Machine Translated by Google

深圳市雷赛智能控制股份有限公司
SHENZHEN LEADSHINE TECHNOLOGY CO.,LTD

Leitai motion control card

DMC5400

User Manual

Version 3.0

Copyright not to be reproduced

Machine Translated by Google

©Copyright 2010 Leadshine Technology Co., Ltd.

All Rights Reserved.

Copyright statement

The copyright of this manual belongs to Shenzhen Leisai Technology Co., Ltd. without the written permission of the company

Yes, no one may reproduce, translate or copy any content in this manual.

The information in this manual is for informational purposes only. For reasons such as improved design and functionality, Ray

Race Company reserves the right of final interpretation of this information, and the content is subject to change without prior notice.

Pay attention to safety when debugging the machine! The user must design effective safety into the machine

Protection device, add error handling program in software. Otherwise, the loss caused by

Raytheon has no obligation or responsibility for this.

Technical support hotline: 0755-26417593 Website: www.szleadtech.com.cn

Machine Translated by Google

content

Machine Translated by Google

Machine Translated by Google

0 About this manual

This manual is designed to help you learn the use of DMC5400 control card, including hardware interface wiring, parameters setting, calling of software functions, and writing of application routine software, etc.

This manual is divided into 8 parts: 1. Introduction:

A general description of this product and relevant statements about this product. 2. Hardware Overview:

Introduction to the hardware of this product, including detailed hardware structure and dimensions, hardware functions Able to describe and example of motion control platform position sensor and control signal layout.

3. Hardware configuration and installation: including jumper and switch configuration of hardware configuration and hardware installation instructions. 4. Software System Overview: Introduction to the software of this product, including the system drivers supported by this product number. Motion programs, detailed descriptions of motion control function libraries, demonstration programs and sample programs.

5. Driver Installation: Introduce the detailed installation steps of the driver, including the three most commonly used environments: Demonstration of the installation process under Windows2000, WindowsXP and Windows-7.

6. Demonstration software and applications: including detailed description and usage of demonstration software and applications. 7. User system development: Provides application example programming in VB and VC++ development environment.

8. Appendix: Provide detailed hardware signal interface table, motion control function list, common problem library and anti-interference measures.

Machine Translated by Google

1 Introduction

Leadtech DMC5400 is a motion control card with superior performance and powerful functions based on PCI bus and ASIC as the core. It can control four-axis stepper motor or digital servo motor, especially suitable for multi-axis interpolation linkage , encoder position detection and other complex functions.

DMC5400 contains hardware interpolation processor, multi-axis linear interpolation and 2-axis circular interpolation are all completed by hardware. The control card has the motion look-ahead function, and is equipped with a 2-level interpolation motion parameter preset register. The application software on the PC writes a series of motion parameters into the preset register. After the execution of the current motion is completed, the hardware interpolation processor automatically loads the motion parameters in the preset register and executes the motion command. Therefore, when DMC5400 executes multi-segment continuous interpolation motion, it has the advantages of fast interpolation speed and smooth connection.

The DMC5400 accepts 4 encoder signals and provides a position latch function. When the latch signal is triggered, the current encoder position is captured immediately. The process of capturing the current position signal is completed by hardware at high speed. This function is very accurate and convenient for position measurement.

The DMC5400 also has many other advanced features. For example: in the process of motor movement, the program can modify the speed and target position of the movement process according to different conditions. Trapezoidal and S-shaped velocity curves with different acceleration and deceleration can be set. Using software or external input signals, each axis of DMC5400 or axes on multiple DMC5400 cards can be controlled to start moving or stop moving at the same time.

At the same time, Leisai Technology Co., Ltd. introduced the advanced technology of Motion Engineering Company in the United States to provide DMC5400 has designed a set of motion function library that is easy to learn and use, and has rich functions, which greatly shortens the development and debugging time of user application software. The free Motion5000 software provided with the card can not only demonstrate and test most of the control functions of the DMC5400, but also facilitate customers to test the control card and motor control system hardware.

Machine Translated by Google

2 Hardware overview

Leadtech DMC5400 motion control card hardware provides 4-axis pulse and direction respectively

Control signals, and provide a variety of motion control functions at the same time, the specific hardware system block diagram is shown in Figure 2-1:

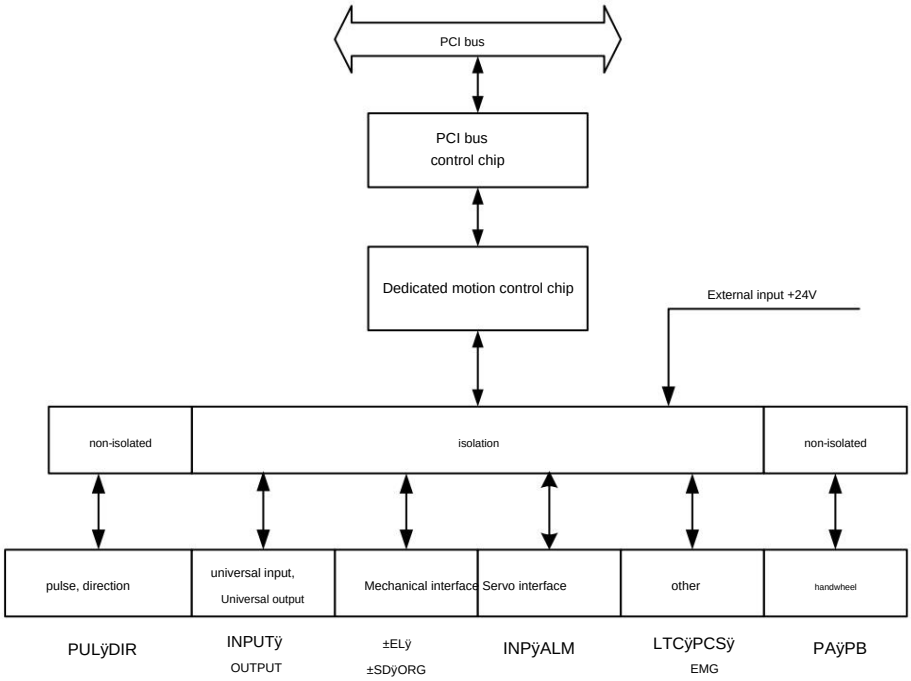


Figure 2-1 DMC5400 motion control card system block diagram

2.1 Hardware structure size

Leadtech DMC5400 motion control card is compatible with PCI V2.3 standard 32Bit PCI standard half length

The size specification of the card, the specific structure size is shown in Figure 2-2:

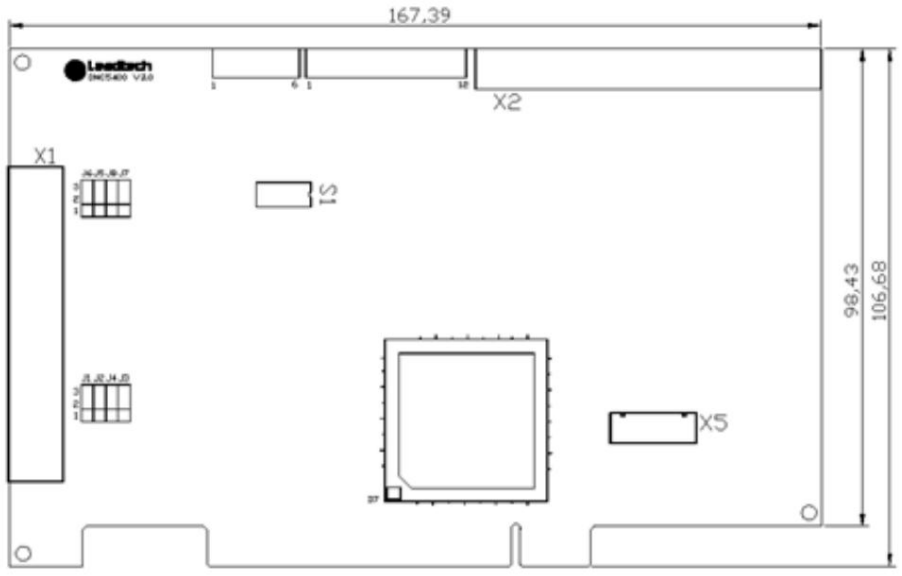


图2-2 DMC5400运动控制卡硬件结构尺寸示意图

Machine Translated by Google

2.2 Hardware function description

Leadtech DMC5400 hardware provides a variety of motion control functions, including 4-axis pulse and direction control signals, mechanical position control interface, servo drive control interface, encoder control interface, handwheel pulse signal interface, and general Input and output interfaces, etc.

2.2.1 Control card power supply

Before connecting the external input and output, it is necessary to connect the 24V power supply to the DMC5400 motion control card to provide each An energy source for an input and output interface circuit. The specific circuit schematic is shown in Figure 2-3:

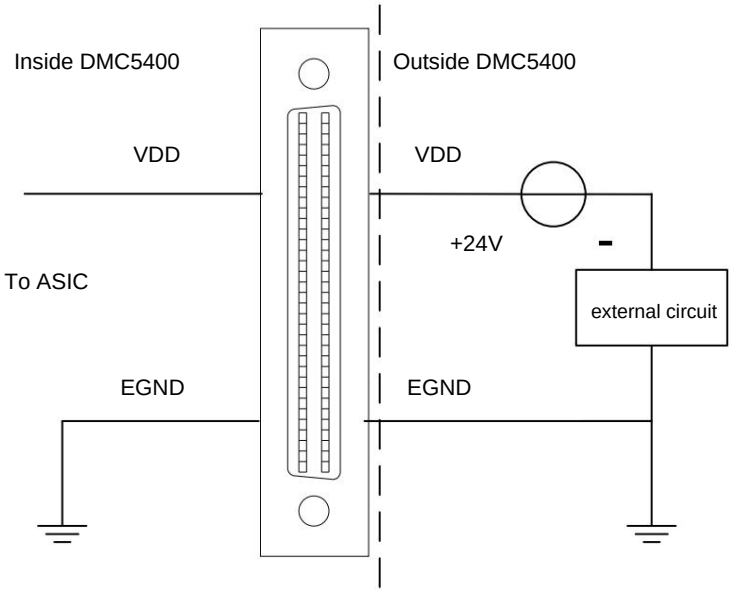


Figure 2-3 Board power supply

2.2.2 Motion Control Function

Leadtech DMC5400 provides users with a wealth of motion control functions, including: trapezoidal point motion control, S-type point-position motion control, trapezoidal continuous motion control, S-type continuous motion control, 2~4 axis linear interpolation Motion control, arbitrary 2-axis circular interpolation motion control and other functions.

2.2.2.1 Position control The most

basic position control refers to moving from the current position to another position, generally called point movement or fixed-length movement. After setting the parameters such as acceleration/deceleration, initial speed and maximum speed, execute the displacement control command. The host computer writes the number of command pulses to be executed into the DMC5400 card, and the DMC5400 card outputs pulses at the set speed; when the number of output pulses is equal to the command When the number of pulses is reached, the DMC5400 card will stop outputting. The relationship between displacement and time is shown in Figure 2-4:

Machine Translated by Google

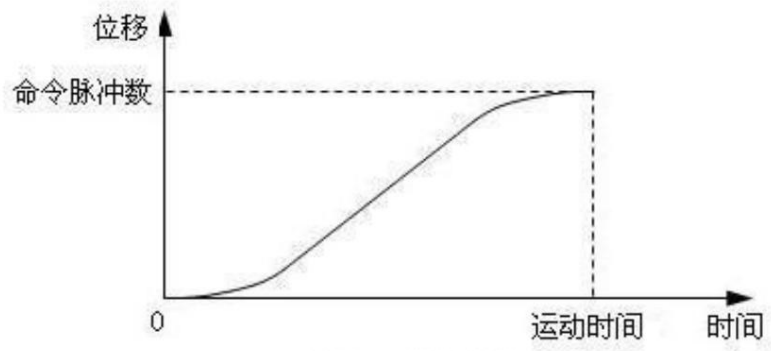


图2-4 位移曲线

2.2.2.2 Speed Control

Speed control means that the motor starts to run from the initial speed and accelerates to the specified speed for continuous motion. only when After receiving a stop command or an external stop signal, it decelerates until it stops (it can also be set to stop immediately). the mode It does not control the movement distance, its main use is: finding the mechanical origin, teaching or speed control. its speed and time The relationship between them is shown in Figure 2-5.

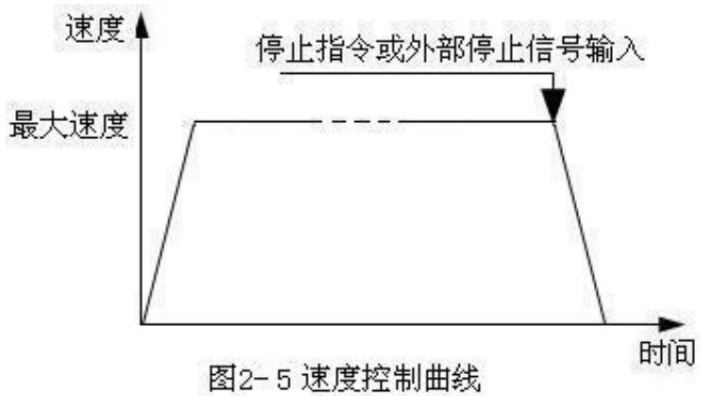


图2-5 速度控制曲线

Leadtech DMC5400 provides users with trapezoidal and S-shaped speed control modes.

A) Trapezoidal curve speed control

The trapezoidal speed curve control command is to make the DMC5400 card output command pulses according to the trapezoidal speed curve. which is: The motor starts to move from the starting speed, keeps the speed unchanged after accelerating to the maximum speed, and decelerates to the starting point before the end speed and stop. The distance of the movement is set by the fixed-length movement command. The trapezoidal velocity curve is shown in Figure 2-6.

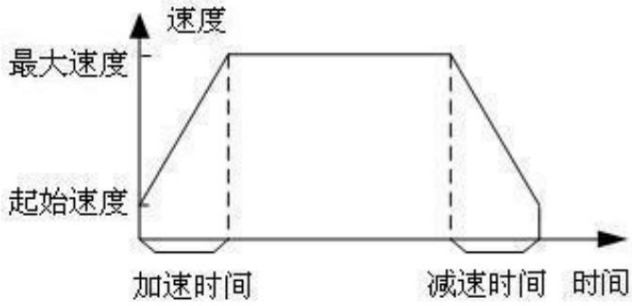


图2-6 梯形速度曲线

B) S -curve speed control

Machine Translated by Google

Although the trapezoidal velocity curve is simple to implement, its acceleration has a sudden change, and the velocity curve is not smooth. However, there is impact in the movement, which is easy to cause machine noise and wear of the transmission mechanism. on the trapezoidal velocity curve (see See Figure 2-7), the unsmooth motion is mainly manifested in the four instantaneous speed transitions and the corresponding acceleration sudden changes. The four instants are: the start, the rise to top speed, the descent from top speed, and the final stop.

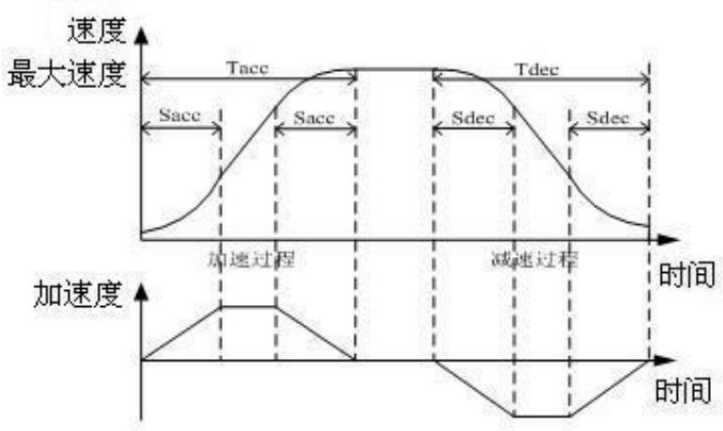


图2-7 S形速度曲线及其加速度曲线

If the acceleration is changed to a linear change, the velocity curve will be smoothed accordingly, as shown in Figure 2-8. Speed up and the deceleration phase both become shaped like an S. With this speed profile, the motion is smoother and helps shorten the Accelerates the process, reduces the vibration and noise of the moving device, and also prolongs the life of the mechanical transmission part.

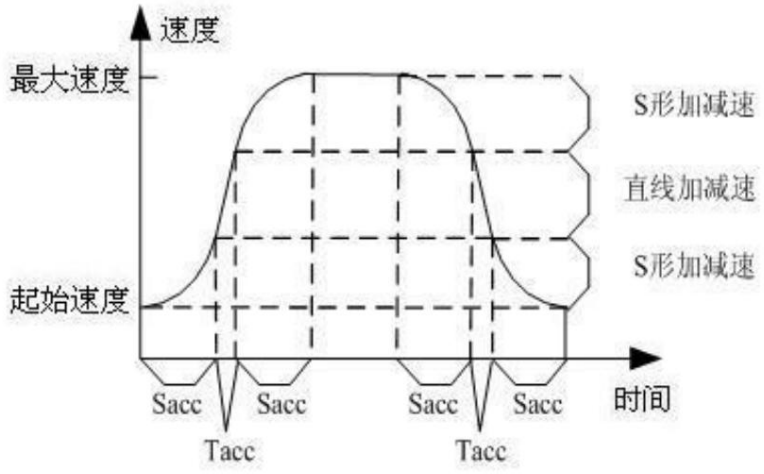


图2-8 S形速度曲线

2.2.2.3 Interpolated motion

Interpolation is based on a given mathematical function, between the known points on the ideal trajectory contour, to determine some A method for the middle point. The interpolation methods include: linear interpolation, circular interpolation and so on. The DMC5400 card has powerful (for details, please refer to the relevant content in Section 4.2.5.2 Multi-axis Motion Control).

(1) Two-axis to four-axis linear interpolation

Linear interpolation can be performed by selecting any two to four axes.

(2) Circular interpolation

Circular interpolation can be performed on any two axes selected from the four axes. Circular interpolation starts from the current position, according to the specified

Machine Translated by Google

The center and end position of the circle and the direction of interpolation (clockwise or counterclockwise).

(3) Constant linear velocity

No matter how the curve changes during the interpolation movement, its linear velocity can remain constant during the movement.

(4) Continuous interpolation

Continuous interpolation is the process of executing a series of interpolation instructions, such as continuous execution of linear interpolation, circular interpolation, Linear interpolation, ... and other commands. During this process, the motion does not stop and the speed remains constant between the line segments.

continued.

2.2.3 Pulse and direction control interface

Leadtech DMC5400 hardware provides 4-axis pulse and direction control signal interface.

When both the pulse signal PUL and the direction signal DIR are differential output, the typical interface circuit is shown in Figure 2-9. Simultaneously It can be configured as open collector output, as shown in Figure 2-10. For the specific settings of the output mode, please refer to 3.1.2 Jump See 8.1.1 Interface X1 Pin Definition and 8.1.2 Interface X2 Pin Definition righteous. And PUL+, PUL-, DIR+, DIR- of all axes are non-isolated outputs.

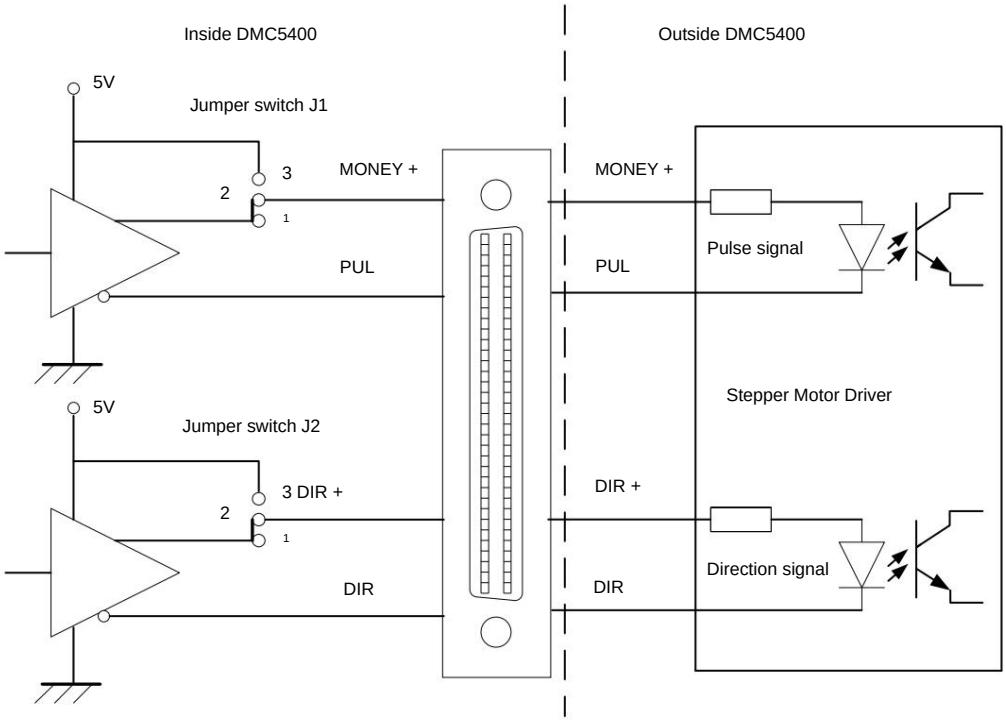


Figure 2-9 Differential wiring diagram

Note: Using the differential output method can effectively reduce the interference in transmission, it is recommended that the signal transmission line be longer When using the differential output method.

Machine Translated by Google

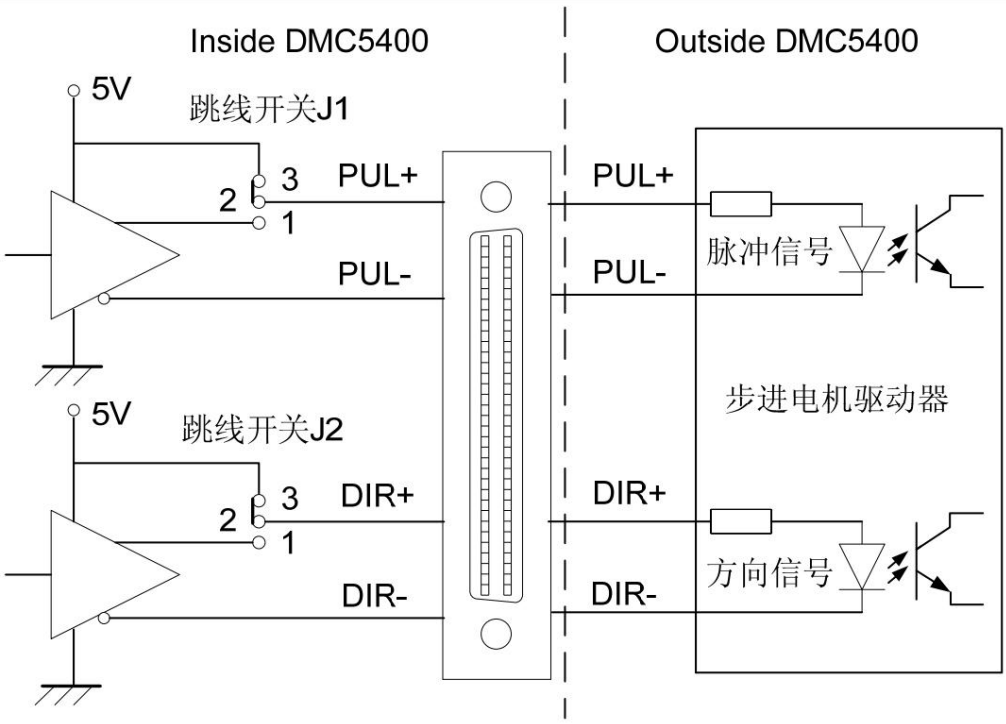


图 2-10 集电极开路输出方式接线图

If the pulse output is open collector output mode, PUL- and DIR- are used as the pulse and direction signal output.

Generally, the current of the PUL and DIR terminals cannot exceed 20mA; while the working power of the photoelectric isolation of the motor driver is The current is generally around 10 MA, please choose a suitable resistor to limit the current. The current at the PUL and DIR terminals is provided by 5V.

Leadtech DMC5400 card can output two types of command pulse direction signals: one is pulse + Direction mode (single pulse mode, as shown in Figure 2-11); one is positive pulse + negative pulse mode (double pulse mode, Figure 2-12).

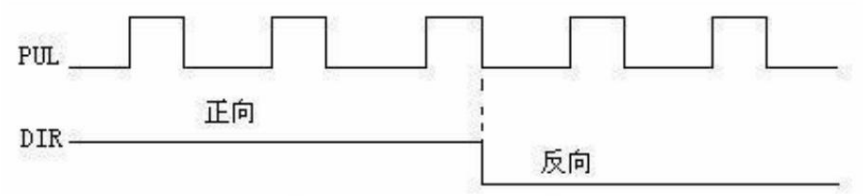


图2-11 单脉冲模式

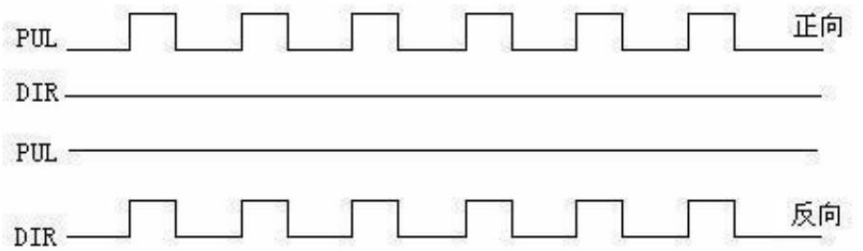


图2-12 双脉冲模式

Machine Translated by Google

2.2.4 Mechanical position control interface

Leadtech DMC5400 provides origin ORG position signal input interface, SD deceleration position signal input interface, EL+/EL- positive and negative limit signal input interface and EMG emergency stop input signal interface for 4 axes.

