PCI-1241

4-Axis Voltage-type Servo Motor Control Card

PCI-1242

4-Axis Pulse-type Servo motor Control Card

User Manual

Acknowledgments

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Part No. 2003124100 1st Edition

Printed in Taiwan June 2007

2 Year Product Warranty

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech.s high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

CE Notification

The PCI-1241/42, developed by ADVANTECH CO., LTD., has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Technical Support and Assistance

1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:

- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

The package should contain the following items:

- PCI-1241 or PCI-1242 motor control card
- User Manual
- Driver CD-ROM (DLL driver and Utility included)
- 10-pin horn female connector to DB-9 male connectors conversion bracket
- PCI-1242: One bracket with two DB-9 connectors
- PCI-1241: One bracket with two DB-9 connectors and one bracket with one DB-9 connector

Contents

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CHAPTER 1

General Information

This chapter provides general information on the PCI-1241/42.

Sections include:

- Introduction
- Features
- Applications
- How to get Started
- Software Programming Choices
- Accessories

Chapter 1 Introduction

1.1 Introduction

PCI-1242 is a 4-Axis Pulse-type Motion Control Card and PCI-1241 is a 4-axis Pulse/Voltage-command Motion Control Card. In pulse output control, these motion control cards use a synchronous DDA (Digital Differential Analyzer) pulse generator to send out pulses evenly and simultaneously, which successfully realizes synchronous four-axis positioning and motion control.

With a powerful control library, it is suitable for the pulse-type servo motor or stepping motor control. It also can read back motor encoder values through the encoder's input interface.

PCI-1241 provides a proportional control algorithm, which generates voltage output signals between –10V and 10V to drive velocity-type servo motors. This means it can be used for multi-axis precision servo control.

There are three input points for each axis control, including Home position, upper travel limit, and lower travel limit. In addition, there is a servo-on signal output point for each axis. A position ready output point and an emergency stop point is available for the board.

PCI-1241/1242 also supports the PCLD-8241 remote I/O module that saves wires. PCLD-8241 provides 64-ch isolated digital input, 64-ch isolated digital output and the output channels support both sink type and source type output. PCI-1242 can connect with one PCLD-8241 module and PCI-1241 can connect with two PCLD-8241 modules.

1.2 Features

PCI-1241/1242 provides the motor control functions as seen below:

- Independent 4-axis motion control
- Each axis of PCI-1241 can be configured independently as closed loop control (voltage command) or open loop control (pulse command).
- 2/3-axis linear interpolation function
- 2/3-axis circular interpolation function
- Continuous interpolation function
- Multiple group function. 72 groups can be performed at the same time
- One card can support two 2-axis linear/circular interpolation functions at the same time
- Programmable T/S-curve acceleration and deceleration
- Up to 4 MPPS pulse output for each axis
- Three pulse output types: Pulse/Direction, CW/CCW and A/B Phase
- Up to 2 MHz encoder input for each axis
- Equipped with 5 encoder input channels, each encoder channel can be used as MPG or stand alone encoder input channel when its corresponding axis is in pulse command mode
- 3 encoder input types: Pulse/Direction, CW/CCW and A/B/Z Phase.
- 4 onboard digital input channels for Home Sensor Signal of each axis.
- 4 on-board digital input channels for “Positive-direction Limit Switch Signal” of each axis.
- 4 on-board digital input channels for “Negative-direction Limit Switch Signal” of each axis.
- One on-board digital input channel for “Emergency Stop Signal”
- 4 on-board digital output channels for “Servo On Signal” of each axis
- One on-board digital output channel for “Position Ready Signal
- One built-in 24-bit timer and one 16-bit watchdog timer
- Position management and software limit switch function
- Software Board ID
- Free Motion Utility bundled for configuration and diagnosis
- Support PCLD-8241 remote I/O module

1.3 Applications

- Precise X-Y-Z position control
- Precise rotation control
- Packaging and assembly equipment
- Machine control with up to 4 axes
- Semiconductor pick and place and testing equipment
- Other stepping motor and pulse/velocity-type servo motor applications

1.4 How to Get Started

Before you install your PCI-1241/1242 card, please make sure you have the following necessary components:

- PCI-1241 or PCI-1242 motor control card
- PCI-1241/1242 User Manual
- Driver Software, Advantech PCI-1241/1242 DLL drivers
  (Included in the companion CD-ROM)
- Motion Utility
  Advantech PCI-1241_42_61 Motion Utility
  (Included in the companion CD-ROM)
- Wiring cable: PCL-10168, PCL-10109M
- Wiring board: ADAM-3968
- Computer: Personal computer or workstation with a PCI-bus slot

After you get the necessary components and maybe some of the accessories for enhanced operation of your PCI-1241/1242 card, you can begin the installation procedure. Figure 1-1 provides a concise flow chart to give users a broad picture of the software and hardware installation procedures.

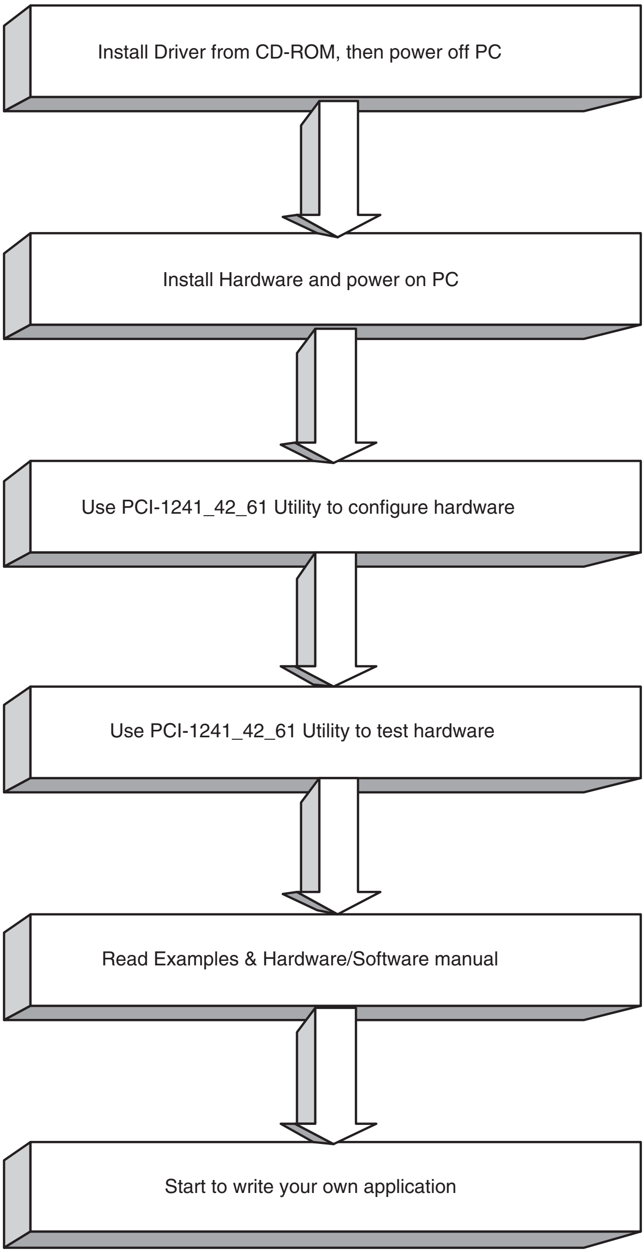

Figure 1.1: Installation Flow Chart

1.5 Software Programming Choices

Advantech offers complete DLL drivers and utility support to help fully exploit the functions of your PCI-1241/1242.

- Driver Software: Advantech PCI-1241/1242 DLL drivers
  (Included in the companion CD-ROM)

- Motion Utility: Advantech PCI-1241_42_61 Utility
  (Included in the companion CD-ROM)

1.6 Accessories

Advantech offers a complete set of accessory products to support the PCI-1241/1242 cards. These accessories include:

1.6.1 Wiring Cables

- PCL-10168
  The PCL-10168 shielded cable is specially designed for PCI-1241/1242 motion control cards to provide high resistance to noise. To achieve a better signal quality, the signal wires are twisted in such a way as to form a “twisted-pair cable”, reducing cross-talk and noise from other lines are separately sheathed and shielded to neutralize EMI/EMC problems.
- PCL-10109M
  The PCL-10109M shielded cable is specially designed for PCI-1241/1242 motion control card to provide high resistance to noise. To achieve a better signal quality, the signal wires are twisted in such a way as to form a “twisted-pair cable”, reducing cross-talk and noise from other lines are separately sheathed and shielded to neutralize EMI/EMC problems.

1.6.2 Wiring Board

- ADAM-3968 The ADAM-3968 is a pin-to-pin wiring board for PCI-1241, PCI-1242, which supports DIN rail mounting

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CHAPTER 2

Installation

This chapter provides information on the installation of PCI-1241/42.

Sections include:

- Software Installation
- Hardware Installation

Chapter 2 Installation

2.1 Software Installation

We recommend you to install the driver before you install the PCI-1241/42 card into your system, since this will guarantee a smooth installation process.

The 32-bit DLL driver Setup program for the card is included on the companion CD-ROM that is shipped with your DAS card package. Please follow the steps below to install the driver software:

Step 1: Insert the companion CD-ROM into your CD-ROM drive.

Step 2: The Setup program will be launched automatically if you have the auto-play function enabled on your system. When the Setup Program is launched, you'll see the following Startup Screen. Then just follow the installation instructions step by step to complete your DLL driver setup. The Setup program can detect your operating system automatically and install proper files into the system accordingly.

Note: *If the auto-play function is not enabled on your computer, use Windows Explorer or Windows Run command to execute SETUP.EXE on the companion CD-ROM.*

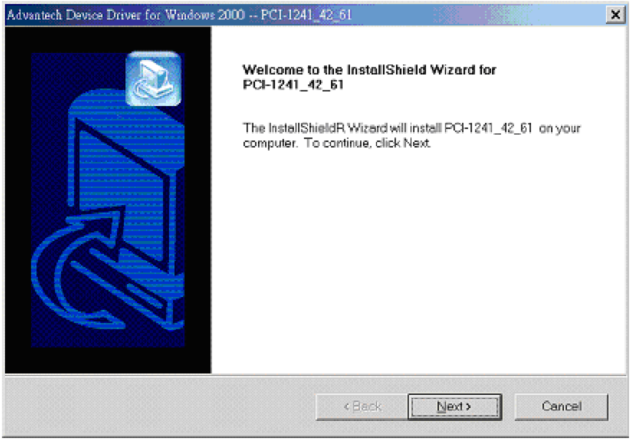


Figure 2.1: The Setup Screen of Advantech Automation Software

Step 3: After the installation completed, you will find PCI-1241/1242/1261 Card Index Manager, User Manual and Utility under the following default path: Start\Programs\Advantech Automation\Motion\PCI-1241_42_61

The example source codes can be found under the corresponding installation folder such as the default installation path:

C:\Program Files\Advantech\Motion\PCI-1241_42_61\Examples

2.2 Hardware Installation

After the DLL driver installation is completed, you can now go on to install the PCI-1241/42 card in any PCI slot on your computer. It is suggested that you refer to the computer user manual or related documentations if you have any doubt. Please follow the steps below to install the card on your system.

Step 1: Turn off your computer and unplug the power cord and cables.

Step 2: Remove the cover of your computer.

Step 3: Remove the slot cover on the back panel of your computer.

Step 4: Touch the metal part on the surface of your computer to neutralize the static electricity that might be on your body.

Step 5: Insert the PCI-1241/42 card into a PCI slot. Hold the card only by its edges and carefully align it with the slot. Insert the card firmly into place. Use of excessive force must be avoided, otherwise the card might be damaged.

Step 6: Fasten the bracket of the PCI card on the back panel rail of the computer with screws.

Step 7: Connect appropriate accessories (conversion bracket, 68-pin cable, 9-pin cable, wiring terminals, etc. if necessary) to the PCI card.

Step 8: Replace the cover of your computer chassis. Re-connect the cables you removed in step 1.

Step 9: Plug in the power cord and turn on the computer.

2.2.1 Board Layout and Jumper/Switch Settings

Figure 2.2 shows the names and locations of jumpers and VRs on the PCI-1241/1242. There are 5 jumpers and 4 VRs on PCI-1241/1242. Table 2-1 shows jumpers and VRs functionalities..

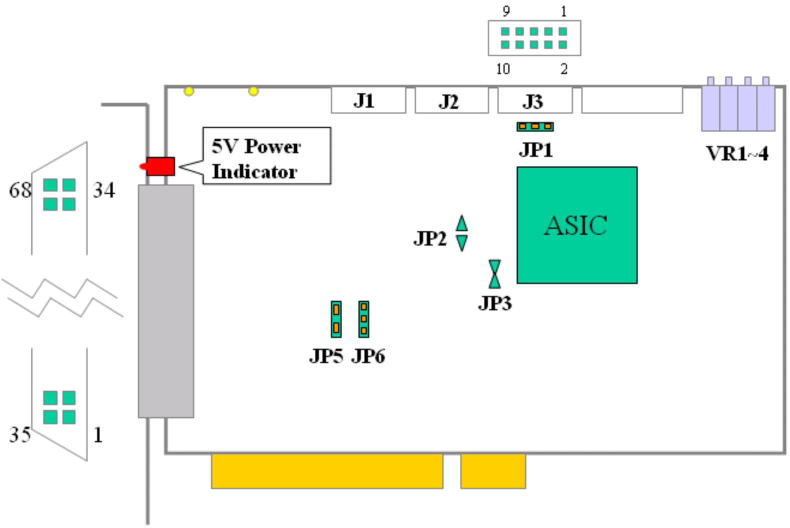


Figure 2.2: Location of Jumpers and VRs on PCI-1241/42

Table 2.1: Summary of Jumper and Connector Settings

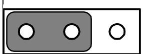
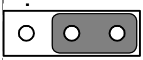
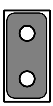
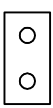
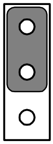
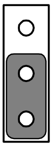
Jumpers No.	Function Description	
J1	Remote I/O channel 1 for PCLD-8241, 10-pin simple horn female connector type	
J2 (PCI-1241 only)	Remote I/O channel 2 for PCLD-8241, 10-pin simple horn female connector type	
J3	Encoder Input channel for Manual Pulse Generator (MPG), 10-pin simple horn female connector type	
JP1		Set pin 9 of J3 as +5V power for MPG wiring (Default Setting)
		Set pin 9 of J3 as +12 V power for MPG wiring
JP2 / JP3	JP2: Open JP3: Short	Use on-board 40 MHz oscillator as CLOCK source (Default Setting)
	JP2: Short JP3: Open	Solder metal pads of JP2 and cut off metal pads of JP3. Use OSC signal (33MHz) on PCI Bus as CLOCK source
JP5		Disable emergency stop function. Value is always 0 (Default Setting)
		Enable emergency stop function. Value is read from E_STOP channel

Table 2.1: Summary of Jumper and Connector Settings		
JP6		Set Local Input channels as source type. On-board Common Input of Local Input Channel connects to VEX pin. (Default) Setting)
		Set Local Input channels as sink type. On-board Common Input of Local Input Channel connects to VEX_GND pin.
VR1~VR4 (PCI-1241 only)	Variable resistors to adjust voltage output channels OFFSET voltage: VR1 is for channel A0_VO OFFSET voltage VR2 is for channel A1_VO OFFSET voltage VR3 is for channel A2_VO OFFSET voltage VR4 is for channel A3_VO OFFSET voltage	

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CHAPTER 3

Signal Connections

This chapter provides useful information about how to connect input and output signals to the PCI-1241/1242 via the I/O connector.

Sections include:

- I/O Connector Pin Assignments
- Voltage Output Connection
- Pulse Output Connection
- Local Input Connection
- Local Output Connection
- Local I/O Wiring Example

Chapter 3 Signal Connections

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly. A good signal connection can avoid unnecessary and costly damage to your PC and other hardware devices.

3.1 I/O Connector Pin Assignments

There are four I/O connectors on the PCI-1241/1242. J1 is internal on-board 10-pin simple horn connector for remote I/O module PCLD-8241. J2 is also for PCLD-8241 and provided by PCI-1241 only. J3 is also a internal on-board 10-pin simple horn connector to provide encoder input channel for manual pulse generator (MPG) device, and the final one is a SCSI-II 68-pin connector that enables you to connect to accessories with the PCL-10168 shielded cable. Figure 3-1 and Figure 3-2 show the pin assignment of remote I/O channels. Figure 3-3 shows pin assignment of MPG channel. Figure 3-4 shows the pin assignments for the 68-pin I/O connector on the PCI-1241/1242. Table 3-1 to Table 3-7 show their I/O connector signal descriptions.

