

PC-HELPER

High-Speed Up/Down Counter Board
for PCI Express

CNT-3208M-PE

User's Guide

CONTEC CO.,LTD.

Check Your Package

Thank you for purchasing the CONTEC product.

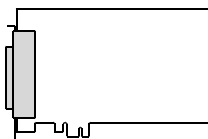
The product consists of the items listed below.

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

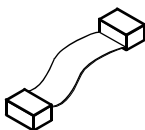
Product Configuration List

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- Synchronization cable (10cm) ...1

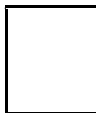
*1 : The CD-ROM contains the driver software and User's Guide (this guide).



Board



Synchronization cable



First step guide



CD-ROM
[API-PAC(W32)]

Copyright

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1. Before Using the Product

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

About the Board

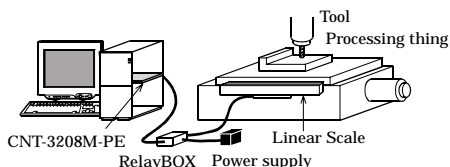
This product is a PCI Express bus compliant counter input board which counts the pulse signal input from an external device.

8 ch 32-bit up/down counter is mounted, and the bus master transfer function makes it possible to transfer data at a high speed by high speed pulse input (unisolated TTL-level input, differential line receiver) up to 10MHz. In addition, 2-phase signals and 1-phase signals such as a rotary encoder or linear scale can be counted.

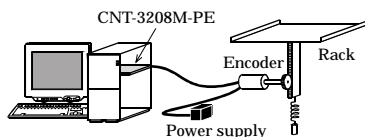
With the driver libraries for Windows supplied as standard, applications with CONTEC hardware features fully utilized can be created.

< Example >

- Detecting a position of the table of a machine tool



- Detecting a change in weight



Features

8ch 32-bit up/down counter, high speed pulse input of 10MHz, and disconnection detection are available.

A 32-bit up/down counter with 8 channels is mounted on one board, high speed pulse input up to 10MHz (unisolated TTL-level input, differential line receiver) is available, and disconnection detection can be performed for differential line receiver input.

2-phase signals and 1-phase signals such as a rotary encoder or linear scale can be counted. Surge protection is realized by implementing protectors in the input circuit.

In addition, 1pin/ch of control input signal is provided. It can be used as counter start/stop, preset, zero clear, general-purpose input.

Bus master transfer function is provided.

Bus master transfer makes it possible to transfer large data at a high speed without extra CPU load at a sampling rate up to 20MHz.

Digital filter function to prevent wrong recognition of input signals due to noises is provided.

Digital filter function by which noises of counter input signals (phase-A, phase-B, phase-Z) and control input signals can be prevented is equipped. Digital filter can either be not used or set within the range of 0.1μ - 1.6384msec by software.

In addition, as all these input signals are taken into the internal counter via the digital filter, when using the digital filter, these signals are taken in with a delay of a specified duration.

Windows compatible driver libraries are attached.

Using the attached driver library API-PAC(W32) makes it possible to create applications of Windows. In addition, a diagnostic program by which the operations of hardware (interrupt, I/O address, I/O status) can be checked is provided.

The synchronization control connectors are provided

The synchronization control connectors which can make boards up to 16 pieces synchronously run are provided. In addition, the synchronous operation with CONTEC boards where a synchronization control connector is mounted can be easily realized.

The input circuit has a built-in varistor for voltage surge protection

To protect the input circuit from voltage surges, a varistor is connected.

Functions and connectors are compatible with PCI compatible board CNT32-8M(PCI).

The functions same with PCI compatible board CNT32-8M(PCI) are provided. In addition, as there is compatibility in terms of connector shape and pin assignments, it is easy to migrate from the existing system.

Independent general-purpose timer is provided

The timer which can let interrupts occur at a specified interval is provided.

The timer can be set within the range of 1 - 6553msec (selectable in step of 1 msec).

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++.

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

CONTEC provides download services (at <http://www.contec.com/apipac/>) 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, Server 2003, 2000
Adaptation language	Visual C++ .NET, Visual C# .NET, Visual Basic .NET, Visual C++, Visual Basic, Delphi, C++Builder, etc..

Cable & Connector (Option)

Shielded cable with double-ended connector for 96-pin half-pitch connector (Molded type)

: PCB96PS-0.5P (0.5m)

: PCB96PS-1.5P (1.5m)

Flat Cable with 96-Pin Half-Pitch Connectors at Both Ends

: PCB96P-1.5 (1.5m)

Shielded cables with single-ended connector for 96-pin half-pitch connector (Molded type)

: PCA96PS-0.5P (0.5m)

: PCA96PS-1.5P (1.5m)

Flat Cable with One 96-Pin Half-Pitch Connector

: PCA96P-1.5 (1.5m)

Half Pitch 96-Pin Female Connector Set (5Pieces)

: CN5-H96F

Accessories (Option)

Screw Terminal : EPD-96A *1

Screw Terminal : EPD-96 *1

Digital I/O 64CH Series Terminal Panel : DTP-64(PC) *1

*1: A PCB96P or PCB96PS optional cable are 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 product 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

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.

CAUTION

- There are switches and jumpers on this product that need to be set in advance. Be sure to check these before installing this product.
 - Only set the switches and jumpers on this product to the specified settings. Otherwise, this product may malfunction, overheat, or cause a failure.
 - Do not strike or bend this product. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
 - Do not touch this product's metal plated terminals (edge connector) with your hands. Otherwise, this product 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 this product to or from the slot while the personal computer or expansion unit power is turned on. Otherwise, this product may malfunction, overheat, or cause a failure. Be sure that the personal computer or the I/O expansion unit power is turned off.
 - Make sure that your PC or expansion unit can supply ample power to all the products installed. Insufficiently energized products 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, this product may overheat, malfunction, or cause a failure.

Operating temperature

0 - 50°C

Operating humidity

10 - 90%RH (No condensation)

Corrosive gases

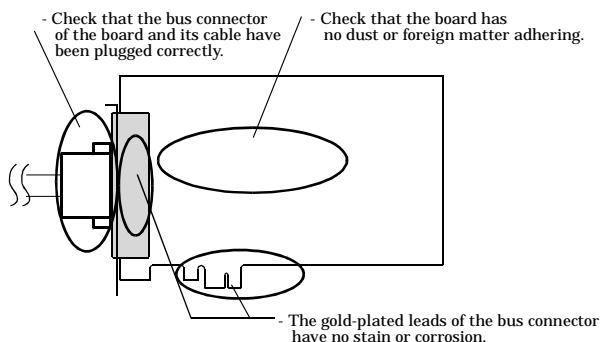
None

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 this product in the storage bag.
- (2) Wrap it in the packing material, 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 manual for that software. See also the following parts of this manual 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 an OS other than Windows, see the following parts of this manual.

This chapter Step 2 Setting the Hardware

Chapter 3 External Connection

Chapter 6 About Hardware

Step 1 Installing the Software

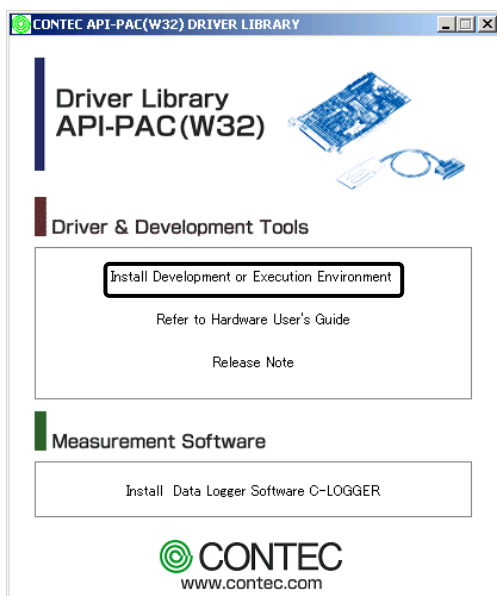
This section describes how to install the Driver libraries.

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 Development or Execution Environment] button.

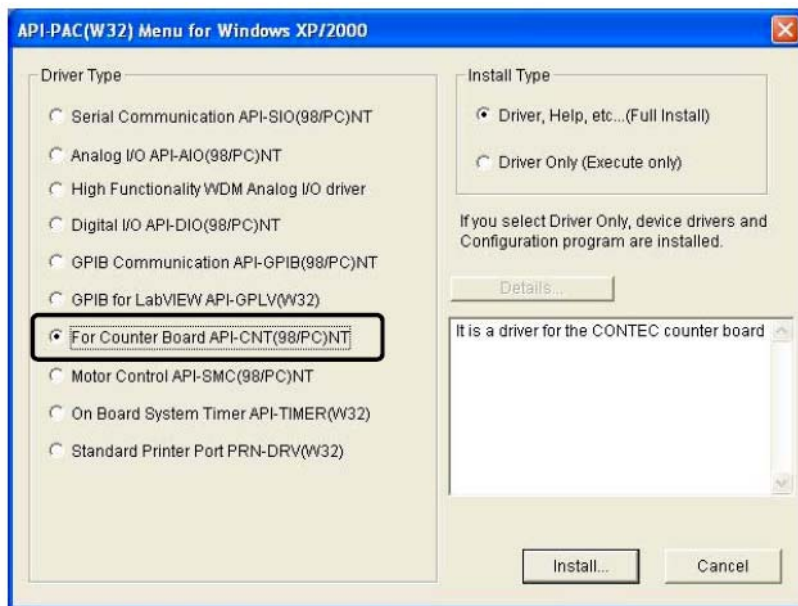


CAUTION

Before installing the software in Windows XP, Server 2003 and 2000, log in as a user with administrator privileges.

Select the counter driver

- (1) The following dialog box appears to select “Driver Type” and “Install Type”.
- (2) Select “For Counter Board API-CNT(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 (API-TOOL Configuration)” and “Show readme file” check boxes are displayed.

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

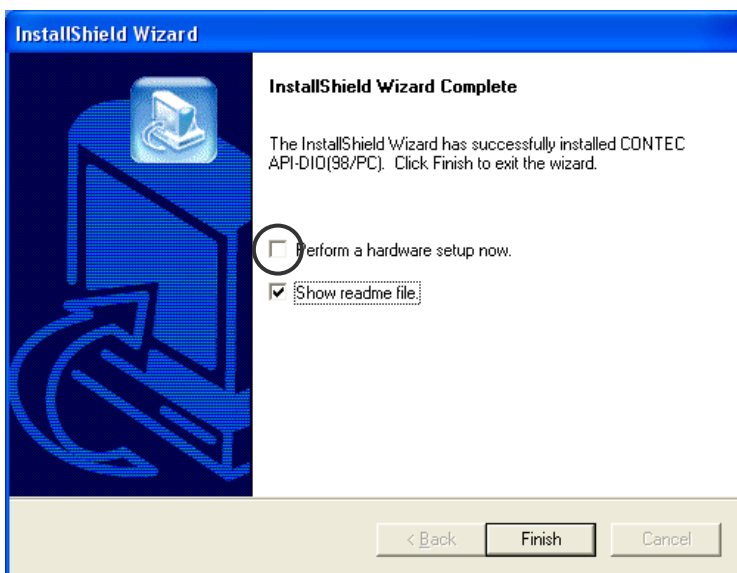
1) Uncheck “Perform a hardware setup now”.

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 (API-TOOL Configuration)”, 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.
The board has some switches to be preset.
Check the on-board switches before plugging the board into an extension slot.
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. shows the names of major parts on the board.
Note that the switch setting shown below is the factory default.

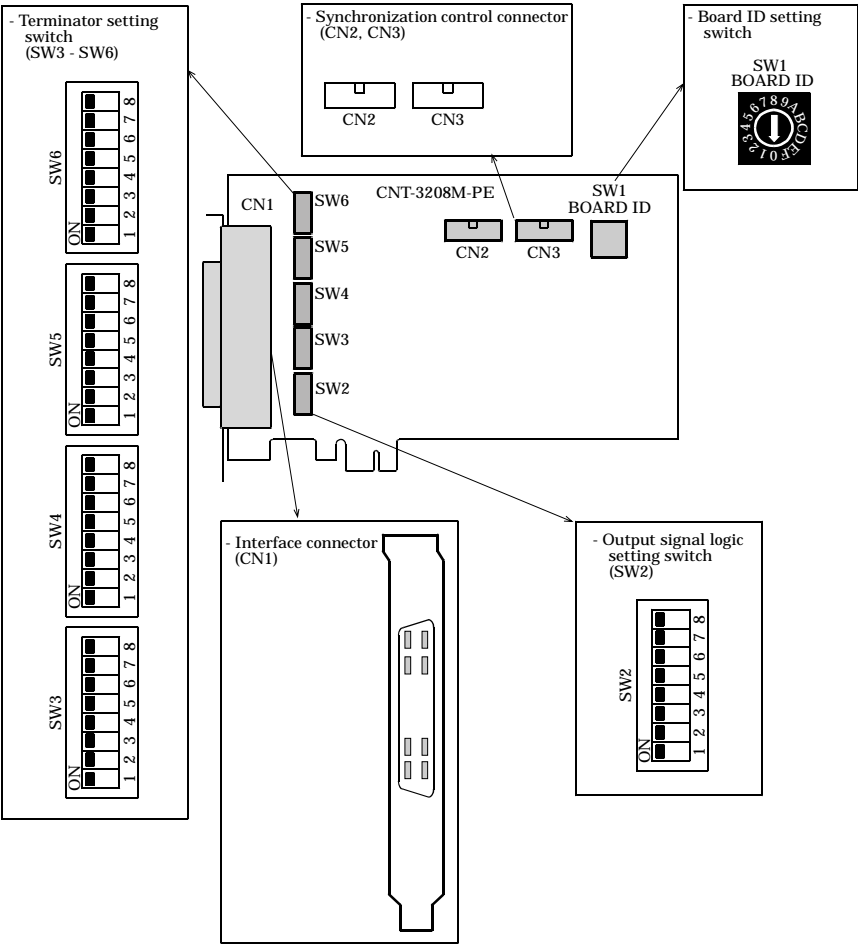


Figure 2.1. Component Locations

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.

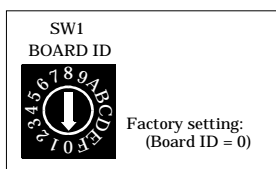


Figure 2.2. Board ID Settings (SW1)

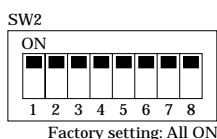
Setting the Logic of External Control Signals

This product has one pin for external control output signals per channel.

Positive or negative logic can be selected for the output signals for each channel. Select either logic depending on the specifications of the external device to be connected.

Setting Procedure

To set the logic for output signals, use the on-board DIP switch (SW2). See Figure 2.3 below to set the SW2.



Bit	Channel	Negative logic	Positive logic
1	ch0	ON	OFF
2	ch1	ON	OFF
3	ch2	ON	OFF
4	ch3	ON	OFF
5	ch4	ON	OFF
6	ch5	ON	OFF
7	ch6	ON	OFF
8	ch7	ON	OFF

Figure 2.3. Board ID Settings (SW2)

Setting Terminators

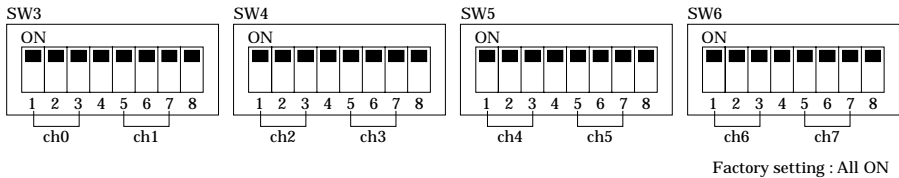
This product allows you to select whether to insert a differential line receiver input terminator (terminal resistor).

