

PC-HELPER

High-Speed Motion Control  
Board for PCI  
(4ch)

**SMC-4DL-PCI**

(8ch)

**SMC-8DL-PCI**

User's Guide

CONTEC CO.,LTD.

---

# Check Your Package

---

Thank you for purchasing the CONTEC product.

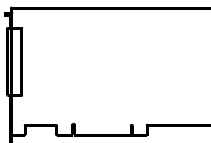
The product consists of the items listed below.

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

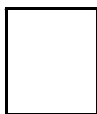
## Product Configuration List

- Board (One of the following)  
[SMC-4DL-PCI or SMC-8DL-PCI] ...1
- First step guide ...1

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



Board



First step guide



CD-ROM  
[API-PAC(W32)]

---

# Copyright

Copyright 2006 CONTEC CO., LTD. ALL RIGHTS RESERVED.

No part of this document may be copied or reproduced in any form by any means without prior written consent of CONTEC CO., LTD.

CONTEC CO., LTD. makes no commitment to update or keep current the information contained in this document. The information in this document is subject to change without notice.

All relevant issues have been considered in the preparation of this document. Should you notice an omission or any questionable item in this document, please feel free to notify CONTEC CO., LTD.

Regardless of the foregoing statement, CONTEC assumes no responsibility for any errors that may appear in this document or for results obtained by the user as a result of using this product.

# Trademarks

MS, Microsoft and Windows are trademarks of Microsoft Corporation. Other brand and product names are trademarks of their respective holder.

---

# Table of Contents

Check Your Package.....	i
Copyright.....	ii
Trademarks .....	ii
Table of Contents.....	iii

## 1. BEFORE USING THE PRODUCT

1

About the Board.....	1
Features .....	1
Support Software .....	2
Cable & Connector (Option) .....	2
Accessories (Option) .....	2
Customer Support .....	3
Web Site.....	3
Limited Three-Years Warranty .....	3
How to Obtain Service .....	3
Liability.....	3
Safety Precautions .....	4
Safety Information .....	4
Handling Precautions.....	5
Environment.....	6
Inspection.....	6
Storage .....	6
Disposal .....	6

## 2. SETUP

7

What is Setup? .....	7
Using the Board under Windows Using the Driver library API-PAC(W32).....	7
Using the Board under Window Using Software Other than the Driver library API-PAC(W32) .....	7
Using the Board under an OS Other than Windows .....	8
Step 1 Installing the Software .....	9
Starting the Install Program.....	9
Selecting API-SMC(WDM) .....	10
Executing the Installation .....	10
Step 2 Setting the Hardware .....	11
Parts of this product and Factory Defaults .....	11
Setting the Board ID .....	13
Setting the Terminating Register.....	13
Plugging the Board .....	14

Step 3 Installing the Hardware .....	15
Turning on the PC .....	15
When Using API-SMC(WDM) .....	15
Step 4 Initializing the Software .....	17
Step 5 Checking Operations with the Diagnosis Program .....	19
What is the Diagnosis Program? .....	19
Check method .....	19
Using the Diagnosis Program .....	21
Setup Troubleshooting .....	24
Symptoms and Actions .....	24
If your problem cannot be resolved .....	24

<b>3.</b>	<b>EXTERNAL CONNECTION</b>	<b>25</b>
-----------	----------------------------	-----------

How to connect the connectors .....	25
Connector shape .....	25
Connector Pin Assignment .....	26
Connecting Output Signals .....	32
Pulse output circuit (CW, CCW) .....	32
Control signal/general-purpose signal output circuit (OUT1 - OUT3, ERC, CP1, CP2) .....	34
Connecting Input Signals .....	35
Encoder input circuit .....	35
Limit input/general-purpose input/control input circuit (IN1 - IN7, +LIM, -LIM, ORG) .....	38
Connection Examples .....	39
Surge Voltage Countermeasures .....	40

<b>4.</b>	<b>FUNCTIONS</b>	<b>41</b>
-----------	------------------	-----------

About each motor control operation .....	41
PTP operation function .....	41
JOG operation function .....	41
ORG operation function .....	41
Linear interpolation .....	41
S-curve acceleration/deceleration function .....	41
Meanings of signals .....	42
Limit input signals .....	42
Encoder input signal .....	43
Pulse output signal .....	44
General-purpose input signals .....	45
General-purpose output signals .....	46
P.COM (Plus common) .....	46
GND (Ground) .....	46
Motion control system .....	47
System configuration .....	47

<b>5.</b>	<b>ABOUT SOFTWARE</b>	<b>49</b>
	CD-ROM Directory Structure .....	49
	About Software for Windows.....	50
	Accessing the Help File.....	50
	Uninstalling the Driver library .....	51
<b>6.</b>	<b>ABOUT HARDWARE</b>	<b>53</b>
	For detailed technical information .....	53
	Hardware specification.....	53
	Block Diagram.....	56



# 1. Before Using the Product

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

## About the Board

This product is a PCI bus-standard motion control board that can position a stepping motor or (a pulse-train input type of) servomotor.

This product has the functions for positioning, origin return, linear interpolation, and for S-curve acceleration and deceleration, capable of multi-axial linear interpolation and speed/position overriding. This product covers a wide range of applications including semiconductor equipment, test instruments, multi-axis robots, and X-Y robots.

The < SMC-4DL-PCI > can control up to four axes alone.

The < SMC-8DL-PCI > can control up to eight axes alone.

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

## Features

Capable of easily controlling the stepping motor and servomotor using software under Windows

Controlling a larger number of axes

SMC-4DL-PCI : can control up to four axes

SMC-8DL-PCI : can control up to eight axes

Capable of controlling the jogging at fixed speed or by linear/S-curve acceleration and deceleration, positioning, and origin returning

Carrying a motor control IC in the PCL6100 series from Nippon Pulse Motor Co., Ltd., capable of controlling jogging, positioning, origin returning, and linear interpolation

Capable of using an encoder supporting differential output, TTL level output, open-collector output

Capable of pulse output of up to 9.8 Mpps

Capable of pulse output of up to 9.8 Mpps. Offering a choice of motor control command pulses selectable from among common, 2, and 90-degree phase-shifted pulses

Capable of speed and position overriding

Capable of changing the speed and target position during operation

Comparator circuits allowing the set value and counter value to be compared

A pair of comparator circuits are provided for each axis, allowing the set value and counter value to be compared with each other. They also allow signals to be output while comparator conditions are met.

Provided with seven general-purpose input pins per axis and three general-purpose output pins

Seven general-purpose inputs are provided for each axis, five of which are also available as alarm, positioning completion, deceleration stop, counter latch, and positioning start inputs. Logic can be changed by software.

Three output pins are provided for each axis. The output signals can be selected from among the deviation counter clear, comparator condition satisfied state, level signal, and one-shot pulse signals. Logic can be changed by software.

Dedicated terminal strip CCB-SMC2 (option) available focusing on the ease of use for wiring



### 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

### Cable & Connector (Option)

#### Shielded Cable With Two 100pin Connector

: PCB100PS-0.5 (0.5m)  
: PCB100PS-1.5 (1.5m)  
: PCB100PS-3 (3m)  
: PCB100PS-5 (5m)

#### Flat Cable with One 100-Pin Connector

: PCA100P-1.5 (1.5m)  
: PCA100P-3 (3m)  
: PCA100P-5 (5m)

### Accessories (Option)

Connection Conversion Board for SMC

: CCB-SMC2 \*1\*2

Screw Terminal (M3\*100)

: EPD-100A \*2

\*1 Distributes 100-pin 0.8-mm pitch connector x 1 to: D-SUB 37 connector x 4, D-SUB-9 connector x 4.

\*2 A PCB100PS optional cable is required separately.

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

## Customer Support

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

### Web Site

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

Latest product information

CONTEC provides up-to-date information on products.

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

Free download

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

Note! For product information

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

## Limited Three-Years Warranty

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

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

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

## How to Obtain Service

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

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

## Liability




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

# Safety Precautions

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

## Safety Information

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

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

## Handling Precautions

### DANGER

---

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 extension slot while the computer's power is turned on. And also do not connect this product and external device while the power is turned on.  
Otherwise, this product may malfunction, overheat, or cause a failure.  
Be sure that the personal computer or the I/O extension unit power is turned off.
  - Do not connect or remove a cable with or from this product while the computer's power is turned on.  
And also do not connect this product and external device while the power is turned on.  
Otherwise, this product 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 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 this product continuously, be sure to read the manual and understand the contents.
  - Do not modify this product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this product.
  - Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.
-

### Environment

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

Operating temperature

0 - 50°C

Humidity

10 - 90%RH (No condensation)

Corrosive gases

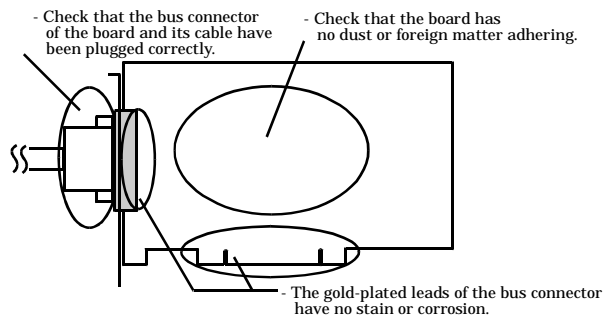
None

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 this product.

### 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 Window

#### 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

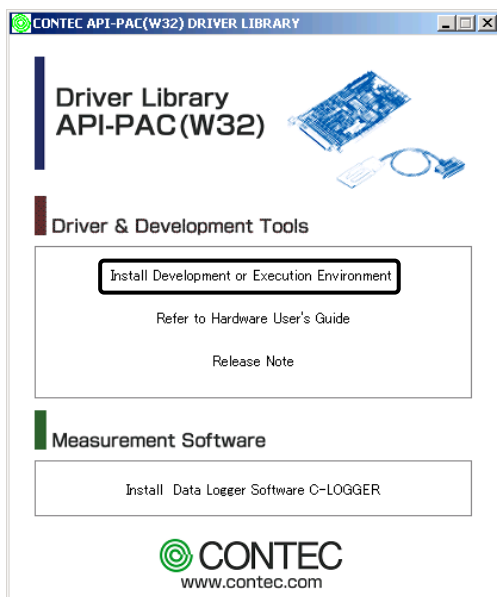
This section describes how to install the API function libraries.