NC	10	9	RIO1_SDOP
RIO1_SDIP	8	7	RIO1_SCSP
RIO1_CLKP	6	5	RIO1_GND
RIO1_SDON	4	3	RIO1_SDIN
RIO1_SCSN	2	1	RIO1_CLKN

Figure 3.1: J1 Remote I/O Connector Pin Assignments

Table 3.1: PCI-1241/1242 I/O J1 Conn. Signal Description – Remote I/O				
Pin No.	**Signal Name**	**Reference**	**Direction**	**Description**
6	RIO1_CLKP	-	Output	RI/O Ch. 1 Clock Output +
1	RIO1_CLKN	-	Output	RI/O Ch. 1 Clock Output -
7	RIO1_SCSP	-	Output	RI/O Ch. 1 Slave Module Activation Signal +
2	RIO1_SCSN	-	Output	RI/O Ch. 1 Slave Module Activation Signal -
8	RIO1_SDIP	-	Input	RI/O Ch. 1 Data Input +
3	RIO1_SDIN	-	Input	RI/O Ch. 1 Data Input -
9	RIO1_SDOP	-	Output	RI/O Ch. 1 Data Output +
4	RIO1_SDON	-	Output	RI/O Ch. 1 Data Output -
5	RIO1_GND	-	-	Ground
10	NC	-	-	No Connection

NC	10	9	RIO2_SDIP
RIO2_SDOP	8	7	RIO2_SCSP
RIO2_CLKP	6	5	RIO2_GND
RIO2_SDIN	4	3	RIO2_SDON
RIO2_SCSN	2	1	RIO2_CLKN

Figure 3.2: J2 Remote I/O Connector Pin Assignments

Table 3.2: PCI-1241/1242 I/O J2 Conn. Signal Description – Remote I/O

Pin No	Signal Name	Reference	Direction	Description
6	RIO2_CLKP	-	Output	RI/O Channel 2 Clock Output +
1	RIO2_CLKN	-	Output	RI/O Channel 2 Clock Output -
7	RIO2_SCSP	-	Output	RI/O Channel 2 Slave Module Activation Signal +
2	RIO2_SCSN	-	Output	RI/O Channel 2 Slave Module Activation Signal -
8	RIO2_SDIP	-	Input	RI/O Channel 2 Data Input +
3	RIO2_SDIN	-	Input	RI/O Channel 2 Data Input -
9	RIO2_SDOP	-	Output	RI/O Channel 2 Data Output +
4	RIO2_SDON	-	Output	RI/O Channel 2 Data Output -
5	RIO2_GND	-	-	Ground
10	NC	-	-	No Connection

MPG_VCC	10	9	MPG_VCC
MPG_ECZN	8	7	MPG_ECBN
MPG_ECAN	6	5	MPG_GND
MPG_GND	4	3	MPG_ECZP
MPG_ECBP	2	1	MPG_ECAP

Figure 3.3: J3 MPG connector pin assignments

Table 3.3: PCI-1241/1242 I/O J3 Conn. Signal Description – MPG Input

Pin No.	Signal Name	Reference	Direction	Description
1	MPG_ECAP	-	Input	MPG Encoder Input Phase A
6	MPG_ECAN	-	Input	MPEG Encoder Input Phase A/
2	MPG_ECBP	-	Input	MPG Encoder Input Phase B
7	MPG_ECBN	-	Input	MPG Encoder Input Phase B/
3	MPG_ECZP	-	Input	MPG Encoder Input Phase Z
8	MPG_ECZN	-	Input	MPG Encoder Input Phase Z/
9, 10	MPG_VCC	MPG_GND	Output	+5/12V Output, JP1 jumper selection
4, 5	MPG_GND	-	-	Ground

Signal	Pin	Pin	Signal
A3_PBN	68	34	A2_PBN
A3_PBP	67	33	A2_PBP
A3_PAN	66	32	A2_PAN
A3_PAP	65	31	A2_PAP
A1_PBN	64	30	A0_PBN
A1_PBP	63	29	A0_PBP
A1_PAN	62	28	A0_PAN
A1_PAP	61	27	A0_PAP
A3_ECZN	60	26	A2_ECZN
A3_ECZP	59	25	A2_ECZP
A3_ECBN	58	24	A2_ECBN
A3_ECBP	57	23	A2_ECBP
A3_ECAN	56	22	A2_ECAN
A3_ECAP	55	21	A2_ECAP
A1_ECZN	54	20	A0_ECZN
A1_ECZP	53	19	A0_ECZP
A1_ECBN	52	18	A0_ECBN
A1_ECBP	51	17	A0_ECBP
A1_ECAN	50	16	A0_ECAN
A1_ECAP	49	15	A0_ECAP
A3_SERVON	48	14	A2_SERVON
A3_LMT-	47	13	A2_LMT-
A3_LMT+	46	12	A2_LMT+
A3_HOME	45	11	A2_HOME
A1_SERVON	44	10	A0_SERVON
A1_LMT-	43	9	A0_LMT-
A1_LMT+	42	8	A0_LMT+
A1_HOME	41	7	A0_HOME
P_RDY	40	6	E_STOP
VEX_GND	39	5	VEX
VO_VCC	38	4	A3_VO
A2_VO	37	3	A1_VO
A0_VO	36	2	GND
GND	35	1	GND

Figure 3.4: SCSI-II 68-pin Connector Pin Assignments

Table 3.4: PCI-1241/1242 I/O Conn. Signal Desc. – DDA Pulse Output

Pin No.	Signal Name	Reference	Direction	Description
27	A0_PAP	-	Output	Axis 0 Pulse Output Phase A
28	A0_PAN	-	Output	Axis 0 Pulse Output Phase A/
29	A0_PBP	-	Output	Axis 0 Pulse Output Phase B
30	A0_PBN	-	Output	Axis 0 Pulse Output Phase B/
61	A1_PAP	-	Output	Axis 1 Pulse Output Phase A
62	A1_PAN	-	Output	Axis 1 Pulse Output Phase A/
63	A1_PBP	-	Output	Axis 1 Pulse Output Phase B
64	A1_PBN	-	Output	Axis 1 Pulse Output Phase B/
31	A2_PAP	-	Output	Axis 2 Pulse Output Phase A
32	A2_PAN	-	Output	Axis 2 Pulse Output Phase A/
33	A2_PBP	-	Output	Axis 2 Pulse Output Phase B
34	A2_PBN	-	Output	Axis 2 Pulse Output Phase B/
65	A3_PAP	-	Output	Axis 3 Pulse Output Phase A
66	A3_PAN	-	Output	Axis 3 Pulse Output Phase A/
67	A3_PBP	-	Output	Axis 3 Pulse Output Phase B
68	A3_PBN	-	Output	Axis 3 Pulse Output Phase B/

Table 3.5: PCI-1241/1242 I/O Conn. Signal Desc. – Encoder Input

Pin No.	Signal Name	Reference	Direction	Description
15	A0_ECAP	-	Input	Axis 0 Encoder Input Phase A
16	A0_ECAN	-	Input	Axis 0 Encoder Input Phase A/
17	A0_ECBP	-	Input	Axis 0 Encoder Input Phase B
18	A0_ECBN	-	Input	Axis 0 Encoder Input Phase B/
19	A0_ECZP	-	Input	Axis 0 Encoder Input Phase Z
20	A0_ECZN	-	Input	Axis 0 Encoder Input Phase Z/
49	A1_ECAP	-	Input	Axis 1 Encoder Input Phase A
50	A1_ECAN	-	Input	Axis 1 Encoder Input Phase A/
51	A1_ECBP	-	Input	Axis 1 Encoder Input Phase B
52	A1_ECBN	-	Input	Axis 1 Encoder Input Phase B/
53	A1_ECZP	-	Input	Axis 1 Encoder Input Phase Z
54	A1_ECZN	-	Input	Axis 1 Encoder Input Phase Z/
21	A2_ECAP	-	Input	Axis 2 Encoder Input Phase A
22	A2_ECAN	-	Input	Axis 2 Encoder Input Phase A/
23	A2_ECBP	-	Input	Axis 2 Encoder Input Phase B
24	A2_ECBN	-	Input	Axis 2 Encoder Input Phase B/
25	A2_ECZP	-	Input	Axis 2 Encoder Input Phase Z
26	A2_ECZN	-	Input	Axis 2 Encoder Input Phase Z/
55	A3_ECAP	-	Input	Axis 3 Encoder Input Phase A
56	A3_ECAN	-	Input	Axis 3 Encoder Input Phase A/
57	A3_ECBP	-	Input	Axis 3 Encoder Input Phase B
58	A3_ECBN	-	Input	Axis 3 Encoder Input Phase B/
59	A3_ECZP	-	Input	Axis 3 Encoder Input Phase Z
60	A3_ECZN	-	Input	Axis 3 Encoder Input Phase Z/

Table 3.6: PCI-1241/1242 I/O Connector Signal Description – Local I/O

Pin No.	Signal Name	Reference	Direction	Description
7	A0_HOME	VEX_GND	Input	Axis 0 Home Sensor Input
8	A0_LMT+	VEX_GND	Input	Axis 0 + Direction Limit Input
9	A0_LMT-	VEX_GND	Input	Axis 0 - Direction Limit Input
10	A0_SERVON	VEX_GND	Output	Axis 0 Servo On Output
41	A1_HOME	VEX_GND	Input	Axis 1 Home Sensor Input
42	A1_LMT+	VEX_GND	Input	Axis 1 + Direction Limit Input
43	A1_LMT-	VEX_GND	Input	Axis 1 - Direction Limit Input
44	A1_SERVON	VEX_GND	Output	Axis 1 Servo On Output
11	A2_HOME	VEX_GND	Input	Axis 2 Home Sensor Input
12	A2_LMT+	VEX_GND	Input	Axis 2 + Direction Limit Input
13	A2_LMT-	VEX_GND	Input	Axis 2 - Direction Limit Input
14	A2_SERVON	VEX_GND	Output	Axis 2 Servo On Output
45	A3_HOME	VEX_GND	Input	Axis 3 Home Sensor Input
46	A3_LMT+	VEX_GND	Input	Axis 3 + Direction Limit Input
47	A3_LMT-	VEX_GND	Input	Axis 3 - Direction Limit Input
48	A3_SERVON	VEX_GND	Output	Axis 3 Servo On Output
6	E_STOP	VEX_GND	Input	Emergency Stop (for all axes)
40	P_RDY	VEX_GND	Output	Position Ready Output
5	VEX	VEX_GND	Input	External Power (24VDC) for Local Digital Output
39	VEX_GND	-	-	Ground for Local Digital Output

Table 3.7: PCI-1241 I/O Conn. Signal Desc. – Voltage Output & Others

Pin No.	Signal Name	Reference	Direction	Description
36	A0_VO	GND	Output	Axis 0 Voltage Output
3	A1_VO	GND	Output	Axis 1 Voltage Output
37	A2_VO	GND	Output	Axis 2 Voltage Output
4	A3_VO	GND	Output	Axis 3 Voltage Output
38	VO_VCC	GND	Output	+5V Output (500mA max.)
1, 2, 35	GND	-	-	Ground

Note: Pin 36, 3, 37, 4 are provided by PCI-1241 only

3.2 Voltage Output Connection (PCI-1241 only)

PCI-1241 supports 4-axis voltage output channels for servo driver control. PCI-1241 provides proportional-type close loop control mode, and each axis can be configured as close loop control mode or not independently.

3.2.1 Voltage Output Specifications

- Resolution: 16 bits
- Power on value: 0V
- External load: must be over 2K
- Output range: ±10V maximum

3.2.2 Wiring Consideration

The follows is the wiring considerations and Figure 3-5 shows wiring diagram between PCI-1241 and velocity-type SERVO MOTOR DRIVER.

Four voltage output channels of PCI-1241 are A0_VO, A1_VO, A2_VO and A3_VO. These four channels are velocity command output for connecting with Vcmd input channels of SERVO MOTOR DRIVER accordingly.

Be noted that PCI-1241 ground channel GND must be connected to ground pin of SERVO MOTOR DRIVER.

The motor encoder signal of SERVO MOTOR DRIVER (A/B/Z signals) must be connected back to PCI-1241 in DIFFERENTIAL form. It's recommended that the three sets of singles A, A/, B, B/ and Z, Z/ are suggested using twisted pair cable to reduce common mode noise. In addition, as shown in Figure 3-5 the shield net is used to reduce the interference of electromagnet.

Connect one side of the shield net to the external housing of SCSI-II 68-pin connector (connected to PC frame ground) and the other side to SERVO MOTOR DRIVER FG (Frame Ground). It helps to make sure that Frame Ground of both PC and SERVO MOTOR DRIVER has connected together to the same field ground.

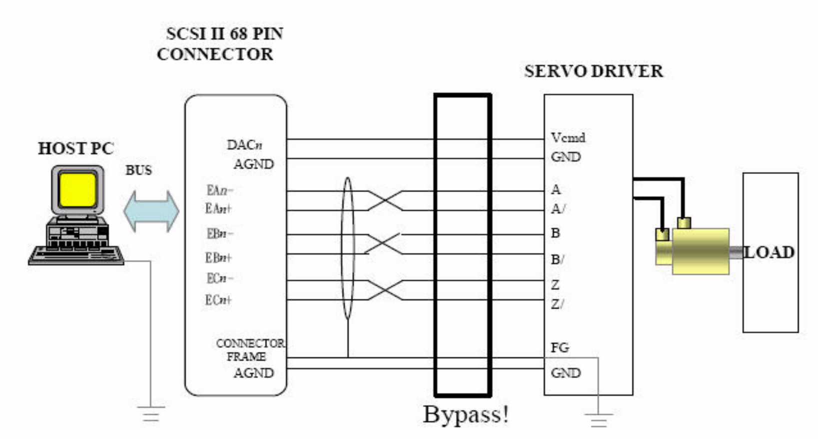


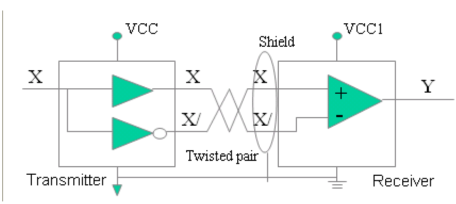
Figure 3.5: Wiring Diagram between PCI-1241 and Servo Motor Driver

3.3 Pulse Output Connection

PCI-1241/1242 supports 4-axis pulse output channels for pulse-type servo motor driver and stepping motor driver control.

Pulse Output Specifications

- Differential signal transmission method.
  Refer to Figure 3-6. A transmitter will convert the input signal X into X and X/ before outputting, and a receiver will compare the X and X/ inputs to obtain Y. Its truth table is shown in Figure 3-7. The advantage of using the differential signal transmission method is that it eliminates common mode noise. Please note that the reference point for the transmitter and the receiver must be connected to prevent current leakage from damaging the sending and receiving end due to potential differences.
- Pulse output format.
  A/B Phase, CW/CCW, Pulse/Direction (please refer to Figure 3-7). In A/B Phase mode, the encoder input signal can also be multiplied by 0 (input forbidden), 1, 2 or 4 times.
- A*_ECAP and A*_ECBP channels support polarity reversion.
- A*_ECAP and A*_ECBP channels support interchange function.
- Line driver: MC3487, output with 5V differential method.



Transmitter	Transmission Signals		Receiver
X	X	X/	Y
0	0	1	0
1	1	0	1

Figure 3.6: Differential Signal Transmission Method

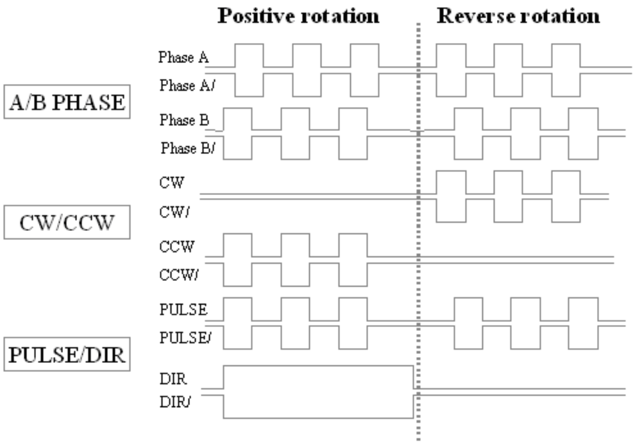


Figure 3.7: Pulse Output Format

Wiring Considerations

The following is the wiring considerations, and Figure 3-8 shows the wiring diagram between PCI-1241/42 and the pulse-type servo motor driver and stepping motor driver.

- The four pulse output channels of PCI-1241/42 are A*_PAP, A*_PAN, A*_PBP and A*_PBN. These channels are pulse command outputs for connecting with P+, P+/, P- and P-/ channels of the pulse-type servo motor driver / stepping motor driver accordingly, as shown in Figure 3-8.
- Be noted that PCI-1241/42 ground channel GND must be connected to the ground pin of the motor driver.
- It's recommended to use twisted wires with shielding mesh for signal transmission.

