Compact PCI Bus CPD Board Series

HCPCI-CPD734
HCPCI-CPD738

User's Manual

Individual Board Information

Multifunctional High-speed NC Boards with
Circular Interpolation, Linear Interpolation, and Positioning

Tentative Version

Hivertec Inc.
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This manual applies to the following Boards in the CPD Series.

CPD730 Series: Compact PCI Bus

HCPCI-CPD734
HCPCI-CPD738

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Extent of Warranty

1. The product warranty is valid for a period of one year from the date of purchase. If a defect is acknowledged by Hivertec within the period of warranty, Hivertec will repair or replace the product upon return of the product to Hivertec.

2. Hivertec is not responsible beyond the purchase price of the product for any damages or loss of profit, direct, indirect, or secondary, caused by application, delivery, or failure of a Hivertec product either within or outside of the period of warranty.

Limitations to Liability

1. Hivertec is not responsible for any damages resulting from product installation, connections, settings, or operation that do not follow the contents of this manual.

2. This product uses semiconductor devices manufactured for general electronics equipment, such as machine tools, instrumentation, FA devices, OA devices, and communications equipment. They are not designed, conceived, approved for, or warranted for application in devices for which faulty operation or failure will have a direct affect on human life or result in personal injury or damage to property. The safety, quality, and performance of the product are not guaranteed explicitly or implicitly beyond those given in this manual or related catalogs.

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Important Safety Instructions

Thank you for choosing a Hivertec NC Board. This manual contains information that is important for the safe and reliable operation of the NC Board. Read this section and understand the information contained before attempting to use the NC Board.
Furthermore, save this manual and store it in an easily accessible location near the installed NC Board, so that it can be referenced when necessary.

Safety Precautions

Always read this manual and any attached documents completely before attempting to use the product. Be sure that you understand the information provided and are using the product correctly.
Do not use the product before having a complete understand of the product, product safety information, and precautions.
In this manual, safety precautions are classified as either Warnings or Cautions.

Warning	Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury. .

Caution	Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury, or property damage. .

1 . Authorized For

Caution

The product and this manual are designed for those with the following knowledge.

- **A basic knowledge of installing and wiring expansion boards.**
- **A basic knowledge of electronic control devices and personal computers.**

2 . Applicable Bus

Warning

The boards (products) described in this manual are applicable to CompactPCI Specification Rev.2. 1 . Do not use them in any environment where this bus is not operating.

3 . Environmental Conditions

Warning

Store and use the board only under the following environmental conditions.

- Ambient operating temperature: 0 to 50 °C
- Ambient operating humidity: 20% to 85% (with no condensation)
- Ambient storage temperature: -15 to 75 °C
- Ambient storage humidity: 10% to 90% (with no condensation)
- Atmosphere: No corrosive gas, inflammable gas, oil mist, or dust
- Altitude: 3,000 m above sea level max.
  (Lower upper level of temperature ranges by 2 °C for every 300 m.)

4 . Transportation and Installation

Warning

Touch a metal object to discharge static electricity from your body before touching the board. Static electricity may cause board failure.

Do not wrap the board in any wrapping material that easily carries a static charge, such as bubble wrap. Static electricity may cause board failure.

Do not touch the edge connector on the board. Contamination on the edge connector may cause operating errors.

Do not place any heavy object on the board. Heavy object may damage components on the boards, possibly causing board failure.

Set the jumpers on the board before mounting it to the computer. If the jumpers are set with the power supply turned ON, the settings may not be recognized correctly possibly causing operating errors.

Set the board jumpers correctly. Incorrect settings may cause operating errors.

Always turn OFF the power supply to the computer and disconnect the power supply cable before installing the board. Installing the board without removing the power supply cable may cause board failure. Furthermore, the device may exhibit unexpected operation.

When installing the board in the computer, be sure the board is straight to the connector in the computer and press in the board so that the gold-plated edge connector is deeply inserted into the CompactPCI connector. If the board is inserted at an angle or not inserted deeply enough, poor contact may cause operating error or board failure.

When installing the board in the computer, use mounting brackets and mounting screws to secure it firmly. Improper securing of the board may cause operating errors.

Caution

Do not drop the board or handle it roughly. Vibration or shock may cause board failure.

Do not touch the solder surface of the board with your hands. Sharp points on the components may cause injury.

5 . Wiring

Warning

Always turn OFF the power supply to the computer and disconnect the power supply cable before wiring connectors to exterior lines or before connecting or disconnecting such connectors. Performing this work without removing the power supply cable may cause board failure. Furthermore, the device may exhibit unexpected operation.

When wiring connectors to exterior lines, check connector signal tables carefully and wire all lines correctly. Incorrect wiring may cause board failure or burning.

Always keep external power supply within ratings. Using a power supply that is not within ratings may cause board failure, burning, or operating errors.

Always keep circuits connected to the I/O circuits within the rated currents and voltages. Using circuits that are not within ratings may cause board failure, burning, or operating errors.

Use the recommended connectors for external lines. Using any other connector may cause operating errors because of faulty contact.

Always lock connectors for external lines. A connector that is not locked may come loose, possibly causing operating errors because of faulty contact.

Do not pull on or place heavy objects on cables for external wiring. The connector may come loose and faulty contact may cause operating errors.

Separate cables for external wiring as far as possible from AC power cables, motor cables, or other cables that generate excessive noise. Noise may cause operating errors.

6 . Trial Operation and Adjustment

Warning

Always debug the program completely before using the board to drive a device. Any error in the program may cause unexpected operation.

When using sample programs provided with the product to operate a device, always start at low speed and be sure that settings match the mechanical system before attempting operation. Operating with settings that do not match the mechanical system may result in unexpected operation.

7 . Disposal

Warning

Abide by all applicable laws and ordinances when disposing of a board.

Manual Configuration

The following manuals are provided with CPD-series Boards.

1. User's Manual: Individual Board Information (this manual)

This manual provides the following information for individual CPD Boards.

(1) Hardware information
(2) Installation procedures for accessory software
(3) Operating procedures for sample software
(4) Operating procedures for the Trial Tour
(5) Other specific information for individual Board

2. CPD Board Series User's Manual: Software

This manual describes the following software information for the CPD Board Series.

(1) Library functions (library function level 1: VC++, VB)
(2) Driver functions (device driver interface library: VC++, VB)

3. CPD Board Series User's Manual: Common Information

This manual provides information common to all of the CPD Board Series in tutorial style.

(1) Basic operating methods for CPD Boards (including samples using library functions)
(2) Descriptions of CPD Board applications (samples of using library functions as reference required for a broader range of application)
(3) Descriptions of registers based on the PCL6045
(4) Other information

Contents

Contents of Tables and Figures

1. Introduction

This user's manual provides information for the CPD730-series CompactPCI-bus Motion Control Boards. (The HCPCI-CPD738 CPD Board that provides 4-axis interpolation and 8-axis positioning as well as the HCPCI-CPD734 CPD Board that provides 2-axis interpolation and positioning.).

Use this manual together with the *CPD Board Series User's Manual: Common Information*, which contains information common to all of the Boards in the CPD Board Series.

In the remainder of this manual, the HCPCI-CPD738 is referred to as the **CPD738** and the HCPCI-CPD734 is referred to as the **CPD734**.

1.1 About This Manual

This manual provides the following information.

- ■ Software Startup Guide for Windows
  - 1) Installation of the provided software
  - 2) Explanation of the sample programs
  - 3) Testing operation “Trial Tour”
- ■ Hardware Information
  - 1) Port address
  - 2) Board settings
  - 3) Connector allocation
  - 4) Servomotor interface and stepping-motor interface
  - 5) Machine interface
- ■ Information on Functions Specific to the CPD738 and CPD734
  - 1) Axis combinations
  - 2) Interrupts
- ■ Overview of Device Driver Functions
  - 1) Device Driver Functions for the Windows version

1.2 Provided Software

The following software is provided with this Board. Refer to this software when reading this manual to facilitate understanding.

Device Drivers for Windows	There are four kinds for Windows 98, Windows NT, Windows 2000, and WindowsXP
Library Functions for Windows (Level 1)	Provides functions necessary for basic operations. Refer to the *CPD Board Series User’s Manual: Software Information* for descriptions of the functions.
Windows Sample Programs	Sample software showing usage of library functions.
“Trial Tour” for Windows	Enables minimal operations by simply connecting Board to computer. Can also be used to check connections.

1.3 Axis Names

When using the 8-axis CPD738, the 8 axes are known as the X, Y, Z, U, V, W, A, and B axes.
When using the 4-axis CPD734, the 4 axes are known as the X, Y, Z, and U axes.

2. Accessories (Sold Separately)

The following Connector Boards and Cables are available as accessories to simplify connections between the CPD Board and the motor driver or machine sensors.

■ Connector Boards: The ACB-MUxxxx/* Boards allow each axis to be connected to motor drivers and sensors very easily through an MIL header connector.
The ACB-MDR100/* Boards connect through a terminal block. These are ideal for testing.

■ Cables: There are two kinds of Cable available: the HCL-018W Connector Board Cable (standard length 2 m, other lengths available by special-order) and the HCL-018 Cable (laminated).

CPD Board	Compatible Cable	Length	Connector Board		Remarks
HCPCI-CPD734	HCL-018W	2m	---	ACB-MU01004/*	The asterisk at the end of the model number represents one of the following codes: MR: Right-angle connector MS: Straight connector MS(D): Half-pitch DIN Track-mounting connector
			Terminal-block style	ACB-MDR100/*	
HCPCI-CPD738	HCL-018W (x2)	2m	---	ACB-MU01004/* (x2)	
			Terminal-block style	ACB-MDR100/* (x2)	

Table 2-1 Accessories (Connector Boards and Cables)

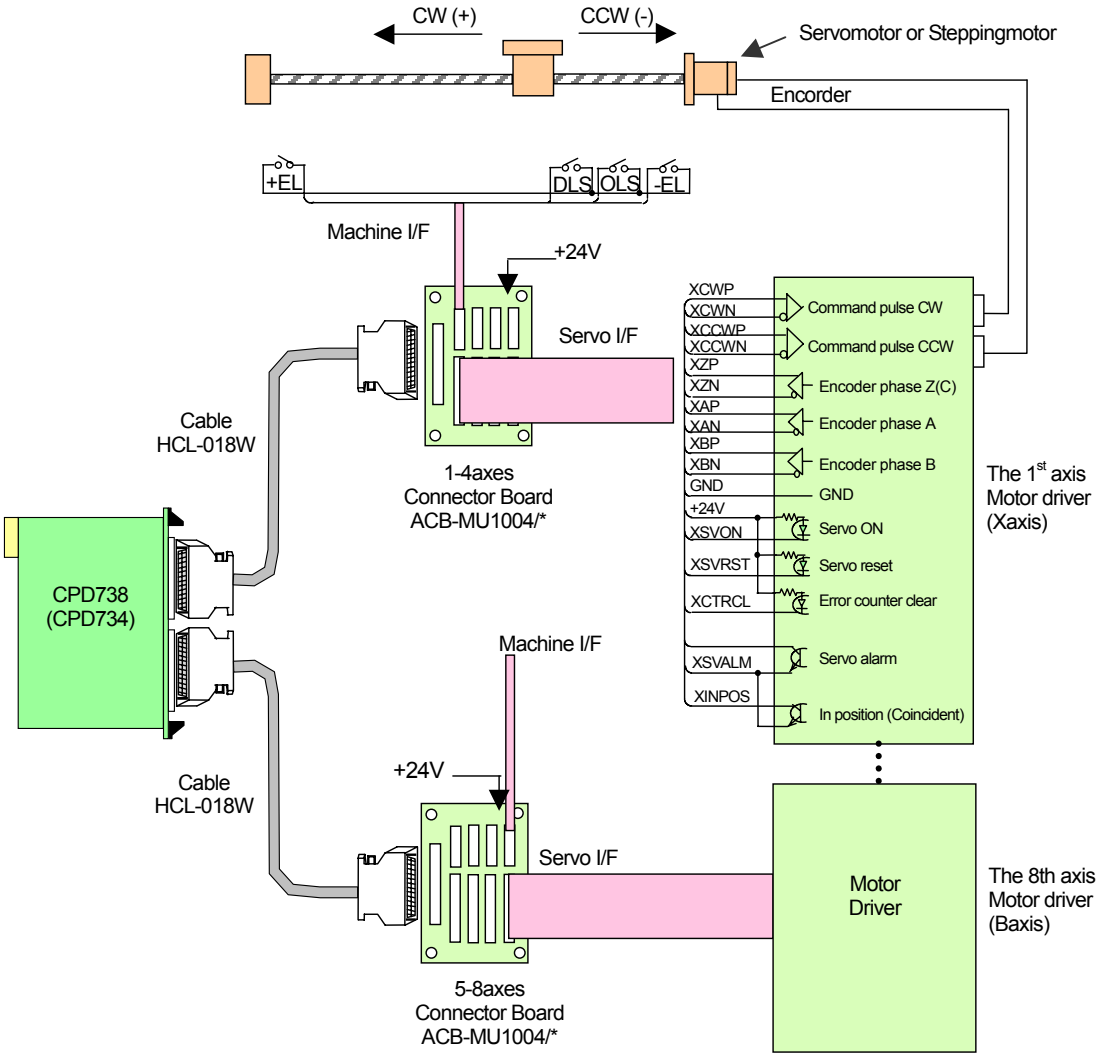


Figure 2-1 Accessories (Connector Boards and Cables)

3. Hardwear

3.1 Block diagram

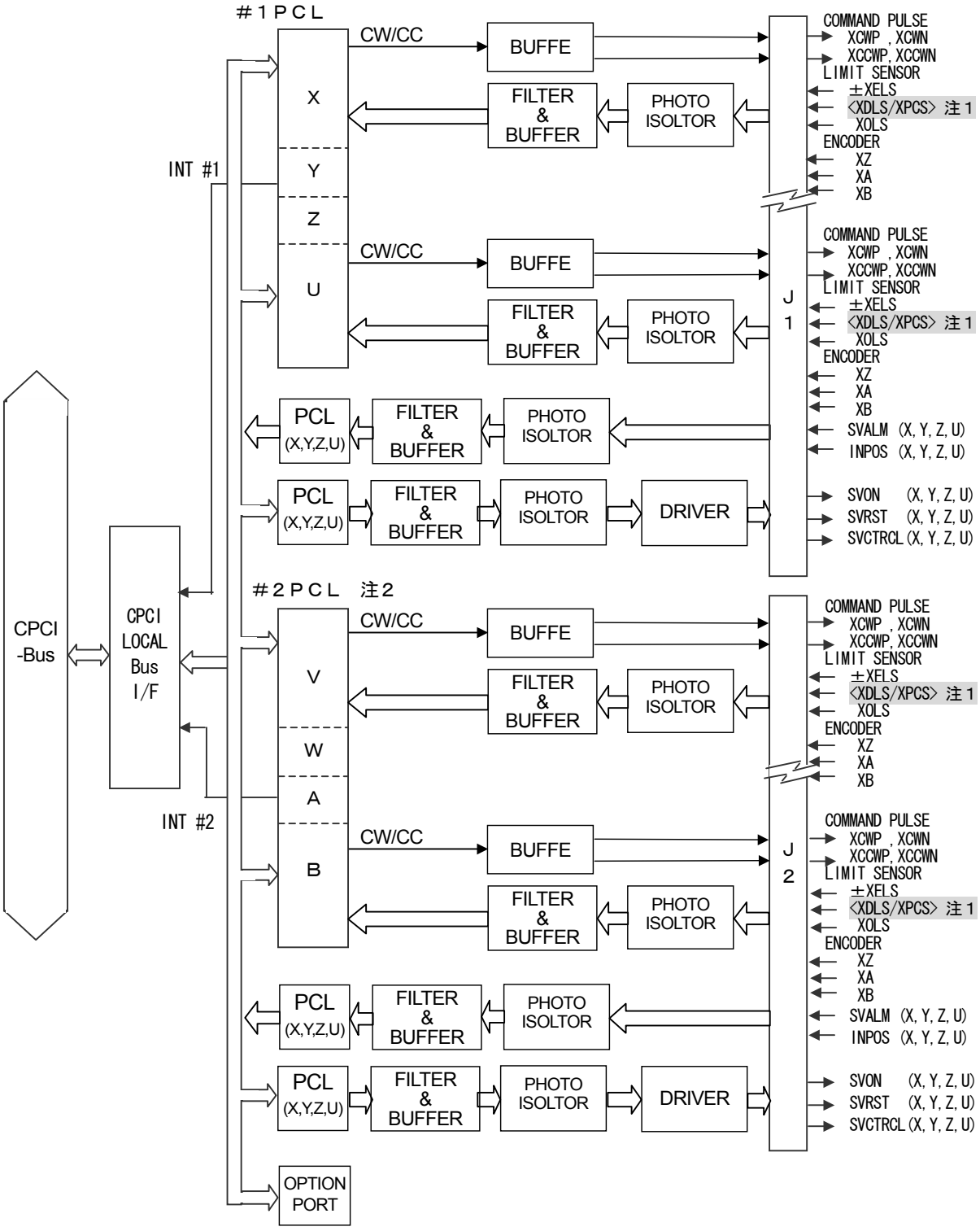


Figure 3. 1-1 BLOCK DIAGRAM of CPD738

3. 2 Port Addresses

3.2.1 Board Addresses

I/O maps are used for all ports. *Table 3. 2-1* shows the ports.
Knowledge of the following table is not required to use the provided software library (level 1) functions.
The following table is required when using the provided software driver functions.

