

PCI2394 User's Manual

 **Beijing ART Technology Development Co., Ltd.**

Contents

<i>Contents</i>	2
<i>Chapter 1 Overview</i>	4
<i>Chapter 2 Components Layout Diagram and a Brief Description</i>	6
2.1 The Main Component Layout Diagram	6
2.2 The Basic Block Diagram	6
2.3 Signal Input/Output Connector	7
2.4 Indicator Lights	7
2.5 Physical ID of DIP Switch	7
<i>Chapter 3 Signal Connectors</i>	9
3.1 The Definition of Signal Input/Output Connector	9
<i>Chapter 4 Connection Ways for Input and Output</i>	10
4.1 Connection method for single-ended input	10
4.2 Connection method for differential inputs	10
4.3 Connection method for monopulse signal input	10
4.4 Connection method for monopulse signal input	11
4.4.1 Up/Down signal input	11
4.4.2 Rising edge signal input	11
4.4.3 Falling edge signal input	12
4.5 Connection method for digital signal input/output	12
4.5.1 Digital signal input	12
4.5.2 Digital signal output	13
<i>Chapter 5 Method of using a variety of functions</i>	14
5.1 Input Mode	14
5.1.1 Disabled Mode	14
5.1.2 Quadrature Input Counter Mode	14
5.1.3 Dipulse Mode	14
5.1.4 Pulse/Direction Mode	14
5.2 Latch Mode	14
5.2.1 Software Latch	14
5.2.2 Index Latch	14
5.2.3 Timer Latch	15
5.2.4 DI0~DI3 Latch	15
5.3 Interrupt	15
5.3.1 Counter Interrupt	15
5.3.2 Timer and DI Interrupt	15
5.4 Other parameter settings	15
5.4.1 Counter Overflow Lock	15
5.4.2 Counter Underflow Lock	15
5.4.3 Digital Filter	16
5.4.4 Reset Value	16
5.4.5 Enable Index Reset	16
5.5 DO settings	16

5.5.1 DO Control Mode	16
5.5.2 DO Output Mode	16
5.6 Timer setting	16
5.7 Comparer setting	16
<i>Chapter 6 Notes and Warranty Policy</i>	<i>17</i>
6.1 Notes	17
6.2 Warranty Policy	17
Products Rapid Installation and Self-check	18
Rapid Installation	18
Self-check	18
Delete Wrong Installation	18

Chapter 1 Overview

PCI2394 is a data acquisition module based on PCI bus. It can be directly inserted into IBM-PC/AT or any compatible computer with a PCI slot.

This card includes four 32-bit quadruple AB phase encoder counters, 8-bit timer with multi range time-base selector, four isolated digital inputs, and four isolated digital outputs. Its flexible interrupts sources are suitable for motor control and position monitoring.

Unpacking Checklist

Check the shipping carton for any damage. If the shipping carton and contents are damaged, notify the local dealer or sales for a replacement. Retain the shipping carton and packing material for inspection by the dealer.

Check for the following items in the package. If there are any missing items, contact your local dealer or sales.

- PCI2394 Data Acquisition Board
- ART Disk
 - a) user's manual (pdf)
 - b) drive
 - c) catalog
- Warranty Card

FEATURES

Encoder

- Axes: 4 (independent)
- Resolution: 32 bits
- Input mode: single-ended or differential inputs
- Counter input mode: not counting, X1, X2, X4, dipulse, monopulse
- Single-ended voltage input range: High Level: CH-=0V, CH+>2.8V
 Low Level: CH-=0V, CH+<0.8V
 CH+ maximum input voltage is ±12V
- Differential voltage input range: High Level: CH+ - CH->0.2V
 Low Level: CH+ - CH-<-0.2V
 CH+/CH- maximum input voltage is ±12V
- Sample clock frequency: 1MHz, 2MHz, 4MHz, 8MHz
- Digital Filter: 4 levels
- The maximum quadrature input frequency: 1MHz (with digital filter)
 4MHz (without digital filter)
- Opto-isolated: 2500Vrms