2.2.4.1 ORG: Origin position signal input interface

Usually, a position sensor is used in the motion system to set a position reference point, that is, the origin position, so as to facilitate precise position control. Leadtech DMC5400 provides an origin position sensor input port ORG for each axis. For the specific pin assignment of the external interface, see 8.1.1 Pin Definition of Interface X1 and 8.1.2 Pin Definition of Interface X2 , typical interface circuit As shown in Figure 2-13.

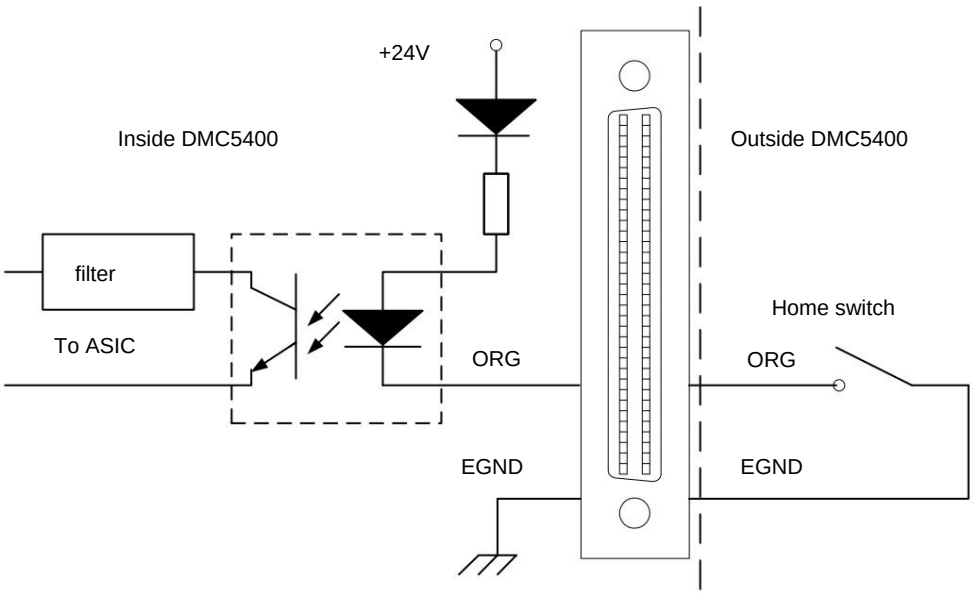


Figure 2-13 Schematic diagram of the origin signal interface

The origin position sensor signal of each axis of Leadtech DMC5400 control card is connected to DMC5400 through ORG input port, and then enters ASIC chip after photoelectric isolation. Optical isolation can effectively isolate the interference of external power supply to the internal circuit of DMC5400, so as to improve the reliability of the system. Usually before the motion control card detects the ORG signal of the origin sensor, the motion stops automatically, and the stop position is set as the origin of the axis. Test 4.2.3 For the specific method and operation, please refer to the movement to the origin

2.2.4.2 SD: Deceleration position signal input interface

In motion systems, a position sensor is usually used to set a deceleration start point for precise position control. During the motion, when the motion control card detects the deceleration signal SD, the controlled motor will decelerate. Leadtech DMC5400 provides a deceleration point position sensor input port SD for each axis. For the specific pin assignment of the external interface, see 8.1.1 Interface X1 pin definition and 8.1.2 Interface X2 pin definition, typical interface The principle is shown in Figure 2-14 below. Its internal circuit is equipped with a filter to filter high-frequency noise,

Machine Translated by Google

At the same time, the photoelectric isolation can effectively isolate the interference of the external power supply to the internal circuit of the DMC5400, thereby improving the reliability of the DMC5400 and the entire control system. When this function is disabled, this port can be used as a general-purpose digital input port.

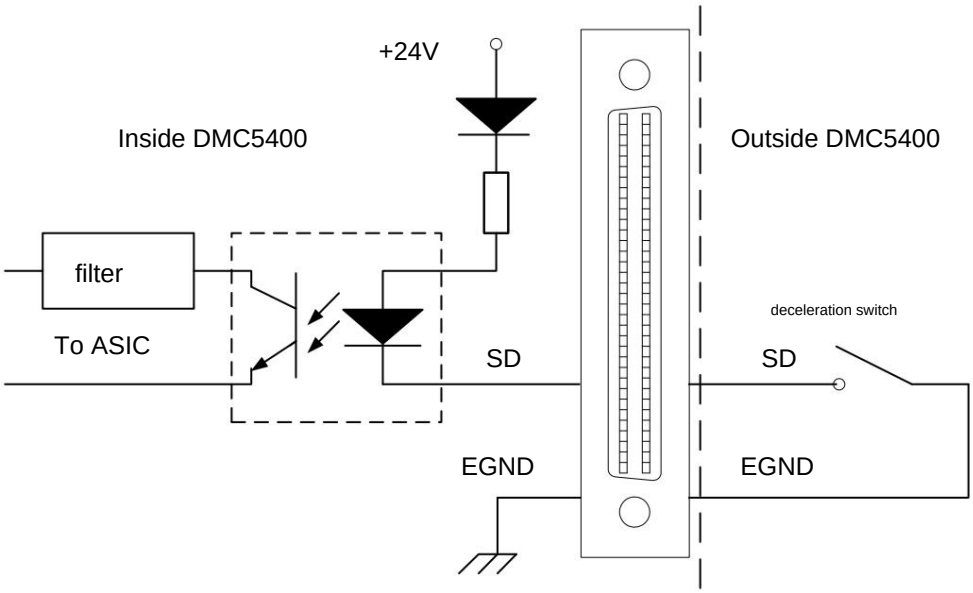


Figure 2-14 Schematic diagram of the deceleration signal interface

2.2.4.3 EL+/EL-: Positive and negative limit signal input interface

In the motion system, a position sensor is usually used to set a mechanical limit point to determine the boundary position of the motion and protect the mechanical facilities. Leadtech DMC5400 provides two mechanical limit signals EL+ and EL- for each axis, EL+ is the forward limit signal, EL- is the reverse limit signal. When the moving part touches the limit switch, EL+/EL- is valid, and the DMC5400 will prohibit the moving part from continuing to move toward the limit. The typical interface and wiring principle are shown in Figure 2-15. For the specific signal pin assignment of the external interface, see 8.1.1 Pin Definition of Interface X1 and 8.1.2 Pin Definition of Interface X2.

Machine Translated by Google

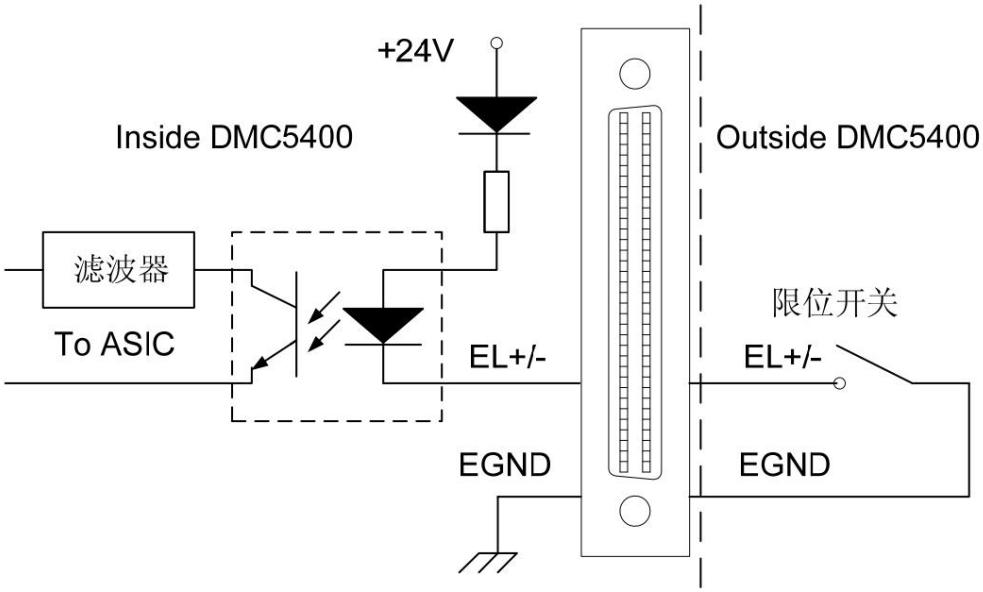


图2-15 限位信号接口原理图

Mechanical limit sensors of each axis of the system using the Leadtech DMC5400 motion control card

After the signal is connected to the DMC5400 through the EL+/EL- input port, it is sent to the motion control ASIC after photoelectric isolation.

chip. Its internal circuit is also equipped with a filter to filter high-frequency noise, and photoelectric isolation can effectively isolate

The external power supply interferes with the internal circuit of DMC5400, thereby improving the performance of DMC5400 and the entire control system.

reliability.

The user can set the limit switch mode through software, see 3.1.3 DIP switch configuration for details. for specific applications

Users need to set the effective working level of the limit switch according to the type of limit switch. When using the normally open limit switch

off, the EL+/EL- signal should be selected by the software to be active low; when using the normally closed limit switch, it should be through the

The software selects the EL+/EL- signal to be active high.

2.2.4.4 EMG: Emergency stop input signal interface

Leadtech (Leadtech) DMC5400 motion control card has an EMG emergency stop input signal,

When its input is valid, all axes stop outputting pulses. Its internal circuit is equipped with a filter to filter high-frequency noise,

to improve the reliability of the system. emergency stop Input signal input principle Typical interface and wiring principle are shown in Figure 2-16

See 8.1.1 Interface X1 Pin Definition for the specific signal pin assignment of the external interface

Machine Translated by Google

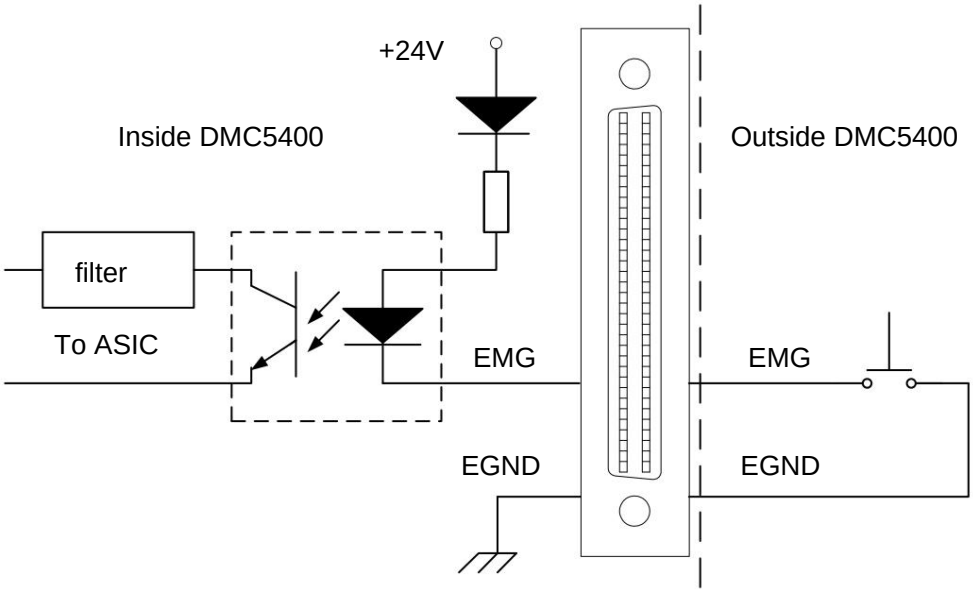


Figure 2-16 Schematic diagram of emergency stop input signal interface

2.2.5 Servo drive control interface

Leadtech DMC5400 motion control card provides servo motor driver dedicated signal interfaces (INP, ALM and ERC) for each axis, where INP and ALM are used to monitor the status of the servo motor, and ERC is used to set the servo motor state.

2.2.5.1 INP: Servo positioning completion signal

Leadtech DMC5400 motion control card provides INP signal interface for monitoring the positioning result of servo motor for each axis. The typical interface and wiring principle are shown in Figure 2-17. For the specific signal pin assignment of the external interface, see 8.1.1 Pin Definition of Interface X1 and 8.1.2 Pin Definition of Interface X2. When the specific input port is used as an INP

Machine Translated by Google

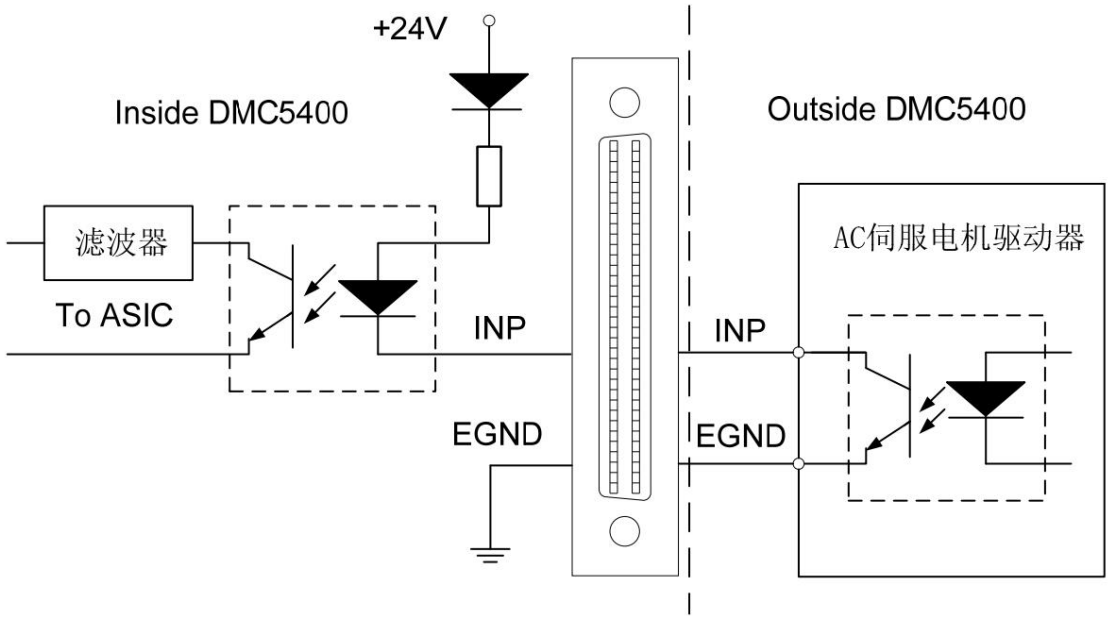


图2-17 INP信号接线原理图

Servo motor drives usually have a position deviation counter that records command pulses and position feedback pulses deviation between. The servo motor driver will control the motor movement to make the position deviation tend to 0, however, the motor actually The position always lags the command pulse. Therefore, when the command pulse of the motion control card is sent, Servo electric The machine does not stop immediately, but continues to move (Fig. 2-18) until the position deviation tends to 0; then, The drive will send an INP signal to the motion controller to inform the motion control card that the servo motor has stopped.

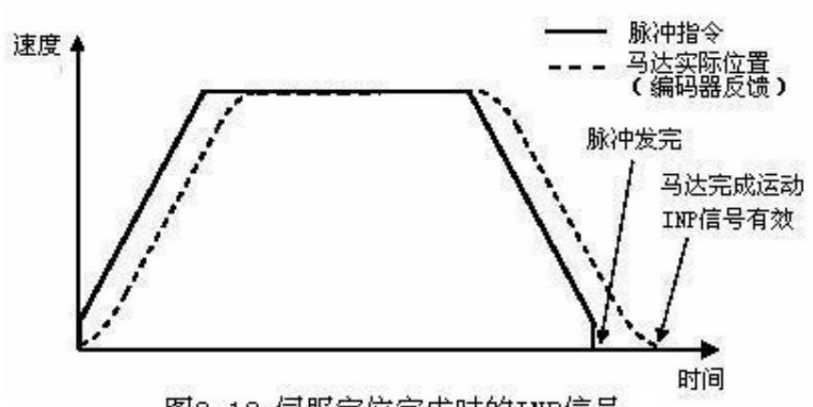


图2-18 伺服定位完成时的INP信号

2.2.5.2 ALM: Servo drive alarm signal

Leadtech DMC5400 motion control card provides each axis for monitoring the servo drive And the ALM signal input interface of the motor status. The typical interface and wiring principle are shown in Figure 2-19, and the external interface is specific For signal pin assignment, see 8.1.1 Interface X1 Pin Definition And 8.1.2 Interface X2 pin definition.

Machine Translated by Google

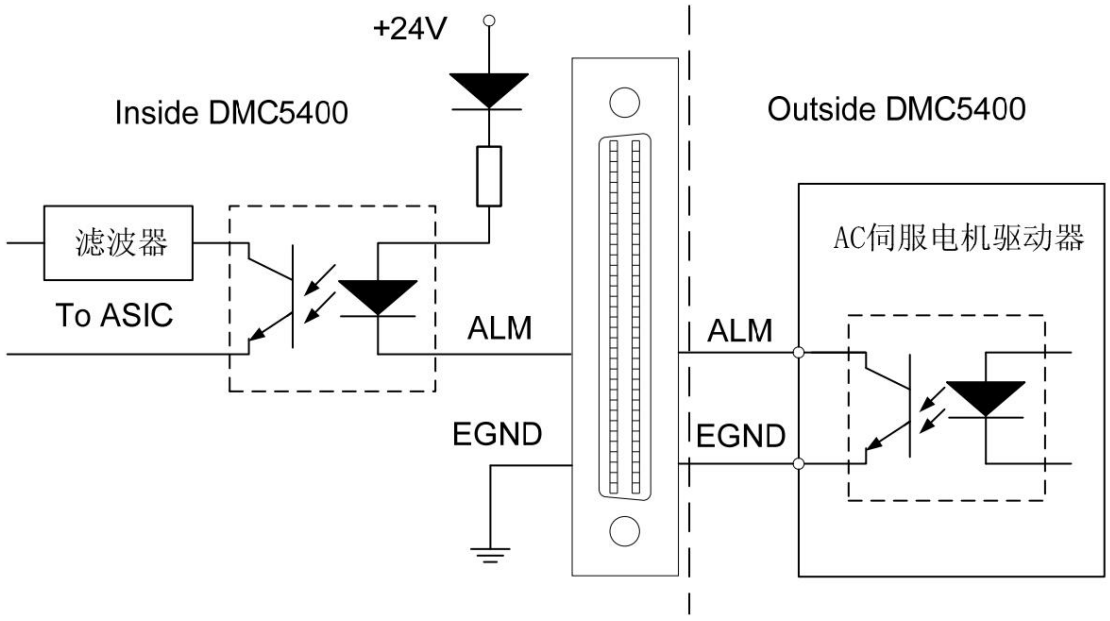


图2-19 ALM信号接线原理图

The ALM signal is an alarm signal issued by the AC servo motor driver. When the DMC5400 receives an ALM After the signal, it will immediately stop sending motion command pulses, or decelerate first and then stop sending pulses.

2.2.5.3 ERC: Servo drive position deviation counter clear signal

The servo driver relies on the error between the target position of the motor (that is, the position that the motor is required to reach) and the current position (that is, the position that the motor has reached) to drive the motor to move. If the error is zero, the motor will stop moving. The ERC signal is the control signal output by the control card to the servo drive. When the servo drive receives this signal, it will immediately clear the error and stop the motor. The typical interface and wiring principle are shown in Figure 2-20. For the specific pin interface, see 8.1.1 Pin Definition of Interface X1 and 8.1.2 Pin Definition of Interface X2.

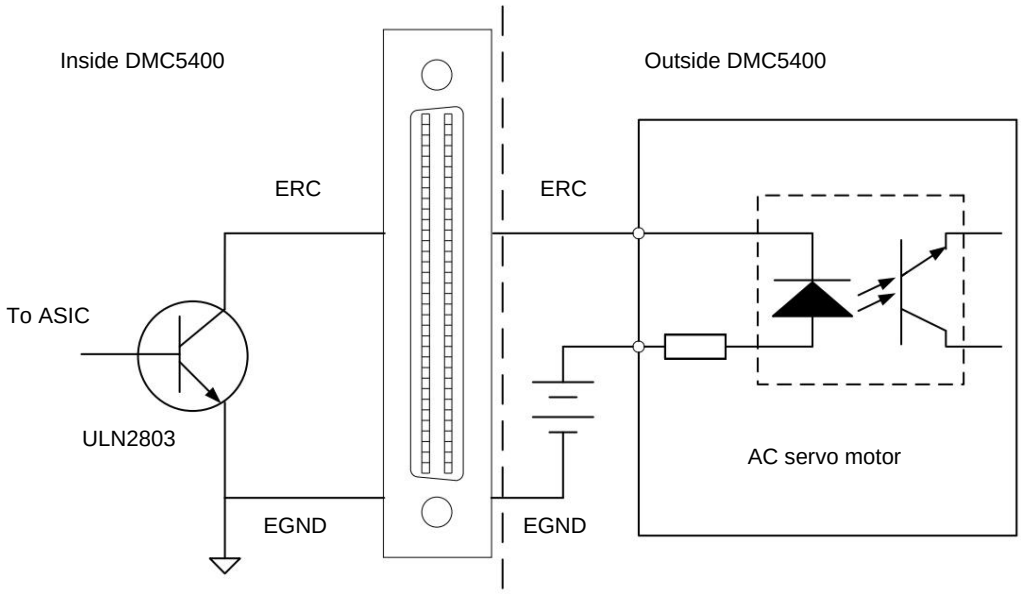


Figure 2-20 Schematic diagram of ERC signal wiring

The ERC (Deflection counter clear) signal counts the position deviation in the AC servo motor driver clear the motor to stop the motor immediately. ERC signals may be required in the following situations:

(1) When the origin signal is triggered during the homing movement; (2) When the limit signal is triggered during the movement; (3) When the servo drive sends an ALM signal; (4) When the software sends an immediate stop signal. When these four situations occur, the control card will stop outputting pulses, but due to the characteristics of the servo motor itself, there will be some delay between the command pulses and the motor itself, and the motor will continue to run until the INP signal is valid (that is, the error count reaches the allowable range). At this time, if an ERC signal is sent to the servo drive, the error can be cleared and the motor will stop. When the specified axis outputs the ERC signal, it starts the timing according to the setting, during this period, no new command pulses are received until the ERC valid time ends.

(ERC signal OFF), a new command pulse is received again.

2.2.6 Encoder control interface

Leadtech DMC5400 motion control card provides independent encoder input port, position latch signal input interface LTC and position change trigger signal PCS for each axis to detect the actual position of motor motion.

2.2.6.1 EA/EB/EZ: encoder signal input interface

Leadtech DMC5400 motion control card provides each axis with an interface for connecting to the encoder input EA+/-, EB+/-, EZ+/- 3 sets of differential signal input, the specific pin assignment of the external interface see 8.1 .1 Interface X1 pin definition and 8.1.2 Interface X2 pin definition.

All axes EA+, EA-, EB+, EB-, EZ+, EZ-, and LTC are non-isolated inputs, which must be 5V TTL level or CMOS level input. The power interface of the encoder should preferably use VCC and GND, namely pins 33 and 34 of the SCSI68 type X1 socket. For the specific pin assignment, see 8.1.1 Interface X1 Pin Definition, EA, EB and EZ signals, EA and EB are used for position counting, EZ is used for origin signal input. TTL digital signals of EA, negative and positive; DMC5400 supports pulse input or AB phase quadrature signal. Each pair of differential signals will be converted into 2 types of encoder signal input: positive and

(1) The non-AB phase pulse input mode is the pulse + direction mode. In this mode, the EA terminal receives the pulse signal; the EB terminal receives the direction signal, A high level corresponds to an increase in the counter value, and a low level corresponds to a decrease in the value.

(2) AB phase quadrature signal input mode

In this mode, the EA pulse signal "leads" or "lag" the EB pulse signal by 90 degrees, and this "lead" or "lag" indicates the running direction of the motor. As shown in Figure 2-21: When the EA signal leads EB When the signal is 90°, it is regarded as a forward rotation; when the EB signal is 90° ahead of the EA signal, it is regarded as a reverse rotation.

Machine Translated by Google

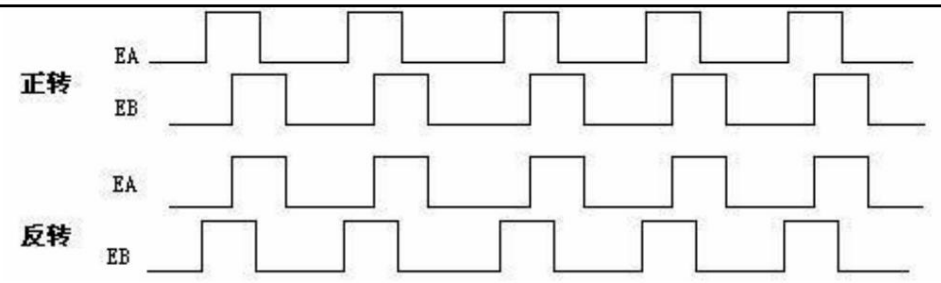


图2-21 正反转A/B相正交信号

When the EA signal "leads" the EB signal, the encoder counts up; when the EA signal "lags" the EB signal, the encoder counts down. Moreover, the user can select 4, 2, and 1 times counting mode to set the count of EA and EB signals, which are described as follows: 4 times counting: if it is forward counting, the value of the encoder counter is 4 times the number of EA feedback pulses to Between 4 times minus 3; if it is negative counting, the value of the encoder counter is between 4 times to 4 times plus 3 of the number of EB feedback pulses. 2 times counting: if it is positive counting, the value of the encoder counter is between 2 times the number of EA feedback pulses to 2 times minus 1; if it is negative counting, the value of the encoder counter is 2 times the number of EB feedback pulses to 2 times plus 1. 1 times counting: if it is positive counting, the value of the encoder counter is the number of EA feedback pulses; if it is negative counting

The encoder counter value is the number of EB feedback pulses. For example: if the encoder used is 2500 lines, that is, the number of EA and EB pulses fed back for one revolution of the motor is 2500, so that the motor rotates one revolution, if the encoder feedback input mode is 4 times count, the value of the encoder counter is 10000; if it is set to double count, the value of the encoder counter is 5000; if it is set to double count, the value of the encoder counter is 2500. This increases the resolution of the encoder.

