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# PCI-DMC-A01/B01 **User Manual**





## About this Manual

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# **Chapter 1 Installation Environment**

# 1.1 Physical Architecture

The communications framework of the PCI-DMC-01 interface is based on the Delta Motion Control Network (DMCNET<sup>TM</sup>) protocol. Figure 1.1 is a diagram of the physical architecture. As shown in Figure 1.1, when you wish to use the PCI-DMC-01 for communications, attach one end of the network cable (please refer to Cable Types in Section 1.2 Hardware Specifications for cable specifications) to CN2 on the PCI-DMC-01 interface card (end A in Figure 1.1), and attach the other end to the slave module (end B in Figure 1.1: CN6 on the Delta ASDA-A2-F Drive) to establish a series connection.

Make sure that both ends of the network cable use <u>RJ45 connectors with metal</u> <u>shielding</u> (indicated by yellow arrows in Figure 1.2). The last Slave Module in the link must have a <u>Terminal</u> (see Figure 1.3 left) connected to its RJ45 port (Figure 1.1 B-side: port CN6 on the Delta ASDA-A2-F Servo Drive.).

Terminal operation: Connect pin 1 and pin 2 of the RJ45 connector (Figure 1.3: right side) with a 150 $\Omega$  (Ohm) resistor then connect pin 3 and pin 6 with another 150 $\Omega$  (Ohm) resistor to make a terminal.





Figure 1.2 Connector with Metal Shielding



Figure 1.3 Actual Terminal

Figure 1.1 PCI-DMC-01 Overview of Physical Architecture

## **1.2 Hardware Specifications**

### Motion Control

- Supported Module: Delta ASDA -A2-F Servo Drive
- Homing modes: 35 types (controlled by DMCNET parameter settings)
- Acceleration mode: T-curve, S-curve
- Interpolation modes: linear, arc, helical, and continuous

### <u>DMCNET</u>

- Ring quantity: 1 set
- Serial Control Interface: half duplex RS-485 with transformer isolation
- Cabling Type:CAT-5e STP Ethernet cable (24AWG/4Pairs)
- Communications distance: Maximum 30 meters (12 slave module)

### <u>General</u>

- Axis card size (including bracket): 189mm x 126mm x 20mm (I x w x h)
- PCI specifications: ver. 2.2;Supports 32-bit, 3.3V/5VDC operating mode
- Power Consumption: +5V DC at 0.5A typical
- Surge Voltage Tolerance: 1500VAC(Primary-secondary);

### 1500VAC(Primary-PE)

- ESD:8KV Air Discharge
- EFT: Power Line-2KV
- RS:80MHz ~ 1GHz, 10V/m
- Operating temperature:0 °C ~ 50 °C

## **1.3 Electrical Safety Precautions**

- 1. To prevent electrical hazards, please disconnect the system from the power supply before moving the system.
- 2. Make sure that all power supply cables have been disconnected before connecting or disconnecting any signal wires from the main board.
- 3. Please make sure that the voltage of the power supply has been set to the standard voltage used for your current country/region. If you are not sure what the voltage of your local power supply is, please contact your local electrical company.
- 4. If the power supply is damaged, do not attempt to repair it by yourself. Please contact professional technicians or your distributors for assistance.

# 1.4 PCB Layout

■ PCI-DMC-A01 (Ver.2.0)



Figure 1.4 PCI-DMC-A01 Physical Layout

|--|

Title	Function	
CN1	Digital Input/output Connector	
CN2	DMCNET Expansion Module Connection Port	
RSW1	Card ID Number Configuration Switch	
DSW2	Input/Output Signal SINK/SOURCE Device Switch	



Figure 1.5 PCI-DMC-B01 Physical Layout

Title	Function	
CN1	Connector (digital input/output, encoder & compare)	
CN2	DMCNET Expansion Module Connection Port	
CN9	Position compare signal output (channel 1, 3.3V)	
CN10	I10 Position compare signal output (channel 1, 3.3V)	
RSW1 Card ID Number Configuration Switch		

# 1.5 Connector Pin Guide

■ CN1: Digital Input / Output (for A01\_Ver.2.0)

11	6	1
		0

Figure 1.6 CN1 pin definition

Pin	Label	Description
1	GPIO IN 0	GPIO Input signal
2	GPIO IN 1	GPIO Input signal
3	GPIO IN 2	GPIO Input signal
4	GPIO IN 3	GPIO Input signal
5	External GND	GND Signal
6	E24V	24VDC Power Input
7	GPIO IN 4	GPIO Input signal
8	GPIO IN 5	GPIO Input signal
9	GPIO IN 6	GPIO Input signal
10	GPIO IN 7	GPIO Input signal
11	External GND	GND Signal
12	GPIO OUT 0	GPIO Output signal
13	GPIO OUT 1	GPIO Output signal
14	GPIO OUT 2	GPIO Output signal
15	GPIO OUT 3	GPIO Output signal

GPIO: General Purpose Input & Output

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Figure 1.7

CN1 pin definition

# CN1: Digital Input / Output (for A01\_Ver.1.1 & B01)

Pin	Label	Description
1	QA_1-	QA Signal 1 ( - )
2	QB_1-	QB Signal 1 ( - )
3	QA_2-	QA Signal 2 ( - )
4	QB_2-	QB Signal 2 ( - )
5	External GND	GND Signal
6	QA_1+	QA Signal 1 ( + )
7	QB_1+	QB Signal 1 ( + )
8	QA_2+	QA Signal 2 ( + )
9	QB_2+	QB Signal 2 ( + )
10	GPIO IN	GPIO Input signal
11	CMP_1+(RS-422)	1 <sup>st</sup> RS422 Differential Signal ( + )
12	CMP_1- (RS-422)	1 <sup>st</sup> RS422 Differential Signal ( - )
13	CMP_2+(RS-422)	2 <sup>nd</sup> RS422 Differential Signal (+)
14	CMP_2- (RS-422)	2 <sup>nd</sup> RS422 Differential Signal ( - )
15	GPIO OUT	GPIO Output signal

GPIO: General Purpose Input & Output

%This is the pin definition for PCI-DMC-B01 Ver2.0. On PCI-DMC-A01 Ver1.1 only Pin 5, Pin 10 and Pin 15 are valid.

