W32) Installer window appears automatically.  
If the panel does not appear, run (CD-ROM drive letter):\AUTORUN.exe.
- (3) Click on the [Install the drivers] button.

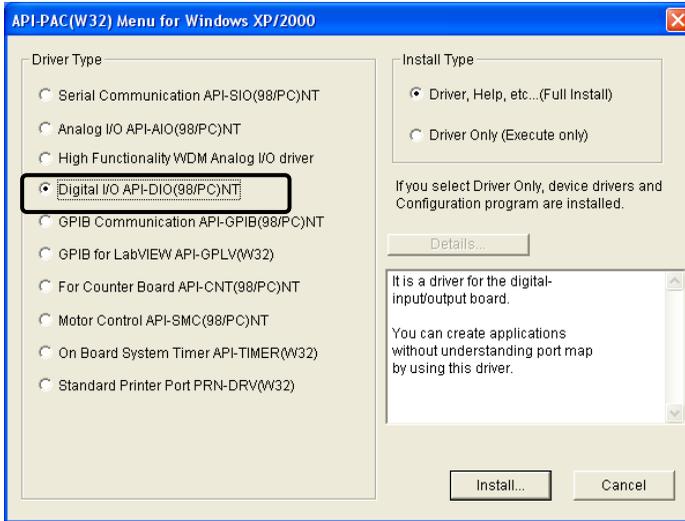


### ⚠ CAUTION

Before installing the software in Windows XP, 2000, or NT, you need to log in as a user with administrator privileges.

## Selecting the Digital I/O Driver

- (1) The following dialog box appears to select “Driver Type” and “Install Type”.
- (2) Select “Digital I/O API-DIO(98/PC)NT”.
- (3) Select “Driver, Help, etc... (Full install)”.
- (4) Click on the [Install] button.



## Executing the Installation

- (1) **Follow the on-screen instructions to proceed to install.**
- (2) When the required files have been copied, the “Perform a hardware setup now” and “Show readme file” check boxes are displayed.

**When you are installing the software or hardware for the first time:**

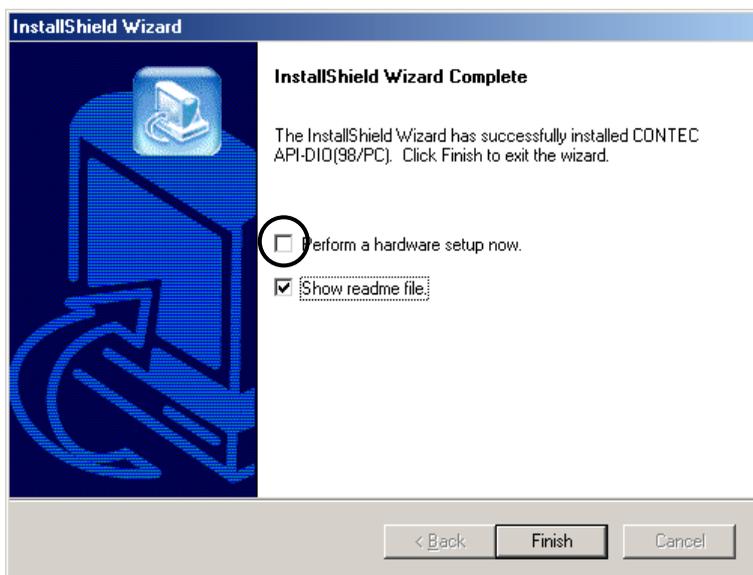
**1) Uncheck “Perform a hardware setup now”.**

**2) Click on the [Finish] button.**

**Go to Step 2 to set and plug the hardware.**

\* When the hardware has already been installed:

Check “Perform a hardware setup now” and then go to Step 4 “Initializing the Software”.



**You have now finished installing the software.**

## Step 2 Setting the Hardware

This section describes how to set the board and plug it on your PC.

There are switches and jumpers on the board that need to be set in advance.

Be sure to check these before installing the board.

The board can be set up even with the factory defaults untouched. You can change board settings later.

### Parts of the Board and Factory Defaults

Figure 2.1. or 2.2. shows the names of major parts on the board.

Note that the switch setting shown below is the factory default.