Classification	I/O Address	Read (INP)		Write (OUT)	
		Name	Content	Name	Content
PCL6045 X-axis (Axis 1)	+0	MSTS	Main status	CMD	Command
	+2	SSTS	Sub-status, general-purpose I/O Port IN	OTP	Not used (reserved)
	+4	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+6	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 Y-axis (Axis 2)	+8	MSTS	Main status	CMD	Command
	+a	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+c	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+e	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 Z-axis (Axis 3)	+10	MSTS	Main status	CMD	Command
	+12	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+14	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+16	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 U-axis (Axis 4)	+18	MSTS	Main status	CMD	Command
	+1a	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+1c	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+1e	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 V-axis (Axis 5)	+20	MSTS	Main status	CMD	Command
	+22	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+24	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+26	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 W-axis (Axis 6)	+28	MSTS	Main status	CMD	Command
	+2a	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+2c	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+2e	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 A-axis (Axis 7)	+30	MSTS	Main status	CMD	Command
	+32	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+34	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+36	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
PCL6045 B-axis (Axis 8)	+38	MSTS	Main status	CMD	Command
	+3a	SSTS	Sub-status, general-purpose I/O port IN	OTP	Not used (reserved)
	+3c	BUF0	I/O buffer IN (15 to 0)	BUF0	I/O buffer OUT (15 to 0)
	+3e	BUF1	I/O buffer IN (31 to 16)	BUF1	I/O buffer OUT (31 to 16)
Option ports	+80	ELPOL	Status of ELS polarity for each axis	ELPOL	ELS polarity setting for each axis
	+82	DLS/PCS	Status of DLS/PCS input selection	DLS/PCS	DLS/PCS input selection
	+84	CMP4	STA output when CMP4 condition is established	CMP4	STA output when CMP4 condition is established
	+86	CMP5	STP output when CMP5 condition is established	CMP5	STP output when CMP5 condition is established
	+90	BINTM	Board interrupt output mask setting status	BINTM	Board interrupt output mask setting
	+92	BINTS	Board interrupt status	BINTR	Not used (reserved)
	+9C	BID	Board ID (setting by Jumper SW)	---	Not used (reserved)
	+c8,+ca	BCOD	Board code	---	Not used (reserved)

Table 3. 2-1 Board Addresses

3.2.2 Option Ports

Option ports are provided with each Board. The port functions are described below.

The CPD734 Board is not equipped with the Z-axis and U-axis. (It has only the X-axis and Y-axis.)

(1) Sets or reads the ELS polarity setting for each axis (ELPOL). When the power is turned ON, the bits are set to 0 (N. C.).

N. C. condition selected when bit n is set to 0. N. O. condition selected when bit n is set to 1.

N. O. : ELS detected when current to coupler is ON.

N. C. : ELS detected when current to coupler is OFF.

Bit	7	6	5	4	3	2	1	0
Function	BELS	AELS	WELS	VELS	UELS	ZELS	YELS	XELS

(2) Sets or reads the DLS/PCS input selection (DLS/PCS). When the power is turned ON, the bits are set to 0 (DLS).

Selects the DLS signal input as PCS signal input for connector J1 (X to U axes) or J2(V to B axes).

DLS input port selected when bit n is set to 0. PCS input port selected when bit n is set to 1.

Bit	7	6	5	4	3	2	1	0
Function	UPCS	ZPCS	YPCS	XPCS	UPCS	ZPCS	YPCS	XPCS

(3) Sets or reads the simultaneous start signal (STA) when the Comparator 4 (CMP4) comparison condition is established. When the power is turned ON, the bits are set to 0 (output disabled).

Bit	7	6	5	4	3	2	1	0
Function	B-axis	A-axis	W-axis	V-axis	U-axis	Z-axis	Y-axis	X-axis

(4) Sets or reads the simultaneous stop signal (STP) when the Comparator 5 (CMP5) comparison condition is established. When the power is turned ON, the bits are set to 0 (output disabled).

Bit	7	6	5	4	3	2	1	0
Function	B-axis	A-axis	W-axis	V-axis	U-axis	Z-axis	Y-axis	X-axis

(5) Sets or reads the Board interrupt mask (BINTM). When the power is turned ON, bit 0 is set to 0 (interrupts masked).

Sets the interrupt mask from the Board to the PCI bus.

Interrupts masked when bit 0 is set to 0. Interrupts unmasked when bit 0 is set to 1 (interrupt enabled).

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	0	BINTM

(6) Indicates the Board interrupt status (BINTS). When the power is turned ON, bit 0 is set to 1 (no interrupt).

Indicates the interrupt status from the Board to the PCI bus.

There is an interrupt when bit 0 is 0. There is no interrupt when bit 0 is 1.

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	0	0	0	BINTS

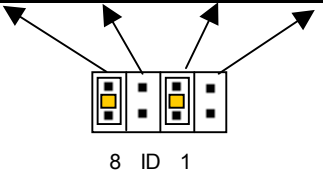
(7) Board ID

Reading board ID by addressing 9ch. The illustrated figure shows resulted value for example.

The factry setting is all jumpered (‘0000’).

Bit	7	6	5	4	3	2	1	0
Function	0	0	0	0	8	4	2	1
					Jumpered pins takes value ‘0’			

Denotes ‘0101’



3.2.3 Board I/O and Device Drivers

The following table shows the correspondence between the device drivers and the I/O to option ports and each axis (PCL6045) on the Board.

Classification	Axis specification or Port specification	Read (INP)		Write (OUT)	
		Name	Driver function	Name	Driver function
Axis	Argument: Axis 0(X) to7(B)	MSTS	cp730_rMstsW()	CMD	cp730_wCmdW()
		SSTS	cp730_rSstsW()	OTP	-------
		BUF0	cp730_rReg() cp730_rBufDW()	BUF0	cp730_wReg() cp730_wBufDW()
		BUF1		BUF1	
Option port	Argument: Port 0x80 to 0x8e 0x9c, 0xc8, 0xca	ELPOL	cp730_rPortB()	ELPOL	cp730_wPortB()
		DLS/PCS		DLS/PCS	
		CMP4		CMP4	
		CMP5		CMP5	
	0x90	BINTM	(Device driver process)	BINTM	(Device driver
	0x92	BINTS			---------

Table 3. 2-2 Board I/O and Driver Functions

Note 1. There are device drivers provided for each type of OS that can be used to operate the application programs.
Note 2. The device driver's function names are the same for all of the OS versions.
Note 3. Refer to the *CPD Board Series User's Manual: Software Information* for details on the driver functions. The various functions are listed in this manual in *6. Driver Functions*.

3.2.4 PCI configuration registers

The table 3. 2-3 sows the PCI configuration register values for CPD738 and CPD734.

31 24	23 16	15 8	7 0	Address
Device ID 3018h		**Vendar ID 14a9h**		00h
Device status		Device control		04h
Class code			Revision ID (02h)	08h
Base class (06h)	Sub class (80h)	Program interface		
Self test	Header type	Master latency timer	Cash line	0ch
Base addres register	0 0 0 0 0 0 0 0 h (Reserved)			10h
	x x x x x x x x h (Reserved for the board)			14h
	I/O address in the CPD738 or CPD734 board			18h
	0 0 0 0 0 0 0 0 h (Reserved)			1ch
	0 0 0 0 0 0 0 0 h (Reserved)			20h
	0 0 0 0 0 0 0 0 h (Reserved)			24h
Card bus CIS pointer				28h
Sub system ID 3018h		Sub system vender ID 14a9h		2ch
Reserved				30h | fch

Table 3. 2-3 PCI configuration register

3.3 Board Settings

3.3.1 CPD734 Board

There are two jumper settings on the CPD734 Board: the Board ID setting jumper pins and the Encoder circuit format jumper pins, but set the Board ID only.

The Board ID setting is used to distinguish between Boards when 2 or more Boards are being used in an application program.

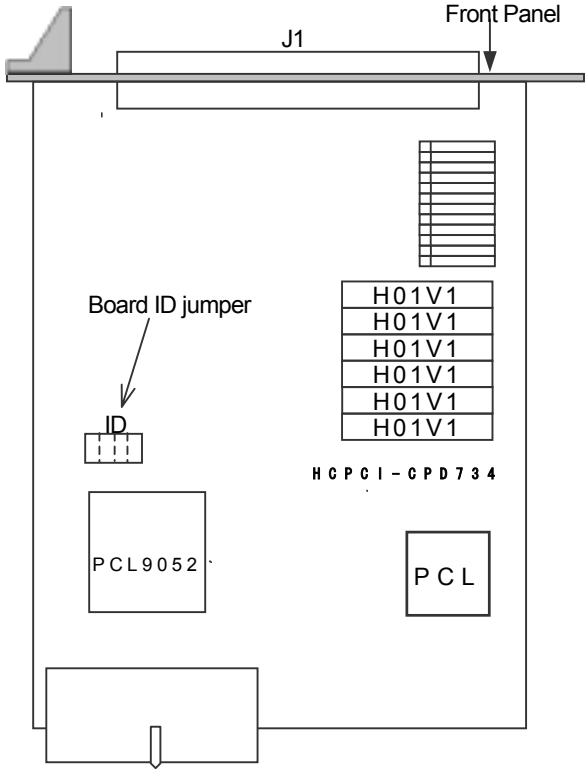


Figure 3. 3-1 Jumper Pin Locations on the CPD734 Board

(1) Board ID Setting Jumper Pins

The Board ID jumper pins can be used to set the CPD Board's Board ID (0 to 15). The following table shows 4 example settings. (The factory setting is 0.)

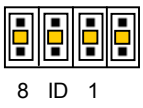
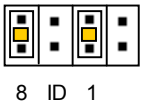
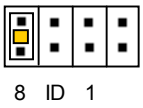
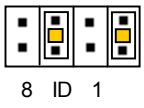
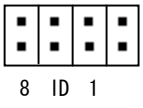
Board ID setting	0	5	7	10	15
Jumper settings					
Binary equivalent	0 0 0 0	0 1 0 1	0 1 1 1	1 0 1 0	1 1 1 1

Figure 3. 3-2 CPD734 Board ID Setting Jumper Pins

3.3.2 CPD738 Board

There are two jumper settings on the CPD738 Board: the Board ID setting jumper pins and the Encoder circuit format jumper pins.

The Board ID setting is used to distinguish between Boards when 2 or more Boards are being used in an application program.

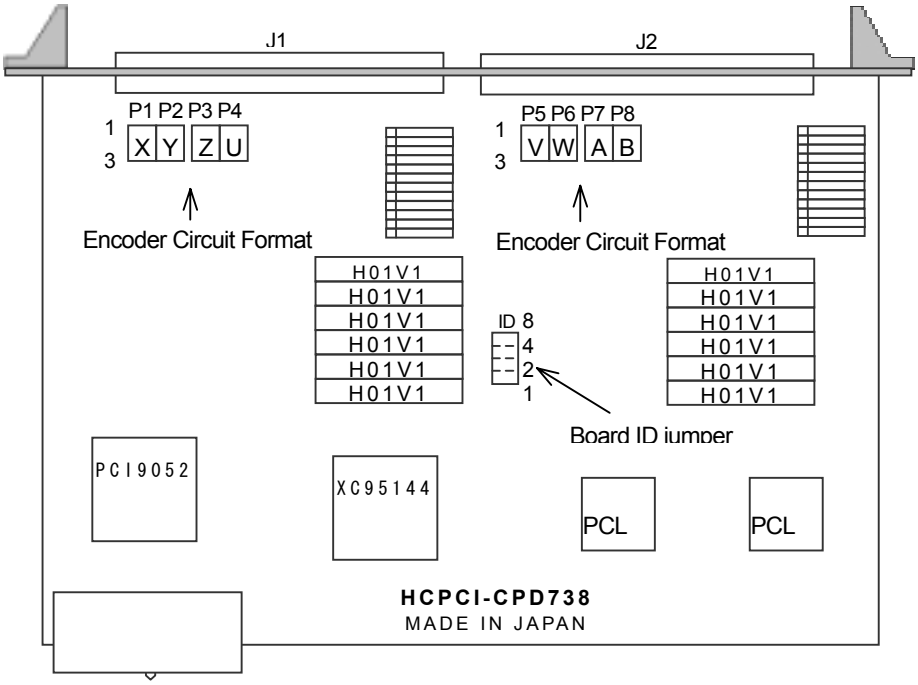


Figure 3. 3-3 Jumper Pin Locations on the CPD738 Board

(1) Board ID Setting Jumper Pins

The Board ID jumper pins can be used to set the CPD Board's Board ID (0 to 15). The following table shows 4 example settings. (The factory setting is 0.)

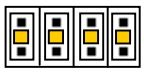
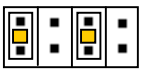
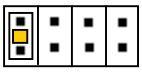
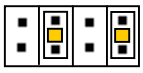
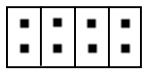
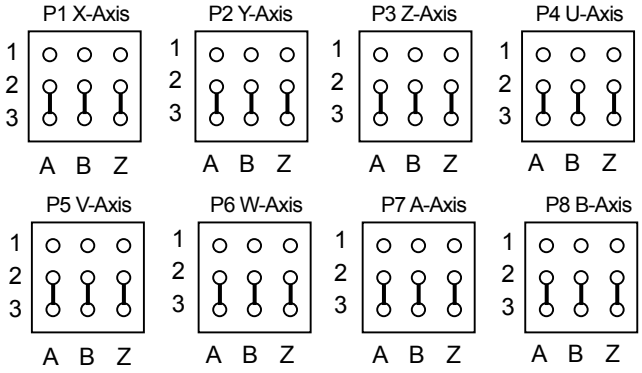
Board ID setting	0	5	7	10	15
Jumper settings	 8 ID 1	 8 ID 1	 8 ID 1	 8 ID 1	 8 ID 1
Binary quivalent	0 0 0 0	0 1 0 1	0 1 1 1	1 0 1 0	1 1 1 1

Figure 3. 3-4 CPD738 Board ID Setting Jumper Pins

(2) Encoder Circuit Format

Select the appropriate input circuit for the encoder output circuit being used (differential or open-collector output). (Refer to *3. 4-3 Encoder Input Circuits* for details.)



Differential connection (jumper connecting pins 2 and 3)
Open-collector connection (jumper connecting pins 1 and 2)

Figure 3. 3-5 Encoder Circuit Format Setting Jumper Pins

3.4 Servo and Machine Interfaces

3.4.1 Command Pulse Output and Driver Connections

Table 3. 4-1 shows the output circuit conditions.

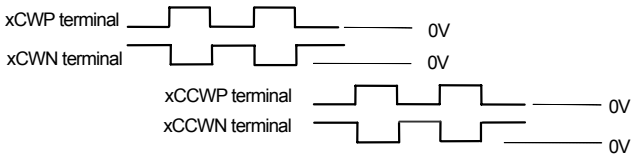
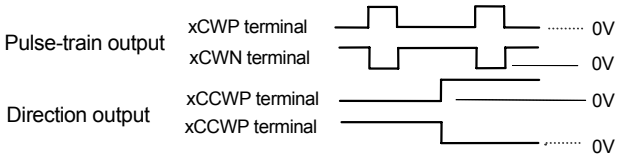
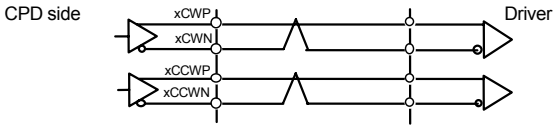
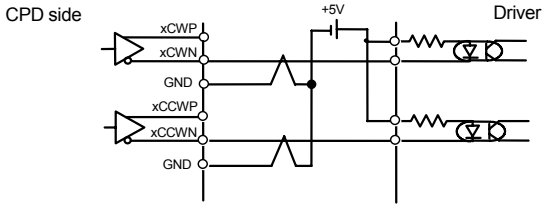
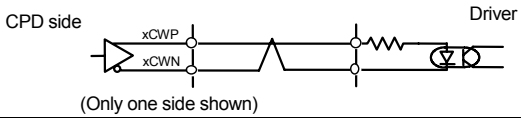
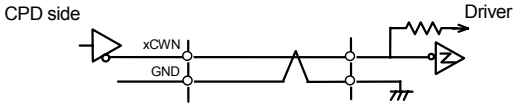
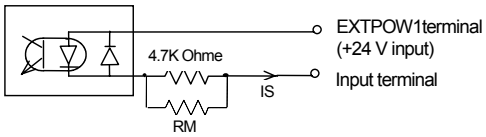
<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Contens</th></tr>
<tr><td>1</td><td>Electrical contions</td><td>Output pulse driver pulse width</td><td>Differential driver (26LS31)
Command pulse frequency 50% duty width
or a pulse width of 200 microsecond when the frequency is less than 2. 4 Kpps</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Signal format</td><td>Individual pulse output method (Set in Environment Setting Register 1.)</td><td> 
</td></tr>
<tr><td>Direction and pulse train method (Set the direction output logic in Environment Setting Register 1.)</td><td> 
</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Connection to motor driver</td><td>Connection to motor driver by differential input</td><td> 
</td></tr>
<tr><td>Connection to motor driver by coupler input</td><td> 
</td></tr>
<tr><td>For the motor drivers ensuring differential connection to the coupler input</td><td> 
</td></tr>
<tr><td>Connection to motor driver by TTL input</td><td> 
</td></tr>
</table>

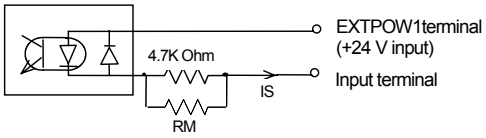
Table 3. 4-1 Command Pulse Output Circuits

Note: Caution is required for speeds and cable lengths when the motor driver does not use a differential input. As guidelines, use 500 Kpps with a cable length of 3 m for coupler connections and 250 Kpps with a cable length of 1 m for TTL connections.
Always check motor driver reception circuit specifications before application.