The encoder input signal wiring method is as follows: 1. Differential mode: As shown in Figure 2-22, in this mode, the positive terminal of the input signal is connected to EA+/EB+/EZ+ terminal, and the negative terminal is connected to EA-/EB-/EZ- end.

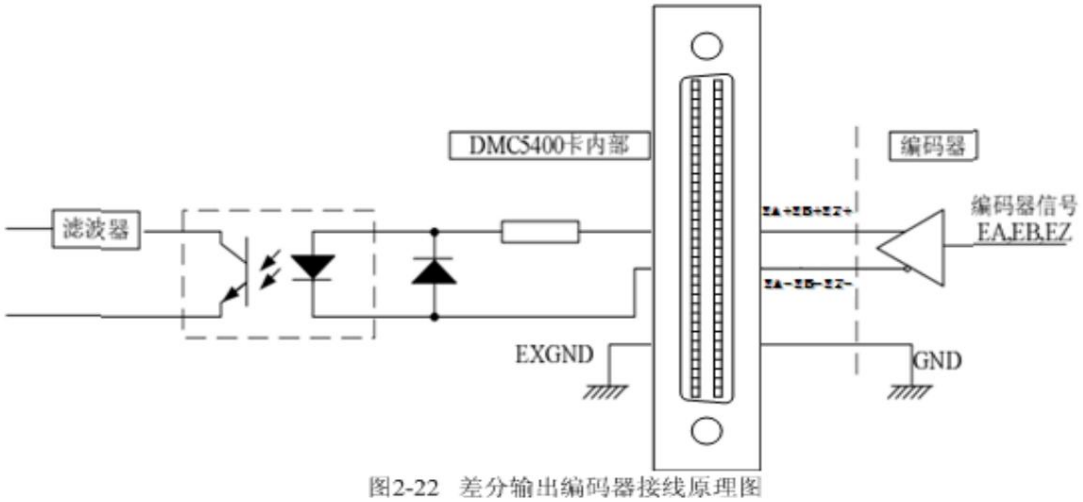


图2-22 差分输出编码器接线原理图

Machine Translated by Google

Note: Differential signals of EA+, EA-, EB+, EB- and EZ+, EZ- of pulse input signals such as encoders

The voltage difference must be higher than 3.5V, less than 5V, and the output current should not be less than 6mA.

2. Open collector mode

As shown in Figure 2-23, if an encoder with open-collector output is used, the encoder output signal is connected to the

The EA+/EB+/EZ+ terminals are left open, while the EA-/EB-/EZ- terminals are left open. Note: External collectors must be used in open collector mode

Please select an appropriate current limiting resistor to ensure that the input current is 6~10mA.

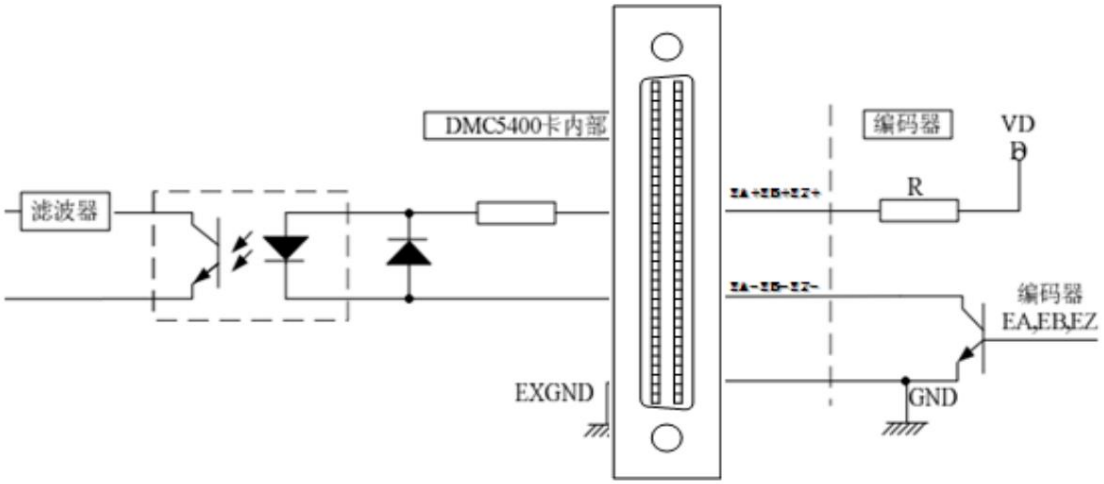


图2-23 集电极开路输出的编码器接线原理图

2.2.6.2 LTC: position latch signal input interface

Leadtech DMC5400 motion control card provides a position latch input signal for each axis

LTC. The schematic diagram of the typical interface is shown in Figure 2-24. For the specific pin assignment of the external interface, see 8.1.1 Interface X1

Pin definition and 8.1.2 Interface X2 pin definition.

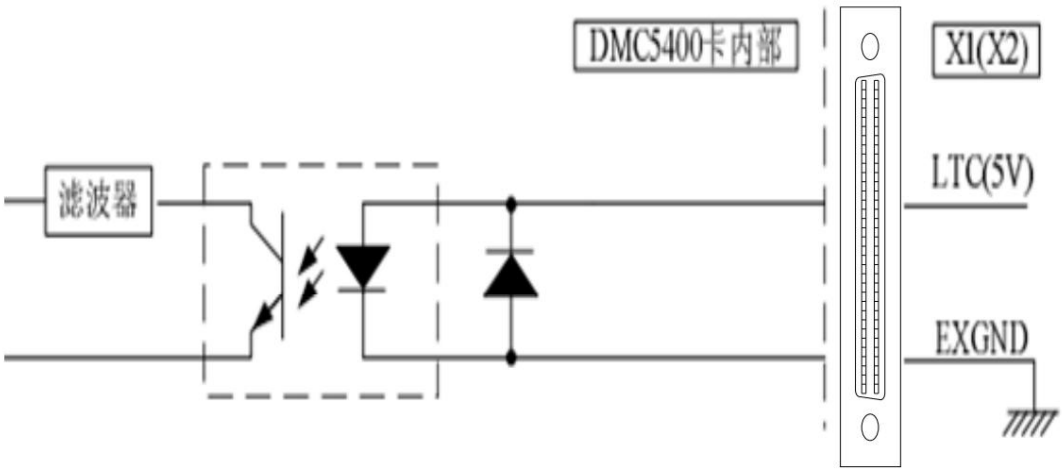


Figure 2-24 Schematic diagram of position latch input signal interface

The position latch mode can choose to latch each encoder signal independently, or through any latch terminal.

Machine Translated by Google

The interface latches all encoder count values at the same time, and the trigger command LTC interface is generally connected to the trigger signal of the measuring probe. This function is very accurate and convenient for position measurement. The LTC1~LTC4 signals can latch the positions of the four axes respectively; it can also be set by software, and the LTC1 signal simultaneously latches the positions of the four axes. The 5V LTC signal will trigger the position latch to capture the current encoder position or the current command position. Its internal circuit is equipped with a filter to filter high-frequency noise, and a Schmitt anti-jamming circuit is added to improve the reliability of the system.

2.2.6.3 PCS: position change trigger signal interface

The position change trigger signal is used to change the target position during running: when running, the motor moves to the command target position. When the PCS signal is valid, the motor will give up executing the current command position and execute the next command target position. That is, the execution of the existing displacement command is aborted, and the next displacement command is executed instead. Its internal circuit is equipped with a filter to filter high-frequency noise, and a Schmitt anti-jamming circuit is added to improve the reliability of the system. When this function is not used, this terminal can be used as a general digital input port.

For specific pin assignment, please refer to 8.1.1 Pin Definition of Interface X1 and 8.1.2 Pin Definition of Interface X2 of External Interface SCSI68 Socket . A typical interface schematic is shown in Figure 2-25 below:

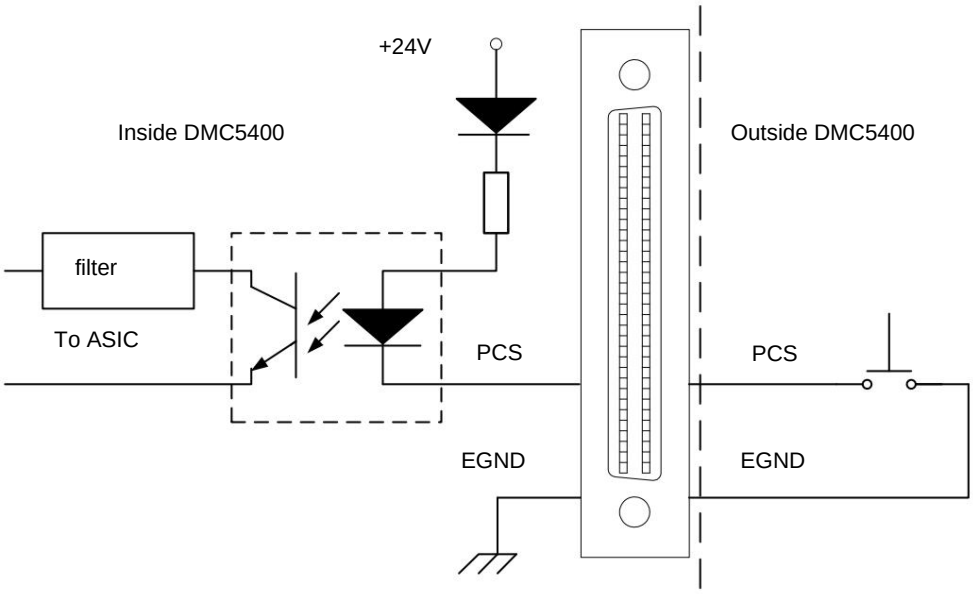


Figure 2-25 Schematic diagram of position change trigger signal interface

2.2.7 Handwheel pulse input interface

Leadtech DMC5400 motion control card provides hand pulse generator input interface PA (PB) for each axis. The typical wiring principle is shown in Figure 2-26 below. The user can control the movement of the motor by inputting the pulse signal through the PA (PB), and the movement distance and speed of the motor are controlled by the input pulse number and pulse frequency. See 8.1.3 Pin Definition of Interface X3 for specific pin port definition , and see 4.2.7 Handwheel Motion Control for specific input mode setting and motion control function enable .

Machine Translated by Google

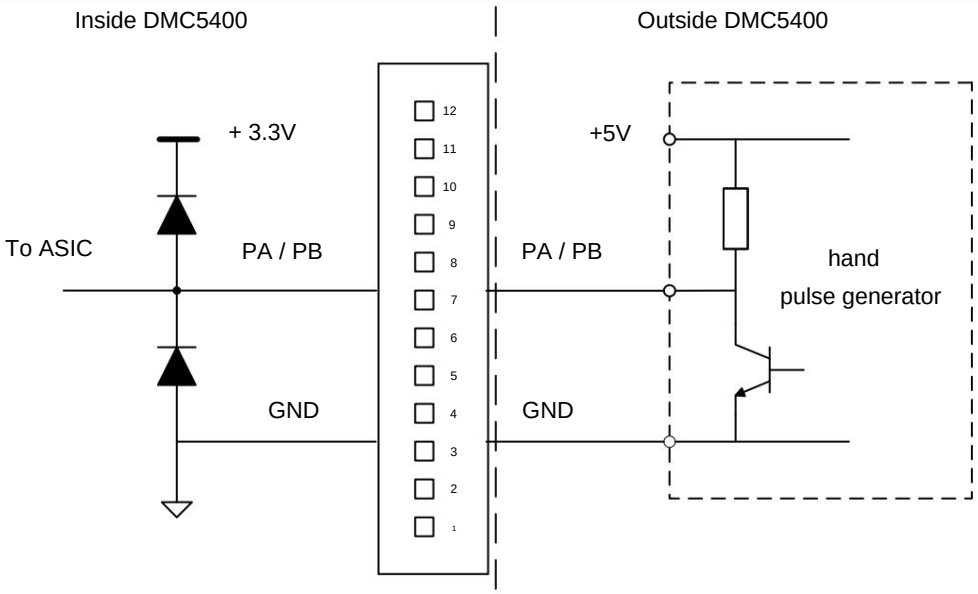


Figure 2-26 Schematic diagram of external pulse signal input

2.2.8 General digital input/output signal interface

In addition to dedicated digital I/O interfaces, Leadtech DMC5400 motion control card also provides a large number of general-purpose digital I/O interfaces. It includes 16 general-purpose digital input signals and 16 general-purpose output signals. At the same time, SD, INP, and PCS can also be used as general-purpose digital input interfaces when they are not dedicated inputs.

2.2.8.1 INPUT general digital input signal interface

The DMC5400 card provides users with 16 general-purpose digital input signals for input of switch signals, sensor signals or other signals. For example, the general-purpose INPUT signal is used to define the RDY (ready) signal of the servo motor driver. The interface circuit is equipped with a filter to improve the reliability of the system. The schematic diagram is shown in Figure 2-27 the

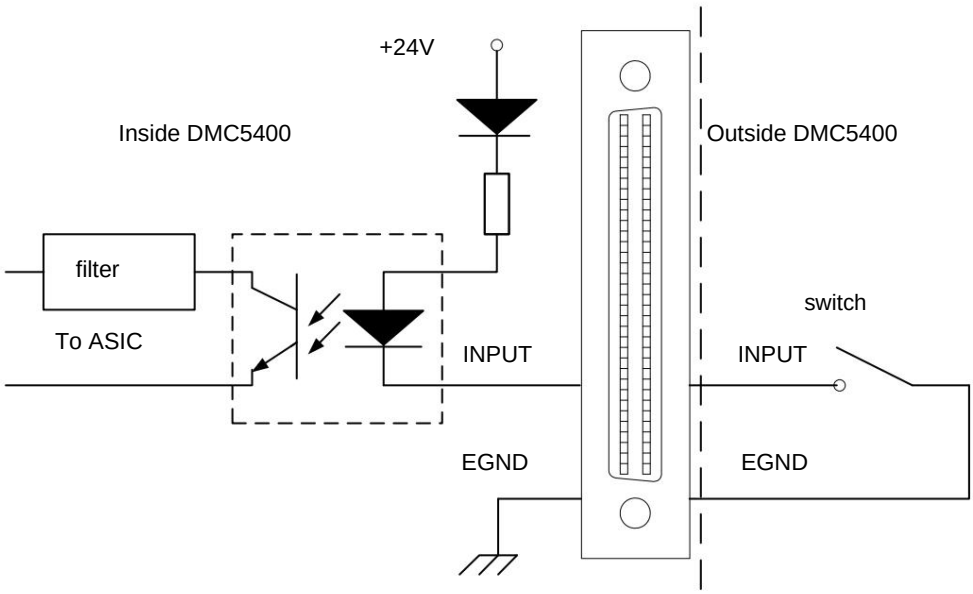


Figure 2-27 Schematic diagram of general-purpose input port circuit

Machine Translated by Google

2.2.8 .2 General purpose digital output Signal interface OUTPUT

DMC5400 card provides users with 16 general-purpose digital output signals, driven by ULN2803, available

For the control of relays, solenoid valves, signal lights or other equipment , such as using the OUT signal to define as the servo power machine driver SVON signal. The connection method of common component control is as follows:

1. Light Emitting Diode

When controlling the light-emitting diode, it is necessary to connect a current limiting resistor R, the limiting current is about 10mA, and the resistance value is large.

It is about 2K to 5K, which is selected according to the power supply used. The higher the voltage, the larger the resistance value used.

The schematic diagram is shown in Figure 2-28:

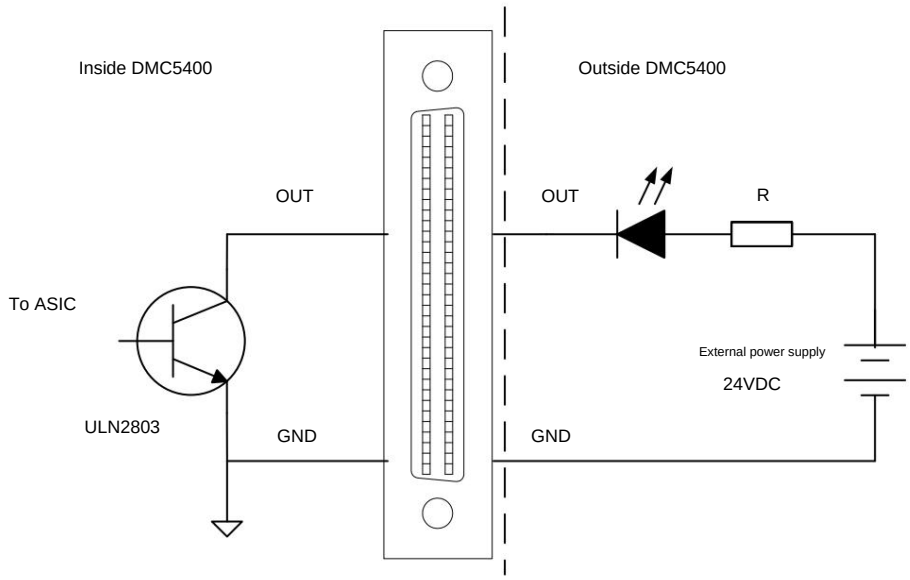


Figure 2-28 Schematic diagram of output port connected to LED

2. Filament type indicator light

When controlling the filament type indicator light, in order to improve the life of the indicator light, it is necessary to connect the preheating resistor R, the larger the resistance value is.

Small, the light is off when the output port is 1 after the resistor is connected. The schematic diagram is shown in Figure 2-29:

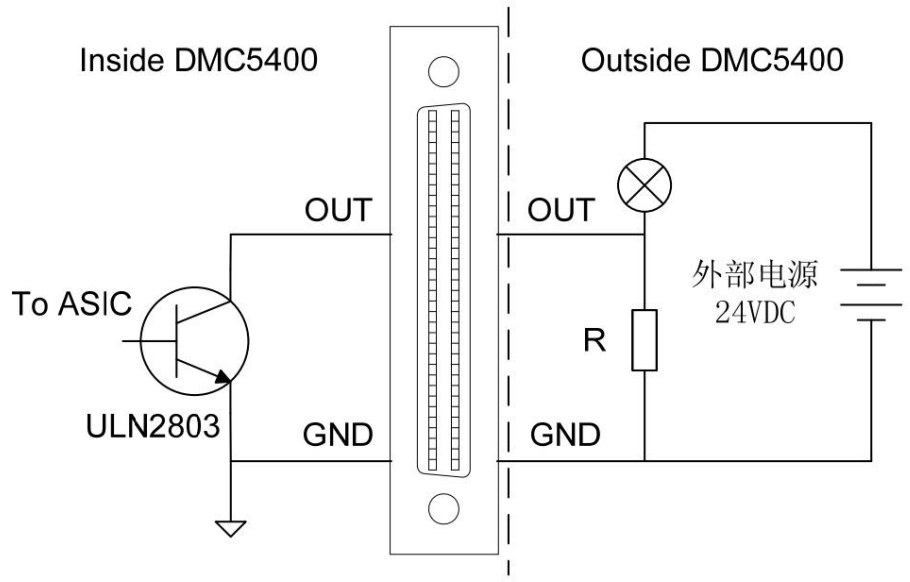


图2-29 输出口接指示灯原理图

Machine Translated by Google

3. Small relay

The relay is an inductive load and must be Connect a freewheeling diode in parallel to protect the output port of the DMC5400 card Drive element ULN2803. The wiring diagram is shown in Figure 2-30:

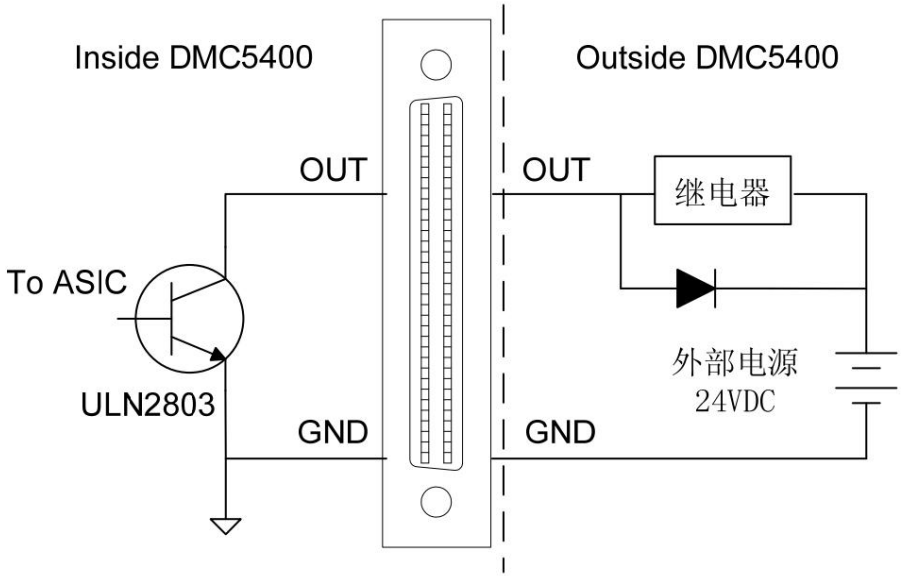


图2-30 接小型继电器原理图

Note: If the load is an inductive load such as a relay, a solenoid valve, etc., a reverse freewheeling diode must be added to protect the protect.

2.3 Motion control platform position sensor and control signal layout example

Leadtech DMC5400 motion control card is equipped with 2 limit signals and 1 deceleration signal for each axis. number, 1 origin signal. Each signal is added with a filter to filter high-frequency noise, and photoelectric isolation is carried out to avoid Reduce external interference to internal and ensure reliable action. Figure 2-31 shows the general motion platform position sensor and Layout of control signals.

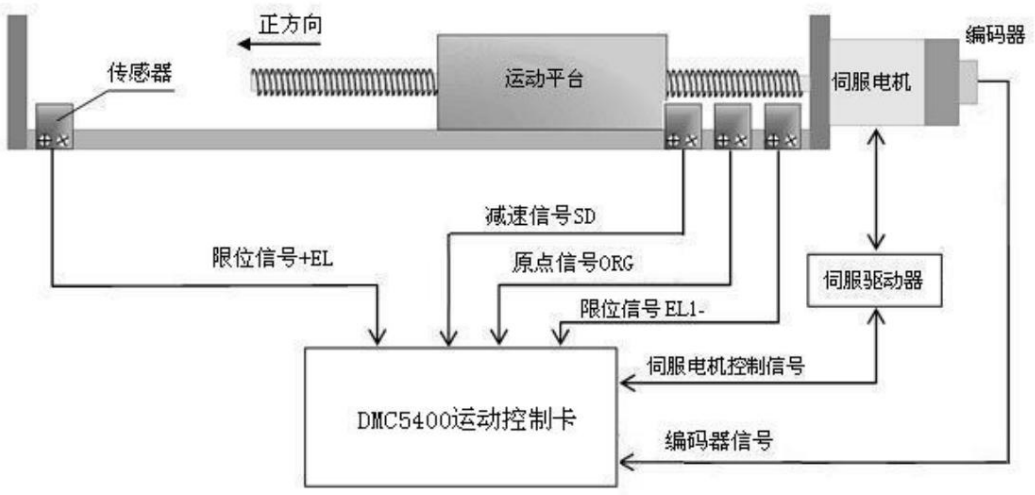


图 2-31 运动平台位置传感器及控制信号的布置图

Machine Translated by Google

3 Hardware configuration and installation

3.1 Hardware configuration

Leadtech (Leadtech) DMC5400 motion control card has multiple groups of jumper switches or DIP switches, respectively Used to set how the control card works. Such as: pulse output mode, relationship between external ground and internal ground, internal electrical The relationship between the source and the external power supply, the effective logic level of the signal, the working mode of the limit switch.

3.1.1 Board Socket and Jumper Switch Layout

Figure-1 shows the layout of jumpers and setting switches on the DMC5403 board.

There are main signal sockets X1 and X2 on the board, these two sockets can meet the general engineering application the basic socket is used for X3 required the handwheel pulse signal, the socket X4 is used for the simultaneous start of multiple cards stop signal Connection. The socket X5 card programming interface, the user Don't care.