## CN2: DMCNET Expansion Module Connection Port



Figure 1.8 CN2 pin definition

Pin	Label	Description
1	RS485T_1(+)	1 <sup>st</sup> RS485 transmission signal(+)
2	RS485T_1(-)	1 <sup>st</sup> RS485 transmission signal(-)
3	RS485T_2(+)	2 <sup>nd</sup> RS485 transmission signal(+)
6	RS485T_2(-)	2 <sup>nd</sup> RS485 transmission signal(-)
7	EGND	9V Ground Signal
8	EGND	9V Ground Signal

## DSW2:SINK/SOURCE Loop Switch



Figure 1.9

DSW2 pin definition

Label	Description
ON	SOURCE (connected with PNP device)
OFF	SINK (connected with NPN device)

DSW2 is for PCI-DMC-A01 only. There is no such part in Ver. 1.1.

When the connected external device is Low active then DSW2 must be set to OFF; If it is High active then DSW2 must be set to ON instead.

## CN9: 3.3V Compare Output 1



Figure 1.10 CN9 pin definition

Pin	Label	Description
1	CMP_OUT1(QEP1)	CMOS 3.3V to level comparison trigger signal output
2	GND	GND Signal
3	CMP_1+(LVDS)	LVDS Differential Signal (+)
4	CMP_1- (LVDS)	LVDS Differential Signal ( - )

CN9 is for PCI-DMC-B01 only. PCI-DMC-A01 does not contain this part.

This is the socket-side pin definition. PIN 1 on the cable corresponds to PIN 4 here.

## ■ CN10: 3.3V Compare Output 2



Figure 1.11 CN10 pin definition

Pin	Label	Description
1	CMP_OUT2(QEP2)	CMOS 3.3V to level comparison trigger signal output
2	GND	GND Signal
3	CMP_2+(LVDS)	LVDS Differential Signal (+)
4	CMP_2- (LVDS)	LVDS Differential Signal ( - )

CN10 is for PCI-DMC-B01 only. PCI-DMC-A01 does not contain this part.

This is the socket-side pin definition. PIN 1 on the cable corresponds to PIN 4 here.

### SW1: Dial for Setting the Card ID Number



Figure 1.12 SW1 dial

Card ID is the value that the dial is turned to.

It can be set to a value between  $0 \sim 15$ .

% This dial is used to set the Card ID on PCI-DMC-A01 / PCI-DMC-B01 Ver.2.0.

## SW1: Card ID Number Configuration Switch



Figure 1.13 SW1 Dip Switch

Pin	Label	Description
1	Bit3	Card ID Bit3
2	Bit2	Card ID Bit2
3	Bit1	Card ID Bit1
4	Bit0	Card ID Bit0

Card ID = Bit3x2\*<sup>3</sup>+Bit2x2\*<sup>2</sup>+Bit1x2\*<sup>1</sup>+Bit0x2\*<sup>0</sup>

% This dip switch is used on PCI-DMC-A01 Ver.1.1 to set the Card ID.

# 1.6 Wiring Example

Connecting the PCI-DMC-A01 Digital Output to External Input Device

SINK type

PCI-DMC-A01 ver.1.1





PCI-DMC-A01 ver.2.0



Figure 1.15

SOURCE type

PCI-DMC-A01 ver.2.0



Figure 1.16

※ PCI-DMC-A01 Ver.1.1 output points do not support connections of SOURCE type Input devices.

## Connecting the PCI-DMC-A01 Digital Input to External Output Device

SINK type

PCI-DMC-A01 ver.1.1



Figure 1.17

PCI-DMC-A01 ver.2.0



Figure 1.18

※ PCI-DMC-A01 input point only supports connection of SINK type output devices.

## Wiring of PCI-DMC-B01 High-speed Counter

### Encoder



Figure 1.19

### Compare (RS-422 differential)





### Compare (non-differential)



Figure 1.21

# ■ 3.3V Compare Output Wiring (CN9, CN10)



Figure 1.22

# 1.7 Card Compatibility

Please check the number of cards you plan to use before installing the PCI-DMC-01 card. If you plan to install <u>3 or less</u> PCI-DMC-01 cards, the recommended power supply for the system, is <u>300W (Watt)</u> at least. For <u>8 or more</u> PCI-DMC-01 cards, please use a power supply rated higher than <u>500W (Watt)</u> to ensure that the PCI-DMC-01 cards will operate normally.

The following table lists the testing environment used for PCI-DMC-01 card's compatibility tests.

Test PC Name	CPU Card	Power Supply	Operation System
IEI IP-4SA-RS	IP-4SA-RS-R30 Rev.3.0	200W	Windows XP
IEI IPC	Intel N270 1.6GHz / HPE-8S0	300W	Windows XP
Advantech IPC	PCA-6106P3-0C1 Rev.C1	200W	Windows XP
ADLINK IPC	HPCI6S VER6.0	230W	Windows XP
iSM ICS-2442-20	PEAK-765VL2 / NBP-1412P	500W	Windows XP

Table 1.3 Overview of compatible IPC specifications

Table 1.4 Overview o	compatible commercial	specifications PCs
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Test PC Name	CPU Card	Power Supply	Operation System
DELL Vistro 220	G45M03 / Core 2 Duo 2.8GHz	350W	Windows Vista
DELL Vistro 430	Intel Core i5-750 2.66GHz	350W	Windows XP
DELL Vostro 230	Intel Pentium E6700 3.2GHz	350W	Windows 7

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# **Chapter 2 Installation Guide**

This chapter describes how to install the PCI-DMC-01 multi-axis motion control card. Please follow the following installation process:

- Product Packaging and Accessories (section 2.1)
- Hardware Installation (section 2.2)
- Driver Installation (section 2.3)

# 2.1 Product Packaging and Accessories

This product should include:

- PCI-DMC-01 Multi-axis Motion Control Card 1 pcs
- PCI-DMC-01 Driver Installation CD x 1

If this product's standard accessories are missing or damaged, please contact your distributor for replacement. Please store the packaging in a safe place in case you need to mail the product in the future.