Parts name of board

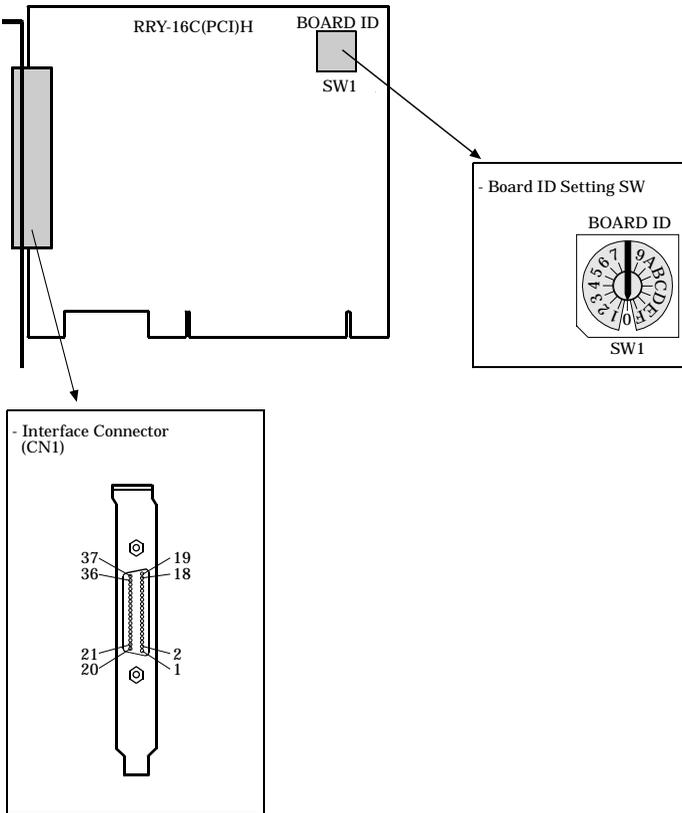


Figure 2.1. Parts name of board < RRY-16C(PCI)H >

Parts name of board

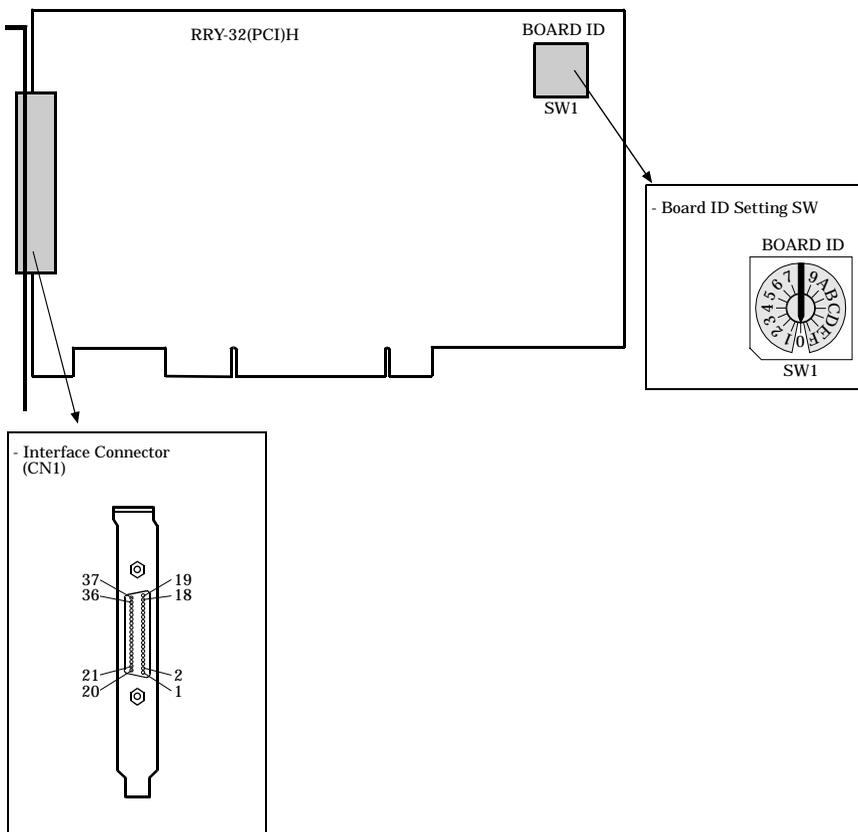


Figure 2.2. Parts name of board < RRY-32(PCI)H >

## Setting the Board ID

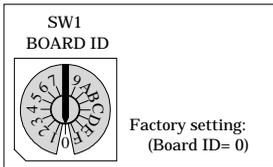
If you install two or more boards on one personal computer, assign a different ID value to each of the boards to distinguish them.

The board IDs can be set from 0 to Fh to identify up to sixteen boards.

If only one board is used, the original factory setting (Board ID = 0) should be used.

### Setting Procedure

To set the board ID, use the rotary switch on the board. Turn the SW1 knob to set the board ID as shown below.



**Figure 2.3. Board ID Settings (SW1)**

## Plugging the Board

- (1) Before plugging the board, shut down the system, unplug the power cord of your PC.
- (2) Remove the cover from the PC so that the board can be mounted.
- (3) Plug the board into an expansion slot.
- (4) Attach the board bracket to the PC with a screw.
- (5) Put the cover back into place.

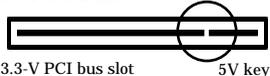


### Applicable PCI bus slots

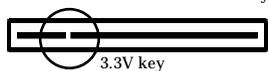
PCI bus slots used in PCs have keys to prevent 5V and 3.3V PCI bus boards from being accidentally plugged into wrong bus slots. This board can be plugged into both of the 5V and 3.3V PCI bus slots.

<PCI bus slot>

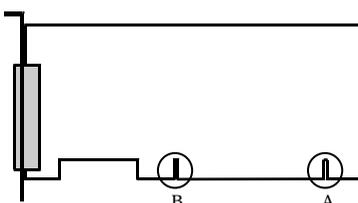
5-V PCI bus slot



3.3-V PCI bus slot



<PCI bus board>



A : Slit for 5-V PCI bus slot  
B : Slit for 3.3-V PCI bus slot



### CAUTION

- Do not touch the board's metal plated terminals (edge connector) with your hands. Otherwise, the board may malfunction, overheat, or cause a failure. If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Do not install or remove the board to or from the expansion slot while the PC or expansion unit power is turned on. Otherwise, the board may malfunction, overheat, or cause a failure. Be sure that the PC power is turned off.
- Make sure that your PC or expansion unit can supply ample power to all the boards installed. Insufficiently energized boards could malfunction, overheat, or cause a failure.
- Power supply from the PCI bus slot at +5V is required.

## Step 3 Installing the Hardware

For using an expansion board under Windows, you have to let the OS detect the I/O addresses and IRQ to be used by the board. The process is referred to as installing the hardware.

In the case of using two or more boards, make sure you install one by one with the Add New Hardware Wizard.

### Turning on the PC

Turn on the power to your PC.

#### CAUTION

- The 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 board, first determine what PC resources are free to use.
  - The resources used by each board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more boards that have already been installed and then remount one of them on the computer, it is unknown that which one of the sets of resources previously assigned to the two boards is assigned to the remounted board. In this case, you must check the resource settings.
- 

## Setting with the Found New Hardware Wizard

(1) The “Found New Hardware Wizard” will be started.

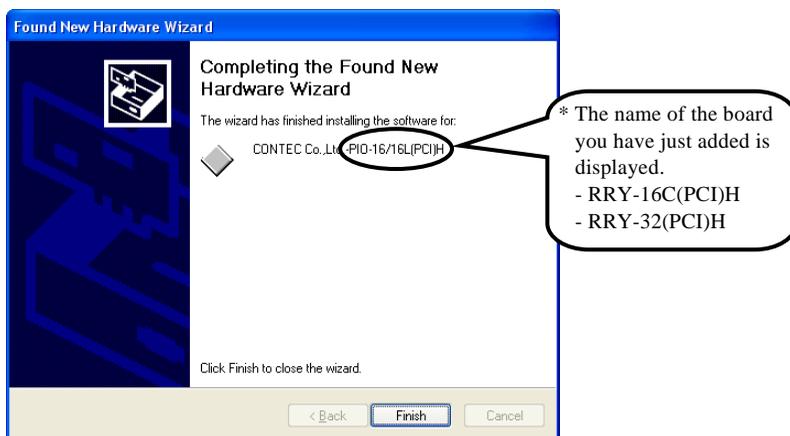
Select “Install from a list or specific location (Advanced)”, then click on the [Next] button.

**If you are using Windows NT 4.0, the “Found New Hardware Wizard” is not started.**

**Go to Step 4 “Initializing the Software”.**



- (2) Specify that folder on the CD-ROM which contains the setup information (INF) file to register the board.

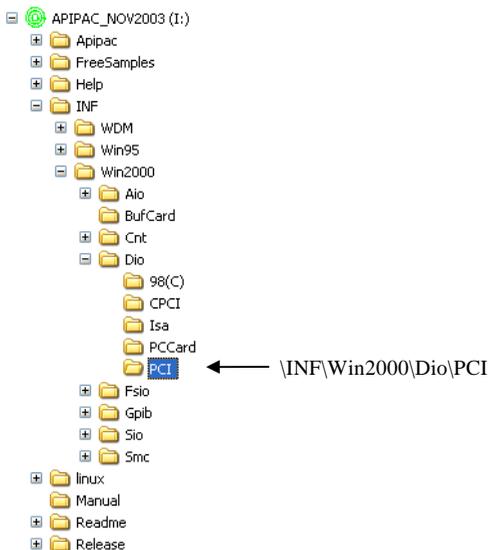


Source folder

The setup information (INF) file is contained in the following folder on the bundled CD-ROM.