**Before installing the hardware on your PC, install the API 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.**



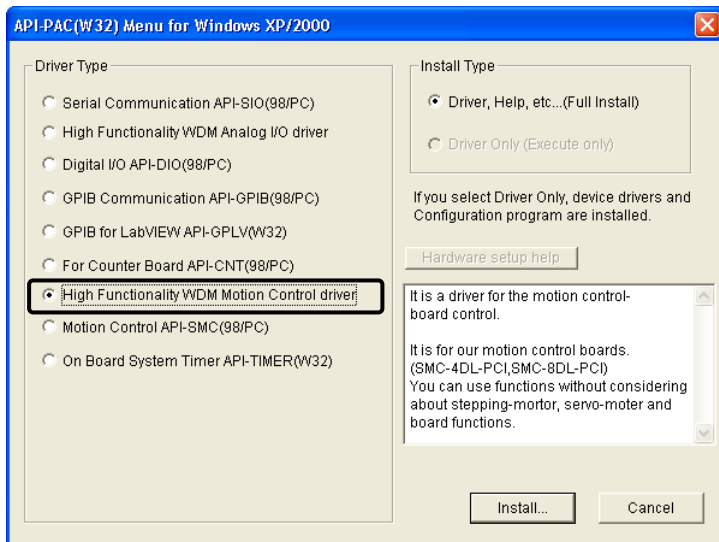
### CAUTION

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



## Selecting API-SMC(WDM)

- (1) The following dialog box appears to select “Driver Type” and “Install Type”.
- (2) Select the "High Functionality WDM Motor Control driver".
- (3) Click on the [Install] button.



## Executing the Installation

- (1) Follow the on-screen instructions to proceed to install.
- (2) After finishing installing, Readme file is displayed.

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

## Step 2 Setting the Hardware

This section describes how to set this product and plug it on your PC.

This product has some switches and jumper to be preset.

Check the on-product switches and jumpers before plugging this product into an expansion slot.

This product can be set up even with the factory defaults untouched. You can change this product settings later.

### Parts of this product and Factory Defaults

Figure 2.1. - 2.2. shows the names of major parts on this product.

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

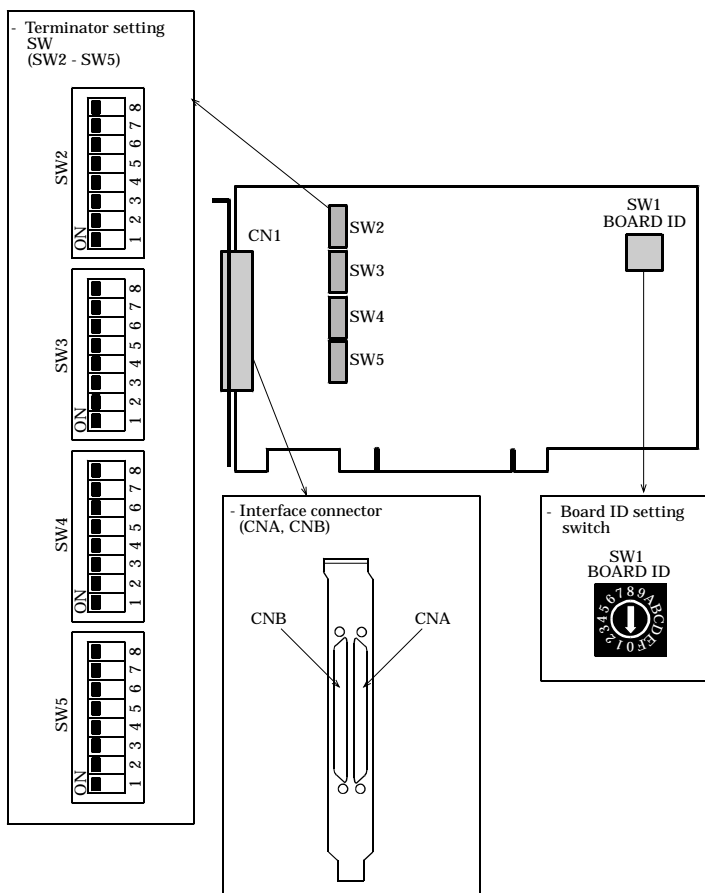


Figure 2.1. Component Locations < SMC-8DL-PCI >

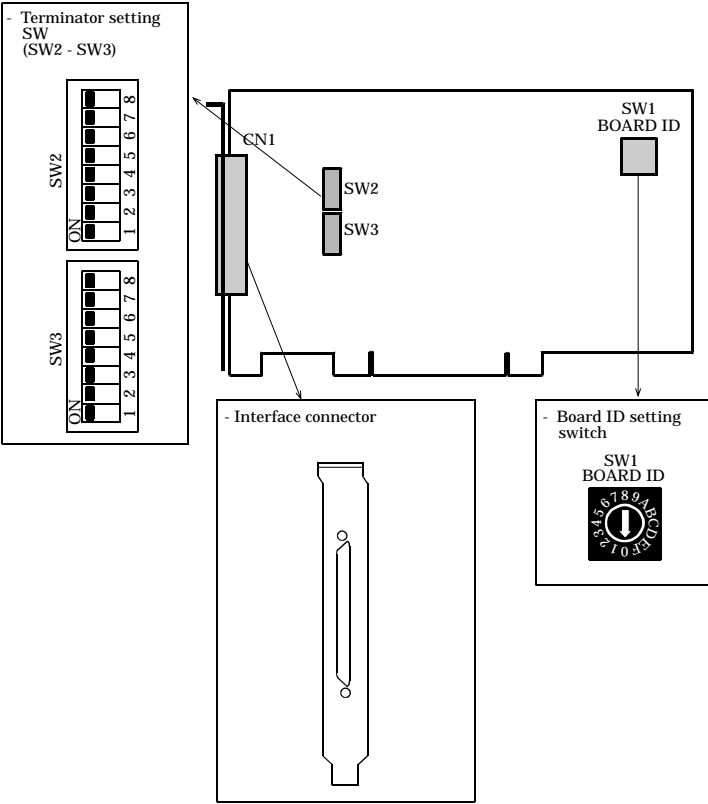


Figure 2.2. Component Locations < SMC-4DL-PCI>

## 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 - Fh to identify up to sixteen boards.

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

### Setting Procedure

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

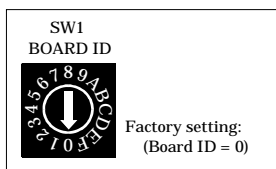


Figure 2.3. Board ID Settings (SW1)

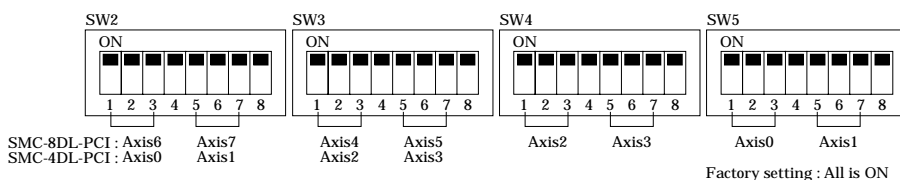
## Setting the Terminating Register

You can select whether to insert a terminator (terminal resistor) in the differential input section. Select whether to insert the terminator depending on the system to be used.

### Setup Method

To select whether to insert the terminator, use the DIP switches (SMC-4DL-PCI : SW2 and SW3, SMC-8DL-PCI : SW2 - SW5) on the board.

Set SW2 and SW3 according to the figure shown below.



Bit	Input signal	Insert the terminal	Not insert the terminal
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 Setup Switches and Settings

## Plugging the Board

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



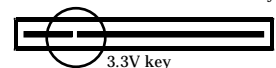
### Applicable PCI bus slots

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

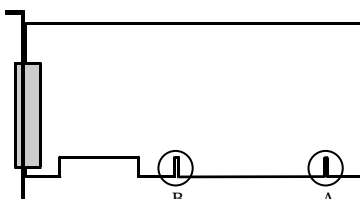
<PCI bus slot>

5-V PCI bus slot

3.3-V PCI bus slot



<PCI bus board>



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

## ⚠ CAUTION

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

## Step 3 Installing the Hardware

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

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

### Turning on the PC

Turn on the power to your PC.



#### CAUTION

- The board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the board, first determine what PC resources are free to use.
- The resources used by each board do not depend on the location of the 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.

### When Using API-SMC(WDM)

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

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



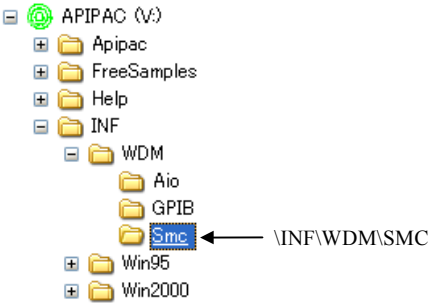
- (2) Specify that folder on the CD-ROM which contains the setup information (INF) file to register the board.



Source folder

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

\INF\WDM\SMC



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

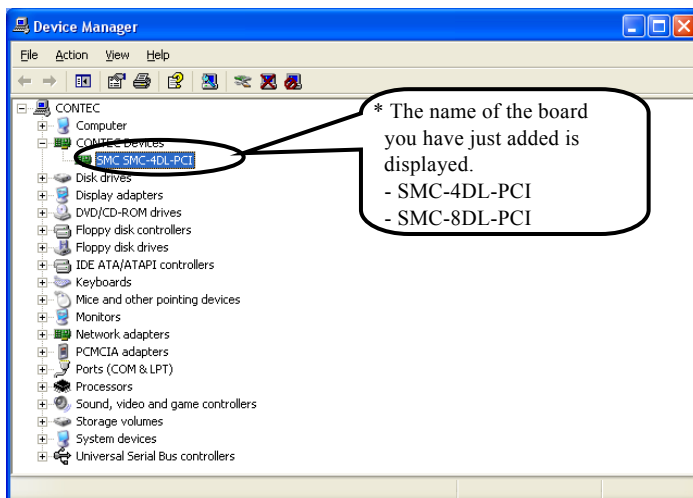
## Step 4 Initializing the Software

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

Setting the device name

- (1) Run Device Manager. From [My Computer] - [Control Panel], select [System] and then select the [Device Manager] tab.

(You can also open Device Manager by right clicking on My Computer and selecting Properties.)



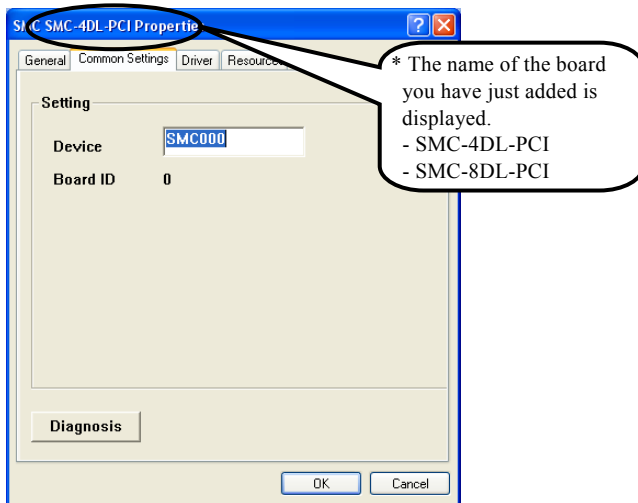
- (2) The installed hardware appears under the CONTEC Devices node. Open the CONTEC Devices node and select the device you want to setup (the device name should appear highlighted). Click [Properties].



(3) The property page for the device opens.

Enter the device name in the common settings tab page and then click [OK].

The device name you set here is used later when programming.



- \* The initial device name that appears is a default value. You can use this default name if you wish.
- \* Make sure that you do not use the same name for more than one device.