## 2.2 Hardware Installation

### Hardware Configuration

PCI-DMC-01 is treated as a standard Plug and Play device by the PC. Basic system functions such as memory allocation and I/O port assignments can all be managed through BIOS of the PC system. The user does not need to configure the hardware directly.

## PCI Slot Selection

When the PC system has both built-in ISA and PCI expansion slots, please take care not to insert this product into an ISA expansion slot! The card is not only physically incompatible but is also designed for use with PCI only, so it will only work normally in a PCI expansion slot.

## Motion Card Installation

- Step 1: Turn off the main power supply of the computer in which the PCI-DMC-01 will be installed, and disconnect any peripherals such as printers and monitors. Confirm that the power supply is connected to the computer and is grounded.
- Step 2: Touch the back plate of the system case to discharge any static electricity on your body. Once done, disconnect the system's power supply.
- Step 3: Open the system case, choose an empty PCI slot and remove the corresponding back plate. Watch out for any sharp edges on the metal plating during the removal process.
- Step 4: Remove PCI-DMC-01 from its packaging while keeping one hand touching the metallic part of the system case. This action is intended to earth any static electricity on your body through the system case. Make sure that you do not touch any of the components on the card to avoid electro-static damage. Put on rubber gloves and pick up the PCI-DMC-01 card in the manner shown in Figure 2.1.



Figure 2.1

Shown below are two wrong ways of handling the PCI-DMC-01 card. In Figure 2.2, the hands are in direct contact with the components of the PCI-DMC-01 card. Handling the card in this manner may crush the card components or damage them through static electricity. In Figure 2.3, the hand is in direct contact with the golden pins of the PCI-DMC-01 card. Handling the card in this manner may lead to static electricity on the hands discharging through the golden pins, which could damage the IC or other components.



Figure 2.2 <u>Do not</u> touch the card components directly with your hands.



Figure 2.3 <u>Do not</u> touch the golden pins of the card directly with your hands.

Step 5: Make sure that the PCI-DMC-01 card is inserted vertically into the PCI slot as shown in Figure 2.4. Press the PCI-DMC-01 card firmly into the slot. Extra care should be taken where the card touches the slot as shown in Figure 2.5. This will help avoid damage to the card or main board.



Figure 2.4



Figure 2.5

- Step 6: Secure the PCI-DMC-01 card in its PCI slot to the case with a screw.
- Step 7: Reinstall the system case. This completes the hardware installation of the PCI-DMC-01 card.

## Hardware Installation Troubleshooting

If you installed the card following the above procedure but the system will not restart normally, please turn off the system and disconnect the power. Open the system case and check that the PCI-DMC-01 card is inserted properly. Check to see if the screw is loose or the PCI-DMC-01 is not properly seated in the PCI slot. Try removing the PCI-DMC-01 from the PCI slot then restart the system to see if the system runs normally. If the system runs normally, follow the above procedure and install the PCI-DMC-01 again. If the system still does not start normally, please contact your distributor for assistance.

## 2.3 Preparation for Driver Software Installation

## 2.3.1 Close New Hardware Wizard

When you install the hardware and start the system for the first time, the "New Hardware Wizard" window will pop up as shown in Figure 2.6. Please click on "Cancel" to close the wizard as the next step is to install the software bundle.

尋找新増硬酸精靈	
	歡迎使用尋找新增硬體精霊
	Windows將會搜尋您的電腦、硬體安裝 CD 或 Windows Update 網站(您尤許的話)來尋找目前的以及已更新的軟 體。 閱讀我們的隱私權聲明
	Windows 是否可以連線到 Windows Update 尋找軟體?
	<ul> <li>○ 是,只有現在(Y)</li> <li>○ 是,現在以及每次我連接了一個裝置時(E)</li> <li>○ 不,現在不要(I)</li> </ul>
	請按 [下一步] 繼續。
	>上一步(图) 下一步(图) ■ <b>取消</b>

Figure 2.6

# 2.3.2 Find the New PCI Device

Open the system "Control Panel" as shown in Figure 2.7, then find and open "System".



Figure 2.7

In the "Hardware" field of "System Properties", click on "Device Manager" as shown in Figure 2.8.

要直管理員列出 使用装置管理員	所有安裝在 來變更裝置	電腦上的破 內容。	更體裝置。北	四以
			置管理員( <u>D</u> )	
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		硬	<b>體設定檔(2)</b>	

Figure 2.8

As shown in Figure 2.9, if you have only one PCI-DMC-01 card installed in the PCI slot, the listing will show one unknown "PCI Device". This means that the PCI-DMC-01 card you installed has been detected by the system. The next step is to install the driver software for this card. Please see section 2.4 "Driver Software Installation".

檔案 E 執行 (실) 核視 (Y) 說明 (E) ← → E	
<ul> <li>●</li> <li>●</li></ul>	
□ □ □ DYD/CD-ROM 光碟機 □ □ DYD/CD-ROM 光碟機 □ □ DE ATA/ATAPI 控制器 □ ② SCSI及 RAID 控制器 □ ② 人性化介面裝置 □ □ 系統裝置 □ ③ 其他裝置 □ ② FCI 裝置	
<ul> <li>● 音效, 視訊及速戲控制器</li> <li>● 處理器</li> <li>● 蘇碟機控制卡</li> <li>● ● 動產流排控制器</li> <li>● ● 連接埠 (COM 和 LPT)</li> <li>● ● 滑鼠及其他指標裝置</li> <li>● ● 電腦</li> <li>● ● 電腦</li> <li>● ● 電腦</li> <li>● ● 職務介面卡</li> <li>● ● 鍵盤</li> <li>● ● 2 顯示卡</li> </ul>	

Figure 2.9

## 2.3.3 New PCI Device Not Detected by System

If you have installed the hardware and restarted the system, but the "New Hardware Wizard" shown in Figure 2.6 does not automatically pop up, an unknown PCI device is not detected in Device Manager (see Figure 2.10). To see if the system has detected a new PCI device, please refer to section 2.3.2 "Find the new PCI device"

旦, 装置管理員		
	Finding a New PCI Device Not	
田		

Figure 2.10

PCI and ISA cards are installed differently by the system. For this reason, <u>do</u> <u>not</u> attempt to install the driver from the "Control Panel" using "Add new Hardware" (see Fig. 2.11 and Fig. 2.12). Try installing the PCI-DMC-01 card to <u>another free PCI slot on the system</u> or <u>try to use another test system</u>. If the problem is not resolved, please contact your distributor for assistance.