Windows XP, 2000    \INF\Win2000\Dio\PCI  
 Windows Me, 98, 95    \INF\Win95\Dio\PCI

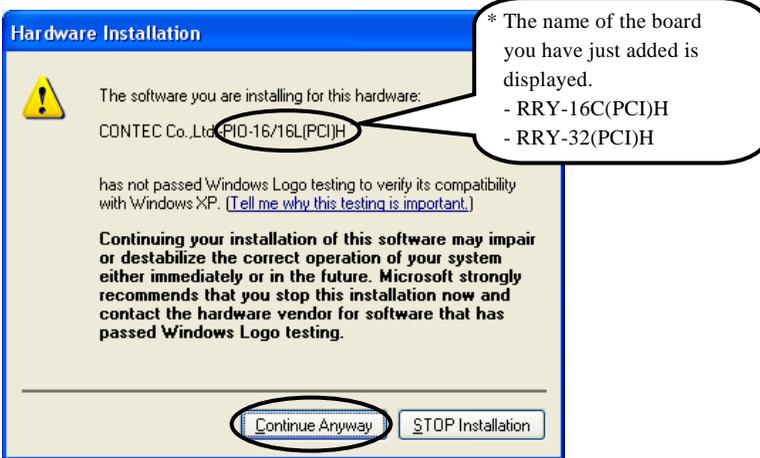
### Example of specifying the folder for use under Windows XP



**⚠ CAUTION**

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.**



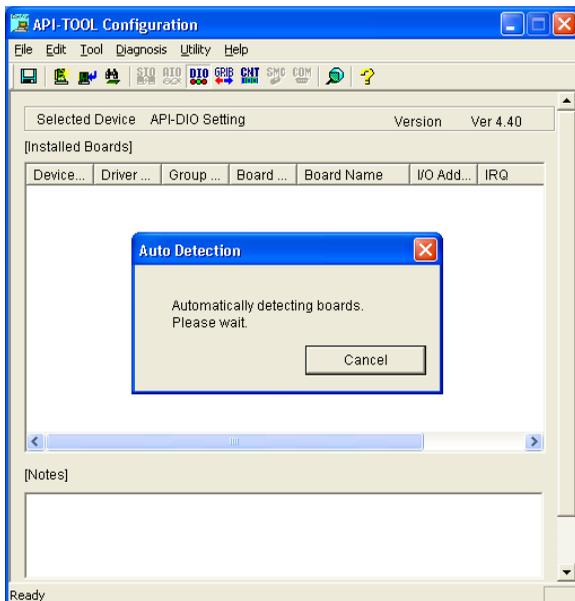
**You have now finished installing the software.**

## Step 4 Initializing the Software

The API function library requires the initial setting to recognize the execution environment. It is called the initialization of the Driver library.

### Invoking API-TOOL Configuration

- (1) Open the Start Menu, then select “Programs” – “CONTEC API-PAC(W32)” – “API-TOOL Configuration”.



- (2) API-TOOL Configuration detects boards automatically.  
The detected boards are listed.

### Updating the Settings

- (1) Select “Save settings to registry...” from the “File” menu.

**You have now finished installing the initial setting of Software.**

# Step 5 Checking Operations with the Diagnosis Program

Use the diagnosis program to check that the board and driver software work normally, thereby you can confirm that they have been set up correctly.

## What is the Diagnosis Program?

The diagnosis program diagnoses the states of the board and driver software.

It can also be used as a simple checker when an external device is actually connected.

Using the “Diagnosis Report” feature reports the driver settings, the presence or absence of the board, I/O status, and interrupt status.

## Check Method

Connect the board to a remote device to test the input/output or check the execution environment.

Please confirm that the board settings are the same as the factory settings.

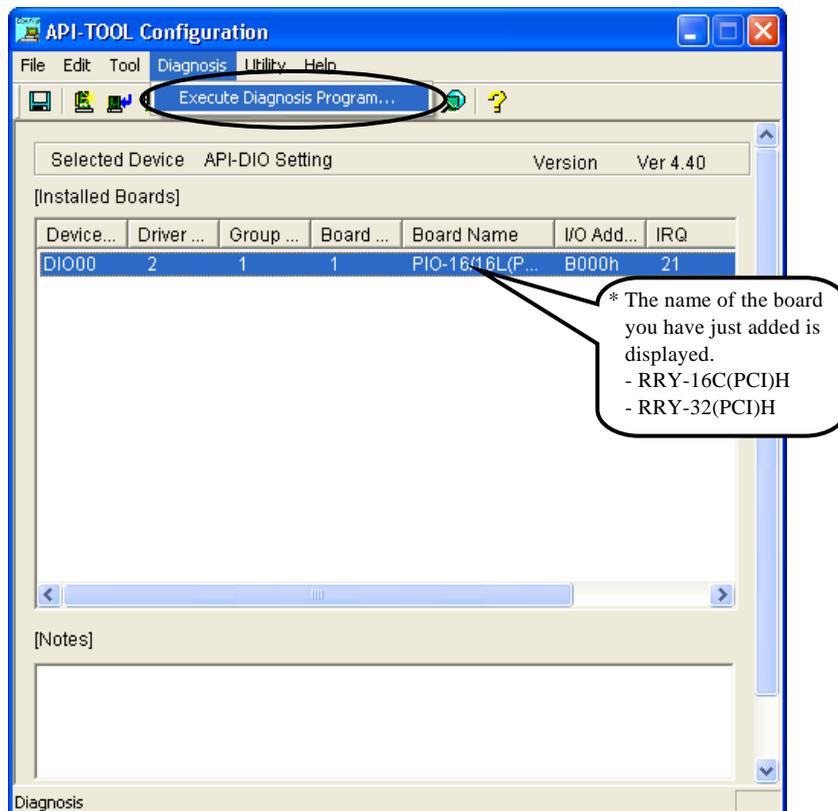
To connect the board to external device, please refer to chapter 3 “External Connection”.

## Using the Diagnosis Program

### Starting the Diagnosis Program

Select the board in the API-TOOL Configuration windows, then run the Diagnosis Program. Follow the instructions on screen.

\* The name of the board you have just added is displayed.



### Checking Digital Inputs and Outputs

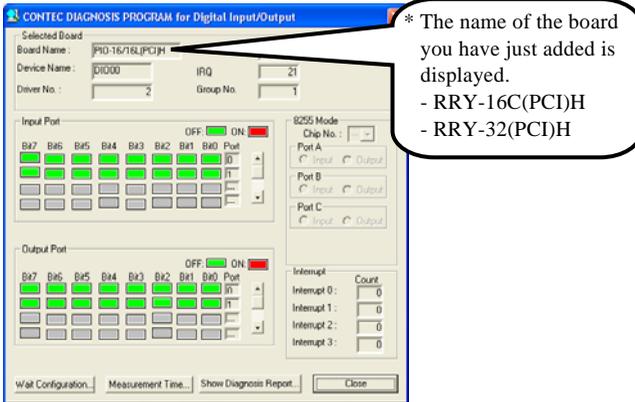
The main panel of the Diagnosis Program appears.