Timer

- Resolution: 8-bit
- Time base: 50KHz, 5KHz, 500Hz, 50Hz, 5Hz

Isolated Digital Input

- Channels: 4
- Input voltage range: $50V_{DC} < V_{IH} < 30V_{DC}$
 $V_{IL} < 3.4V_{DC}$
- Opto-isolation: 2500Vrms
- Opto-isolation response time: <100ns
- Over-voltage protection: 70V

Digital Output

- Channel No.: 4
- Opto-isolation: 2500Vrms
- Opto-isolation response time: <100ns
- Supply voltage: TTL

Others

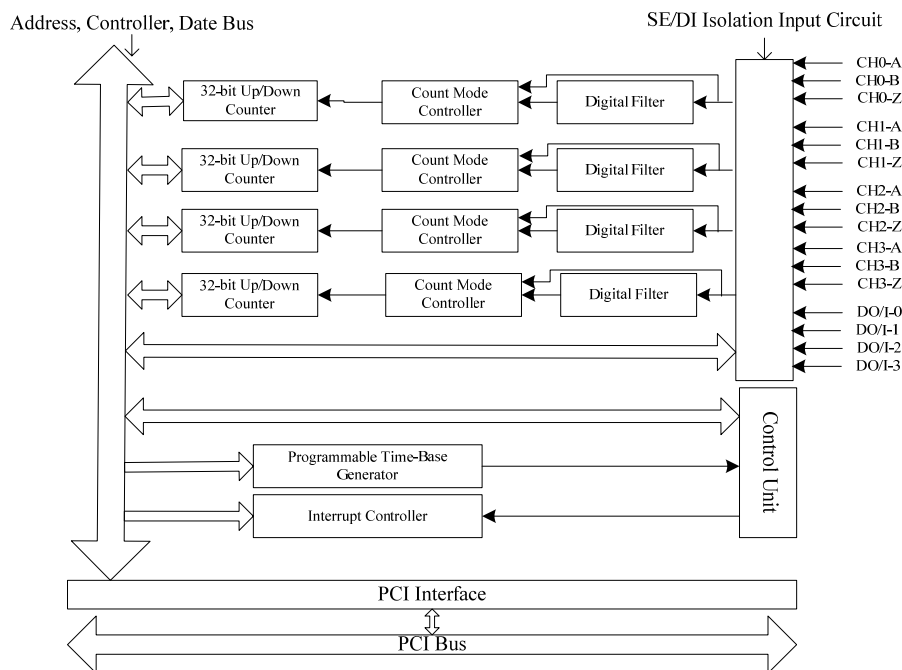
- Interrupt source: counter overflow, counter underflow, index input, timer, digital input
- Counter lock source : software, timer, index, digital input
- Dimension: 145.3mm (L) * 99mm (W) * 18mm (H)

Chapter 2 Components Layout Diagram and a Brief Description

2.1 The Main Component Layout Diagram



2.2 The Basic Block Diagram



2.3 Signal Input/Output Connector

CN1: signal input/output connector

DID: Physical ID Setting

TST_FPGA1: Reset button

2.4 Indicator Lights

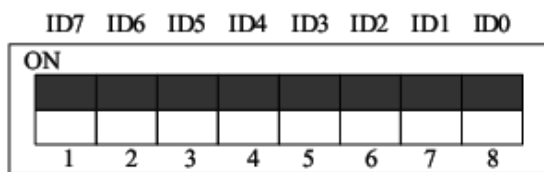
LED5V: 5V power supply indicator light

LED3.3V: 3.3V power supply indicator light

LED1.2V: 1.2V power supply indicator light

2.5 Physical ID of DIP Switch

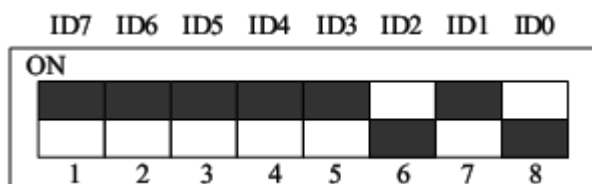
When the PC is installed more than one PCI2394 , you can use the DIP switch to set a physical ID number for each board, which makes it very convenient for users to distinguish and visit each board in the progress of the hardware configuration and software programming. The following eight-place numbers are expressed by the binary system: When DIP switch points to "ON", that means "1", and when it points to the other side, that means "0." As they are shown in the following diagrams: place "ID7" is the high place."ID0" is the low place, and the black part in the diagram represents the location of the switch.