3.4.2 Axis Sensor and Servo Interface Input Circuits

Table 3. 4-2 shows the input circuits.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Contents</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Circuit format 1</td><td rowspan="4">Shared by ±xELS, xDLS, and xOLS.</td><td> 

Input terminal: 5mA ≤ IS ≤ 10mA
EXTPOW1: standard 24-V input terminal
■ Following Resistance Module needed to mount when using 12V</td></tr>
<tr><td>CPD738's EXTPOW1A module resistance: RM28, 30, 32, 34 3. 9 k Ohm (4 elements, 8 pins)</td></tr>
<tr><td>CPD738's EXTPOW1B module resistance: RM54, 56, 58, 60 3. 9 k Ohm (4 elements, 8 pins)</td></tr>
<tr><td>CPD734's module resistance: RM18, 20,22,24 3. 9 k Ohm (4 elements, 8 pins)</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Circuit format 2</td><td rowspan="4">Shared by xINPOS and xSVALM</td><td> 

Input terminal: 5 mA ≤ IS ≤ 10 mA
EXTPOW2: standard 24-V input terminal
■ Following Resistance Module needed to mount when using 12V</td></tr>
<tr><td>CPD738's EXTPOW1A module resistance: RM36, 38 3. 9K Ohme (4 elements, 8 pins)</td></tr>
<tr><td>CPD738's EXTPOW1B module resistance: RM62, 64 3. 9K Ohme (4 elements, 8 pins)</td></tr>
<tr><td>CPD734's module resistance: RM26, 28 3. 9K Ohme (4 elements, 8 pins)</td></tr>
<tr><td>3</td><td>Polarity settings</td><td>Polarity settings for ±xELS, xDLS, xOLS, xINPOS, and xSVALM;</td><td>N. O. (Normal Open) condition: The signal is detected when current to the photocoupler is ON

N. C. (Normal Open) condition: The signal is detected when current to the photocoupler is OFF

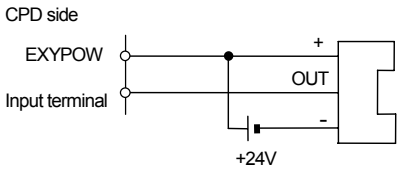
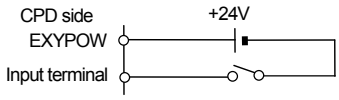
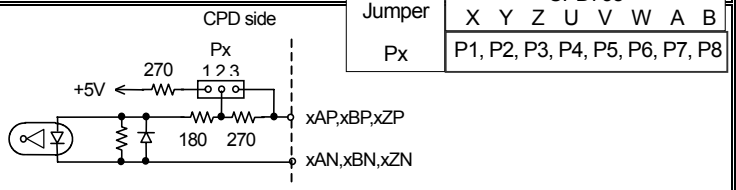
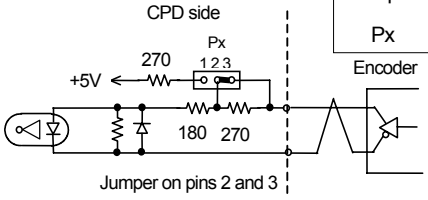
For ELS, set the polarity with the option port. (See 3. 2. 2 Option Ports for details.)
For DLS, OLS, INPOS, and SVALM, set the polarity with the RENV1.
(See CPD Board Series User's Manual: Common Information for details.)</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">External connections</td><td>Photoelectric sensor input</td><td> 
</td></tr>
<tr><td>Limit switch input</td><td> 
</td></tr>
</table>

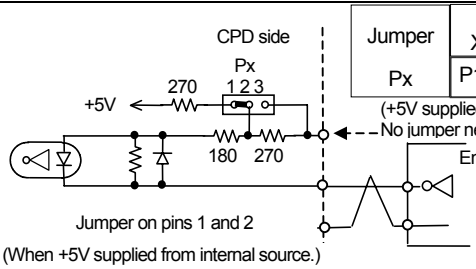
Table 3. 4-2 Axis Sensor and Servo Interface Input Circuits

3.4.3 Encoder Input Circuits

(1) CPD738's Encoder Input Circuit (CPD738 can select differential connection or open-collector connection.)

<table>
<tr><th>No.</th><th>Item</th><th>Cor</th></tr>
<tr><td>1</td><td>Encoder input circuit format</td><td> 

<table>
<tr><td>Jumper</td><td>CPD738
X Y Z U V W A B</td></tr>
<tr><td>Px</td><td>P1, P2, P3, P4, P5, P6, P7, P8</td></tr>
</table></td></tr>
<tr><td>2</td><td>Advancement of phase settings for Phase A or Phase B</td><td>Set by means of software.</td></tr>
<tr><td rowspan="2">3</td><td>Differential connection</td><td> 

<table>
<tr><td>Jumper</td><td>CPD738
X Y Z U V W A B</td></tr>
<tr><td>Px</td><td>P1, P2, P3, P4, P5, P6, P7, P8</td></tr>
</table></td></tr>
<tr><td>Open-collector connection
(when using internal +5V power)
(Leave the jumper off when supplying +5V from an external power source.)</td><td> 

<table>
<tr><td>Jumper</td><td>CPD738
X Y Z U V W A B</td></tr>
<tr><td>Px</td><td>P1, P2, P3, P4, P5, P6, P7, P8</td></tr>
</table></td></tr>
</table>

(2) CPD734's Encoder Input Circuit (Only differential connection.)

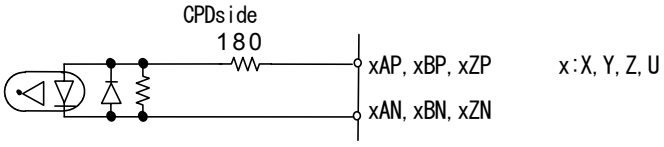
4	Differential connection	

Table 3. 4-3 Encoder Input Circuit

3.4.4 Servo interface output circuits

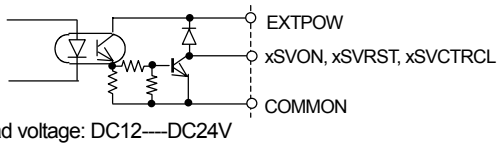
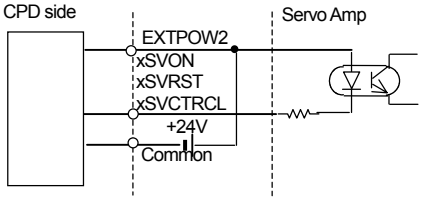
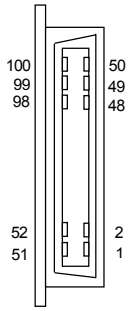
No.	Item	Contents
1	Driver circuit format xSVON,xSVRST, xSVCTRCL	 Rating load voltage: DC12----DC24V Allowable load current: Less than 80mA/terminal
2	Output logic level (The polarity cannot be changed.)	The xSVON, xSVRST; or xSVCTRCL is ON when the port output is "1".
3	External connections	

Table 3. 4-5 Servo Interface Output Circuits

3.5 Connector PIN out

3.5.1 CPD734 connector PIN out



·Connector type

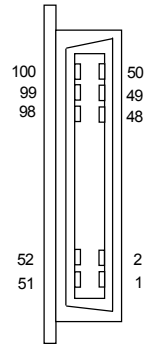
Board side:100pin MDR type connector (half pitched):
Type 102A0-52A2JL (SUMITOMO 3M)

Cable side connector: Plug 101A0-6000EL (Climp type):
Shell 103A0-A200-00 (aluminium die cast)

PIN No.	Signal Name(Function)	PIN No.	Signal Name(Function)
1	+5V power out	51	+5V power out
2	+5V power out	52	+5V power out
3	GND	53	GND
4	GND	54	GND
5	XCWP (diff.positive out:CW pulse/pulse out)	55	ZCWP (diff.positive out:CW pulse/pulse out)
6	XCWN (diff.negative out:CW pulse/pulse out)	56	ZCWN (diff.negative out:CW pulse/pulse out)
7	XCCWP (diff.positive out:CCW pulse/pulse out)	57	ZCCWP (diff.positive out:CCW pulse/pulse out)
8	XCCWN (diff.negative out:CCW pulse/pulse out	58	ZCCWN (diff.negative out:CCW pulse/pulse out)
9	YCWP (diff.positive out:CW pulse/pulse out)	59	UCWP (diff.positive out:CW pulse/pulse out)
10	YCWN (diff.negative out:CW pulse/pulse out)	60	UCWN (diff.negative out:CW pulse/pulse out)
11	YCCWP (diff.positive out:CCW pulse/pulse out)	61	UCCWP (diff.positive out:CCW pulse/pulse out)
12	YCCWN (diff.negative out:CCW pulse/pulse out)	62	UCCWN (diff.negative out:CCW pulse/pulse out)
13	XAP (Encoder A-phase positive input)	63	ZAP (Encoder A-phase positive input)
14	XAN (Encoder A-phase negative input)	64	ZAN (Encoder A-phase negative input)
15	XBP (Encoder B-phase positive input)	65	ZBP (Encoder B-phase positive input)
16	XBN (Encoder B-phase positive input)	66	ZBN (Encoder B-phase positive input)
17	XZP (Encoder Z-phase positive input)	67	ZZP (Encoder Z-phase positive input)
18	XZN (Encoder Z-phase positive input)	68	ZZN (Encoder Z-phase positive input)
19	YAP (Encoder A-phase positive input)	69	UAP (Encoder A-phase positive input)
20	YAN (Encoder A-phase negative input)	70	UAN (Encoder A-phase negative input)
21	YBP (Encoder B-phase positive input)	71	UBP (Encoder B-phase positive input)
22	YBN (Encoder B-phase positive input)	72	UBN (Encoder B-phase positive input)
23	YZP (Encoder Z-phase positive input)	73	UZP (Encoder Z-phase positive input)
24	YZN (Encoder Z-phase positive input)	74	UZN (Encoder Z-phase positive input)
25	GND	75	GND
26	GND	76	GND
27	XSVALM (Sarvo alarm input)	77	ZSVALM (Sarvo alarm input)
28	XINPOS (Positioning completion input)	78	ZINPOS (Positioning completion input)
29	XSV0N (Servo ON output)	79	ZSV0N (Servo ON output)
30	XSVRST (Servo reset output)	80	ZSVRST (Servo reset output)
31	XSVCTRCL (Error counter clear output)	81	ZSVCTRCL (Error counter clear output)
32	YSVALM (Sarvo alarm input)	82	USVALM (Sarvo alarm input)
33	YINPOS (Positioning completion input)	83	UINPOS (Positioning completion input)
34	YSV0N (Servo ON output)	84	USV0N (Servo ON output)
35	YSVRST (Servo reset output)	85	USVRST (Servo reset output)
36	YSVCTRCL (Error counter clear output)	86	USVCTRCL (Error counter clear output)
37	C0MM0N2 (Common GND for +24V)	87	C0MM0N2 (Common GND for +24V)
38	C0MM0N2 (Common GND for +24V)	88	C0MM0N2 (Common GND for +24V)
39	EXTPOW 2 (+24V power input for isolation supply)	89	EXTPOW 2 (+24V power input for isolation supply)
40	EXTPOW 2 (+24V power input for isolation supply)	90	EXTPOW 2 (+24V power input for isolation supply)
41	+XELS (Input for positive limit sensor)	91	+ZELS (Input for positive limit sensor)
42	-XELS (Input for negative limit sensor)	92	-ZELS (Input for negative limit sensor)
43	XDLS/XPCS (Input for DLS/PCS positioning start)	93	ZDLS/ZPCS (Input for DLS/PCS positioning start)
44	XOLS (Input for origin sensor)	94	ZOLS (Input for origin sensor)
45	+YELS (Input for positive limit sensor)	95	+UELS (Input for positive limit sensor)
46	-YELS (Input for negative limit sensor)	96	-UELS (Input for negative limit sensor)
47	YDLS/YPCS (Input for DLS/PCS positioning start)	97	UDLS/UPCS (Input for DLS/PCS positioning start)
48	YOLS (Input for origin sensor)	98	UOLS (Input for origin sensor)
49	EXTPOW 1 (+24V power input for isolation supply)	99	EXTPOW 1 (+24V power input for isolation supply)
50	EXTPOW 1 (+24V power input for isolation supply)	100	EXTPOW 1 (+24V power input for isolation supply)

Table 3. 5-1 CPD734 J1 CONNECTOR PIN OUT

3.5.2 CPD738 connector PIN out



·Connector type(J1, J2)

Board side: 100pin MDR type connector (half pitched):
Type 102A0-52A2JL (SUMITOMO 3M)

Cable side connector: Plug 101A0-6000EL (Climp type):
Shell 103A0-A200-00 (aluminium die cast)

(1) CPD738 J1 connector PIN out (Axes X, Y, Z, U)

PIN No.	Signal Name(Function)	PIN No.	Signal Name(Function)
1	+5V power out	51	+5V power out
2	+5V power out	52	+5V power out
3	GND	53	GND
4	GND	54	GND
5	XCWP (diff.positive out:CW pulse/pulse out)	55	ZCWP (diff.positive out:CW pulse/pulse out)
6	XCWN (diff.negative out:CW pulse/pulse out)	56	ZCWN (diff.negative out:CW pulse/pulse out)
7	XCCWP (diff.positive out:CCW pulse/pulse out)	57	ZCCWP (diff.positive out:CCW pulse/pulse out)
8	XCCWN (diff.negative out:CCW pulse/pulse out	58	ZCCWN (diff.negative out:CCW pulse/pulse out)
9	YCWP (diff.positive out:CW pulse/pulse out)	59	UCWP (diff.positive out:CW pulse/pulse out)
10	YCWN (diff.negative out:CW pulse/pulse out)	60	UCWN (diff.negative out:CW pulse/pulse out)
11	YCCWP (diff.positive out:CCW pulse/pulse out)	61	UCCWP (diff.positive out:CCW pulse/pulse out)
12	YCCWN (diff.negative out:CCW pulse/pulse out)	62	UCCWN (diff.negative out:CCW pulse/pulse out)
13	XAP (Encoder A-phase positive input)	63	ZAP (Encoder A-phase positive input)
14	XAN (Encoder A-phase negative input)	64	ZAN (Encoder A-phase negative input)
15	XBP (Encoder B-phase positive input)	65	ZBP (Encoder B-phase positive input)
16	XBN (Encoder B-phase positive input)	66	ZBN (Encoder B-phase positive input)
17	XZP (Encoder Z-phase positive input)	67	ZZP (Encoder Z-phase positive input)
18	XZN (Encoder Z-phase positive input)	68	ZZN (Encoder Z-phase positive input)
19	YAP (Encoder A-phase positive input)	69	UAP (Encoder A-phase positive input)
20	YAN (Encoder A-phase negative input)	70	UAN (Encoder A-phase negative input)
21	YBP (Encoder B-phase positive input)	71	UBP (Encoder B-phase positive input)
22	YBN (Encoder B-phase positive input)	72	UBN (Encoder B-phase positive input)
23	YZP (Encoder Z-phase positive input)	73	UZP (Encoder Z-phase positive input)
24	YZN (Encoder Z-phase positive input)	74	UZN (Encoder Z-phase positive input)
25	GND	75	GND
26	GND	76	GND
27	XSVALM (Sarvo alarm input)	77	ZSVALM (Sarvo alarm input)
28	XINPOS (Positioning completion input)	78	ZINPOS (Positioning completion input)
29	XSV0N (Servo ON output)	79	ZSV0N (Servo ON output)
30	XSVRST (Servo reset output)	80	ZSVRST (Servo reset output)
31	XSVCTRCL (Error counter clear output)	81	ZSVCTRCL (Error counter clear output)
32	YSVALM (Sarvo alarm input)	82	USVALM (Sarvo alarm input)
33	YINPOS (Positioning completion input)	83	UINPOS (Positioning completion input)
34	YSV0N (Servo ON output)	84	USV0N (Servo ON output)
35	YSVRST (Servo reset output)	85	USVRST (Servo reset output)
36	YSVCTRCL (Error counter clear output)	86	USVCTRCL (Error counter clear output)
37	C0MM0N2A (Common GND for +24V)	87	C0MM0N2A (Common GND for +24V)
38	C0MM0N2A (Common GND for +24V)	88	C0MM0N2A (Common GND for +24V)
39	EXTPOW 2A (+24V power input for isolation suppl	89	EXTPOW 2A (+24V power input for isolation suppl
40	EXTPOW 2A (+24V power input for isolation suppl	90	EXTPOW 2A (+24V power input for isolation suppl
41	+XELS (Input for positive limit sensor)	91	+ZELS (Input for positive limit sensor)
42	-XELS (Input for negative limit sensor)	92	-ZELS (Input for negative limit sensor)
43	XDLS/XPCS (Input for DLS/PCS positioning start)	93	ZDLS/ZPCS (Input for DLS/PCS positioning start)
44	XOLS (Input for origin sensor)	94	ZOLS (Input for origin sensor)
45	+YELS (Input for positive limit sensor)	95	+UELS (Input for positive limit sensor)
46	-YELS (Input for negative limit sensor)	96	-UELS (Input for negative limit sensor)
47	YDLS/YPCS (Input for DLS/PCS positioning start)	97	UDLS/UPCS (Input for DLS/PCS positioning start)
48	YOLS (Input for origin sensor)	98	UOLS (Input for origin sensor)
49	EXTPOW 1A (+24V power input for isolation supply	99	EXTPOW 1A (+24V power input for isolation supply
50	EXTPOW 1A (+24V power input for isolation supply	100	EXTPOW 1A (+24V power input for isolation supply