**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.

For Quick Check, the program checks the board resources for validity. The resources include the I/O addresses, interrupt level (IRQ), board ID, and sync signal.

For Detail Check, the program checks the connections of the motor control board, driver unit, and limit sensor for validity. The program inputs/outputs signals in interactive mode to check for validity. Check items are Limit Signals Input, Control Signals Input/Output and Pulse Signals Output.

### Check method

Perform the input/output test and check the execution environment with the driver unit connected.

The dedicated screw terminal CCB-SMC2 will come in handy when you check the board.

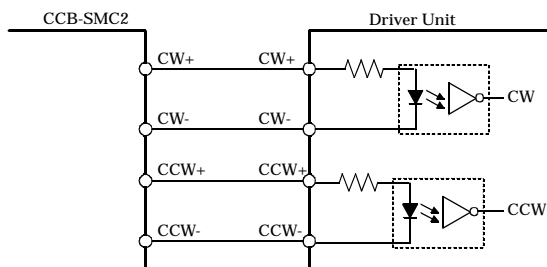
The board should be checked with the factory defaults.

For direct connection to the board, see Chapter 3 “External Connection”.

Connection diagram

The following connection diagrams show connections using the dedicated screw terminal CCB-SMC2.

<Pulse output>



**Figure 2.5. Connection diagram** < 1 / 2 >

<Limit input>

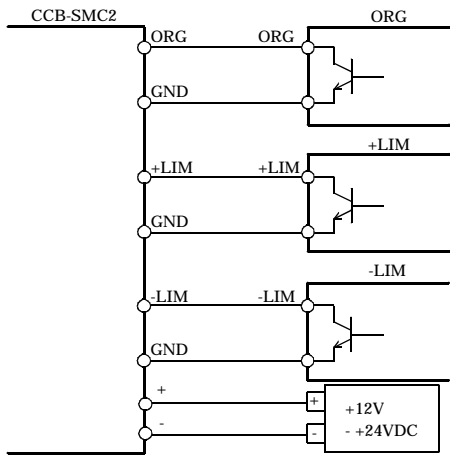
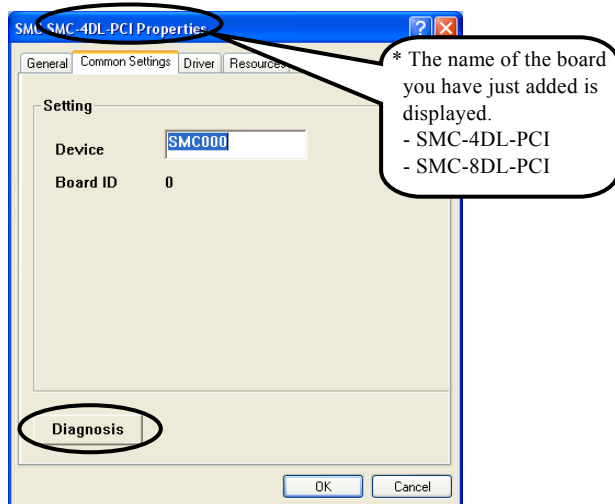


Figure 2.5. Connection diagram < 2 / 2 >

## Using the Diagnosis Program

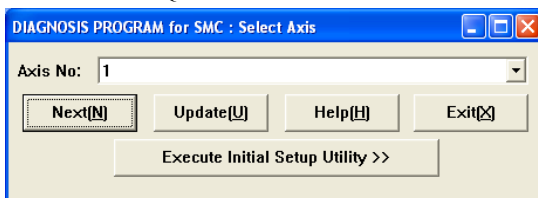
### Starting the Diagnosis Program

Click the [Diagnosis] button on the device property page to start the diagnosis program.

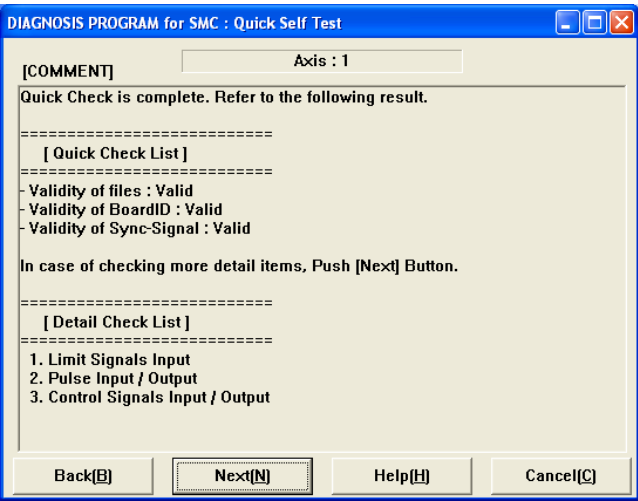


Checking for motor control

- (1) Select the name of the axis you want to diagnose, then click on the [Execute Initial Setup Utility] button to execute Quick Check.

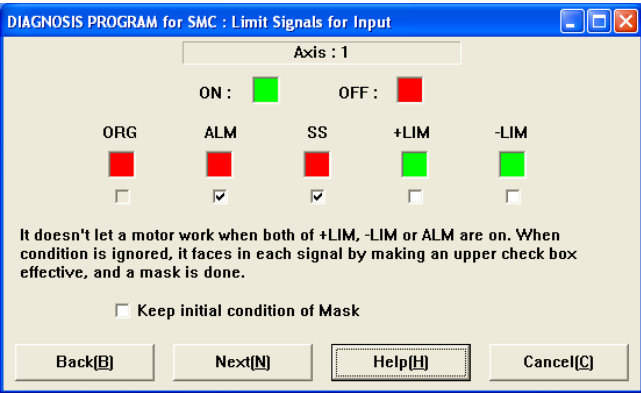


To execute Detail Check, click on the [Next] button. Otherwise, click on the [Back] or [Cancel] button.

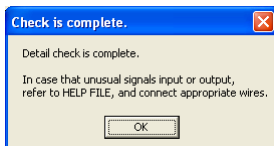
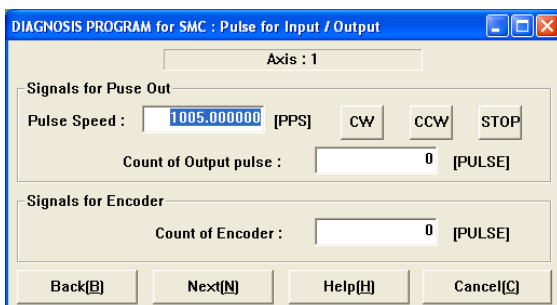
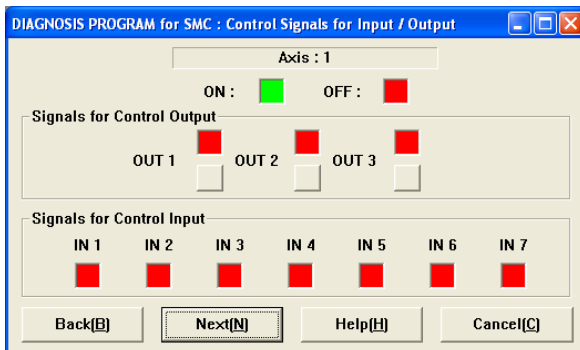


(2) Check/mask each signal.

When the alarm (ALM/ES) is ON or each limit (+LIM, -LIM) is ON, the motor does not operate in that direction. In this case, check the connection of the signal or mask it.



(3) Simple operation is performed.



# Setup Troubleshooting

## Symptoms and Actions

Data input or output does not operate correctly

- Run the diagnosis program to check that the device is registered and whether any initialization errors have occurred.
- Is there a problem with the device settings, wiring, or similar? Check the I/O setting of motor driver unit and limit sensor for validity.

The diagnostic program works correctly but the application program does not.

The diagnostic program uses the API-TOOL functions. If the diagnostic program works correctly, other applications should work correctly also. If you have a problem, recheck your program taking note of the following points.

- Check the return values of the API functions.
- Refer to the source code for the sample programs.

The OS does not boot correctly or does not detect the device correctly.

Refer to the "Troubleshooting" section of API-SMC(WDM) HELP.

## If your problem cannot be resolved

Contact your retailer.

## 3. External Connection

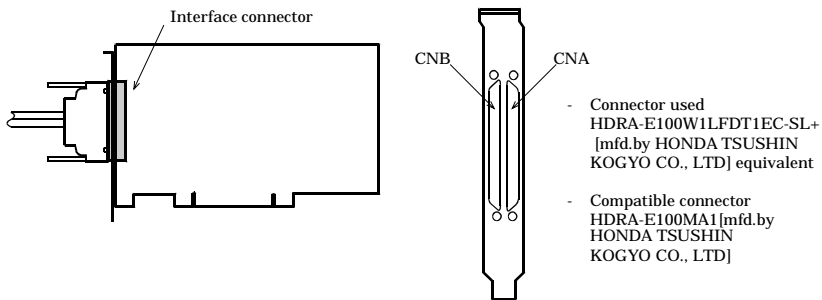
This chapter describes the interface connectors on the board and the external I/O circuits. Check the information available here when connecting an external device.

### How to connect the connectors

#### Connector shape

##### < SMC-8DL-PCI >

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

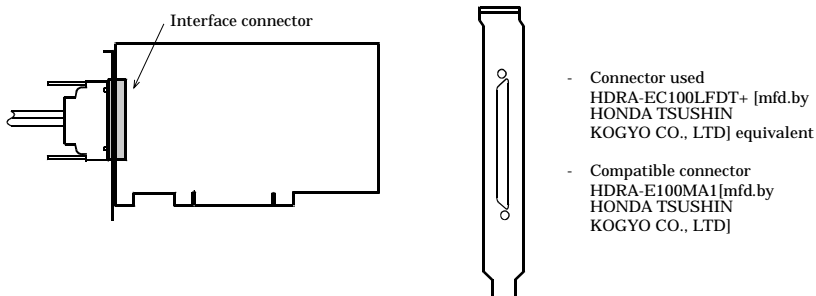


\* Please refer to chapter 1 for more information on the supported cable and accessories.