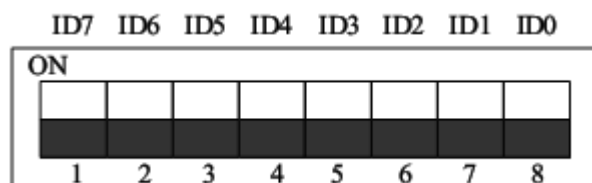
The above chart shows "1111 1111", so it means that the physical ID is 0.



The above chart shows "1111 1110", so it means that the physical ID is 1.



The above chart shows "1111 1010", so it means that the physical ID is 5.



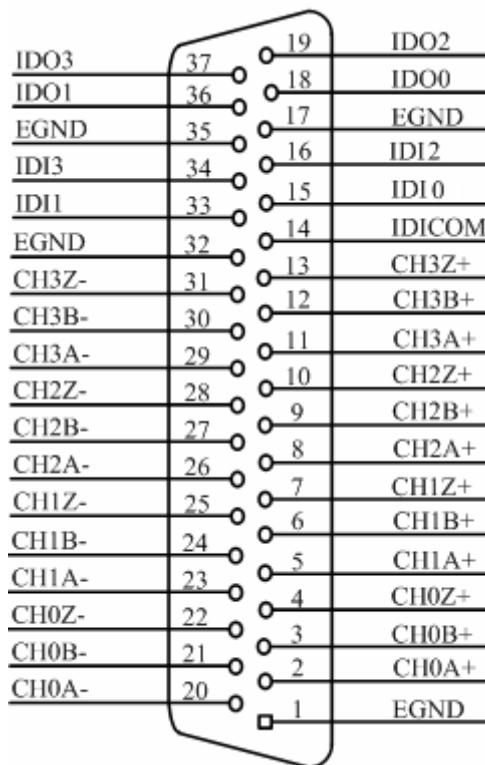
The above chart shows "0000 0000", so it means that the physical ID is 255.

High 4 bits				Low 4 bits				Physical ID
ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0	
ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	0
ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	OFF(0)	1
ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	ON(1)	OFF(0)	ON(1)	2
...			
ON(1)	ON(1)	ON(1)	ON(1)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	15
ON(1)	ON(1)	ON(1)	OFF(0)	ON(1)	ON(1)	ON(1)	ON(1)	16
...			
ON(1)	ON(1)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	63
...			
OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	ON(1)	OFF(0)	253
OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	ON(1)	254
OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	OFF(0)	255