Select whether to insert the terminator depending on your system configuration.

Setting Procedure

To select whether to insert the terminator, use the on-board DIP switches (SW3 - SW6).

See Figure 2.4 to set the SW3 - SW6.



Bit	Input signal	Insert terminator	Do not insert terminator
1	Phase-A	ON	OFF
2	Phase-B	ON	OFF
3	Phase-Z	ON	OFF
4	N.C.	----	----
5	Phase-A	ON	OFF
6	Phase-B	ON	OFF
7	Phase-Z	ON	OFF
8	N.C.	----	----

Figure 2.4. Terminator Setting Switches and Their Settings



CAUTION

For those channels which do not use the differential line receiver input or for unused input signals, select “Do not insert the terminator”.

Plugging the Board

- (1) Before plugging the board, shut down the system, unplug the power code 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.
- (5) Put the cover back into place.



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 slot while the computer's or extension unit's power is turned on. Otherwise, the board may malfunction, overheat, or cause a failure.
Be sure that the personal computer or the I/O extension unit power is turned off.
 - Make sure that your PC or extension unit can supply ample power to all the boards installed. Insufficiently energized boards could malfunction, overheat, or cause a failure.
-

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 Found New Hardware Wizard.

Turning on the PC

Turn on the power to your PC.

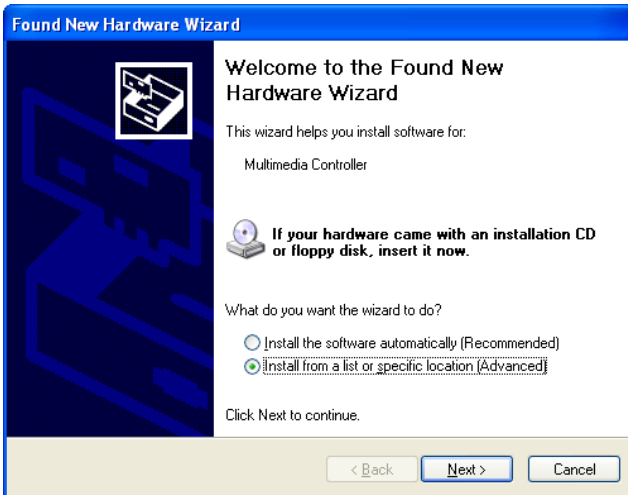
CAUTION

- 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 Express 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.



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

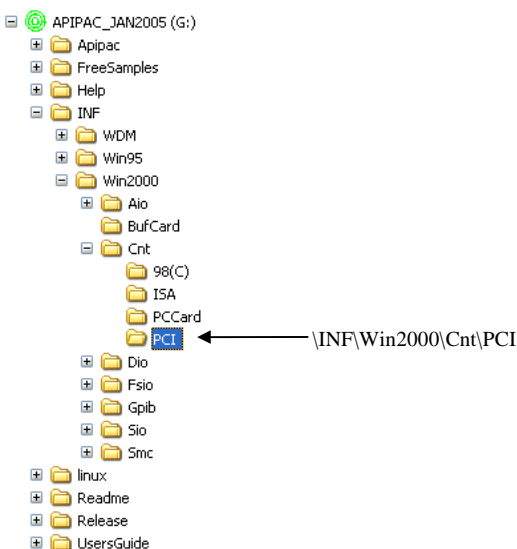


Source folder

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

\INF\Win2000\Cnt\PCI

Example of specifying the folder for use under Windows XP

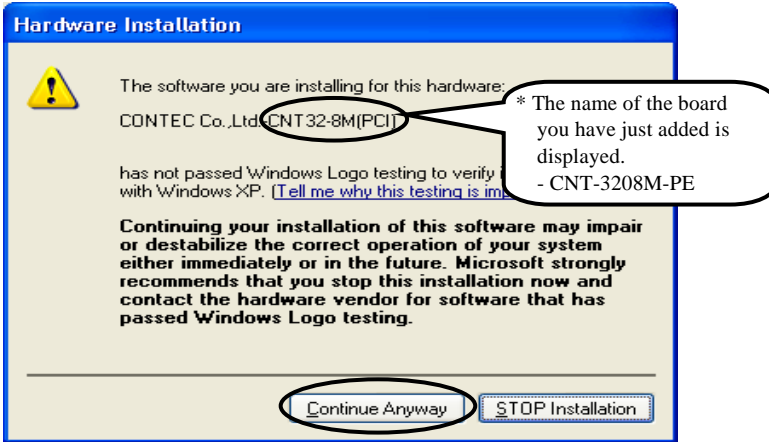




CAUTION

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.



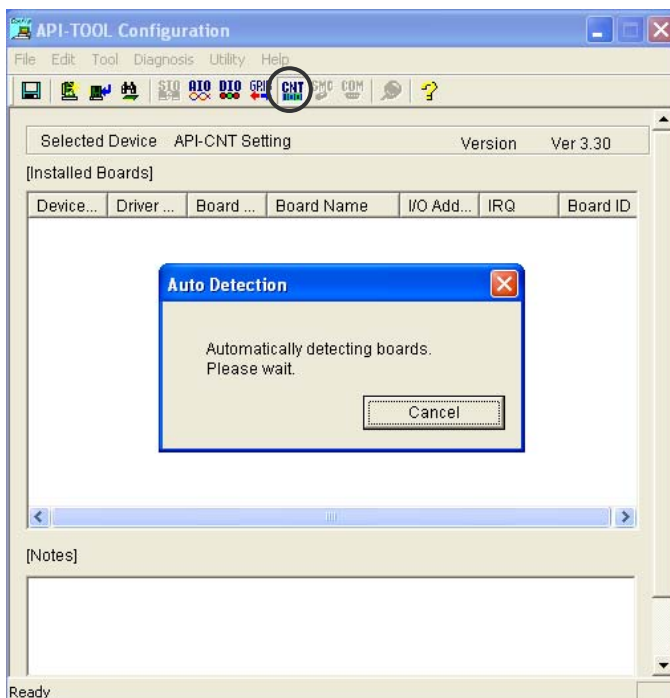
You have now finished installing the hardware.

Step 4 Initializing the Software

The driver 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) Please click the icon of "CNT".
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.

The program has the following diagnosis methods for checking the board as a single unit using its internal test pulses and the method for checking the board actually connected to an external device.

- Checking the board as a unit (without external connection)
- Checking the board as a unit (with external connection)
- Checking the board with an external device

To make sure that the hardware and software have been set up correctly, execute the program for “checking the board as a unit (without external connection)”.

You can use the methods for “checking the board as a unit (with external connection) or “checking the board with an external device” to simply check the board for wiring or for connection to an actually connected external device.

The program has the “diagnosis report” feature to report the driver settings, I/O status, interrupt status, and the presence or absence of the board.

Check method 1: Checking the board single-handedly (without external connection)

The diagnosis program checks whether the board works normally as a single unit along with the driver using the on-board test pulse outputs. With the test pulse outputs set to internal, the board can count pulse signals without external connection as if the board were connected to an external device. Set the board to the factory defaults before using this method.

What is a test pulse output?

The board has one test pulse output for phase-A and another for phase-B to check whether the counter inputs work normally. The output pulses are line receiver outputs fixed at 100 kHz.

The board can also internally output test pulses to each counter channel without supplying them to the outside. In that case, the board outputs two-phase pulses to all channels at the same time.

Check method 2: Checking the board single-handedly (with external connection)

When the test pulse outputs are set to external outputs, the board outputs line receiver output pulses at 100 kHz at the output pins (TPOA+, TPOA-, TPOB+, and TPOB-). Using the test pulse outputs for external connection, the diagnosis program can check whether the input circuit of the board normally works as a single unit along with the driver. Using the test pulse outputs allows the board to count pulse signals as if it were actually connected to an external device. See the following section for the connection.

If the board fails to perform counting normally by check method 2, its input circuit may be defective.

Test pulse output circuit and its sample connection (TPOA+, TPOA-, TPOB+, TPOB-)

This product has one test pulse output for phase-A and another for phase-B for self-diagnosis purposes. The output pulses are fixed at 100 kHz. For connection to the TTL level -compatible input circuit, connect the positive side of the test pulse output circuit.

To check the board in single-phase input mode, connect either the phase-A or phase-B test pulse output connected, respectively. The board performs up-counting (incremental counting) or down-counting (decremental counting) with only the phase-A or phase-B test pulse output connected, respectively.

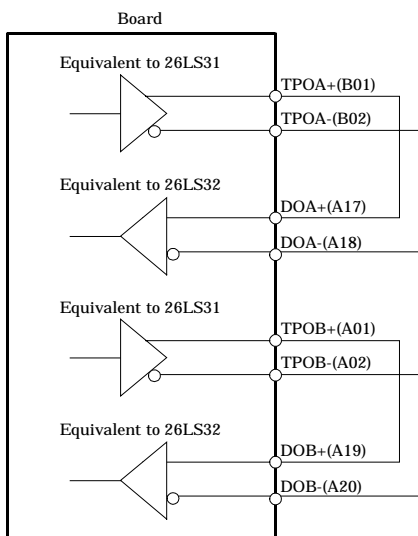


Figure 2.5. Sample connection to differential line receiver input circuit(ch0)

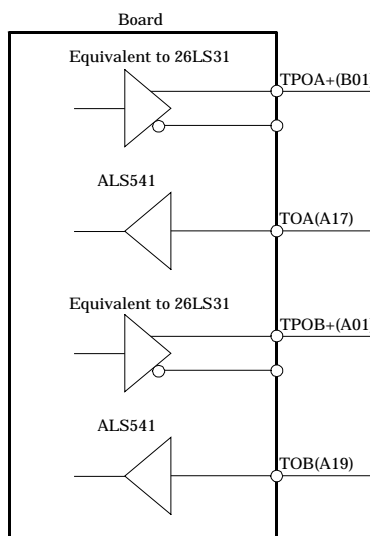


Figure 2.6. Sample connection to TTL level line input circuit(ch0)

Check method 3: Checking the board using an external device

The diagnosis program tests the board actually connected to an external device to check whether count values are displayed correctly and whether signals are successfully turned on/off. See the following section about how they are connected.

If the board fails to perform counting normally by check method 3, the board may be connected incorrectly or the connected device may not be compliant with the specifications.

Connection diagram

The following example shows how a rotary encoder is connected to channel 0 of the TTL level input. For connection to the differential line receiver input or another channel, see Chapter 3 "External Connection".

< Sample connection to rotary encoder (TTL level input, channel 0) >

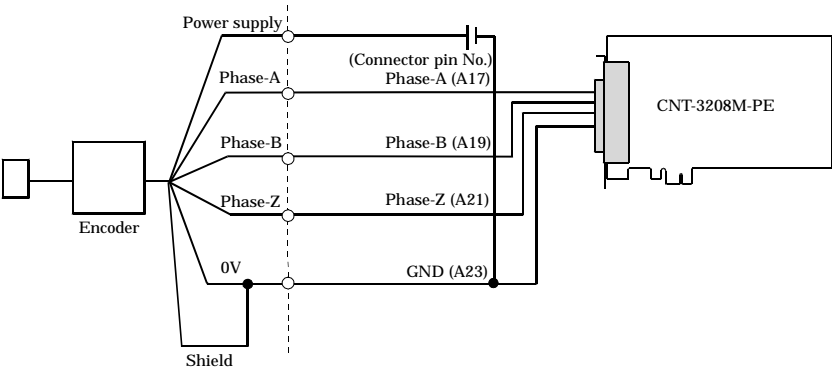
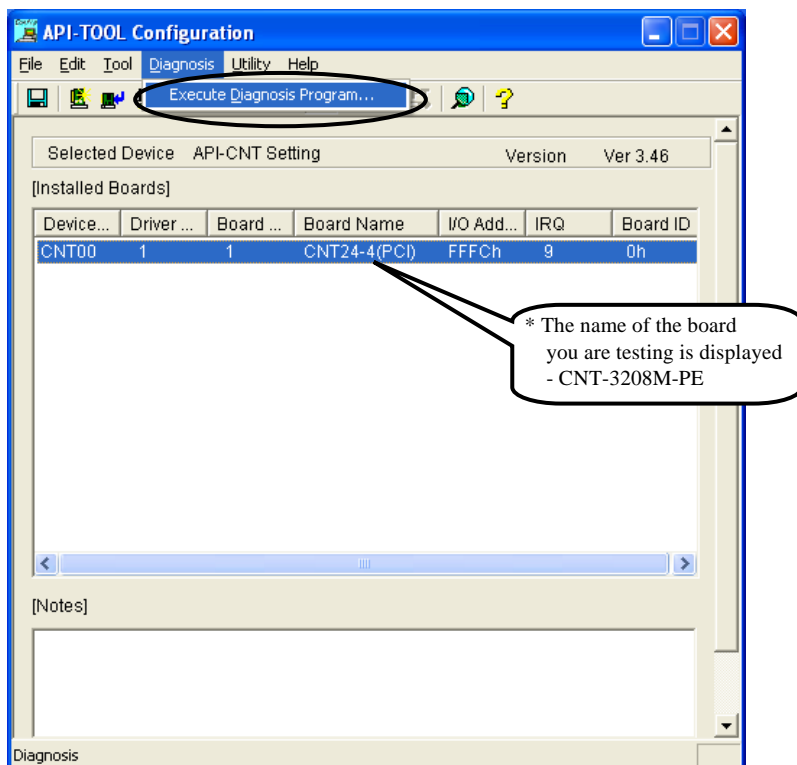


Figure 2.7. Connection diagram

Using the Diagnosis Program

Starting the Diagnosis Program

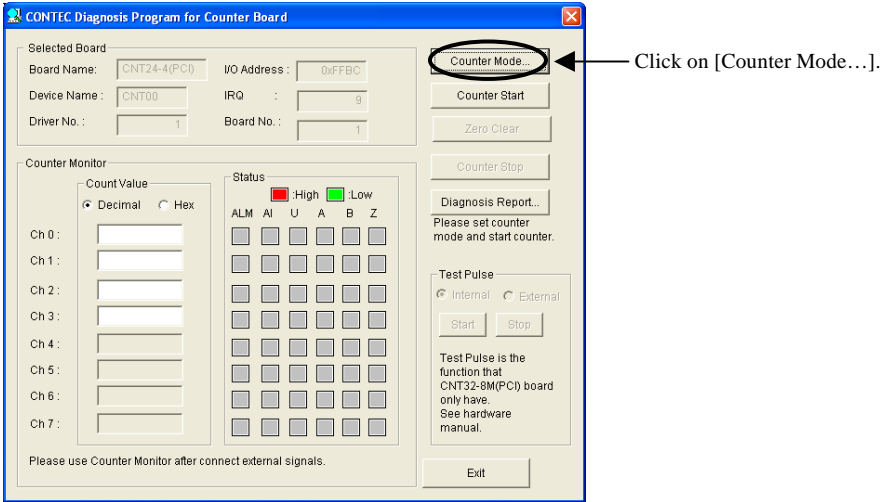
Select the board in the API-TOOL Configuration windows, then run the Diagnosis Program.