# 2.4 Driver Software Installation

## 2.4.1 Software Installation Procedure

Step 1: Open the CD and in the DISK1\_32bit\_XXXX folder select and run "setup.exe" as shown in Figure 2.13.

DI5K1_32bit_All_2013.05.21		-	
『案(E) 編輯(E) 檢視(⊻) 我自	的最愛(A) 工具(	1) 説明(H)	
) 🕂 🐧 - 🕥 - 👔 🎜	) 搜尋 😕 資	料夾 🛄 •	
址(D) C:\Kevin\DISK_Build\PCI	_DMC_合併版\Disl	(1_2013.05.21\32bits\DI5K1_32bit_A	II_2013.05.21 💽 🛃
檔案及資料夾工作	*	program files	System32
建立新的資料夾 輸 將這個資料夾發佈到網站 計用這個資料夾	0	Windows	0x0409.ini 組態設定値 14 KB
其他位置	* 餋	ISSetup.dll 15.0.0.591 InstallShield (R) Setup Engine	PCI-DMC.msi Windows Installer 封裝 778 KB
詳細資料	*	setup.exe	Setup.ini
<b>DI5K1_32bit_All_2013.05.21</b> 檔案資料夾 修改日期: 2013年5月23日,上午 11:34	2	Setup Launcher IDELTA	組態設定値 3 KB

Figure 2.13

Step 2: As shown in Figure 2.14, the system program will start by checking the system resources.



Figure 2.14

Step 3: As shown in Figure 2.15, once the system resources check has been completed, the software installation process will begin. Pleas click on "Next" to continue.



Figure 2.15

Step 4: As shown in Figure 2.16, select the software installation path to use on the system. Using the default path is recommended. Please click on "Next" to continue.

PCI-DMC - InstallShield Wizard			×
Choose Destination Location Select folder where setup will install files.			
Setup will install PCI-DMC in the following folder.			
To install to this folder, click Next. To install to a another folder.	different folder, cli	ck Browse and select	¢.
Destination Folder			_
C:\\Delta Industrial Automation\PCI-DMC\		Biowse	R.,,
Install6hield			
	< <u>B</u> ack	Next> C	ancel

Figure 2.16

Step 5: As shown in Figure 2.17, the driver software is now being installed. Please do not interrupt the installation process.

InstallShield Wizard	×
Setup Status	
PCI-DMCSetup is performing the requested op	erations.
Registering product	
InstallShield	
	Cancel



Step 6: As shown in Figure 2.18, the driver software has been successfully installed. Click on "Finish" to complete the installation process.



Figure 2.18

## 2.4.2 Software Installation Procedure (Windows 764 bit)

Step 1: Open the CD and in the DISK1\_64bit\_XXXX folder select and run "setup.exe" as shown in Figure 2.19.

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名稱	program files	修改日期	類型	+10		
	program files			A.		
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	System32	2013/5/10下午 0	檔案資料夾			
	System64	2013/5/10 下午 0	檔案資料夾			
	0x0409.ini	2013/3/27下午 0	組態設定	14 KB		
1	Autorun.inf	2013/5/10下午 0	安裝資訊	1 KB		
9	ISSetup.dll	2013/5/10下午 0	應用程式擴充	1,542 KB		
թ	PCI-DMCmsi	2013/5/10 下午 0	Windows Installe	787 KB		
ٹ	setup.exe	2013/5/10下午 0	應用程式	589 KB		
1	Setup.ini	2013/5/10 下午 0	組態設定	3 KB		

Figure 2.19

Step 2: The system program will start by checking the system resources.



Step 3: Once the system resources check has been completed, the software installation process will begin. Pleas click on "Next" to continue.



Step 4: Select the software installation path to use on the system. Using the default path is recommended. Please click on "Next" to continue.



Step 5: The driver software is now being installed. Please do not interrupt the installation process.

PCI-DMC InstallShield Wizard	<b>**</b>
Setup Status	
PCI-DMC is configuring your new software installation.	
Validating install	
InstallShield	Cancel

Step 6: Select "Install this driver software anyway".



Step 7: The driver software has been successfully installed. Click on "Finish" to complete the installation process.



## 2.5 Checking Software Pack Installation Results

### 2.5.1 Check that Software has been Installed Successfully

Step 1: Open "Device Manager" (Control Panel →System→ Hardware→ Device Manager) and use the same method as section 2.3.2. If a device named "Delta ASD PCI DMC\_01" was added, this means the driver was installed successfully.



Step 2: There should be a new "Delta Industrial Automation" folder in "Start\All Programs" containing the application program as well as other files included in with the CD.



### 2.5.2 Software Installation Failure

If "Device Manager" (Control Panel  $\rightarrow$ System  $\rightarrow$ Hardware  $\rightarrow$ Device Manager) still shows the device as an unknown PCI device (see Figure 2.20) or there is an "exclamation mark" (see Figure 2.21) for the new device, this means the driver software did not install properly.







Figure 2.21

### 2.6 Dealing with Software Installation Failure

If driver installation failed and the device information shown in "Device Manager" (Control Panel  $\rightarrow$ System  $\rightarrow$ Hardware  $\rightarrow$ Device Manager) is the same as Figure 2.28, please install the driver manually. Please refer to section 2.20 "Manual Driver Installation" for more details.

If the device information shown in "Device Manager" (Control Panel  $\rightarrow$ System  $\rightarrow$ Hardware  $\rightarrow$ Device Manager) is the same as Figure 2.21, please select and "right mouse click" on the device. A pop-up window will appear as shown in Figure 2.22. Please click on "Properties" to inspect the device properties and resources.



Figure 2.22

When you view the device properties of this Delta ASD PCI DMC\_01 device, under the "General" tab is a "Device Status" field. This shows the error message and error code for this device as shown in Figure 2.23 and Figure 2.24.