You can check the current operation states of the board in the following boxes:

“Input Port” : Displays input values bit by bit at fixed time intervals.

“Output Port” : Mouse operation allows the data to output or display.

“Interrupt” : Displays the number of interrupts detected bit by bit.



To use the wait time control feature, click on the [Wait Configuration] button. Use the feature when the wait time based on the DioWait or DioWaitEx function is not normal.

To use the function execution time measurement feature, click on the [Measurement Time] button. Enter the I/O start port and the number of ports, then press the measurement button. The time for each execution of a function will be measured.

## Diagnosis Report

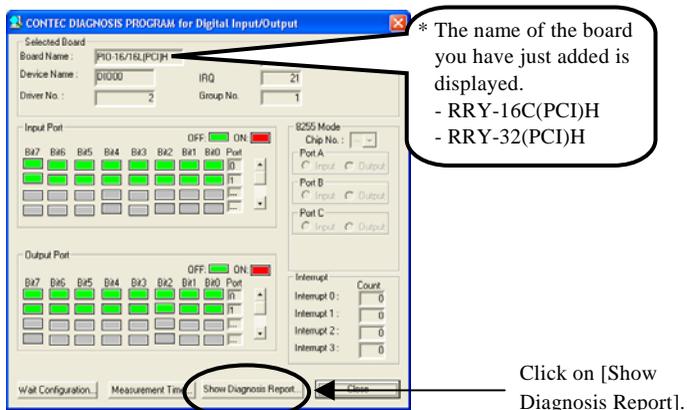
- (1) Clicking on the [Show Diagnosis Report] button displays detailed data such as board settings and the diagnosis results while saving them in text format.

The results are saved and displayed as a text file (DioRep.txt) in the install folder (Program Files\CONTEC\API-PAC(W32)).

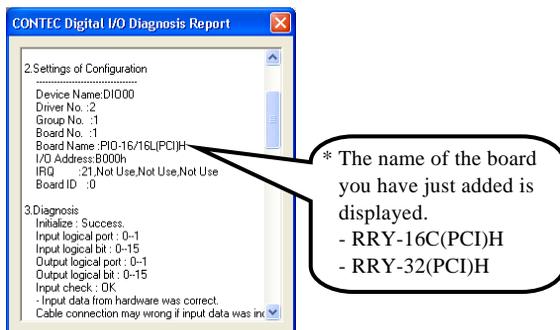
The Diagnosis Program performs “board presence/absence check”, “driver file test”, “board setting test”, and so on.

### ⚠ CAUTION

Before executing diagnosis report output, unplug the cable from the board.



- (2) A diagnosis report is displayed as shown below.



# Setup Troubleshooting

## Symptoms and Actions

The board cannot be initialized [Windows NT 4.0]

The driver may not yet be activated.

When using the board under an OS not compliant with Plug and Play, such as Windows NT 4.0, make sure that the [PnP OS] BIOS option has been set to [NO], [disable], or [Do not use]. If the option has been set to [Windows 95], for example, the board may not be detected normally. For details on BIOS settings, refer to the user's guide for your PC.

No output can be obtained.

Use API-TOOL Configuration to check whether the board name setting is wrong.

The board works with the Diagnosis Program but not with an application.

The Diagnosis Program is coded with API-TOOL functions. As long as the board operates with the Diagnosis Program, it is to operate with other applications as well. In such cases, review your program while paying attention to the following points:

- Check the arguments to functions and their return values.
- When the board is an isolated type, it has a time lag for its response between the output by a function and the actual output. Consider the execution intervals between functions.

The OS won't normally get started or detect the board. [Windows XP, 2000]

Turn off the power of your PC, then unplug the board. Restart the OS and delete the board settings of API-TOOL Configuration. Turn off the PC again, plug the board, and restart the OS. Let the OS detect the board and use API-TOOL Configuration to register board settings.

## If your problem cannot be resolved

Contact your retailer.

## 3. External Connection

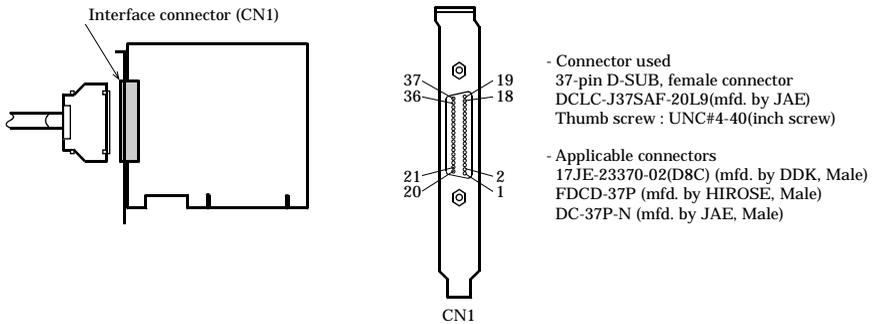
This chapter describes the interface connector on the board and the external I/O circuits. Check the information available here when connecting an external device.

### Using the On-board Connectors

#### Connecting a Device to Connector

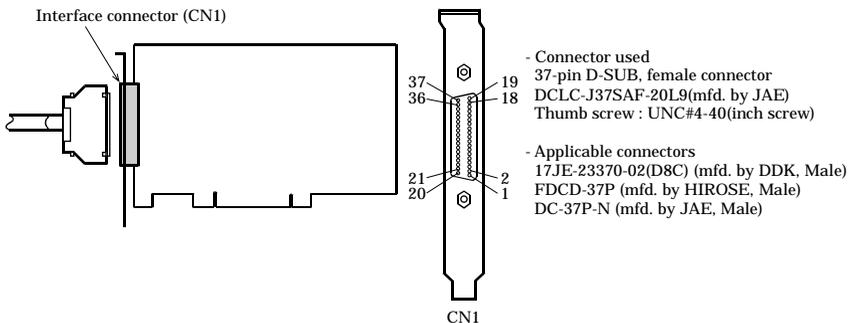
To connect an external device to the board, plug the cable from the device into the interface connector shown below.