Chapter 3 Signal Connectors

3.1 The Definition of Signal Input/Output Connector

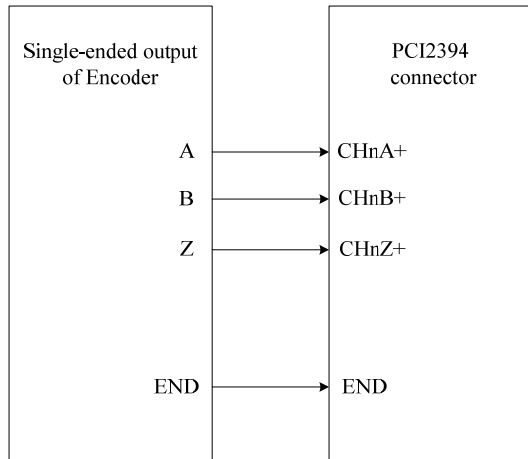
37 core plug on the CN1 pin definition



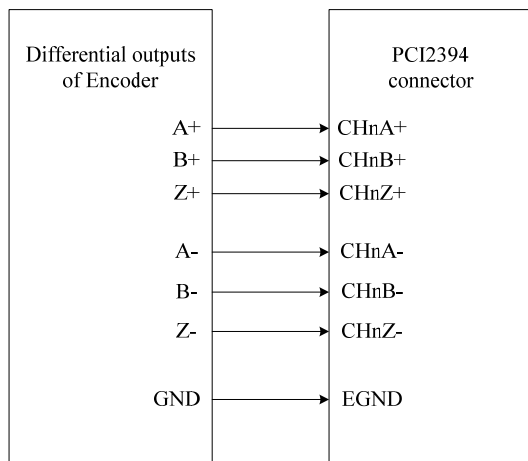
Signal Name	Type	Definition
CH<0..3>A+	Input	Channel<0..3>A differential positive-input.
CH<0..3>A-	Input	Channel<0..3>A differential negative-input.
CH<0..3>B+	Input	Channel<0..3>B differential positive-input.
CH<0..3>B-	Input	Channel<0..3>B differential negative-input.
CH<0..3>Z+	Input	Channel<0..3>Z differential positive-input.
CH<0..3>Z-	Input	Channel<0..3>Z differential negative-input.
IDI<0..3>	Input	Isolated Digital Input, Channels 0 through 3.
IDO<0..3>	Output	Isolated Digital Output, Channels 0 through 3.
IDICOM	GND	The isolated digital input ground.
EGND	GND	External Ground.

Chapter 4 Connection Ways for Input and Output

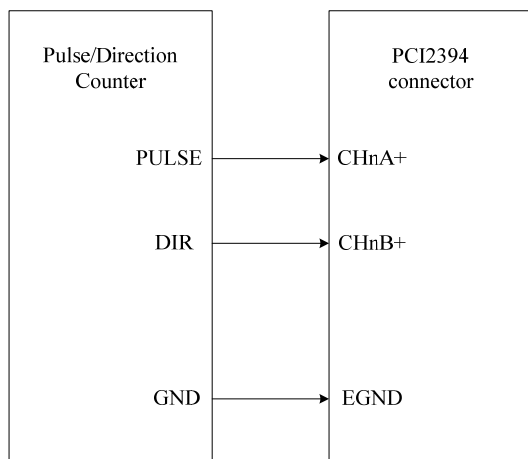
4.1 Connection method for single-ended input