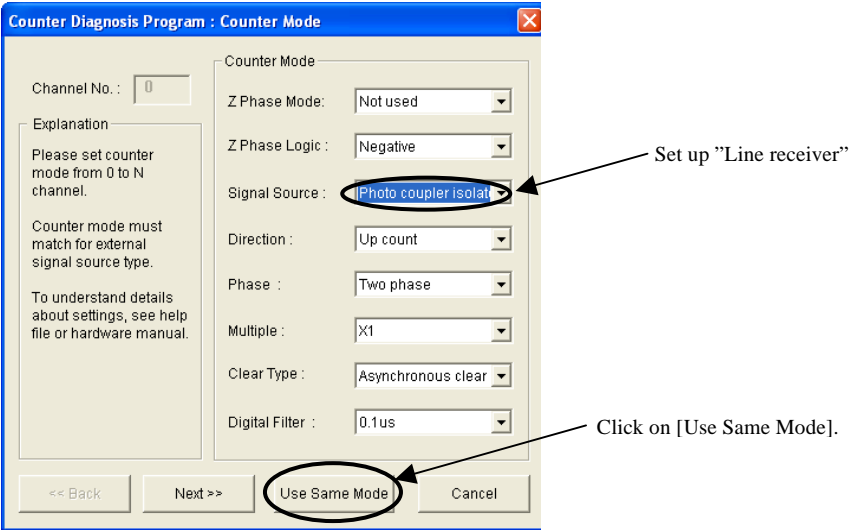
Setting counter operation conditions

- (1) Change counter mode settings. Click on [Counter Mode...].

The Counter Mode setting dialog box appears.



- (2) Set the counter mode for channel 0. Set "Signal Source" to "Line receiver". Leave the other settings at factory defaults. Click on [Use Same Mode] to make the same settings for the other channels.



(3) Click on [End].

Counter Diagnosis Program : Counter Mode

Channel No. :

Explanation

Please set counter mode from 0 to N channel.

Counter mode must match for external signal source type.

To understand details about settings, see help file or hardware manual.

Counter Mode

Z Phase Mode:

Z Phase Logic :

Signal Source :

Direction :

Phase :

Multiple :

Clear Type :

Digital Filter :

<< Back Next >> **End** Cancel

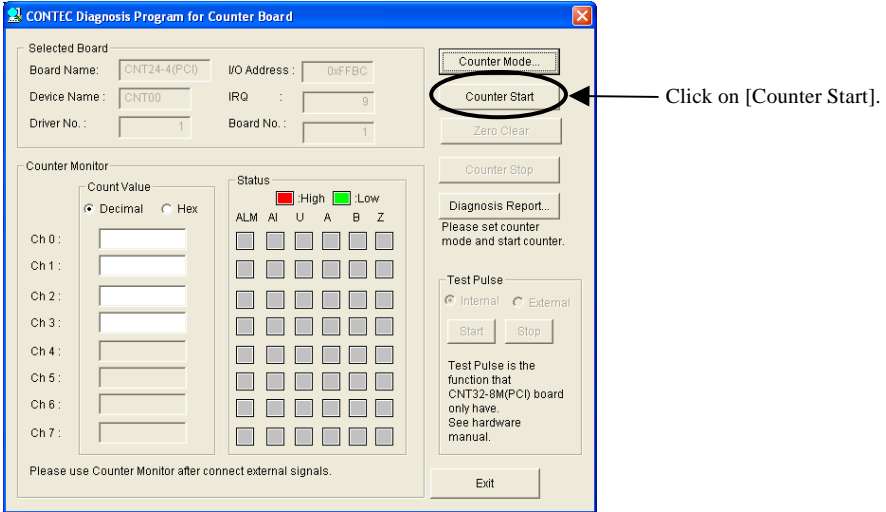
Click on [End].

Checking counter operations

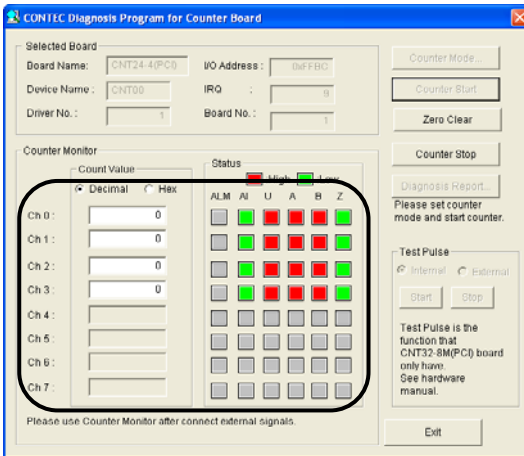
The following commands can be used to check the basic operations of the counter.

- [Counter Start] : Starts the counter.
- [Zero Clear] : Clears the counter to zero.
- [Counter Stop] : Stops the counter.

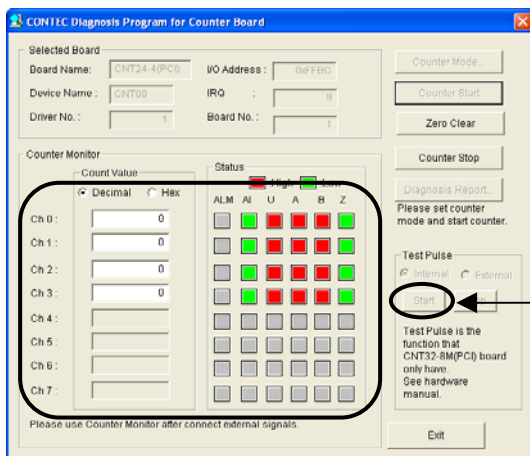
(1) Click on [Counter Start].



(2) The counter value of each channel is displayed along with its status (ALM, AI, U, A, B, Z).



- (3) Clicking on [Start] with “Test Pulse” set to “Internal” outputs two-phase line receiver signals to all channels, allowing you to check their count value and status.

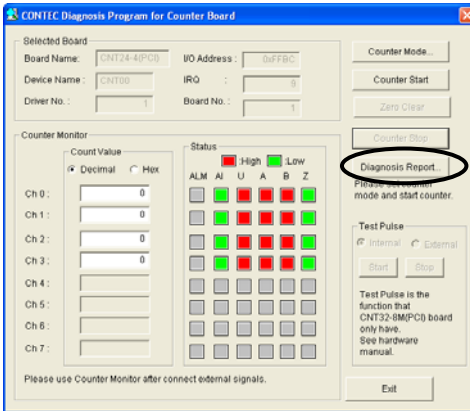


Diagnosis Report

- (1) Clicking on [Diagnosis Report...] displays detailed data such as board and channel settings and the diagnosis results as saved in text format.

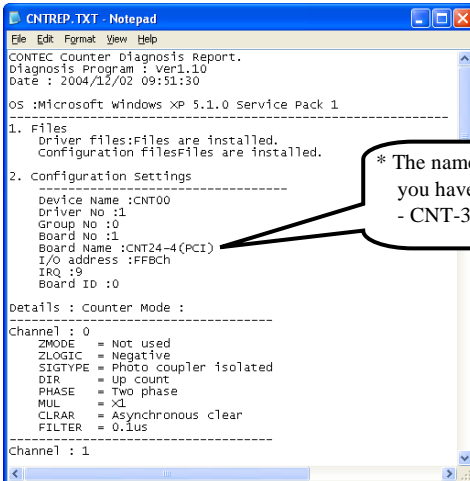
The saved results are displayed as a text file (CntRep.txt) in the install folder (Program Files\CONTEC\API-PAC(W32)).

The diagnosis program performed includes "board presence/absence check", "interrupt test", "driver file test", "board setting test".



Click on [Diagnosis Report...]

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



Setup Troubleshooting

Symptoms and Actions

No count value can be read.

- Check the board properties to see if the I/O address range is invalid
- The counter mode setting may be inappropriate.

The board won't work successfully unless the counter mode is set according to the input signal format. Refer to the function description in API-CNT HELP or the manual for the board to configure the appropriate counter mode.

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.
- Check whether the counter mode is appropriate for the incoming signal format.

The OS won't normally get started or detect the board.

Turn off the power to 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.

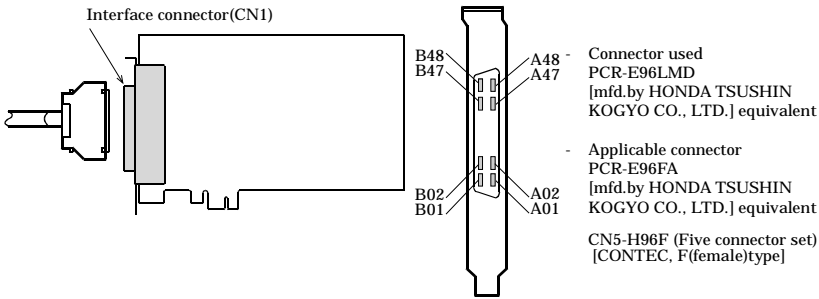
3. External Connection

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

How to connect the connectors

Connector shape

The on-board interface connector (CN1) is used when connecting this product and the external devices.



* Please refer to chapter 1 for more information on the supported cable and accessories.

Figure 3.1. Interface Connector (CN1) Shape

Connector Pin Assignment

This interface board is connected to an external device through the on-board connector.

	[49]	[1]	
Ground	GND --- B48	A48 --- GND	Ground
CH7 differential Phase-Z input-	GND --- B47	A47 --- GND	Ground
CH7 TTL Phase-Z input/Differential Phase-Z input+	D7Z --- B46	A46 --- D3Z-	CH3 differential Phase-Z input -
CH7 differential Phase-B input-	T7Z/D7Z+ --- B45	A45 --- D3Z+/T3Z	CH3 differential Phase-Z input+/TTL Phase-Z input
CH7 TTL Phase-B input/Differential Phase-B input+	D7B- --- B44	A44 --- D3B-	CH3 differential Phase-B input-
CH7 differential Phase-A input-	T7B/D7B+ --- B43	A43 --- D3B+/T3B	CH3 differential Phase-B input+/TTL Phase-B input
CH7 TTL Phase-A input/Differential Phase-A input+	D7A- --- B42	A42 --- D3A-	CH3 differential Phase-A input-
Ground	T7A/D7A+ --- B41	A41 --- D3A+/T3A	CH3 differential Phase-A input+/TTL Phase-A input
Ground	GND --- B40	A40 --- GND	Ground
CH6 differential Phase-Z input-	GND --- B39	A39 --- GND	Ground
CH6 TTL Phase-Z input/Differential Phase-Z input+	D6Z- --- B38	A38 --- D2Z-	CH2 differential Phase-Z input-
CH6 differential Phase-B input-	T6Z/D6Z+ --- B37	A37 --- D2Z+/T2Z	CH2 differential Phase-Z input+/TTL Phase-Z input
CH6 TTL Phase-B input/Differential Phase-B input+	D6B- --- B36	A36 --- D2B-	CH2 differential Phase-B input-
CH6 differential Phase-A input-	T6B/D6B+ --- B35	A35 --- D2B+/T2B	CH2 differential Phase-B input+/TTL Phase-B input
CH6 TTL Phase-A input/Differential Phase-A input+	D6A- --- B34	A34 --- D2A-	CH2 differential Phase-A input-
Ground	T6A/D6A+ --- B33	A33 --- D2A+/T2A	CH2 differential Phase-A input+/TTL Phase-A input
Ground	GND --- B32	A32 --- GND	Ground
CH5 differential Phase-Z input-	GND --- B31	A31 --- GND	Ground
CH5 TTL Phase-Z input/Differential Phase-Z input+	D5Z- --- B30	A30 --- D1Z-	CH1 differential Phase-Z input-
CH5 differential Phase-B input-	T5Z/D5Z+ --- B29	A29 --- D1Z+/T1Z	CH1 differential Phase-Z input+/TTL Phase-Z input
CH5 TTL Phase-B input/Differential Phase-B input+	D5B- --- B28	A28 --- D1B-	CH1 differential Phase-B input-
CH5 differential Phase-A input-	T5B/D5B+ --- B27	A27 --- D1B+/T1B	CH1 differential Phase-B input+/TTL Phase-B input
CH5 TTL Phase-A input/Differential Phase-A input+	D5A- --- B26	A26 --- D1A-	CH1 differential Phase-A input-
Ground	T5A/D5A+ --- B25	A25 --- D1A+/T1A	CH1 differential Phase-A input+/TTL Phase-A input
Ground	GND --- B24	A24 --- GND	Ground
CH4 differential Phase-Z input-	GND --- B23	A23 --- GND	Ground
CH4 TTL Phase-Z input/Differential Phase-Z input+	D4Z- --- B22	A22 --- D0Z-	CH0 differential Phase-Z input-
CH4 differential Phase-B input-	T4Z/D4Z+ --- B21	A21 --- D0Z+/T0Z	CH0 differential Phase-Z input+/TTL Phase-Z input
CH4 TTL Phase-B input/Differential Phase-B input+	D4B- --- B20	A20 --- D0B-	CH0 differential Phase-B input-
CH4 differential Phase-A input-	T4B/D4B+ --- B19	A19 --- D0B+/T0B	CH0 differential Phase-B input+/TTL Phase-B input
CH4 TTL Phase-A input/Differential Phase-A input+	D4A- --- B18	A18 --- D0A-	CH0 differential Phase-A input-
Ground	T4A/D4A+ --- B17	A17 --- D0A+/T0A	CH0 differential Phase-A input+/TTL Phase-A input
Ground	GND --- B16	A16 --- GND	Ground
CH7 control input *1	GND --- B15	A15 --- GND	Ground
CH6 control input *1	D17 --- B14	A14 --- D13	CH3 control input *1
CH5 control input *1	D16 --- B13	A13 --- D12	CH2 control input *1
CH4 control input *1	D15 --- B12	A12 --- D11	CH1 control input *1
External sampling start signal input	D14 --- B11	A11 --- D10	CH0 control input *1
External sampling stop signal input	EXTSTART --- B10	A10 --- EXTCLK	External sampling clock input
Ground	EXTSTOP --- B09	A09 --- GND	Ground
CH7 control output *2	GND --- B08	A08 --- GND	Ground
CH6 control output *2	DO7 --- B07	A07 --- D03	CH3 control output *2
CH5 control output *2	DO6 --- B06	A06 --- D02	CH2 control output *2
CH4 control output *2	DO5 --- B05	A05 --- D01	CH1 control output *2
Ground	DO4 --- B04	A04 --- D00	CH0 control output *2
Test pulse differential Phase-A output-	GND --- B03	A03 --- GND	Ground
Test pulse TTL Phase-A output/	TPOA- --- B02	A02 --- TPOB-	Test pulse differential Phase-B output-
Differential Phase-A output+	TPOA+ --- B01	A01 --- TPOB+	Test pulse differential Phase-B output+ /TTL Phase-B output
	[96]	[48]	

* The numbers in square brackets [] are pin numbers designated by HONDA TSUSHIN KOGYO CO., LTD.

*1 The control inputs can serve as the general-purpose, counter start/stop, preset, and zero-clear inputs.

*2 The control outputs can serve as the general-purpose output, count match, abnormal input error, digital filter error, and discontinuity alarm error outputs.

Figure 3.2. Pin Assignment of an interface connector (CN1)

External Device Connection 1

-differential line receiver input-

Connecting the differential line receiver input

Use the differential line receiver input to connect the board to the line receiver output circuit of a rotary encoder or linear scale. The maximum input frequency is 10 MHz.

For use in two-phase input mode, connect both of the phase-A and phase-B inputs. For use in single-phase input mode, connect either of them. If phase-Z is not used, the input need not be connected.

For differential line receiver input mode, you can select whether to insert the terminal resistor.