**Figure 3.1. Interface Connector Shape < SMC-8DL-PCI >**

##### < SMC-4DL-PCI >

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 3.2. Interface Connector Shape < SMC-4DL-PCI >**



# Connector Pin Assignment

Pin Assignments of Interface Connector (CNA, CNB) < SMC-8DL-PCI >

		CNB	
axis0 : P-COM	100	50	axis2 : P-COM
axis0 : IN1/ALM	99	49	axis2 : IN1/ALM
axis0 : IN2/INP	98	48	axis2 : IN2/INP
axis0 : IN3/SD	97	47	axis2 : IN3/SD
axis0 : IN4/LTC	96	46	axis2 : IN4/LTC
axis0 : IN5/PCS	95	45	axis2 : IN5/PCS
axis0 : IN6	94	44	axis2 : IN6
axis0 : IN7	93	43	axis2 : IN7
axis0 : ORG	92	42	axis2 : ORG
axis0 : +LIM	91	41	axis2 : +LIM
axis0 : -LIM	90	40	axis2 : -LIM
axis1 : P-COM	89	39	axis3 : P-COM
axis1 : IN1/ALM	88	38	axis3 : IN1/ALM
axis1 : IN2/INP	87	37	axis3 : IN2/INP
axis1 : IN3/SD	86	36	axis3 : IN3/SD
axis1 : IN4/LTC	85	35	axis3 : IN4/LTC
axis1 : IN5/PCS	84	34	axis3 : IN5/PCS
axis1 : IN6	83	33	axis3 : IN6
axis1 : IN7	82	32	axis3 : IN7
axis1 : ORG	81	31	axis3 : ORG
axis1 : +LIM	80	30	axis3 : +LIM
axis1 : -LIM	79	29	axis3 : -LIM
axis0 : A+	78	28	axis2 : A+
axis0 : A-	77	27	axis2 : A-
axis0 : B+	76	26	axis2 : B+
axis0 : B-	75	25	axis2 : B-
axis0 : Z+	74	24	axis2 : Z+
axis0 : Z-	73	23	axis2 : Z-
axis1 : A+	72	22	axis3 : A+
axis1 : A-	71	21	axis3 : A-
axis1 : B+	70	20	axis3 : B+
axis1 : B-	69	19	axis3 : B-
axis1 : Z+	68	18	axis3 : Z+
axis1 : Z-	67	17	axis3 : Z-
axis0 : OUT3	66	16	axis2 : OUT3
axis0 : OUT2	65	15	axis2 : OUT2
axis0 : OUT1	64	14	axis2 : OUT1
axis0 : DIR+/CCW+	63	13	axis2 : DIR+/CCW+
axis0 : DIR-/CCW-	62	12	axis2 : DIR-/CCW-
axis0 : OUT+/CW+	61	11	axis2 : OUT+/CW+
axis0 : OUT-/CW-	60	10	axis2 : OUT-/CW-
GND	59	9	GND
axis1 : OUT3	58	8	axis3 : OUT3
axis1 : OUT2	57	7	axis3 : OUT2
axis1 : OUT1	56	6	axis3 : OUT1
axis1 : DIR+/CCW+	55	5	axis3 : DIR+/CCW+
axis1 : DIR-/CCW-	54	4	axis3 : DIR-/CCW-
axis1 : OUT+/CW+	53	3	axis3 : OUT+/CW+
axis1 : OUT-/CW-	52	2	axis3 : OUT-/CW-
GND	51	1	GND

P-COM	Plus common	B+	Encoder phaseB input+
IN1/ALM	General-purpose input1/Alarm input	B-	Encoder phaseB input-
IN2/INP	General-purpose input2/Positionig input	Z+	Encoder phaseZ input+
IN3/SD	General-purpose input3/Slow down input	Z-	Encoder phaseZ input-
IN4/LTC	General-purpose input4/counter latch input	OUT1	General-purpose output 1
IN5/PCS	General-purpose input5/positioning operation start input	OUT2	General-purpose output2
IN6	General-purpose input6	OUT3	General-purpose output3
IN7	General-purpose input7	DIR+/CCW+	Direction/CCW output+
ORG	Origin input	DIR-/CCW-	Direction/CCW output-
+LIM	Positive-direction limit	OUT+/CW+	Pulse/CW output+
-LIM	Negative-direction limit	OUT-/CW-	Pulse/CW output-
A+	Encoder phaseA input+	GND	Power ground input (common to internal GND)
A-	Encoder phaseA input-		

Figure 3.3. Pin Assignments of Interface Connector (CNA, CNB) (1/2) < SMC-8DL-PCI >

CNA			
GND-	1	51	GND
axis7 : OUT-/CW-	2	52	axis5 : OUT-/CW-
axis7 : OUT+/CW+	3	53	axis5 : OUT+/CW+
axis7 : DIR-/CCW-	4	54	axis5 : DIR-/CCW-
axis7 : DIR+/CCW+	5	55	axis5 : DIR+/CCW+
axis7 : OUT1-	6	56	axis5 : OUT1
axis7 : OUT2-	7	57	axis5 : OUT2
axis7 : OUT3-	8	58	axis5 : OUT3
GND-	9	59	GND
axis6 : OUT-/CW-	10	60	axis4 : OUT-/CW-
axis6 : OUT+/CW+	11	61	axis4 : OUT+/CW+
axis6 : DIR-/CCW-	12	62	axis4 : DIR-/CCW-
axis6 : DIR+/CCW+	13	63	axis4 : DIR+/CCW+
axis6 : OUT1-	14	64	axis4 : OUT1
axis6 : OUT2-	15	65	axis4 : OUT2
axis6 : OUT3-	16	66	axis4 : OUT3
axis7 : Z-	17	67	axis5 : Z-
axis7 : Z+	18	68	axis5 : Z+
axis7 : B-	19	69	axis5 : B-
axis7 : B+	20	70	axis5 : B+
axis7 : A-	21	71	axis5 : A-
axis7 : A+	22	72	axis5 : A+
axis6 : Z-	23	73	axis4 : Z-
axis6 : Z+	24	74	axis4 : Z+
axis6 : B-	25	75	axis4 : B-
axis6 : B+	26	76	axis4 : B+
axis6 : A-	27	77	axis4 : A-
axis6 : A+	28	78	axis4 : A+
axis7 : -LIM	29	79	axis5 : -LIM
axis7 : +LIM	30	80	axis5 : +LIM
axis7 : ORG	31	81	axis5 : ORG
axis7 : IN7	32	82	axis5 : IN7
axis7 : IN6	33	83	axis5 : IN6
axis7 : IN5/PCS	34	84	axis5 : IN5/PCS
axis7 : IN4/LTC	35	85	axis5 : IN4/LTC
axis7 : IN3/SD	36	86	axis5 : IN3/SD
axis7 : IN2/INP	37	87	axis5 : IN2/INP
axis7 : IN1/ALM	38	88	axis5 : IN1/ALM
axis7 : P-COM	39	89	axis5 : P-COM
axis6 : -LIM	40	90	axis4 : -LIM
axis6 : +LIM	41	91	axis4 : +LIM
axis6 : ORG	42	92	axis4 : ORG
axis6 : IN7	43	93	axis4 : IN7
axis6 : IN6	44	94	axis4 : IN6
axis6 : IN5/PCS	45	95	axis4 : IN5/PCS
axis6 : IN4/LTC	46	96	axis4 : IN4/LTC
axis6 : IN3/SD	47	97	axis4 : IN3/SD
axis6 : IN2/INP	48	98	axis4 : IN2/INP
axis6 : IN1/ALM	49	99	axis4 : IN1/ALM
axis6 : P-COM	50	100	axis4 : P-COM

P-COM	Plus common	B+	Encoder phaseB input+
IN1/ALM	General-purpose input1/Alarm input	B-	Encoder phaseB input-
IN2/INP	General-purpose input2/Positionig input	Z+	Encoder phaseZ input+
IN3/SD	General-purpose input3/Slow down input	Z-	Encoder phaseZ input-
IN4/LTC	General-purpose input4/counter latch input	OUT1	General-purpose output1
IN5/PCS	General-purpose input5/positioning operation start input	OUT2	General-purpose output2
IN6	General-purpose input6	OUT3	General-purpose output3
IN7	General-purpose input7	DIR+/CCW+	Direction/CCW output+
ORG	Origin input	DIR-/CCW-	Direction/CCW output-
+LIM	Positive-direction limit	OUT+/CW+	Pulse/CW output+
-LIM	Negative-direction limit	OUT-/CW-	Pulse/CW output-
A+	Encoder phaseA input+	GND	Power ground input (common to internal GND)
A-	Encoder phaseA input-		

Figure 3.3. Pin Assignments of Interface Connector (CNA, CNB) (2/2) < SMC-8DL-PCI >

# Pin Assignments of Interface Connector < SMC-4DL-PCI >

CN1			
axis0 : P-COM	100	50	axis2 : P-COM
axis0 : IN1/ALM	99	49	axis2 : IN1/ALM
axis0 : IN2/INP	98	48	axis2 : IN2/INP
axis0 : IN3/SD	97	47	axis2 : IN3/SD
axis0 : IN4/LTC	96	46	axis2 : IN4/LTC
axis0 : IN5/PCS	95	45	axis2 : IN5/PCS
axis0 : IN6	94	44	axis2 : IN6
axis0 : IN7	93	43	axis2 : IN7
axis0 : ORG	92	42	axis2 : ORG
axis0 : +LIM	91	41	axis2 : +LIM
axis0 : -LIM	90	40	axis2 : -LIM
axis1 : P-COM	89	39	axis3 : P-COM
axis1 : IN1/ALM	88	38	axis3 : IN1/ALM
axis1 : IN2/INP	87	37	axis3 : IN2/INP
axis1 : IN3/SD	86	36	axis3 : IN3/SD
axis1 : IN4/LTC	85	35	axis3 : IN4/LTC
axis1 : IN5/PCS	84	34	axis3 : IN5/PCS
axis1 : IN6	83	33	axis3 : IN6
axis1 : IN7	82	32	axis3 : IN7
axis1 : ORG	81	31	axis3 : ORG
axis1 : +LIM	80	30	axis3 : +LIM
axis1 : -LIM	79	29	axis3 : -LIM
axis0 : A+	78	28	axis2 : A+
axis0 : A-	77	27	axis2 : A-
axis0 : B+	76	26	axis2 : B+
axis0 : B-	75	25	axis2 : B-
axis0 : Z+	74	24	axis2 : Z+
axis0 : Z-	73	23	axis2 : Z-
axis1 : A+	72	22	axis3 : A+
axis1 : A-	71	21	axis3 : A-
axis1 : B+	70	20	axis3 : B+
axis1 : B-	69	19	axis3 : B-
axis1 : Z+	68	18	axis3 : Z+
axis1 : Z-	67	17	axis3 : Z-
axis0 : OUT3	66	16	axis2 : OUT3
axis0 : OUT2	65	15	axis2 : OUT2
axis0 : OUT1	64	14	axis2 : OUT1
axis0 : DIR+/CCW+	63	13	axis2 : DIR+/CCW+
axis0 : DIR-/CCW-	62	12	axis2 : DIR-/CCW-
axis0 : OUT+/CW+	61	11	axis2 : OUT+/CW+
axis0 : OUT-/CW-	60	10	axis2 : OUT-/CW-
GND	59	9	GND
axis1 : OUT3	58	8	axis3 : OUT3
axis1 : OUT2	57	7	axis3 : OUT2
axis1 : OUT1	56	6	axis3 : OUT1
axis1 : DIR+/CCW+	55	5	axis3 : DIR+/CCW+
axis1 : DIR-/CCW-	54	4	axis3 : DIR-/CCW-
axis1 : OUT+/CW+	53	3	axis3 : OUT+/CW+
axis1 : OUT-/CW-	52	2	axis3 : OUT-/CW-
GND	51	1	GND

P-COM	Plus common	B+	Encoder phaseB input+
IN1/ALM	General-purpose input1/Alarm input	B-	Encoder phaseB input-
IN2/INP	General-purpose input2/Positioning input	Z+	Encoder phaseZ input+
IN3/SD	General-purpose input3/Slow down input	Z-	Encoder phaseZ input-
IN4/LTC	General-purpose input4/counter latch input	OUT1	General-purpose output1
IN5/PCS	General-purpose input5/positioning operation start input	OUT2	General-purpose output2
IN6	General-purpose input6	OUT3	General-purpose output3
IN7	General-purpose input7	DIR+/CCW+	Direction/CCW output+
ORG	Origin input	DIR-/CCW-	Direction/CCW output-
+LIM	Positive-direction limit	OUT+/CW+	Pulse/CW output+
-LIM	Negative-direction limit	OUT-/CW-	Pulse/CW output-
A+	Encoder phaseA input+	GND	Power ground input (common to internal GND)
A-	Encoder phaseA input-		

**Figure 3.4. Pin Assignments of Interface Connector < SMC-4DL-PCI >**

# Connecting Output Signals

## Pulse output circuit (CW, CCW)

Pulse output circuit on this product is illustrated below. The signal output is a differential line-driver output.