Figure 2.23



If the error code is 39 (see Figure 2.23) you can try manually installing the driver as described in section 2.8 "Manual Driver Installation". If the error code is 39 (see Figure 2.24), we recommend trying to install the PCI-DMC-01 card in another free PCI slot or another system. If you still can't install the driver software, please record the error message and code in this field. Inform your distributor of this error message and error code then ask for their assistance.

# 2.7 Install the Card in Another PCI Slot

As suggested in section 2.6, if you need to switch the PCI-DMC-01 card to another free PCI slot system, please discharge any static electricity, disconnect the system power supply then remove the PCI-DMC-01 card. Follow the instructions in section 2.2.3 to re-install the card.

Once you have switched the PCI-DMC-01 card to another free PCI slot on the system, check to see if the drivers have been installed on the system before your restart the system. If they are not yet installed, please skip the following section and go to section 2.8 "Manual Driver Installation".

When the PCI-DMC-01 card has been properly installed in the new PCI slot and the system is restarted, the "New Hardware Wizard" window (see Figure 2.25) will pop-up. Please select "No, not this time" then click on "Next" to continue.



Figure 2.25

As shown in Figure 2.26, the wizard will indicate that it will now install the driver for "Delta ASD PCI DMC\_01". Please select "Install from a list or specific location (Advanced) ( $\underline{S}$ )" then click on "Next" to continue.

<b>尋找新增硬酸精靈</b>	
	這個精靈協助您安裝軟體於: Delta ASD PCI DMC_01
	如果您的硬酸附有安装 CD 或磁片,現在將它 插入。
	您要精靈執行什麼工作? ・ <u>自動安裝軟體(建議選項)(0</u> ・ 從 <b>酒單或特定位置安裝(</b> 運階)( <u>⑤</u> )
	請按[下一步] 繼續。

Figure 2.26

As shown in Figure 2.27, the system asks you to choose your search and installation options. Choose "Don't search. I will choose a driver to install ( $\underline{D}$ )" then click on "Next" to continue.

机新增	曾硬數精靈
諸選	擇您的搜尋和安裝選項。
¢	<ul> <li>在這些位置中搜尋最好的驅動程式③</li> <li>使用下列核取方塊來限制或擴充包括本機路徑和可卸除式媒體的預設搜尋,將安</li> </ul>
	裝找到的最佳驅動程式 ← 「四、現現式 年間的全球協会」「動力で、「CD」POM (MA)
	► 健康時包括這個位置(2).
	C /Decompents and Settings/M doministration 原面/HF / 創覽(E)
G	・不要搜尋・我將選擇要安裝的驅動程式①
	選擇這個選項來從清單中選取裝置驅動程式。Windows不保證您所選取的驅動程式最符合您的硬體。
	< トー步(B)   下一步(M) >

Figure 2.27

The system will now look for compatible drivers as shown in Figure 2.28. Select the "Delta ASD PCI DMC\_01" driver listed by the system then click on "Next" to continue.

選取惣要爲這個硬體安裝的裝置驅動程式	
<ul> <li>諸選擇您的硬體裝置製造商和機型,然後按[下一步]。如果您想從磁片安裝]。</li> <li>✓ 顯示相容硬體(C)</li> <li>機型</li> <li>Delta ASD PCI DMC_01</li> <li>①          ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●</li></ul>	
■ 動程式,請按[從磁片安裝]。 ○ 顯示相容硬體(C) 機型 Delta ASD PCI DMC_01	非他驅
<ul> <li>✓ 顯示相容硬體(C)</li> <li>機型</li> <li>Delta ASD PCI DMC_01</li> <li></li></ul>	
使 Merrind Beckerer       機型       Delta ASD PCI DMC_01         ①            ●	
Delta ASD PCI DMC_01           ①         運動程式尚未數位签章!         從磁片安裝()           小SE# 26(4) 年前回来的一步放去相手再         ()	
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▲ <b>驅動程式尚未數位答章!</b> (C磁片安皱)	
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Figure 2.28

The system is now installing the driver.

尋找新增硬酸精靈 精靈安裝軟體時,請稍候	
Delta ASD PCI DMC_01	
600	D
	<u>- : 上一步但) 下一步(11) &gt; 取消</u>

The system has finished installing the driver for PCI-DMC-01 card.

<b>尋找新增硬體精靈</b>	
	完成尋找新增硬體精霊
	這個精靈安裝了軟體於
	Delta ASD PCI DMC_01
	按[完成] 關閉精靈。
	< ├────────────────────────────────────
	Carl Start Carlson and Carlson

Once installation is completed, please open "Device Manager" (Control Panel  $\rightarrow$  System  $\rightarrow$  Hardware  $\rightarrow$  Device Manager) to check current device driver status. Figure 2.29 shows that the PCI-DMC-01 card has been installed successfully.

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Figure 2.29

## 2.8 Manual Driver Installation

If you can't use installer to successfully install the PCI-DMC-01 card drivers on the system, you can try the following manual driver installation process.

Step 1: Go to the "... \ Windows \ inf" folder on the CD and select the file "PCI\_DMC\_01.INF", then hold down "Ctrl + C" to copy.



Step 2: Copy the file "PCI\_DMC\_01.INF" to "C: \WINDOWS\inf".

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Step 3: Select the files "DII2DMC01.dll" and "PCI\_DMC\_01.dll" in the CD's "... \ System32" folder, and press "Ctrl + C" to copy these two files.

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Step 4: Copy "DII2DMC01.dll" and "PCI\_DMC\_01.dll" to "C: \WINDOWS \ system32."

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	wuauchti .exe	xpspl res.dll	
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1 我的電腦	wuaucpl.cpl	xpsp3res.dll	
網路上的芳鄰	wuaucpl.cpl.manifest	xpsp4res.dll	
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Step 5: Go to the "... \ System32 \ drivers" folder on the CD, select the file "PCI\_DMC\_01.sys", then hold down "Ctrl + C" to copy.

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Step 6: Copy "PCI\_DMC\_01.sys" to "C: \ WINDOWS \ system32 \ drivers."