Detailed description of differential line receiver input circuit

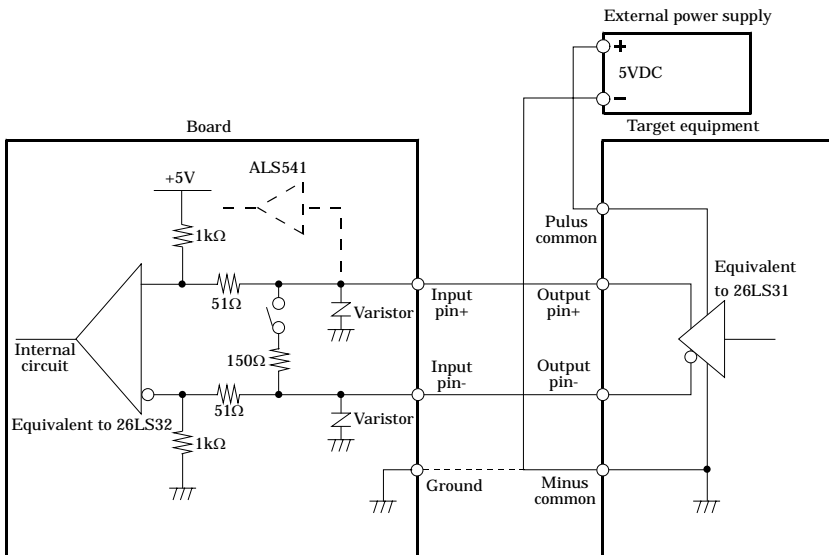
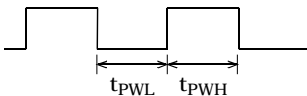


Figure 3.3. Differential line receiver input circuit and its sample connection

To protect the input circuit from voltage surges, a varistor is connected.



t_{PWH} : High-level count input pulse width 50nsec (Min.)

t_{PWL} : Low-level count input pulse width 50nsec (Min.)

Figure 3.4. Input signal



CAUTION

In the input pin+, TTL level input circuit is parallel-connected.

Example Connection with a Rotary Encoder

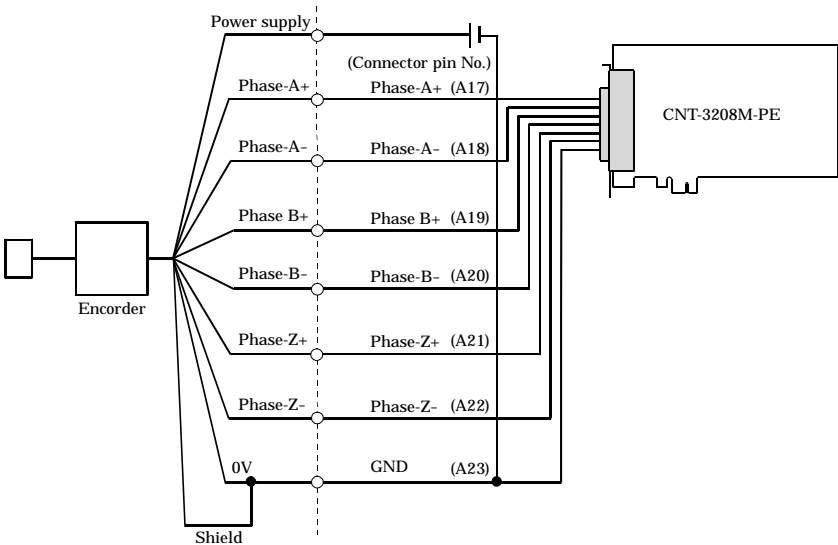


Figure 3.5. Example Connection with a Rotary Encoder (differential line receiver input, Channel 0)

Example Connection with a Linear Scale

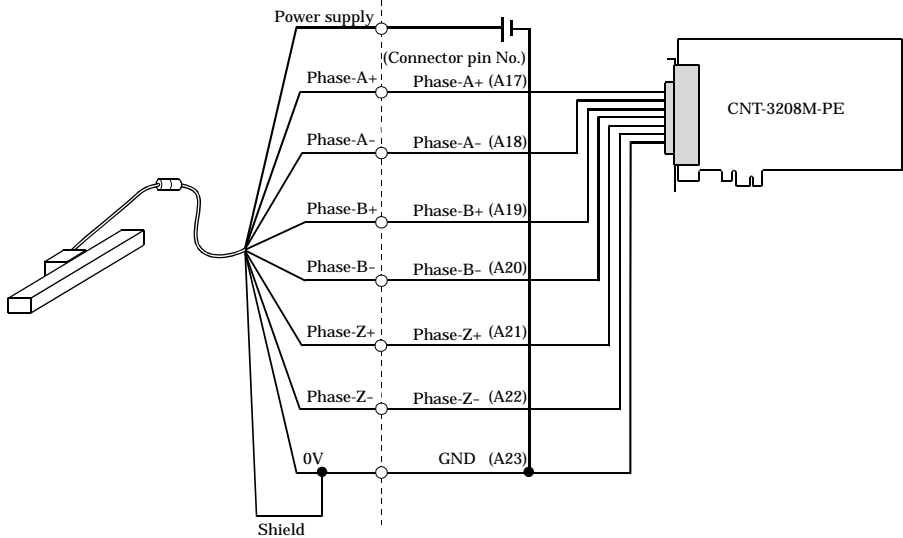


Figure 3.6. Example Connection with a Linear Scale (differential line receiver input, Channel 0)

External Device Connection 2 -TTL level input-

Connecting the TTL level input

Use the TTL-compatible input to connect the board to the TTL-compatible output circuit of a rotary encoder or linear scale. The maximum input frequency is 10 MHz.

For use in two-phase input mode, connect both of the phase-A and phase-B inputs. For use in single-phase input mode, connect either of them. If phase-Z is not used, the input need not be connected.

Detailed description of TTL level input circuit

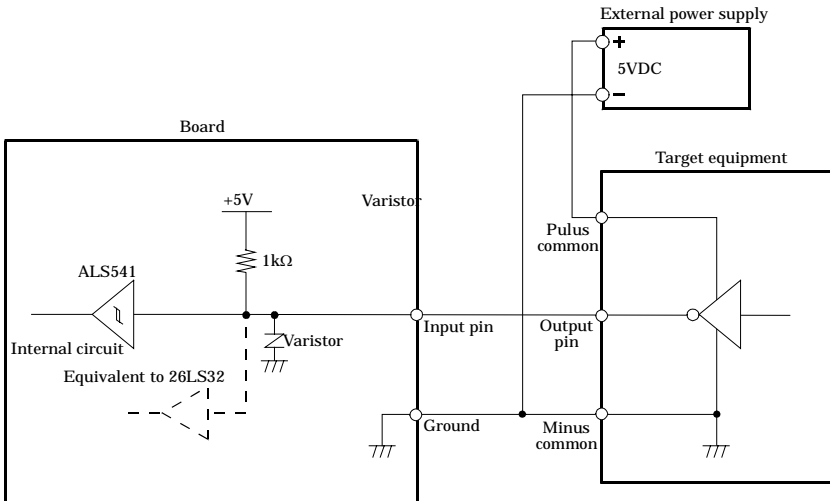
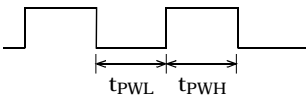


Figure 3.7. TTL level input circuit and its sample connection



tpWH : High-level count input pulse width 50nsec (Min.)

tpWL : Low-level count input pulse width 50nsec (Min.)

Figure 3.8. Input signal



CAUTION

- The connection cable length should be within 1.5 m.
- To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.
- In the input pin+, TTL level input circuit is parallel-connected.

Example Connection with a Rotary Encoder

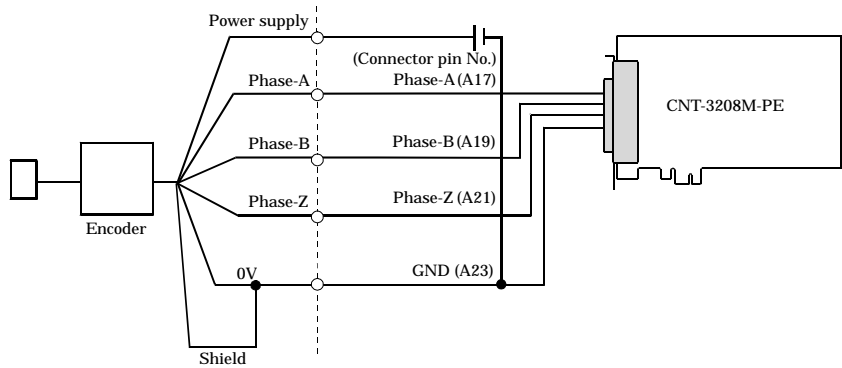
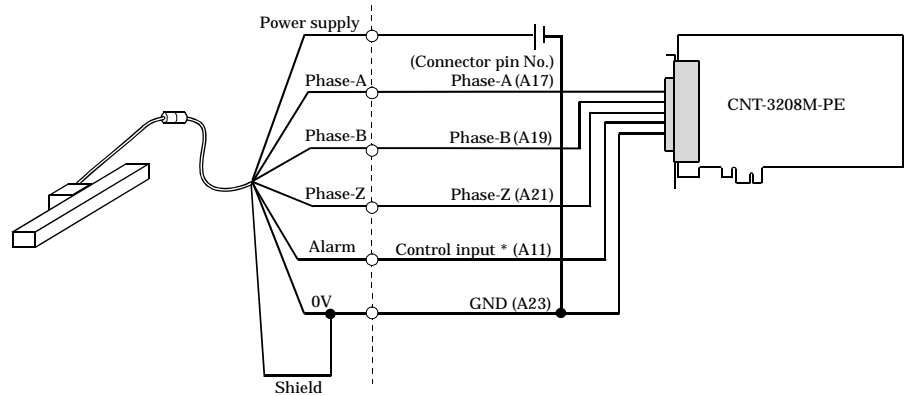


Figure 3.9. Example Connection with a Rotary Encoder (TTL level input, channel 0)

Example Connection with a Linear Scale



* When the control input is set as a general-purpose input, the alarm output state can be checked. When the control input is set as the counter stop input, the counter can be stopped at alarm output.

Figure 3.10. Example Connection with a Linear Scale (TTL level input, channel 0)

Connecting the control signal input/output

Connection of a control input

For control signal input, the board has one pin per channel to be used to selectively start/stop or preset the counter for the channel and one pin per channel to be used to start or stop the sampling clock.

Control input circuit and its sample connection

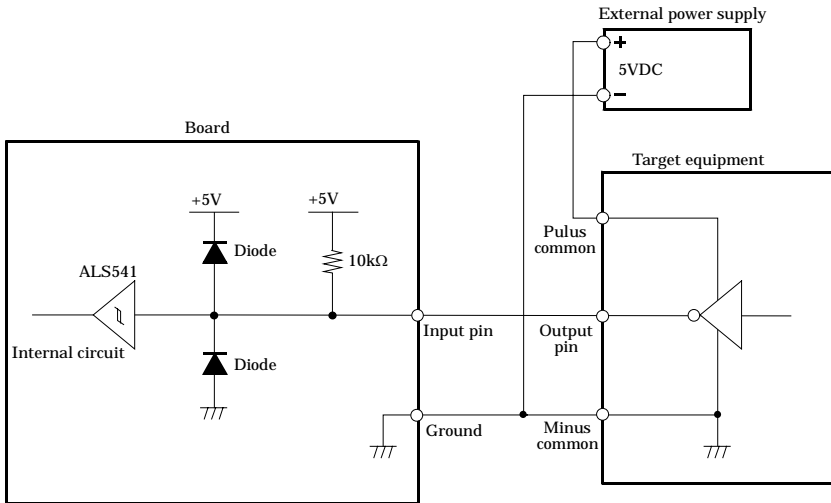


Figure 3.11. Control input circuit (DI0 - DI7, EXTCLK, EXTSTART, EXTSTOP) and its sample connection



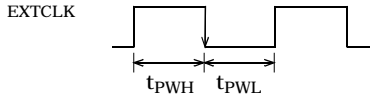
CAUTION

- The connection cable length should be within 1.5 m.
- To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.

External sampling clock signal (EXTCLK)

This pin feeds the external pacer clock signal. The maximum frequency is 10 MHz.

When the sampling clock input has been set to the external clock input, sampling is performed at the falling edge of the signal at this pin.



t_{PWH} : High-level clock pulse width 50nsec (Min.)

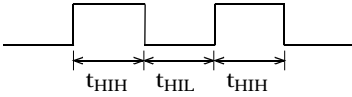
t_{PWL} : Low-level clock pulse width 50nsec (Min.)

Figure 3.12. External sampling clock signal

Other control input signals (DI0 - DI7, EXTSTART, EXTSTOP)

Control input signal can be selected with whether to enable rise or fall by software at the TTL level.

High- and low-level hold times of at least 50 nsec are required to detect an edge of the signal.



t_{HIH} : High-level hold time 50nsec (Min.)

t_{HIL} : Low-level hold time 50nsec (Min.)

Figure 3.13. Control input signals

Connection of a control output

The control output of the board provides the general-purpose output signal (level output) and the one-shot pulse signals that indicate hardware events such as a count match. For the signal output, positive or negative logic can be selected with SW2.

Control output circuit and its sample connection

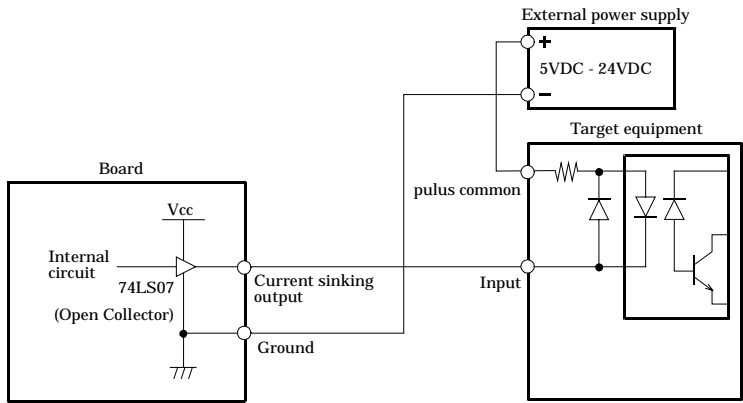


Figure 3.14. Sample connection to Isolated output circuit (DO0 - DO7)

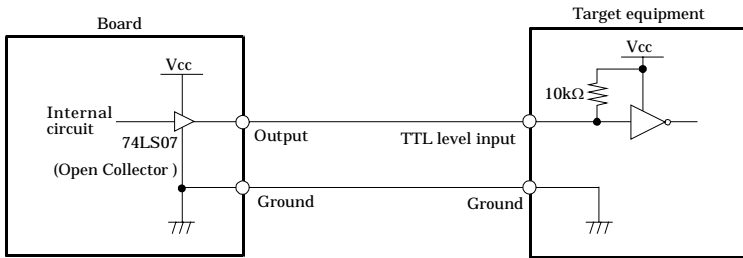


Figure 3.15. Sample connection to TTL level input circuit



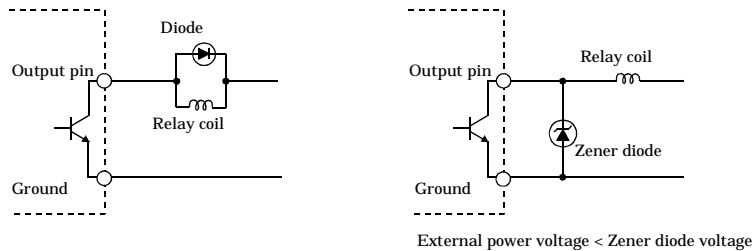
CAUTION

The output of this board has no surge voltage protector. To drive an inductive load such as a relay or lamp using this board, apply surge voltage protection to the load side. For surge voltage protection, see “Surge Voltage Countermeasures” in the next section.

Surge Voltage Countermeasures

When connecting a load that generates surge voltages and inrush currents, such as an induction load (relay coil) or an incandescent light bulb, to the control output signal, appropriate protection must be provided in order to prevent damage to the output stage or a malfunction due to noise. The rapid shutoff of a coil, such as a relay, generates a sudden high-voltage pulse. If this voltage exceeds the voltage tolerance level of the output transistor, it can cause the transistor to gradually deteriorate, or even completely damage the transistor. Therefore, when driving an induction load, such as a relay coil, you should always connect a surge-absorbing device. The following illustrates a surge voltage countermeasure that can be employed:

Examples of use of relay coil



Examples of use of lump

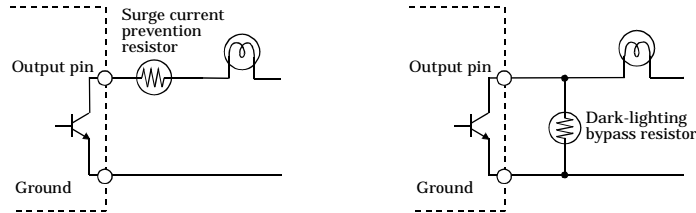


Figure 3.16. Surge Voltage Countermeasures



CAUTION

In order for a protection circuit to operate effectively, it must be connected within 50 cm of a load and a contact point.