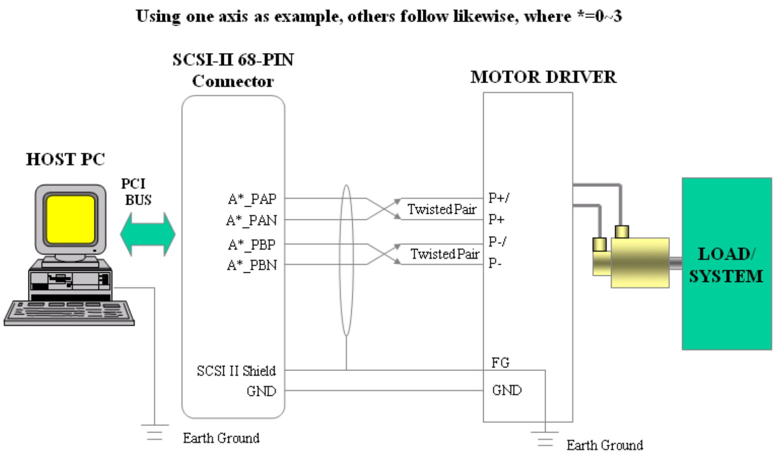


Figure 3.8: Wiring Diagram Between PCI-1241/42 and Pulse-Type Driver

3.4 Local Input Connection

PCI-1241/42 provides 13 dedicated input channels. There are four types of local input channels:

- 4-channel Positive-direction Limit Switch Inputs
  – A0_LMT+, A1_LMT+, A2_LMT+, and A3_LMT+.
- 4-channel Negative-direction Limit Switch Signal
  – A0_LMT-, A1_LMT-, A2_LMT-, and A3_LMT-.
- 4-channel Home Sensor Inputs
  – A0_HOME, A1_HOME, A2_HOME, and A3_HOME.
- 1-channel Emergency Stop Input
  – E_STOP

Local Input Specifications

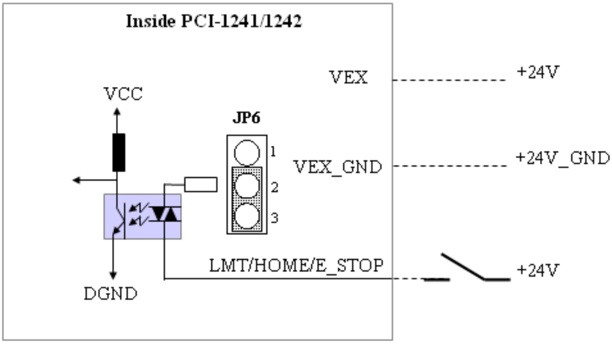
- Active (Logic 0 in real hardware signal) when input voltage is between 18 V and 30 V
- Inactive (Logic 1 in real hardware signal) when input voltage is between 0 V and 1 V
- 2500 VDC isolation protection
- The response time of the circuitry is 3 μsec because of the delay of photo coupling and the RC filter.

Emergency Input

If an emergency stop occurs (value is 1), pulse outputs will be disabled, voltage output values become 0 V and PCI-1241/42's built-in LATCH will latch the status of the emergency stop channel.

Bouncing State

When the mechanical switch in Figure 3-9 is turned from "Open" to "Close", the switch will generate a bouncing state. At this time the reading value will oscillate between 0 and 1. When bounce ends, the switch conducts and the status becomes ACTIVE. On the other hand, when the mechanical switch is turned from "Close" to "Open", the bouncing state lasts only for a short while



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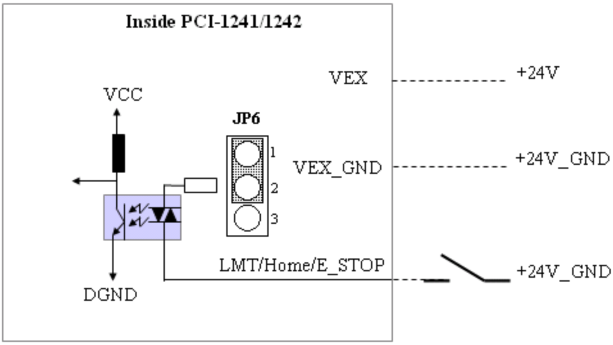


Figure 3.9: Local Input Wiring Diagram

3.5 Local Output Connection

PCI-1241/42 provides 5 dedicated output channels, and Figure 3-10 shows wiring diagram of local output channels. There are two types of local output channels:

- 4-channel Servo On Outputs – A0_SERVON, A1_SERVON, A2_SERVON, and A3_SERVON.
- 1-channel Position Ready Output – P_RDY.

Local Output Specifications

- Output voltage: Open collector 5 ~ 40 VDC
- Sink current: 100mA max. / channel; 500mA max. total
- 2500VDC isolation protection

Output Type

PCI-1241/42 output channels are all open collectors. When the output signal value is “0”, an open collector channel is in “ON” state and the load is activated. When the output signal value is “1”, an open collector channel is in “OFF” state.

Driving Capability

Maximum driving capability of each output load of each channel is 100 mA and overall maximum driving capability is 500 mA.

Warning: *DO NOT connect the 24 V power to output channels directly when there is no load. This will damage the board!*

Connecting RELAY

When the load is a RELAY, it's not necessary for you to connect an external diode to absorb pulse noise because there is an instant over voltage protection diode onboard.

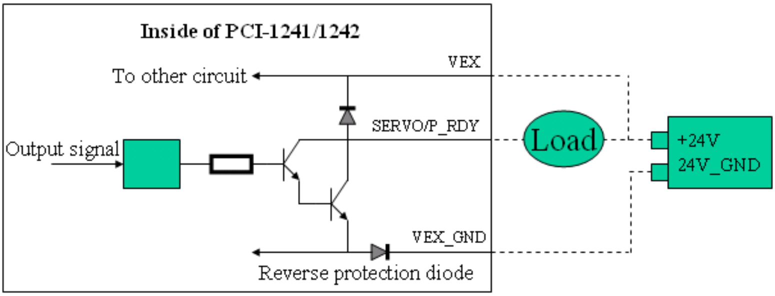
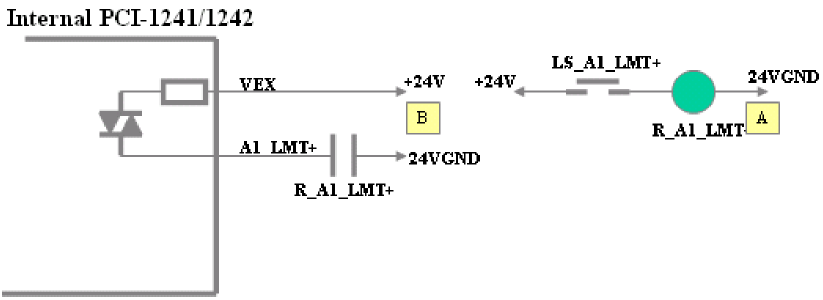


Figure 3.10: Local Output Wiring Diagram

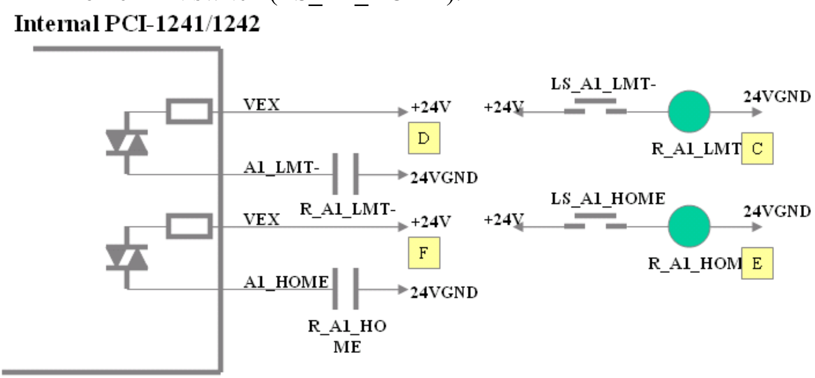
3.6 Local I/O Wiring Example

In this section, it shows a local I/O wiring example of PCI-1241/42 that helps you to setup a system quickly. Figure 3-8 and Figure 3-9 show examples of PCI-1241/42 local I/O wiring diagram of axis one. In the example, all input channels are configured as source type. (Short pin 1 and pin 2 of JP6).

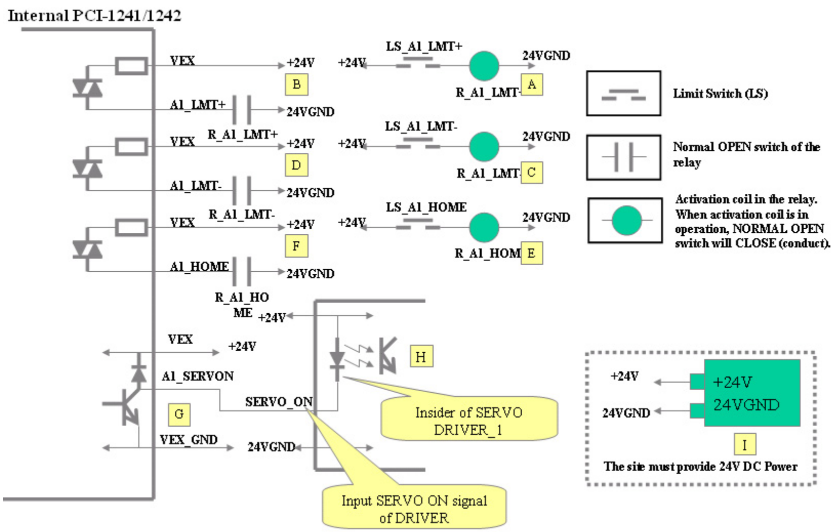
- Please refer to A zone:
  When the first axis moves through the limit switch (LS_A1_LMT+), the RELAY (indicated as R_A1_LMT+) will be activated. At this time, the NORMAL OPEN switch (R_A1_LMT+)(in zone B) will close and enable the current to flow into the A1_LMT+ point on the SCSI-II 68-pin connector. Now, the reading of A1_LMT+ on PCI-1241/42 will change from 1 to 0.



- For the same reason as above, zone C and zone D are for the negative-direction limit switch (LS_A1_LMT-). Zone E and zone F are for the home limit switch (LS_A1_HOME).



- G and H zones: When the servo-ON signal of the first axis (A1_SERVON) is changed from 1 to 0, the open collector output stage is conductive, allowing current to flow through it and enable driver to servo-on. (For the definition of SERVO On please refer to the SERVO MOTOR DRIVER manual).
- Zone I is the 24 VDC power for wiring on-site. Beware that if more than two 24 V power sources are used they must have common ground. In addition, the conducting wire should be thick enough to avoid excessive voltage drops resulting in errors



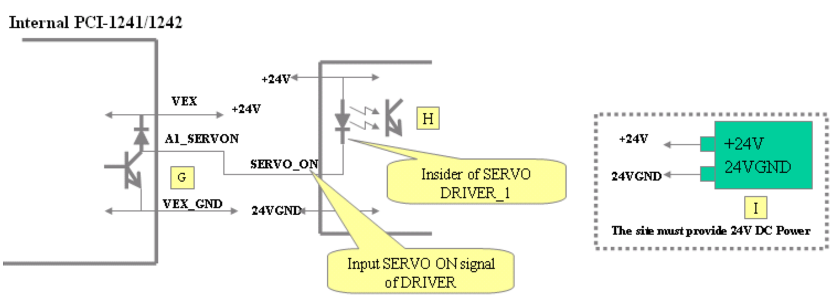


Figure 3.11: Local I/O Wiring Example of Axis One (I)

- Zone J: Under normal conditions the emergency stop switch is CLOSED. Therefore, a current loop forms in the E_STOP circuit. At this time, the reading of E_STOP is 0 and the RELAY(R_E_STOP) is activated. When the E_STOP switch is pressed down, the input current loop cuts off. The signal value of E_STOP becomes 1 and PCI-1241/1242 will disable pulse output and make the output of DAC become 0 V.

Caution: *The E_STOP function is disabled when JP5 (E_STOP) is shorted. (Default: JP5 short). For emergency stop function works properly, it is necessary to remove the jumper on JP5 (E_STOP).*

- Zone K: The software can use P_RDY point (position ready) to communicate with a peripheral circuit to inform that the software state is ready. Using P_RDY, the P_RDY value in PCI-1241/1242 software should be changed from 1 to 0.
- Zone L: NFB (No Fuse Break for 110 or 220 VAC).
- Zone M: Controllable electromagnetic contactor. The control activation coil is labeled MC.
- Zone N: The ALARM signal of SERVO MOTOR DRIVER.
- Zone O: In zone J, if the E_STOP switch is not pressed down, the linked switch R_E_STOP is closed. In zone K, if the system outputs a POSITION READY signal, the linked switch R_P_RDY is closed. In zone N, if the driver operates normally, the linked switch ALARM is opened. If the above conditions are all hold and the SERVO ON switch is closed, the current loop in Zone O holds and relay MR is activated. It makes the linked switch MR in zone P closed and then the control coil MC of the magnetic contact M is activated. Finally the magnetic contact M is closed and the power to the driver is linked.

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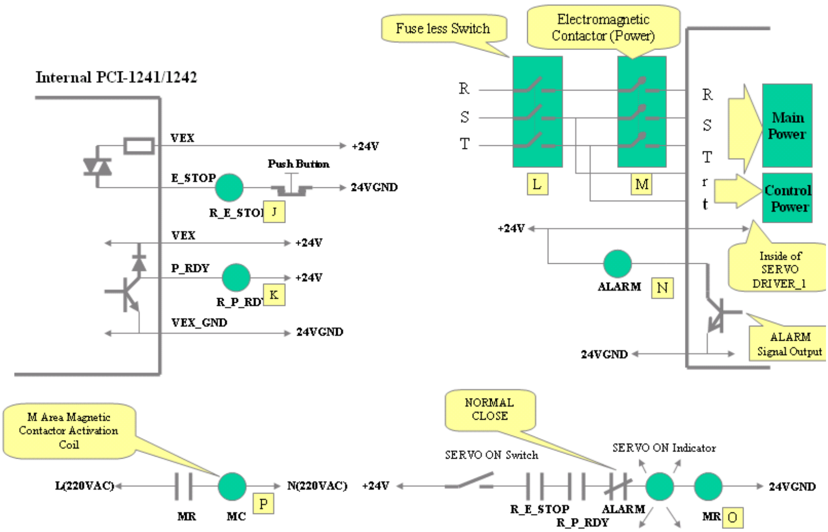


Figure 3.12: Local I/O Wiring Example of Axis One (II)

3.6.1 MPG Encoder Input Connection

In PCI-1241/1242, we provide 5 encoder input channels. Four encoder input channels are for the MOTOR DRIVER connection, and the 5th encoder input channel is specially designed for the manual pulse generator (MPG) device connector. There is an on-board 10-pin simple horn male connector (J3) on PCI-1241/1242. For PCI-1241/1242, we offer accessories such as a conversion bracket with flat cable. One side of the flat cable is a 10-pin simple horn female connector for connecting to the J3 on PCI-1241/1242. The other end of the flat cable is a DB-9 male connector for connecting to external MPG devices. Figure 3-13 shows the pin assignment of the DB-9 male connector on the conversion bracket and Figure 3-14 shows its wiring diagram.

Pin 9 MPG_VCC is a power pin that provides +5V or +12V power output selected by jumper JP1 and has a fuse protected design.

Fuse specifications:

- 0.5A Normal, Imax: 40A, Vmax: 13V
- Time-to-Trip: 0.002sec@40A, 100sec@1A

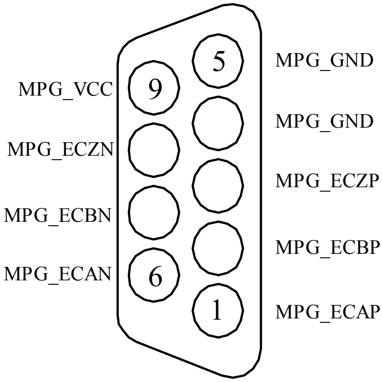


Figure 3.13: MPG Encoder Input DB-9 Connector Pin Assignment

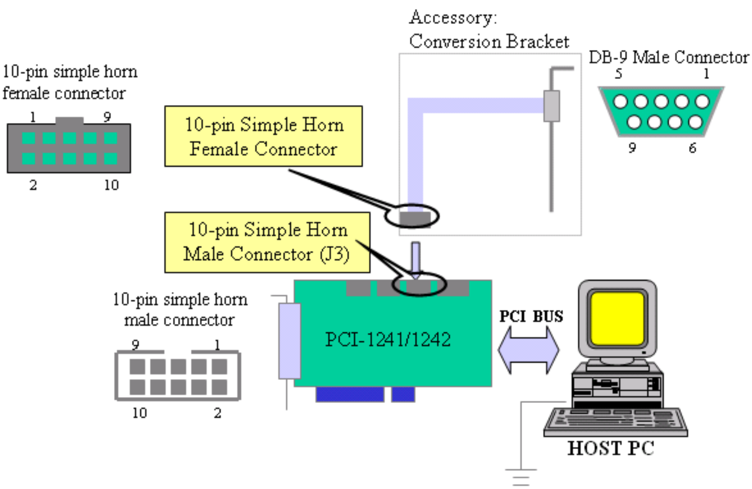


Figure 3.14: MPG Encoder Input Wiring Diagram

3.6.2 Remote I/O Connection

In PCI-1241/42, we provide capability to connect to the PCLD-8241 remote I/O module. The remote I/O module PCLD-8241 is designed to save wiring. The wiring cable between PCI-1241/42 and PCLD-8241 is a DB-9 serial cable. PCI-1241/42 supports one PCLD-8241 module.