Table 3. 5-2 CPD738 J1 CONNECTOR PIN OUT (Axes X, Y, Z, U)

(2)CPD738 J2 connector PIN out (Axes V,W,A,B)

PIN No.	Signal Name(Function)	PIN No.	Signal Name(Function)
1	+5V power out	51	+5V power out
2	+5V power out	52	+5V power out
3	GND	53	GND
4	GND	54	GND
5	XCWP (diff.positive out:CW pulse/pulse out)	55	ZCWP (diff.positive out:CW pulse/pulse out)
6	XCWN (diff.negative out:CW pulse/pulse out)	56	ZCWN (diff.negative out:CW pulse/pulse out)
7	XCCWP (diff.positive out:CCW pulse/pulse out)	57	ZCCWP (diff.positive out:CCW pulse/pulse out)
8	XCCWN (diff.negative out:CCW pulse/pulse out	58	ZCCWN (diff.negative out:CCW pulse/pulse out)
9	YCWP (diff.positive out:CW pulse/pulse out)	59	UCWP (diff.positive out:CW pulse/pulse out)
10	YCWN (diff.negative out:CW pulse/pulse out)	60	UCWN (diff.negative out:CW pulse/pulse out)
11	YCCWP (diff.positive out:CCW pulse/pulse out)	61	UCCWP (diff.positive out:CCW pulse/pulse out)
12	YCCWN (diff.negative out:CCW pulse/pulse out)	62	UCCWN (diff.negative out:CCW pulse/pulse out)
13	XAP (Encoder A-phase positive input)	63	ZAP (Encoder A-phase positive input)
14	XAN (Encoder A-phase negative input)	64	ZAN (Encoder A-phase negative input)
15	XBP (Encoder B-phase positive input)	65	ZBP (Encoder B-phase positive input)
16	XBN (Encoder B-phase positive input)	66	ZBN (Encoder B-phase positive input)
17	XZP (Encoder Z-phase positive input)	67	ZZP (Encoder Z-phase positive input)
18	XZN (Encoder Z-phase positive input)	68	ZZN (Encoder Z-phase positive input)
19	YAP (Encoder A-phase positive input)	69	UAP (Encoder A-phase positive input)
20	YAN (Encoder A-phase negative input)	70	UAN (Encoder A-phase negative input)
21	YBP (Encoder B-phase positive input)	71	UBP (Encoder B-phase positive input)
22	YBN (Encoder B-phase positive input)	72	UBN (Encoder B-phase positive input)
23	YZP (Encoder Z-phase positive input)	73	UZP (Encoder Z-phase positive input)
24	YZN (Encoder Z-phase positive input)	74	UZN (Encoder Z-phase positive input)
25	GND	75	GND
26	GND	76	GND
27	XSVALM (Sarvo alarm input)	77	ZSVALM (Sarvo alarm input)
28	XINPOS (Positioning completion input)	78	ZINPOS (Positioning completion input)
29	XSV0N (Servo ON output)	79	ZSV0N (Servo ON output)
30	XSVRST (Servo reset output)	80	ZSVRST (Servo reset output)
31	XSVCTRCL (Error counter clear output)	81	ZSVCTRCL (Error counter clear output)
32	YSVALM (Sarvo alarm input)	82	USVALM (Sarvo alarm input)
33	YINPOS (Positioning completion input)	83	UINPOS (Positioning completion input)
34	YSV0N (Servo ON output)	84	USV0N (Servo ON output)
35	YSVRST (Servo reset output)	85	USVRST (Servo reset output)
36	YSVCTRCL (Error counter clear output)	86	USVCTRCL (Error counter clear output)
37	C0MM0N2B (Common GND for +24V)	87	C0MM0N2B (Common GND for +24V)
38	C0MM0N2B (Common GND for +24V)	88	C0MM0N2B (Common GND for +24V)
39	EXTPOW 2B (+24V power input for isolation suppl	89	EXTPOW 2B (+24V power input for isolation suppl
40	EXTPOW 2B (+24V power input for isolation suppl	90	EXTPOW 2B (+24V power input for isolation suppl
41	+XELS (Input for positive limit sensor)	91	+ZELS (Input for positive limit sensor)
42	-XELS (Input for negative limit sensor)	92	-ZELS (Input for negative limit sensor)
43	XDLS/XPCS (Input for DLS/PCS positioning start)	93	ZDLS/ZPCS (Input for DLS/PCS positioning start)
44	XOLS (Input for origin sensor)	94	ZOLS (Input for origin sensor)
45	+YELS (Input for positive limit sensor)	95	+UELS (Input for positive limit sensor)
46	-YELS (Input for negative limit sensor)	96	-UELS (Input for negative limit sensor)
47	YDLS/YPCS (Input for DLS/PCS positioning start)	97	UDLS/UPCS (Input for DLS/PCS positioning start)
48	YOLS (Input for origin sensor)	98	UOLS (Input for origin sensor)
49	EXTPOW 1B (+24V power input for isolation supply	99	EXTPOW 1B (+24V power input for isolation supply
50	EXTPOW 1B (+24V power input for isolation supply	100	EXTPOW 1B (+24V power input for isolation supply

Table 3. 5-3 CPD738 J2 CONNECTOR PIN OUT (Axes V, W,A, B)

3.6 HCPCI-CPD734 Specification

	Item		Specification	Notes
Basic Specifications	Axis control	(1)Positioning system	1 to 4 axes	Control LSI: PCL6045 series
		(2)Linear interpolation system	2 to 4 axes simultaneously	
		(3)Circular interpolation system	2 axes simultaneously	
		(4)Pulsar feed system	1 to 4 axes	
	Command system	Command pulses	Pulse-train output by differential driver	
		Position command range	-134,217,728 to 134,217,727 pulses	
		Command coordinate	Relative coordinate command	
		Reference range at continuous feed	Unlimited (but not applicable to the position range of the counter	Available of the cyclic counting for the position every 360deg.
		Position override	Possible only in positioning system	
	Speed Control	Speed range	0. 1pps to 6. 5Mpps (Multiplication 0. 1 to 100)	
		Constant control of linear speed	2-axes circular, linear interpolation down by :square root 3-axes linear interpolation down by : cubic root 4-axes linear interpolation down by : cubic root	
		Speed override	(1)Constant feed(without acc/dec): available in all cases (2)Limited to the positioning, linear interpolation and continuous feed. allowing it during acc/dec duration.	
	Acceleration/ deceleration control (Acc/Dec control)	Automatic Acc/Dec system	(1)Positioning and linear interpolation: Linear acc/dec system, S-curve acc/dec system and the partial S-curve acc/dec system are available. ・Triangular drive peak prevention function available ・Asymmetrically sloped acc/dec possible. (2)For circular interpolation: Automatic acc/dec possible except S-crve	
Function Specifications	Origin-returning control	Origin-returning method	13 returning methods for the sensor's origin,Z-phase origin,ELS shared origin (Each returning is done in a single process by the single command)	
		Origin search	Available	
		Getting out of origin area	Available	
	UP/DOWN counters		Command position counter (Command pulse count: length 28-bit)	4 counter per axis
			Machine position counter (Encoder pulse count: length 28-bit)	
			General-purpose counter (Pulse count: length 28-bit)	
			Error counter for runaway detection (Counter: length 16-bit) (Difference between the values of the encoder and the command.)	
	Comparators (CMP)		CMP1 and CMP2 : Soft-limit use comparating positive and negative limits	5 counter per axis
			CMP3,4 and 5: General-purpose(used for changing speed or starting another axis on comarison of the coordinate)	
	Inputs for encoder or pulsar		Each axis has a common input terminal for the encoder/pulsar input signal.	
	Backlash compensation		Compensated every turn of the direction except the circular interpolation system.	
	Positioning-control-start function (PCS) Idling pulse function		Starts positioning by PCS signal during continuous feed. (Only for positioning system)	
			Function of improving stepping motor acceleration characteristics.	
	Vibration suppress at a stop		Function of vibration suppression when the stepping motor stops.	
	Machine interface		+/-ELS,OLS,DLS, and encoder A,B, and Z-phase per axis. (All with photocoupler isolation)	
	Servo interface		Command-pulse output: differential output	
			Input: Servo alarm and in-position per axis (all with photocoupler insulation)	
			Output: Servo reset, servo ON, and servo error counter clear per axis. (all with photocoupler insulation)	
Conditions	Ambient temperature		0 to 50 centigrade (no condensation)	
	Current consumption		+5V 1. 15A Max	
	Dimensions		160mm x 100mm (3U cPci Card)	

Table 3. 6-1 HCPCI-CPD734 Specifications

3.7 HCPCI-CPD738 Specification

	Item		Specification	Notes
Basic Specifications	Axis control	(1)Positioning system	1 to 8 axes	Control LSI: PCL6045 series
		(2)Linear interpolation system	2 to 4 axes simultaneously x2	
		(3)Circular interpolation system	2 axes simultaneously x2	
		(4)Pulsar feed system	1 to 8 axes	
	Command system	Command pulses	Pulse-train output by differential driver	
		Position command range	-134,217,728 to 134,217,727 pulses	
		Command coordinate	Relative coordinate command	
		Reference range at continuous feed	Unlimited (but not applicable to the position range of the counter	Available of the cyclic counting for the position every 360deg.
		Position override	Possible only in positioning system	
	Speed Control	Speed range	0. 1pps to 6. 5Mpps (Multiplication 0. 1 to 100)	
		Constant control of linear speed	2-axes circular, linear interpolation down by :square root 3-axes linear interpolation down by : cubic root 4-axes linear interpolation down by : cubic root	
		Speed override	(1)Constant feed(without acc/dec): available in all cases (2)Limited to the positioning, linear interpolation and continuous feed. allowing it during acc/dec duration.	
	Acceleration/ deceleration control (Acc/Dec control)	Automatic Acc/Dec system	(1)Positioning and linear interpolation: Linear acc/dec system, S-curve acc/dec system and the partial S-curve acc/dec system are available. ・Triangular drive peak prevention function available ・Asymmetrically sloped acc/dec possible. (2)For circular interpolation: Automatic acc/dec possible except S-crve	
Function Specifications	Origin-returning control	Origin-returning method	13 returning methods for the sensor's origin,Z-phase origin,ELS shared origin (Each returning is done in a single process by the single command)	
		Origin search	Available	
		Getting out of origin area	Available	
	UP/DOWN counters		Command position counter (Command pulse count: length 28-bit)	4 counter per axis
			Machine position counter (Encoder pulse count: length 28-bit)	
			General-purpose counter (Pulse count: length 28-bit)	
			Error counter for runaway detection (Counter: length 16-bit) (Difference between the values of the encoder and the command.)	
	Comparators (CMP)		CMP1 and CMP2 : Soft-limit use comparating positive and negative limits	5 counter per axis
			CMP3,4 and 5: General-purpose(used for changing speed or starting another axis on comarison of the coordinate)	
	Inputs for encoder or pulsar		Each axis has a common input terminal for the encoder/pulsar input signal.	
	Backlash compensation		Compensated every turn of the direction except the circular interpolation system.	
	Positioning-control-start function (PCS) Idling pulse function		Starts positioning by PCS signal during continuous feed. (Only for positioning system)	
			Function of improving stepping motor acceleration characteristics.	
	Vibration suppress at a stop		Function of vibration suppression when the stepping motor stops.	
	Machine interface		+/-ELS,OLS,DLS, and encoder A,B, and Z-phase per axis. (All with photocoupler isolation)	
	Servo interface		Command-pulse output: differential output	
			Input: Servo alarm and in-position per axis (all with photocoupler insulation)	
			Output: Servo reset, servo ON, and servo error counter clear per axis. (all with photocoupler insulation)	
Conditions	Ambient temperature		0 to 50 centigrade (no condensation)	
	Current consumption		+5V 2A Max	
	Dimensions		160mm x 233mm (6U cPci Card)	

Table 3. 7-1 HCPCI-CPD738 Specifications

4. Functions

4.1 Combining Operations Between Axes

The 4-axis PCL6045 LSI has three kinds of the axis operation functions: independent axis operation, linear interpolation of a group of 2 to 4 axes, and circular interpolation of 2 axes.

The “independent axis operations” include the following functions for each axis: Positioning (PTP), continuous feed (terminate with a stop command), origin returning, pulsar feed (handle feed), and timer operation.

In the descriptions about (Axis Operation Combinations), the followings are the meaning of “simultaneous operations”

(1) Operating multiple independent axes at the same time.
Example: performing X-axis operation, continuing with Y-axis operation…

(2) Operating two pairs of interpolating axes at the same time.
Example: performing XY circular interpolation, and continuing with ZU linear interpolation….

(3) Operating independent axis and interpolating axes at the same time.
Example: performing XYZ-axis linear interpolation, and independent U-axis operation …

4.1.1 CPD734 Axis Operation Combinations

Number	Axis operation combination	Explanation	Remarks
1	All axes independent	Simultaneous operation is possible.	
2	All axes in linear interpolation	Linear interpolation of two to four axes is possible.	
3	Combining linear interpolation and independent operation	Simultaneous operation is possible.	
4	Combining circular interpolation and other operation.	The remaining axes can perform another operation while two axes perform circular interpolation.	The remaining axes can perform linear interpolation or independent operation.

Table 4. 1-1 CPD734 Axis Operation Combinations

4.1.2 CPD738 Axis Operation Combinations

The following table shows the operation combinations when two axes are being controlled.

Number	Axis operation combination	X to U-Axis or V to B-axis	Remarks
1	All axes independent	Simultaneous operation is possible.	
2	All axes in linear interpolation	Linear interpolation of two to four axes is possible.	
3	Combining linear interpolation and independent operation	Simultaneous operation is possible.	
4	Combining circular interpolation and other operation.	The remaining axes can perform another operation while two axes perform circular interpolation.	The remaining axes can perform linear interpolation or independent operation.

Table 4. 1-2 CPD738 Axis Operation Combinations

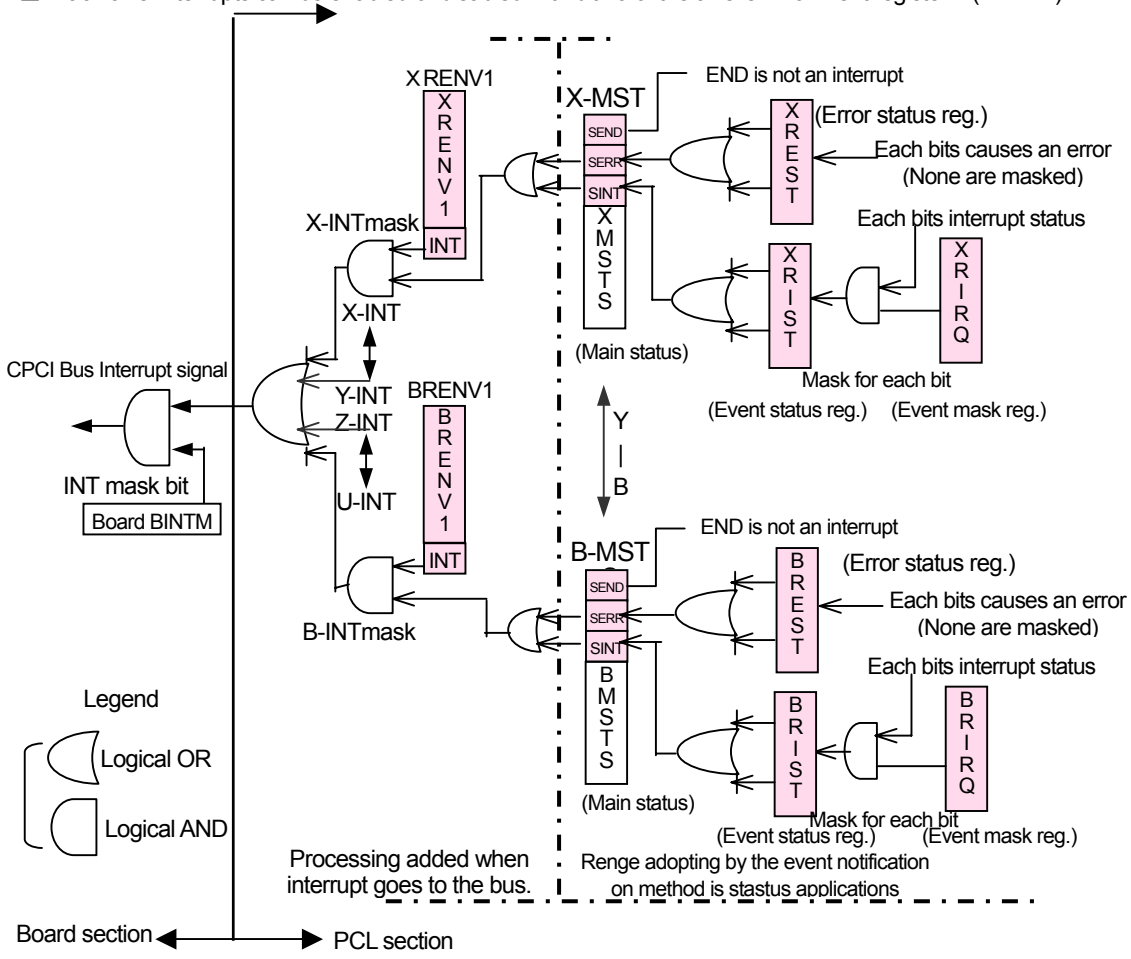
4.3 Interrupt Mechanisms

Figure 4. 3-1 shows the interrupt mechanisms for 4 axes.
Refer to the *CPD Board Series User's Manual: Common Information* for more details on status registers.