Using Two or More Boards Synchronously

Synchronization control connectors

Simultaneous operation or event-synchronous control between boards partly depends on software performance. The synchronization control connectors are provided to eliminate this problem by improving the reliability of the entire system.

This one product can perform synchronous operation with a homogeneous or heterogeneous board by connecting the synchronization control connectors.

For synchronous operation, select one of the boards connected with synchronization control cables as the master board, with the other boards used as slaves. The master board can set the signal to be supplied to the slaves using software. The slaves can set the signal from the master board as the pacer clock operation start or stop factor.

It is possible to stop the operations of all boards in response to the stop signal from the master board at an error or to the request from a slave. Up to 16 boards can be connected, including the master board.

For details on the connection method, refer to the online help for the driver software. When the synchronization control connectors are not used, use the board in the stand-alone configuration.

Example 1 Using multiple boards with the same clock start/stop condition settings

The boards can make up a synchronous system independent of software performance as the clock for the master board is started and stopped in sync with the slaves.

With the homogeneous boards, data maintains synchronism even if the channels are added. Even with the heterogeneous boards, data maintains integrity because the operating clock start/stop timings depend on the master board.

- (1) Connect the boards with synchronization control cables.
- (2) Specify the master and slaves using the software.
- (3) Assign the connectors so that the clock start/stop signals are to be output from the master board.
- (4) Set the slave boards so that they can use all signals.
- (5) Start the slave boards first, then the master board.



CAUTION

- When the clock signal is assigned to a synchronization control connector, the maximum clock frequency available is 5 MHz.
 - When signals are assigned to synchronization control connectors, the slave boards have a delay of about 100 nsec.
-

Example 2 Controlling the slave boards using the internal events of the master board

When the master board outputs its internal event (interrupt) signal to the slave boards, they can start operation in sync with that signal.

- (1) Connect the boards with synchronization control cables.
- (2) Specify the master and slaves using the software.
- (3) Assign the connectors so that the master board outputs the internal event signal.
- (4) Set the signal from the master board as the slave start condition.
- (5) Start the slave boards first, then the master board.

Connecting the synchronization control connectors

(CN2 and CN3)

The CNT-3208M-PE has synchronization control connectors (CN2 and CN3) to accept synchronization control cables for synchronous operations of two or more boards.

Connection method

For synchronous operations of two or more boards, connect them with synchronization control cables. Use a synchronization control cable to connect the CN2 of a smaller ID board to the CN3 of the board with a greater board ID number. Do not use any cable other than the supplied one.

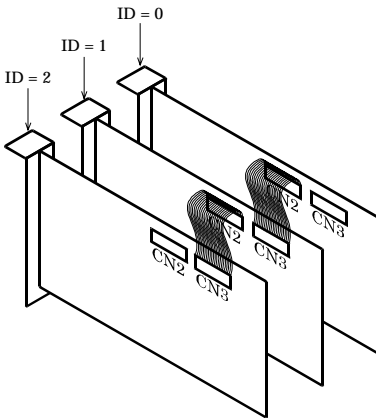


Figure 3.17. Connection method of a cable

4. Functions

This chapter describes the functions of the CNT32-8M(PCI).

Types and Operations of Pulse Signals

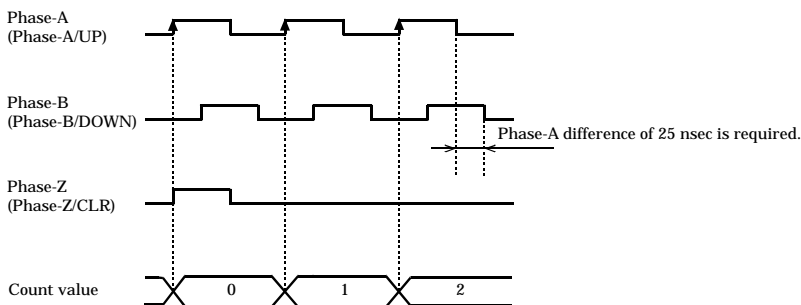
Types of pulse signals

The following types of pulse signals (operation modes) can be set.

- 2-phase Input, Synchronous Clear, Multiply by 1
- 2-phase Input, Synchronous Clear, Multiply by 2
- 2-phase Input, Synchronous Clear, Multiply by 4
- 2-phase Input, Asynchronous Clear, Multiply by 1
- 2-phase Input, Asynchronous Clear, Multiply by 2
- 2-phase Input, Asynchronous Clear, Multiply by 4
- Single-phase Input, Asynchronous Clear, Multiply by 1
- Single-phase Input with Gate Control Attached, Asynchronous Clear, Multiply by 1
- Single-phase Input with Gate Control Attached, Asynchronous Clear, Multiply by 2

2-phase Input

Two-phase input is to input two pulses of phase-A (the leading signal) and phase-B (the trailing signal) which differ by 90°C. When phase-Z (the reference position signal) is available, the counter can be cleared with 2-phase pulse input.

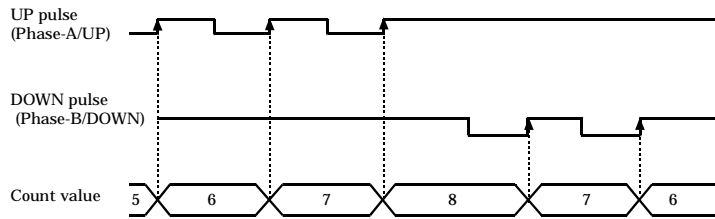


- * Count operation for incremental counting in the CW direction. When decremental counting in the CW direction is set, the board performs decremental counting at the rising edge of the phase-A signal.
- * The minimum phase difference between phases-A and B is 25 nsec. Counting is not performed normally if the phase difference is less than 25 nsec.

Figure 4.1. Example counting during 2-phase input

Single-phase Input

During single-phase input, input of an UP pulse results in counting up while input of a DOWN pulse results in counting down. If UP and DOWN pulses are simultaneously generated or both pulses change to LOW, normal counting does not take place.

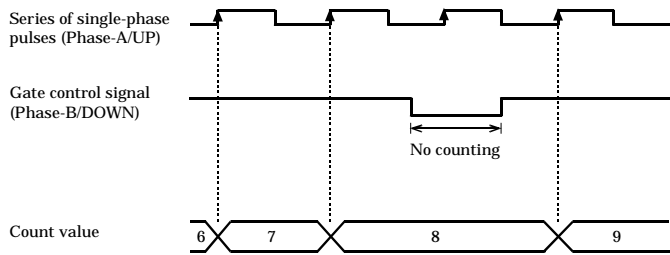


* Count operation for incremental counting in the CW direction. When decremental counting in the CW direction is set, the board performs decremental counting at the rising edges of positive pulse and incremental counting at the rising edges of negative pulses.

Figure 4.2. Example counting during single-phase input

Single-phase Input with Gate Control Attached

The counter can be started/stopped according to a gate control signal input along with a series of single-phase pulses. A clear signal clears the counter value to zero.



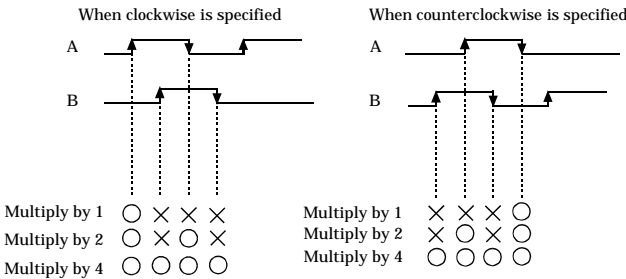
* Count operation for incremental counting in the CW direction. When decremental counting in the CW direction is set, the board performs decremental counting at the rising edges of the single-phase pulse train (phase-A/UP) while the gate control signal (phase-B/DOWN) goes high and stops counting while the gate control signal goes low.

Figure 4.3. Example counting during single-phase input with gate control attached

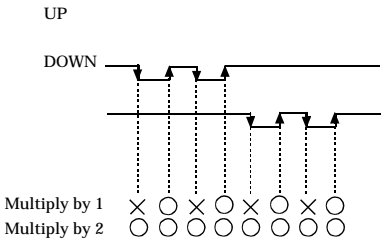
Multiplication of Count Input

Setting the count input multiplication setting to two or four times enables you to fine-tune controlling.

During 2-phase input



Single-phase input



Single-phase input with gate control attached

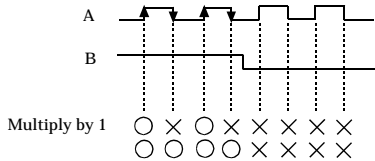
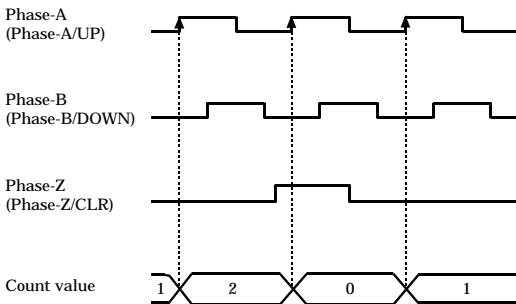


Figure 4.4. Example counting when count input multiplication is set

Synchronous Clear

When incremental counting in the CW (clockwise) direction is set with phase-Z positive logic, this product clears the counter at the rising edge of the phase-A signal while the phase-Z input goes high and starts counting at the rising edge of the phase-A signal after the phase-Z input goes low.

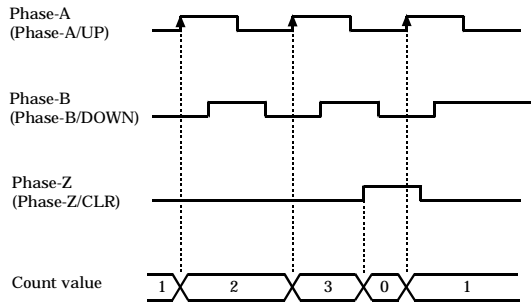


* When decremental counting in the CW direction is set, the board performs decremental counting at the rising edge of the phase-A signal while the phase-B input remains low.

Figure 4.5. Example counting during synchronous clear

Asynchronous Clear

When incremental counting in the CW (clockwise) direction is set with phase-Z positive logic, this product clears the counter when the phase-Z input goes high while phases A and B are in the input state. this product starts counting at the rising edge of the phase-A signal while phase-Z in the input state.



* When incremental counting in the CW direction is set with phase-Z positive logic, the board performs decremental counting at the rising edge of the phase-A signal while the phase-B input remains low. When phase-Z negative logic is used, the signal is enabled while the phase-Z input remains low.

Figure 4.6. Example counting during asynchronous clear

Phase-Z/CLR Input

Phase-Z is the signal to clear the counter to zero. The number of phase-Z inputs can be specified by software.

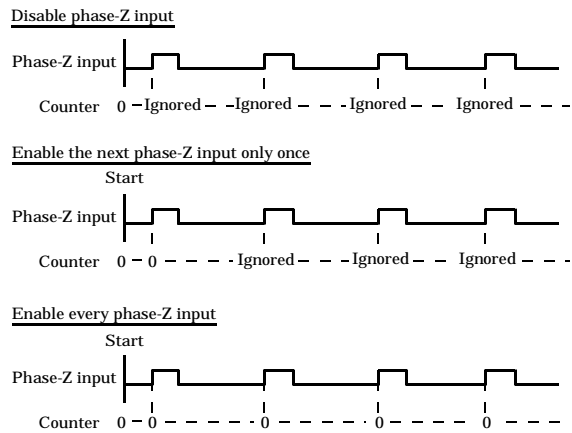


Figure 4.7. Phase-Z enable frequency(Positive logic)

⚠ CAUTION

- The initial setting is “only the next phase-Z input is enabled once”.
- Phase-Z (negative logic) is enabled while the phase-Z input goes low.
- When the phase-Z/CLR input is not used, be sure to disable the phase-Z input.

Control of a counter

Counter start/Counter stop

The start and stop of the counter of this product can be set either for each channel or for all channels. The counter start/stop trigger events are listed below; which are software-selectable.

Table 4.1. Counter operation

Item	Factor	Description	Note
Counter start trigger	Software command (for all/each of channels)	Possible to start the counter for all or each of the channels.	
	Rise of control input signal	The counter is started at a level change (low-to-high transition).	Available only when the control input signal has been selected for counter start/stop.
	Fall of control input signal	The counter is started at a level change (high-to-low transition).	Available only when the control input signal has been selected for counter start/stop.
	Sampling start	Sampling start = counter start	
Counter stop trigger	Software command (for all/each of channels)	Possible to start the counter for all or each of the channels.	
	Rise of control input signal	The counter is ended at a level change (low-to-high transition).	Available only when the control input signal has been selected for counter start/stop.
	FALL of control input signal	The counter is ended at a level change (high-to-low transition).	Available only when the control input signal has been selected for counter start/stop.
	Sampling stop	Sampling start = counter start	

Software

The counter is started or stopped by software either for each channel or for all channels.

Rise/fall of an external input signal

The counter is started or stopped by an external input signal supplied through the control input pin. The rising or falling edge of the signal can be selected for starting or stopping the counter. If the “low-to-high” transition is set for both starting and stopping the counter, the counter is started or stopped if it is inactive or active, respectively, when the level changes from low to high.

- * When the control input pin is used for the counter start/stop signal, it cannot be used for the preset, zero-clear, or general-purpose input.

Sampling start/stop

When the counter start trigger is used for starting sampling, this product starts counting and sampling synchronously. When the counter stop trigger is used for stopping sampling, this product stops counting and sampling synchronously in the same way.

Preset

Presetting means setting the counter to an arbitrary value.
The value in the preset register is loaded into the counter. Preset methods are listed in the table below, below, which are software-selectable.

Table 4.2. Preset

Item	Factor	Description	Note
Preset method	Software command	Possible to preset for all channels	Always available
	Control input signal (rise)	Control input level change (Low to High)	Available only when the control input signal has been selected for presetting.
	Control input signal (fall)	Control input level change (High to Low)	Available only when the control input signal has been selected for presetting.
	Count match(Register0)	Count value = Comparison register 0	
	Count match(Register1)	Count value = Comparison register 1	

Software

The counter is presetting by software either for each channel or for all channels.

Rise/fall of an external input signal

The counter is presetting by an external input signal supplied through the control input pin.

The control input pin is used for preset signal input. The rising or falling edge of the signal can be selected.

* When the control input pin is used for presetting, it cannot be used for the counter start/stop, zero-clear, or general-purpose input.

Count match

The counter is preset when the count value matches the value in comparison register 0 or 1.

Zero-clear

The counter is cleared to zero. Zero-clear methods are listed in the table below.
The zero-clear method is software-selectable.

Table 4.3. Zero-clear

Item	Factor	Description	Note
Zero-clear method	Software command	Possible to preset for all channels	Always available
	Phase-Z input	Phase-Z input level change	Always available
	Control input signal (rise)	Level change	Available only when the control input signal has been selected for Zero-clearing.
	Control input signal (fall)	Level change	Available only when the control input signal has been selected for Zero-clearing.
	Count match(Register0)	Count value = Comparison register 0	
	Count match(Register1)	Count value = Comparison register 1	

Software

The counter is zero-cleared by software either for each channel or for all channels.