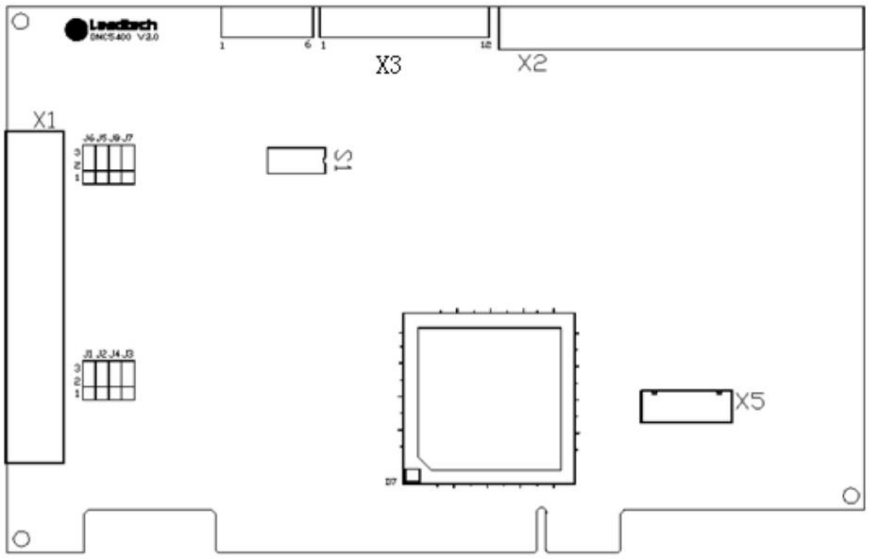


图3-1 DMC5400板卡跳线、开关布局示意图

3.1.2 Jumper Configuration

(1) Jumper switch J1~ J8

J1~J8 jumper switches are used to set the pulse signal output mode as differential or open collector mode.

The setting method is shown in Figure 3-2 and Figure 3-3, each axis pulse and direction signal The output mode of the number is related to the jumper setting The system is shown in Table 3-1.

Machine Translated by Google

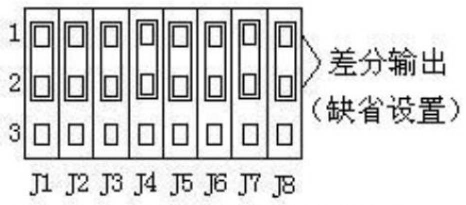


图3-2 差分输出方的跳线设置

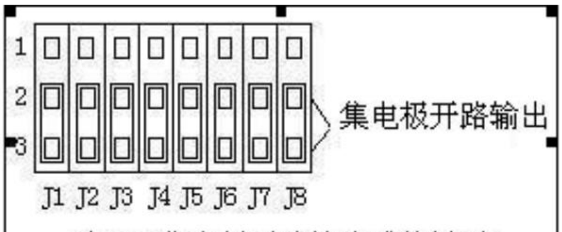


图3-3 集电极开路输出跳线设置

Table 3-1 Correspondence table of pulse and direction signals and jumper switches

X1 pin number signal		Differential output	Open collector output
1	PUL1+	J1: short circuit between pins 1 and 2	J1: short circuit between pins 2 and 3
3	DIR1 +	J2: short circuit between pins 1 and 2	J2: short circuit between pins 2 and 3
21	PUL2+	J3: short circuit between pins 1 and 2	J3: short circuit between pins 2 and 3
23	DIR2+	J4: short circuit between pins 1 and 2	J4: short circuit between pins 2 and 3
55	PUL3+	J5: short circuit between pins 1 and 2	J5: short circuit between pins 2 and 3
57	DIR3+	J6: short circuit differential output	J6: short circuit between pins 2 and 3
X2 pin number signal		between pins 1 and 2	Open collector output
1	PUL4+	J7: short circuit between pins 1 and 2	J7: short circuit between pins 2 and 3
3	DIR4+	J8: short circuit between pins 1 and 2	J8: short circuit between pin 2 and pin 3

The factory default settings J1~J8 are all short circuits 1-2, that is, the difference split output.

(2) Jumper switch J9 and J10 Jumper switch J and J10

are used for testing 9 when producing boards, please do not modify or consult technical support.

holding staff. The default settings of J9 and J10 are as shown in the figure 3-4 shown.

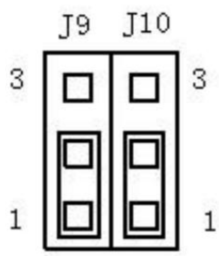


图 3-4 跳线开关J9和J10 的默认设置

(3) Jumper switch J11

Jumper switch J11 is used to set the effective logic level of the emergency stop input signal, its jumper and signal logic

level As shown in Table 3-2. The default setting of J11 is as shown in Figure 3-5.

Table 3-2 J11 jumper table

Level setting	Jumper J11 1-
input signal active low level	pin and 2-pin short circuit
input signal active high level	Short circuit between pin 2 and pin 3

Note: When the card does not work normally, please check whether EMG and EXGND are short-circuited or open-circuited.

Machine Translated by Google

图3-5 跳线开关J11的默认设置

3.1.3 DIP switch configuration

The DMC5400 motion control card is equipped with a DIP switch to set the EL limit mode. Limit open

The relationship between OFF and DIP switch is shown in Table 3-3.

Table 3-3 Limit DIP Switch Table

DIP switch bit number	Dial state	Set limit switch type
4	ON	EL1± is normally open limit switch
	OFF	EL1± is a normally closed limit switch
3	ON	EL2± is normally open limit switch
	OFF	EL2± is a normally closed limit switch
2	ON	EL3± is normally open limit switch
	OFF	EL3± is a normally closed limit switch
1	ON	EL4± is normally open limit switch
	OFF	EL4± is a normally closed limit switch

Its default settings are shown in Figure 3-6:

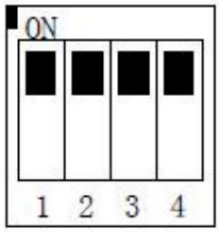


图3-6 拨码开关的默认设置

When the fourth position of the DIP switch is turned ON, EL1± is the signal input mode of the normally open limit switch.

When some mechanical parts touch the limit switch, the switch is closed, EL1± is valid, and the mechanical parts are restricted from continuing in the original direction.

Continue to move.

When the fourth position of the DIP switch is turned OFF, EL1± is the signal input mode of the normally closed limit switch.

When the external mechanical parts touch the limit switch, the switch is disconnected, EL1± is valid, and the mechanical parts are limited to the original direction

Keep moving.

3.2 Hardware Installation

The hardware structure of Leadtech DMC5400 motion control card complies with the 32bit PCI card structure standard.

The installation method is similar to the installation of a common 32bit PCI card. The specific reference steps are as follows:

Machine Translated by Google

1) Open the package of DMC5400, refer to the description of 3.1 hardware configuration, according to the actual application requirements, Complete the hardware configuration;

2) For users who use the auxiliary interface, please connect the auxiliary interface to the corresponding socket of DMC5400, and make sure Ensure the connection is firm and reliable;

3) Touch the ground wire to completely release the static electricity on the operator, and wear anti-static gloves;

4) Make sure the PC has turned off, and all devices connected to the PC are also turned off;

5) Open the case of the PC;

6) Select a 32bit PCI slot close to the processor, and insert the DMC5400 into the slot vertically;

7) Fasten the DMC5400 on the PC chassis with screws Depend on.

8) For users who use the auxiliary interface, please fasten the auxiliary interface on the PC chassis with screws to ensure that the Tight and reliable.

9) Cover the PC case, and the hardware installation is now complete!

Machine Translated by Google

4 Software system overview

Retai (Leadtech) DMC5400 motion control card software system includes: hardware drivers, motion control Control function library, demo software Motion5000. Multiple VB, VC motion control routines.

4.1 Hardware Drivers

Leadtech DMC5400 is provided with Windows7/XP NT/2000 and other operating system environments Drivers. Customers can choose the corresponding system platform according to their own needs to Develop your own application software. For the specific installation method of the hardware driver, please refer to: 5 Drivers . Install

4.2 Motion Control Function Library

In order to enable customers to develop their own application control system, Leadtech DMC5400 provides Provides a rich function library, customers can flexibly call different function functions according to the needs of their own application systems number.

Note: Refer to Appendix: 8.2 Motion Control Function Library for the specific function introduction of each function.

4.2.1 Initialize and close the motion control card

Before operating the Leitai motion control card, the control card initialization function must be called (Leadtech) DMC5400 The number allocates resources for the motion control card. Similarly, when the operation of the motion control card is ended, the control card must be called The shutdown function releases the system resources occupied by the motion control card, so that the occupied resources can be used by other devices. Tool The body-related functions and functions are shown in Table 4-1 。

Table 4-1 Initial shutdown control card function description

	name	Features	reference
1	d5400_board_init()	Initializes the DMC5400 and allocates system resources	8.2.2.1
2	d5400_board_close	closes the DMC5400 and releases system resources	8.2.2.1
Note: When the program ends, the d5400_board_close() function must be called to release system resources.			

Routine: Initialize and close the control card (take standard **C** language as an example, the same below)

……

```
CardCount = d5400_board_init(); if(CardCount == 0)
{ printf("\n No motion control card found");



getch();
return(); }
```

……

Machine Translated by Google


```
d5400_board_close();
……
```

4.2.2 Set pulse output mode

Leadtech (Leadtech) DMC5400 motion control card uses the command pulse method to control the stepper/servo motor. Many motor driver manufacturers on the market have different signal interface requirements (six types are commonly used), so When using the control card to control the specific motor driver, the pulse output mode must be set correctly. machine to work normally. The specific related functions and functions are shown in Table 4-2:

Table 4-2 Description of pulse setting function

	name	Features	reference
1	d5400_set_pulse_outmode	Set the pulse output mode of the specified axis	8.2.2.2
Note: This function should be called to set the command pulse mode before calling the motion control function.			

The command pulse includes two basic information: the running distance of the motor, that is, the number of pulses and the rotation direction of the motor. There are two Basic instruction mode: The two basic modes are shown in Table 4-3:

Table 4-3 Two basic command pulse output modes

model	PULn-pin output	DIRn-pin output
Pulse/Direction (PULSE/DIR)	Pulse signal	Direction signal (level)
Double pulse (CW/CCW)	Forward (CW) Pulse	reverse (CCW) pulse
Note: Please refer to 8.2.2.2 for the specific description of the d5400_set_pulse_outmode function for details.		

Routine: Set the pulse output mode

```
……

d5400_set_pulse_outmode (0,0); //Set the pulse output mode of axis 0 to single pulse mode,
```

The rising edge of the PULn- signal is valid, and the positive direction of DIRn- is low.

```
d5400_set_pulse_outmode (1,4); //Set the pulse output mode of the 1st axis to double pulse mode, on
```

Active on rising edge.

```
……
```

4.2.2.1 Pulse/Direction Mode

In this mode, PULn-output command pulse train, the number of pulses corresponds to the corresponding "distance" of the motor running, The pulse frequency corresponds to the "speed" of the motor; DIRn-outputs the direction signal, and the different levels of the signal correspond to Different directions of rotation of the motor. This mode is the most common among drives.

The pulse signal can be set to be valid on the rising edge (that is, the pulse signal is normally low, and the motor changes to high It can also be set to be valid on the falling edge (that is, the pulse signal is normally high, and when it changes to low, the motor moves step). The direction signal can be set as high level for forward direction or low level for forward direction. So actually There are four types of instructions in this mode, as shown in Figure 4-1:

Machine Translated by Google

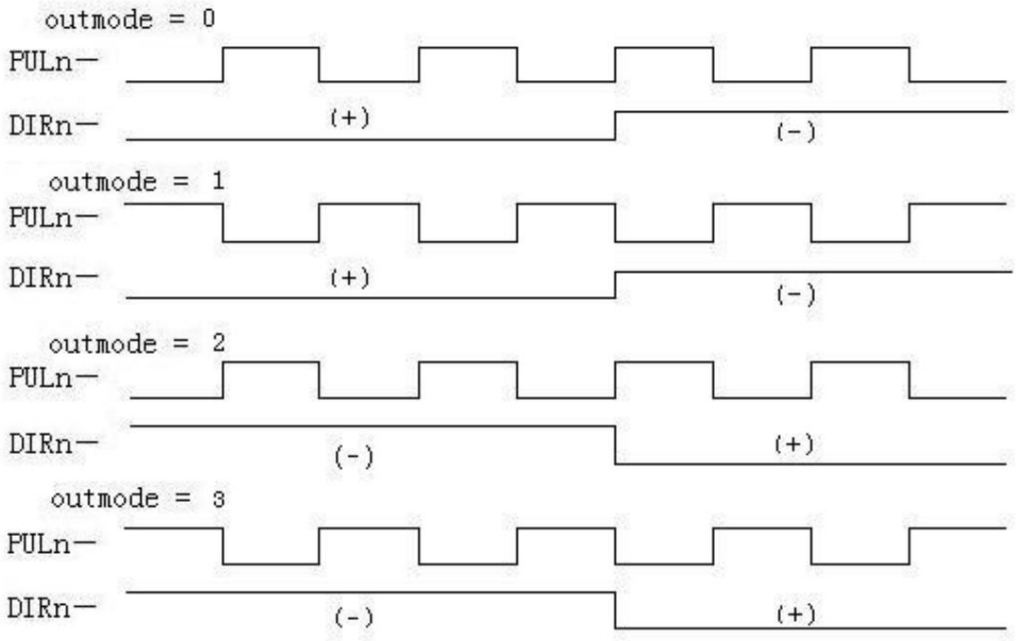


图4-1 单脉冲输出模式

4.2.2 .2 Double Pulse Mode

in this modelIn the formula, the PULn- and DIRn- pins represent the forward (CW) and reverse (CCW) pulses, respectively output . The pulse output from the PULn- pin makes the motor rotate forward, and the pulse output from the DIRn- pin makes the motor reverse. The pulse signal is rising Edge valid or falling edge valid selection, so there are two types of instructions in this mode, such as Figure 4-2 shows:

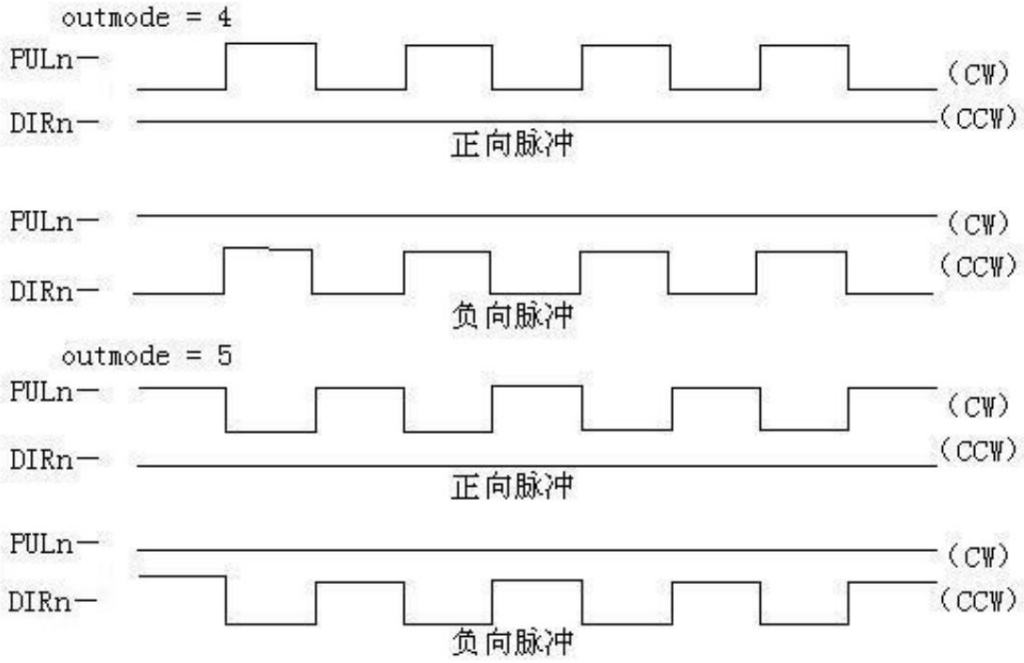


图4-2 双脉冲输出模式

Machine Translated by Google

4.2.3 Return to origin movement

When the motion system is in action, it usually performs the action of finding the origin, and the coordinate position of the system is reset to zero, that is, returning to the origin. sports. Before performing precise motion control, it is necessary to set the origin of the motion coordinate system.

Leadtech DMC5400 motion control card provides a variety of back-to-origin motion methods.

Three common ways of returning to the origin are introduced:

Method 1: Return to origin at low speed

This method returns to the origin at low speed, which is suitable for occasions with short stroke and high safety requirements. The action process is: The machine moves from the initial position to the origin at a constant low speed. When it reaches the origin switch position, the origin signal is touched. The motor stops immediately (process 0); set the stop position as the origin position, as shown in Figure 4-3.

图4-3 回原点方式1-a

Routine: Mode **1** Return to origin at low speed

……

d5400_set_HOME_pin_logic(0,0,1); enable filter function //Set the origin signal of axis 0 to be active at low level,

d5400_config_home_mode(0,0, 0)ÿ EZ ÿ //Set the mode of axis 0 to stop after encountering the origin, The number of occurrences

d5400 of the number is 0 _set_profile(0,500,1000,0.1,0.1); //Set the trapezoidal curve speed of axis 0, acceleration and deceleration time

d5400_home_move(0,2,0); The formula is //Set the No. 0 axis to return to the origin in the negative direction, and the speed is square Return to origin at low speed

while (d5400_check_done(0) == 0) //Wait to return to origin action completed

{}

d 5400_set_position(0,0)ÿ //Set the absolute bit of the command pulse counter of axis 0 set to 0

……

If the above program d5400_config_home_mode (0,0,0) is changed to d5400_config_home_mode(0,0,1), the number of times of EZ signal is 1, then the back-to-origin process is shown in Figure 4-4 shown ÿ

Machine Translated by Google

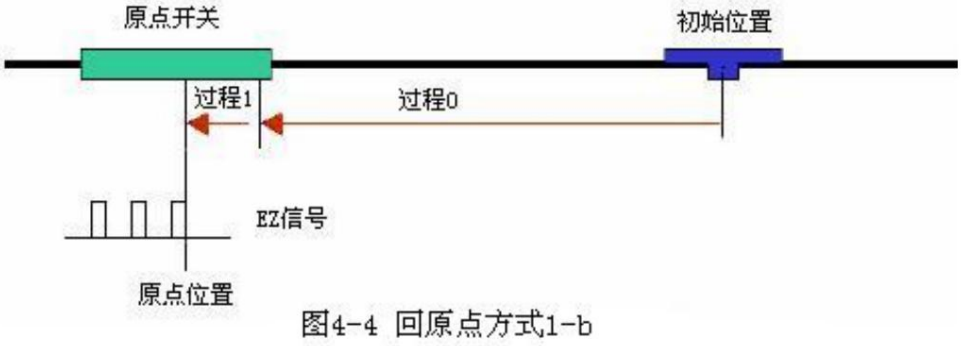


图4-4 回原点方式1-b

Method 2: High-speed back to the origin

In this way, the speed of returning to the origin is fast, and the positioning accuracy is also high. The action process is: the motor starts from the initial position at high speed Move in the direction of the origin, decelerate and stop after triggering the origin signal (process 0); then leave the origin at a low speed in the opposite direction point a small distance (about 65 pulses); Then return to the origin at low speed in the original direction, and stop immediately after the origin signal is triggered (Process 1); Set the stop position as the origin position. As shown 4-5.

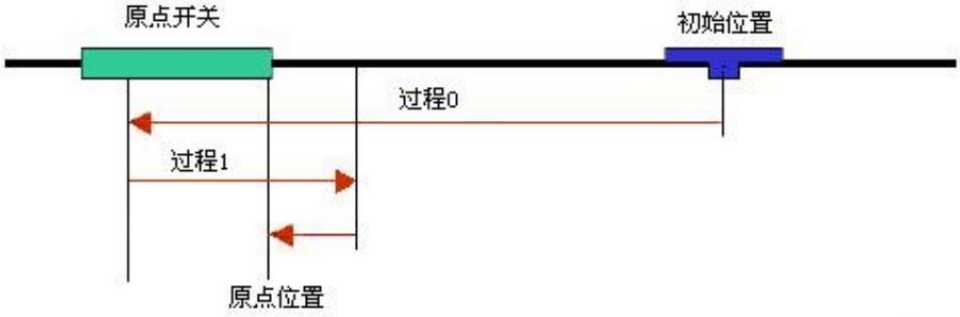


图4-5 回原点方式2

Routine: Mode **2** high-speed back to origin

……

d54 00_set_HOME_pin_logic(0,0,1); //Set the low level of axis 0 to be active, enable the filter function can

d5400 _config_home_mode(0,1,0); press inverse //Set the mode of axis 0 to stop after encountering the origin, and The direction leaves the origin, and then finds the origin according to the original direction and stops

d5400_set_profile(0,500,1000,0.1,0.1); //Set the trapezoidal curve speed of axis 0, acceleration and deceleration time

d5400_home_move(0,2,1); The formula is //Set the No. 0 axis to return to the origin in the negative direction, and the speed is square high-speed back-to-origin

while (d5400_check_done(0) == 0) //Wait for the back-to-origin action to complete

{}

d5400_set_position(0,0); is 0 //Set the absolute position of the command pulse counter of axis 0

……

Method **3 :** High-speed back to the origin

Machine Translated by Google

This method has a fast return-to-origin speed and high positioning precision. Although there are several more instructions, the reliability is high. action The initial position of the process moves towards the origin at high speed, and decelerates to stop after triggering the origin signal (process 0); Then move in the opposite direction at low speed, and stop as soon as the origin number disappears; set the stop position to is the origin position. Such as Figure 4-6 shown.

图4-6 回原点方式3

Routine: Mode **3** high-speed return to original point

……

d5400_set_HOME_pin_logic(0,0,1); //Set the low level of axis 0 to be valid, enable the filtering function

d5400_config_home_mode(0,0,0); //Set the axis 0 mode to stop after encountering the origin, EZ signal Number of occurrences is 0

d5400_home_move (0,2,1); Fast //Axis 0 moves back to the origin in the negative direction, and the speed mode is high Time origin

while (d5400_check_do ne(0) == 0) //Wait for the back-to-origin action to complete

{}

d5400_home_move (0,3,0); Fast origin //Axis 0 moves back to the origin in the positive direction, and the speed mode is low

while (d5400_check_done(0) == 0) //Wait for the back-to-origin action to complete

{}

d5400_set_position(0,0)ÿ // reset axis 0 position

……

The origins of method 1 and method 2 are both Within the range triggered by the origin signal. After performing a return to the origin After that, if it does not move a distance in the positive direction, it leaves the scope of the origin signal, Then once again An error will be generated when the back-to-origin operation is performed. In order to avoid this phenomenon, generally after completing the back-to-origin action (over Program 0), move a distance in the positive direction, leave the trigger range of the origin signal, and then set this position as Logical origin (process 1). As shown 4-7.

图4-7 设置逻辑原点

Machine Translated by Google


```
Routine: Set Logical Origin
……
d5400_home_move (0, home_mode, vel_mode); // Time origin                    action
while (d5400_check_done(0                ) == 0) {}                  //Wait for the back-to-origin action to complete
d5400_ex_t_pm ove(0,200,0)
                                                                      // 200 pulse distances in the positive direction,
Relative Coordinate Mode
d5400_set_position(0,0)ÿ                                              // reset axis 0 position
                                                                      //The current point is the logical origin
……
```

The related functions of back-to-origin are shown in Table 4-4 below. Show:

Table 4-4 Description of functions related to back-to-origin

	name	Features	reference
1	d5400_set_HOME_pin_logic Sets the level and filter	enable of the home signal.	8.2.2.3
2	d5400_config_home_mode	Select homing mode.	8.2.2.3
3	d5400_home_move Note:	Start returning to the origin according to the specified direction and speed.	8.2.2.3
After executing the d5400_home_move function, the command pulse counter will not be cleared automatically; After completion, call the d5400_set_position function to reset it by software.			

4.2.4 Position counting and latching

Leadtech (Leadtech) DMC5400 motion control card has command position counter and Feedback position counter, command position counter for monitoring command position, feedback position counter for monitoring machine At the same time, the motion control card also provides the function of position latch and position comparison output.

4.2.4 .1 Command position counter

The command position counter is a 28-bit positive and negative counter, The output pulses are counted. when losing After a positive pulse is output, the counter increases by 1; when a negative pulse is output, the counter decreases by 1.

The related functions are shown in Table 4-5:

surface 4-5 Instruction pulse position related function description

	name	Features	reference
1	d5400_get_position	Read the command pulse counter of the specified axis.	8.2.2.4.1
2	d5400_set_position	Set the command pulse counter for the specified axis.	8.2.2.4.1

```
Routine: Location Operations
……
d5400_set_postion(0,100); position =          //Set the pulse position of axis 0 to 100 //Read the
d5400_get_position(0);                        current position value of axis 0 to the variable position
……
```

Machine Translated by Google

4.2.4 Feedback position counter

The position feedback counter is a 28-bit positive and negative counter, which is controlled by Card encoder interface EA, EB Input pulses (such as encoder, grating feedback signal, etc.) are counted.

The related functions are shown in Table 4-6:

Table 4-6 Description of encoder related functions

	name	Features	reference
1	d5400_set_pulse_inmode()	Set the counting method of the encoder input port.	8.2.2.4.2
2	d5400_get_encoder()	Read the pulse count value fed back by the encoder.	8.2.2.4.2
3	d5400_set_encoder()	Set the pulse count value of the encoder.	8.2.2.4.2

Routine: Operation of Encoder Feedback Count

d5400_set_pulse_in mode (0,2,0)ÿ //Set axis 0 to count 4 times, the default EA, EB meter Several directions

d540 _ et_encoder(0,0); 0 s //Set the initial value of the count of axis 0 to 0

X_Position = d5400_get_encoder(0); //Read the value of the counter of axis 0 to the variable X_Position

4.2.4.3 Position Latch

Retai (L eadtech) DMC5400 motion control card provides position latch function, which is widely used in various measurement industries. The count source of the position latch can be selected as the command position or the encoder count bit Set; the trigger signal of position latch can choose LTC or ORG signal, command LTC interface one It is generally connected to the trigger signal of the measuring probe. This function is very accurate and convenient for position measurement. The position latch function enables After enabled, when the latch signal is triggered, the current position information is immediately captured into the position latch, and the previous The latched coordinate position is cleared. When using d5400_get_rcun_latch_value to read the latched position information, What is read is the locked position information when the last latch signal is triggered.