MSTS bit 4 (SERR): When an error bit has been set in the error status register (REST), the SERR bit will be set and this is one source of an interrupt output for the affected axis.
MSTS bit 5 (SINT): When a bit has been set in the event status register (RIST) and the bit is not masked, the SINT bit will be set and this is the other source of an interrupt output for the affected axis.

These two interrupt sources from each axis' MSTS register are logically ORed and the result is output as an interrupt from the PCL6045. The interrupt outputs from a CPD738 or CPD734 Board to the PCI bus must pass through the Board's interrupt mask (option port BINTM bit) and then are transmitted to the CPU.

■ Each axis' interrupts can be enabled or disabled with bit 29 of the axis' environment register 1 (RENV1).



Note: The CPD734 does not have the V-axis and B-axis.

Figure 4. 3-1 Route of Interrupts in the CPD738 Board

5. Software Startup Guide

5.1 Overview

This section explains the following operations.

(1) Windows Version

1. Installing and uninstalling drivers
2. Accessing the Board and the Board ID
3. Using the sample programs
4. Executing and navigating the “Let’s try to move” (an executable file)

5.2 Software Configuration

(1) Device Drivers

1. There are 3 different device driver files for Windows, depending on the version of Windows being used.

For Windows XP	(abbreviated as WinXP)	hc730wxp. sys
For Windows 2000	(abbreviated as Win2K)	hc730w2k. sys
For Windows NT	(abbreviated as WinNT)	hccpd730. sys
For Windows 98	(abbreviated as Win98)	hccpd730. vxd

(2) Device Driver Functions

The various functions included in the device driver interface library are referred to as “driver functions. ”

1. Driver Functions for Windows
   hccpd730. dll (The same file is used for all of the Windows operating systems.)

(3) Library Functions Level 1

A group of “library functions that perform special processing using driver functions” for application programs has been provided in a source program. The contents of these library functions can be changed freely. These functions are known as “library functions” in contrast to the driver functions.

1. Library Functions for Windows

cp730l1a. c (cp730l1a. h)	For MicroSoft Visual C++ (Version 5. 0 or higher)
cp730l1a. bas	For MicroSoft Visual Basic (Version 5. 0 / 6. 0)

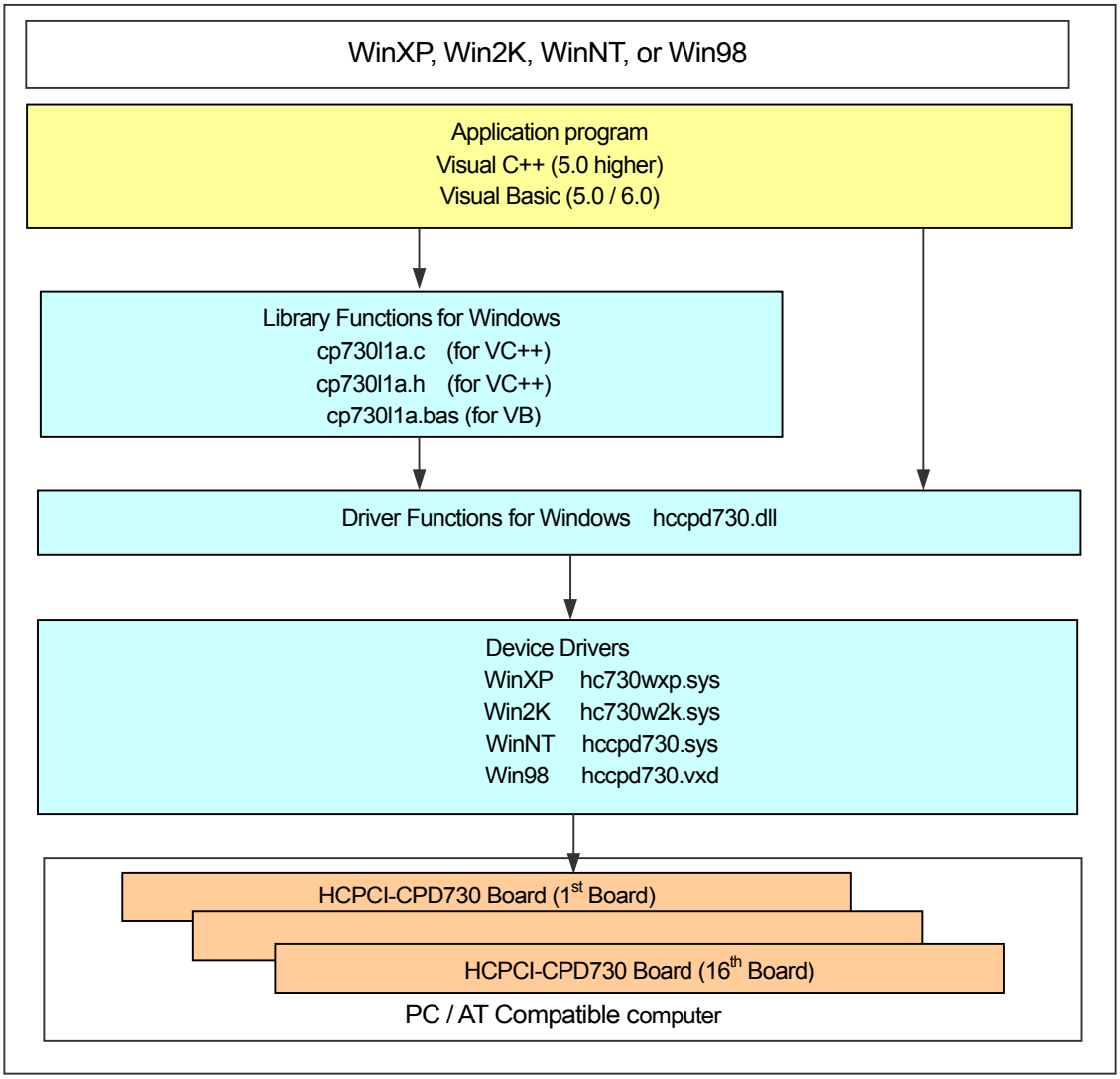


Figure 5. 2-1 Software Configurations

5.3 Installing and Uninstalling the Device Drivers

5.3.1 Installing/Uninstalling Device Drivers in a Windows Systems

(1) Windows XP Installation

1. Verify that the computer's power supply is OFF and install the CPD Board in an available PCI slot in the computer. Turn ON the computer's power supply and start Windows.
2. When WinXP starts up, the CPD Board will be detected by the system and a window will be displayed automatically to guide you in the installation of the required device driver. A dialog box will be displayed requesting the installation source directory. Insert the provided floppy disk into the computer's floppy disk drive.
3. Check "Install the software automatically (Recommended)".
4. Select "Hivertec HCPCI-CPD730 (WinXP)".
5. The warning "has not passed Windows Logo testing to verify its compatibility with Windows XP" is displayed, but continue anyway. We have checked that this software operates on WindowsXP. Complete the installation by following the directions in the system dialog boxes.

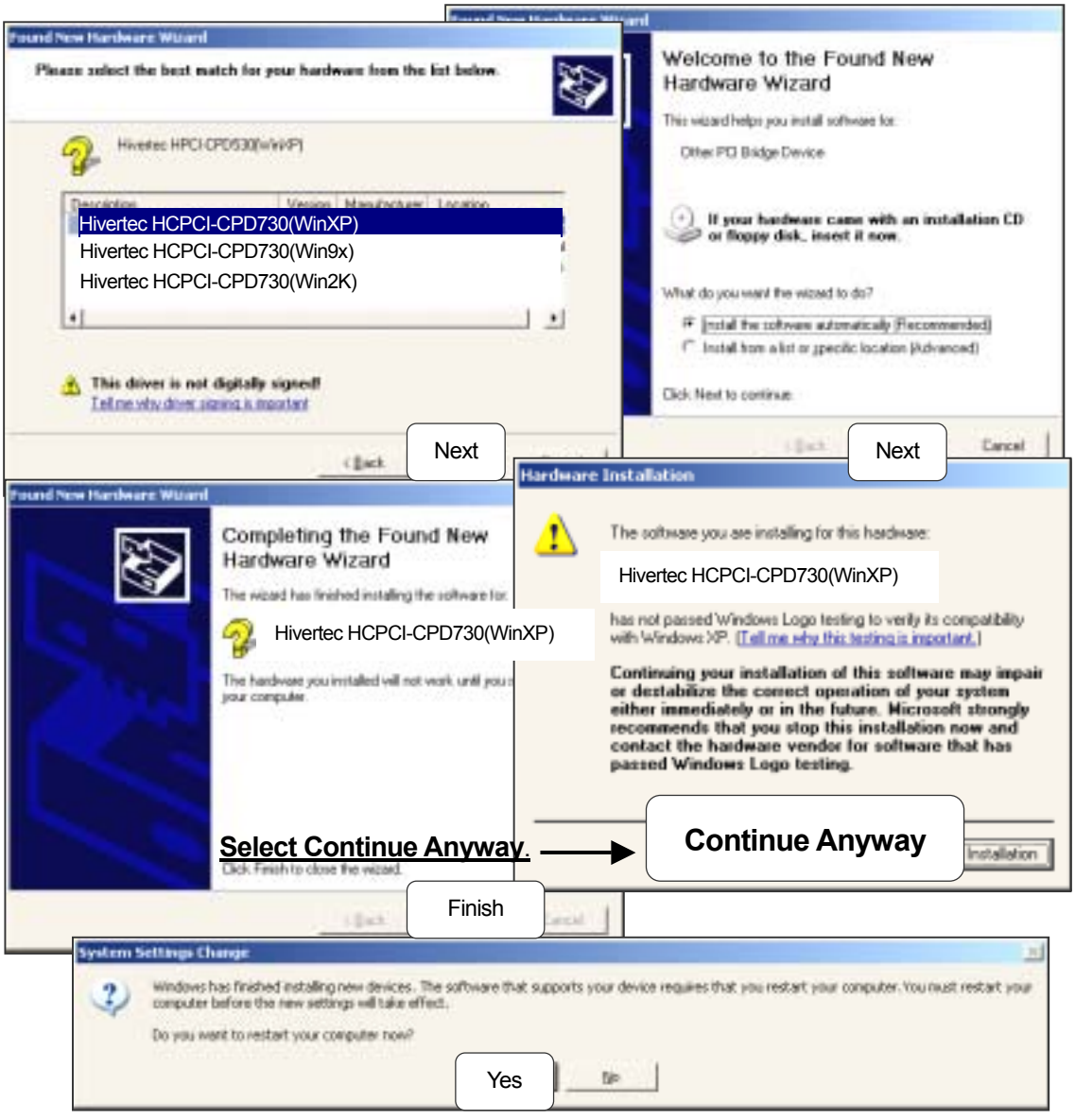


Figure 5. 3-1 WinXP Installations

(2) Windows 2000 Installation

1. Verify that the computer's power supply is OFF and install the CPD Board in an available PCI slot in the omputer. Turn ON the computer's power supply and start Windows.
2. When Win2K starts up, the CPD Board will be detected by the system and a window will be displayed automatically to guide you in the installation of the required device driver.
3. A dialog box will be displayed requesting the installation source directory. Insert the provided floppy disk into the computer's floppy disk drive.
4. Check "Specify a location".
5. Specify the directory "A:¥WIN2K". (In this case, the floppy drive is drive A.)
   Complete the installation by following the directions in the system dialog boxes.

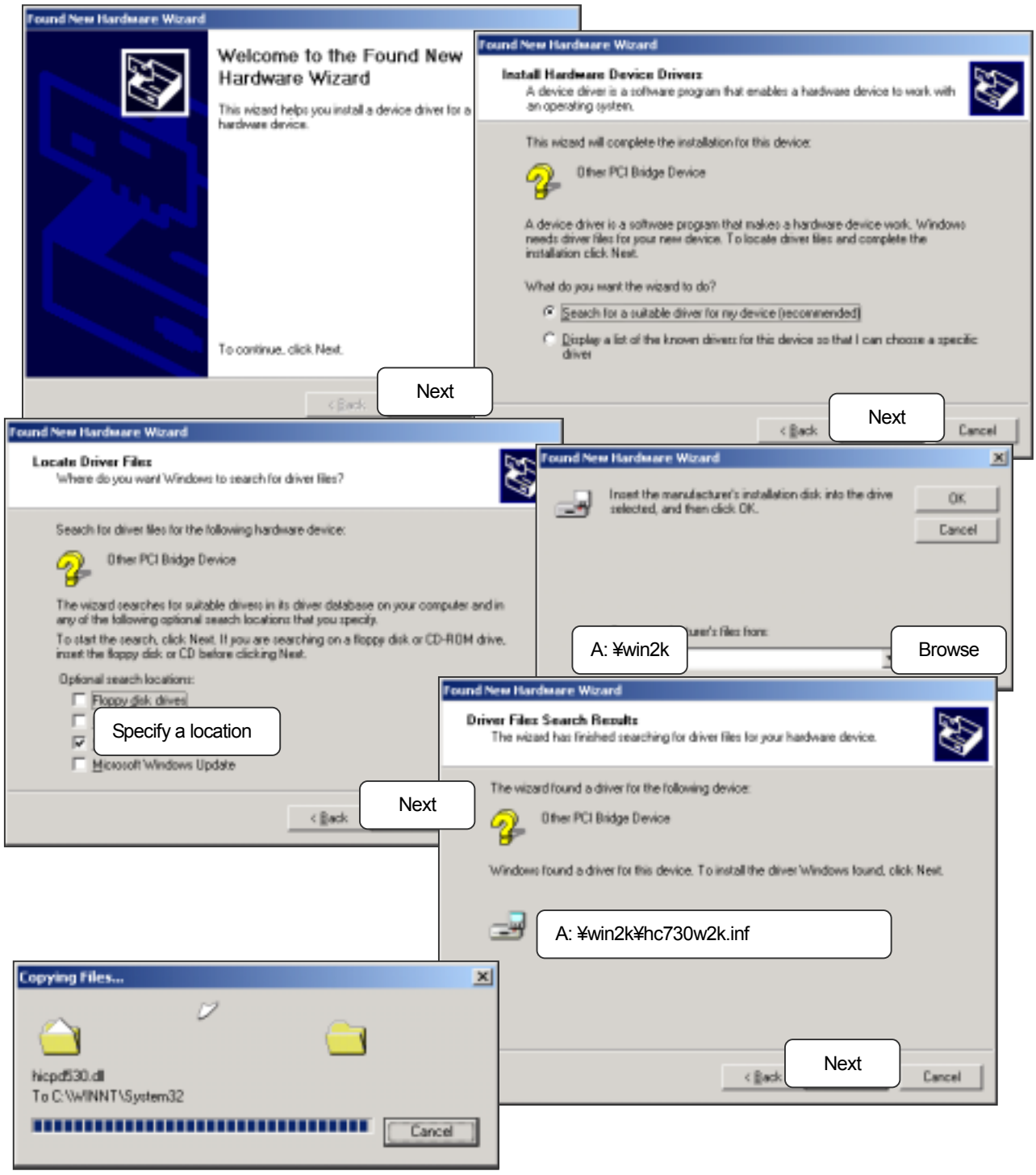
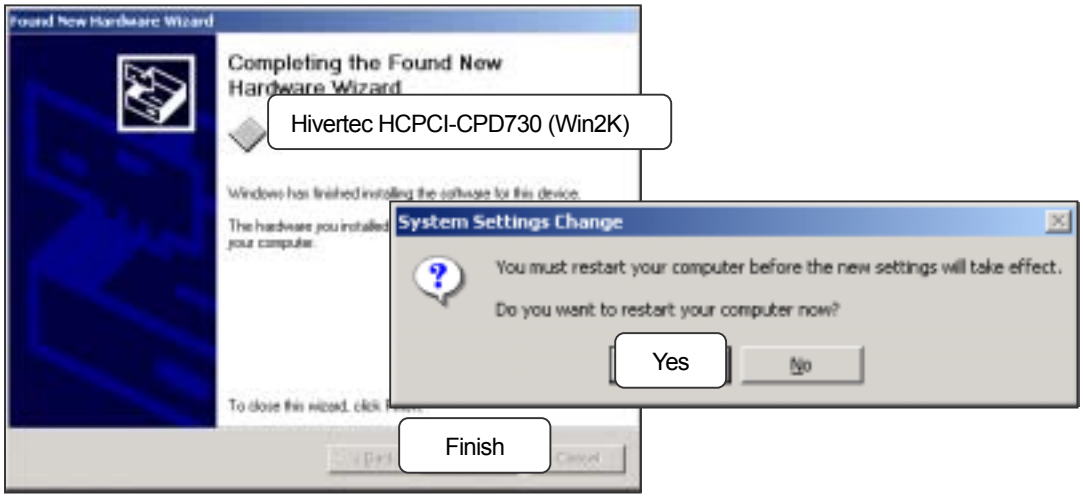


Figure 734 Win2K Installations



(2) Windows NT 4. 0 Installation

[Device Driver Installation]

1. Insert the provided floppy disk into the computer's floppy disk drive. Start "Windows NT Explorer" and select the file "A:¥WinNT¥c730inst. inf". (In this case, the floppy drive is drive A.)
2. Next click the right mouse button. Select NTLP:***Install*** from the popup menu that is displayed. The device driver installation will begin when NTLP:***Install*** is selected. Complete the installation by following the directions in the system dialog boxes. (It is also possible to start the device driver installation by executing the A:¥WinNT¥c730inst. bat batch file from the command prompt.)