##### Connecting an Interface Connector and Connectors That Can Be Used



**Figure 3.1. Connecting an Interface Connector and Connectors That Can Be Used**  
< RRY-16C(PCI)H >

##### Connecting an Interface Connector and Connectors That Can Be Used



**Figure 3.2. Connecting an Interface Connector and Connectors That Can Be Used**  
< RRY-32(PCI)H >

## Connector Pin Assignment

Pin Assignments of RRY-16C(PCI)H Interface Connector

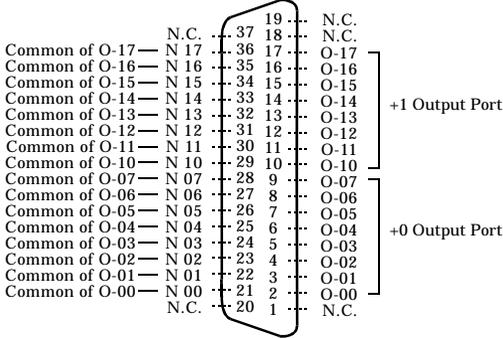


Figure 3.3. Pin Assignments of RRY-16C(PCI)H Interface Connector

Pin Assignments of RRY-32(PCI)H Interface Connector

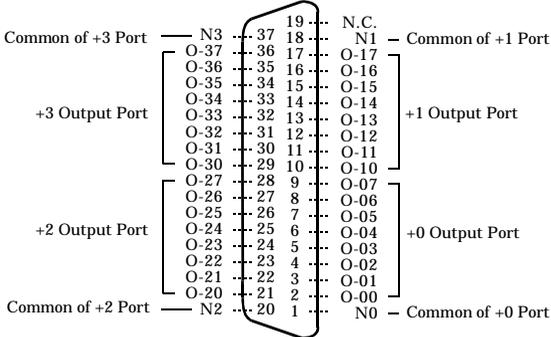


Figure 3.4. Pin Assignments of RRY-32(PCI)H Interface Connector

## Relationships between API-PAC(W32) Logical Ports/Bits and Connector Signal Pins

The following table lists the relationships between the connector signal pins and the logical port/bit numbers used for I/O functions when applications are written with API-PAC(W32).

RRY-16C(PCI)H

**Table 3.1. Logical Ports, Logical Bits, and Connector Signal Pins < RRY-16C(PCI)H >**

	D7	D6	D5	D4	D3	D2	D1	D0
Output logical port 0	O-07 [7]	O-06 [6]	O-05 [5]	O-04 [4]	O-03 [3]	O-02 [2]	O-01 [1]	O-00 [0]
Output logical port 1	O-17 [15]	O-16 [14]	O-15 [13]	O-14 [12]	O-13 [11]	O-12 [10]	O-11 [9]	O-10 [8]

Note: O-xx represents output signals, respectively, where [xx] indicates a logical bit.

RRY-32(PCI)H

**Table 3.2. Logical Ports, Logical Bits, and Connector Signal Pins < RRY-32(PCI)H >**

	D7	D6	D5	D4	D3	D2	D1	D0
Output logical port 0	O-07 [7]	O-06 [6]	O-05 [5]	O-04 [4]	O-03 [3]	O-02 [2]	O-01 [1]	O-00 [0]
Output logical port 1	O-17 [15]	O-16 [14]	O-15 [13]	O-14 [12]	O-13 [11]	O-12 [10]	O-11 [9]	O-10 [8]
Output logical port 2	O-27 [23]	O-26 [22]	O-25 [21]	O-24 [20]	O-23 [19]	O-22 [18]	O-21 [17]	O-20 [16]
Output logical port 3	O-37 [31]	O-36 [30]	O-35 [29]	O-34 [28]	O-33 [27]	O-32 [26]	O-31 [25]	O-30 [24]

Note: O-xx represents output signals, respectively, where [xx] indicates a logical bit.



### CAUTION

The logical port and logical bit numbers are virtual port and bit numbers that enable programming independent of board I/O addresses or board types.

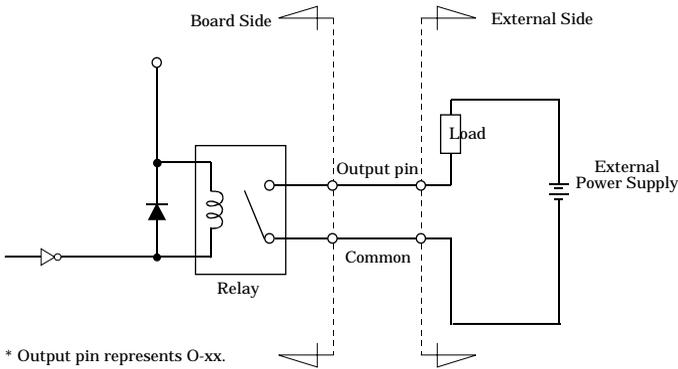
For details, refer to API-DIO HELP available after installing API-PAC(W32).

# Output Signal Connection

Figure 3.5 and figure 3.6 shows the output circuit at the interface section of the board. The signal output section uses a relay contact method to send signals to the external device.

## Output Circuit

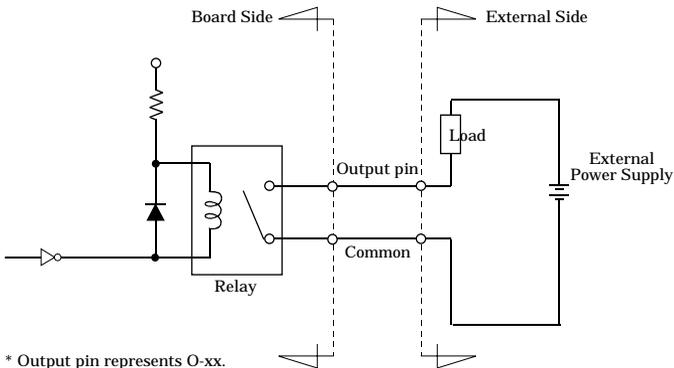
RRY-16C(PCI)H



\* Output pin represents O-xx.

**Figure 3.5. Output Circuit < RRY-16C(PCI)H >**

RRY-32(PCI)H



\* Output pin represents O-xx.

**Figure 3.6. Output Circuit < RRY-32(PCI)H >**

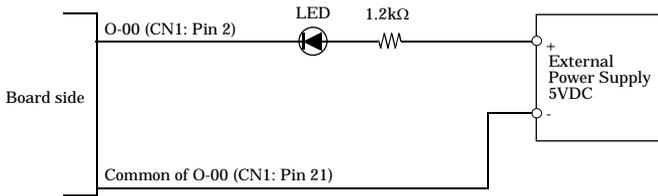


### CAUTION

When the PC is turned on, all outputs are reset to OFF.

## Connection to the LED

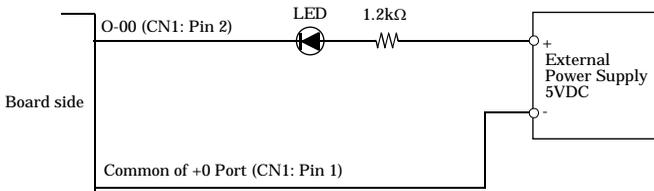
RRY-16C(PCI)H



Output a "1" to a bit will light the LED that is connected to the related relay output.  
On the other hand, output a "0" to the bit will switch the LED off.

**Figure 3.7. An Example to use Output O-00 < RRY-16C(PCI)H >**

RRY-32(PCI)H



Output a "1" to a bit will light the LED that is connected to the related relay output.  
On the other hand, output a "0" to the bit will switch the LED off.