PCLD-8241 has 64 channels of isolated digital inputs and 64 channels of isolated digital outputs. For PCI-1241/42, we offer a conversion bracket accessory with flat cable for remote I/O wiring. Figure 3-15 shows the pin assignment of DB-9 male connector on a conversion bracket and Figure 3-16 shows the wiring diagram.

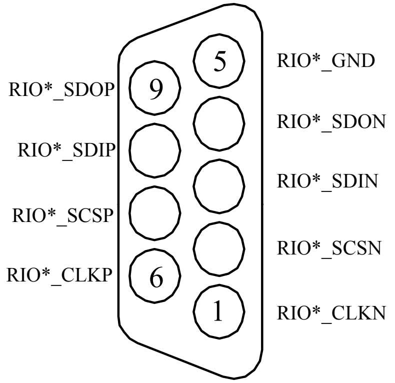


Figure 3.15: Remote I/O DB-9 Connector Pin Assignment

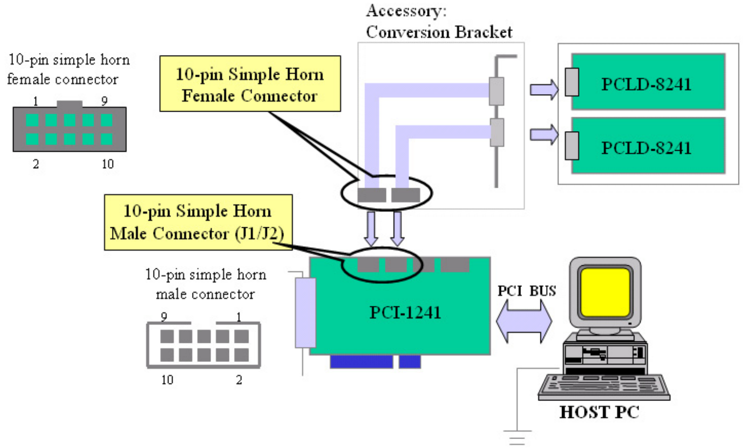


Figure 3.16: Remote I/O Wiring Diagram in PCI-1241

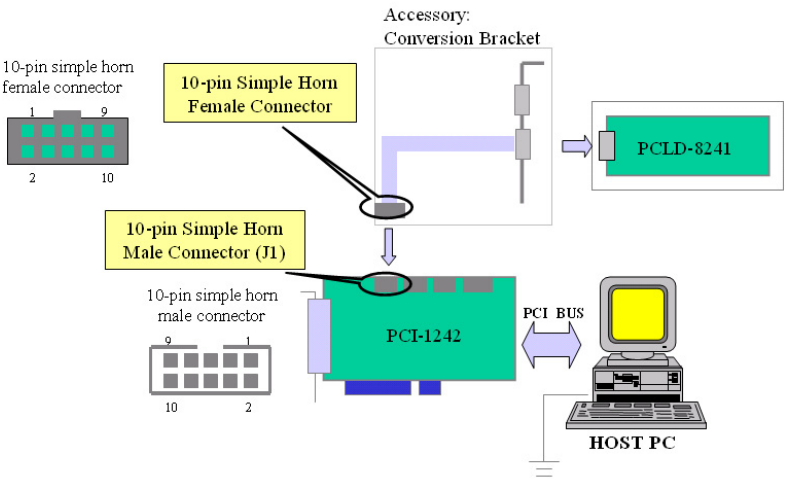


Figure 3.17: Remote I/O Wiring Diagram in PCI-1242

3.6.3 Field Wiring Considerations

When you use the PCI-1241/42 motor control card to connect with motor drivers, noises in the environment might significantly affect the accuracy of your control if due cautions are not taken. The following measures will be helpful to reduce possible interference running signal wires between signal sources and the PCI-1241/42.

- The signal cables must be kept away from strong electromagnetic sources such as power lines, large electric motors, circuit breakers or welding machines, since they may cause strong electromagnetic interference. Keep the analog signal cables away from any video monitor, since it can significantly affect a data acquisition system.
- If the cable travels through an area with significant electromagnetic interference, you should adopt individually shielded, twisted-pair wires as the analog input cable. This type of cable has its signal wires twisted together and shielded with a metal mesh. The metal mesh should only be connected to one point at the signal source ground.
- Avoid running the signal cables through any conduit that might have power lines in it.
- If you have to place your signal cable parallel to a power line that has a high voltage or high current running through it, try to keep a safe distance between them. Or you should place the signal cable at a right angle to the power line to minimize undesirable effects.
- The signals transmitted on the cable will be directly affected by the quality of the cable. In order to ensure better signal quality, we recommend that you use the PCL-10168 shielded cable.

CHAPTER 4

Configuration Utility

This chapter provides information on the configuration utility for PCI-1241 and PCI-1242.

Sections include:

- Utility Main Page
- Select Device
- Set Parameters
- Initializing the Card
- Servo On
- Operate Motor
- Remote I/O Page
- Motion Profile

Chapter 4 Configuration Utility

The Configuration Utility is designed for easy installation, configuration, and diagnosis of PCI-1261, PCI-1242, and PCI-1241. With the configuration utility you can set mechanical parameters, electric parameters, and home modes in the parameter table. Some basic motion functions can be operated in the utility, such as line, arc, circle, jog, and home.

You can also find digital input points status easily in the utility. Furthermore, the remote IO and motion profile functions are also implemented in this software package. In following sections, all the functions will be introduced one by one.

4.1 Utility Main Page

In the main page the operations are categorized as Motion, Jog, Home, DI indicators, Message box, Properties table and operation buttons.

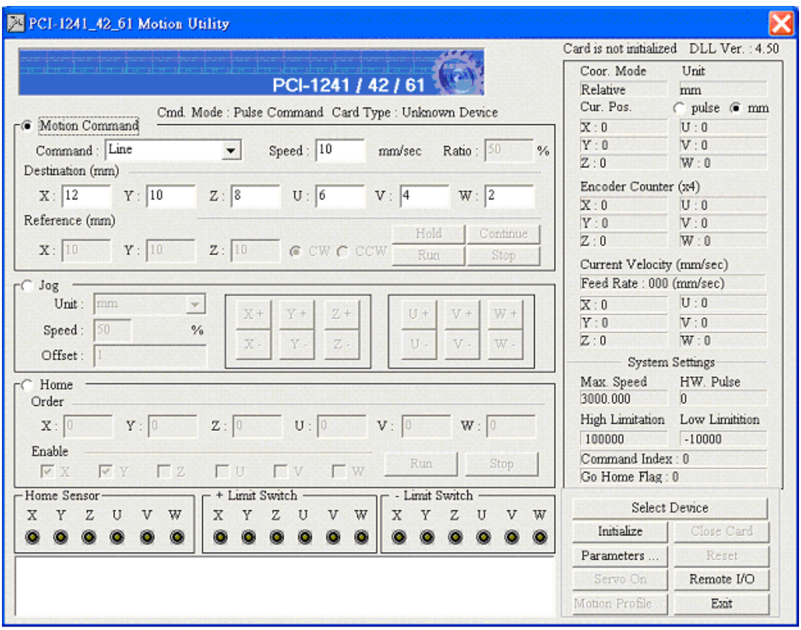


Figure 4.1: Configuration Utility Main Page

You can start with the operation buttons in the lower-right corner. The operation flow chart is as follows:

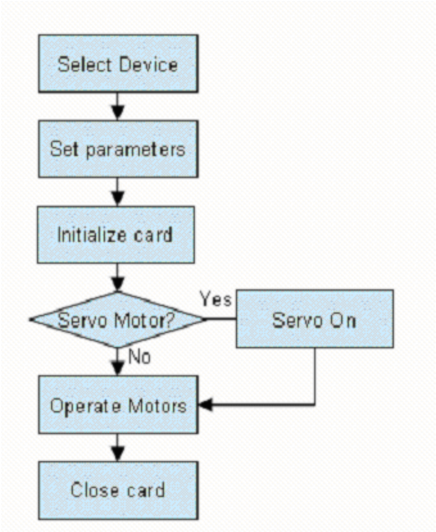


Figure 4.2: Utility Operation Flow Chart

4.2 Select Device

When users press the "Select Device" button, a new dialog box will popup. In the dialog box, all the installed PCI-1241/1242/1261 cards are listed, and you can pick one for configuration and operation. If more than one motion card is installed, you can still identify the cards via the "Card Index" and descriptions. The Card Index is an index code store in the card's firmware, and can be programmed by the "Card Index Manager".

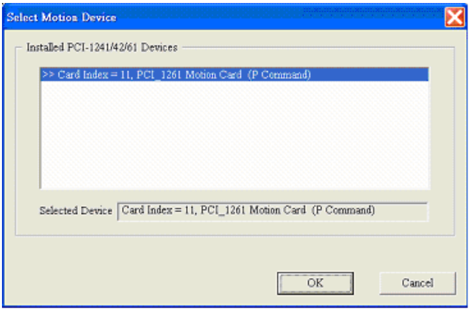


Figure 4.3: Select Device Dialog Window

4.3 Set Parameters

There are a total of four pages in the parameter-setting window. They are categorized as “Mechanism”, “General/PtP Motion”, “System”, and “Home”.

4.3.1 Mechanism Configuration

Advantech provides a convenient tool design the moving patterns in physical units, like mm, or mm/s. Define the entire mechanical factor in the “Mechanism” page, and then use the physical units directly when calling the API.

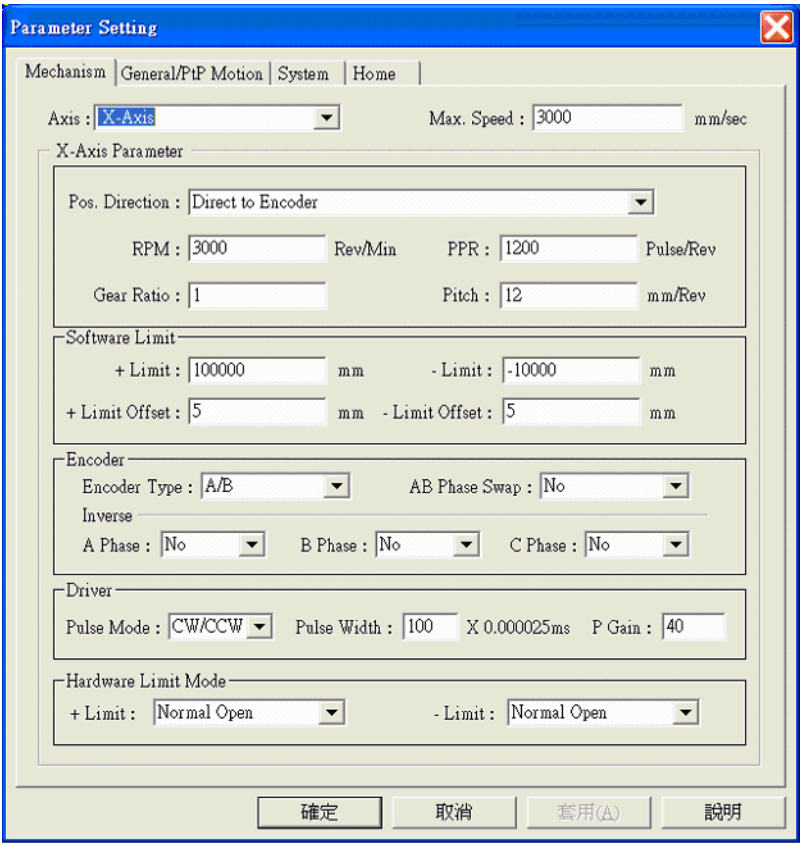


Figure 4.4: Mechanism Configuration Page

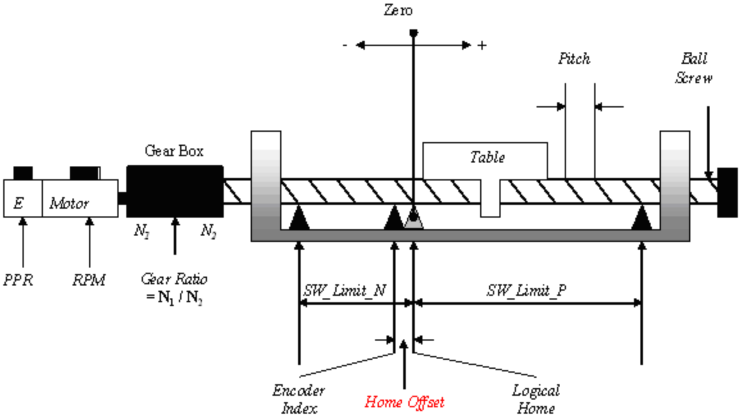


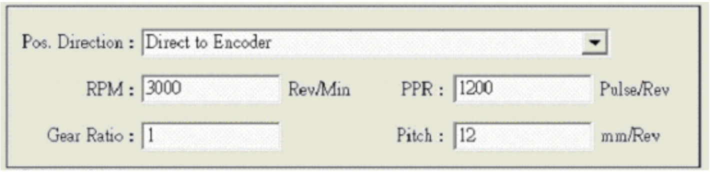
Figure 4.5: Mechanical Parameter Definition

Following are introductions of each parameter:

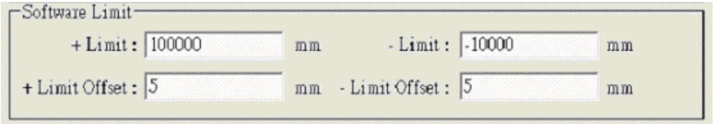
Axis: Defines which axis the parameters will affect.

Max. Speed: The maximum moving speed of the object driven by the motor. For example, if the motor is driving a table, you can define the maximum speed here for safety considerations. And the DLL driver will check every output command to make sure the table does not exceed this speed.

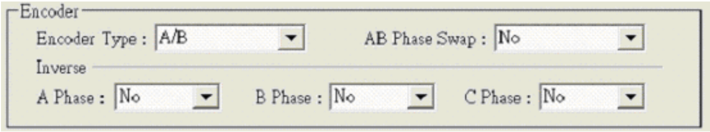
Mechanical: In this area you can define the parameters of the motor, encoder, gear box or ball screw. With the parameters, the DLL driver will be able to translate the physical units into pulse commands. Please refer to figure 4-5 for details.



Software Limit: Besides the hardware limitation switch, PCI-1241/42 also provides a software limit as the secondary safety factor. If the software limit was reached the motion card will stop outputting commands.

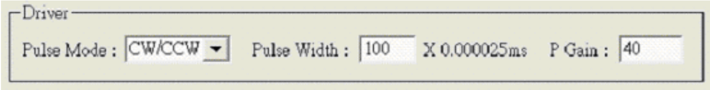


Encoder: There are three types of encoders that can be defined here. They are A/B phase type, CW/CCW type, and Pulse/Direction type. Also if the pulse phase was inversed you could also define that here.



Driver: The motor driver's specifications can be input here. You can define the motion card's pulse output mode according to the motor driver types. PCI-1241/42 supports CW/CCW, A/B and Pulse/Direction output modes. You can even choose no pulse output for simulation purposes. "Pulse Width" defines the pulse type motion card's high-level width of output pulse.

"P gain" is only used for voltage type motion cards, like PCI-1241. Its default value is 40.



Hardware Limit Mode: In this column you can set the limit switch type according to the physical limit switch. It can be normal open, normal close, or not check. If the mode was set as "not check" here, the limit switch status will not be updated even when acquiring with API.

4.3.2 General/PtP Motion Configuration

In this page, you can define the motion characteristics for point-to-point movement.

Unit: The applied length unit. It can be in millimeters (mm) or inches.

Coordination Mode: The type of coordinate system is set here. It can be a relative coordinate or absolute coordinate system.

Acceleration Curve and Time: The acceleration curve can be T Pattern or S Pattern. For a detailed explanation of acceleration patterns, please refer to the software manual’s chapter 2.

Acceleration time defines the total accelerated time interval of every point-to-point movement.

Deceleration Curve & Time: The Deceleration curve can be T Pattern or S Pattern. For a detailed explanation of deceleration patterns, please refer to the software manual’s chapter 2.

Deceleration time defines the total accelerated time interval of every point-to-point movement.

Path Blending: Enable or disable path blending. Please refer to software manual chapter 2 for the definition of path blending.

In Position: Enable or disable in position. This setting is for PCI-1241 only. Please refer to the software manual’s chapter 2 for the definition of ‘In Position’.