4.2 Connection method for differential inputs

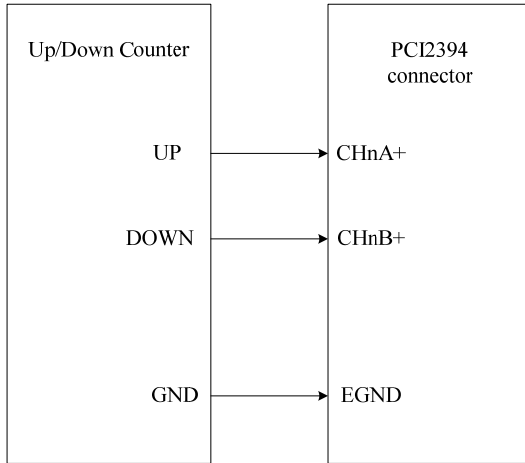


4.3 Connection method for monopulse signal input

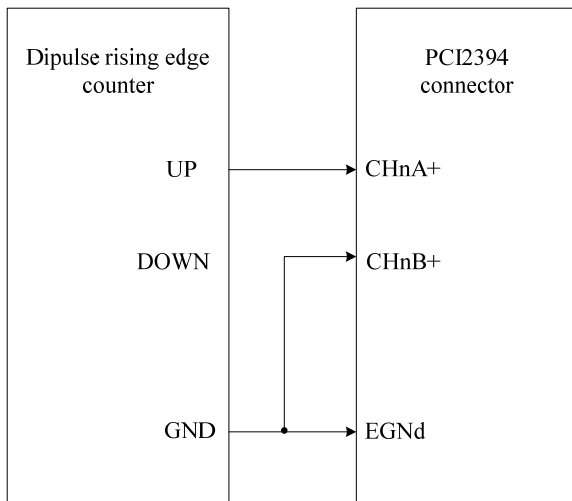


4.4 Connection method for monopulse signal input

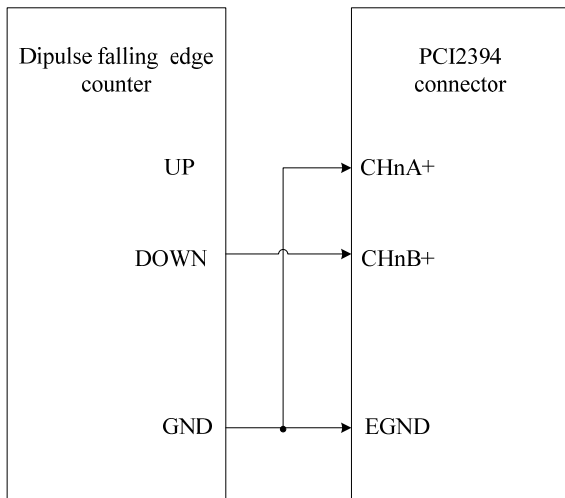
4.4.1 Up/Down signal input



4.4.2 Rising edge signal input

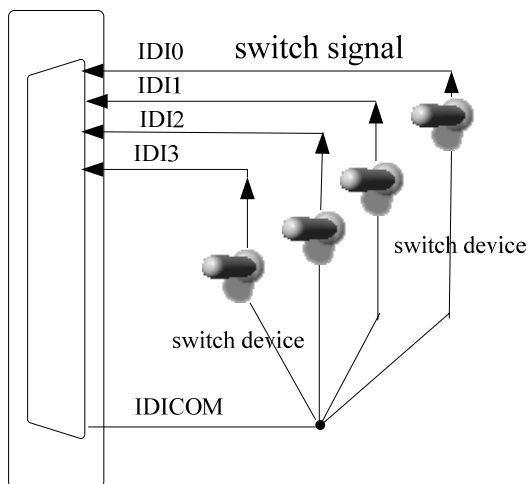


4.4.3 Falling edge signal input

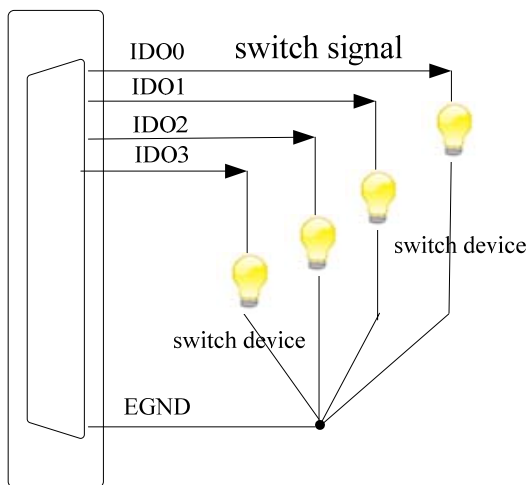


4.5 Connection method for digital signal input/output

4.5.1 Digital signal input

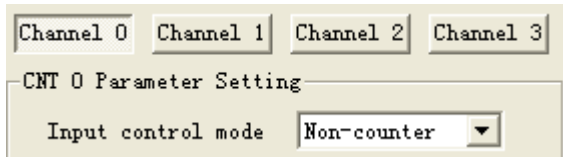


4.5.2 Digital signal output



Chapter 5 Method of using a variety of functions

5.1 Input Mode



5.1.1 Disabled Mode

PCI2394 will not accept input.

5.1.2 Quadrature Input Counter Mode

Quadrature input consists of two square wave inputs(A and B), which are 90°out of phase. There are three different counting methods in quadrature input mode:

X1: The counter will increment (or decrement) the counter whenever a rising edge occurs on input channel A.