The related functions are shown in Table 4-7 below:

Table 4-7 Description of position latch related functions

	name	Features	reference
1	d5400_set_latch_trigger_source Specifies an external trigger signal for the position latch of the specified axis. 8.2.2.4.3		
2	d5400_get_rcun_latch_value Reads the value latched to the position latch triggered by an external signal.		8.2.2.4.3
3	d5400_config_LTC_PIN	Set the LTC signal.	8.2.2.4.3

Routine: Operation of Position Latch

……

d5400_set_latch_trigger_source(0,0); //Select the trigger signal of the encoder of axis 0 as LTC d5400_config_LTC_PIN(0,1,1); //Set the encoder enable of axis 0, LTC trigger mode Trigger on rising edge

i=0ÿ

while ("Test End Condition"==False)

Machine Translated by Google


```
{
Latch_Status=d5400_get_rsts(0); //Read the status of axis 0
If (Latch_Status & 0x4000) //Determine whether the LTC signal is triggered
{ //Read the coordinate value in the latch of axis 0
X_Position[i]=d5400_get_rcun_latch_value(0ÿ0)ÿ
i++ÿ

}}
……
```

4.2.5 Single-axis multi-axis motion control

4.2.5.1 Single axis sport control

When the Leadtech DMC5400 motion control card expresses the motion trajectory can use absolute coordinates and Two modes of relative coordinates (as shown in Figure 4-8) . Both modes have their own advantages. For example: use in absolute coordinate mode A series of coordinate points define a curve. If you want to modify the coordinates of a point in the middle, it will not affect the coordinates of subsequent points; In relative coordinate mode, a curve is defined by a series of coordinate points, and the curve can be repeated with the loop command multiple times.

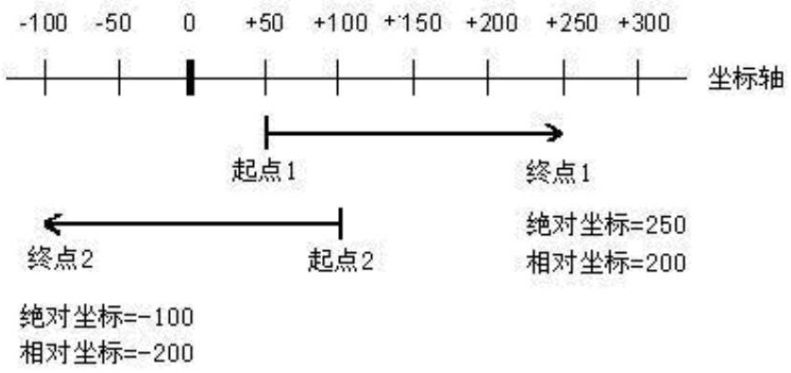


图4-8 绝对坐标与相对坐标中轨迹终点的不同表达方式

In the DMC5400 function library, the unit of distance or position is pulse; the unit of speed is pulse/second; time The unit is seconds. The most basic position control refers to moving from the current position to another position, which is generally called point movement. Movement or fixed-length movement. When the DMC5400 is stuck in single-axis control, it can make the motor follow the trapezoidal speed curve or S Point-to-point motion or continuous motion according to the shape speed curve.

4.2.5.1.1 Trapezoidal Velocity Curve Motion Mode

Trapezoidal velocity curve motion is the most basic motion mode in position control. Move a specified segment in this mode When the distance is increased, its movement speed changes according to a trapezoidal curve, as shown in Figure 4-9.

Machine Translated by Google

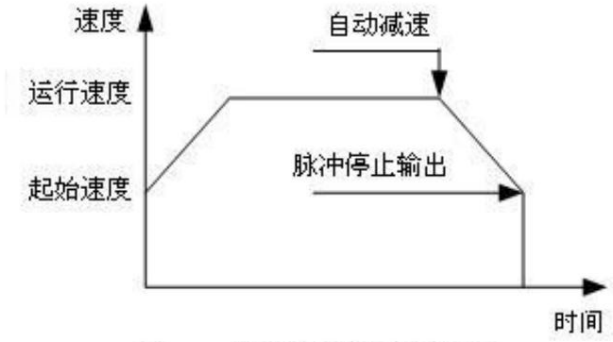


图4-9 简单的梯形速度曲线

The reason why the movement speed changes according to the trapezoidal curve is because: the motor shaft and the object being dragged have inertia. It is impossible to reach the specified speed in an instant, so a certain acceleration time should be given; the deceleration is also similar Otherwise, the motor will lose steps, overshoot (stepper system) or oscillate (servo system) due to insufficient momentary torque. system) phenomenon.

Table 4-8 shows the point control function to realize the movement in trapezoidal velocity curve:

Table 4-8 Description of functions related to trapezoidal point position control

	name	Features	reference
1	d5400_set_profile	Set the initial speed, running speed and acceleration time of the trapezoidal speed curve time, deceleration time.	8.2.2.5.1
2	d5400_t_pmove	Make the specified axis do point motion at the speed of symmetrical trapezoidal curve.	8.2.2.5.1
3	d5400_ex_t_pmove	Make the specified axis do point motion at the speed of asymmetrical trapezoidal curve.	8.2.2.5.1

Routine: Execute point motion with asymmetric trapezoidal velocity curve

……

d5400_set_profile(0,500,6000,0.02,0.01);//Set the initial speed of axis 0 to 500 strokes/ pulse The speed is 6000 pulses/second, the acceleration time is 0.02 seconds, and the deceleration time is seconds 0.01

d 5400_ex_t_pmove(0,5 0,0); //Set No.0 axis, movement distance is 50000 pulses, phase sit opposite mark and start the exercise

……

During single-axis operation, both the motion speed Max_Vel and the target position Dist can be change in real time 4-10 shown.

Machine Translated by Google

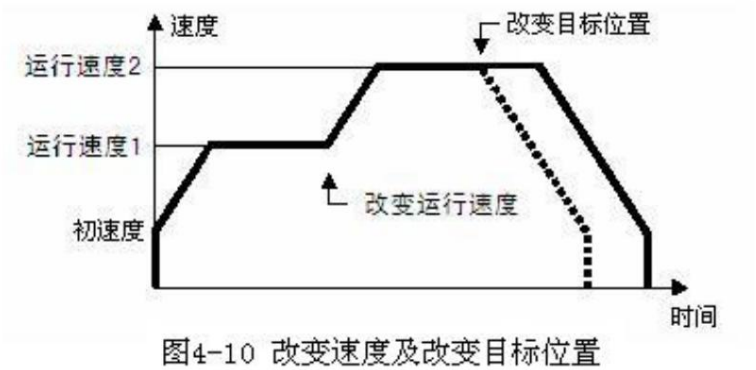


图4-10 改变速度及改变目标位置

If the target position is changed during deceleration, the speed of the motor will change as shown in Figure 4-11.

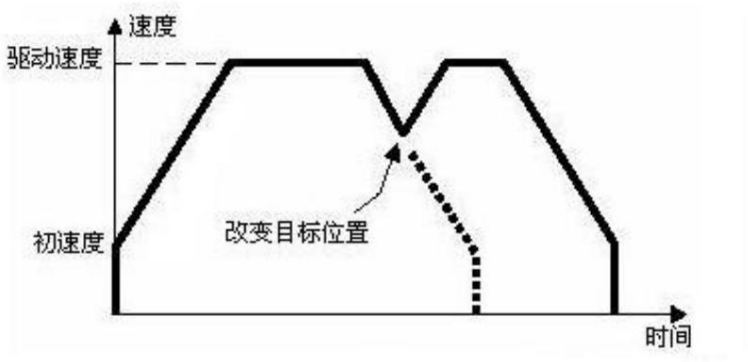


图4-11 减速过程中改变目标位置时速度的变化情况

The functions that implement these two functions are shown in Table 4-9:

Table 4-9 Description of functions related to trapezoidal point position control

	name	Features	reference
1	d5400_change_speed	The function of changing the current running speed during single-axis running.	8.2.2.5.3
2	d5400_reset_target_position	Change the target position function.	8.2.2.5.3

Routine: change speed, change end position

……

d5400_variety_speed_range (0,1,6000000); //Set the speed range

d5400_set_profile (0,100,1000,0.01,0.01)ÿ // Set the trapezoidal curve speed, acceleration and deceleration time

d5400_t_vmove(0,1); //Set Axis number, motion distance 50000, relative coordinate mode

If("change speed condition") //If the change speed condition is satisfied, execute the change speed command

{ Curr_Vel= 9000; //Set the new speed

d5400_change_speed(0,Curr_Vel); //Execute the change speed command

}

If("Change end position condition") //If the change end position condition is satisfied, Then execute changing the end position set command

Machine Translated by Google


```
{ d5400_reset_target_position(0,55000); //Change the end position to 55000
}
……
```

If the running speed during the movement is set to be lower than the initial speed, the entire movement will be run at the initial speed.

move at a constant speed, as shown in Figure 4-12:

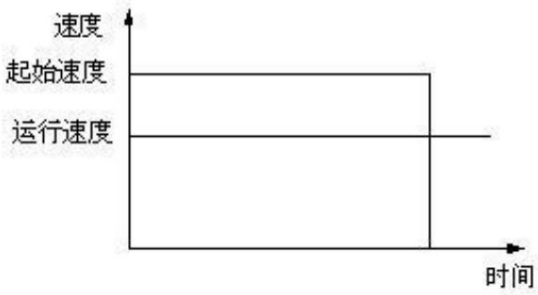


图4-12 运行速度小于起始速度导致恒速

If the movement distance is very short, when the distance is less than or equal to (Max_Vel+Min_Vel)*Tacc, theoretically

The speed curve will become a triangle; however, the DMC5400 motion control card has an automatic adjustment function,

peak to avoid the shock phenomenon that occurs when the speed changes too much. See Figure 4-13:

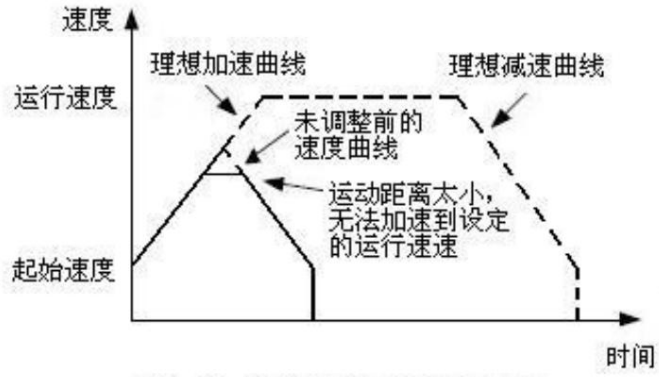


图4-13 运动距离小于加速距离

After the command to control the movement of the axis is issued, the d5400_check_done function can be used to detect the current movement state of the motor.

state. For the specific definition of this function, please refer to Section 8.2.2.5.3.

4.2.5.1.2 S-shaped speed curve motion mode

Although the trapezoidal velocity curve is simple, its velocity curve is not smooth, and its acceleration has a sudden change, so the movement

There is an impact phenomenon, which is easy to cause machine noise and wear of the transmission mechanism. If the acceleration is changed to a linear change,

Then the speed curve will become smooth accordingly, as shown in the description of the S-shaped speed curve in Part B of 2.2.2.2 Speed Control.

Both the acceleration and deceleration phases become S-shaped. With this speed profile, the motion is smoother and helps to reduce

Short-speed machine noise, installation grade, reduce mechanical transmission parts. Shou

set the table 4-10 shows the function of the point position movement of the S-shaped speed:

Machine Translated by Google

Table 4-10 Description of functions related to S-shaped speed control

	name	Features	reference
1	d5400_set_s_profile	Set the initial speed, running speed and acceleration time of the S-shaped speed curve and S segment acceleration/deceleration distance.	8.2.2.5.2
2	d5400_s_pmove	Make the specified axis move in point position with a symmetrical S-shaped velocity curve.	8.2.2.5.2
3	d5400_ex_s_pmove	Make the specified axis perform point motion in an asymmetrical S-shaped velocity curve.	8.2.2.5.2

Notice:

a. Since the vibration of the machine is small when the S-shaped speed curve motion is performed, the user can increase the acceleration, The slope of the linear ramp-up region on the high speed profile, resulting in a shorter acceleration or deceleration time, thus shortening the overall motion time. Therefore, the S-shaped curve is widely used in equipment with very high motion speed requirements;

b. The purpose of using the S-shaped curve is to produce smooth motion, but if the distance is too short or the acceleration is too slow, the When the motor speed cannot rise to the set maximum value Max_Vel in the acceleration segment, theoretically the acceleration segment will suddenly increase. then switch to the deceleration section, resulting in a sharp triangle in the middle of the speed curve, and thus causing the axis to appear relatively Big shakes and related issues. To avoid this problem, the DMC5400 has built-in auto-tuning The transition between the acceleration and deceleration segments remains smooth, as shown in Figure 4-14.

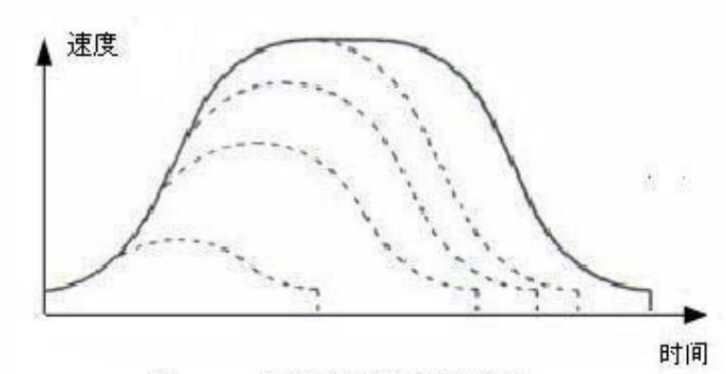


图4-14 自动降速避免尖三角

In the case of single-axis operation, d5400_change_speed can also be called during the movement of the S-shaped speed curve and d 5400_reset_target_position function to change the running speed and target position in real time set. Pay attention to multi-axis interpolation operation The running speed and target position cannot be changed in real time under running conditions.

4.2.5 .1.3 Continuous motion mode

In continuous motion mode, the DMC5400 control card can control the motor in trapezoidal or The S-shaped speed curve is Accelerates from the starting speed to the running speed within the specified acceleration time, and then runs continuously at this speed until the stop is called. The stop command or the axis encounters the limit signal will not press the start time. The speed curve decelerates to a stop. function of continuous motion as table 4-11 shows:

Table 4-11 Description of continuous motion related functions bright

	name	Features	reference
1	d5400_t_vmove	After the specified axis accelerates to the specified running speed in trapezoidal shape, it runs continuously.	8.2.2.5.1
2	d5400_s_vmove	Make the specified axis accelerate to the specified running speed in S shape, and then run continuously.	8.2.2.5.2

Machine Translated by Google

	name	Features	reference
3	d5400_decel_stop	The specified axis decelerates to a stop. call this function Decelerate immediately after reaching the starting speed stop.	8.2.2.5.3

During continuous motion of a single axis, d5400_change_speed can be called to change the speed in real time.

Notice : It is better to change the running speed in the continuous motion of S-shaped acceleration in the constant speed section where the acceleration has been completed.

Figure 4-15 and Figure 4-16 are the speed of speed change and deceleration stop process in continuous motion under trapezoidal and S-shaped acceleration Variety curve.

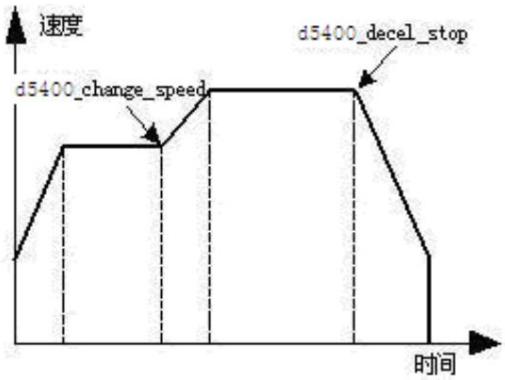


图4-15 梯形速度控制中的变速

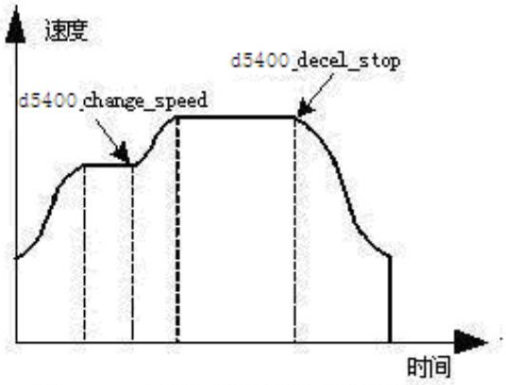


图4-16 S形速度控制中的变速

Routine: continuous motion accelerated by **S** -shaped speed curve, variable speed, and stop control

……

d5400_variety_speed_range (0,1,6000000); //Set the speed range

d5400_set_profile(0,500,1000,0.1,0.1); //Set the trapezoidal curve speed, acceleration and deceleration time

d5400_t_vmove(0,1); //Axis 0 moves continuously, the direction is positive

if("change speed condition") //If the change speed condition is satisfied, execute the change speed command

{ Curr_Vel= 1200; //Set new speed

d5400_change_speed(0,Curr_Vel); //Execute the change speed command

}

if("Stop Condition") //If the motion stop condition is met, execute the deceleration stop command

d5400_decel_stop(0,0.1); //Decelerate to stop, the deceleration time is 0.1 seconds

……

4.2.5.1.4 Calculation of distance (number of pulses) during acceleration and deceleration

For trapezoidal speed curve motion, the motion distance (number of pulses) of the acceleration and deceleration segment can be calculated according to the following formula:

Dacc = ÿ1/2 × ÿMax_Vel + Min_Vel × × Tacc Ddec = ÿ1/2 ÿÿMax_Vel +

Min_Velÿ × Tdec

Dacc and Ddec are the acceleration section distance and the deceleration section distance respectively;

Min_Vel, Max_Vel are the starting speed and running speed;

Machine Translated by Google

Tacc, Tdec are acceleration time and deceleration time. The above

formula is also completely suitable for the case of the S-curve.

4.2.5.2 Multi-axis motion control

Leadtech (Leadtech) DMC5400 motion control card single card can control 4 axes at the same time in various ways.

The most commonly used ones are: multi-axis linkage, linear interpolation, circular interpolation, and continuous interpolation.

4.2.5.2.1 Multi- axis linkage

Several axes move at the same time, generally called multi-axis linkage.

The DMC5400 control card can control multiple motors to execute single-axis motion functions such as d5400_t_move and d5400_s_move at the same time. The so-called simultaneous execution is to sequentially call functions such as d5400_t_move and d5400_s_move in the program. Because the program execution speed is very fast, several motors start to move in an instant, giving people the feeling that they start moving at the same time.

In multi-axis linkage, when the speed of each axis is not set properly, the stop time of each axis is different, and it moves between the starting point and the end point.

The trajectory is not a straight line. As shown in Figure 4-17.

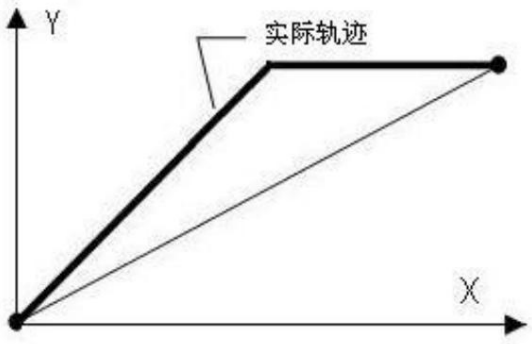


图4-17 二轴联动示意图

4.2.5.2.2 Linear interpolation motion

The interpolation motion is different from the multi-axis linkage: the interpolation motion can not only ensure the accuracy of the starting point and the end point, but also the pulses of the X axis and the Y axis are issued in proportion to the slope of the straight line, so at every moment during the interpolation motion , the error between its motion trajectory and the theoretical curve is always less than one pulse equivalent, as shown in Figure 4-18.

Machine Translated by Google

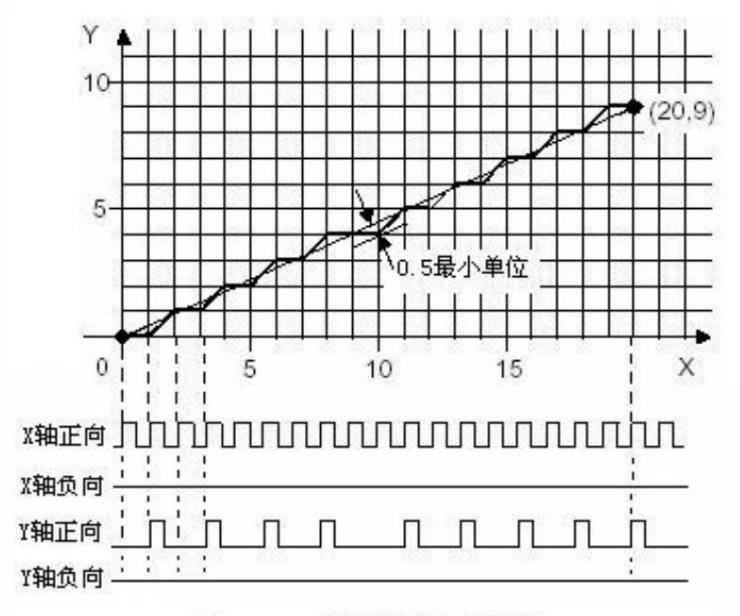


图4-18 直线插补示意图

The DMC5400 card can perform any 2-axis, 3-axis and 4-axis linear interpolation, and the interpolation work is controlled by the control card.

Hardware implementation, the user only needs to write the speed, acceleration, end position and other parameters of the interpolation movement into the relevant functions,

There is no need to intervene in the calculation work in the interpolation process.

Two-axis linear interpolation:

As shown in Figure 4-19, 2-axis linear interpolation moves from point P0 To point P1, the X and Y axes start at the same time, and the

reach the end point when the ÿX: ÿY, the two-axis composite vector velocity is:

$$\frac{\text{ÿÿ ÿ } PX\ Y}{\text{ÿÿttÿt}} = \sqrt{\text{ÿ ÿÿ ÿ ÿ ÿ}}$$

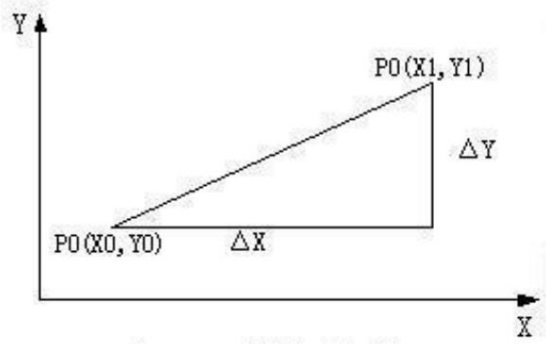


图4-19 两轴直线插补

Three-axis linear interpolation:

As shown in Figure 4-20, XYZ 3-axis linear interpolation moves from point P0 to point P1. 3-axis during interpolation

The velocity ratio is ÿX:ÿY:ÿZ, and the three-axis composite vector velocity is:

$$\frac{\text{ÿ ÿÿ ÿÿ ÿ ÿÿ ÿ ÿ } PX\ Y}{\text{ÿÿ ÿÿ ÿ ÿÿ ÿÿ ÿ}} = \sqrt{Z}$$

Machine Translated by Google

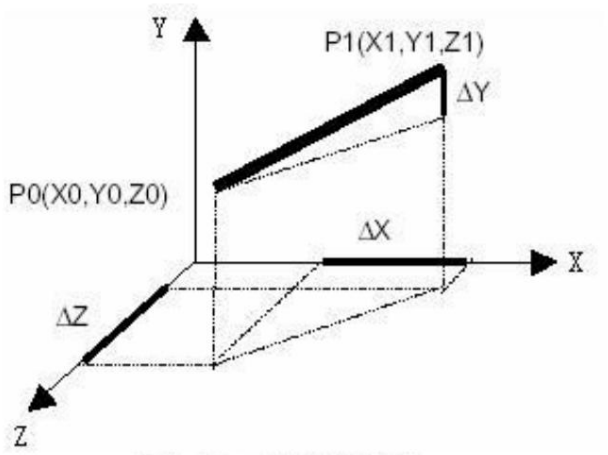


图4-20 三轴直线插补

Four-axis linear interpolation:

4-axis interpolation can be understood as linear interpolation in 4-dimensional space. In general, 3 axes are linearly inserted.

The other axis of rotation also moves together with this space line according to a certain proportional relationship. Its composite vector speed

The degree is:

$$\text{ÿÿ}\frac{PX\ Y}{\text{ÿÿ ÿÿ ÿÿ}}\sqrt{\text{ÿ ÿÿ ÿÿ ÿÿ ÿ}} = \frac{\text{ÿÿÿ ÿÿ ÿÿ}}{\text{ÿÿ ÿÿ ÿÿ ÿ}}^{2}$$

When calling the 2-axis linear interpolation function, the caller needs to provide the vector speed, including its initial vector speed

Min_Vel and working vector velocity M ax_Vel, Trapezoidal and S-shaped velocity curve parameters.