Software Limit Check: You can enable the software limit function for each axis by checking the corresponding check box.

Hardware Limit Check: The check box here will enable or disable the software checking to the limit switch input points.

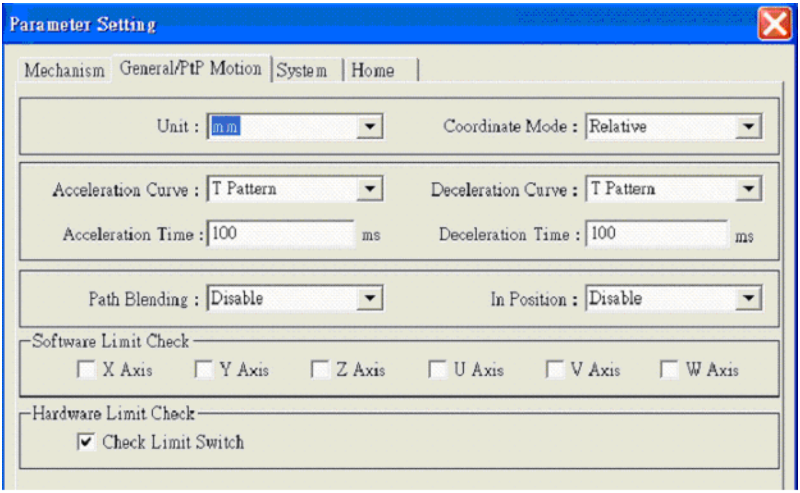


Figure 4.6: General/PtP Configuration Page

4.3.3 System Configuration

Some important system parameters are defined in this page.

Interpolation Time: Since a software driver calculates the interpolation of PCI-1241/42, the interpolation time defines how often the motion card will raise interpolation requests to the CPU of the system. If users set the interpolation time to be smaller, the velocity profile will be smoother. However, that will also consume more CPU resources. Generally, 10 ms is recommended for most applications.

Command Mode: This setting is only for PCI-1241, which can be set as pulse output or voltage output. For PCI-1242 and PCI-1261, it has to be "Pulse Command".

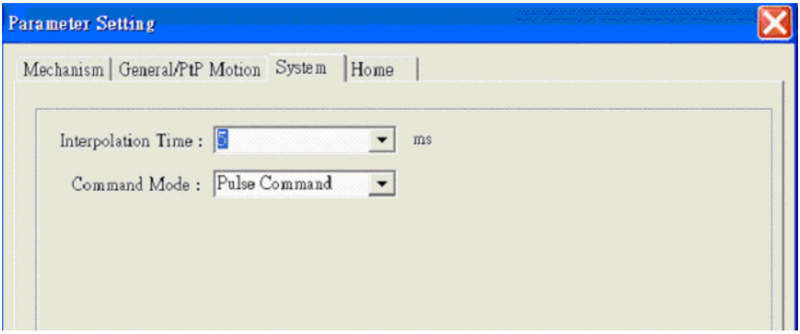


Figure 4.7: System Configuration Page

4.3.4 Home Configuration

In this page, you can set every detailed parameter related to the home function. With well-defined parameters, moving objects can reach their home precisely when requested.

Home mode: PCI-1241/42 provides different home modes to fulfill different needs. There are overall fourteen home modes, from mode0 to mode13. Please refer to appendix C for further details.

Sensor mode: Here the electrical types of home sensors are defined. It can be normal open or normal close.

Direction: Use this setting to set the initial direction to move towards when the home command is issued. 0 means positive direction and 1 means negative direction.

Index Count: Used in home mode 2, 3, 4, 7, 8, 10, 11, and 12. If the index count has been set as n, the motor will slow down or stop at the n+1 index input.

Home Offset: Represents the offset distance when the normal home point was reached. It can be a positive or negative value.

Acc./Dec. Time: The acceleration/deceleration time interval when the start/stop point was reached.

High Speed & Low Speed: You can accurately define the high speed and low speed for home functions. Generally the motor will start with high speed. When the home sensor is reached, the motor will switch to low speed and position itself as close as possible to the home point.

Home Mode Diagram: This diagram clearly shows the velocity profile, the return, slow down, and stop point in each mode.

Let's take Home mode0 as an example. In Home mode0, the motor will start at low speed FL, accelerate to high speed FH as it goes towards the home sensor. Once the home sensor has been reached, the motor will decelerate, and then stop when the speed is down to FL.

If the home sensor was active when started, or the limit switch was met first, the motor would go in the opposite direction when reaching the limit switch, then keep moving until it has crossed the home sensor, and then search the home signal again.

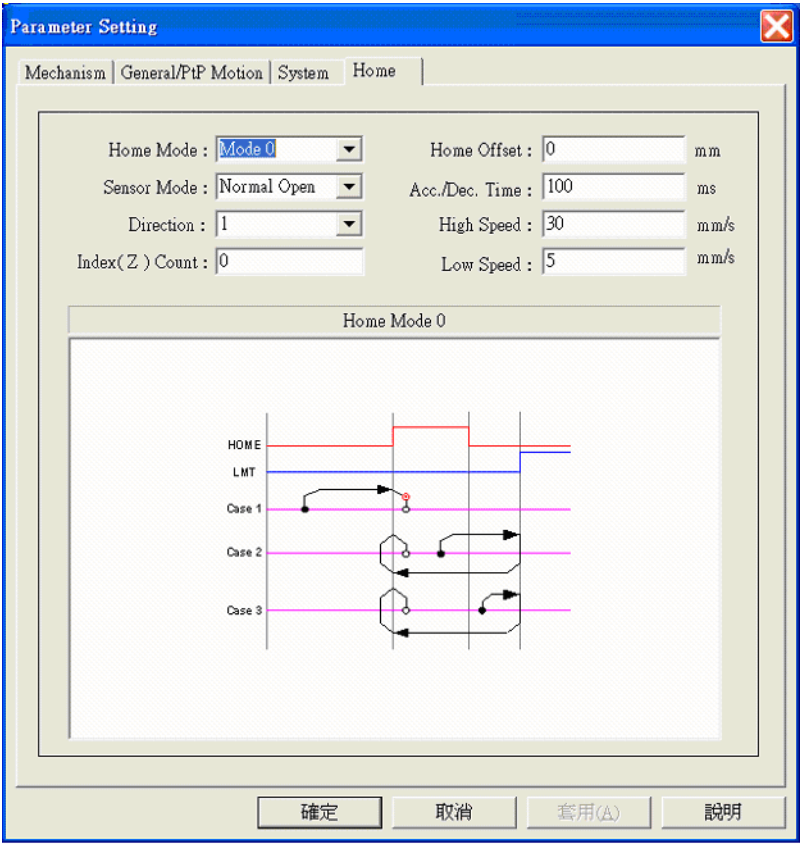


Figure 4.8: Home Configuration Page

4.4 Initializing the Card

When the 'Initialize' button is pressed, the utility will process the initialization commands to the PCI-1241/42. If the card is correctly plugged, the message "Card is active" will show on the top of utility, and the 'Close card' button will be enabled.

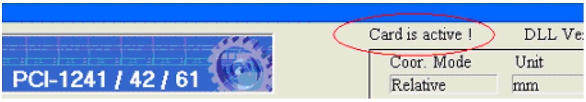


Figure 4.9: The Card Is Now Active

4.5 Servo On

This step is only if you need to work with servo motors. The servo motor can be activated when the "Servo On" button is pressed.

4.6 Operate Motor

The configuration utility provides some basic operations in the main page. You can perform “Motion Command”, “Jog”, and “Home” here. In the mean time, the digital input signals are also displayed in the main page, so you can check the status of sensors if the hardware limit switch is not disabled.

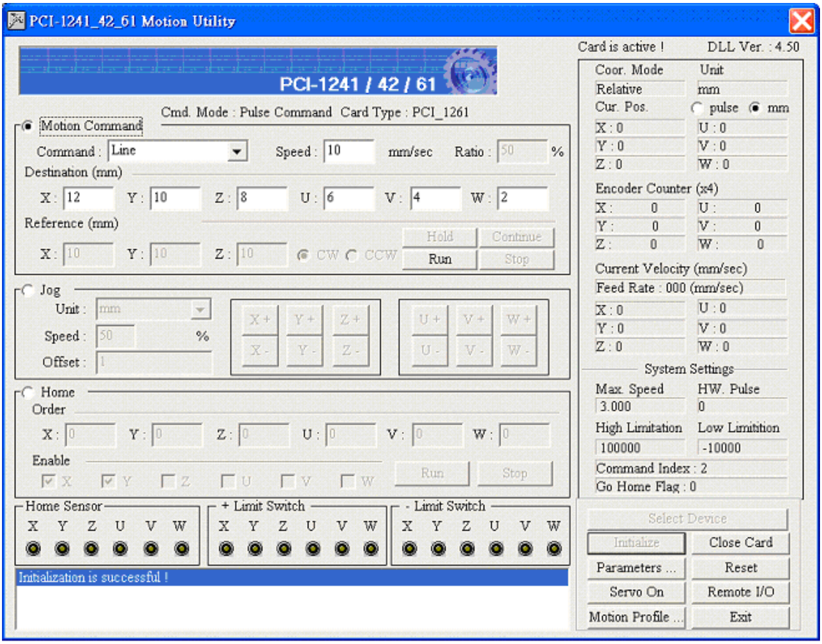


Figure 4.10: Operation Main Page of Test Utility

4.6.1 Motion Command

There are four types of commands that can be operated here, PtP, Line, Circle, and Arc.

PtP: Point to Point, all axes can be operated together. The moving distance of each axis need to be defined, and all axes will start moving when the “Run” button is pressed, but will not necessarily arrive at the same time. As to the moving speed, it is defined as a percentage of the maximum motor rotation speed of each axis.

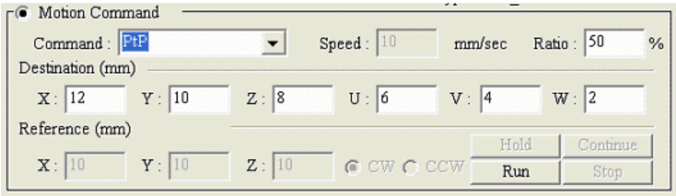


Figure 4.11: Point-to-Point Motion Configuration Window

Line: All axes are defined as two points in a three-dimensional coordinate system, XYZ and UVW. The speed is defined in the three-dimensional vector speed of the XYZ coordinate system. Unlike PtP, with the Line command, all axes will start and stop together, which means linear interpolation is performed here.

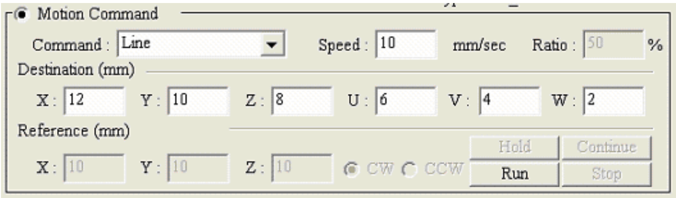


Figure 4.12: Line Command Configuration Window

CircleXY, CircleYZ, and CircleZX: Performs two-dimensional circles. You need to define the center point and rotation direction, CW and CCW. The motor will start from its current point and the diameter will be calculated automatically.

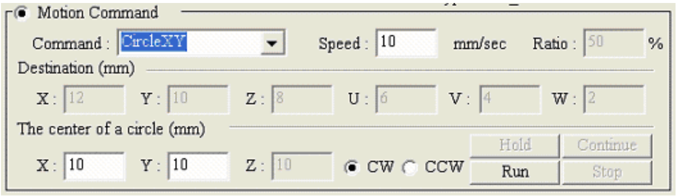


Figure 4.13: 2D Circle Motion Configuration Window

CircleXY_UVW: Similar to CircleXY, only the UVW axes will perform line movement along with XY axes. The movement of all axes will start and stop at the same time.

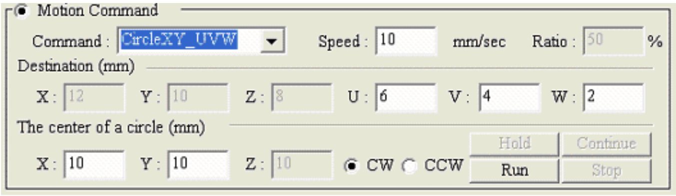


Figure 4.14: 2D Circle with Line Motion Configuration Window

ArcXYZ: A 3D arc will be performed. The path is calculated by using three points: current location, destination, and reference point. The distance between the destination and the reference point is calculated by referring to the coordinate mode defined in the parameter setting page. Please refer to part 4.3 for details.

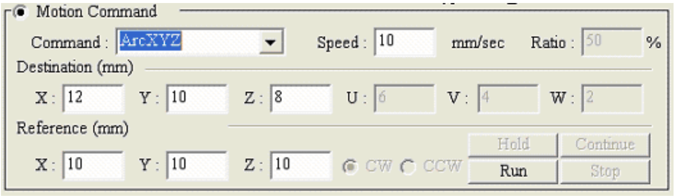


Figure 4.15: 3D Arc Motion Configuration Window

ArcXY, ArcYZ, ArcZX: Similar to ArcXYZ, but only a 2D arc is performed in this command.

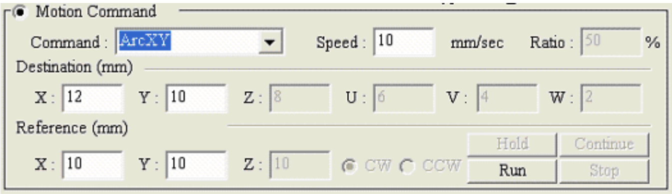


Figure 4.16: 2D Arc Motion Configuration Window

ArcXY_UVW: Performs a 2D arc where the UVW axes will perform a line movement at the same time. All axes will start and stop together.

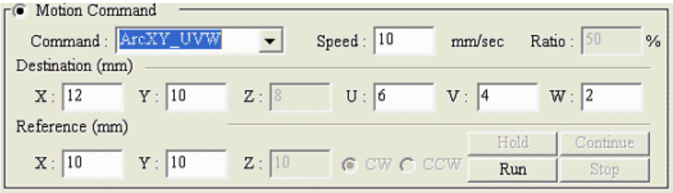


Figure 4.17: 3D Arc with Line motion Configuration Window

4.6.2 Jog

In 'Jog' mode, you can operate each axis separately by simply pressing a button. In the operation buttons, X+ means to move the X axis in a positive direction and X- means to move in a negative direction. The moving speed is given by percentage of maximum motor rotation speed of each axis.

In this mode, "Offset" means the displacement that occurs when the button is pressed. The motor will continuously run for the specific distance when the pushed button is pressed. The unit of offset can be mm or pulse, and the value can be positive or negative.

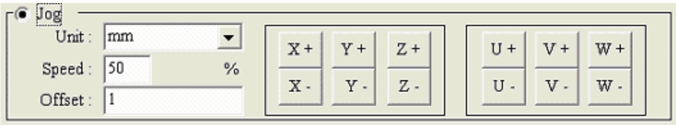


Figure 4.18: Jog Configuration Dialog Box

4.6.3 Home

In the home mode, the checked axes can perform the home function according to the home mode setting in the parameter page. If you want each axis to go home in sequence, you can put 0~5 in the “Order” column. Then the system will follow the order from 0 to 5.

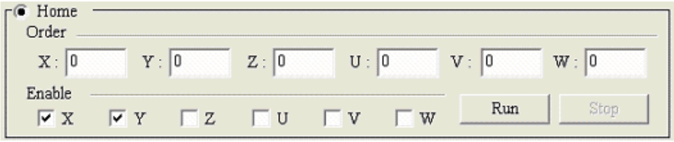


Figure 4.19: Home Motion Configuration Window

4.7 Remote IO Page

PCI-1241/42 supports powerful remote IO functions. The high-density IO modules are controlled and monitored via communication lines. You can control and monitor the IO modules through this page. Please also refer to appendix D for details about the remote IO modules.

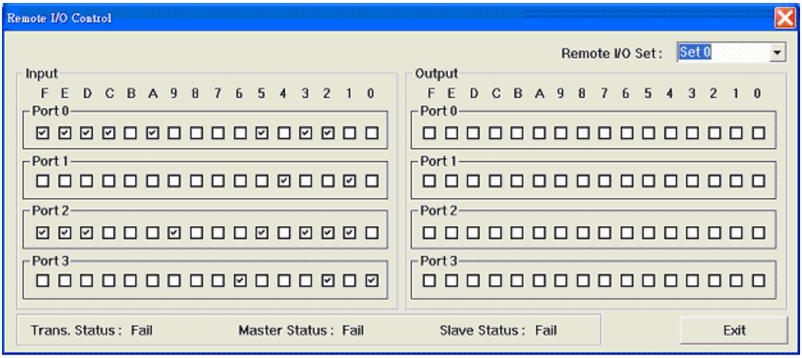


Figure 4.20: Remote I/O Status Window

4.8 Motion Profile

This is a user aid tool, in this page, users can check the position profile and velocity profile of each axis. Then they can easily clarify if the parameters were set correctly.