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Step 7: Open "Device Manager" (Control Panel →System →Hardware →Device Manager), "right mouse click" the unknown "PCI Device", then select "Scan for hardware changes."(Please check that the PCI device has been installed in the system).

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掃描變更或新增的隨插	即用裝置。	

Step 8: The "New Hardware Wizard" window will pop-up. Select "No, not this time" and click on "Next" to continue.



Step 9: The wizard will indicate that it will now install the driver for "Delta ASD PCI DMC\_01." Please select "Install from a list or specific location (Advanced) (<u>S</u>)" and click on "Next" to continue.



Step 10: The system asks you to choose your search and installation options. Choose "Don't search. I will choose a driver to install (<u>D</u>)", then click on "Next" continue.

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諸選擇您的	的搜尋和安裝選項。
○ 在這 使用	些位置中搜尋最好的驅動程式③ 丁列核取方塊來限制或擴充包括本機路徑和可卸除式媒體的預設搜尋,將表
装技	判的病性難動程式。 地理可能時去媒體(軟化)CD-ROAL 1041
Ē	復靈時包括這個位置位).
	C /Documents and Settings/Administration原面/HE 之子 瀏覽(E)
• 不要	
選擇式最	這個選切來從指單中選取委直隨動推到。Windows不休證忽所選取的隨動推 符合您的硬體。
	Lutani Trutani Brite

Step 11: The system will list the compatible drivers for "Delta ASD PCI DMC\_01." Click on "Next" to continue.

<b>뢎找新增硬體精靈</b>	and the second se
選取您要爲這個硬體安裝的裝置驅動	EX S
<b>清湖</b> 擇您的硬體裝置製造商和機型	」,然後按 [下一步]。如果您想從磁片安裝其他驅
■■● 動程式 ' 諸按 [從磁片安裝]。	
▼ 顯示相容硬體(C)	
後型	
Dena ASD PCI DMC_01	
▲ 驅動程式尚未數位签章!	從磁片安裝(出)
告訴我為什麼驅動程式簽章很重要	
	<上一步(B) 下一步(0) 》 取消

Step 12: The system is now installing the driver.

:找新增硬設結靈 精靈安裝軟體時,請稍候	
Delta ASD PCI DMC_01	
600	D
	. L_42700 1

Step 13: The system has finished installing the driver for the PCI-DMC-01 card.

<b>尋找新</b> 増硬體精靈	
	完成尋找新增硬體精霊
	這個精靈安裝了軟體於:
	Delta ASD PCI DMC_01
	按「完成」關閉結本。
	《上一步(B) <b>完成</b> 取消

Step 14: Once installation is completed, please open "Device Manager" (Control Panel →System →Hardware →Device Manager) to check current device driver status. Figure 2.53 shows that the PCI-DMC-01 card has been installed successfully.

<u>□</u> 装置管理員	
檔案(12) 執行(△) 檢視(型) 說明(Ⅱ)	
□       ●	

# 2.9 Borland C++ Builder (BCB) Example

After completing software installation in 2.4, there will be program libraries in C: \Program Files\Delta IndustrialAutomation \PCI-DMC\samples for the six languages, including BCB (Borland C++ Builder), C#, Delphi, VB, VB.Net, and VC. Of these, BCB employs dynamic link (PCI\_DMC.dll). If you wish to use PCI\_DMC.dll with a static link, copy the two files PCI\_DMC.h and BCBPCI\_DMC.lib, which can be found in the location C: \Program Files\Delta Industrial Automation \PCI-DMC\lib to BCB\Sample File. After launching the BCB program, select BCBPCI\_DMC.lib in Project\Add to project (see Figure 2.30, Figure 2.31).



Figure 2.30



Figure 2.31

When you have added the BCB lib file, be sure to add "#include "PCI\_DMC.h"" to the BCB program code (see Figure 2.32). Once these two actions have been completed, you can begin the demonstration of BCB examples included with the CD.

🗎 Unit1.cpp	
English Project1 - Classes	Unit1.cpp
	//
	<pre>#include <vcl.h></vcl.h></pre>
	#pragma hdrstop
	#include "Unit1.h"
	<pre>#include "PCI_DMC.h"</pre>
	#include "PCI_DMC_Err.h"
	//
	#pragma resource "*.dfm"
	TForm1 *Form1;

Figure 2.32

(This page is intentionally left blank.)

# Chapter 3 Using EzDMC

EzDMC is a serial control utility that tests the serial connection to see if it is working properly. When EZDMC is running, the system automatically scans and classifies all known online extension modules. You can use the listed modules to determine if the serial control modules on the system are working normally and select each expansion module for function testing. A brief description of EzDMC functions is provided below.

# **3.1 Introduction to EzDMC Functions**

As shown in Figure 3.1, once you launch EzDMC the following program screen will appear on your computer system. The very top is the function menu block (**①**).Below the function menu block is the toolbar (**②**). This can be used for basic status control. There are two display blocks beneath the toolbar: The left display block (**③**) displays the control system and expansion module list; the right display block (**④**) is used expansion function's basic messages and command console. Part of the window is the SDI operation mode that shows various information. Below the display screen is the program status display block (**⑤**). It not only shows the system's basic connection status but also the connection details.



Figure 3.1

# 3.2 EzDMC Connection Procedure

After you have configured the PCI-DMC-01 interface card and linked modules (such as driver and motor), if you wish to use EzDMC to test the serial link, you must carry out the following testing and operating procedure in order.

- Step 1: Launch EzDMC.
- Step 2: Find the PCI-DMC-01 control card. (see section 3.3)
- Step 3: Find linked expansion module devices. (see section 3.4)
- Step 4: Motion control on single-axis and multi-axis. (see section 3.6 and 3.7)
- Step 5: Stop using expansion device.
- Step 6: PCI-DMC-01 interface card reset. (see section 3.8)

Step 7: Exit EzDMC.

# 3.3 Finding the PCI-DMC-A01

The first menu function (marked with bracket) is the "Search Card" function for finding the PCI-DMC-01 card. All the PCI cards and their setup in the system can be found using this function as shown below in Figure 3.2. When Search Card is completed, the device list shows the status of all found cards as well as the number and setup of master cards.