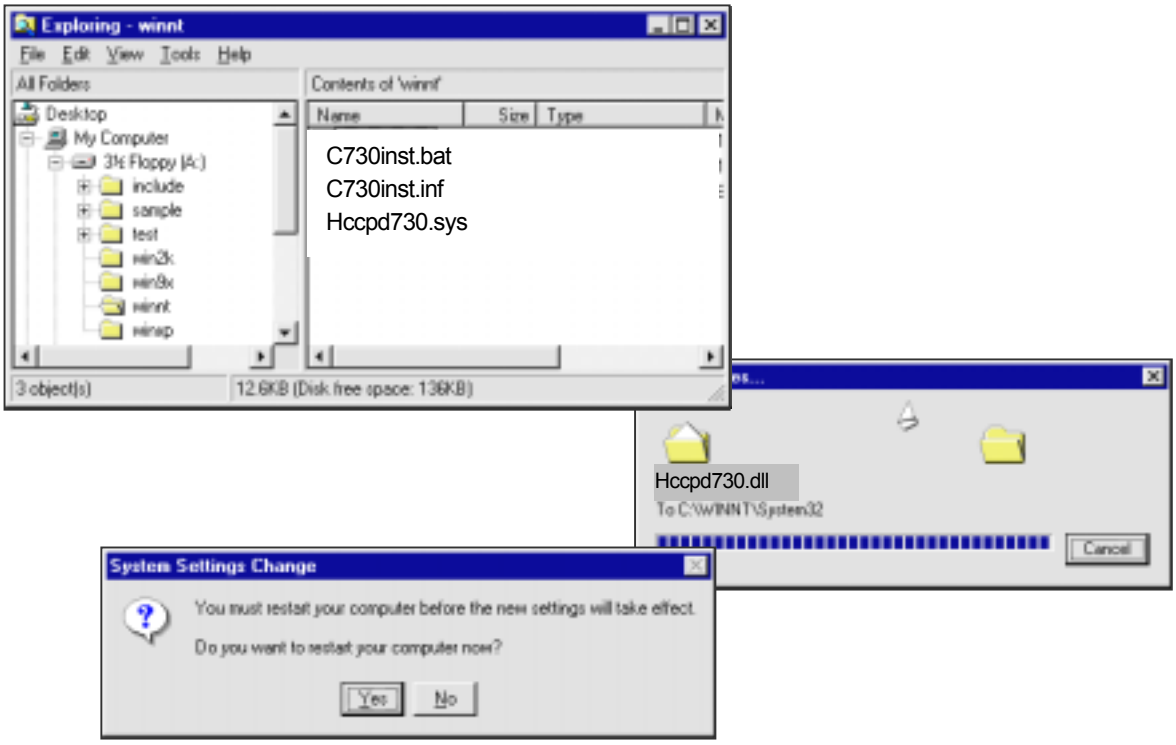


Figure 5. 3-3 WinNT Installations

[Starting and Stopping the Device]

After installing the device drivers, set the device driver to "automatic startup" so that the service for the CPD Board will be started when Windows NT starts up.
If the device must be stopped for some reason, use the following procedure to stop it.

1. Open the Control Panel and double-click the **Devices** icon. Select ***Hivertec HCPCI-CPD730*** from the list of devices.
2. Click the **Startup** Button to display the Startup Type Button Box. Select **Disabled** for the Startup Type. (The device status will be "Stopped. ")
   To restart the CPD, open the Control Panel again and double-click the **Devices** icon. Select ***Hivertec***

HCPCI-CPD730 and select **Automatic** for the Startup Type. (The device status will be “Started. ”)

(3) Windows 98 Installation

1. Verify that the computer’s power supply is OFF and install the CPD Board in an available PCI slot in the computer. Turn ON the computer’s power supply and start Windows.
2. When Win98 starts up, the CPD Board will be detected by the system and a window will be displayed automatically to guide you in the installation of the required device driver.
3. A dialog box will be displayed requesting the installation source directory. Insert the provided floppy disk into the computer’s floppy disk drive.
4. Check the appropriate boxes to select the floppy disk drive as the search location.
5. Specify the directory “A:¥Win9x”. (In this case, the floppy drive is drive A.) Complete the installation by following the directions in the system dialog boxes.

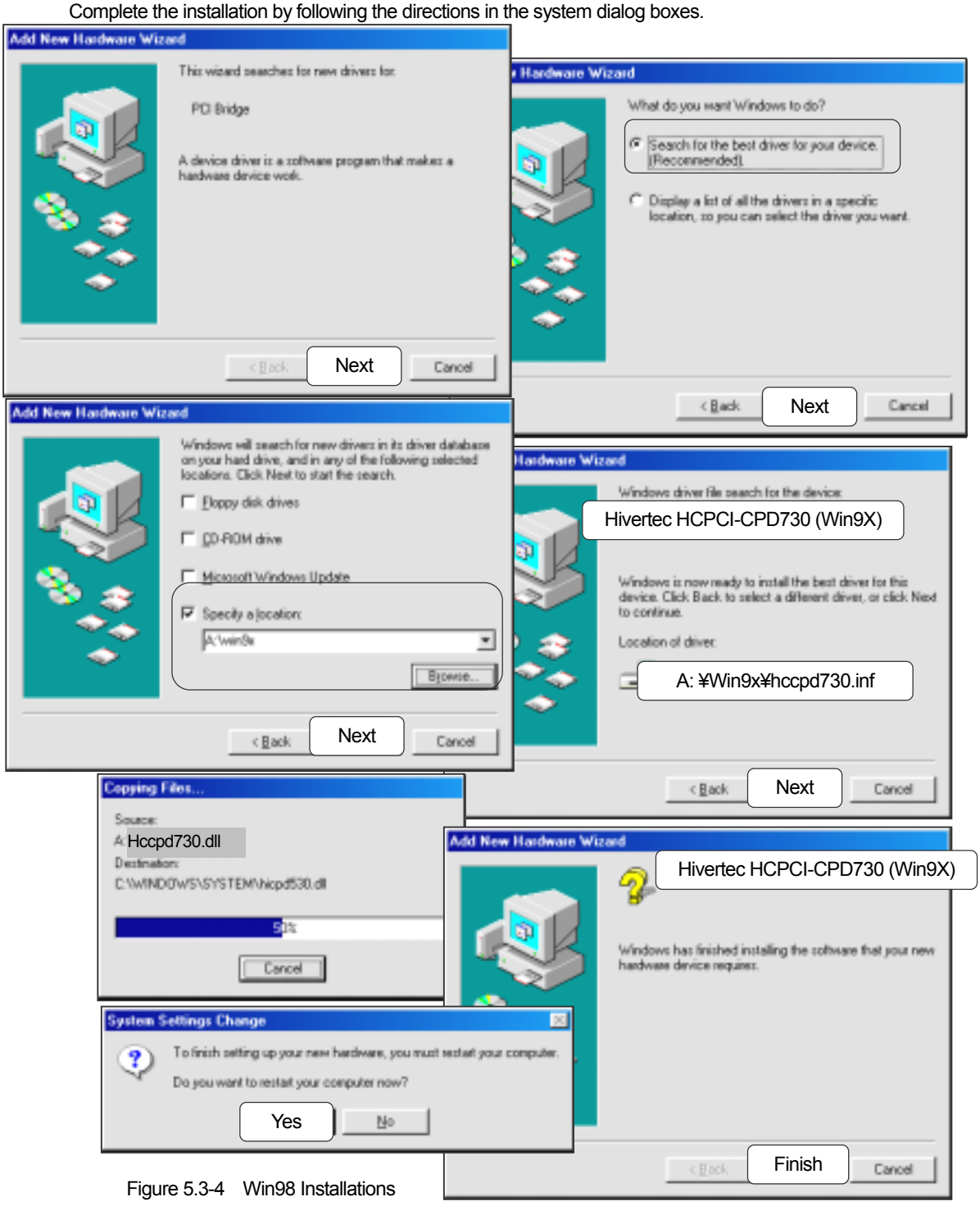


Figure 5.3-4 Win98 Installations

(4) Uninstalling the Device Driver for Windows

1. Insert the provided floppy disk into the computer's floppy disk drive.

2. Start Windows Explorer and execute the program "A:¥cp730uin. exe". (In this case, the floppy drive is drive A.)
It is also possible to start the device driver uninstallation program by executing A:¥cp730uin. exe from the command prompt.

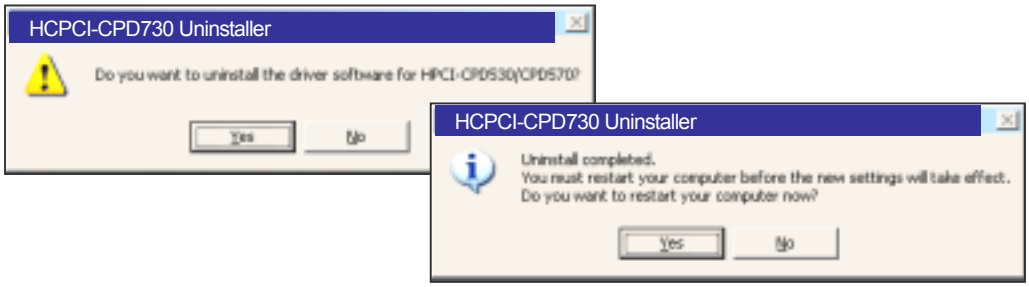
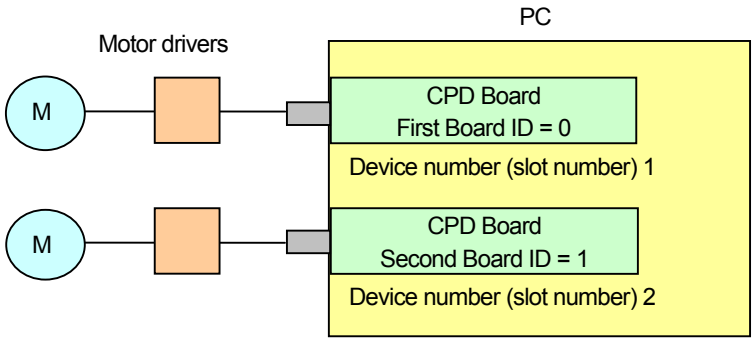


Figure 5. 3-5 Uninstalling the Device Drivers

5.4 Using Two or More CPD Boards

This section explains how to install more than one CPD Board in a computer and connect the Boards to external devices.



This example shows how to connect each Board to a separate driver.

Figure 5. 4-1 Using Multiple Boards

(1) Board Slot Number and Board ID

The computer's BIOS manage board addresses in the PCI bus system. The BIOS determines the slot number allocated to the slot in which the Board is mounted. The slot number is also known as the device number.

The slot numbers are dynamically allocated by the BIOS, so the relationship between the Boards and slot numbers cannot be tracked externally. Therefore, the CPD Boards are equipped with "Board ID Jumper Pins" to distinguish the Boards and coordinate the Board and software processing.

(2) Using Board IDs

The Board IDs can be set between 0 and 15. Up to sixteen CPD Boards (including CPD738, CPD734,) can be controlled. Refer to *3. 3 Board Settings* for details on setting the Board ID.

5.5 Accessing the Board

It is possible to control more than one CPD Board with this function group. In order to access a particular CPD Board, it is necessary to open the device first and obtain the device handle value used to access the Board.
To open a device, it is necessary to know the hardware resources allocated to the device being opened. Hardware resources are resources such as the I/O port address and IRQ number, which are defined by the Windows.

5.5.1 Data Structure for Board (Device) Recognition

(1) Windows Version of the Data Structure for Board (Device) Recognition

The following HPCDEVICEINFO structure is provided to recognize Boards. Use the number of structures required for the number of Boards being used (up to 16 Boards).

C language: Visual C++

```
typedef struct _HPCDEVICEINFO {
   DWORD        dwBusNumber;        /* Bus number */
   DWORD        dwDeviceNumber;     /* Device number */
   DWORD        dwIoPortAddress;    /* I/O port address */
   DWORD        dwIrqNo;            /* IRQ number */
   DWORD        dwNumber;           /* Management number */
   DWORD        dwBoardID;          /* Board ID (0 to 15) */
} HPCDEVICEINFO, *PHPCDEVICEINFO
```

Visual Basic

```
Public Type HPCDEVICEINFO
   dwBusNumber       As Long     ' Bus number
   dwDeviceNumber    As Long     ' Device number
   dwIoPortAddress   As Long     ' I/O port address
   dwIrqNo           As Long     ‘ IRQ number
   dwNumber          As Long     ' Management number
   dwBoardID         As Long     ' Board ID (0 to 15)
End Type
```

Note: The “Management number” is not used in Windows 98.
An “INVALID_HPC_NUMBER (-1)” will be stored.

5.5.2 Board Access Preparatory Procedure and End Processing

(1) Using Driver Functions

When using the driver functions, the preparatory procedure and end processing are almost the same for both the Windows versions. Refer to the *CPD Board Series User's Manual: Software Information* for details on the driver functions.

[Preparatory Procedure]

1. Obtain the device information for all of the Boards being used.
   First obtain the device information for all of the CPD Boards in the Board recognition structure area (array).
   cp730_GetDeviceCount() : Confirms the number of Boards.
   cp730_GetDeviceInfo() : Obtains the device information for all of the Boards.

2. Open every Board.
   Transfer the CPD Board's device information to the Open Device function.
   The CPD Board is opened and the Open Device function returns the device handle value that is needed to access that Board.
   When two or more Boards are being used in the computer, the processing must be performed for each individual Board.
   cp730_OpenDevice() : Opens the Board.

3. Make the initial settings for the Board's signal processing.
   From this point on, use the Board's device handle to access that CPD Board.
   Before initializing the Board, use the following function to set the Board's device operating conditions.
   Refer to the *CPD Board Series User's Manual: Software Information* for details on these settings.
   cp730_wPortB() : Sets each device's operating conditions.

4. Initialize each Board and each axis.
   After making the settings above, initialize each axis in all of the Boards being used.
   Refer to the User's Manuals and make the appropriate settings in each register.
   It will be possible to operate the axes normally once the settings have been made properly.

[End Processing]

5. Close the devices that were opened.
   When all of the required processing has been completed and the application has ended, close all of the devices that were opened.
   cp730_CloseDevice() : Closes the specified Board (1 Board).

(2) Using Library Functions

Refer to the *CPD Board Series User's Manual: Software Information* for details on the library functions.

Preparatory Procedure

1. Obtain the device information for all of the Boards being used.
   First obtain the device information for all of the CPD Boards in the Board recognition structure area (array).
   hcp730_GetDevInfo() : Confirms the number of Boards and obtains the device information for all of the boards.
   This library function combines two driver functions.

2. Open every Board.
   Transfer the CPD738 or CPD734 Board's device information to the Open Device function.
   The CPD Board is opened and the Open Device function returns the device handle value that is needed to access that Board.
   From this point on, use the Board's device handle to access that CPD Board.
   This step makes it possible to operate the axes normally, such as outputting pulses to each axis.
   When two or more Boards are being used in the computer, the processing must be performed for each individual Board.
   hcp730_DevOpen() :Opens the Board, makes the settings for the Board's signal processing, and sets each axis' operating conditions.

   This library function combines the driver functions in steps 2, 3, and 4 of the *Using Driver Functions* procedure.
   The initialization conditions are performed directly within the function. Refer to the *CPD Board Series User's Manual: Software Information* for more details on this function.

[End Processing]

3. Close the devices that were opened.
   When all of the required processing has been completed and the application has ended, close all of the devices that were opened.
   hcp730_DevClose() : Closes the specified Board (1 Board).

5.5.3 Verifying Each Axis is Ready for Operation

Verify the following points when each axis is connected to a motor and ready for operation.

1. Operational test of the ±ELS signals (The sensors are operated alone, with the motor stopped.)
2. Status of signal inputs when the servo alarm signals have been connected
3. Input status of the origin signal (OLS or Phase-Z)
4. Input status of the In-Position signal (Positioning completed: INPOS)

Proper operation may not be possible if the signals listed above are not being input properly.

The following points must be checked if the command pulse output to the motor is not operating properly.

1. Check that the command pulse output setting matches the “servodriver” input.
2. Check whether there is something in the “servodriver” input signal causing the motor to be stopped.