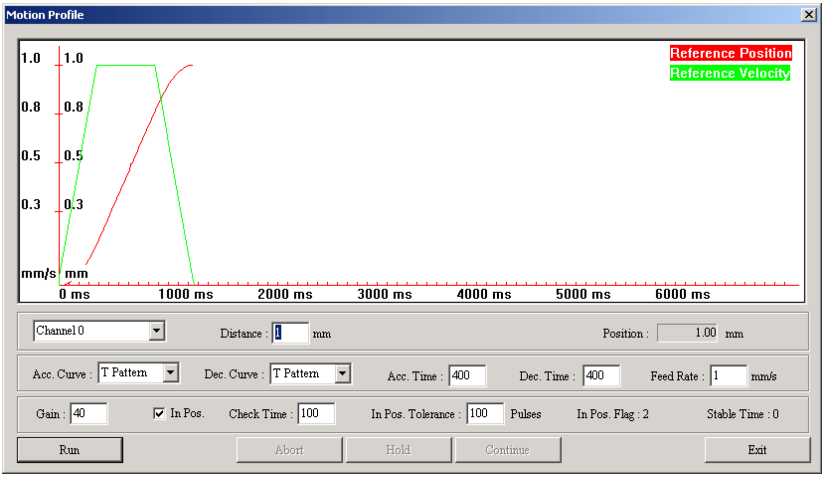


Figure 4.21: Motion Profile Display Window

2

CHAPTER 5

Software Startup Guide

In this chapter you can get detailed information about card index configurations, and some samples of program usage.

Sections include:

- Card Index Manager
- Sample Program Usage

Chapter 5 Software Startup Guide

5.1 Card Index Manager

The card index manager is designed for applications that use more than one motion card in the system. Since the PCI cards support the plug & play function, the IO address is assigned by the system. If you put two cards in one system, it can be difficult to identity the cards without an additional identifier. In PCI-1241/42 a special utility called “Card Index Manager” is provided along with the software driver. With this utility you can configure the software index by yourself.

After installing the driver, you can find the Card Index Manager in the following folder:

[Disk]:\Program Files\Advantech\Motion\PCI-1241_42_61\Utility\

The following window will show up after executing the program.

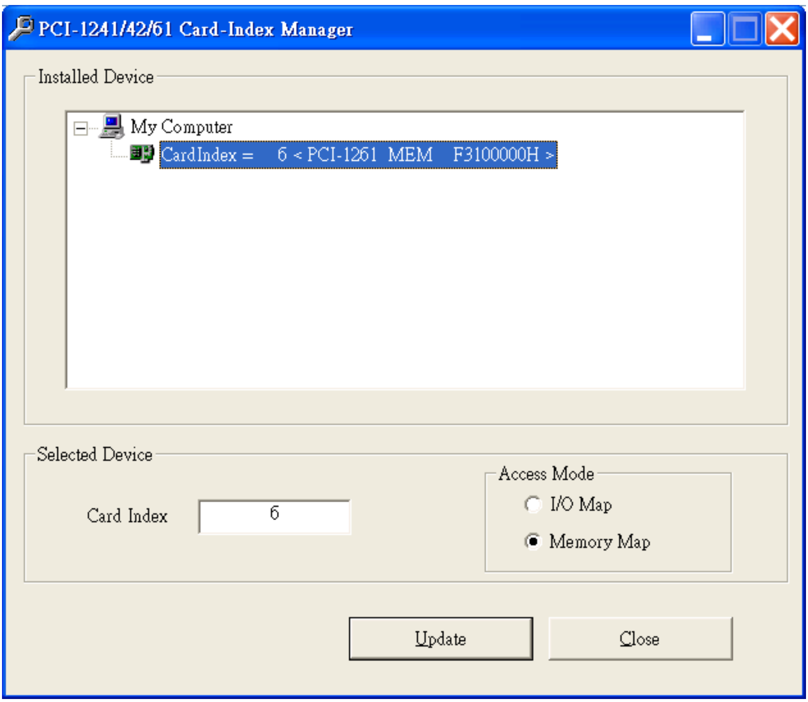


Figure 5.1: Card Index Manager

In the ‘Installed Device’ area, all installed cards will be listed. The card’s name, base address, and card index is also displayed.

You can modify the card index by selecting the card, keying in the new index number in the lower-left text field, and then pressing the ‘Update’ button.

Secondly, the default access mode of PCI-1241/1242/1261 is set as "Memory Mapping". If you want to use the cards in DOS mode, it has to be set as "IO mapping" here with Card Index manager.

Note: *The default index is ‘0’ for each card. Please modify the index before testing with examples. Since the driver also uses the card index to identify the cards, if you have more than one PCI-1241/ 1242/1261 card in one system, each of card need to be set with a different card index. The index range goes from 0 to 11.*

5.2 Sample Program Usage

Beside driver library, Advantech also provides variant sample programs along with the PCI-1241/1242/1261 DLL driver. There are over 30 samples programs written in VC and VB can be found in following folder

[Disk]:\program files\Advantech\Motion\PCI-1241_42_61\example\

Each sample program is designed for demonstrating different motion operation. Users can test motion cards with the sample program. Or even accomplish their applications by modifying the sample programs.

Following is a list of all sample programs and their functions:

Table 5.1: Sample Program Usage

Name	VC& VB	PCI-1241	PCI-1242	PCI-1261	Description
AccStep	Yes	Yes	Yes	Yes	Demonstrates how to set motion's acceleration and deceleration time (or steps)

Table 5.1: Sample Program Usage					
CheckHWStock	Yes	Yes	Yes	Yes	For stable control performance, the amount of hardware pulse stocks must exceed 60 in motion period. This example demonstrates how to get the HW stock information with library.
CheckOT	Yes	Yes	Yes	Yes	Demonstrates how to enable/ disable the over-traveling protection. And check whether software over-traveling protection occurs.
CtrlMotion	Yes	Yes	Yes	Yes	Demonstrates utilizing hold/ continue/abort functions for motion controls.
CycleInterrupt	Yes	Yes	Yes	Yes	Demonstrates how to use a cyclic interrupt facility, including designing a cycle interrupt service routine (ISR)
DACOutput	Yes	-	Yes	-	Demonstrates how to use D/ A converter.
DelayMotion	Yes	Yes	Yes	Yes	Demonstrates how to use the delay function which can delay executing the next motion command for a specific time.
ENCCompare	Yes	Yes	Yes	Yes	Demonstrates how to set a comparison value for an encoder and design an encoder ISR, and this ISR will be triggered when the encoder's counter is equal to the preset value.
ErrorStatus	Yes	Yes	Yes	Yes	Verifying the parameters passing into the library.
GeneralMotion	Yes	Yes	Yes	Yes	Demonstrates executing a general motion command (i.e. line, arc, and circle motions)

Table 5.1: Sample Program Usage					
GetENCLatch	Yes	Yes	Yes	Yes	Demonstrates how to latch a encoder value in defined conditions.
GetStatus	Yes	Yes	Yes	Yes	Displays current position, speed, and information of an executing motion command.
GoHome	Yes	Yes	Yes	Yes	Demonstrates how to use go-home functions and acquire the status of executing a go-home process.
InitSys	Yes	Yes	Yes	Yes	Demonstrates how to initialize a motion control system.
InPosCheck	Yes	-	Yes	-	Demonstrates how to use in-position functions and check in-position status in a motion process.
JogMotion	Yes	Yes	Yes	Yes	Demonstrates how to perform the jog motion.
LIOTrigger	Yes	Yes	Yes	Yes	Demonstrates how to design a local I/O ISR and enable local I/O signals to trigger this ISR.
MotionFinished	Yes	Yes	Yes	Yes	Demonstrates how to get system working status (e.g. stop, running, or holding).
MultiGroup	Yes	Yes	Yes	Yes	Demonstrates how to build two motion groups, and execute two circle motions simultaneously in the groups.
OverSpeed	Yes	Yes	Yes	Yes	Changes speed dynamically while executing a motion command.
PCLOverflow	Yes	-	Yes	-	Demonstrates how to design a position-control-loop (PCL) ISR and enable overflow signals to trigger this ISR.
PtPMotion	Yes	Yes	Yes	Yes	Executes a point-to-point motion command.

Table 5.1: Sample Program Usage					
RIOCtrl	Yes	Yes	Yes	Yes	Demonstrates how to enable remote I/O functions and read/write remote I/O signals
RIOError	Yes	Yes	Yes	Yes	Demonstrates how to design a remote I/O ISR and enable a transmission error to trigger this ISR.
RIOInput	Yes	Yes	Yes	Yes	Demonstrates how to design a remote I/O ISR and enable some specific signals of remote I/O inputs to trigger this ISR.
RIOStatus	Yes	Yes	Yes	Yes	Checks transmission sta-tuses of master and slave cards.
SetBlend	Yes	Yes	Yes	Yes	Enables/disables motion blending.
SetSpeed	Yes	Yes	Yes	Yes	Sets speeds for general and point-to-point motions
TimerTrigger	Yes	Yes	Yes	Yes	Demonstrates how to design a timer ISR and use the timer expiration signal to trigger this ISR.
WatchDog	Yes	Yes	Yes	Yes	Demonstrates how to use the watch dog facility

2

APPENDIX A

Specifications

This chapter provides information on the specifications of PCI-1241/42.

Sections include:

- Axes
- Pulse Output
- Input Pulse for Encoder Interface
- Local Input/Output
- Other Motion Functions
- General

Appendix A Specifications

A.1 Axis:

Number of Axis	**4 Axes**	
2/3-Axis Linear Interpolation	Range	-8,388,608 ~ +8,388,607 for each axis
	Speed	1 PPS ~ 4M PPS
	Precision	± 0.5 LSB
2-Axis Circular Interpolation	Range	-8,388,608 ~ +8,388,607 for each axis
	Speed	1 PPS ~ 4M PPS
	Precision	± 1 LSB
3-Axis Helical Interpolation	Range	-8,388,608 ~ +8,388,607 for each axis
	Speed	1 PPS ~ 4M PPS
	Precision	± 1 LSB
Continuous Interpolation	Speed	1 PPS ~ 4M PPS
Motion Function	Command Type	Jog, Point to Point, Line, Arc, Circle, Helical
	Speed Curve	T/S-Curve Acceleration / Deceleration
	Command Mode	Pulse Command and Voltage Command (PCI-1241 only)
	Pulse Output Format	Pulse/Direction, CW/CCW, A/B Phase
	Position Accuracy	In Position Check
	Continuous Moving	Blending Mode
	Compensation	256 Divisoins
	Limit Switch	Software and Hardware Limit Switch Check
	Go Home	14 Modes
	Motion Operation	Hold, Continuous, Abort
	Changing Speed in Moving	Over Speed Control

A.2 Voltage Output: (PCI-1241 only)

Voltage Output	**Resolution**	16 bits
	Output Range	-10V ~ +10V
	Max. Update Rate	625 KHz
	Relative Accuracy	1 LSB
	Differential Non-linearity	+- 0.001% FSR
	Offset	< 1 LSB
	Slew Rate	10 V / us
	Driving Capability	+- 5mA
	Output Impedance	0.1 max.
	External Load	Must be over 2K
	Setting time	1.6 us (to +- 0.006% of FSR)

A.3 Pulse Output:

Pulse Output	**Range**	1 PPS ~ 4M PPS
	Precision	+- 0.1%
	Change of Acceleration for S Curve	954 ~ 31.25 x 109 PPS/sec2
	Acceleration / Deceleration	125 ~ 500 x 106 PPS/sec
	Initial Velocity	1 PPS ~ 4M PPS
	Drive Speed	1 PPS ~ 4M PPS (can be changed during driving)
	Number of Output Pulses	0 ~ 268,435,455 (fixed pulse driving)
	Pulse Output Type	Pulse/Direction, CW/CCW and A/B Phase
	Output Signal Modes	Differential line driving output / Single-ended output
	Speed Curve	T/S-curve Acceleration / Deceleration

A.4 Encoder Input:

<table>
<tr><td rowspan="13">Input Pulse for Encoder Interface</td><td>Input</td><td colspan="2">5 channels</td></tr>
<tr><td>Encoder Pulse Input Type</td><td colspan="2">Quadrature (A/B phase) or Up/Down</td></tr>
<tr><td>Counts per Encoder Cycle</td><td colspan="2">X0, x1, x2, x4 (A/B phase only)</td></tr>
<tr><td>Interface</td><td colspan="2">Differential with Photo Coupler</td></tr>
<tr><td>Max. Input Frequency</td><td colspan="2">2 MHz</td></tr>
<tr><td rowspan="7">Input Voltage</td><td rowspan="3">Single Ended Configuration</td><td>Logic High : CH- > 3V CH+ = 0V(GND)</td></tr>
<tr><td>Logic Low : CH- < 0.8V CH+ = 0V(GND)</td></tr>
<tr><td>CH- Max. input voltage: +12V</td></tr>
<tr><td rowspan="4">Differential Configuration</td><td>CH+ - CH- > 3V is positive</td></tr>
<tr><td>3V > CH+ - CH- > -3V is unknown</td></tr>
<tr><td>CH+ - CH- < -3V is negative</td></tr>
<tr><td>CH+/CH- Max. input voltage: +/-12V</td></tr>
<tr><td>Protection</td><td colspan="2">2,500 VDC isolation</td></tr>
</table>

A.5 Local Input/Output

Input Signal	**Positive-direction Limit Switch**	4 channels	
	Negative-direction Limit Switch Signal	4 channels	
	Home Sensor	4 channels	
	Emergency Stop	1 channel	
	Max. Input Frequency	20KHz	
	Input Voltage	Low	18 VDC min.
			30 VDC max.
		High	0 VDC min.
			1 VDC max.
	Input Current	1 VDC	0.5 uA (typical)
		18 VDC	3.3 mA (typical)
		30 VDC	5.8 mA (typical)
	Protection	2,500 Vrms photo coupler isolation and RC filtering	
Output Signal	**Servo On**	4 channels	
	Position Ready	1 channel	
	Output Voltage	Open Collector 5 ~ 40 VDC	
	Sink Current	100 mA max. / channel; 500mA max. total	
	Protection	2,500 Vrms photo coupler isolation	

A.6 Other Motion Functions:

Position Counter	Range of Command Position Counter (for output pulse)	-2,147,483,648 ~ +2,147,483,647 for each axis
	Range of Actual Position Counter (for input pulse)	-2,147,483,648 ~ +2,147,483,647 for each axis
Comparison Register	Register Range	-2,147,483,648 ~ +2,147,483,647
Interrupt Functions (Trigger-Defined Functions)	Interrupt Condition (All conditions could be enable/disable individually)	Local Input
		Encoder Index
		Encoder Comparison
		Programmable Timer
Software Board ID	4 bits, ID: 0 ~ 15	

A.7 General:

I/O Connector Type	68-pin SCSI-II female	
Dimensions	174 x 107mm (6.85" x 4.2")	
Power Consumption	Typical	+5V @ 850mA ; +12V @ 600mA
	Max.	+5V @ 1A; +12V @ 700mA
External Power Voltage	DC +24V	
Temperature	Operation	0 ~60 (32 ~140) (refer to IEC 68-2-1,2)
	Storage	-20 ~ +85 (-4 ~ 185)
Relative Humidity	5 ~ 95% RH non-condensing (refer to IEC 68-2-3)	
Certification	CE certified	

2

APPENDIX B

Block Diagram

This chapter provides information on the block diagram for PCI-1241/1242.

Appendix B Block Diagram

B.1 Appendix B. Block Diagram

Figure B-1 shows PCI-1241/1242 system block diagram. Circuits of block (13), (14), (16), (17) and (18) are hardware close loop control function provided by PCI-1241 only, and PCI-1242 doesn't support this function.