Figure 3.2

If the first menu function (Search Card) does not find any PCI-DMC-01 cards, the "No PCI\_DMC\_A01 Card Found!" error will pop up as shown in Figure 3.3. Please check that your PCI-DMC-01 card is properly installed in the system. Or turn off the power and remove the card. Follow the "2.2.3 Physical Card Installation" process to reinstall the PCI-DMC-01 card again.



Figure 3.3

# 3.4 Find Connected Extension modules

When the PCI-DMC-01 card has been found and marked, this means that the serial communications link has been established. The next step is to scan and see how many connected modules are linked in series on the same Ring. As shown in Figure 3.4, the second menu function (marked with bracket) is Scan Slave. You can use it to find the available and working modules on the Ring as well as the properties of these connected modules.



Figure 3.4

If the second menu option (Scan Slave) can't find the extension modules you wish to connect to, the "No slave found!" error message shown in Figure 3.5 will pop up. Please check that your extension modules are all connected properly. Also check that the expansion module is receiving power from the power supply.

EzDMC	×
No slave fou	nd!
確定	

Figure 3.5

# 3.5 EzDMC Status Display

The status display at the bottom of EzDMC shows information about the current status of the PCI-DMC-01 card. This is shown in Figure 3.6:





- 1: FIFO length
- 2: Task time that currently used
- ③: Linkage status of control card and connected extension modules
- ④: MailBox error count

# 3.6 Single-axis Control Interface

When you add the connected extension modules to the serial communications link, the next step is to test the expansion module operations. As shown in Figure 3.7, you can go to the "Left Display Block (①)" and click on the "icon (②)" for any expansion module and the "right display block (③)" will pop-up with the single-axis control interface window for that module. This can be used to control the single-axis operation of that module.

🛦 EZDMC		
File(E) HardWare(H) About		
<u>* / / / </u>		
× Servo		×
Slave Hardware	Velocity Profile	-IO Status
PCI-DMC-A01 CardID 0 Command 0	Distance O Pulse	RDY
FeedBack	Start Vel 0 PPS	swi 🞽 📗
D Servo A2F Slave: 0, 3 Speed RPM 0		
Torque	max vei	
Putter D	TACC Sec	Fault 🔴
	TDec sec	N/A 🔴
Beset	- Operate Mode	Qstop 🦲
	P to P     C Homing C Velocity	N/A 🍝 📗
Coperate Moving	C Continue C Torque 🔲 IP Mode	N/A 🍝
	- Motion ID	N/A 🍝
	Servo Beset Motion	Remote Ă
	On ALM Done	Target
	Version	
E Repet S Curve Abs	1736	
Index Sub Type D0 D1 D2	2 D3 SD0 OP CardNo	FLowErr
6060 0 2f 1 0 0	0 Send 6041 Read Node	N/A 🔴
CMD:581,COBID:606C,Data:0xl	00000000,= 0 1	N/A 🍝 📗
	0	-
		I
nro: U JU.Sms JProtocal= 3 JETr= U		h.

When you have opened the single-axis control interface of expansion module, Figure 3.8 below will explain the functions of each block in single-axis control interface as well as their purpose.



Figure 3.8

First block: Displays count values of motions. These include the position, velocity, torque, position reset function and number of buffered commands.

Second block: Execute motion commands such as clockwise rotation, CCW rotation and stop.

- Check "Repeat" to repeatedly execute clockwise and CCW motion.
- Check "S Curve" to set acceleration/deceleration as S-curve. The T-curve will be used otherwise.
- Check "Abs" to use absolute motion. Relative motion will be used otherwise.
- Third block: Sets CANOpen commands. The module's CANOpen commands can be read / sent here.
- Fourth block: Sets the motion command. This includes motion distance, starting velocity, maximum velocity and acceleration/deceleration time.
- Fifth block: Displays the status of the connected expansion module using an ON/OFF status light.

Sixth block: Motion operating mode settings. Available operation modes include point to point, home and constant velocity.

Check "IP Mode" to use PDO service for motion control. Otherwise SDO service will be used for motion control instead.

Seventh block: Set motor excite, motion status display and reset servo alarm message.

# 3.7 Multi-axis Control Interface

When you have added the connected extension modules to the serial communications link, if you wish to perform multi-axis motion control then click on the third menu motion (marked with square bracket) in the EzDMC "Toolbar" to execute Multi-Axis Control. The multi-axis control window will appear in the right display block (2) as shown in Figure 3.9.



Figure 3.9

The multi-axis control window will be divided into four blocks and each explained individually on the following page.

As shown in Figure 3.10, the multi-axis control window can be divided into the four following blocks and functions.





- First block: Select the motion status display, position reset and motor excite function. Only 3-axis motion control is available at the moment.
- Second block: Each motion parameter that must be set for motion operation; these settings are linked with the selections in the "Third block: Motion operating mode settings."
- Third block: Motion operating mode settings. The 6 motion control commands available include 2-axis linear interpolation, 3-axis linear interpolation, 2-axis arc interpolation and 3-axis helical.

Fourth block: Execute motion commands such as clockwise rotation, CCW rotation and stop.

- Check "Repeat" to repeatedly execute clockwise and CCW motion.
- Check "S Curve" to set acceleration/deceleration as S-curve. The T-curve will be used otherwise.
- Check "Abs" to use absolute motion. Relative motion will be used otherwise.

# 3.8 Master Security Interface



Figure 3.11 Launching Master Security operating interface

Master Security Card Numt User Write Login Login Status	per: 12 💌	X
Check Verify Key	Verify Key Check Verify Key	

Figure 3.12 Open Master Security user login interface

The above input fields all have 1~8 bits and accept hexadecimal values between 0~F.