Connection with the differential input

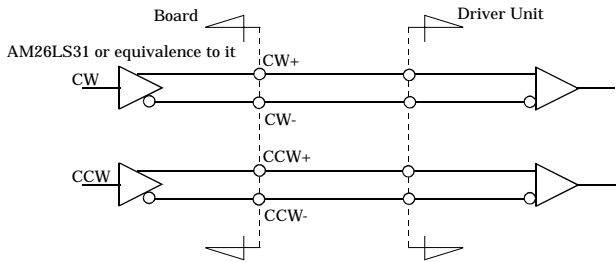


Figure 3.5. Pulse output circuit (Connection with the differential input)

Connection with the opto-coupler input (When the driver unit guarantees the connection with the differential output)

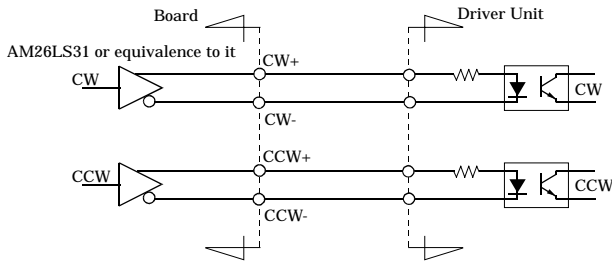
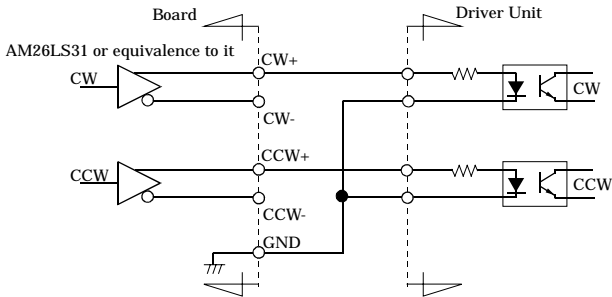


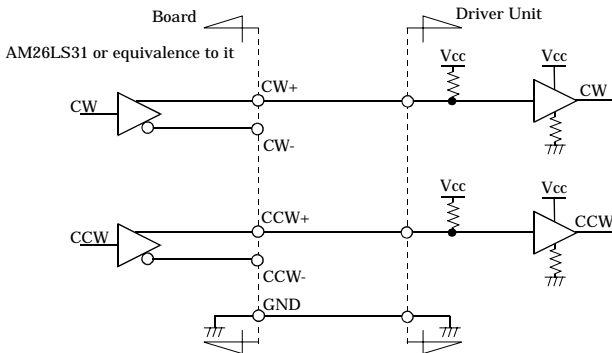
Figure 3.6. Pulse output circuit (connection with the opto-coupler input)

Connection with the opto-coupler input



**Figure 3.7. Pulse output circuit (connection with the opto-coupler input)**

Connection with TTL input



**Figure 3.8. Pulse output circuit (connection with the TTL input)**



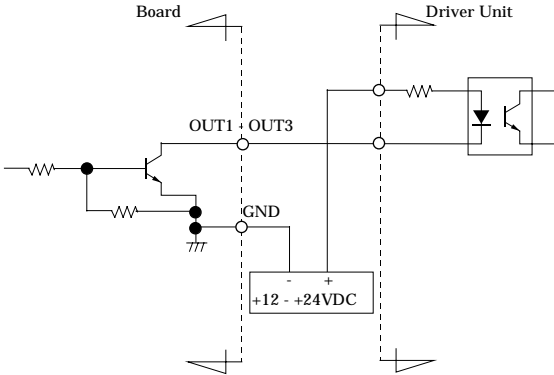
### CAUTION

- When connecting with the photo-coupler input or the TTL input, check the specification for the driver unit beforehand.
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.



## Control signal/general-purpose signal output circuit (OUT1 - OUT3, ERC, CP1, CP2)

Output circuit of each output signal on this product is illustrated below. The signal output is an open-collector output. A ground wire must therefore be connected for driving.



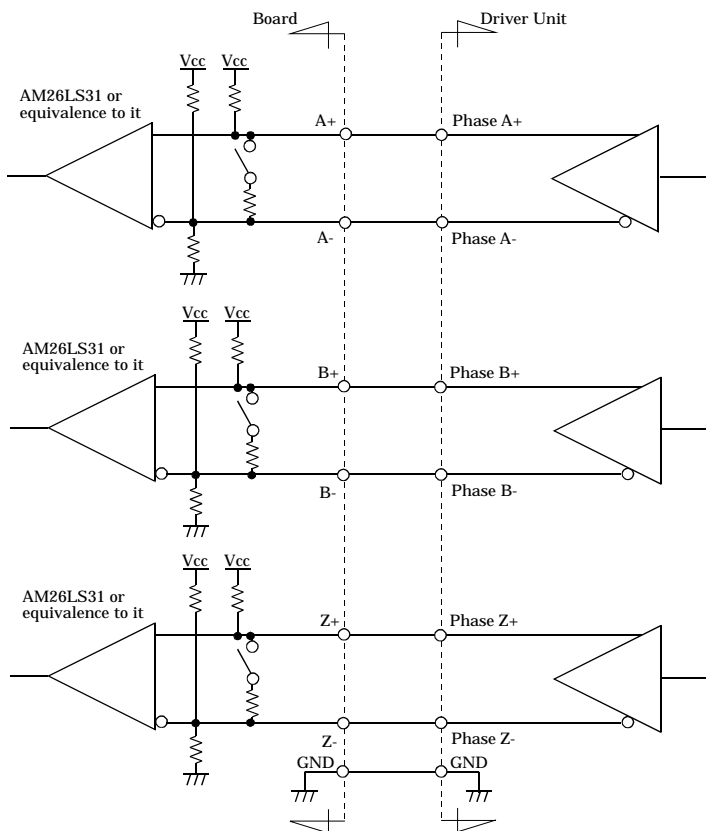
**Figure 3.9. Output circuit**

# Connecting Input Signals

## Encoder input circuit

Encoder input circuit on this product is illustrated below. The signal input is a differential input capable of connecting a line driver output, TTL level output and open-collector output.

Connection with the differential output



**Figure 3.10.**Encoder input circuit

Connection with the TTL level output

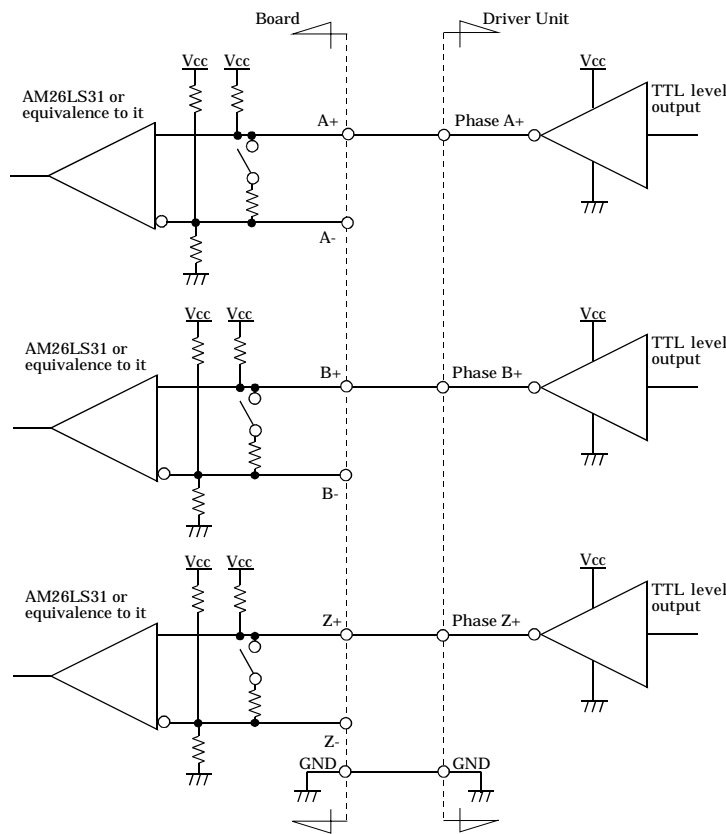
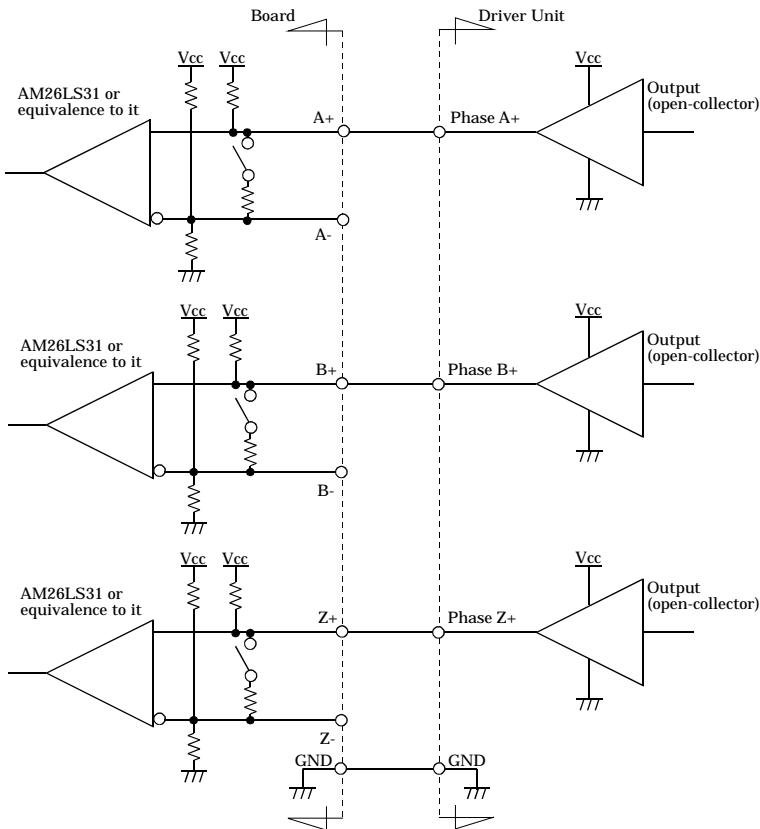


Figure 3.11.Encoder input circuit

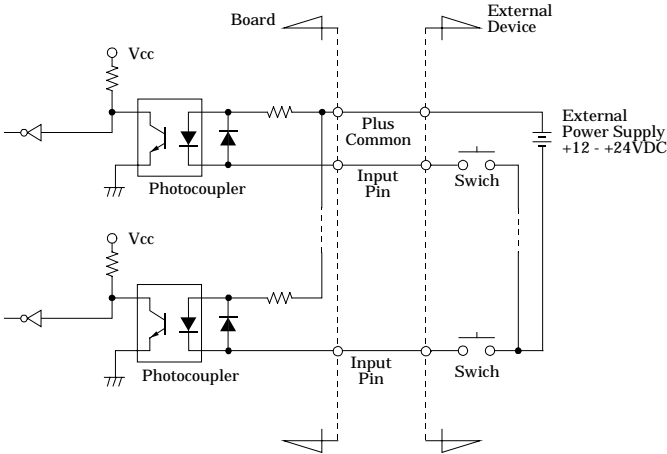
## Connection with the open-collector output

**Figure 3.12. Encoder input circuit****CAUTION**

- Do not insert a terminator when you connect TTL level output signals or open-collector output signals. Otherwise, this product may malfunction, overheat, or cause a failure.
- Restrict the use of cables to 10m for the line driver output, 3m for the open-collector output, and 1.5m for the TTL level output.
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.