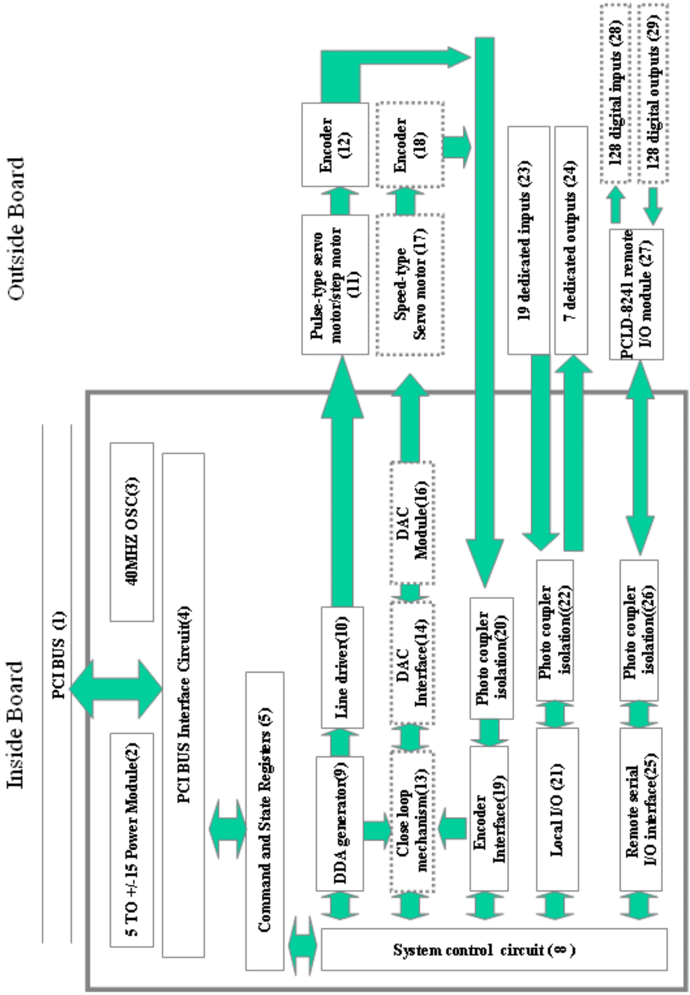


Figure B.1: PCI-1241/1242 System Block Diagram

B.2 Open Loop Motion Control (Pulse Command)

PC Controller sends commands to the PCI BUS interface circuit (4) on PCI-1241/1242 card through PCI BUS (1). At this time, the command and state register (5) with system control circuit (8) will decode commands and enable DDA generator (9) in the driver to send out pulses evenly (selectable to A/B PHASE, CW/CCW, and PULSE/DIRECTION formats). Pulses are then sent to external motor drivers of pulse-type servo motor/stepping motor (11) through line driver (10) (MC3487) in the form of differential signal. If there is a need, the motor encoder (12) signal could be feedback to command and state register (5) through photo coupler isolator (20) and then entering encoder interface (19) for CPU to read.

B.2.1 Digital Differential Analyzer (DDA)

DDA generator receives the position command from CPU (i.e. the required rotation quantity of pulse for the motor) and time required to execute the command (defined as DDA CYCLE TIME). After calculation, DDA generator could send out the pulse required evenly within DDA cycle.

For instance (refer to Figure B-2), assuming the starting position for motor is at 0. When the position command is positive rotation of 1000 pulses, the command execution time (DDA CYCLE TIME) is 0.5 seconds, then DDA generator will send out 1000 pulses smoothly within 0.5 seconds and the motor could rotate 1000 pulses smoothly at the same speed.

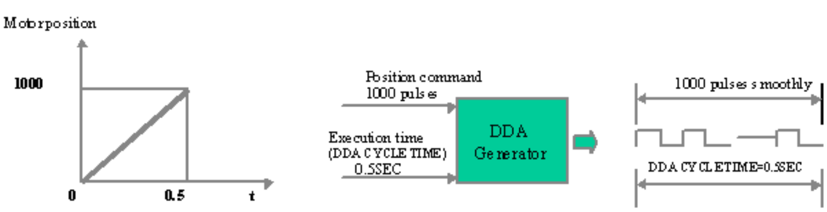


Figure B.2: DDA Example

B.3 Close Loop Motion Control (Velocity Command)

The PC Controller sends commands to the PCI BUS interface circuit (4) on the PCI-1241/1242 card through PCI BUS (1). At this time, the command and state register (5) with system control circuit (8) will decode commands and enable DDA generator (9) in the driver to send out pulses evenly (selectable to A/B PHASE, CW/CCW, and the PC Controller sends commands to the PCI BUS interface circuit (4) on the PCI-1241 card through PCI BUS (1).

At this time, the ASIC will decode commands and direct the DDA generator (9) in the driver to send out pulses evenly. The pulses are then sent to the close loop mechanism (13). At the same time, the feedback signal of motor encoder (18) (in the form of a differential drive) enters PCI-1241 through a connector. It goes through photo coupler isolation (20) module and enters into the encoder interface (19) for signal processing (including filtering).

The signal then enters close loop mechanism (13) for calculation. The close loop mechanism (13) uses a proportional control algorithm (Figure B-3 shows P-type control method in close loop control) to produce velocity command for driving DAC module (16) via DAC interface (14). The voltage commands are produced by multiplying a gain on the difference of pulses sent by DDA and pulses be feed backed by encoder. Finally, voltage command (–10V ~ +10V) is sent to velocity-type servo motor (17) through connector.

Each set of close loop voltage output control is provided with a set of D/A converter outputs and a set of encoder inputs. When the set of close loop voltage output control is not used, the D/A converter can be spared for CPU’s use to output voltage signal. In addition, encoder input can also be connected to other encoders or MPG and read by CPU for encoder values.

If there four sets of close loop voltage output control are used, then four sets of D/A and four sets of encoder input are allocated for close loop control and no longer available for CPU use alone.

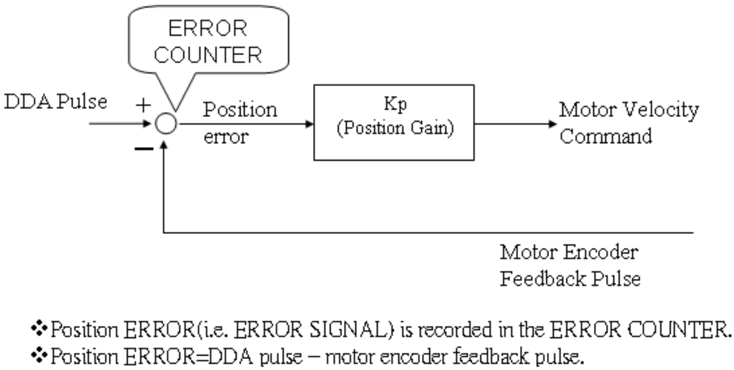


Figure B.3: P-type Control Method in Close Loop Control

B.4 Local Input / Output

The PC Controller sends commands to the ASIC on PCI-1241/1242 through the PCI BUS. This ASIC will read or write information to local I/O (21) based on instructions. The outputs through photo coupling isolation (22) are amplified by a Darlington output stage. Inputs are also entered to local IO (21) through photo coupling isolation (21). Besides, Local I/O can be operated by the CPU independently from other functions.

B.5 Remote Input / Output

The remote digital I/O is designed with wire-saving technology. It uses serial communication cables to remotely control the remote I/O module PCLD-8241 (27) via remote serial I/O interface (25). The maximum capability is 128 outputs (28) and 128 inputs (29).

2

APPENDIX C

Home Function

An accurate home position is fundamental for every precision machine. In order to manage the various requirements for the home position, PCI-1241 and PCI-1242 each provide a total of 14 home modes.

This chapter gives users an overview of each home mode and its characteristics. After reading this chapter, it should be easier to choose the most suitable home mode for your application.

Appendix C Home Function

C.1 How to Read the Home Velocity Profile

Since the homing process is quite complex, PCI-1241/1242/1261 provides a ‘Home Pattern Graph’ for each mode to give users a clear concept about how the home function proceeds.

In the Home velocity profile, there are three types of sensor inputs that can be found, and they are all high-active. “HOME” represents the status of the home sensor, and the raising edge means the home sensor was triggered. “LMT” means limit switch, and the raising edge means the limit switch was activated. “ECZ” represents the index signal of the encoder.

The pattern in each case shows the velocity profile of the motor. It starts from a solid dot, and the arrow represents the direction of movement, which then ends up at a hollow dot. There are only two movement speeds that can be defined in the homing process. One is the start up speed FL, and the other is the maximum speed FH. For velocity, the slants means speed up or slow down.

C.2 Home Mode0

In Home mode0, the motor will start up at low speed FL, and accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate. And then stop when the speed is down to FL.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again.

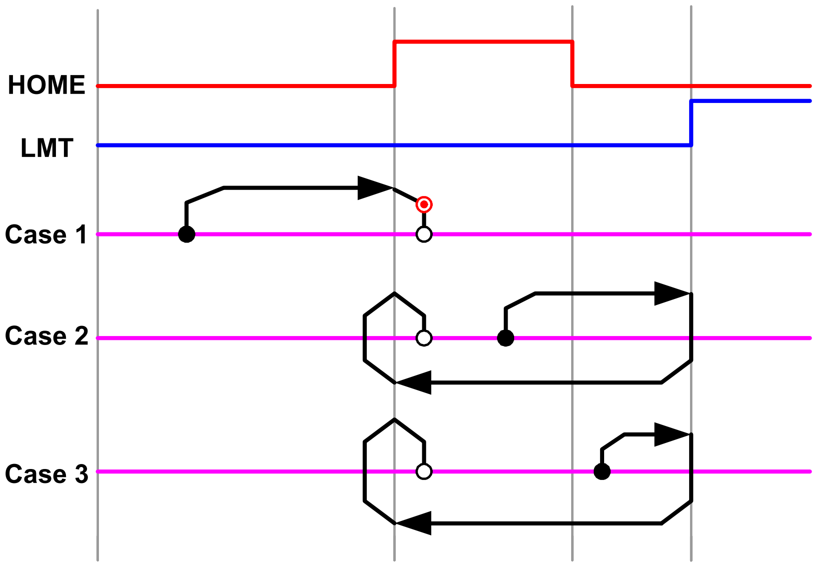


Figure C.1: Velocity Profile of Home Mode0

C.3 Home Mode1

In Home Mode1, the motor will start up at speed FL, and accelerate to speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate. The main difference with mode0 is that in this mode, the motor will go back and approach the home again with low speed FL. This makes the stop point even closer to the raising edge of the home sensor.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again.

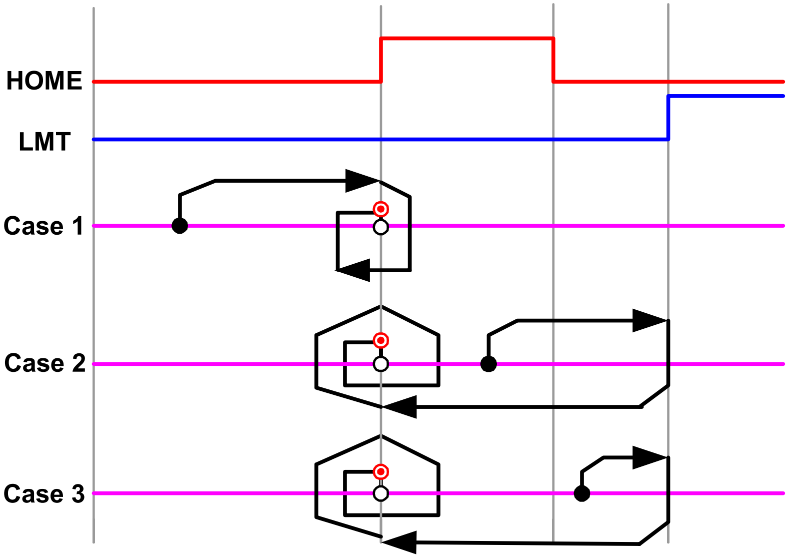


Figure C.2: Velocity Profile of Home Mode1

C.4 Home Mode2

In Home mode2, the motor will start up at low speed FL, and accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate, and search for an encoder index signal with FL. Meanwhile, you can configure how many index counts will be ignored with "EIC". When EIC is '1', this means one index will be ignored and the motor will stop at the second index after the home sensor is triggered. Like case 1 in the following diagram.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again.

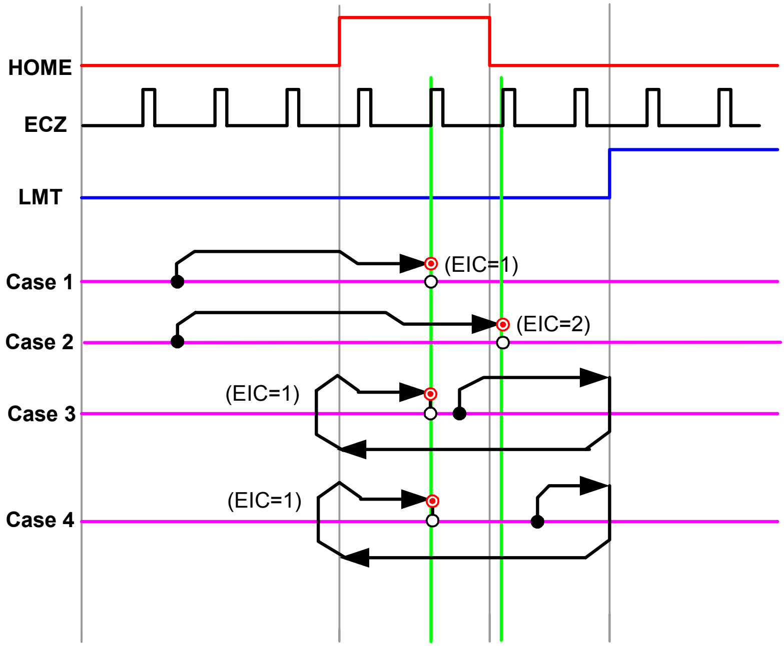


Figure C.3: Velocity Profile of Home Mode2

C.5 Home Mode3

In Home mode3, the motor will start up at low speed FL, and accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor starts to search for an encoder index signal with high speed FH. After the index is reached, the motor will decelerate to FL then stop. Meanwhile, you can configure how many index counts will be ignored with parameter “EIC”. When EIC is ‘1’, this means one index will be ignored and the motor will stop at the second index after the home sensor was triggered. Like case 1 in following diagram.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again. Like case 3 and case 4 in figure 4-4.

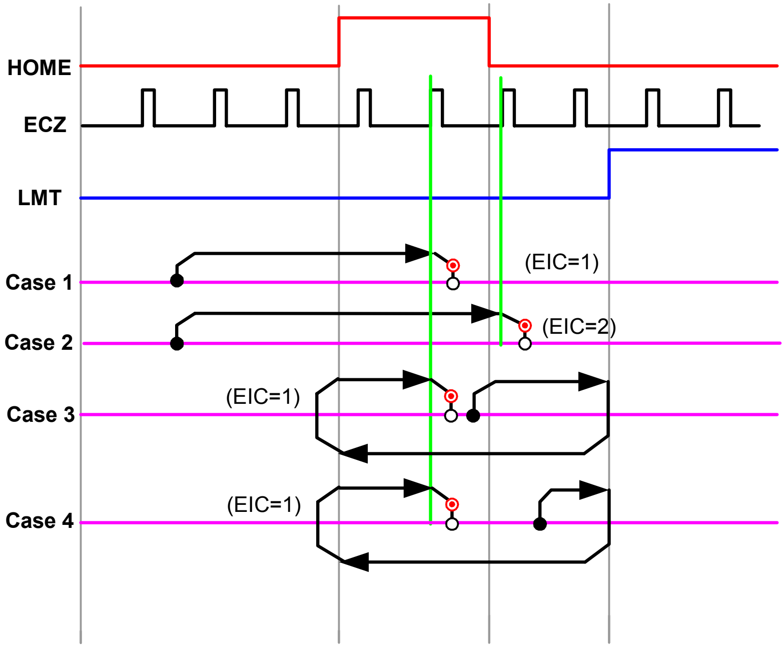


Figure C.4: Velocity Profile of Home Mode3

C.6 Home Mode4

In Home mode4, the motor will start up at low speed FL, and accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate, and go backward while the velocity reaches FL. After changing direction, the motor will search for the index signal then stop. Meanwhile you can configure how many index counts will be ignored before stopping with parameter “EIC”. When EIC is ‘1’, it means one index will be ignored and the motor will stop at the second index after turning around. Like case 1 in the following diagram.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again. Like case 3 and case 4 in figure 4-5.

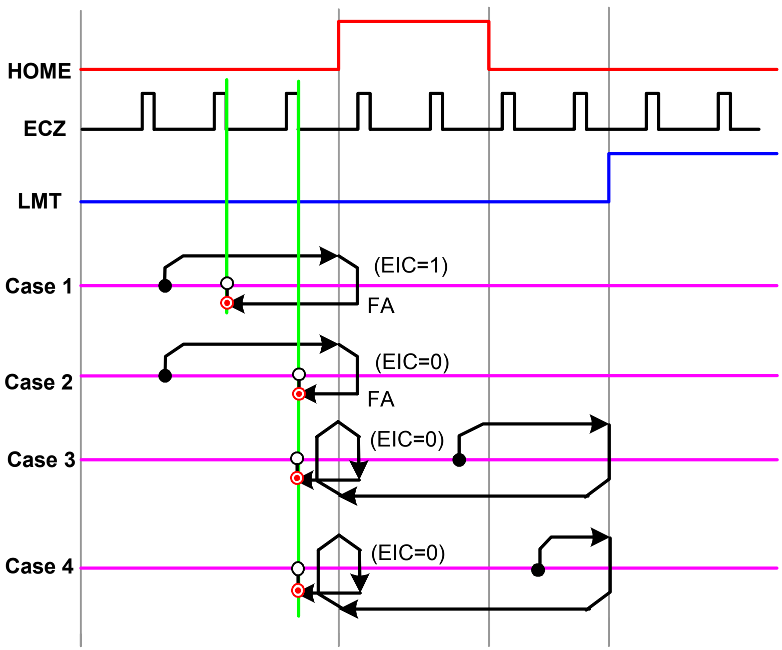


Figure C.5: Velocity Profile of Home Mode4

C.7 Home Mode5

In Home mode5, the motor will start up at low speed FL, and accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate, and go backwards while the velocity reaches FL. After changing direction, the motor will accelerate to FH and search for the index signal, then slow down and stop. Meanwhile, you can configure how many index counts will be ignored before stopping with parameter “EIC”. When EIC is ‘1’, it means one index will be ignored and the motor will stop at the second index after turning around. Like case 1 in following diagram.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again. Like case 3 and case 4 in figure 4-6.