X2: The counter will increment (or decrement) the counter whenever a rising or falling edge occurs on input channel A.

X4: The counter will increment (or decrement) the counter whenever a rising edge occurs on input channel A or B.

5.1.3 Dipulse Mode

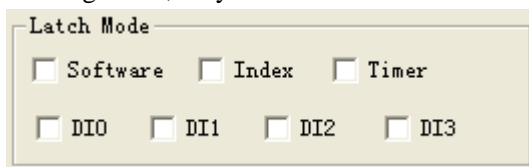
In dipulse mode the PCI2394 uses two input pulses as counting sources: one for clockwise and one for counterclockwise counting. The counter will increment whenever a rising edge occurs on channel A. it will decrement whenever a rising edge occurs on channel B.

5.1.4 Pulse/Direction Mode

In pulse/direction mode the PCI2394 uses one input line (A) for pulse input and one line (B) for direction. If channel B is high (1), the counter will decrement whenever a rising edge occurs in channels A. if channel B is low (0), the counter will increment whenever a rising edge occurs on channel A.

5.2 Latch Mode

When you read a counter, you are actually reading a value latched into a buffer. The PCI2394 provide seven different latching mode, only one of which is active at any given time. The PCI2394’s latching modes are as follows:



5.2.1 Software Latch

Whenever you read a channel’s data registers, the counter values will be latched in the buffer.

5.2.2 Index Latch

A rising edge on the channel Z will latch the channel’s counter value.

5.2.3 Timer Latch

The card latches the counter value on a rising edge of pulses from the card's on-board timer.

5.2.4 DI0~DI3 Latch

A rising edge on the DI0, DI1, DI2 or DI3 will latch the counter value for the channel.

5.3 Interrupt

5.3.1 Counter Interrupt

CNT 0 interrupt Setting

Overflow Interrupt Greater than comparative value

Underflow Interrupt Less than comparative value

Index Interrupt

1. Overflow interrupt control: Interrupt when count value reaches the maximum count value and overflow to 0.
2. Underflow interrupt control: Interrupt when count value reaches 0 and overflow to the maximum count value.
3. Index interrupt control: Interrupt when channel Z signal has a rising edge.
4. Greater than comparative value: Interrupt when the count value is greater than the user-defined comparative value.
5. Less than comparative value: Interrupt when the count value is less than the user-defined comparative value.

5.3.2 Timer and DI Interrupt

Interrupt Setting

Timer DI0 DI1 DI2 DI3

Interrupt message control

Message No. 10

Timer: The timer sends an interrupt signal after the user-defined time interval.

DI0~DI3: Interrupt when DI0~DI3 input signal is high level.

Message No.: Record the number of interruptions.

5.4 Other parameter settings

Reset value (0x80000000) Digital filter

Overflow counter Underflow counter latch

Index reset

5.4.1 Counter Overflow Lock

Stop counting when the counter value reaches the maximum count value, or else overflow to 0.

5.4.2 Counter Underflow Lock

Stop counting when the counter value reaches 0, or else overflow to the maximum count value.

5.4.3 Digital Filter

Apply to the use environment of the scene is a bad situation.

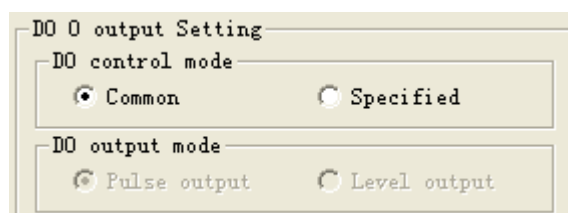
5.4.4 Reset Value

When this checkbox is selected, the counter's reset initial is 0x8000000, or else the reset initial is 0.

5.4.5 Enable Index Reset

When this checkbox is selected, the counter reset if channel Z signal has a rising edge.