## Limit input/general-purpose input/control input circuit (IN1 - IN7, +LIM, -LIM, ORG)

The limit input/general-purpose input/control input circuit on this board is illustrated below. The signal input is an opto-isolated, current driven input (sink type). To drive the limit input/general-purpose input/control input block, therefore, an external power supply is required at +12 - +24 V.



\* Input pin is IN1 - IN7, +LIM, -LIM, ORG.

**Figure 3.13. Limit input/general-purpose input/control input circuit**

# Connection Examples

Given below are practical examples of connection of this product that outputs pulses by the independent pulsing method to motor drivers. These examples show the connections through axis0.

Example of Connection to driver unit (Σ II Series) for Servo motor

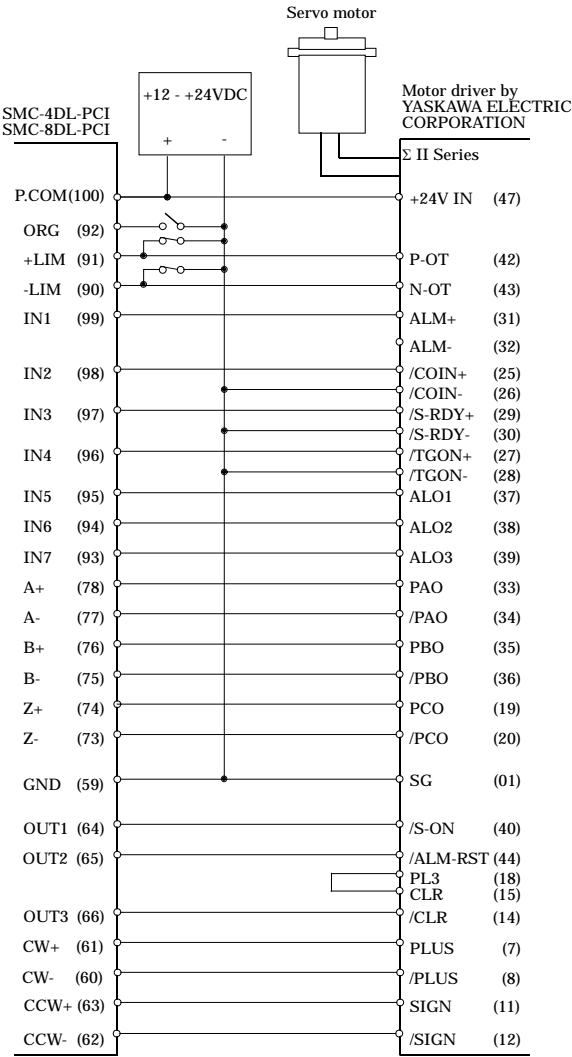


Figure 3.14.Example of Connection to driver unit (Σ II Series) for Servo motor

# 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 digital output, 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:

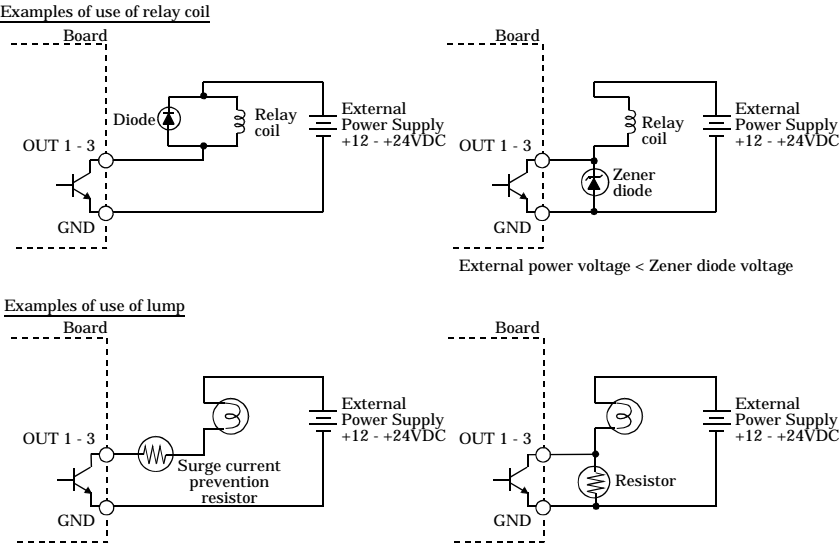


Figure 3.15.Surge Voltage Countermeasure



## CAUTION

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

## 4. Functions

This chapter describes the functions of this product.

You can easily set up and execute each of the functions using the bundled driver library.

For more information on this product, please refer to the “API-SMC HELP” after installing.

## About each motor control operation

### PTP operation function

This function moves the motor from one point to another (Point To Point motion).

Use the function for simple position control.

### JOG operation function

This function moves the motor without specifying the travel distance.

Use the function to manually position the motor.

### ORG operation function

This function moves the motor to the origin.

### Linear interpolation

This product supports multi-axial linear interpolation. Linear interpolation causes linear motion to the specified position.

### S-curve acceleration/deceleration function

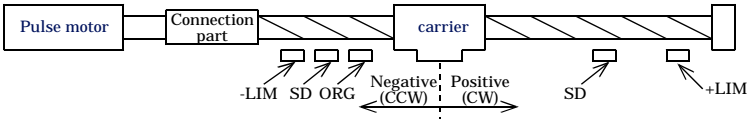
This product has the S-curve acceleration/deceleration function in addition to the linear acceleration/deceleration function. The S-curve acceleration/deceleration function reduces acceleration when starting and stopping accelerating/decelerating the motor, thereby suppressing the vibration generated at the start and end of motion.



# Meanings of signals

## Limit input signals

Limits switches are used to detect the position of the carrier in a positioning system using a stepping motor to stop the motor when the carrier has reached the target position (final destination). This product is also provided with the slow-down stop input to slow down the high-speed rotation at acceleration or deceleration. The mounting position of each limit switch is shown below.



**Figure 4.1. The attachment position relation of a limit switch**

+LIM (Positive-direction end limit input), -LIM (Negative-direction end limit input)

Place +LIM at the end position when the stepping motor rotates clockwise (CW) and -LIM at the end position when the stepping motor rotates counterclockwise (CCW). When the carrier reaches either position (the limit input is turned on), the motor stops immediately unconditionally. Even when a subsequent operation directive (instruction) for moving in the same direction is issued, the carrier won't move forward beyond the limit position as long as the limit has been applied. The motor restarts operation (rotation) in response to an operation directive for moving in the opposite direction. The logical direction can be set by software.

SD (deceleration (decelerated stop) input)

SD is a limit input to detect the position at which to start deceleration during high-speed rotation (accelerating/decelerating operation). The carrier operating (moving) at high speed starts deceleration at that position and stops after slowing down to the initial speed. The logical direction can be set by software.

ORG (origin input)

ORG is the switch input to detect the origin to be set as the base point for each operation. The logical direction can be set by software.

# Encoder input signal

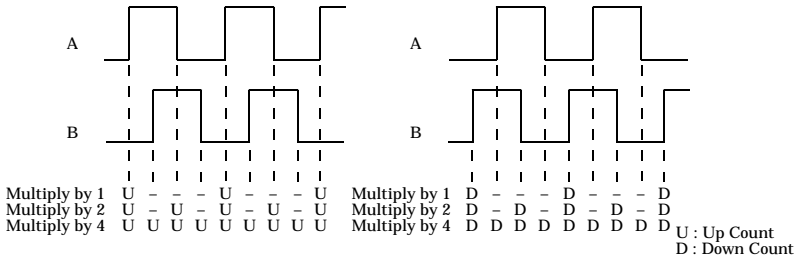
Phases A, B and Z are available to this product for encoder input. The signals that can be connected are those in the following output forms: the line driver output form, the TTL level output form, and the open-collector output form.

The specifications for the input pulse that can be set are as follows:

- 2-phase Input, Multiply by 1
- 2-phase Input, Multiply by 2
- 2-phase Input, Multiply by 4
- Single-phase Input, Multiply by 1

## 2-phase Input

Two-phase input is a pulse input consisting of two phases between which there is a phase difference of 90° : Phase A (leading signal) and Phase B (trailing signal). The minimum phase difference between Phase A and Phase B should be set to 0.2μ sec for line driver output connection, to 0.34μ sec for TTL level output connection or to 1μ sec for open-collector output connection.

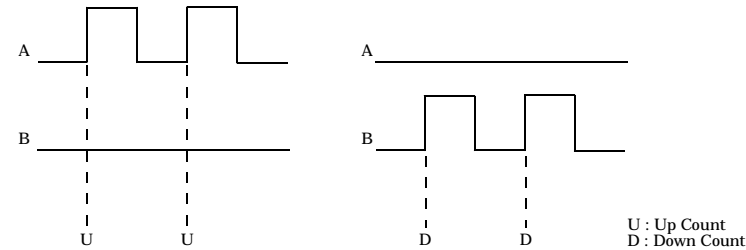


**Figure 4.2. Sample Count for Two-phase Input Setting**

## Single-phase input

In single-phase input, the counter counts up at the rising edge of Phase A (UP) pulse and counts down at the rising edge of Phase B (DOWN) pulse.


A count cannot be performed properly, if Phase A (UP) pulse and Phase B (DOWN) pulse are generated at the same time.



**Figure 4.3. Sample Count for Single-phase Input Setting**

### Pulse output signal

Apart from the independent pulse (CW, CCW), this product can also generate the following pulses : common pulse (pulse output, direction output), 90°-phase-different pulse (leading pulse output, trailing pulse output). This allows you to use (or select) the most suitable one in accordance with the pulse motor drive unit to be used (or connected). As these pulse outputs are line driver outputs, check the specifications of the motor driver unit to be used before connecting them.