5.6 Sample Programs for Windows Systems

Sample programs have been provided to help explain how to use the library (level 1) functions. The following two kinds of programs have been provided and have almost identical displays and operations. The explanation in this section is based on the Visual C++ (5. 0) C coding sample program.

1. Visual C++ (5. 0) C coding (scc73000. exe)
2. Visual Basic (5. 0) (scc73002. exe)

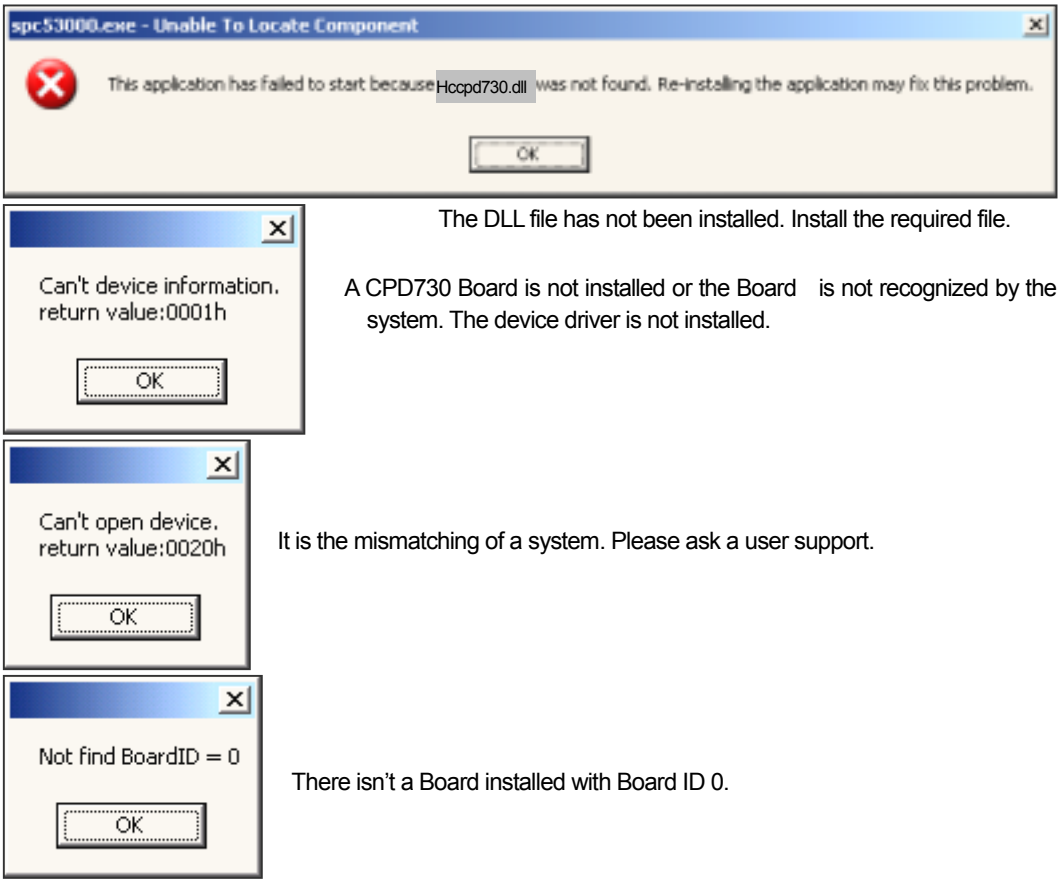
5.6.1 Executing the Sample Program

When using the sample program, copy the program to your hard disk.
The sample program can be executed by double-clicking the corresponding executable file (spc73000. exe or spc73002. exe).

(1) Precautions when Executing the Sample Program

1. When using the sample program for Visual C++, version 5. 0 (or higher) of Visual C++ must be installed already as the development tool.
2. When using the sample program for Visual Basic, version 5. 0 (or higher) of Visual Basic must be installed already as the development tool.
3. If the computer's OS is Windows 95 or Windows NT 4. 0 and Visual Basic 6. 0 is being used as the development tool, it may not be possible to execute spc73002. exe. In this case, spc73002. exe can be made executable by opening the project file "spc73002. vbp" and creating spc73002. exe again.
4. Set one CPD Board's Board ID to 0.
5. When two or more CPD Boards are being used, set a unique Board ID on each Board. If the same Board ID is set on more than one Board, the first Board found with that Board ID will operate.
6. The program will not run if one of the following error messages is displayed when you execute the program.

(2) Error Messages



The DLL file has not been installed. Install the required file.

A CPD730 Board is not installed or the Board is not recognized by the system. The device driver is not installed.

It is the mismatching of a system. Please ask a user support.

There isn't a Board installed with Board ID 0.

Figure 5. 6-1 Sample Program Error Messages

5.6.2 Sample Program Operations

There is a source program in the sample program that initializes each axis. Therefore, this source program must be changed if you want to operate the Board with different initialization conditions.

The following selection menu will be displayed if the sample program starts properly:

[Select Operation Menu]

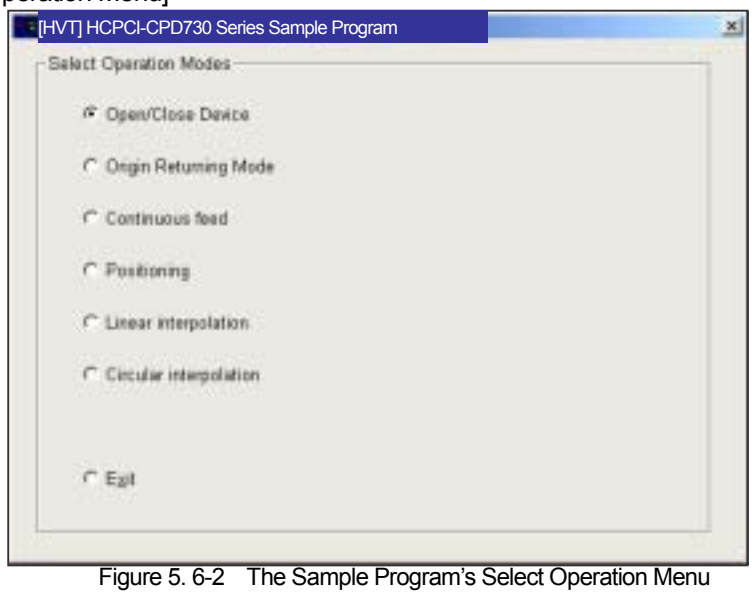


Figure 5. 6-2 The Sample Program's Select Operation Menu

Select the desired operation to execute that operation example.
(With the VC++ sample program, the operations are selected with a single-click. With the VB sample program, the operations are selected with a double-click.)

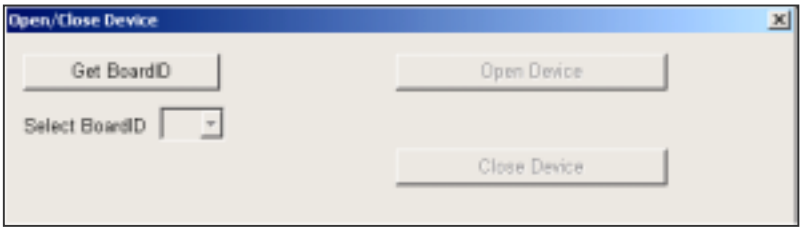
(1) Opening/Closing Devices

This sample program obtains device information and opens/closes the devices.
In order to access a CPD Board, it is necessary to first open the device and obtain the device handle that is required to access the device. The Open Device function initializes each register and the option ports at the same time that it opens the device and obtains the device handle.

In this sample operation, its Board ID selects the Board, the device information is obtained for the selected Board, and that Board's device is opened.
Also, that Board's device is closed with the Close Device function.
For more details on device information and opening/closing devices, refer to the *CPD Board Series User's Manual: Common Information*.

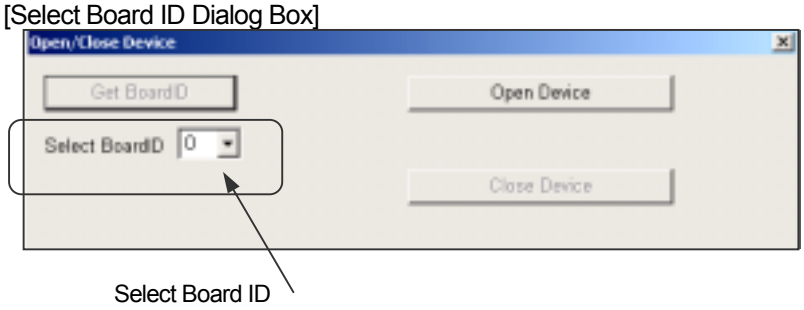
The following diagrams show how to perform the sample operations.

[Device Opening/Closing Dialog Box]



When you click "**Get Board ID"** in the dialog box, the **"Select Board ID"** area will display the Board IDs of the Boards that are actually installed in the computer.

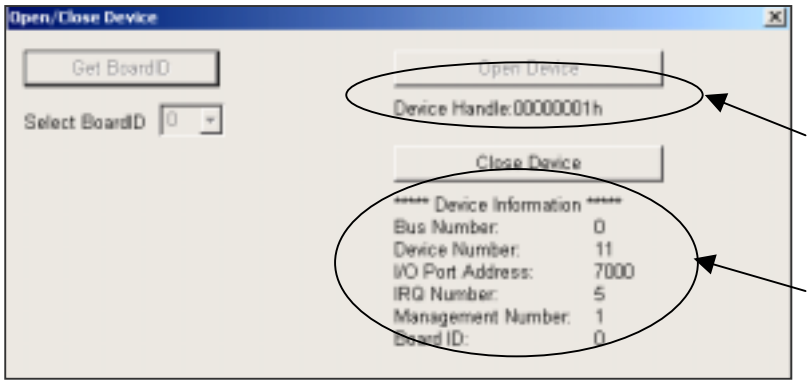
[Select Board ID Dialog Box]



Select Board ID

Select the desired Board ID and click the **"Open Device"** Button to open the device.

[Window after Open Device Button is clicked]



Device handle obtained by Open Device

Device information for the device that was opened

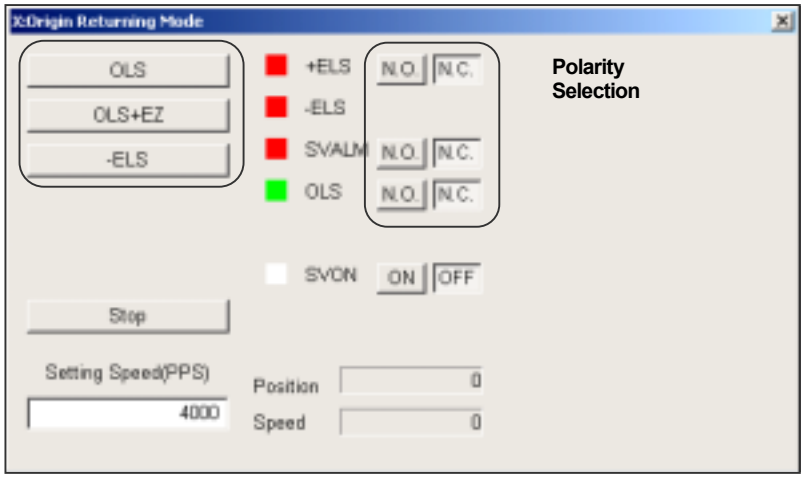
Click the **"Close Device"** Button to close the device and return to the **"Select Board ID"** Dialog Box.

(2) Origin Returning Operation

This sample program makes the settings for the origin returning operation and performs the origin returning operation.

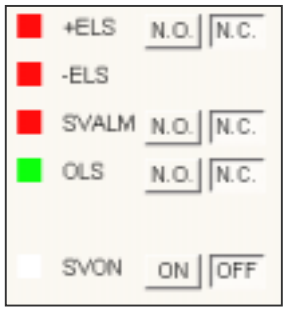
[Initial Window for the Origin Returning Operation]

Select Origin Returning Operation



Polarity Selection

[Preparations for Operation]

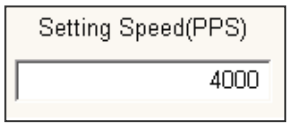


1. Polarity Selection

The indicated color will change when there is an input from the sensor. The +ELS, -ELS, and SVALM indicators will be red when there is an input and the OLS indicator will be green.
If the SVON signal is being output, the indicator will be green.
The input polarity can be switched by clicking the **"N. O. "** and **"N. C. "** Buttons.
The Servo can be turned ON and OFF by clicking the **"ON"** and **"OFF"** Buttons.

When a stepping motor driver is being used, the **"OFF"** Button turns the excitation ON and the **"ON"** Button turns the excitation OFF.

Note 1. Operation is disabled while +ELS, -ELS, or SVALM is being input. Start operation after checking the status of each sensor.
It is assumed that SVON is connected as specified.
Note 2. With a normally open (N. O.) terminal, the signal is ON (detected) when there is a current.
With a normally closed (N. C.) terminal, there is normally a current flowing and the signal is ON (detected) when there is no current.



2. Setting the Operation Speed

The operation speed can be set in the range of 1 to 65,535 pps. The initial value is 4,000 pps, so change this initial value to the desired speed when necessary.
Also, the base speed is set to 400 pps. If the operation speed is set below 400 pps, the motor will accelerate when the speed drops to 400 pps even if it is supposed to decelerate because the DLS or OLS signal is ON. In this case, change the sample program and set the base speed to the appropriate value.

[Executing the Origin Returning Operation]

Any one of the following origin returning methods can be selected.
"OLS": Origin returning operation 1(After OLS is detected, Get out of origin, re-enter and end.)
"OLS+EZ": Origin returning operation 2: OLS ON is detected and encoder phase-Z is detected.
" ELS": Origin returning operation 6: Reverse when ELS is detected and end when ELS is exited.
Refer to the *CPD Board Series User's Manual: Software Information* for more details on the origin returning operations.

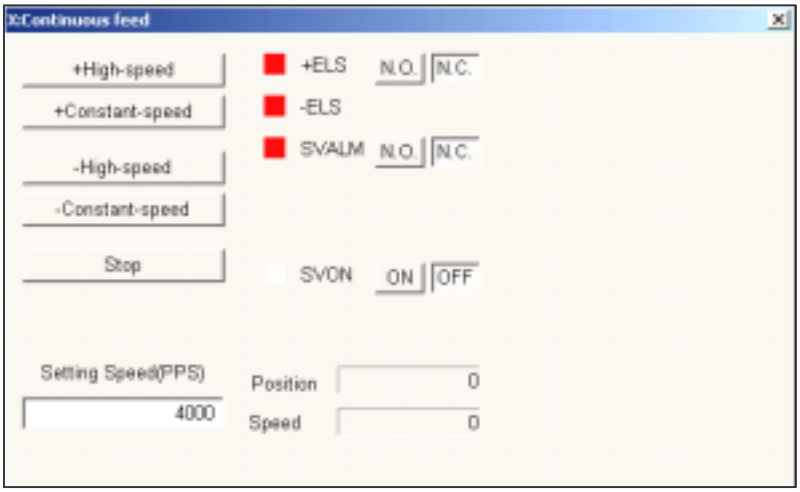
After completing, the "Preparations for Operation" and specifying one of the origin returning methods, click the **"Origin Returning"** Button to execute the specified origin returning operation.
Clicking the **"Stop"** Button can stop the operation.
The current position display indicates the command pulse count.
The current speed display indicates the pulse speed (pps) currently being output.

Note The OLS signal detection is rising-edge detection, so the OLS signal will not be detected if the signal is already ON when operation starts. In this case, perform continuous feed operation until the OLS signal goes OFF and then execute the origin returning operation.

(3) Continuous Feed Operation

This sample program demonstrates the high-speed continuous feed and constant-speed continuous feed operations.

[Continuous Feed Operation Window]

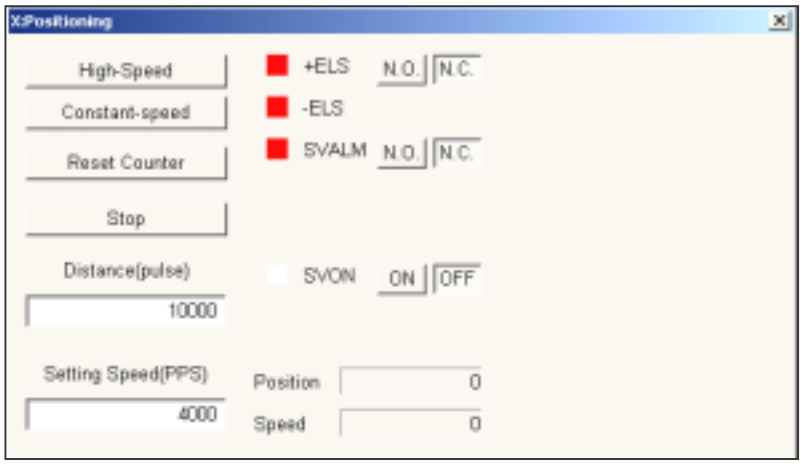


Before starting operation, perform the same preparatory checks (such as checking sensor connections) performed for the origin returning operation.
Click the **"+High-speed"**, **"+Constant-speed"**, **"-High-speed"**, or **"-Constant-speed"** Button to perform the corresponding continuous feed operation.
Clicking the **"Stop"** Button can stop the operation.