**1** Card ID of DMCNET motion card.

**2** User login and status display field.

Default password		
Password1	FFFFFFF	
Password2	FFFFFFF	

(If login is successful, status will display "Pass" and grant access to the functions in Blocks ③, ④ and ⑥ in Figure 3.13; if not, status will display "Failed", and user must re-login)

	🖹 Master Security 🔀	I
	Card Number : 👔 🔽 🚺	
0	User Write Login Password Password Confirmation Status Pass. Write	6
	Write Verify Key	
8	Serial No. Input User Key Verify Key Read Make Verify Key Write	
	- Data Read/Write	
6	Page: 0 ~ 9 Read Write Sync	
	Status : 🛛 Readonly 🗖 Write Enable	
	- Check Verify Key Verify Key	
4	Check Verify Key	

Figure 3.13 Open Master Security interface after user login.

The above input fields all have 1~8 bits and accept hexadecimal values between 0~F.

- Card ID of DMCNET motion card.
- **2** User login and status display field.
- **3** Generate verify key.
  - Step1: Click on the "Read" button to read the product serial number. This gives two sets of 1 ~ 8 bit values made up of hexadecimal values between 0 ~ F.
  - Step2: User enters a custom User Key then click on "Make Verify Key" to generate a verify key. (The input and output will be 1 ~ 8 bits made up hexadecimal values between 0 ~ F)
  - Step3: Click on the "Write" button to write the generated Verify Key. (If write is successful, block ② will display "Done". "Failed" is displayed otherwise)
- Verify key confirmation field and status display. Enter the 4 sets of Verify Key generated above into the 4 fields of Check Verify Key then click on "Check Verify Key". (If verification is successful then "Pass" is displayed on the status bar below". "Lock!" is displayed otherwise)

**(D)** Data read and write area. (Please see Figure 3.14 for details)

- **6** Change password field.
  - Step1: Enter two new passwords in the "Password" field. Each is 1~8 bits in length and takes hexadecimal values between 0~F.
  - Step2: Enter the same password from "Password" in "Confirmation" again for verification.
  - Step3: If the two passwords in "Password" and "Confirmation" match, clicking on "Write" will change the password. If the passwords do not match, then block ② will show the error message "Confirmation Error". The change password procedure must now be repeated again.



Below is a more detailed description of block **(3)** in Figure 3.13

Figure 3.14 Description of master security block **G** functions

- (1) Page: Page to read or write to  $(0 \sim 9)$ .
- (2) Read: Read data from specified page.

(If read successful then block (5) will display 16 binary 0 ~ F hexadecimal values)

(3) Write: Data to write to specified page.

Step 1: In block (6), please fill in the desired 16 binary 0 ~ F hexadecimal values.

Step 2: Check "Write Enable" and Status bar will now display "Write/Read."

- Step 3: Click on "Write" to write data.
- (4) Sync: Copy data from block (5) to block (6).
- (5) Displays the output data when Read function is executed.
- (6) Contains the input data when Write function is executed.
- (7) Status: Shows the read status as either Read-only or Write/Read.
- (8) Write Enable: Change status to Write Enable.

# 3.9 Card Reset

When you are finished with serial motion control and wish to turn off the EzDMC program, please click on "Hardware/PCI\_Card\_Reset" to reset the PCI-DMC-01 card. Initialize the PCI-DMC-01 card again the next time you wish to use the card to ensure that the stability of data transmission/reception and the validity of test data. As shown in Figure 3.11, clicking this function resets the card. The card will be re-initialized the next time "Search Card" is executed.

<b>E</b> ZDMC		
File(E) HardWare(H) About	٠	
PCI_Card Reset(R)		
X Slave Hardware	🖞 Servo	×
	Position Velocity Profile	-IO Status
PCI-DMC-A01 CardID 0	Command 0 Distance 0 Pulse	RDY 🦲
Servo A2F Slave: 0 , 2	FeedBack 0 Start Vel 0 PPS	swi 🎽 📗
🖅 Servo A2F Slave: 0 , 3	Speed 0 Max Vel 0 PPS	OP 👗
	Torque TAcc 0 sec	Fault
	Buffer 0 TDec 0 sec	N/A
		Ostop
	Reset Uperate Mode	N/A
	Operate Moving O Continue O Torque 🔲 IP Mode	N/A 🍝
	Motion 10	N/A 🍈
	Servo Reset Motion	Remote 🦲
		Target 🦲
	Version	N/A 🍝
		SetPoint 🦲
	SD0 Operation	FLowErr
	6060 0 2f 1 0 0 0 Send 6041 Bead Node	N/A 🎽
	CMD:581,COBID:606C,Data:0x00000000 ,= 0 1	N/A 🍝
		-
fifo: 1 0.5ms Prote	ical= 3 Frr= 0	

Figure 3.15

# 3.10 Other Functions

When you are finished with single-axis or multi-axis motion control, you can use "File/Save Configuration" from the menu to save your motion control parameter. The next time you open EzDMC, "File/Load Configuration" from the menu can be used to load the motion control parameter you previously set into EzDMC to begin motion control right away. Figure 3.12 (indicated by arrow) shows the position of the menu option described above.

A EZDMC		
File(F) HardWare(H) About	1	
Save Configuration(S)		
Load Configuration(L)		
Load Default Configuration(D) X	Servo	
Slave Hardware		
PCI-DMC-A01 CardID 0	Compand	
🚽 🚽 Servo A2F Slave: 0 , 1	Distance Pulse	RDY 🔴
Servo A2F Slave: 0 , 2	PeedBack 1 Start Vel 0 PPS	swi 🦲 📋
Servo A2F Slave: 0, 3	Speed 0 MaxVel 0 PPS	ор 🁗
	Torque TAcc 0 sec	Fault
	Buffer 0 TDec 0 eec	
	Reset Operate Mode	Ustop
	C P to P C Homing C Velocity	N/A 🔴
	Operate Moving 💿 Continue O Torque 🔲 IP Mode	N/A 🍈
		N/A 🦲
		Remote
	On ALM Done	
	Repet SCurve Abs 1736	
		SetPoint 🔵 🔡
	Index Sub Tupe D0, D1, D2, D3 SD0 OP CardNo F	LowErr 🍝 🗌
	6060 0 2f 1 0 0 0 Send 6041 Read Node	N/A 🍝
	CMD:581,COBID:606C,Data:0x00000000 = 0	N/A 🍈
) fifo: 0 0.5ms Pro	tocal= 3 Err= 0	

Figure 3.16

(This page is intentionally left blank.)