**Figure 3.8. An Example to use Output O-00 < RRY-32(PCI)H >**



## 4. Function

This section describes the features of the board.

### Data I/O Function

#### Data Output

Providing “1” output to the corresponding bit makes the relay contact turned ON (make state).

Providing, in turn, “0” output to the corresponding bit makes the relay contact turned OFF (break state).

The state of the output data is kept intact until the output instruction is executed again.



#### CAUTION

---

When the PC is turned on, all outputs are reset to 0 (OFF).

---

#### Monitoring Output Data

The board can read the state of the data currently being output without affecting the output data.



## 5. About Software

### CD-ROM Directory Structure

```

\
|— Autorun.exe           Installer Main Window
| Readmej.html          Version information on each API-TOOL (Japanese)
| Readmeu.html          Version information on each API-TOOL (English)
|
|
|
|— APIPAC                Each installer
| |— AIO
| | |— DISK1
| | |— DISK2
| | |— .....
| | |— DISKN
| |— AioWdm
| |— CNT
| |— DIO
| |— .....
|
|
|
|— HELP                  HELP file
| |— Aio
| |— Cnt
| |— .....
|
|
|
|— INF                   Each INF file for OS
| |— WDM
| |— Win2000
| |— Win95
|
|
|
|— linux                 Linux driver file
| |— cnt
| |— dio
| |— .....
|
|
|
|— Readme                Readme file for each driver
|
|
|
|— Release               Driver file on each API-TOOL
| |— API_NT              (For creation of a user-specific install program)
| |— API_W95
|
|
|
|— UsersGuide            Hardware User's Guide(PDF files)

```

## About Software for Windows

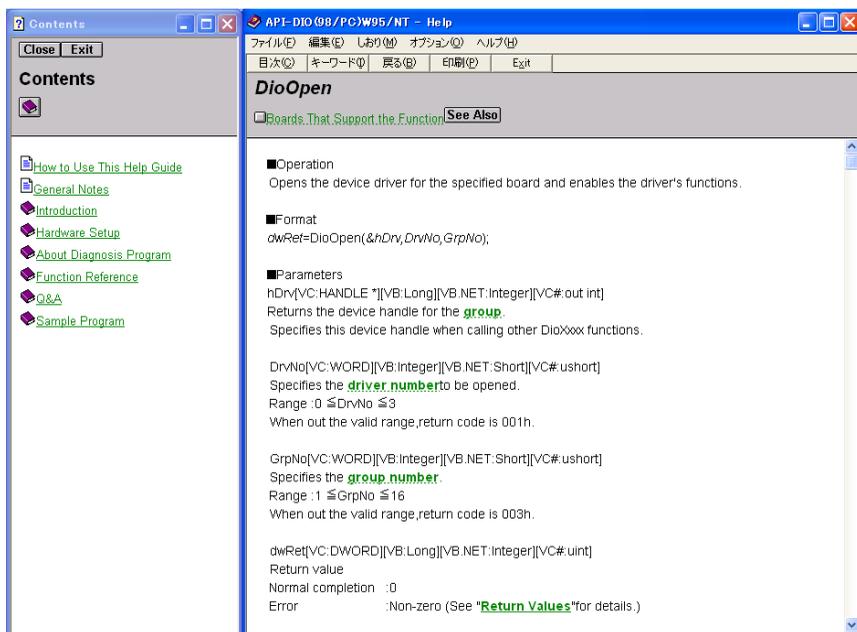
The bundled CD-ROM “Driver Library API-PAC(W32)” contains the functions that provide the following features:

- Digital input/output of specified ports
- Hardware digital input/output of specified bits

For details, refer to the help file. The help file provides various items of information such as “Function Reference”, “Sample Programs”, and “FAQs”. Use them for program development and troubleshooting.

### Accessing the Help File

- (1) Click on the [Start] button on the Windows taskbar.
- (2) From the Start Menu, select “Programs” – “CONTEC API-PAC(W32)” – “Dio” – “API-DIO HELP” to display help information.



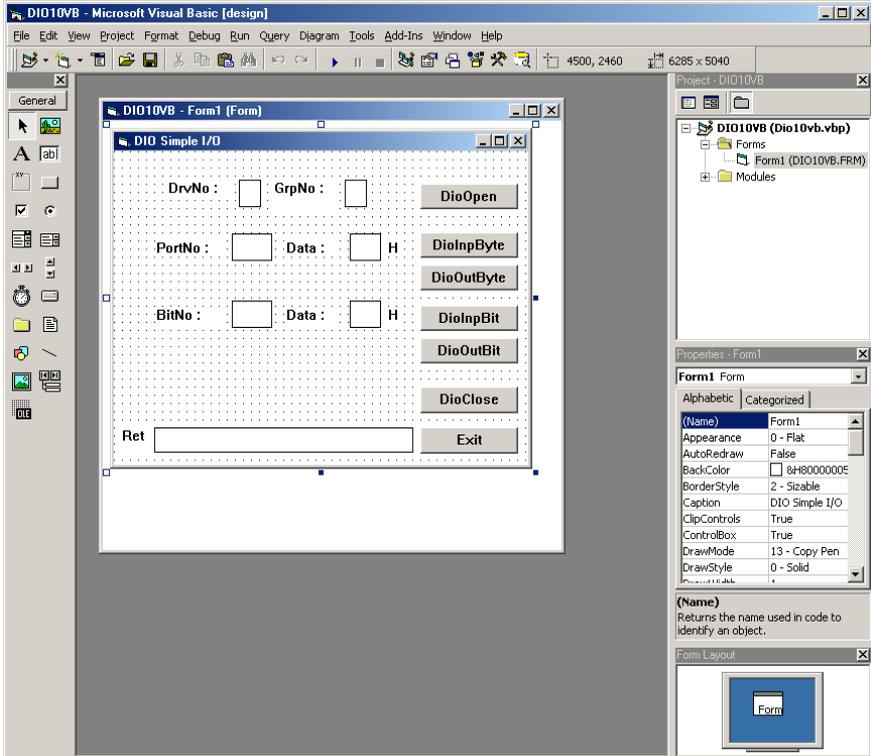
## Using Sample Programs

Sample programs have been prepared for specific basic applications.

To use each sample program, enter its driver number and group number set by API-TOOL Configuration in the DrvNo and GrpNo fields.

Use these sample programs as references for program development and operation check.

The sample programs are stored in \Program Files\CONTEC\API-PAC(W32)\Dio\Samples.



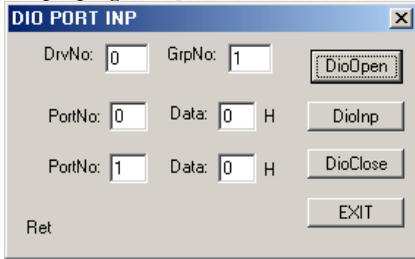
### Running a Sample Program

- (1) Click on the [Start] button on the Windows taskbar.
- (2) From the Start Menu, select “Programs” – “CONTEC API-PAC(W32)” – “Dio” – “SAMPLE...”.
- (3) A sample program is invoked.