5.5 DO settings



5.5.1 DO Control Mode

Common: Users set the output high level and low level

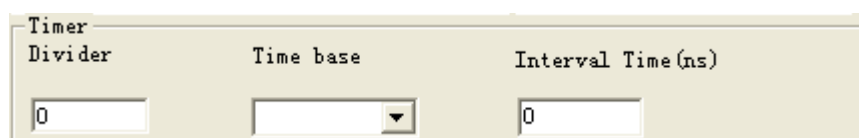
Specified: appoint the digital output mode is "Pulse Output" or "Level Output"

5.5.2 DO Output Mode

Pulse Output: Output high level when the count value is equal to the comparative value, or else output low level.

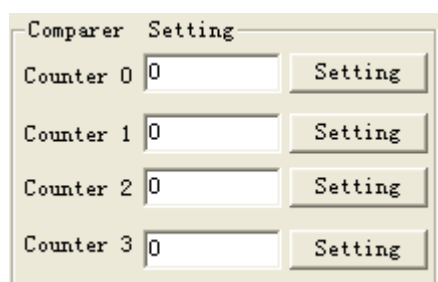
Level Output: Output high level all the time after the count value is equal to the comparative value.

5.6 Timer setting



Set the timer's time base, divider and time interval.

5.7 Comparer setting



Set the comparative value of each counter

Chapter 6 Notes and Warranty Policy

6.1 Notes

In our products' packing, user can find a user manual, a PCI2394 module and a quality guarantee card. Users must keep quality guarantee card carefully, if the products have some problems and need repairing, please send products together with quality guarantee card to ART, we will provide good after-sale service and solve the problem as quickly as we can. When using PCI2394, in order to prevent the IC (chip) from electrostatic harm, please do not touch IC (chip) in the front panel of PCI2394 module.

6.2 Warranty Policy

Thank you for choosing ART. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ART's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: www.art-control.com.
2. All ART products come with a limited two-year warranty:
 - The warranty period starts on the day the product is shipped from ART's factory
 - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ART is not responsible for any loss of data.
 - Please ensure the use of properly licensed software with our systems. ART does not condone the use of pirated software and will not service systems using such software. ART will not be held legally responsible for products shipped with unlicensed software installed by the user.
3. Our repair service is not covered by ART's guarantee in the following situations:
 - Damage caused by not following instructions in the User's Manual.
 - Damage caused by carelessness on the user's part during product transportation.
 - Damage caused by unsuitable storage environments (i.e. high temperatures, high humidity, or volatile chemicals).
 - Damage from improper repair by unauthorized ART technicians.
 - Products with altered and/or damaged serial numbers are not entitled to our service.
4. Customers are responsible for shipping costs to transport damaged products to our company or sales office.
5. To ensure the speed and quality of product repair, please download an RMA application form from our company website.

Products Rapid Installation and Self-check

Rapid Installation

Product-driven procedure is the operating system adaptive installation mode. After inserting the disc, you can select the appropriate board type on the pop-up interface, click the button **【driver installation】**; or select CD-ROM drive in Resource Explorer, locate the product catalog and enter into the APP folder, and implement Setup.exe file. After the installation, pop-up CD-ROM, shut off your computer, insert the PCI card. If it is a USB product, it can be directly inserted into the device. When the system prompts that it finds a new hardware, you do not specify a drive path, the operating system can automatically look up it from the system directory, and then you can complete the installation.

Self-check

At this moment, there should be installation information of the installed device in the Device Manager (when the device does not work, you can check this item.). Open "Start -> Programs -> ART Demonstration Monitoring and Control System -> Corresponding Board -> Advanced Testing Presentation System", the program is a standard testing procedure. Based on the specification of Pin definition, connect the signal acquisition data and test whether AD is normal or not. Connect the input pins to the corresponding output pins and use the testing procedure to test whether the switch is normal or not.

Delete Wrong Installation

When you select the wrong drive, or viruses lead to driver error, you can carry out the following operations: In Resource Explorer, open CD-ROM drive, run Others-> SUPPORT-> PCI.bat procedures, and delete the hardware information that relevant to our boards, and then carry out the process of section I all over again, we can complete the new installation.