The linear interpolation motion related functions are shown in Table 4-12:

Table 4-12 Description of linear interpolation motion related functions

	name	Features	reference
1	d5400_t_line2	Make the specified two axes perform symmetrical trapezoidal acceleration and deceleration interpolation motion.	8.2.2.6.1
2	d5400_t_line3	Make the specified three axes perform symmetrical trapezoidal acceleration/deceleration interpolation motion.	8.2.2.6.1
3	d5400_t_line4	Specify the four axes to perform interpolation motion with a symmetrical trapezoidal velocity curve.	8.2.2.6.1
4	d5400_set_vector_profile	Set the starting point of the interpolation vector motion curve Start speed, running speed, acceleration time time, deceleration time	8.2.2.6.1

Routine: XY axis linear interpolation

……

short AxisArray[2]ÿ

AxisArray[0]=0; //Define interpolation 0 axis as X axis

AxisA rray[1]=1; //Define interpolation 1 axis as Y axis

d5400_set_vector_profile(1000,5000,0.1,0.2)

d5400_t_line2(AxisArray[0], 30000, AxisArray [1], 40000.0) ÿ

……

This routine makes the X and Y axes perform relative mode linear interpolation motion, and its related parameters are:

ÿX=30000 pulseÿÿY=40000 pulse

Machine Translated by Google

Initial vector speed=1000pps (0 axis, 1 axis minute speed is 600, 800pps);

Working vector speed=5000pps (0 axis, 1 axis minute speed is 3000, 4000pps);

T-shaped acceleration time=0.1s; T-shaped deceleration time=0.2s.

4.2.5.2.3 Circular interpolation movement

Circular interpolation can be performed between any two axes of the DMC5400 card. The circular interpolation is divided into relative position circular arcs. Interpolation and absolute position circular interpolation, the direction of movement is divided into clockwise (CW) and counterclockwise (CCW), such as As shown in Figure 4-21.

图4-21 两轴圆弧插补

The related functions are shown in Table 4-13:

Table 4-13 Description of functions related to circular interpolation

	name	Features	reference
1	d5400_arc_move	Make the specified two axes perform absolute position circular interpolation motion.	8.2.2.6.2
2	d5400_rel_arc_move	Make the specified two axes perform relative position circular interpolation motion.	8.2.2.6.2

Routine: XY axis circular interpolation

……

short AxisArray[2]ÿ

AxisArray[0]=0; //Define the 0 axis as the interpolation X axis

AxisArray[1]=1; //Define axis 1 as interpolation Y axis

d5400_set_vector_profile(1000,3000,0.1,0.2)ÿ

d5400_arc_move (AxisArray, 5000, 0, 5000, -5000, 0)ÿ

// XY axis performs clockwise absolute circular interpolation motion, end point (5000, 0), circle center (5000, -500 0ÿ

……

4.2.5 .2.4 Continuous interpolation motion

DMC5400 The card allows the multi-axis motor to perform continuous multi-segment interpolation motion, and can be set through the motion speed setting function. Numerical Simple settings can realize continuous interpolation of multi-line constant synthesis speed, and there is no acceleration/deceleration between line segments program, the effect of continuous interpolation The result can be represented by Figure 4-22:

Machine Translated by Google

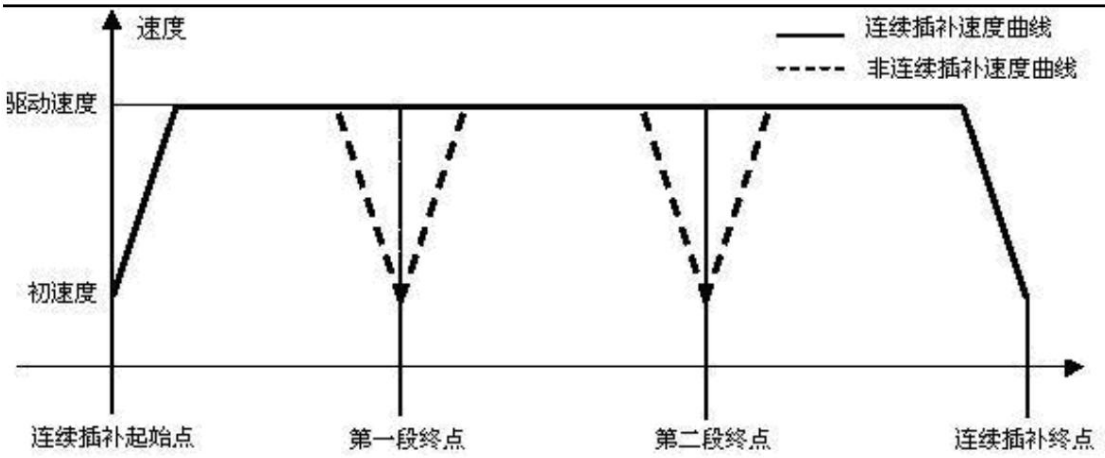


图4-22 连续插补运动

The related functions are shown in Table 4-14:

Table 4-14 Description of continuous interpolation related functions

	name	Features	reference
1	d5400_prebuff_status	Read the state of the preset buffer of the specified axis	8.2.2.6.3

The DMC5400 control card has two-level hardware buffer function, which can store the data of two-step motion in advance.

The data of the current movement of the control card is stored in buffer 1 (that is, the working register R (register)), and the following two

The data of the step movement are stored in buffer 2 (ie, the first pre-register PR1 (pre-register 1))

And buffer 3 (ie the second pre-register PR2 (pre-register 2)), as shown in Figure 4-23.

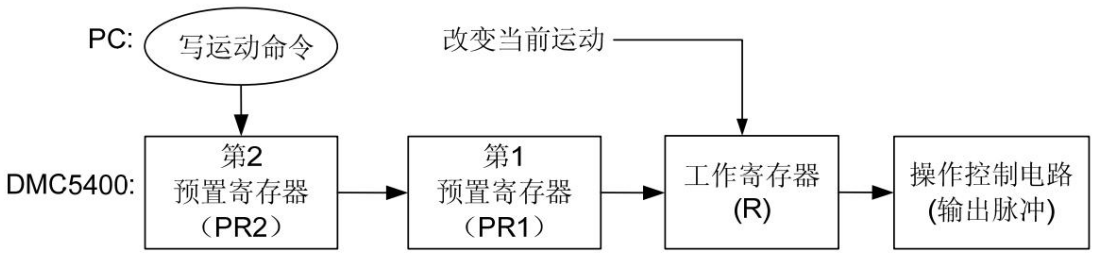


图4-23 双缓冲寄存器连续插补的工作原理

The current movement is completed, the data in PR1 is automatically moved to R to start execution, and the data in PR2 is also automatically

move to PR1, register PR2 becomes empty at this time. After the PC checks that PR2 or PR1 is empty, you can repair

charge A movement data. This cycle continues until all movements are completed. It is allowed and can only be repaired during exercise

change the current state of motion. For example, to change the speed, write new data directly to the working register R. Considerations for continuous imputation:

1. continuous insertionInterpolation motion only supports interpolation motion in relative mode.

2. When the second preset register PR2 is not empty, the user cannot write a new motion command, otherwise it will cause

unknowable error

3. If during the interpolation movement, the trigger limit occurs and stops, then the data and commands written in subsequent

orders are invalid.

Routine: Continuous Interpolation

Machine Translated by Google

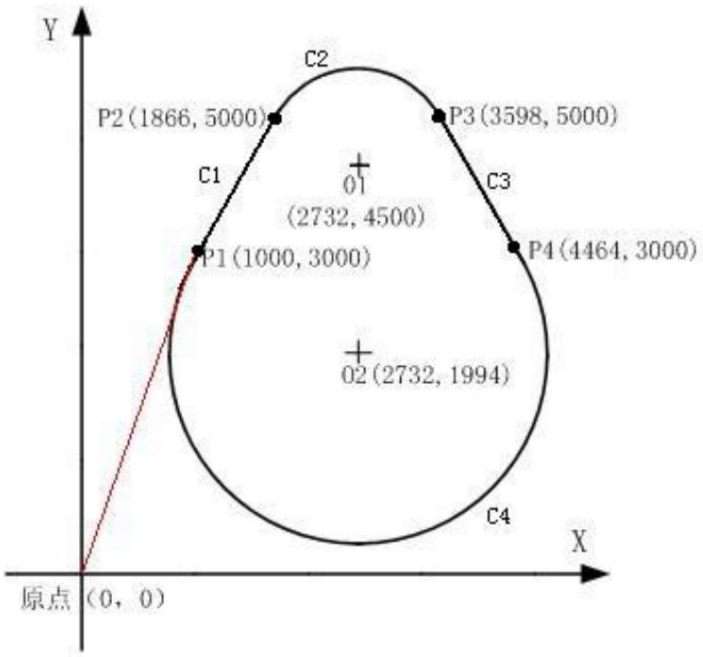


图4-24 两轴连续插补示例

Description: As shown in Figure 4-24, it is assumed that on a work plane, the tool is at the physical origin of the XY axis of the system Positive position (X axis corresponds to Axis[0], Y axis corresponds to Axis[1]), the current tool first returns to the physical origin of the system, and then Executethe interpolation motion C1, then execute the circular interpolation motion C2, then execute the interpolation motion C3, and finally implement interpolation Movement C4 returns to point P1.

code:

……

WORD Axis[2]; //Define the motion axis

Axis[0] = 0ÿ Axis[1] = 1ÿ

long Pos1[2] = {3598,5000}; //Define the end position of C2 arc interpolation P3

Pos2[2] = {1000,3000}; //Define the end position of C4 arc interpolation P1 long

en1[2] = {2732,4500}; //Define the center position of C2 arc interpolation O1 long C

long Cen2[2] = {2732,1994}; //Define the center position O2 of C2 arc interpolation

d 5400_set_vector_profile (50,500,0.01,0.01); //Set interpolation speed, acceleration and deceleration time

d5400_set_HOME_pin_logic(0,0,1); //Set the axis 0 home signal low level is valid, enable filter wave function

d5400_config_home_mode(0,0,0); //Set the axis 0 mode to stop after encountering the origin, EZ signal Occurrence is 0

d5400_set_HOME_pin_logic(1, 0,1); //Set the home signal of axis 1 to be active at low level, enable Filter function

d5400_config_home_mode(1,0,0); //Set the axis 1 mode to stop after encountering the origin, EZ signal Occurrence is 0

d5400_home_move(0,2,0); //Set the axis 0 to return to the origin in the negative direction, and the speed mode to return to the origin at low speed

Machine Translated by Google


```
point

        d5400_home_move(1,2,0); //Set axis 1 to return to origin in the negative direction, and the speed mode to return to origin at low speed
point

        while ÿ(d5400_check_done (0) ==0) || (d5400_check_done (1) ==0) ÿ //ÿÿ

        {}

        d5400_set_vector_profile (100,5000,0.1,0); //Set the interpolation speed, acceleration and deceleration time

        d5400_t_line2(Axis[0],1000,Axis[1],3000,1);//Execute the origin of the stroke and reach the point P1

        while ÿ(d5400_prebuff_status (0)==3) || (d5400_prebuff_status (1)==3)ÿ

        {} //Wait for the buffer register to be empty

        d5400_set_vector_profile (100,5000,0.1,0); //Set interpolation speed, acceleration and deceleration time

        d5400_t_line2(Axis[0],1866,A                    xis[1],5000,1);//Execute the stroke C1 and reach the point P2

        while ÿ(d5400_prebuff uff_status (1)==3)ÿtatus (0) == 3) || (d5400_preb

        {} //Wait for the buffer register to be empty

        d5400_set_vector_profile (100,5000, 0,0) //Set interpolation speed, no acceleration and deceleration

        d5400_rel_arc_move(Axis,Pos1,Cen1,0); //Execute stroke C2 to reach point P3

        while ÿ(d5400_prebuff_status (0)==3) || (d5400_prebuff_status (1)==3)ÿ

        {} //Wait for the buffer register to be null

        d5400 _set_vector_profile (100,5000,0,0); //Set the interpolation speed, acceleration and deceleration time

        d5400_t_line2(Axis[0],4464,Axis[1], 3000,1); //Execute stroke C3, reach P4 point

        while ÿ(d5400_prebuff_status (0)==3) || (d5400_prebuff_status (1)==3)ÿ

        {} //Wait for the buffer register to be null

        d5400_set_vector_profile (100,5000, 0,0.1); //Set the interpolation speed, acceleration and deceleration time

        d5400_rel_arc_move(Axis,Pos2,Cen2,0); //Execute the stroke C3 and reach the point P4

        while (d5400_check_done (0) ==0) //Stop

        {}

        ……
```

Note: when the buffer register is not empty , must not write new motion command, otherwise it will cause unknowable error error.

4.2.6 Dedicated to Servo Drive

Leitai 00 motion control card has the 5 signals of the servo motor driver: ÿleadtechÿ DMC54 INP, ALM, ERC, SVON, RDY, provides dedicated interfaces. where INP and ALM are servo drives input for controller state; ERC is the control The signal output from the card to the servo drive is used to clear the The error between the command position and the actual position in the running process; SVON servo motor enable signal is output by the control card to Servo The control signal of the drive is used to control whether to turn on the servo motor; RDY is the signal sent by the servo drive to the control state of the card Signal that the servo drive is ready to receive control commands.

Machine Translated by Google

4.2.6.1 INP: Servo positioning completed

INP is the servo motor positioning completion signal, which is the status signal sent by the servo motor driver to the control card. When the positioning of the servo motor is completed, the servo driver automatically sets this signal to be valid. in the library The d5400_config_INP_PIN function can set the effective level value of the INP signal and enable or disable the response to the INP signal. If it is set to not respond to the INP signal (ie disable), the control card will move at a fixed length After the pulse is sent, regardless of whether the positioning of the servo motor is completed, the movement completion mark on the card is immediately flipped, that is d5400_check_d enab one will return a "done" status. Conversely, if enabled INP signal (ie le), Then the control card has to wait until after sending the pulse. After the INP signal becomes valid, the flip motion is completed mark, the d5400_che function returns a "done" status. The INP signal level can be passed through d5400_get_rsts function to read.

The related functions are shown in Table 4-15 ›

Table 4-15 Description of INP signal related functions

	name	Features	reference
1	d5400_config_INP_PIN	Set enable/disable INP signal and its valid logic level.	8.2.2.7
2	d5400_get_rsts	Read the external signal status of the specified axis.	8.2.2.7

Routine: INP signal setting

……

d5400_config_INP_PIN(0, 1, 1); //Set the INP signal of axis 0 to be active at high level

……

4.2.6 .2 ALM: Servo Alarm

The ALM signal is the status signal sent from the servo motor driver to the control card to report the servo driver The device or motor is faulty. When the 5400 motion control card receives the ALM A signal, it will stop sending pulses immediately. This process is a hardware process. right Whether the ALM signal is enabled or not and the setting of the effective level can be passed through. This is done by calling the d5400_config_ALM_PIN function, the ALM signal status can be passed through d54000_axis_io_status function to read.

The related functions are shown in Table 4-16:

Table 4-16 Description of INP signal related functions

	name	Features	reference
1	d5400_config_ALM_PIN	Sets the logic levels of the ALM and how it works.	8.2.2.7
2	d5400_axis_io_status	readGet the state of the motion signal of the specified axis, including the specific axis of the specified axis. For I / O state.	8.2.2.7

Routine: ALM Signal Setup

……

d 5400_config_A LM_PIN 0, 1, 1); //Set the 0 axis ALM signal to have effective, and decelerates to stop (brake mode

……

Machine Translated by Google

4.2.6.3 ERC: Error Clear Signal

Leadtech DMC5400 motion control card provides servo drive position error for each axis count Clear to zero (ERC) signal output interface and operation function. When the ERC signal is valid, the servo motor will Stop exercising. This signal can be enabled or disabled by software, while Its effective level and output direction can be to set up. specific correlation function As shown in Table 4-17:

Table 4-17 Description of INP signal related functions

	name	Features	reference
1	d5400_config_ERC_PIN	Set enable/disable ERC signal and its active level and output method.	8.2.2.7
2	d5400_get_rsts	Read the external signal status of the specified axis.	8.2.2.7

Routine: ERC Signal Setup

……

d5400_config_ERC_PIN(0, 0, 1, 0, 1); //Set the ERC signal of axis 0 to be active high, and For non-automatic output mode, the effective output width is 12us, Turn off time is also 12us

……

4.2.6.4: Servo drive enable SVON

SVON is the control signal output by the control card to the servo motor driver. When the SVON signal is inactive When the SVON signal is active, the servo drive does not work and the motor is in a free state; when the SVON signal is valid, the servo drive device works, Motor is locked. DMC5400 motion control card can define a SVON signal.

The related functions are shown in Table 4-18 below:

Table 4-18 SVON signal related function description

	name	Features	reference
1	d5400_write_outbit()	Output the servo signal status of a certain bit of the control card.	8.2.2.9

4.2.6.5 RDY: Servo get ready

RDY is the status signal sent by the servo motor driver to the control card, when When the RDY signal is valid, the It indicates that the servo drive is ready, and the control card can send motion commands to the servo drive after receiving the signal. command; if the RDY signal is invalid, Indicates that the servo drive is not ready, at this time the control card sends out a pulse signal, The servo drive will also not move according to this command. The DMC5400 motion control card can utilize a general-purpose digital input Entry to define an RDY signal.

The correlation functions are shown in Table 4-19 below.

Table 4-19 RDY signal related function description

	name	Features	reference
1	d5400_read_inbit()	Read the level state of a certain input port of the specified control card	8.2.2.9

Machine Translated by Google

4.2.7 Handwheel motion control

thunder Leadtech DMC5400 motion control card provides handwheel input interface and phase for 4 axes respectively.

corresponding function. The specific related functions are shown in Table 4-20:

Table 4-20 Description of functions related to handwheel control

	name	Features	reference
1	d5400_set_handwheel_inmode	Set the counting mode of the input handwheel pulse signal.	8.2.2.8
2	d5400_handwheel_move	Start the handwheel pulse movement of the specified axis.	8.2.2.8
3	0 d540 _get_handwheel_pulse	reads the number of handwheel pulses	8.2.2.8

Routine: Handwheel Control

……

d5400_set_handwheel_inmode(0, 0, 0); times the count, and is the //Set the pulse mode of the 0 axis to AB phase signal, 1 default PA B input count direction /P

d5400_handwheel_m (0,vh); these //Start the 0-axis handwheel pulse movement

……

4.2.8 General I / O control

Leadtech DMC5400 motion control card has 16 general-purpose digital input ports, 16

With digital output ports, all general-purpose input and output ports are isolated by optocouplers. Users can use these I / O mouth

For input switch signal, sensor signal and other signals, or the control of output devices such as output relays and solenoid valves.

control signal.

The related functions are shown in Table 4-21 shown:

Table 4-21 General IO related function description

	name	Features	reference
1	d5400_read_inbit	Read the status of the input port	8.2.2.9
2	d5400_write_outbit	Set the state of the output port	8.2.2.9
3	d5400_read_outbit	Read the status of the output port	8.2.2.9
4	d5400_read_inport	Read the value of the input port	8.2.2.9
5	d5400_read_outport	Read the value of the output port	8.2.2.9

Routines: General Purpose Input and Output

If(d5400_read_inbit(input1==1) //Read the status of INPUT1 port and judge whether the button is pressed

{ d5400_write_outbit(out1)=0; //If the button is pressed, the OUT1 port outputs 1, and the LED lights up

}

else

Machine Translated by Google


```
{ d5400_write_outbit(out1)=1; //If the button is not pressed, the OUT1 port outputs 0, and the LED does not light up
}
……
```

4.2.9 Software limit function

DMC5400 motion control card can Realize positive and negative software limit.

Call d5400_enable_softlimit to enable or disable software limit;

Call the d5400_config_softlimit function to set the pulse source and response mode of the software limit; this In addition, d5400_set_int_factor can be used to set whether an interrupt will be generated after the limit is triggered. The interrupted state can be call function d5400_read_event_int_factor to read.

The positive and negative direction limit positions of the software limit can be set by calling d5400_set_softlimit_data. these two The limit position defines the travel range of the specified axis.

If the positive limit value is set to n, when the value of the selected counter is greater than n, then when the selected counter counts When the number is greater than or equal to n, the control card will automatically respond according to the set limit switch response mode, and control The card will not respond to the movement command in the positive direction until the value of the selected counter is modified to be less than the software limit value.

If the set negative limit value is -n, when the selected counter value is less than or equal to -n, the control card will Set the limit switch response method, and the control card will not respond to the movement command in the negative direction should be applied until the value of the selected counter is modified to be greater than the software limit value.

The related functions are shown in Table 4-22:

Table 4-22 Description of functions related to software limit function

	name	Features	reference
1	d5400_config_softlimit	Configure software limit function	8.2.2.10
2	d5400_enable_softlimit	Enable or disable the software limit function of the specified axis	8.2.2.10
3	d5400_set_softlimit_data	Set the software limit range of the specified axis	8.2.2.10

Routine: Setting of software limit

```
d5400_set_int_factor(0,8); //When setting the limit of axis 0 beyond the positive direction, an interrupt will be generated
d5400_config_softlimit(0,1,0); //Set the position count of axis 0 to count from the encoder position, control
The movement method is to stop immediately
d5400_set_softlimit_data(0,-1000,5000); //Set the limit range of axis 0, the negative direction is
-1000, positive Direction is 5000
d5400_enable_softlimit(0,1); //Enable the software limit function of axis 0
```

4.2.10 Interrupt function

DMC5400 motion control card can set multiple interrupt sources, when one or more conditions are met,

Machine Translated by Google

Generate INT signal to obtain the right to use PC resources. Enable or disable the interrupt function by calling the library function,

Interrupt sources can be configured, allowing up to 15 interrupt sources to be set. After the system is interrupted, you can

event interrupt factor or error Stop the interrupt factor query function to query the interrupt factor.

In the VC++ programming environment, you can call the d5400_set_board_isr function to specify a regular function as

The event of the interrupt response, that is to say, when the control card interrupt is triggered, it will automatically execute the routine specified by this function.

gauge function.

The related functions are shown in Table 4-23:

Table 4-23 Interrupt function related functions illustrate

	name	Features	reference
1	d5400_set_board_isr	set interrupt event	8.2.2.11
2	d5400_set_int_enable	interrupt enable	8.2.2.11
3	d5400_set_int_disable	Interrupt disable	8.2.2.11
4	d5400_set_int_factor	Specify the interrupt source of the DMC5400 card	8.2.2.11
5	d5400_read_event_int_factor	Interrupt factor for read events	8.2.2.11
6	d5400_read_error_int_factor	Interrupt factor for read error stop	8.2.2.11

4.2. 11 multi-card operation

The DMC5400 card driver supports up to 5 cards working simultaneously. Therefore, a PC machine can simultaneously

Control up to 20 axes of stepper/servo motors working simultaneously. Because the DMC5400 card supports plug and play, users can

Don't worry about how to set the card's base address and IRQ interrupt value, these are all set by the system BIOS when the system starts.

Automatically set.

The user can use the software to determine the interface correspondence between the control card number and the axis number, for example: to axis 0

Send fixed-length motion, and the motor that executes the motion can determine that it is located on the No. 1 card and No. 0 axis.

Corresponding relationship between card number and axis number: card 1: (axis 0-3); card 2 (axis 4-7); ...; card N: (axis

4 × (N-1) ÿ4N-1 (ÿ (

4.3 Demonstration program

In order to help users master the application skills of DMC5400 faster and write applications more suitable for their own machines

Software, Leitai also provides a demo software Motion5000 with the card, which has a variety of motion control functions

and test functions. Using Motion5000 software, users can quickly become familiar with DMC5400 motion control

The software and hardware functions of the card can easily and quickly test the performance and performance of the motor drive system when performing various movements.

characteristic.

The design of the demo software greatly simplifies the user's debugging process. Insert the software CD of the DMC5400

Computer CD-ROM, in the corresponding directory, such as "Demo Interface", copy all of them to the computer hard disk

After any location is specified, run Motion5000.exe to test the main functions of the control card,

Learning, you can also use this software to perform preliminary operation of your entire automation system. For details, please refer to: 6.

Machine Translated by Google

4.4 Example program

Leadtech DMC5400 motion control card provides examples for typical functions such as single-axis motion, back-to-origin, interpolation motion, encoder reading, etc. for the convenience of users to secondary development For the source code, please refer to the Samples directory of the CD.

Users can directly copy the code in the corresponding directory in the matching CD to your program project for use. We provide the following examples, including: Example 1 C# initialization, release operation, pulse mode selection, single-axis motion, hardware limit function, multi-axis linkage, motion status display. Example 2 Returning to the origin, including the setting of the speed and direction of the return to the origin. Example 3 Variable speed control, target position change, software limit function, position reset. Example 4 Two-axis/three-axis/multi-axis linear interpolation. Example 5 Helical interpolation. Example 6 Hardware latch function, encoder reading. Example 7 Circular interpolation function. Example 8 General purpose/dedicated input and output. You can find the source programs for these routines in the Motion5000\samples directory.

Machine Translated by Google

5 Driver Installation

The process of installing the DMC5400 motion control card driver is the same as installing other PC boards (such as MODEM cards, graphics cards, etc.) drivers are very similar. Therefore this manual only provides Windows 2000/XP Installation example in an operating system environment.

5.1 Installation steps in Windows 2000 operating system environment

First find the batch file regist2k.bat in the inf_win2000 folder and double-click to run it;

Insert the DMC5400 motion control card into the PCI slot of the PC. For the process and precautions, please refer to 3. Hardware configuration and installation.