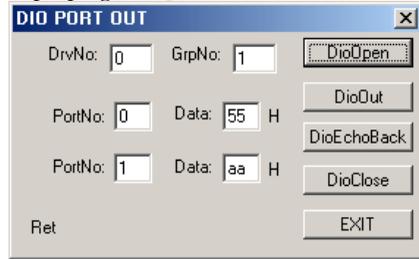
Sample Programs - Examples

- Sample program 1 : Inputs digital data through a specified port.
- Sample program 2 : Outputs digital data through a specified port.
- Sample program 3 : Inputs/outputs digital data from/to a programmable board.
- Sample program 4 : Inputs digital data from a specified port in the background.
- Sample program 5 : Inputs/outputs digital data from/to a specified bit.
- Sample program 6 : Services interrupts of a specified board.
- Sample program 7 : Provides process control of a specified board.
- Sample program 8 : Performs trigger monitoring of a specified board.
- Sample program 9 : Inputs digital data through a specified port using BCD data.
- Sample program 10 : Executes digital input (simple functions) at specified bits through a specified port.
- Sample program 11 : Services interrupts of a specified board (using an extended function).
- Sample program (Console): Inputs/outputs digital data through a specified board.

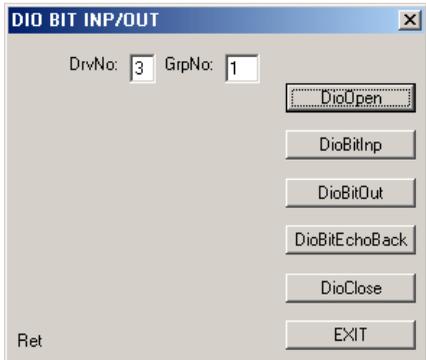
[Sample program 1]



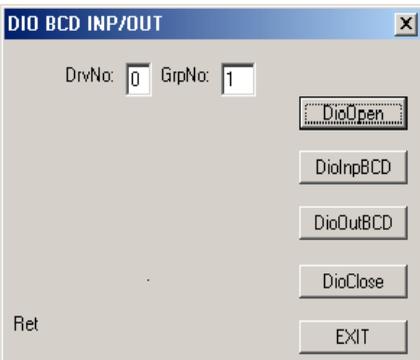
[Sample program 2]



[Sample program 5]



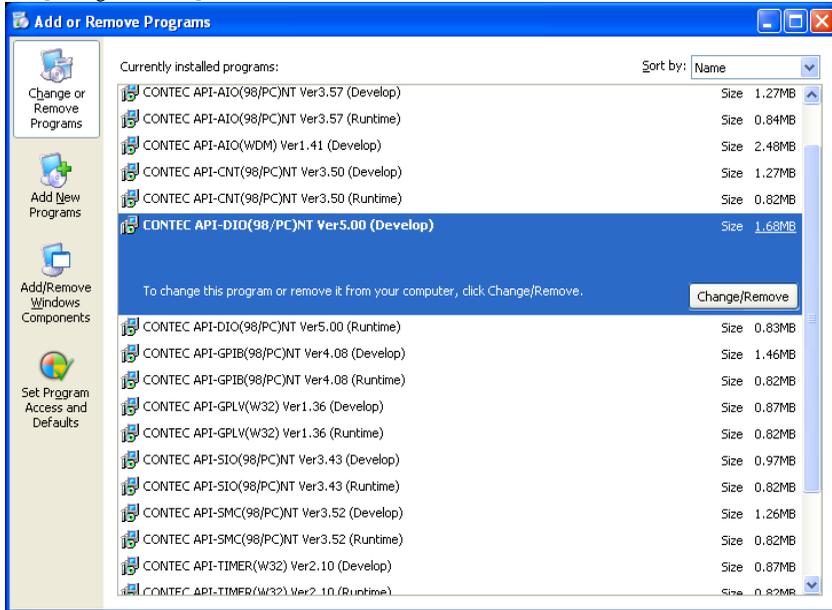
[Sample program 9]



## Uninstalling the Driver Libraries

To uninstall API-PAC(W32), follow the procedure below.

- (1) Click on the [Start] button on the Windows taskbar. From the Start Menu, select “Control Panel”.
- (2) Double-click on “Add/Remove Programs” in the Control Panel.
- (3) Select “CONTEC API-DIO(98/PC)xx” from the application list displayed, then click on the [Change/Remove] button. Follow the on-screen instructions to uninstall the function libraries.



# About Software for Linux

The Linux version of digital I/O function driver, API-DIO(LNX), provides functions that execute the following features:

- Digital input/output of specified ports
- Digital input/output of specified bits

For details, refer to the help file. The help file provides various items of information such as “Function Reference”, “Sample Programs”, and “FAQs”. Use them for program development and troubleshooting.

## Driver Software Install Procedure

The Linux version for digital I/O driver, API-DIO(LNX), is supplied as a compressed file /linux/dio/cdioXXX.tgz on the bundled API-PAC(W32)CD-ROM. (Note: XXX represents the driver version.)

Mount the CD-ROM as shown below, copy the file to an arbitrary directory, and decompress the file to install the driver.

For details on using the driver, refer to readme.txt and the help file in HTML format extracted by installation.

To install the driver, log in as a superuser.

Decompression and setup procedure

```
# cd
# mount /dev/cdrom /mnt/cdrom           Mount the CD-ROM.
# cp /mnt/cdrom/linux/dio/cdioXXX.tgz ./ Copy the compressed file.
# tar xvfz cdioXXX.tgz                 Decompress the compressed file.
.....
# cd contec/cdio
# make                                  Compile the file.
.....
# make install                          Install.
.....
# cd config
# ./config                              Set up the board to be used.
..... Set as follows.....
# ./contec_dio_start.sh                 Start the driver.
# cd
```

## Accessing the Help File

- (1) Invoke a web browser in your X-Window environment.
- (2) In the browser, open diohelp.htm in the contec/cdio/help directory.

## Using Sample Programs

Sample programs have been prepared for specific basic applications.

Sample programs for each language are contained in the contec/cdio/samples directory. For compiling them, refer to the manual for the desired language.

## Uninstalling the driver

To uninstall the driver, use the uninstall shell script contained in the contec/cdio directory. For details, check the contents of the script.



## 6. About Hardware

This chapter provides hardware specifications and hardware-related supplementary information.