Phase-Z Input

The counter is zero-cleared by the external phase-Z input signal. Software is used to select positive or negative logic and to enable or disable zero-clearing.

Rise/fall of an external input signal

The counter is zero-cleared by an external input signal supplied through the control input pin.

The control input pin is used for preset signal input. The rising or falling edge of the signal can be selected.

* When the control input pin is used for zero-clearing, it cannot be used for the counter start/stop, zero-clear, or general-purpose input.

Count match

The counter is zero-cleared when the count value matches the value in comparison register 0 or 1.

Register

This product has a preset register and comparison registers.

Preset Register

The preset register is a 32-bit register to load the value in the preset register to the counter when presetting occurs.

Comparison register 0, Comparison register 1

These are 32-bit registers. A variety of events can occur when the counter value matches the value in comparison register 0 or 1.

Obtaining the count value

Obtaining the count value

There are two modes for obtaining the count value. One is the counter mode to directly read the count value without using bus mastering and the other is the sampling mode to sample the count value periodically using bus mastering.

This product is capable of bus mastering, enabling periodical sampling of the count value using the internal or external clock signal.

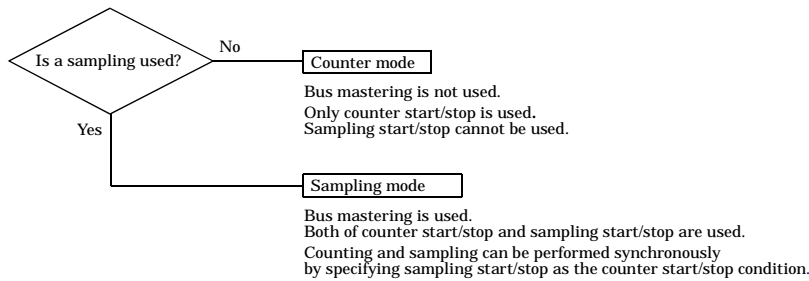


Figure 4.8. Counter mode and sampling mode

Counter mode

In the counter mode, this product starts the counter after setting counter operation conditions and performs counter operations such as reading the count value and status.

In addition, this mode allows this product to preset, zero-clear, start/stop the counter at the rising or falling edge of the control input signal. A one-shop pulse can be output to the control input signal at an occurrence of a count match or error.

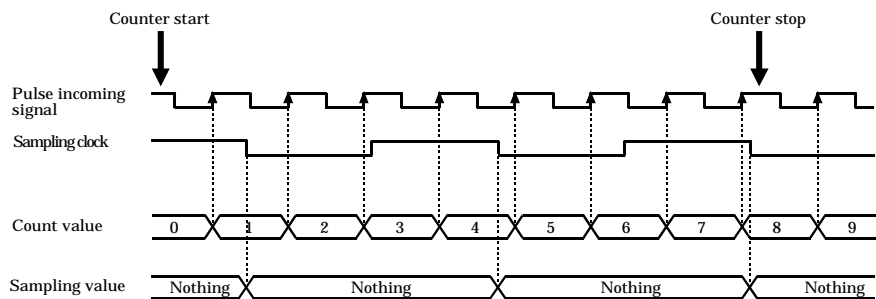


Figure 4.9. Timing chart (Counter mode)

Sampling mode

In the sampling mode, this product samples the count value periodically to load it into memory on the PC according to the specified internal or external clock. The area of memory to store sampling data is a maximum of 64 megabytes (16777216 data items), which is restricted depending on the OS used. In particular, Windows XP, Server 2003, 2000 allows less memory to be allocated relative to the total amount of physical memory. For use under such an OS, therefore, the area of memory that can be allocated should be checked with a sample program

For the sampling mode, sampling operation conditions must be set as well as counter operation conditions. For details about sampling, see “Sampling function” described later in this chapter. The counter start can be synchronized with the sampling start.

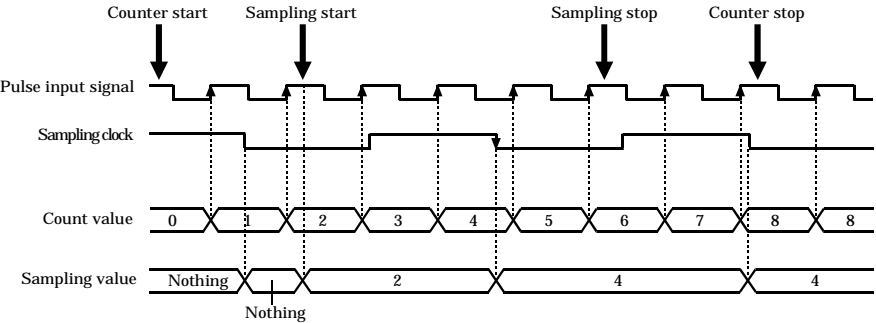


Figure 4.10. Timing chart (Counter-asynchronous sampling mode)

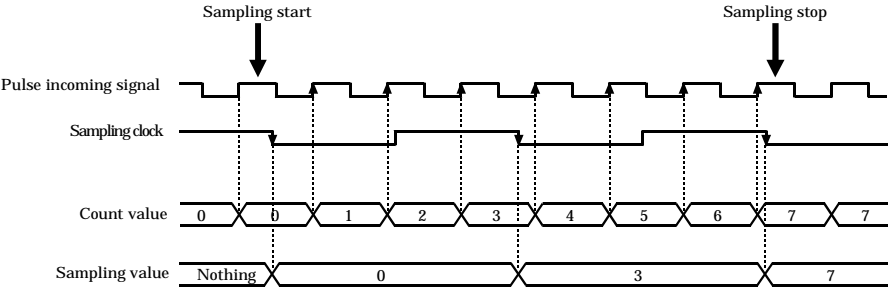
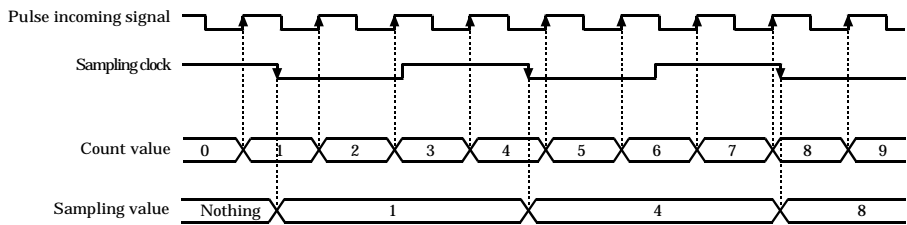


Figure 4.11. Timing chart (Counter- synchronous sampling mode)

Totalizing/line receiver counter

In the sampling mode, the counter can be used as a line receiver counter. The totalizing counter mode samples the count value at fixed intervals in the same way as with the normal up/down counter. The line receiver counter mode samples the difference between the current count value and the previously sampled count value. The totalizing or line receiver counter can be set for each channel.

Totalizing counter mode



Differential counter mode

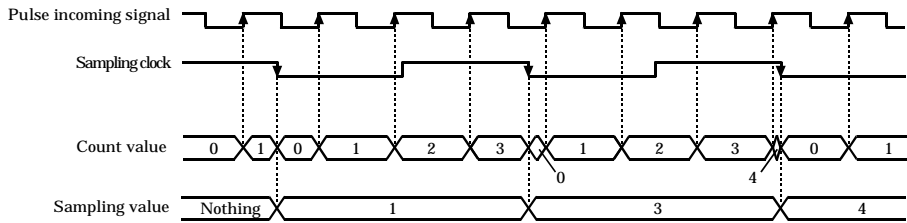


Figure 4.12. Totalizing/line receiver counter

Sampling function

Sampling function

The sampling function obtains count data periodically using the internal or external clock.

Acquired sampling data is transferred to memory on the PC by bus mastering. When the internal clock is used, sampling can be performed at a maximum of 20 MHz (for sampling of one channel).

If this product fails to gain access to the bus to transfer in time, as bus mastering is used, this product stops transfer, resulting in an error. Note that it depends on the application activities on the PC whether continuous transfer can be performed at 20 MHz.

This product can perform sampling in various conditions, depending on the combination of the start, clock, and stop conditions. For setting sampling conditions, see “Control of sampling” described later in this section.

Bus mastering

The bus mastering feature of this product executes DMA transfer between this product and the memory space allocated for the application during PCI bus idle time. For the memory space for the application, a static area is specified, which is allocated by ordinary variable definition. Under the OSs such as Windows, the memory space for applications is represented by logical addresses; physical addresses form noncontiguous address spaces. This product transfers data continuously to these noncontiguous physical address spaces. Bus mastering by this product enables transfer to up to 64 megabytes of physical memory space. When the actual area to transfer data to from the PC is set, the memory size available depends on the type of the OS used and the total amount of physical memory mounted on the PC.

As memory usage types for bus mastering, batch transfer and ring transfer are available. Batch transfer is completed when transfer reaches the end of the specified memory area. Ring transfer restarts transfer from the beginning of the specified memory area when the transfer reaches the end of it. Ring transfer continued until either the stop condition is satisfied or it is stopped by software.

Interrupt (During bus mastering)

The following interrupt features are available during bus mastering:

- Generating an interrupt upon completion of transfer of the specified number of data items
- Generating an interrupt upon completion of transfer

These interrupts can be reported to the application by using the relevant function of “API-CNT(98/PC)”.

If transfer is terminated with an error such as failure to acquire the bus or transfer data in time, this product stops transfer and generates a transfer completion interrupt. The occurrence of any transfer error can be detected by checking the status.

Status, Count

The following types of status (error) are available concerning bus mastering.

Table 4.4. Status about bus master (Error)

Status	Description
BUS MASTER STOP	Indicates that bus mastering transfer has completed.
CNT START	Indicates that counter sampling has been started.
CNT STOP	Indicates that counter sampling has been stopped.
TRIGGER IN	Indicates that the external start signal has been received.
OVER RUN	Indicates that the external start signal has been received at least twice Transfer continues normally.

Error	Description
FIFO FULL	Indicates that FIFO memory has been full. This is mainly because a heavy load on the system prevented bus mastering from being executed in time. Take appropriate action, for example, lower the transfer rate or system load.
S/G OVER IN	Indicates a buffer overflow. The number of data items to be transferred exceeds the buffer size. Increase the buffer size.
TRG ERROR	Indicates that the external start and stop signals have been received. Transfer is not performed when this status is set. Check how the external start and stop signals are input.
CLOCK ERROR	Indicates that, during data input/output at an external clock pulse, the next clock pulse was received. If this status is set, consider lowering the external clock frequency.
SLAVE HALT	Indicates that transfer has been aborted in response to a stop event from a slave board.Check the error detected on the slave side.
MASTER HALT	Indicates that transfer has been aborted in response to a stop event from a master board.Check the error detected on the master side.

These status can be obtained by using the relevant API-CNT(98/PC) function in API-PAC(W32).

The 32-bit or 64-bit transfer count can be obtained by using the relevant API-CNT(98/PC) function in API-PAC(W32). The transfer count is obtained as the number of data items (per channel) which have been transferred to the memory area for the user application.

Control of a sampling

This product can acquire sampling data periodically using the sampling clock. The sampling clock, sampling start trigger, and sampling stop trigger events are listed below.

Table 4.5. Sampling clock start stop

Item	Factor	Description	Note
Sampling clock	Not used	Sampling is not used.	Set for counter mode.
	Internal clock	Internal clock(50nsec - 107sec) 25nsec unit	
	External clock	Fall of external sampling clock input (EXTCLK) (Maximum frequency response of 10 MHz)	
	Sync control connectors	Clock input from synchronization control input (Maximum frequency response of 5 MHz)	
Sampling start trigger	Not used	Sampling is not used.	Set for counter mode.
	Software	Software command	
	Rise of an external input signal	Rise of external sampling clock input (EXTCLK)	
	Fall of an external input signal	Fall of external sampling clock input (EXTCLK)	
	Sync control connectors	Start signal from synchronization control input	
	Count match	When the count value for channel 0 - 7 matches the value in comparison register 0 or 1	
Sampling stop trigger	Not used	Sampling is not used.	Set for counter mode.
	Software	Software command	
	Rise of an external input signal	Rise of external sampling clock input (EXTCLK)	
	Fall of an external input signal	Fall of external sampling clock input (EXTCLK)	
	Sync control connectors	Start signal from synchronization control input	
	Count match	When the count value for channel 0 - 7 matches the value in comparison register 0 or 1	
	Specified number of times	Terminated after sampling for the specified number of times	
	Bus master error	When FIFO memory has become full	

- Sampling is performed based on one clock/start/stop signal. One sampling start signal and one sampling signal are used per board. The rising or falling edge of the signal can be selected.
- When the sampling start trigger is input, the first sampling data is acquired (not synchronized with the sampling clock signal). Sampling data that follows is obtained in sync with the sampling clock signal. Note, therefore, that the sampling interval between the first and second sampling may be different from the specified sampling clock period in some cases.
- When the sampling stop trigger is input, sampling is stopped immediately. Sampling data is not acquired when sampling has been suspended and after it is stopped.
- The sampling clock can be set to a minimum of 50 ns assuming that only one channel is subject to sampling. For sampling for more channels, the minimum sampling clock must be set to “the number of sampling channels x 50 nsec”.

Example: Minimum sampling clock for 8-channel sampling = 8 x 50 nsec = 400 nsec

Hardware event

Types of hardware events

This product operates automatically in response to changes to the control input signal, control output signal status, and count matches. These are generically called hardware events.

One control input signal line and one control output signal line are provided for each channel.

Table 4.6. Hardware event

Item	Purpose	Condition
Control input signal *1	Preset	Rise(Low → High)
		Fall(High → Low)
	Zero-clear	Rise(Low → High)
		Fall(High → Low)
	Counter start/stop	Rise(Low → High)
		Fall(High → Low)
Control output signal *2	Count match(Register 0)	Count value = Comparison register 0
	Count match(Register 1)	Count value = Comparison register 1
	Abnormal input error	When phases-A and B are changed at the same time
	Digital filter error	When a pulse faster than the digital filter setting is input
	Disconnection alarm error	When a high-level signal is input to both of the positive and negative differential line receiver inputs
Count match	Preset	Count value = Comparison register 0
		Count value = Comparison register 1
	Zero clear	Count value = Comparison register 0
		Count value = Comparison register 1

*1 When the control input signal is used as a general-purpose input, hardware events cannot be set as above.

*2 When the control output signal is set for hardware events as above, it becomes a one-shot pulse output.

The pulse width is set by software to 10 μsec, 100 μsec, 1 msec, 10 msec, or 100 msec.

When the control output signal is used as a general-purpose output, it becomes a level output and hardware events cannot be set as above. The output signal logic is set with the SW2 on this product. For setting the logic, see

“Setting

the Logic of External Control Signals” in Chapter 2.

Control input signal

One control input signal is provided for each channel. The control input signal can serve for one of the following applications. The application is software-selectable.

Table 4.7. Control input signal

Item	Purpose	Condition
Control input signal	General-purpose input	Software status(positive logic)
	Preset	Rise(Low → High)
		Fall(High → Low)
	Zero-clear	Rise(Low → High)
		Fall(High → Low)
	Counter start/stop	Rise(Low → High)
		Fall(High → Low)

General-purpose input

When not used for a hardware event, the control input pin can be used as the general-purpose input signal pin. The input logic is fixed as positive logic.

Preset

When the control input signal is set to presetting, the control input pin serves as the external trigger input pin for presetting. The rising or falling edge of the signal can be selected.

Zero-clear

When the control input signal is set to zero-clearing, the control input pin serves as the external trigger input pin for zero-clearing. The rising or falling edge of the signal can be selected.

A counter start/stop

When the control input signal is set to counter start/stop, the control input pin serves as the external trigger input pin for counter start/stop. The rising or falling edge of the signal can be selected for each of the counter start and counter stop.