1. Start the PC;

2. When entering Windows 2000, the new hardware installation wizard shown in Figure 5-1 will pop up, install the DMC5400 Insert the provided CD into the CD-ROM drive, and press "Next" to continue;

Figure 5-1 Windows2000 operating system installation wizard

3. After pressing "Next", the dialog box shown in Figure 5-2 will appear, select "Search for Backup driver (recommended)", press "Next" to continue;

Machine Translated by Google

Figure 5-2 Searching for a driver for my device

4. In the search location dialog box shown in Figure 5-3, select "Specify a location" and press "Next" to continue.

continued;

Figure 5-3 Select "Specify a location" in the dialog box

5. In the dialog box to find the driver, click Browse. DMC5400 driver files on CD

Machine Translated by Google

For example, find the DMC5400.inf file in the \DMC5400\inf\ directory, click "Open" to continue, see

Figure 5-4;

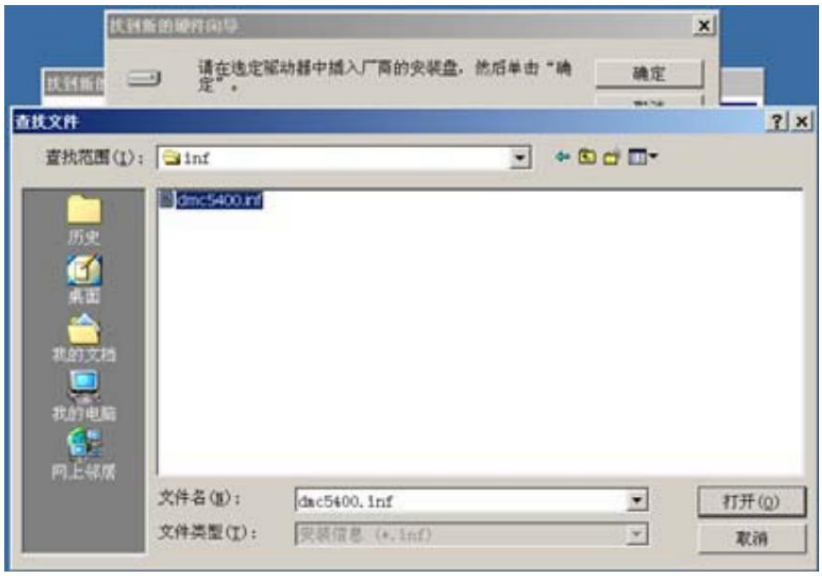


Figure 5-4 Find the DMC5400.inf file

6. After clicking "Open", Windows 2000 will load the DMC5400.inf file, click "Next"

Continue the installation, see Figure 5-5;

Figure 5-5 Installing the DMC5400.inf file

7. After the driver installation is complete, the interface shown in Figure 5-6 will appear. Click "Finish", after restarting,

That completes the installation of the DMC5400.

Machine Translated by Google

Figure 5-6 DMC5400 installation completed

8. Install the application: double-click drive.exe in the CD, follow the instructions Complete the installation until the installation is complete, Click Finish, see Figure 5-7

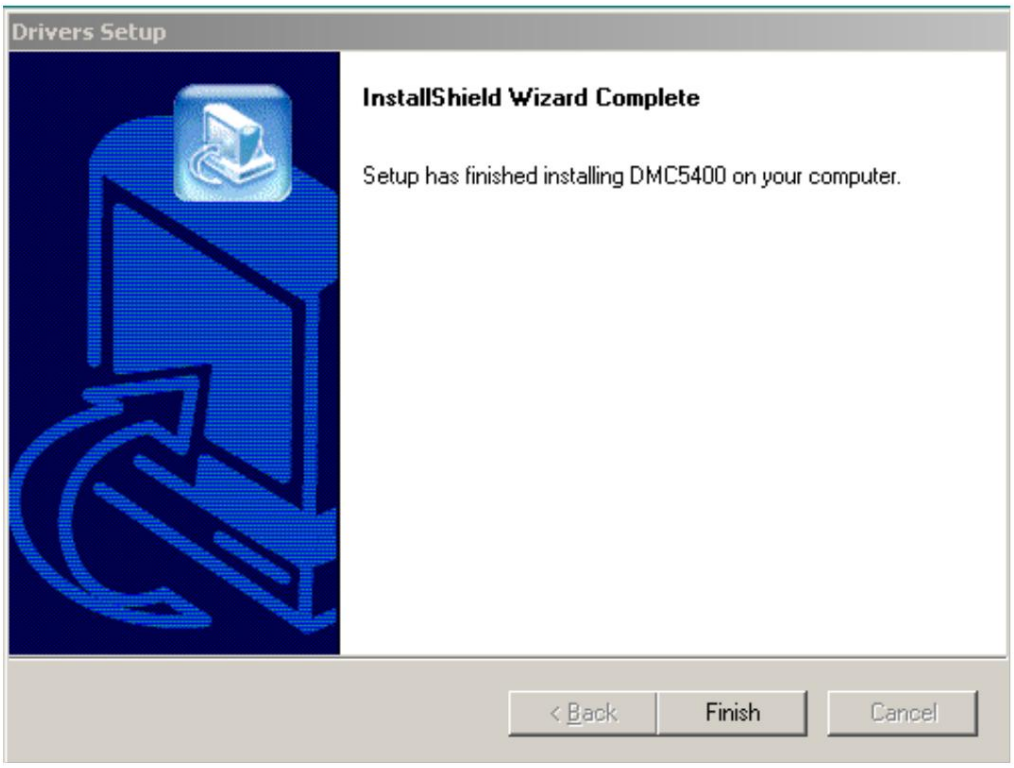


Figure 5-7 Complete the leisai driver installation

9. Open the device manager to see the leisai DMC5400 device and the Leisai Driver device, as shown in the figure 5-8 shows:

Machine Translated by Google

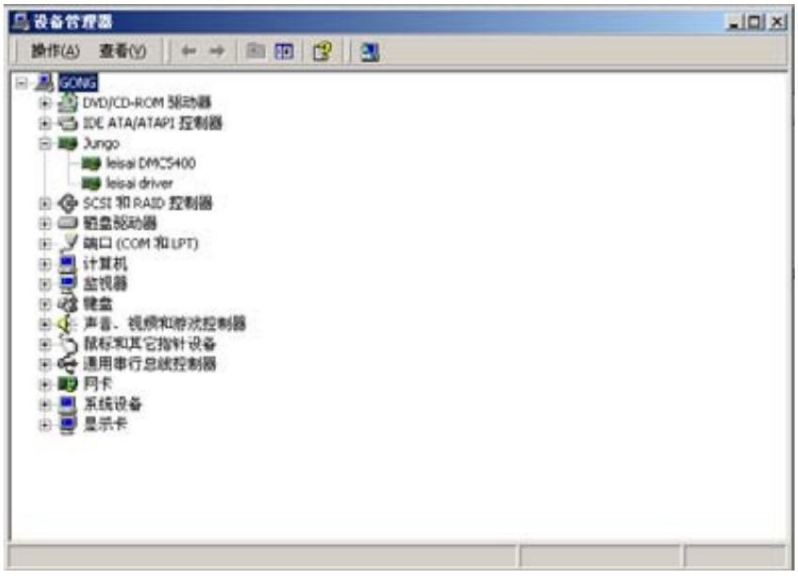


Figure 5-8 Device status displayed by the resource manager

5.2 Installation steps in Windows XP operating system environment

First find the regist2k.bat batch file in the inf_winxp folder and double-click to run it;

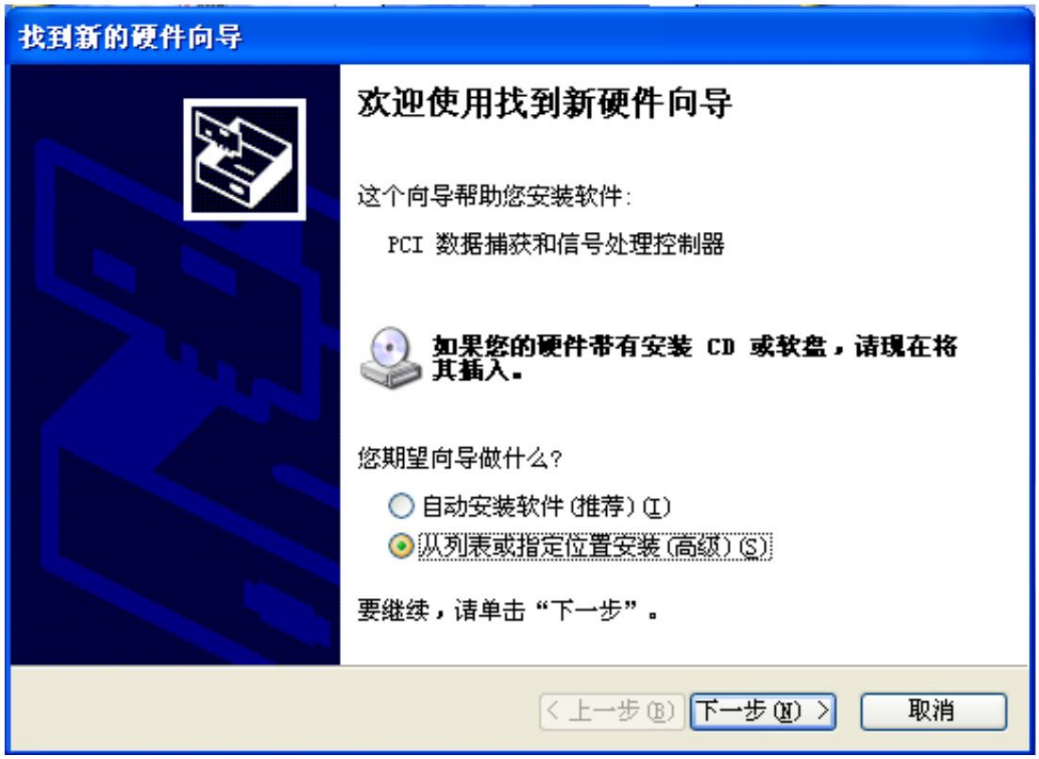
1. Insert the motion control card into the PCI slot of the PC, DMC5400 hardware Please refer to the process and precautions carefully.

Photo 3.configuration and installation;

2. Start the PC;

3. When entering the Windows XP system, the new hardware installation wizard shown in Figure 5-9 will pop up, install the DMC5400

Insert the provided CD into the CD-ROM drive, and press "Next" to continue;



Machine Translated by Google

Figure 5-9 Select "Install from list or specified location"

4. When the dialog box shown in Figure 5-10 appears, select "Search for the latest driver for the device", and click "Next".

one step" to continue the installation;

5. In the dialog box shown in Figure 5-10, select Include this location in search, browse and point to

Select the folder INF in the CD, and then press OK;

Figure 5-10 Browse and select the installation folder INF

6. Then click Next to continue the installation;

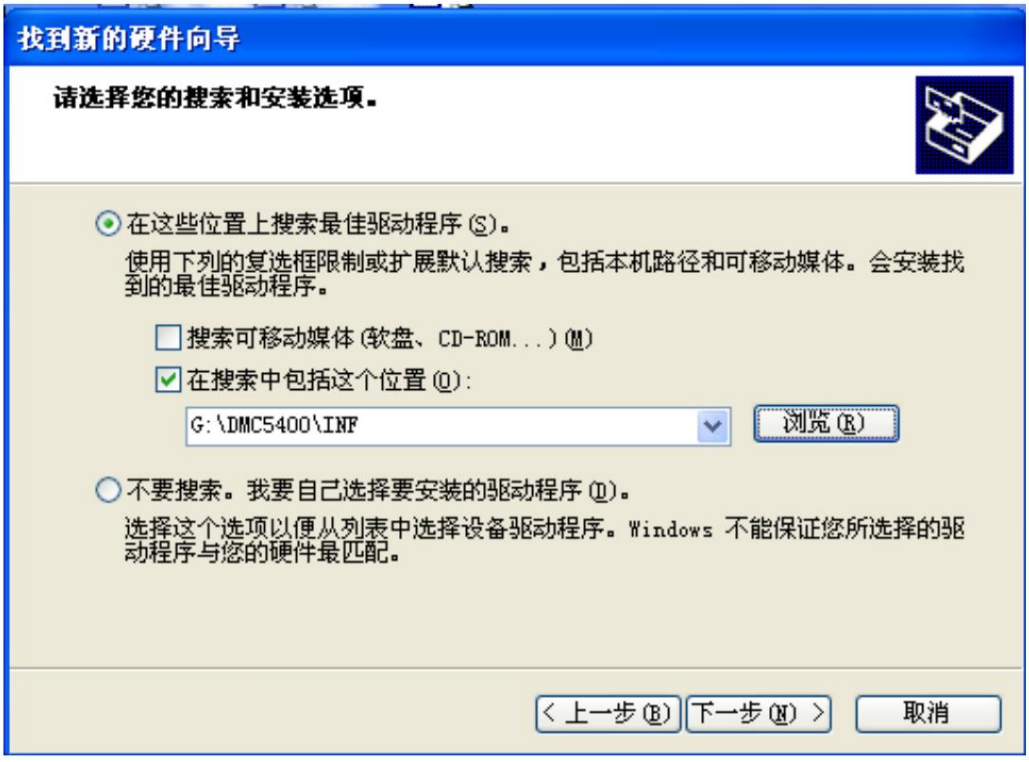


Figure 5-11 Start to install the driver software

Machine Translated by Google

Figure 5-12 Installing the driver software in progress

7. After the installation is complete, the display interface is shown in Figure 5-13:

Figure 5-13 Complete the DMC5400 installation

8. Then double-click the installation application DRIVER of the leisai driver in the CD, and complete the installation according to the instructions.

Install until the installation is complete, as shown in Figure 5-14, click Finish:

Machine Translated by Google

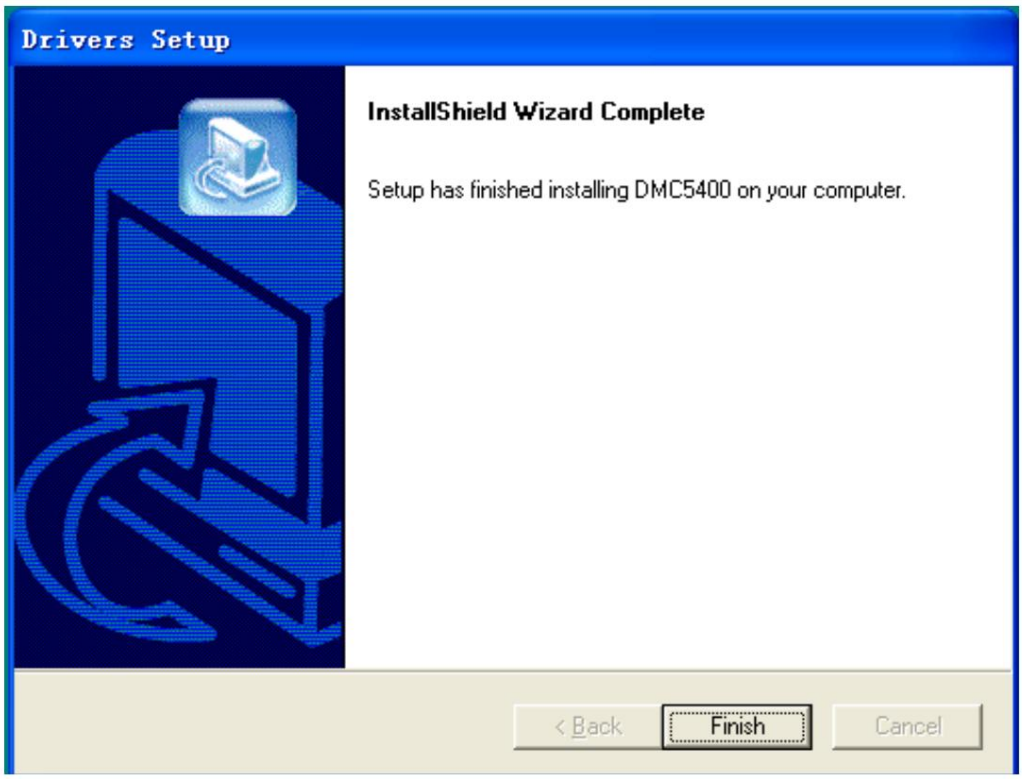


Figure 5-14 Complete the leisai driver installation

9. This completes all the installation process of the driver, you can see leisai in the device manager DMC5400 device and LeisaiDriver device, as shown in Figure 5-15:

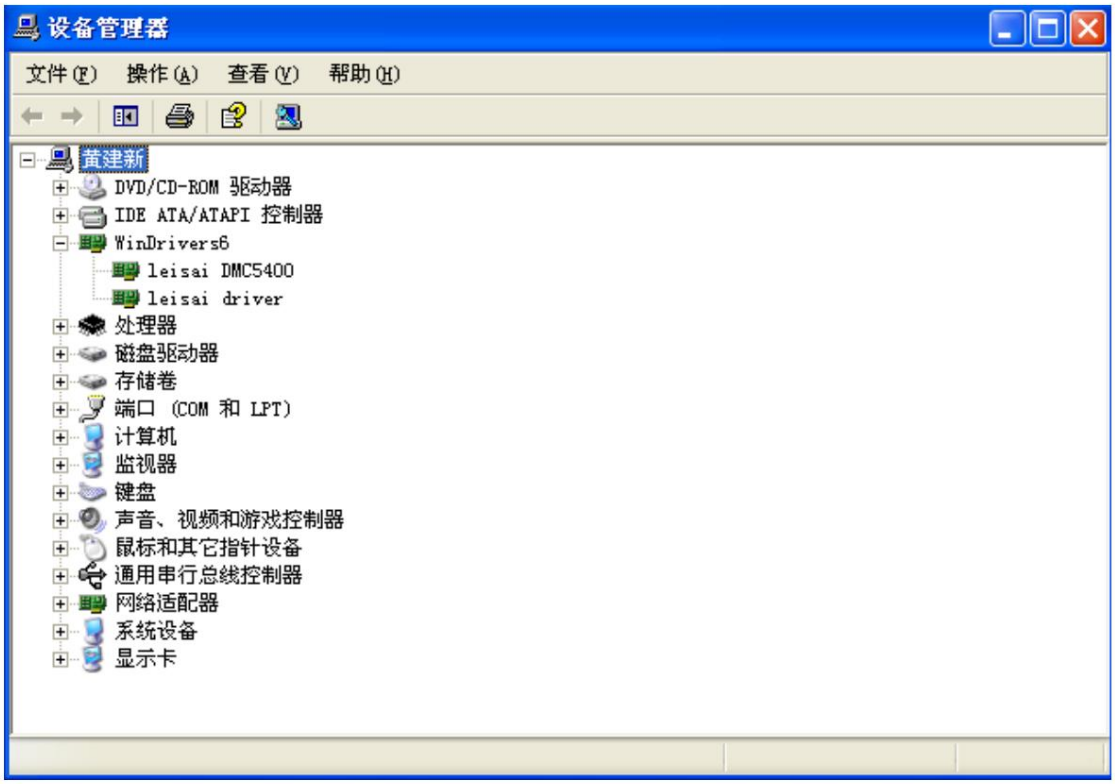


Figure 5-15 Device status displayed by the resource manager

Machine Translated by Google

5.3 Installation steps in Windows 7 operating system environment

1. Turn off the PC and open the case, and insert the DMC5400 motion control card into the PCI slot

2. Start the PC, after entering the Windows7 operating system, the system will prompt to find new hardware, and

The message prompt shown in Figure 5-7 appears in the lower task bar, please do not click this message prompt, or

then close it;

Figure 5-7 The system prompts that new hardware is found

3. Put the CD-ROM with DMC5400 into the CD-ROM drive, open "inf_Win7" in the corresponding directory

Folder, find the "REG_Win7.bat" batch file, as shown in Figure 5-8, single Right-click the mouse, select

"Run as administrator (A)", the system will pop up a DOS interface as shown in Figure 5-9, start

information about the automatic registration of the DMC5400 card, wait for the DOS interface to disappear, that is, the registration is automatically completed (Note

: If a prompt or warning message appears during the installation process, please select "Install" or "Yes");

图 5-8 以管理员身份运行批处理文件

Machine Translated by Google

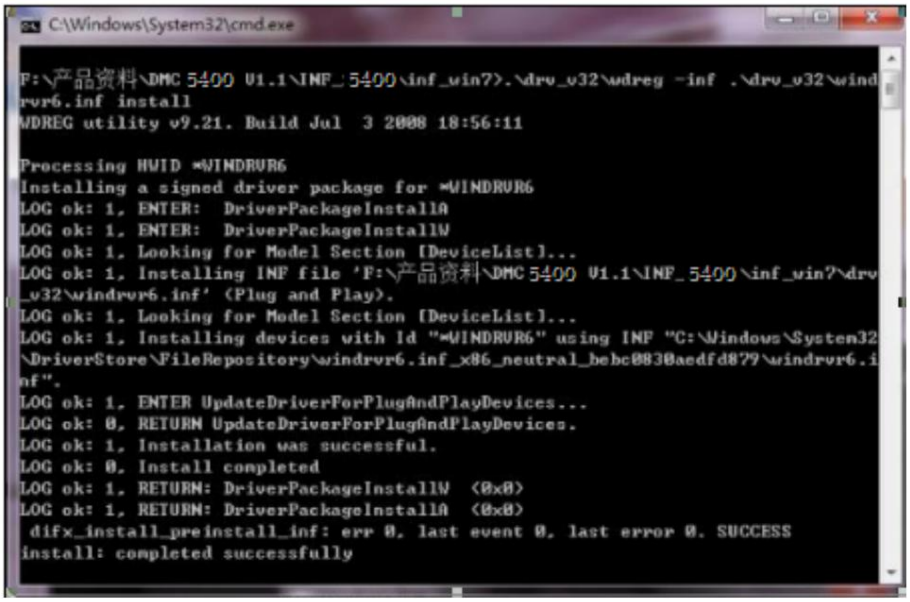


Figure 5-9 The system automatically registers information about the DMC5400 card

4. Right-click "Computer" -> select "Manage (G)" -> select "Device Manager"

Manager", find the device with a yellow exclamation mark in the "Device Manager" "PCI Device" option,

rightClick this option and select “Update Driver Software (P)…”, as shown in Figure 5-10:

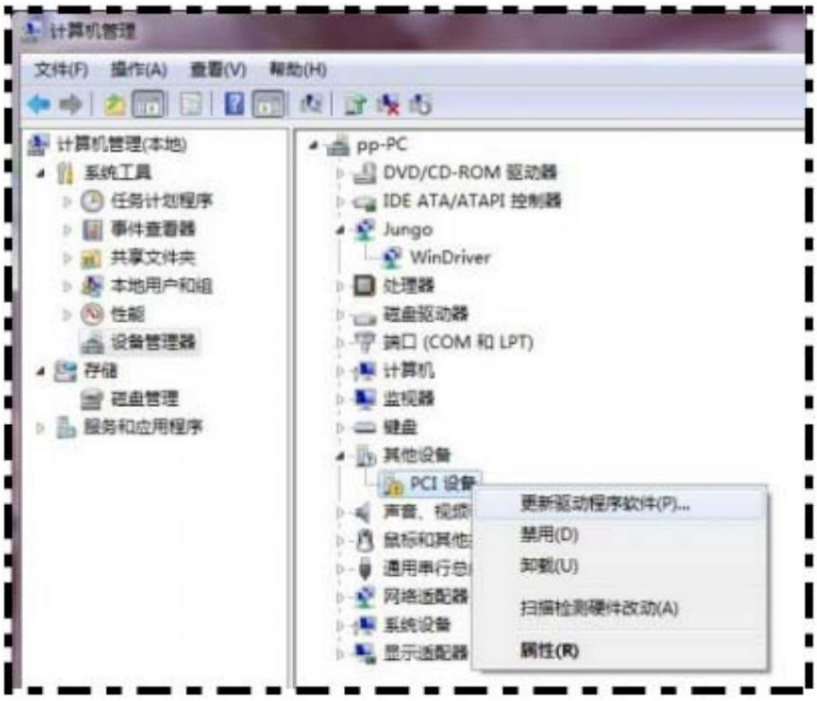


Figure 5-10 Update driver

Machine Translated by Google

5. In the pop-up dialog box shown in Figure 5-11, select "Browse my computer for driver"

Program software (R)”

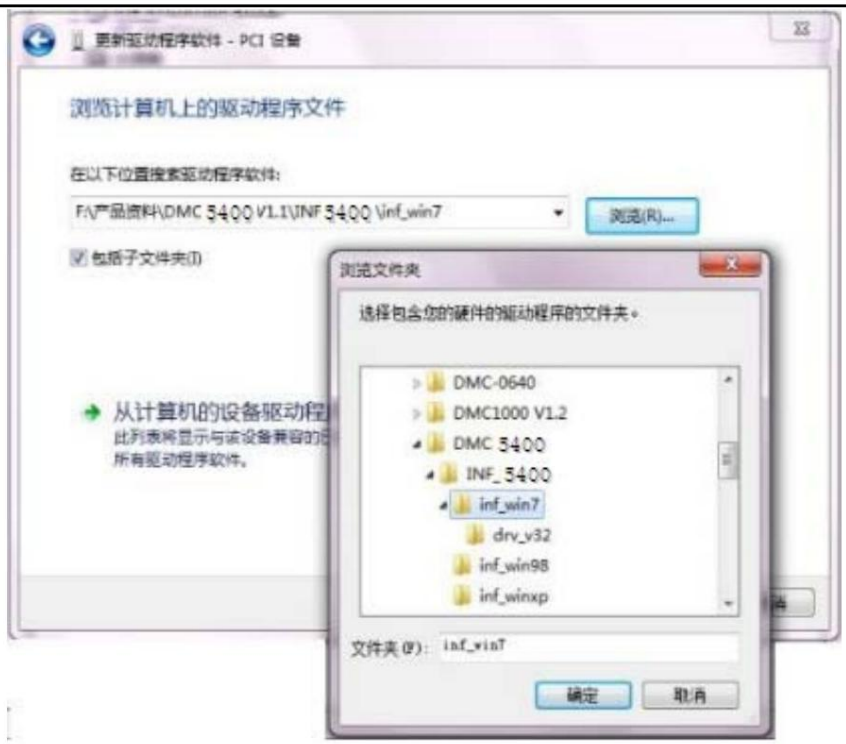
Figure 5-11 Find driver software

6. In the pop-up "Update Driver Software" dialog box as shown in Figure 5-12, click

"Browse", point to the directory where "inf_Win7" is located, click "OK" and click "Next"

one step" to continue the installation;

Machine Translated by Google



7. If the system pops up a security prompt dialog box as shown in Figure 5-13, please select "Always install

This driver software (I)", and continue the installation;

Figure 5-13 Windows Security Tips

8. After the installation is complete, the interface is displayed as shown in Figure 5-14, click “Close”;

Machine Translated by Google

9. Open the device manager, as shown in the figure 5-15, under the "Jungo" option you can see DMC5400 driver "DMC5400" and related registration information "WinDriver", to Therefore, the DMC5400 control card can to normal use. (Note: only if these two options are all correctly installed and functioningAfter the DMC5400 card can be used normally);

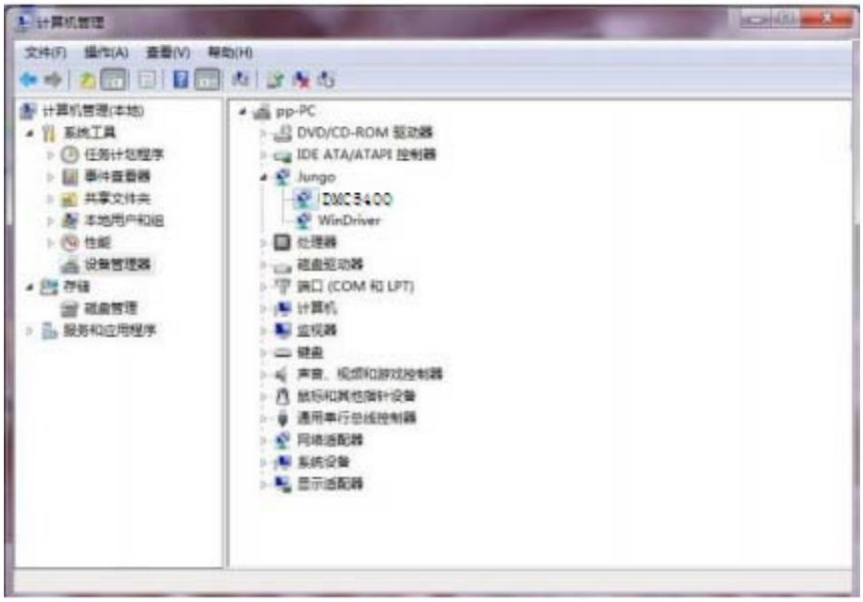


Figure 5-15 Device information after the driver is installed correctly

Machine Translated by Google

6 Demonstration software and applications

Motion5000 is a DMC5400 motion function and related functions developed by Lexair to facilitate users to familiarize themselves with the motion functions and related functions of DMC5400.