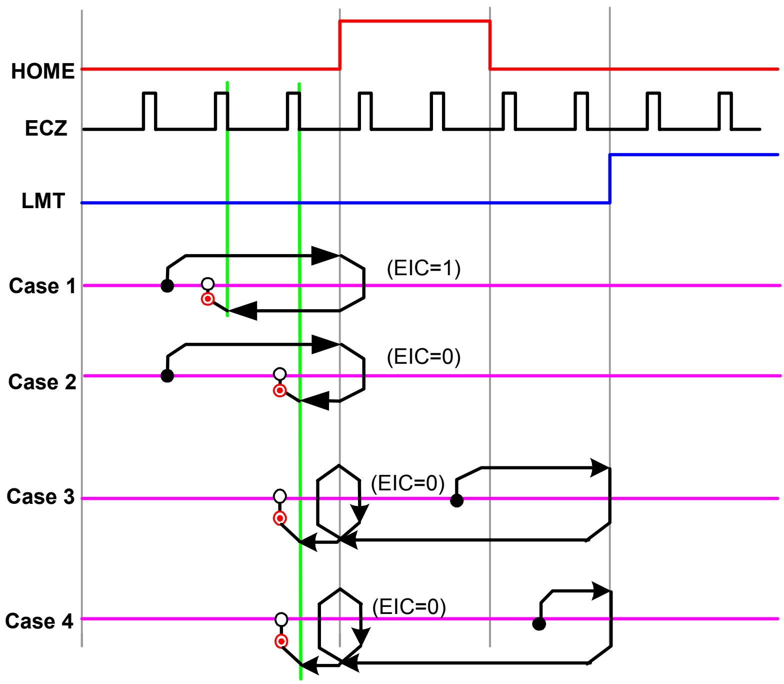


Figure C.6: Velocity Profile of Home Mode5

C.8 Home Mode6

In Home mode6, the motor will start up at low speed FL, and accelerate to high speed FH towards the limit switch. Once the limit switch is reached, the motor will stop immediately.

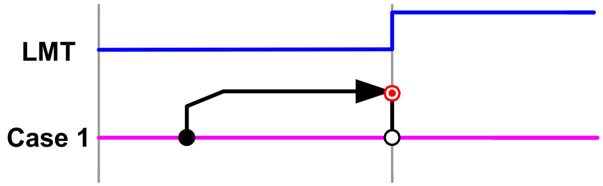


Figure C.7: Velocity Profile of Home Mode6

C.9 Home Mode7

In Home mode7, the motor will start up at low speed FL, and accelerate to high speed FH towards the limit switch. Once the limit switch is reached, the motor will stop, and then go backwards at speed FL. After changing direction, the motor will stop when the index signal condition was met. Meanwhile, you can configure how many index counts will be ignored before stopping with parameter "EIC". When EIC is '1', it means one index will be ignored and the motor will stop at the second index after turning around. Like case 1 in following diagram.

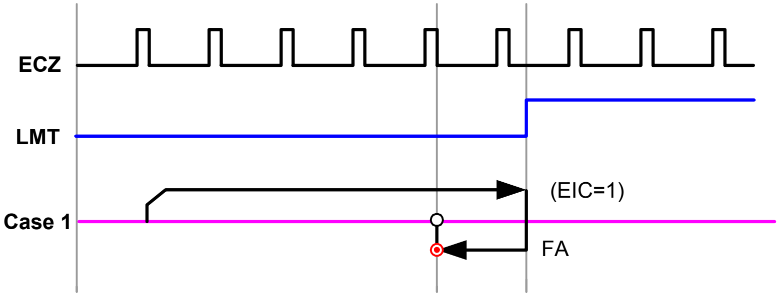


Figure C.8: Velocity Profile of Home Mode7

C.10 Home Mode8

In Home mode8, the motor will start up at low speed FL, and accelerate to high speed FH towards the limit switch. Once the limit switch is reached, the motor will stop, and go backwards at speed FH. After changing direction, the motor will decelerate to FL then stop when the index signal condition was met. Meanwhile, you can configure how many index counts will be ignored before stopping with parameter “EIC”. When EIC is ‘1’, it means one index will be ignored and the motor will stop at the second index after turning around. Like case 1 in following diagram.

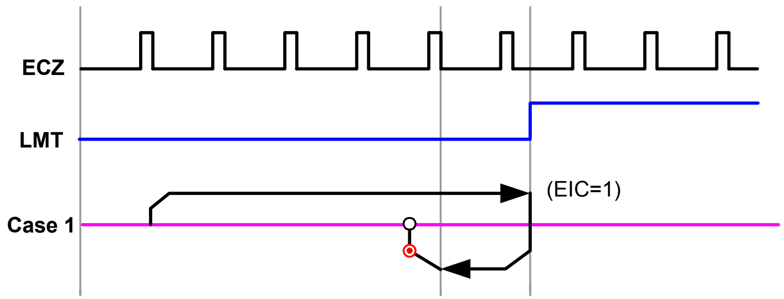


Figure C.9: Velocity Profile of Home Mode8

C.11 Home Mode9

In Home mode9, the motor will start up at speed FL, and accelerate to speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate and go backward at speed FL. Once the motor leave the triggered area of home sensor, it will stop immediately.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again.

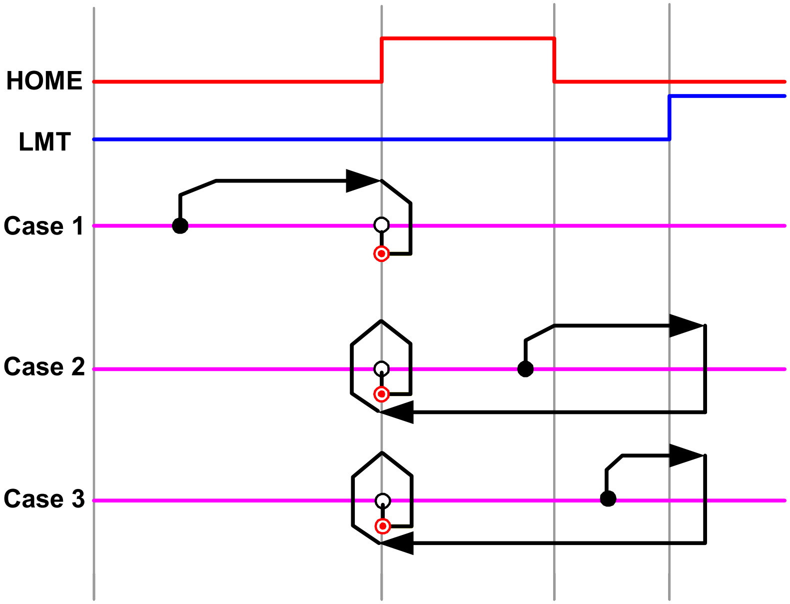


Figure C.10: Velocity Profile of Home Mode9

C.12 Home Mode10

In Home mode10, the motor will start up at low speed FL, and accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor will start to search the encoder index signal for the high speed FH. After the index is reached, the motor will decelerate to FL then go backward with speed FL. At this time, the motor will stop when the index trigger edge was met. Meanwhile, you can configure how many index counts will be ignored when passing the home sensor with parameter "EIC". When EIC is '1', it means one index will be ignored and the motor will stop at the second index after the home sensor was triggered. Like case 1 in figure 4-11.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again.

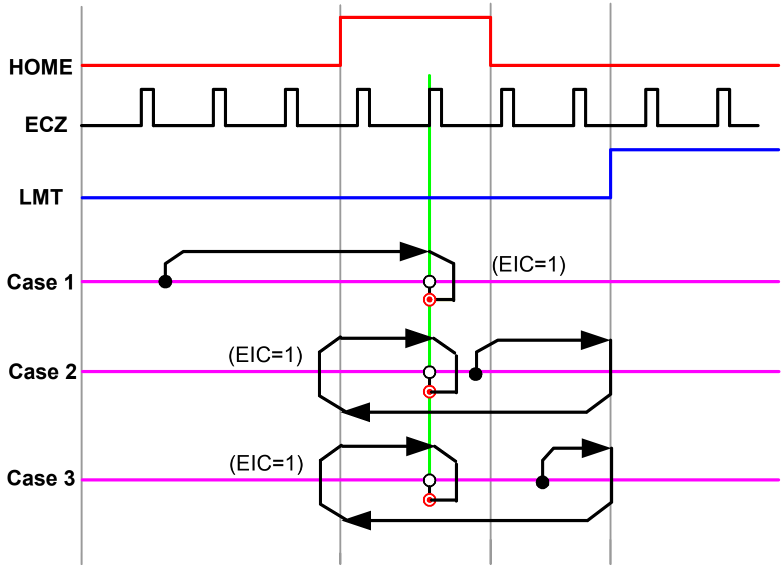


Figure C.11: Velocity Profile of Home Mode10

C.13 Home Mode11

In Home mode11, the motor will start up at low speed FL, and then accelerate to high speed FH towards the home sensor. Once the home sensor is reached, the motor will decelerate, and go backward while the velocity goes down to FL. After changing direction, the motor will accelerate to FH and search for the index signal. When meeting the raising edge of index, the motor will slow down, return and approach the trigger edge again with speed FL. Meanwhile, you can configure how many index counts will be ignore before stopping with parameter "EIC". When EIC is '1', it means one index will be ignore and the motor will stop at the second index after turning around. Like case 1 in figure 4-12.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again. Like case 3 and case 4 in figure 4-6.

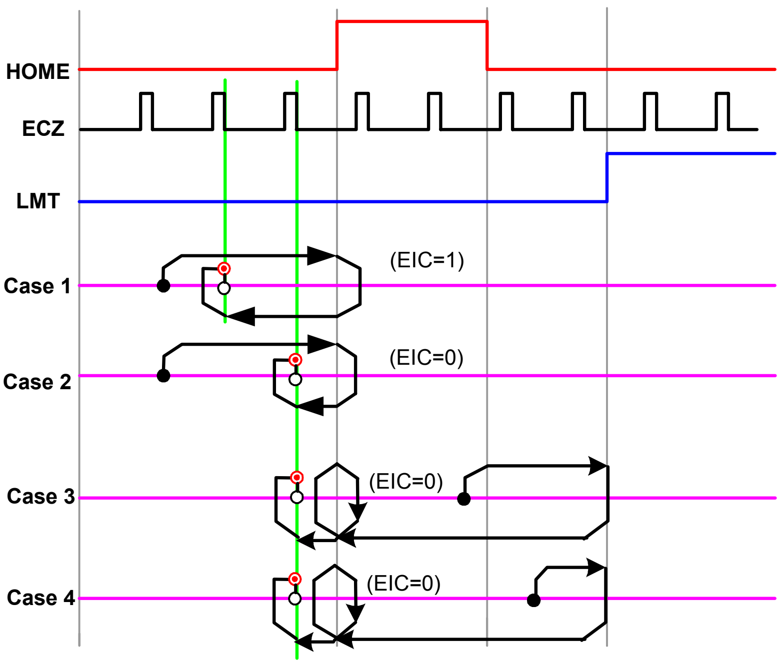


Figure C.12: Velocity Profile of Home Mode11

C.14 Home Mode12

In Home mode12, the motor will start up at low speed FL, and then accelerate to high speed FH towards the limit switch. Once the limit switch is reached, the motor will go backwards. After changing direction, the motor will accelerate to FH and search for the index signal. When meeting the raising edge of the index, the motor will slow down, return and approach the trigger edge again at speed FL. Meanwhile, you can configure how many index counts will be ignored before stopping with parameter "EIC". When EIC is '1', it means one index will be ignored and the motor will stop at the second index after turning around. Like case 1 in figure 4-13.

If the home sensor was active at start up, or the limit switch was met first, the motor will go in the opposite direction when reaching the limit switch. Then it will keep moving until it crosses the home sensor, and finally search the home signal again.

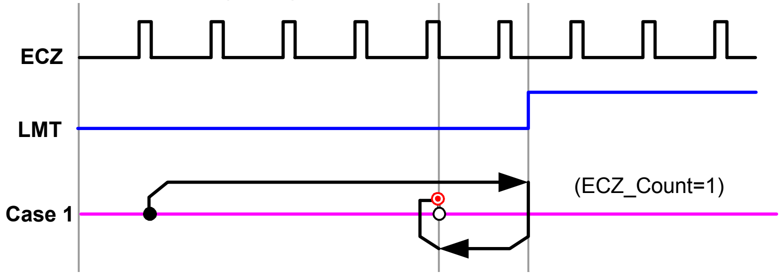


Figure C.13: Velocity Profile of Home Mode12

C.15 Home mode13

In Home mode13, the motor will start up at speed FL, and accelerate to speed FH towards the limit switch. Once the limit switch is reached, the motor will decelerate and go backwards at speed FL. Once the motor leave the triggered area of the limit switch, it will stop immediately.

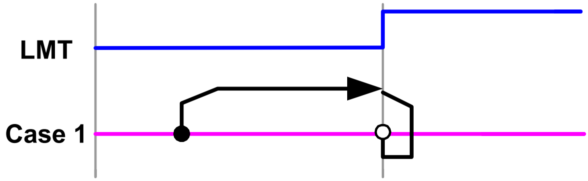


Figure C.14: Velocity Profile of Home Mode13

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APPENDIX D

Remote I/O

This chapter provides information on the remote I/O function of PCI-1241/42 and the PCLD-8241 I/O Module.

Appendix D Remote I/O

Both PCI-1241 and PCI-1242 support a powerful remote IO function that dramatically save wiring by transferring the DIO command to serial communication. The PCLD-8241 is a remote IO module that can work with PCI-1241, 1242 and 1261 without extra configuration. You simply connect the PCLD-8241 and PCI-1241/42 with a 9-pin cable, and they can operate remote IO points with motion commands.

D.1 Features

The remote IO module PCLD-8241 has the following features

- Serial communication interface
- 64 digital inputs
- 64 PhotoMos-Relay outputs
- Full photo isolation
- Din rail package

D.2 Specifications

- Size: 107 x 290 mm
- Din rail package--- TS32 (A)/TS35 (A)
- 5EHDBV terminals (DINKLE)
- Ambient Temperature: 0 ~ 55° C
- 64 Source-Type or Sink-Type input points (Figure D.1)

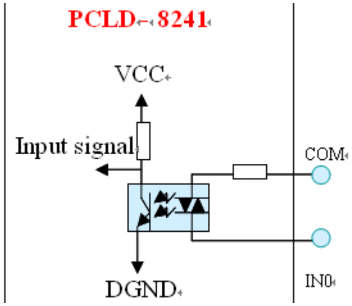

Figure D.1:

- Bi-directional photo coupler with current limit resistor
- One independent COM for every 8 input points
- Isolation: 2500 Vrms
- Interrupt points configurable :Input 0~3
- Operation
  Logic 0 when | Input-VCOM| = 24 V
  Logic 1 when | Input-VCOM| = 0 V or open
- COM Voltage: +24V or 0V
- 64 output points (Figure D.2)

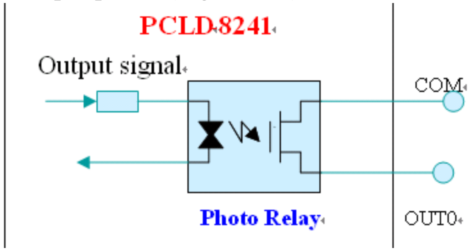

Figure D.2:

- PhotoMos-Relay applied
- Load voltage: 60V (DC or AC)

- Load current: 400mA
- Off-state leakage current: 1uA Max.
- Turn-ON time: 2ms Max.
- Turn-OFF time: 0.2 ms Max.
- Arc-Free with no snubbing circuits
- Isolation: 1500Vrms
- Power requirements: E5V: DC+5V (4.8V~5.5V) ---500 mA

Note: If the voltage of E5V is less than +4.8 V, the PCLD-8241 will not work properly.

Please refer to following table for the effective Remote IO distance. Since the effective distance is related to the communication base frequency, users can configure the base frequency with function API EP_SetRIOClockDivider before working with the remote IO modules.

Communication Base Frequency (Hz)	250 K	500 K	1 M	2 M
Effective Distance (Meter)	100	40	10	5