Control output signal

One control output signal is provided for each channel. The output signal can be used as a general-purpose output (level output) or a one-shot pulse output for reporting a hardware event to an external device.

Although all hardware events can be reported by the one-shot pulse output, that event cannot be identified which results in the one-shot pulse output. Check the status in such cases.

The output logic is set with the on-board DIP switch(SW2).

Table 4.8. Control output signal

Item	Purpose	Condition	Note
Control output signal	General-purpose output	Software command	Level output (Positive logic/Negative logic)
	Count match(Register 0)	Count value = Comparison register 0	A one shot pulse is outputted. (Positive logic/Negative logic) *1
	Count match(Register 1)	Count value = Comparison register 1	
	Abnormal input error	When phases-A and B are changed at the same time	
	Digital filter error	When a pulse faster than the digital filter setting is input	
	Disconnection alarm error	When a high-level signal is input to both of the positive and negative differential line receiver inputs	

*1 The one-shot pulse width is set by software to 10 μsec, 100 μsec, 1 msec, 10 msec, or 100 msec.

General-purpose output

When the control output signal is not used for a hardware event, the control output pin can be used as a general-purpose output. In this case, it is not a one-shot pulse output but a level output. It can be switched between positive logic and negative logic.

Count match (Register 0)

When the count value matches the value in comparison register 0, a one-shot pulse is output as a count match (register 0) output. It can be switched between positive logic and negative logic.

Count match (Register 1)

When the count value matches the value in comparison register 1, a one-shot pulse is output as a count match (register 1) output. It can be switched between positive logic and negative logic.

Abnormal input error

When both of phase-A and B change at the same time, a one-shot pulse is output as an abnormal input error. It can be switched between positive logic and negative logic.

Digital filter error

When a pulse faster than the digital filter time setting, a one-shot pulse is output as a digital filter error. It can be switched between positive logic and negative logic.

Disconnection alarm error

When a high-level signal is received at both of the positive and negative differential line receiver inputs, a one-shot pulse is output as a discontinuity alarm error. Both of the inputs go high upon detection of discontinuity or an alarm output from the differential line receiver input circuit. It can be switched between positive logic and negative logic.

Count match

This product can generate an interrupt, output an external one-shot pulse, preset the counter, and clear it to zero when the count value matches the value in comparison register 0 or 1.

This product has two comparison registers for each channel to compare the count value with. If two or more registers are required, reprogram the setting using software. When you have two comparison registers available at the same time, the upper and lower values can be set.

Table 4.9. Count match

Item	Factor	Function
Count match	Count value = Comparison register 0 or Count value = Comparison register 1	Interrupt
		One-shot pulse output
		Preset
		Zero-clear

Given below are application examples using the count match feature.

<Example 1> Move count values 100 - 200 in both ways. When the count value falls below 90 or exceeds 210, a one-shot pulse is output to an external device.

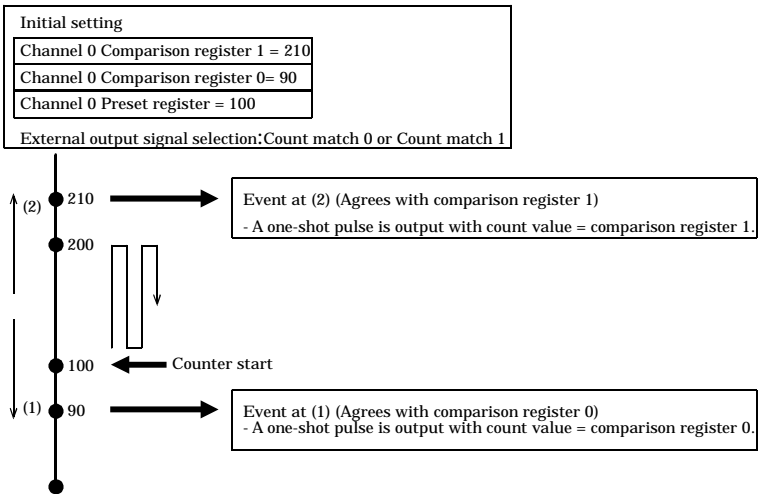


Figure 4.13. Example 1

<Example 2> Start sampling with a count value of 500 and stop it with a count value of 1000.

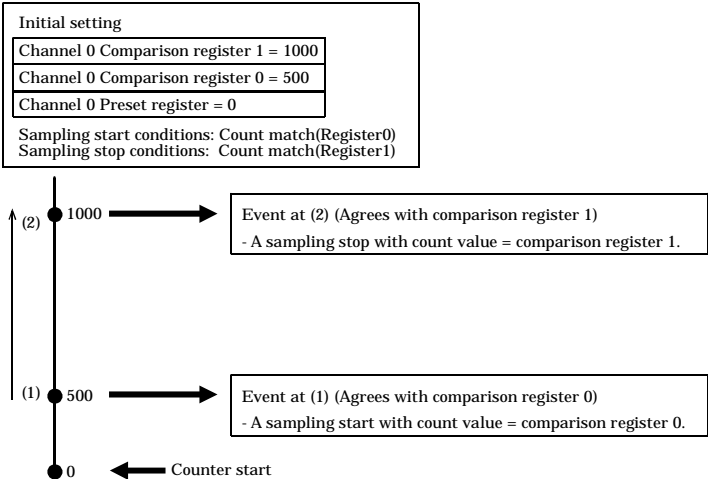


Figure 4.14. Example 2

<Example 3> Set comparison values of 100, 200, 300, 400, 500, ... and generate interrupts in sequence.

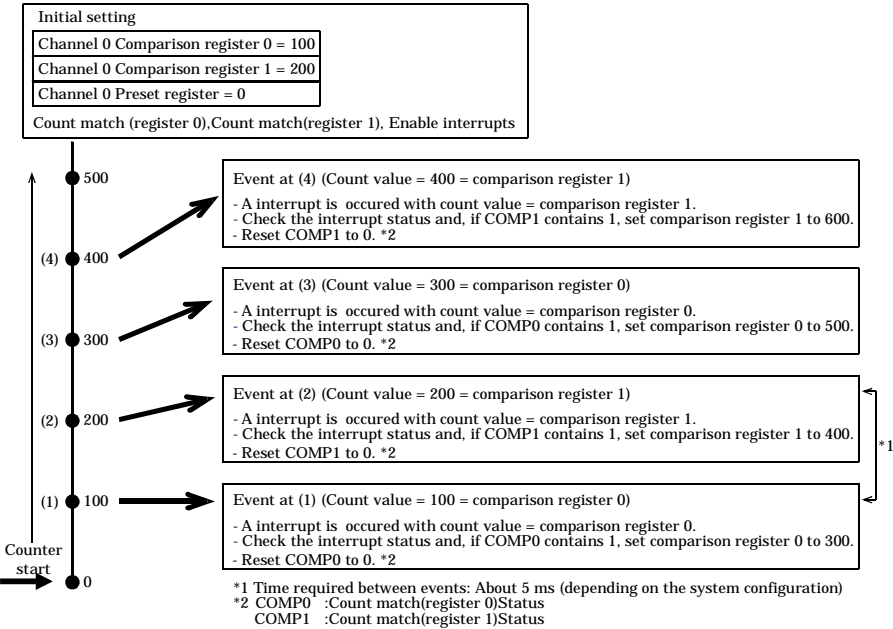


Figure 4.15. Example 3

Counter error

Counter errors are classified into three types: digital filter error, abnormal input error, and continuity alarm error.

Digital filter error

When a signal faster than the digital filter setting is input to phase-A or B, it is reported as a digital filter error. The report method is a status report (latch/clear), interrupt, or external output (one-shot pulse).

For the digital filter error, the levels of input signals are monitored according to the filter source clock signal the period of which is half the digital filter setting. If the monitor fails to detect the same level twice or more consecutively, a digital filter error is detected.

Note, however, that no filter error occurs when the input signal frequency is equal or close to an integer multiple of the filter source clock frequency.

- When a signal faster than the digital filter setting is input
- Noise is generated.

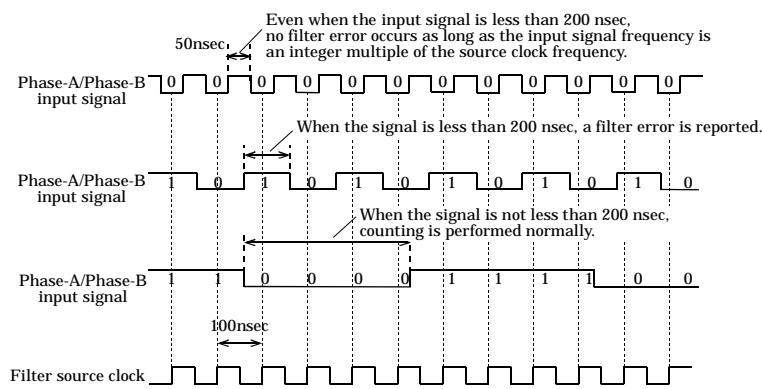


Figure 4.16. Filter error (Set to 0.2 μ sec)

Abnormal input error

When both of the phase-A and phase-B counter input signals change in level, it is reported as an abnormal input error in the form of a status report (latch/clear), interrupt, or external output (one-shot pulse). If phases-A and B change in level simultaneously during a digital filter source clock cycle when the digital filter has been set, it is reported as an abnormal input error. If phases-A and B change in level simultaneously during this product reference clock cycle of 40 MHz (25 nsec) with no filter set, it is also reported as an abnormal input error.

A possible cause of the abnormal input error is as follows.

- When the phase difference between phases-A and B is shorter than one digital filter source clock cycle (25 nsec with no filter set)
- Noise is generated.

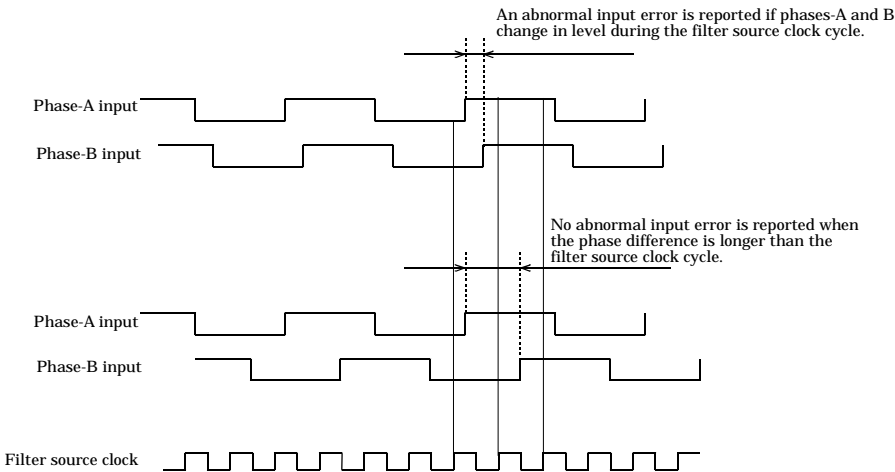


Figure 4.17. Abnormal input error

Disconnection alarm error

Discontinuity detected in Phase-A, B, or Z or an alarm output from the line receiver output circuit can be detected as a discontinuity alarm error in differential line receiver input mode (but not in TTL level input mode). The discontinuity alarm error occurs if any of the phases goes high (2.0 V or more) for 200 nsec or more on both of the positive and negative sides. The report method is a status report (status reflection), interrupt, or external output (one-shot pulse).

- ⚠

CAUTION

- The discontinuity alarm error is valid only when the terminal resistor has been set to ON. It cannot be detected with the terminal resistor set to OFF. When this product is used with the phase-Z signal unused, set the corresponding terminal resistor to OFF. Setting the terminal resistor for an unused pin to ON causes the alarm error state from the beginning.
 - Extending the distance lowers the input voltage and extends the rise and fall times, where the alarm error either never or always occurs. The extension distance within the alarm error function is valid is about 100 m (depending on the operating environment).
 - When either of the positive and negative sides is disconnected, the alarm error can be detected if the input signal is 2.5 MHz or less (200 nsec or more at High level). It cannot be detected if the input signal is 2.5 MHz or more (200 nsec or less at High level).

A possible cause of the discontinuity alarm error is as follows:

- The cable is disconnected.
- An alarm output from the line receiver output circuit is detected.
- The terminal resistor for an unused pin is ON.

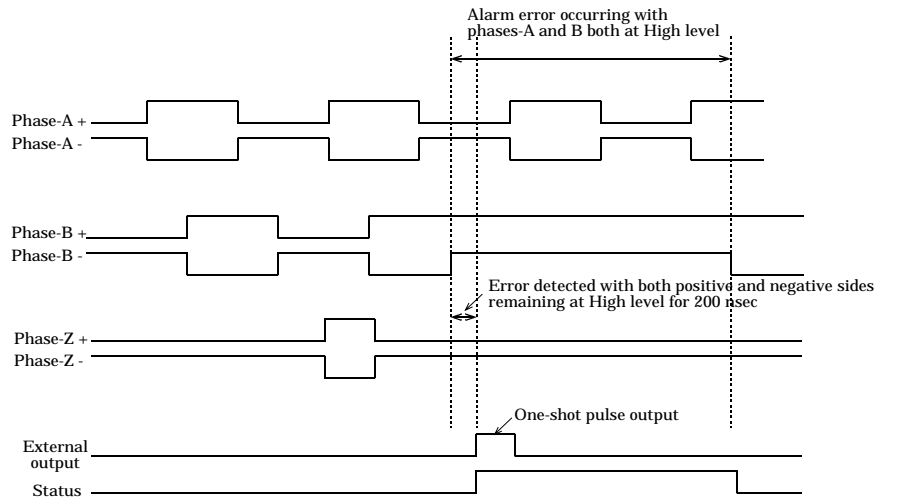


Figure 4.18. Disconnection alarm error

Status input

This product has the following status.

Pulse signal input states

The phase-A, phase-B, and phase-Z input states and count directions can be checked by their status.

Control input signal states

The control input signal states can be checked by the status.

Error

Abnormal input error

When both of the phase-A and phase-B counter input signals change in level, it is reported as an abnormal input error. To report the error, the status is latched and cleared by software.

Digital filter error

When a signal faster than the digital filter setting is input to phase-A or B, it is reported as a digital filter error. The status is latched and cleared by software.

Disconnection alarm error

Discontinuity detected in phase-A, B, or Z or an alarm output from the line receiver output circuit can be detected as a discontinuity alarm error in differential line receiver input mode (but not in TTL level input mode). The status is not latched but reported as “error status = [1]” or “error cleared = [0]”.

Carry/Borrow

Carry

The 32-bit counter is set to [1] when incremented from its maximum value FFFFFFFFh to 0h.

Borrow

The counter is set to [1] when decremented from 0H to FFFFFFFFh.

Count match

A count match (to register 0), count match (to register 1), incremental count match, or decremental count match for each channel can be checked by the status.

Other functions

Digital filter

The digital filter is provided so that the counter works normally even when the pulse input to the counter, phase-A/B/Z signal, or control input signal has noise. When the digital filter detects the High (or Low) level maintained for the digital filter setting time, it outputs “High” (or “Low”) to the counter circuit. The setting range is set by software to “unused” or 0.1 μ sec - 1.6384 msec.

Note that, since all of these digital signals are input to the internal counter through the digital filter, a delay of the set time is required for them to be input when the digital filter is used.

Initially, the delay owing to the digital filter does not occur as it is not used by default.