 **CAUTION**

This product cannot directly drive the stepping motor. These pulse output signals must therefore be connected to the motor driver unit prepared for the stepping motor.

CW (Positive-direction pulse output), CCW (Negative-direction pulse output)

CW (forward pulse output) is the pulse output signal to rotate (operate) the stepping motor clockwise (CW). CCW (backward pulse output) rotates the motor counterclockwise. These signals are independent of each other. When a command for rotation is executed, the pulse signal for the specified direction outputs the preset number of operation pulses.

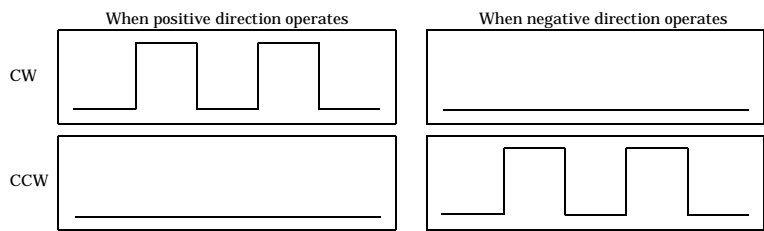


Figure 4.4. Specification for Output Pulse in Independent Pulsing Method

OUT (Pulse output), DIR (Direction output)

OUT (pulse output) is the serial pulse output that carries the above CW and CCW signals on a single line. The CW and CCW directions are indicated by the signal status of DIR (direction output). Note that the DIR signal is valid only when the OUT signal is active.

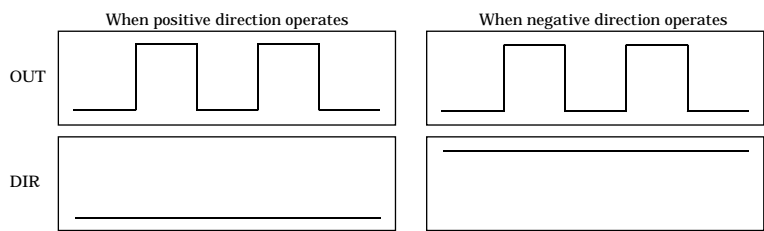
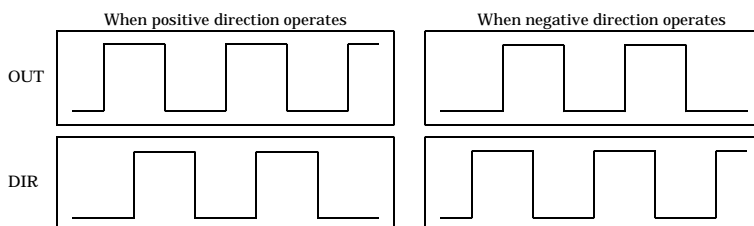


Figure 4.5. Specification for Output Pulse in Common Pulsing Method

OUT (leading pulse output) and DIR (trailing pulse output)

The OUT (leading pulse output) signal and the DIR (trailing pulse output) signal are generated. The motor is operated (rotated) in the positive direction (clockwise), when there is a phase difference of  $+90^\circ$  between DIR (trailing pulse output) and OUT (leading pulse output). On the other hand, the motor is operated (rotated) in the negative direction (counterclockwise), when there is a phase difference of  $-90^\circ$  between DIR (trailing pulse output) and OUT (leading pulse output).



**Figure 4.6. Specification for Output Pulse in  $90^\circ$ -phase-different Pulsing Method**

## General-purpose input signals

This product has general-purpose input signals (IN1 - IN7) in addition to limit input and encoder input signals.

IN1 - IN7 (General-purpose input signals)

IN1 - IN7 (general-purpose input signals) can be used to read data from I/O ports. Since these are independent of motor control, they do not affect pulse output even during motor operation. As seven signals are provided for each axis, they can be used to input the alarm signal or positioning completion signal from the motor driver unit. IN1 - IN5 can be switched to serve as the alarm input, positioning completion input, deceleration (decelerated stop) input, counter latch input and positioning control start input respectively. The input logic can also be changed by software.

ALM (Alarm input signal)

ALM is the input signal to detect the alarm signal from the motor driver. The input logic can be changed by software.

INP (positioning completion signal)

INP is the signal to detect the positioning completion signal from the motor driver unit. The input logic can be changed by software.

SD (deceleration (decelerated stop) input)

SD is a signal to detect the position at which to start deceleration. The input logic can be changed by software.

### LTC (counter latch input)

Signal to latch with the counter value, allowing the counter value to be cleared immediately after latching or an interrupt request to be generated upon latching. The input logic can be changed by software.

### PCS (positioning control start input)

Signal for overriding (replacing) the target position, allowing positioning to be performed by the set amount of shifting from the input-ON timing. The input logic can be changed by software.

## General-purpose output signals

This product has general-purpose output signals (OUT1 - OUT3) in addition to pulse output signal.

### OUT1 - OUT3 (General-purpose output signals)

OUT1 - OUT3 (general-purpose output signals) can be used to write data to I/O ports. Since these are independent of motor control, they do not affect pulse output even during motor operation. As three signals are provided for each axis, they can be used to output the level output signal for the servo-on and hold-off to the motor driver unit, one-shot pulse signal for each clear signal and the comparator output signal. The output logic can also be changed by software.

### ALMCLR (alarm clear output signal), ERC (driver differential clear output)

ALMCLR and ERC are signals to output clear one-shot pulses to the alarm clear and deviation counter clear inputs of the motor driver unit. The width of one-shot pulses (output logic changeable) can be selected from among 12  $\mu$ sec, 102  $\mu$ sec, 408  $\mu$ sec, 1.6 msec, 13 msec, 52 msec, 104 msec.

### CP1, CP2 (comparator output)

CP1 and CP2 are signals for comparing the counter value to the set comparator value. The output logic can also be changed by software.

## P.COM (Plus common)

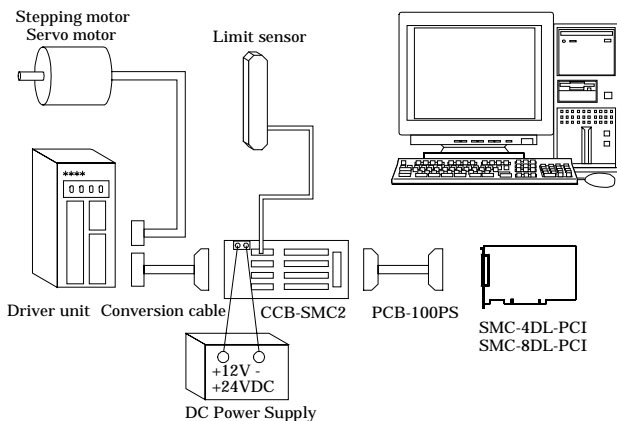
P.COM is the plus common signal for limit input signals (+LIM, -LIM, SD, ORG) and general-purpose input/output signals (IN1 - IN7, OUT1 - OUT3).

## GND (Ground)

GND is the ground line for the general-purpose output signals (OUT1 - OUT3).

# Motion control system

## System configuration



**Figure 4.7. System configuration**

**Table 4.1. Component features**

Item	Description
SMC-4DL-PCI SMC-8DL-PCI (Main board)	When installed on the PC, this board generates pulses required for position control.
PCB-100PS (Option)	This cable connects the board to the CCB-SMC2.
CCB-SMC2 (Option)	This screw terminal is used to efficiently connect the devices (the board, driver unit, DC power supply, limit sensor) required for position control. The screw terminal can connect a four-axis motion control system alone.
Conversion cable (User)	The shape of the control connector of each driver unit is largely different depending on the manufacturer and type. A conversion cable must be prepared to connect each driver unit to the CCB-SMC2.
Driver unit (Motor maker)	Motor and driver unit to be subject to motion control.
Stepping motor Servo motor (Motor maker)	Available in various types by motor capacity, power-supply voltage, and motor shape. Select the ones that best fit your needs.
Limit sensor (Switch maker)	This sensor is installed at the forward/backward limit and origin detection positions. When a table is used in the system, the sensor is bundled with the table. For a self-made system, use commercially available switches.
DC Power supply (Power supply maker)	Power supply to the CCB-SMC2. Use a 12 - 24-VDC power supply.



## 5. About Software

### CD-ROM Directory Structure

\	
—Autorun.exe	Installer Main Window
Readmej.html	Version information on each driver (Japanese)
Readmeu.html	Version information on each driver (English)
.	
.	
—APIPAC	Driver file for Windows
—AIO	
—DISK1	
—DISK2	
—.....	
—DISKN	
—AioWdm	
—CNT	
—DIO	
—.....	
.	
.	
—HELP	HELP file
—Aio	
—Cnt	
—.....	
.	
.	
—INF	Each INF file for OS
—WDM	
—Win2000	
—Win95	
.	
.	
—linux	Driver file for Linux
—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

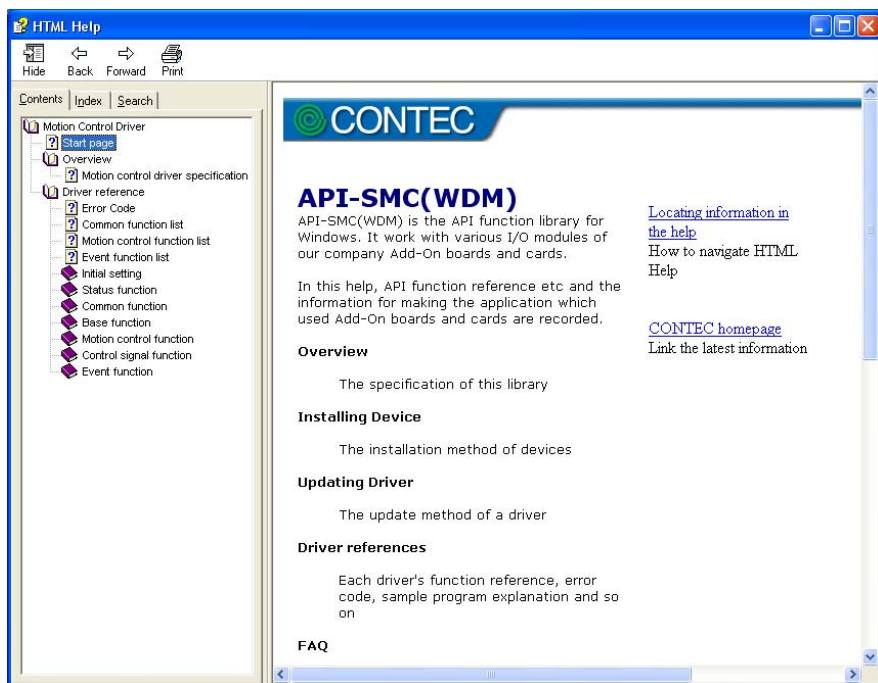
The bundled CD-ROM “API Function Library Package API-PAC(W32)” contains the functions that provide the following features:

- Function to easily set and control the position of the stepping motor or servomotor
- Function to set and execute basic motor operations such as PTP and JOG operations
- Capable of digital input/output of specified axes

For details, refer to the help file. The help file provides various items of information such as “Function Reference”, “Sample Programs”, and “Q&A”. 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)” - “SMC” - “API-SMC-D HELP” to display help information.