(4) Positioning Operation

This sample program demonstrates the high-speed positioning and constant-speed positioning operations.

[Positioning Operation Window]

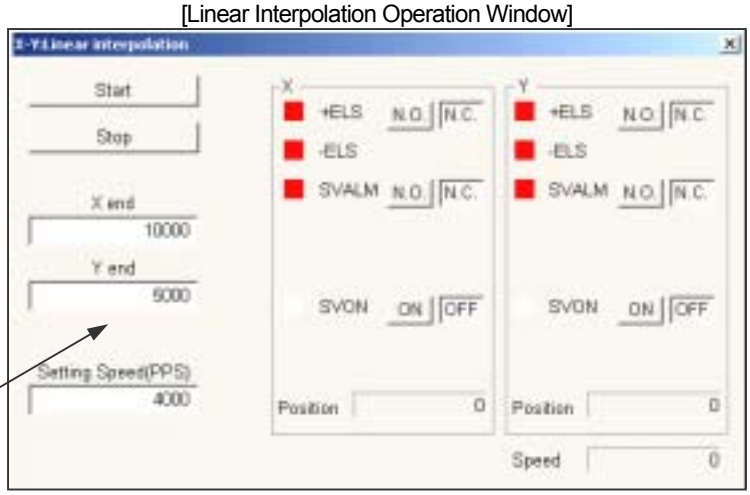


Before starting operation, perform the same preparatory checks (such as checking sensor connections) performed for the origin returning operation.
Click the **"High-speed"**or **"Constant-speed"** Button to perform the corresponding continuous feed operation.
Set the distance in pulse units.
The current position can be reset to 0 by clicking the **"Reset Counter"** Button.
Clicking the **"Stop"** Button can stop the operation.

(5) Linear Interpolation Operation

This sample program performs linear interpolation operation at high speed. The combined speed is fixed.

[Linear Interpolation Operation Window]

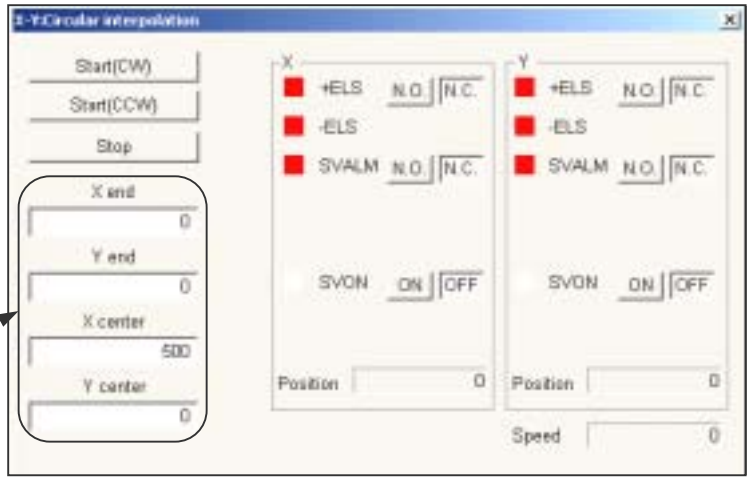


Before starting operation, perform the same preparatory checks (such as checking sensor connections) performed for the origin returning operation.
Set the end positions for the X-axis and Y-axis.
Click the **"Start"** Button to perform the linear interpolation operation.
Clicking the **"Stop"** Button can stop the operation.

(6) Circular Interpolation Operation

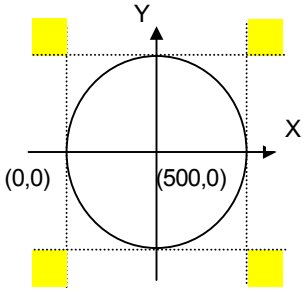
This sample program performs circular interpolation operation at the base speed. (Constant surface speed control with a base speed of 500 pps)

[Circular Interpolation Operation Window]



Before starting operation, perform the same preparatory checks (such as checking sensor connections) performed for the origin returning operation.
Set the end position and center position for the X-axis and Y-axis.

Note The current point is the starting point, and the end position is at the end coordinate values relative to that starting point.
When the end point value is set to (0,0), a complete circle will be formed.
If the end point coordinates are not on the circle, end point withdrawal will start when the operation reaches either the specified X-axis or Y-axis end position. If the end position has been set in one of the yellow regions shown in the diagram on the right, the operation will never reach the X-axis or Y-axis end position so operation will not stop.



Setting example

Click the **"Start (CW)" or "Start (CCW)"** Button to perform the circular Interpolation operation.
Clicking the "Stop" Button can stop the operation.

5.7 ”Let’s try to move” Program for Windows Systems

The “Let’s try to move” program software allows you to check minimal operations on the display by simply connecting Board to computer. Execute the A:¥test¥Release¥tpc73000. exe file on the provided floppy disk. (In this case, the floppy disk drive is drive A.)

< Caution >

When two or more CPD Boards are being used, set a unique Board ID on each Board. If the same Board ID is set on more than one Board, the first Board found with that Board ID will operate.
For safety reasons, the display will not change with this application while the axis is operating.
The program will not run if one of the following error messages is displayed when you execute the program.

[Error Messages]

The DLL file has not been installed.
The installation is incomplete.

A CPD730 Board is not installed or the Board is not recognized by the system.
The device driver is not installed.

It is the mismatching of a system. Please ask a user support.

Figure 5. 7-1 Let’s try to move Error Messages

5.7.1 "Let's try to move" Operation Window

The following window will be shown when the "Let's try to move" program is executed. When the program starts, it will operate with the first Board that is found. To operate the "Let's try to move" program with a different Board, select the Setting Window by clicking the **"X-U Setting"** or **"V-B Setting"** tab at the top of the Window.

Refer to *5. 7. 2 Let's try to move Settings Window* for details on selecting another Board.

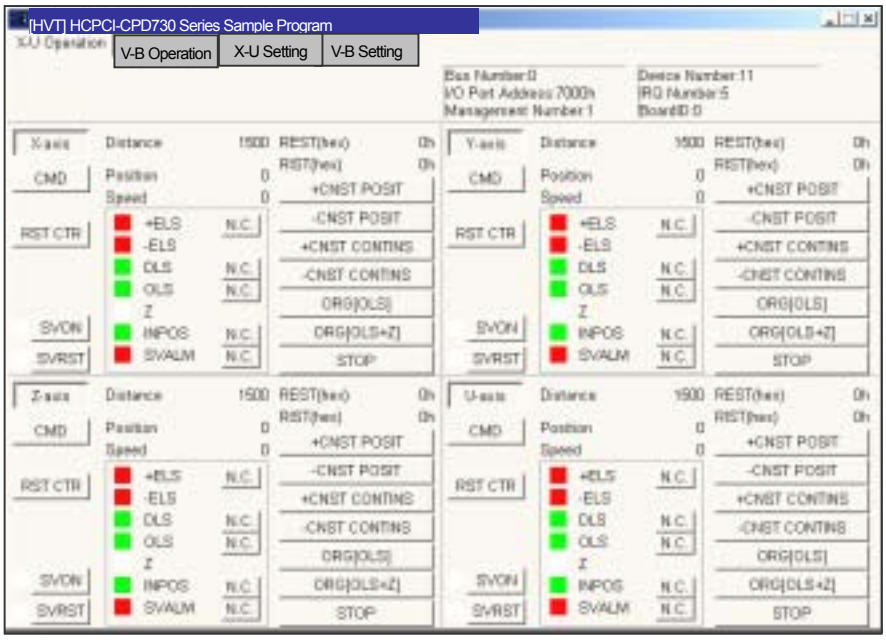
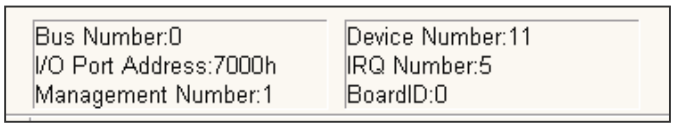


Figure 5. 7-2 Let's try to move Operation Confirmation Window

(1) Device Information Display

The device information for the Board that is currently selected is displayed near the top of the window, as shown below.

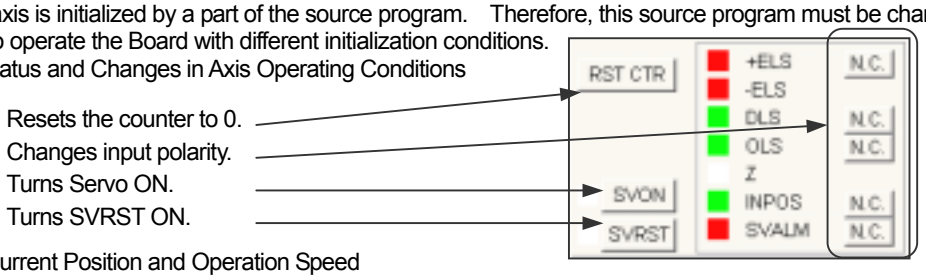


Note 1.The "NTLP: Management Number" will be "-1" in a Win9x or WinMe system.
Note 2.The "Board ID" is the value set with the Board's Board ID jumper pins.
Note 3.The "Device number" (The slot number)

(2) Individual Axis Displays and Operation Commands

The operations are the same for each axis on the Board.
Each axis is initialized by a part of the source program. Therefore, this source program must be changed if you want to operate the Board with different initialization conditions.

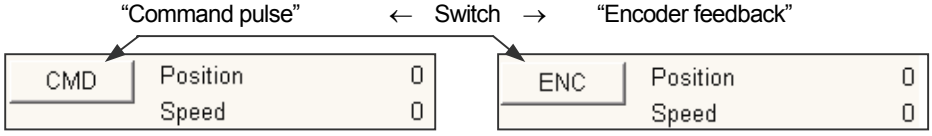
1. Axis Status and Changes in Axis Operating Conditions



2. Axis' Current Position and Operation Speed

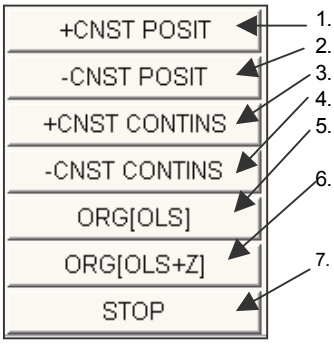
Each axis' current position and NTLP:operation speed is refreshed approximately every 0. 1 s.
The current position display can be switched between the command-output-pulse and the encoder-feedback.

The position is displayed in pulses and the speed is displayed in pps.



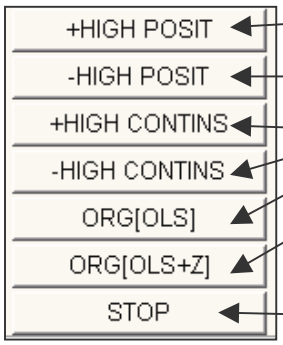
3. Sending Start and Stop Commands to an Axis. Each axis' operation can be set to constant/high-speed positioning operation, constant/high-speed continuous feed operation, constant/high-speed origin returning operation, or Stop. Refer to *5. 7. 2 Let's try to move Settings Window* for details on the axis operating conditions that can be changed.

Setting Constant-speed Operation



1. Positioning in "+" direction at base speed. (Set positioning amount in Settings Window.)
2. Positioning in "–" direction at base speed. (Set positioning amount in Settings Window.)
3. Constant-speed operation in "+" direction at base speed.
4. Constant-speed operation in "–" direction at base speed.
5. Origin returning operation in "–" direction at base speed. When the OLS signal goes ON, operation stops immediately and the origin returning operation is completed.
6. High-speed origin returning operation in "–" direction at operation speed. When the OLS signal goes ON, operation decelerates to base speed. When the first Z-phase input is received, operation stops immediately and the origin returning operation is completed.
7. When operating at operation speed, operation is decelerated to a stop.
   When operating at base speed, operation is stopped immediately.

Setting High-speed Operation



1. High-speed positioning in "+" direction at operation speed.
   (Set positioning amount in Settings Window.)
2. High-speed positioning in "–" direction at operation speed.
   (Set positioning amount in Settings Window.)
3. High-speed operation in "+" direction at operation speed.
4. High-speed operation in "–" direction at operation speed.
5. Origin returning operation in "–" direction at base speed. When the OLS signal goes ON, operation stops immediately and the origin returning operation is completed.
6. High-speed origin returning operation in "–" direction at operation speed. When the OLS signal goes ON, operation decelerates to base speed. When the first Z-phase input is received, operation stops immediately and the origin returning operation is completed.
7. When operating at operation speed, operation is decelerated to a stop.
   When operating at base speed, operation is stopped immediately.

Note 1. Acceleration/deceleration operations use linear acceleration/deceleration.
Note 2. The DLS signal is enabled. If this signal is not being used, set it as an N. O. condition and set it so that it is not input.
Note 3. The INPOS signal is enabled. If this signal is not being used, set it as an N. C. condition and set it so that it is not normally input.
Note 4. The OLS signal detection is rising-edge detection, so the OLS signal will not be detected if the signal is already ON when operation starts. In this case, perform continuous feed operation until the OLS signal goes OFF and then execute the origin returning operation.
Note 5. During operation, if EA/EB error or PA/PB error occur, the"POSIT"Button, the"CONTINS"Button, and the"ORG"Button is enabled.

5.7.2 "Let's try to move" Settings Window

The following settings window will be displayed when all axes were stopped in the Let's try to move Operation Confirmation Window and the **"X-U Setting"** tab was clicked at the top of that Window.

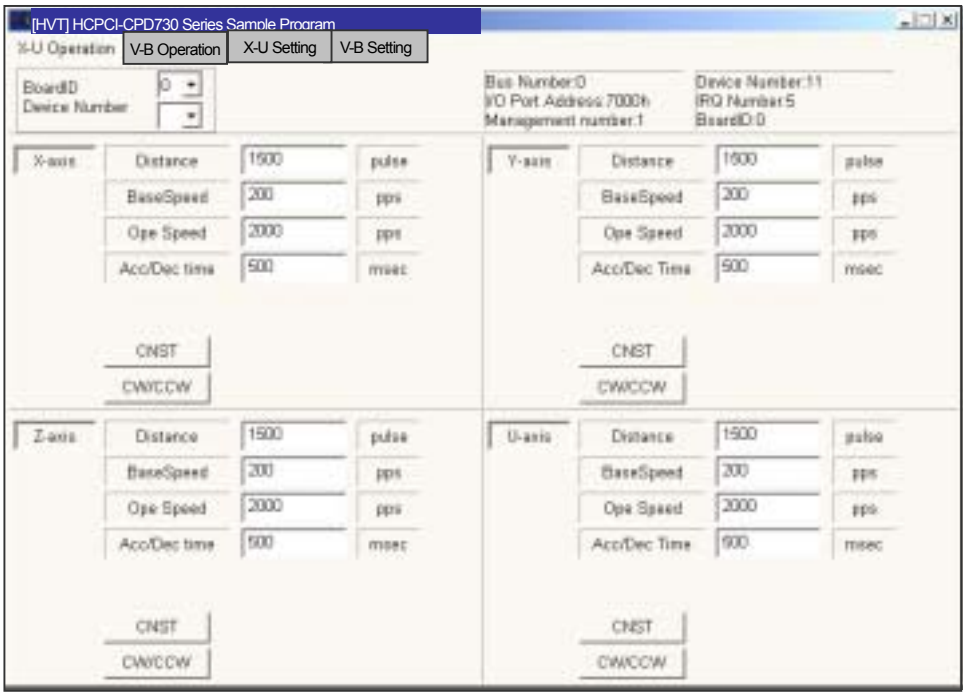
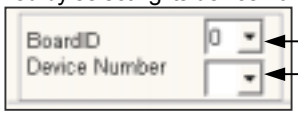


Figure 5. 7-3 Let's try to move Settings Window

(1) Board Selection and Device Information

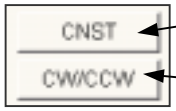
When two or more Boards have been installed in the computer, the Board used for the Let's try to move can be specified by selecting its device number or Board ID, as shown below.



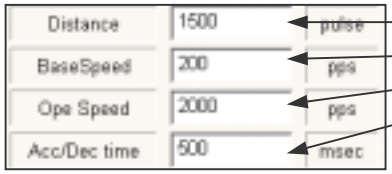
1. Select by Board ID.
2. Select by device number.

(2) Changeable Axis Operating Conditions

The operating conditions can be set individually for each axis that can operate.



1. Switches between constant-speed and high-speed operation. The default setting is constant-speed.
2. The command pulse output format can be switched between discrete and shared pulse methods. The default setting is the discrete pulse method.



1. Sets the travel distance. (1,500)
2. Sets the base speed. (200)
3. Sets the operation speed. (2,000)
4. Sets the acceleration/deceleration time. (500)

Note. The default settings are in parentheses.

Note 1. The setting range for the travel distance is –999,999 to +9,999,999 pulses.

Note 2. The setting ranges for both the base speed and operation speed are 1 to 65,535 pps, although the full setting range may not be usable depending on the combination of settings being used. For the same reason, it may not be possible to use the full setting range of the acceleration/deceleration time depending on the settings made for the operation speed and base speed.

Note 3. If the operation speed is set below the base speed, the motor will accelerate when the speed drops to 400 pps even if it is supposed to decelerate because the Stop command is input, the DLS is ON, or the OLS signal is ON.

Note 4. Error Message

The window shown on the right will be displayed if an invalid setting has been input. Click **OK** and enter a valid setting.