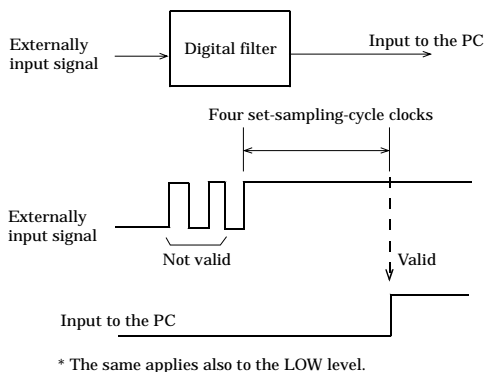


Figure 4.19. Digital filter



CAUTION

- The digital filter is initially disabled. (It remains disabled when left untouched.)
- The delay may be longer than the set time depending on the noise included.
- If the level changes at a frequency shorter than the set time, the level change is ignored and the input is not counted correctly.

Timer

The timer can generate an interrupt at software-set intervals. The setting range is 1 - 6553 msec (in 1 ms increments).

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

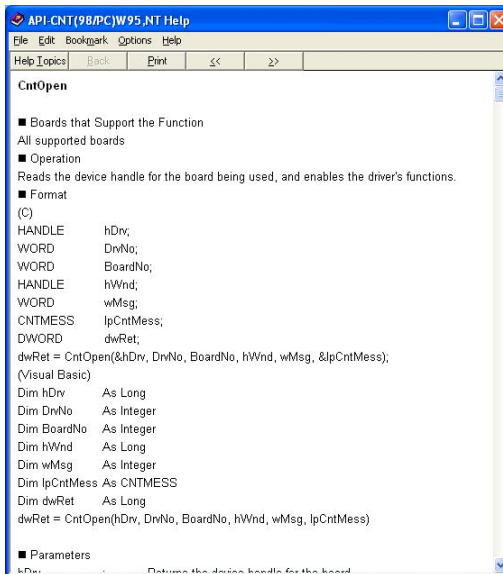
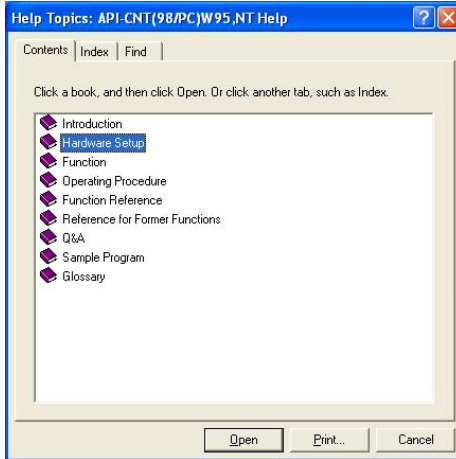
The bundled CD-ROM “Driver library API-PAC(W32)” contains the functions that provide the following features:

- Function to read the current count value of a specified channel.
- Function to read the current status register for a specified channel.
- Function to prevent chattering based on a digital filter using hardware capabilities.
- Function to preset or zero-clear the counter at the rising or falling edge of the control input signal.
- Function to output a one-shot pulse to the control output signal upon detection of a count match or error.
- Function to sample count values using bus mastering in sync with the specified external clock or internal clock.

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)” – “CNT” – “API-CNT HELP” to display help information.



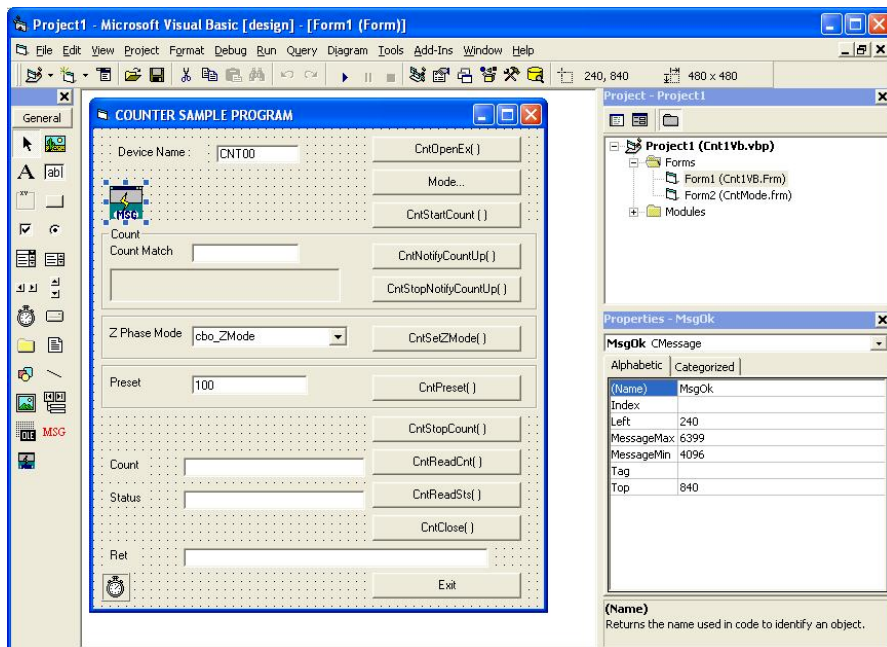
Using Sample Programs

Sample programs have been prepared for specific basic applications.

To use each sample program, enter its device name set by API-TOOL Configuration.

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

The sample programs are stored in \Program Files\CONTEC\API-PAC(W32)\Cnt\Samples or
 \Program Files\CONTEC\API-PAC(W32)\Cnt\Samples\CntMaster(Sample program for
 CNT-3208M-PE/CNT32-4MT(CB)/ CNT32-4MT(LPCI)/).



Sample Programs - Examples

- Counter Sample : Execute basic operations such as input signal count processing and hardware event handling for eight channels.
- Sampling Sample : Samples pulse signals at eight channels, saves the resulting data to a text file, and displays it along with the sampling status.
- Synchronous Sampling (for CNT-3208M-PE) : Uses two boards to sample pulse signals at eight channels each, save the resulting data to text files, and to display it along with the sampling status.

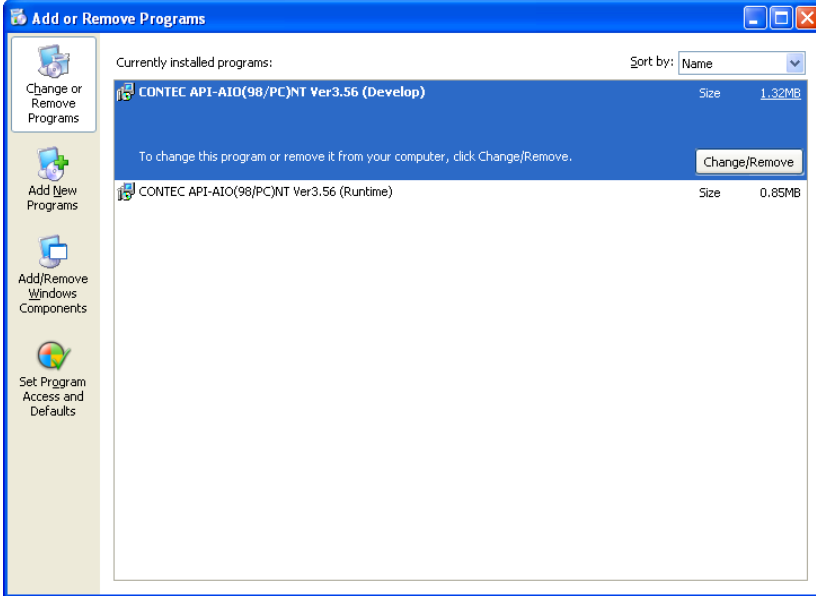
[Counter Sample]

[Synchronous Sampling]

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 “Install or Remove Programs and Windows components” in the Control Panel.
- (3) Select “CONTEC API-CNT(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.



6. About Hardware

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

For detailed technical information

For further detailed technical information (“Technical Reference” including the information such as an I/O map, configuration register, etc.), visit the Contec's web site (<http://www.contec.com/support/>) to call for it.

Hardware specification

Table 6.1. Specification < 1 / 3 >

Item	Specification
Input	
Counter	
Channel count	8 ch
Count system	Up / down counting (2-phase / Single-phase / Single-phase Input with Gate Control Attached)
Max. count	FFFFFFFFh (binary data, 32Bit)
Input type	Differential line receiver input or Unisolated TTL level input (Selectable by software)
Input signal	Phase-A/UP One x 8 ch Phase-B/DOWN One x 8 ch Phase-Z/CLR One x 8 ch
Differential line receiver input section	Element in use : Equivalent to AM26LS32 (T.I.) Terminating resistance : 150Ω (Can be disconnected switch.) Receiver input sensitivity : ±200mV In-phase input voltage range : ±7V Signal extension distance : 1200m (dependent on wiring environment and input frequency) *1
TTL level input section	Element in use : Equivalent to 74ALS541NS (T.I.) Signal extension distance : 1.5m (dependent on wiring environment)
Response frequency (Max.)	10MHz 50% duty
Digital filter	0.1μsec - 1.6384msec or not used (can be independently set for each channel.)
Timer	1msec - 6553msec 1msec unit
Counter start trigger	Software / External start input / Sampling start trigger
Counter stop trigger	Software / External start input / Sampling stop trigger

Table 6.1. Specification < 2 / 3 >

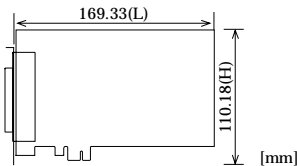
Item	Specification
Input	
Sampling	
Sampling start trigger	Software / External start input / Sync control connectors / Count match
Sampling stop trigger	Software / External stop input / Specification number / Bus master tranfer error / Sync control connectors / Count match
Sampling clock	Sampling timer / External clock input / Sync control connectors
Sampling timer	50nsec - 107sec 25nsec unit (can not be independently set for each channel.)
External sampling start signal	TTL level (Select Rise or Fall)
External sampling stop signal	TTL level (Select Rise or Fall)
External sampling clock signal	TTL level (Fall)
Response frequency (Max.)	10MHz 50% duty
Control	
Control input signal type	Unisolated TTL level
Control input channel	One x 8 ch
Control input signal	- Preset (Select Rise or Fall) - Zero-clear (Select Rise or Fall) - Counter start / stop (Select Rise or Fall) - General-purpose input (positive logic) Software-selected from among the above four options
Response time (Max.)	100nsec
Interrupt factor	Count match (16 ch), Counter error (2 ch), Sampling factor (6 ch), Sync control connectors error (2 ch), Carry / Borrow (1 ch), Timer (1 ch)

*1 The frequency response at an extension of 50 m is about 10 MHz (depending on the wiring environment).
The frequency response at an extension of 100 m is about 5 MHz (depending on the wiring environment).
The frequency response at an extension of 150 m is about 1.5 MHz (depending on the wiring environment).
The frequency response at an extension of 300 m is about 1 MHz (depending on the wiring environment).
The frequency response at an extension of 600 m is about 500 KHz (depending on the wiring environment).
The frequency response at an extension of 1200 m is about 80 KHz (depending on the wiring environment)

Table 6.1. Specification < 3 / 3 >

Item	Specification
Output	
Control	
Control output channel	One x 8 ch
Control output signal	<ul style="list-style-type: none"> - Count match 0 output (one-shot pulse output) - Count match 1 output (one-shot pulse output) - Digital filter error output (one-shot pulse output) - Abnormal input error output (one-shot pulse output) - Disconnection alarm error output (one-shot pulse output) - General-purpose output (Level output) Software-selected from among the above five options (Positive / negative logic is selected with the on-board switch.)
One shot output signal amplitude	Selected between 10μsec, 100μsec, 1msec, 10msec and 100msec (Can be set for each channel, within precision + 1μsec)
Element in use	Non-Isolated Open Collector Output : Equivalent to 74LS07NS (T.I)
Output rating	30VDC 40mA
Response speed (Max.)	5μsec
TP	
Test pulse output signal	One line receiver output for each of phases-A and B (For TTL level output, use the positive line receiver output.)
Element in use	Equivalent to AM26LS31 (T.I)
Frequency	100kHz
Bus master	
DMA channel	1 ch
Transfer bus width	32-Bit width
Transfer data length	8 PCI Words length (Max.)
Transfer rate	80MB / sec (Max.133MB / sec)
FIFO	1K-DWord
Scatter/Gather function	64MB
Interrupt factor	Bus master event (7 ch)
Synchronization	
Control output signal	Select the output signal by software when setting the synchronization master board.
Control input signal	Select the synchronization factor by software when setting the synchronization slave mode.
Connectable number of device	16 boards including the master board
Common	
I/O address	Occupies 2 locations, any 32-bytets and 64-byte boundary
Additional function	Filter function, count match pulse output, test pulse output, disconnection alarm detection
Power consumption (Max.)	3.3VDC 1.8A
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Bus specification	PCI Express Base Specification Rev. 1.0a x1
Dimension (mm)	169.33(L) x 110.18(H)
Connector used	CN1 : 96-pin half-pitch connector PCR-E96LMD [mfd by HONDA TSUSHIN KOGYO CO., LTD.] or equivalent to it CN2, CN3 : PS-10PE-D4L1-B1 [JAE] or equivalent to it x 2
Weight	160g

Board Dimensions



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

Difference in bus mastering transfer rate by system configuration

Table 6.2. When it inserts in the expansion slot of a personal computer

	Limited	Unlimited
430TX/Pentium233MHz	20	13.4
440BX/PentiumII450MHz	20	13.4
i820/PentiumIII800MHz	20	13.4
i815E/PentiumIII800MHz	20	13.4

[MHz]

"Limited" indicates that the number of transfers is specified; "Unlimited" specifies that it is not specified.
These values may not be satisfied depending on the system configuration including other boards and applications.

Table 6.3. When CONTEC's extension adapter and chassis is used

	Limited	Unlimited
430TX/Pentium233MHz	20	10
440BX/PentiumII450MHz	20	10
i820/PentiumIII800MHz	20	10
i815E/PentiumIII800MHz	20	10

[MHz]

"Limited" indicates that the number of transfers is specified; "Unlimited" specifies that it is not specified.
These values may not be satisfied depending on the system configuration including other boards and applications.

Block Diagram

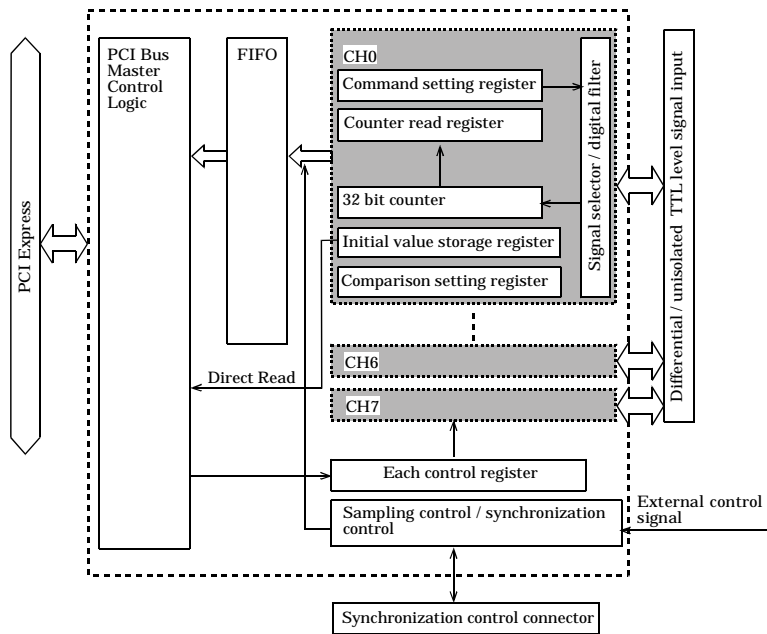


Figure 6.1. Block Diagram

CNT-3208M-PE

User's Guide

CONTEC CO., LTD.

October 2006 Edition

3-9-31, Himesato, Nishiyodogawa-ku, Osaka 555-0025, Japan

Japanese <http://www.contec.co.jp/>

English <http://www.contec.com/>

Chinese <http://www.contec.com.cn/>

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Management No. A-51-307

Parts No. LYGP021