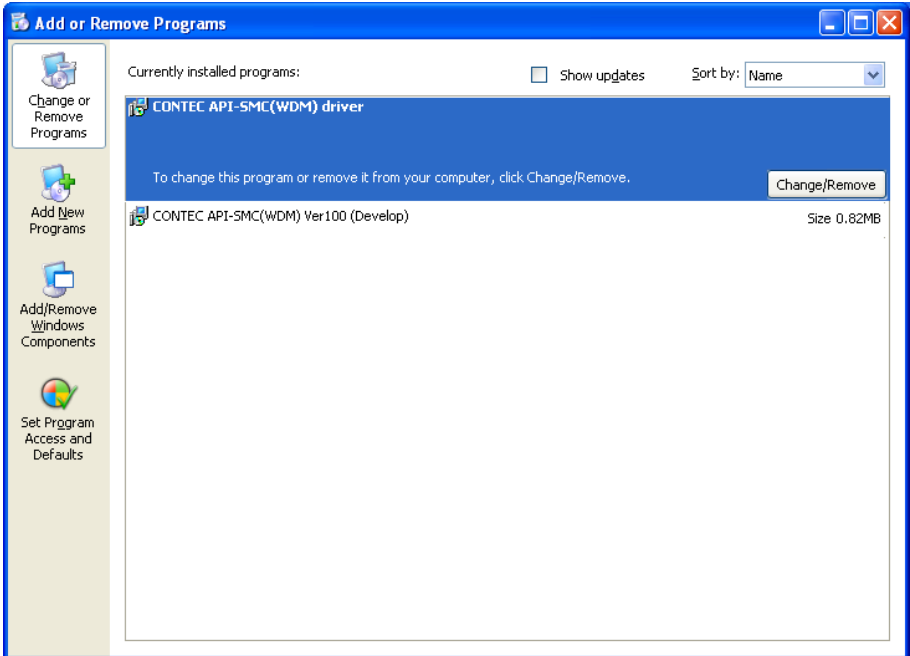


## Uninstalling the Driver library

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

- (1) Click on the [Start] button on the Windows taskbar. From the Start Menu, select “Settings” – “Control Panel”.
- (2) Double-click on “Add/Remove Programs” in the Control Panel.
- (3) Double-click on “Add or Remove Programs” in the Control Panel.

Select “CONTEC API-SMC(WDM) driver” 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

Tables 6.1 - 6.6 list the hardware specifications of the board.

**Table 6.1. Common Section**

Item	Specification	
	SMC-4DL-PCI	SMC-8DL-PCI
Control target	Stepping motor or servo motor driver unit(pulse train input type)	
Number of axes to control	4axis	8axis
Device used	PCL6143 (Nippon Pulse Motor CO., LTD.) or equivalence to it	
Interrupt	1 ch	
Interrupt factor	At the time of stop by positive-direction end limit input ON At the time of stop by negative-direction end limit input ON At the time of stop by alarm input on At the time of stop by simultaneous stop operation At the time of stop by deceleration (decelerated stop) input on At the time of occurring the encoder input error The other event (setting by the software)	
I/O address	Any 128 ports boundary	
Current consumption (Max.)	5VDC 700mA	5VDC 1200mA
Operating condition	0 - 50°C, 10 - 90% (No condensation)	
PCI bus specification	32-bit, 33MHz, Universal key shapes supported *1	
Dimension (mm)	176.41(L) x 106.68(H)	
Connector used	HDRA-EC100LFDT+ [made by HONDA TSUSHIN KOGYO CO., LTD.] or equivalence to it	HDRA-E100W1LFDT1EC-SL+ [made by HONDA TSUSHIN KOGYO CO., LTD.] or equivalence to it
Weight	100g	120g

\*1 This board requires power supply at +5 V from an expansion slot (it does not work on a machine with a +3.3V power supply alone).

**Table 6.2. Encoder Input Section**

Item	Specification
Encode type	Incremental
Maximum counter value	8000000h - 7FFFFFFh(-134,217,728 - 134,217,727), 28 bit
Input signal type	Single-phase input (UP/DOWN/Z) / Phase input(A/B/Z)
Supported output type	Differential output, TTL level output, open-collector output
Device used	AM26LS32(T.I) or equivalence to it
Terminal resistor	150Ω (Separatable with SW)
Receiver input sensitivity	±200mV
In-phase input voltage range	±7V
Distance in which signal can be extended	10m (Depending on the time of connecting the differential output, wiring environment and input frequency) 3m (Depending on the time of connecting the open-collector output, wiring environment and input frequency) 1.5m (Depending on the time of connecting the TTL level output, wiring environment and input frequency)
Response frequency	5MHz duty 50% (differential output), 3MHz duty 50% (TTL level output), 1MHz duty 50% (open-collector output)

**Table 6.3. Limit Input Section**

Item	Specification
Signal channel	3ch/axis (original point, Forward limit, reserve limit)
Input signal name	ORG : origin input +LIM : positive direction end limit input -LIM : negative direction end limit input
Input logic	Enables selecting the positive/negative logic by using the Software
Input type	Opto-isolated input (corresponding to current sink output)
Response time (Max.)	200 μsec
Input resistance	4.7kΩ
Input ON current	2.0mA or more
Input OFF current	0.16mA or less
External circuit power supply	12V - 24VDC(±10%)

**Table 6.4. General-purpose Input Section**

Item	Specification
Signal channel	7ch/axis
Input signal name	IN1/ALM : alarm input, general-purpose input IN2/INP : positioning completion input, general-purpose input IN3/SD : deceleration (decelerated stop) input, general-purpose input IN4/LTC : counter latch input, general-purpose input IN5/PCS : positioning control start input, general-purpose input IN6 : general-purpose input IN7 : general-purpose input
Input logic	Enables selecting the positive/negative logic by using the Software
Input type	Opto-coupler input (corresponding to current sink output)
Response time (Max.)	200 μsec
Input resistance	4.7kΩ
Input ON current	2.0mA or more
Input OFF current	0.16mA or less
External circuit power supply	12V - 24VDC(±10%)

**Table 6.5. Pulse Output Section**

Item	Specification
Pulse rate	0.3 - 9.8 Mpps
Output signal name	CW : pulse / CW output CCW : direction / CCW output
Output signal system	2 Pulse types (pulse for positive/negative direction) or the common pulse type (pulse signal/directional signal)
Output form	Un-isolated differential line driver output
Device used	AM26LS31(T.I) or equivalence to it

**Table 6.6. General-purpose Output Section**

Item	Specification
Number of signal channel	3ch/axis
Output signal name	OUT1 : general-purpose output OUT2 : general-purpose output OUT3 : general-purpose output ALMCLR : alarm clear output ERC : driver differential clear output CP1 : comparator1 output CP2 : comparator2 output
Signal specification	Un-isolated open collector output (current sink type) (Enables selecting the positive/negative logic by using the Software)
Response time (Max.)	10 $\mu$ sec (when using the loading on the input side 510 $\Omega$ , +24VDC)
Rated output current (Max.)	100mA per 1ch, 300mA per 1axis
Rated output withstanding voltage (Max.)	50VDC

# Block Diagram

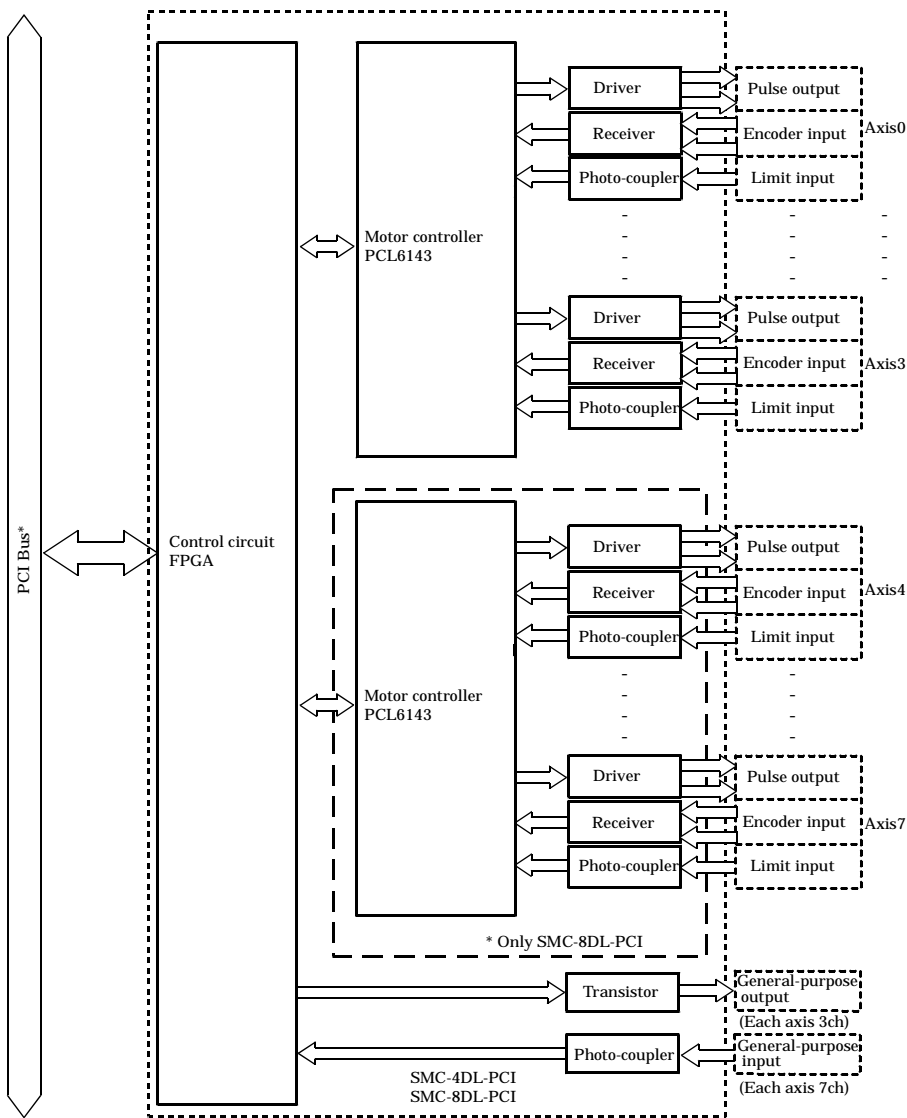


Figure 6.1. Block Diagram

# SMC-4DL-PCI SMC-8DL-PCI User's Guide

---

CONTEC CO.,LTD.

July 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/>

No part of this document may be copied or reproduced in any form by any means without prior written consent of CONTEC CO., LTD. [07252006]

---

[07252006]

Management No. A-51-263

Parts No. LYG561