### Hardware specification

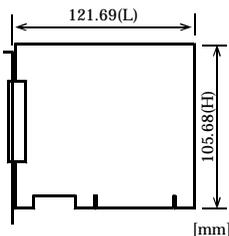
RRY-16C(PCI)H

**Table 6.1. Specification < RRY-16C(PCI)H >**

Items		Specifications
No. of Output Channels		16 channels
Output Format		Reed Relay (1a, make) Output
Relay Contact Spec.	Max. Operating Voltage	125V (AC), 30V (DC)
	Max. Carry Current	2A (Max.)
	Contact resistance (Initial state)	30mΩ or less
	Operating time (At the time of ON)	Within 7ms
	Recovery time (At the time of OFF)	Within 6ms
	Mechanical Life Expectancy	20,000,000 operations min or more Switching times : 180/min
	Electrical lifetime	100,000 operations min or more Switching times : 20/min
	Relay Type	PCN-105D3MHZ
I/O Addresses		8 bits x 32 ports boundary
Max. board count in One System		16 boards including this board
Power Consumption		5 VDC 550mA (Max.)
Operating Condition		0 - 50°C, 10 - 90%RH (No condensation)
PCI Bus Specification		32bit, 33MHz, Universal key shapes supported *1
Dimension(mm)		121.69(L) x 105.68(H)
Weight		150g

\*1 This board requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).

Board Dimensions



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

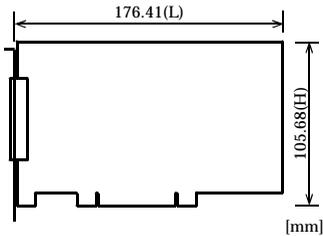
## RRY-32(PCI)H

**Table 6.2. Specification < RRY-32(PCI)H >**

Items		Specifications
No. of Output Channels		32 channels
Output Format		Reed Relay (1a. make) Output
Relay Contact Spec.	Max. Operating Power	10VA(AC), 10W(DC)
	Max. Operating Voltage	100V(AC), 100V(DC)
	Max. Carry Current	0.5A(Max.)
	Contact resistance	100mΩ or less
	Response Time	Within 1ms
	Mechanical Life Expectancy	200,000,000 operations min or more
	Relay Type	MSG-105AK1 (or equivalent to it)
I/O Address		8 bits x 32 ports boundary
Max. board count in One System		16 boards including this board
Power Consumption		5 VDC 1050mA (Max.)
Operating Condition		0 - 50°C, 10 - 90%RH (No condensation)
PCI Bus Specification		32bit, 33MHz, Universal key shapes supported *1
Dimension(mm)		176.41(L) x 105.68(H)
Weight		150g

\*1 This board requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).

## Board Dimensions



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

# Block Diagram

RRY-16C(PCI)H

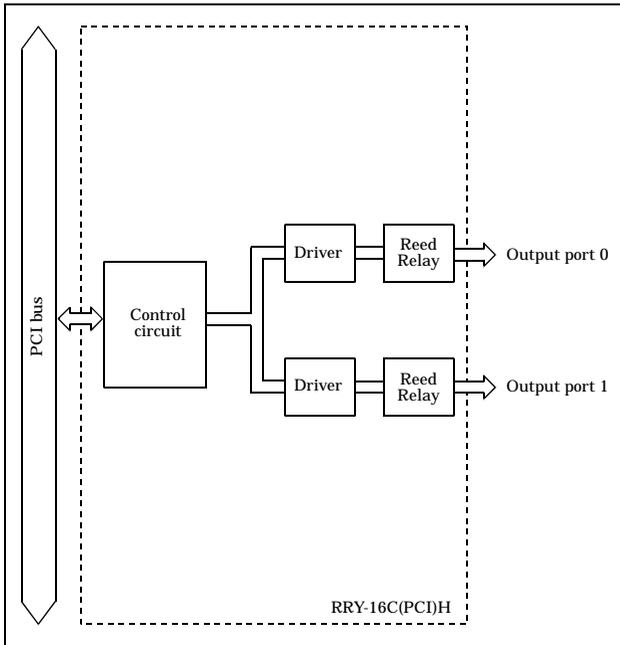


Figure 6.1. Block Diagram < RRY-16C(PCI)H >

RRY-32(PCI)H

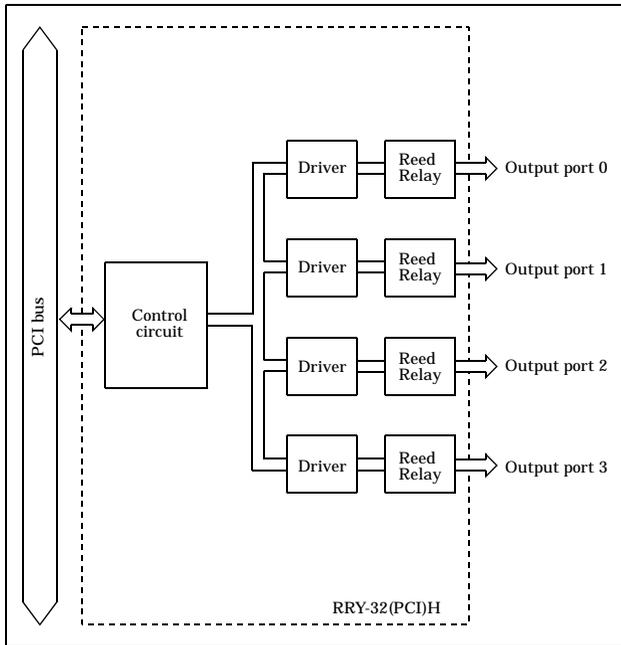


Figure 6.2. Block Diagram < RRY-32(PCI)H >

## Difference from RRY-16C(PCI) and RRY-32(PCI)

RRY-16C(PCI)H and RRY-32(PCI)H are partially enhanced version of the conventional products of RRY-16C(PCI) and RRY-32(PCI) and they are upper compatible with RRY-16C(PCI) and RRY-32(PCI).

So you can use the same operating procedures as RRY-16C(PCI) and RRY-32(PCI).

There are some differences in specifications as shown below.

**Table 6.3. Difference of specifications**

RRY-16C(PCI)H

	RRY-16C(PCI)	RRY-16C(PCI)H
I/O address	8 bits x 4 ports boundary	8 bits x 32 ports boundary
Power consumption	5VDC 700mA (Max.)	5VDC 550mA (Max.)
PCI bus specification	32bit, 33MHz, 5V	32bit, 33MHz, Universal key shapes supported (Supply 5V to the 5V pin)
Dimension (mm)	121.69(L) x 106.68(H)	121.69(L) x 105.68(H)

RRY-32(PCI)H

	RRY-32(PCI)	RRY-32(PCI)H
I/O address	8 bits x 4 ports boundary	8 bits x 32 ports boundary
Power consumption	5VDC 1200mA (Max.)	5VDC 1050mA (Max.)
PCI bus specification	32bit, 33MHz, 5V	32bit, 33MHz, Universal key shapes supported (Supply 5V to the 5V pin)
Dimension (mm)	176.41(L) x 106.68(H)	176.41(L) x 105.68(H)

# RRY-16C(PCI)H RRY-32(PCI)H User's Guide

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CONTEC CO., LTD.

February 2005 Edition

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