A test software developed. Using this software, users can quickly become familiar with the DMC5400 motion control

The software and hardware functions of the business card, and can easily and quickly test the performance characteristics of the motor drive system when performing various movements.

point.

After you install the DMC5400 motion control card and Motion5000 on the PC, start the computer,

You can find the startup program of Motion5000 in the Windows "Start" -> "Programs" menu, and run

the software. Motion5000 software provides motion test operation, IO signal detection operation, board signal setting operation.

There are four main Chinese operation interfaces for operation and programming operation. Depending on the interface's information, you can do some basic

Control operations: such as simple point movement, IO signal detection, etc.

For some basic motion control functions of the DMC5400 card and the description of hardware wiring, please read carefully

DMC5400 hardware section chapter.

After starting the Motion5000 software, first enter the motion test operation interface as shown in Figure 6-8.

You can choose to enter other interfaces by clicking the button on the menu, such as: I/O signal detection operation, board

Card signal setting operation, programming operation.

6.1 Installation of demo software

Insert the CD-ROM of the DMC5400 into the CD-ROM drive of the computer, double-click MotionInstall.exe, and the DMC5400 will

automatically install to the destination of your choice Record, the process is as follows:

1. After running MotionInstall.exe, the system displays the installation process, as shown in Figure 6-1;

Figure 6-1 Start to install Motion 5000

2. In the pop-up Motion5000 Setup dialog box, click the Next button, in the next License

In the Agreement dialog box, click the Yes button to continue the installation, otherwise give up the installation, as shown in Figure 6-2;

Machine Translated by Google

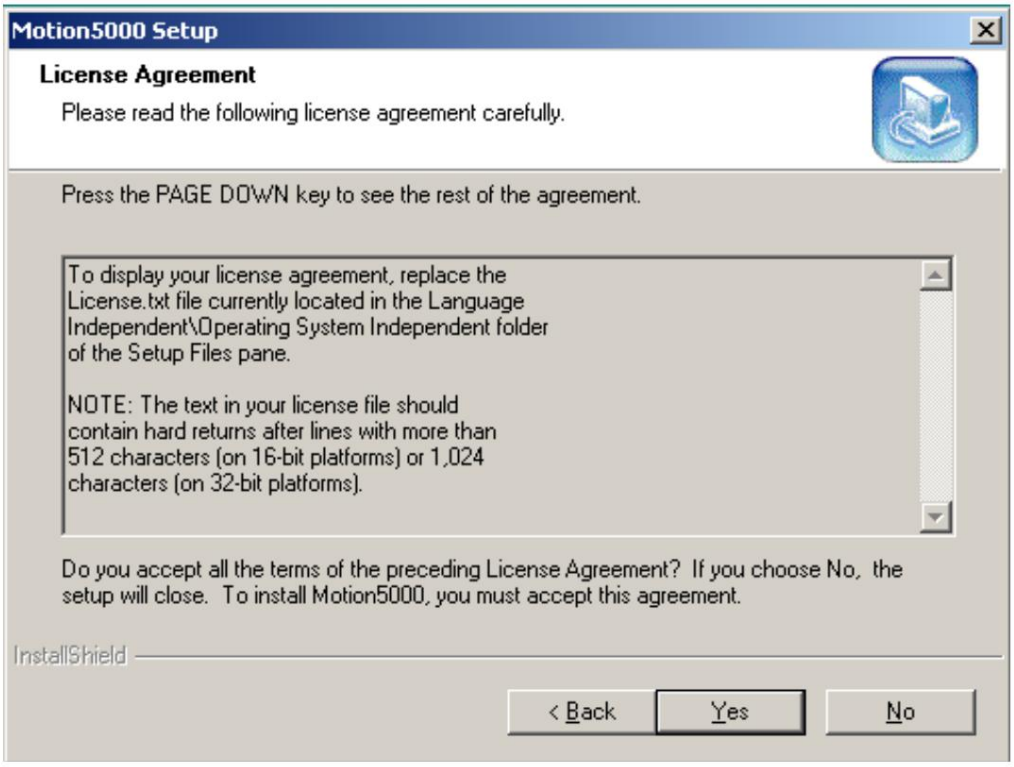


Figure 6-2 License Agreement dialog box

3. Click the Next button on the pop-up Motion5000 Setup "Information" dialog box, and then

In the following dialog box, fill in User Name, Serial Name and click Next

button , as shown in Figure 6-3;

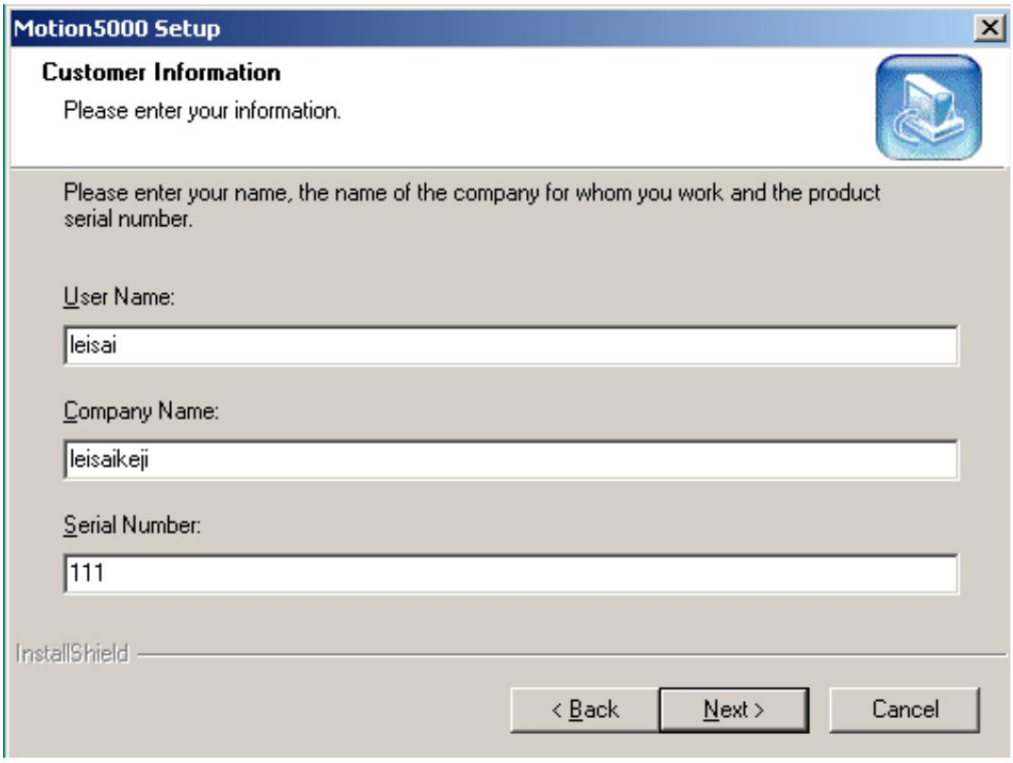


Figure 6-3 Fill in relevant information

Machine Translated by Google

4. The system will display the interface for selecting the installation path shown in Figure 6-4. Generally speaking, the user presses the default path.

installation, and then click the Next button;

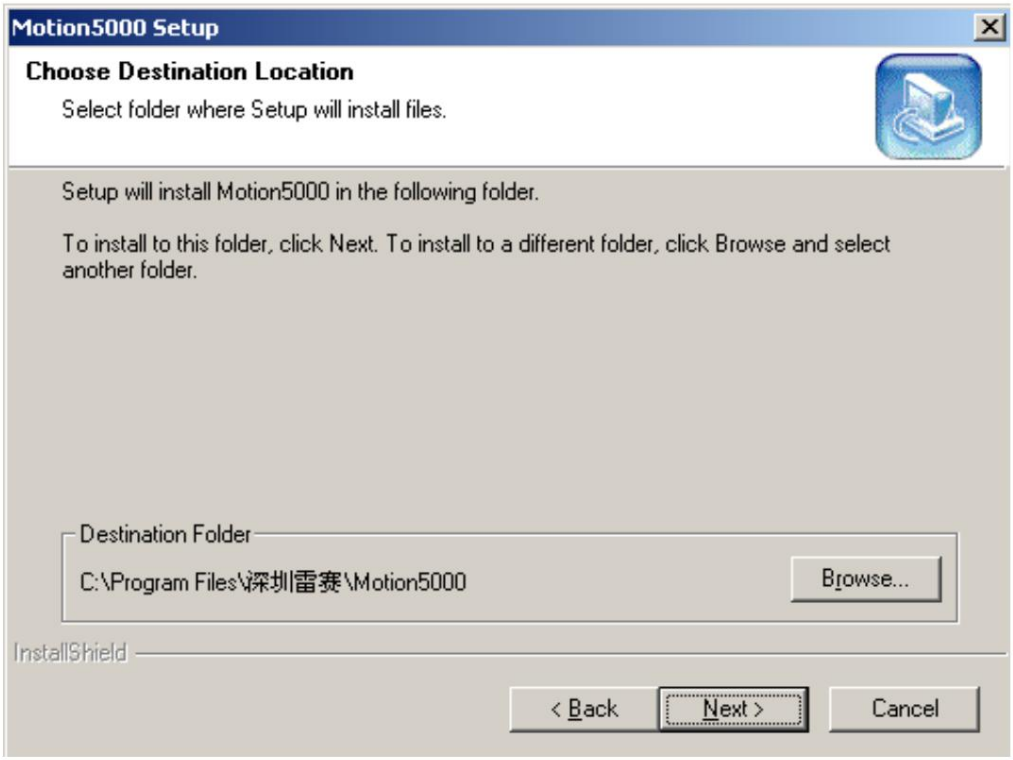


Figure 6-4 Selecting the installation path

5. Select the type of installation, and then click the Next button, as shown in Figure 6-5;

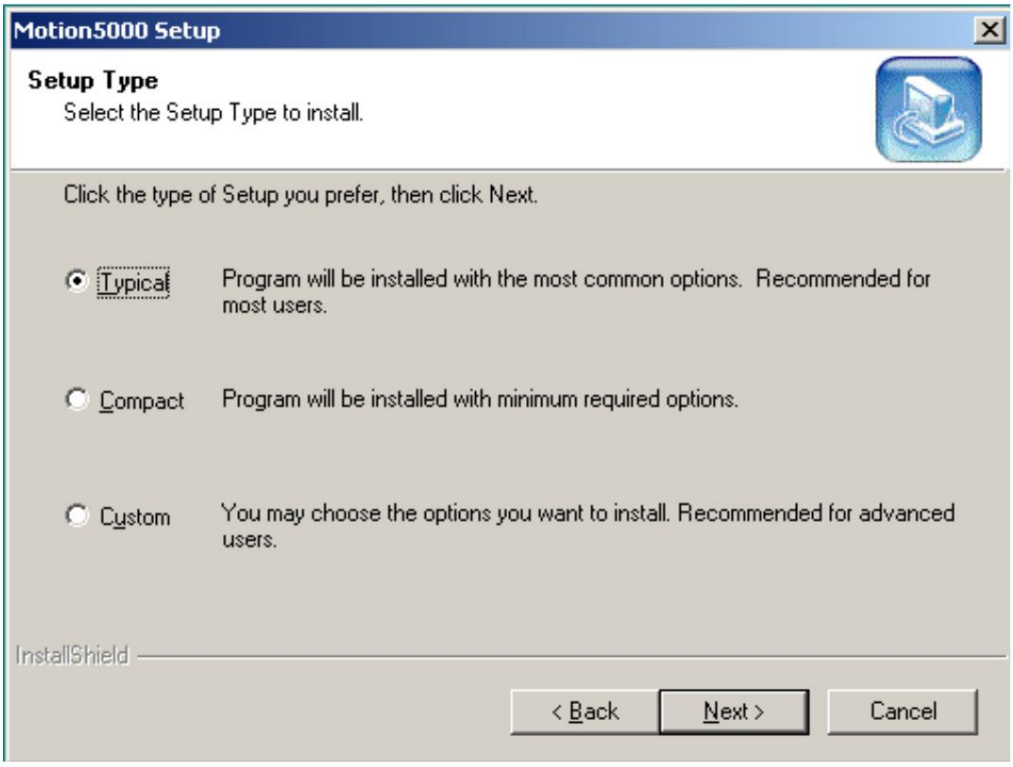


Figure 6-5 Select the installation method

Machine Translated by Google

6. After filling in the name of the new installation folder, click the Next button, and then follow the prompts to continue the installation, as shown in the figure 6-6;

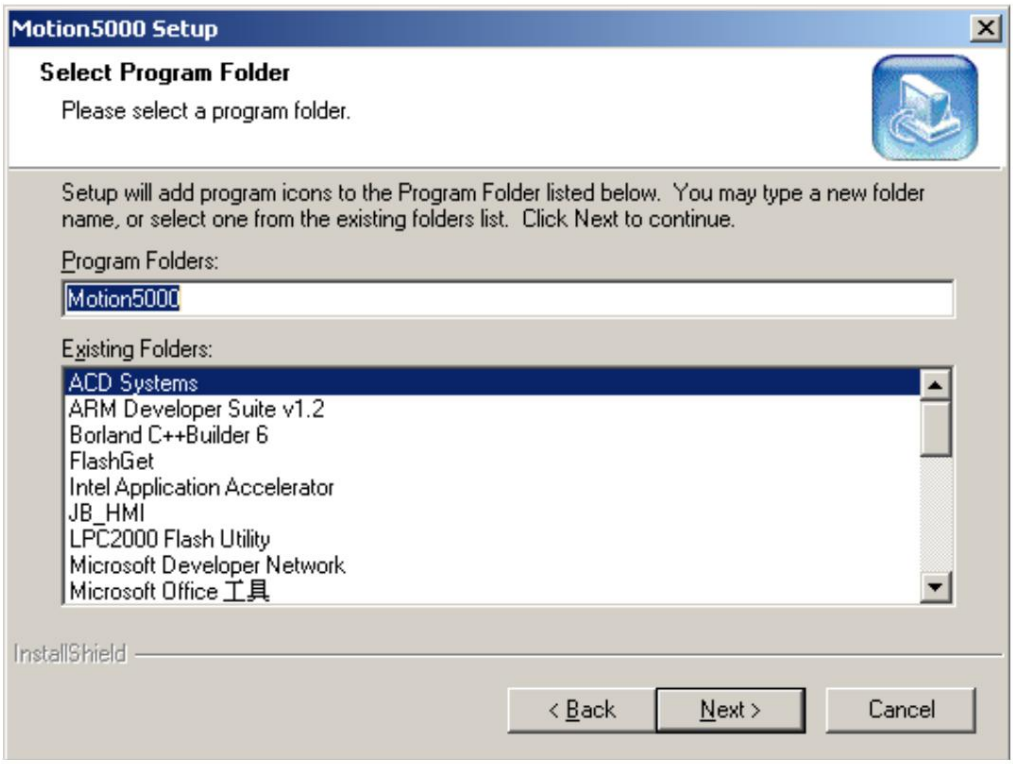


Figure 6-6 Select the installation folder

7. After the installation is complete, the system will pop up the prompt shown in Figure 6-7, indicating that the installation process has been completed;

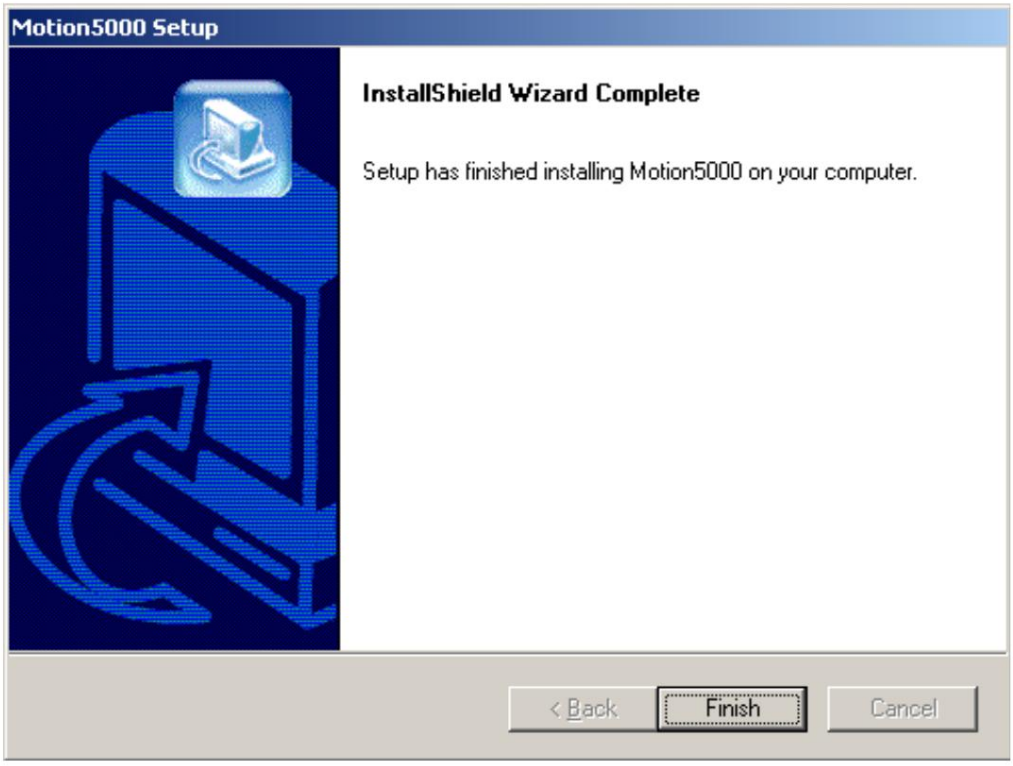


Figure 6-7 Installation completed

Machine Translated by Google

8. After the installation is complete, open the installation directory to find the files listed below: DMC5400.lib, 5400.h, DMC5400.bas, Motion5000.exe, etc.

6.2 Parameter setting demonstration

On the exercise test operation interface, the user must first select the appropriate card number, and then operate the corresponding axis motion. For the single-motion-card, the card number is 0. Next, select the axis number and movement distance (unit: pulse), low speed (initial speed), and maximum speed (running speed).), acceleration time (total acceleration time), S-curve segment distance (single pulse) and other parameters; Bit:

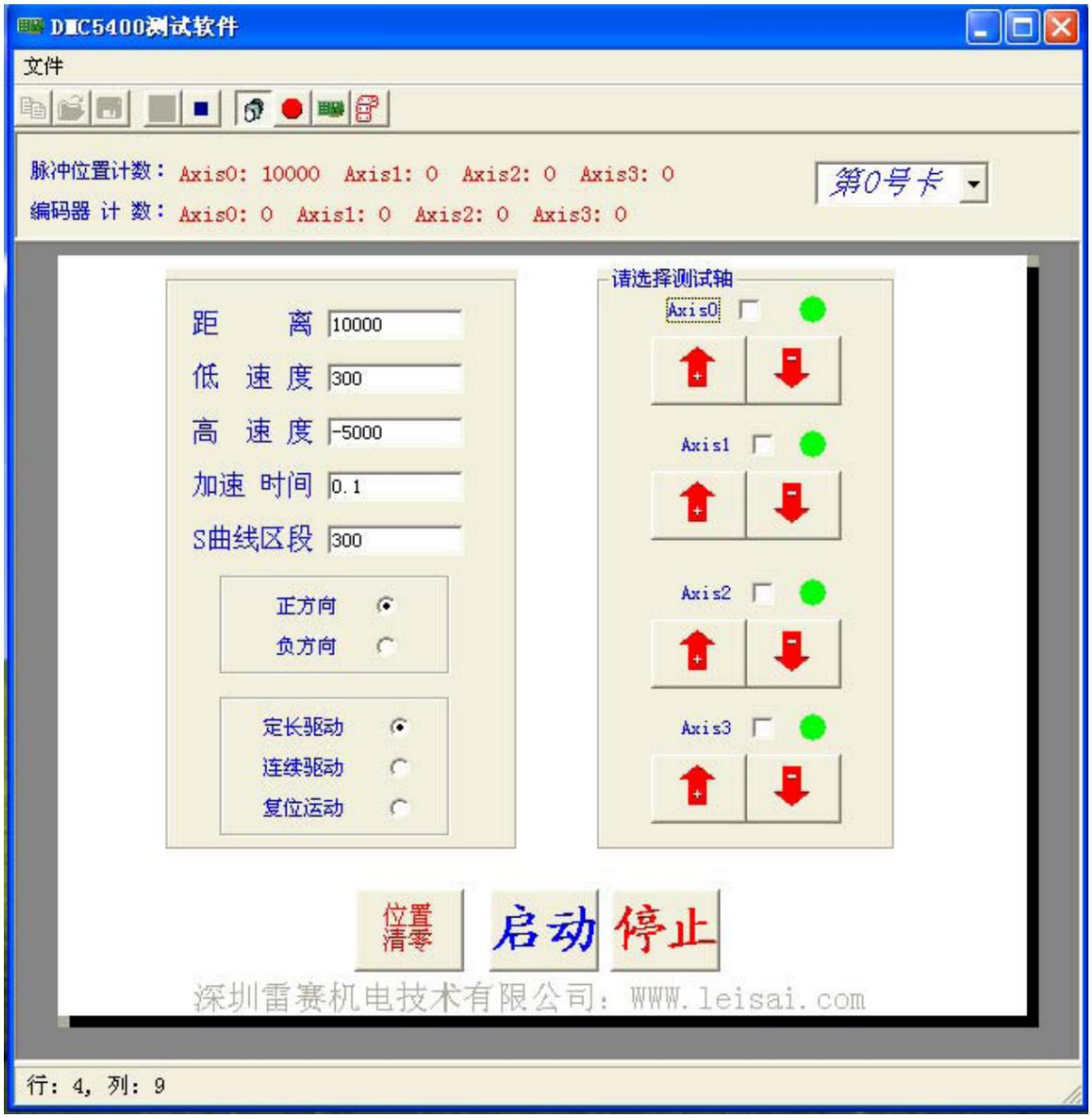


Figure 6-8 Operation axis motion interface

The direction of the motion axis can be set by selecting "positive direction" and "negative direction" through the following single items; press the up and down arrows on the left to make the motor move in the corresponding direction, release the arrow, the motor stops moving;

Machine Translated by Google

Click the "Start" button to make the motor move according to the parameters set by the customer. Click the "Stop" button, the motor in motion will stop immediately; click the "Position Clear" button, the "Pulse Position Count" and "Encoder Count" above all return to zero.

6.3 I/O Signal Detection Operation

The I/O signal detection operation interface is used to observe the real-time status of each dedicated I/O. Each indicator light corresponds to the status of an I/O signal, green means ON, red means OFF; you can also set each general output port through the button Level.

The I/O signal detection operation interface is shown in Figure 6-9:

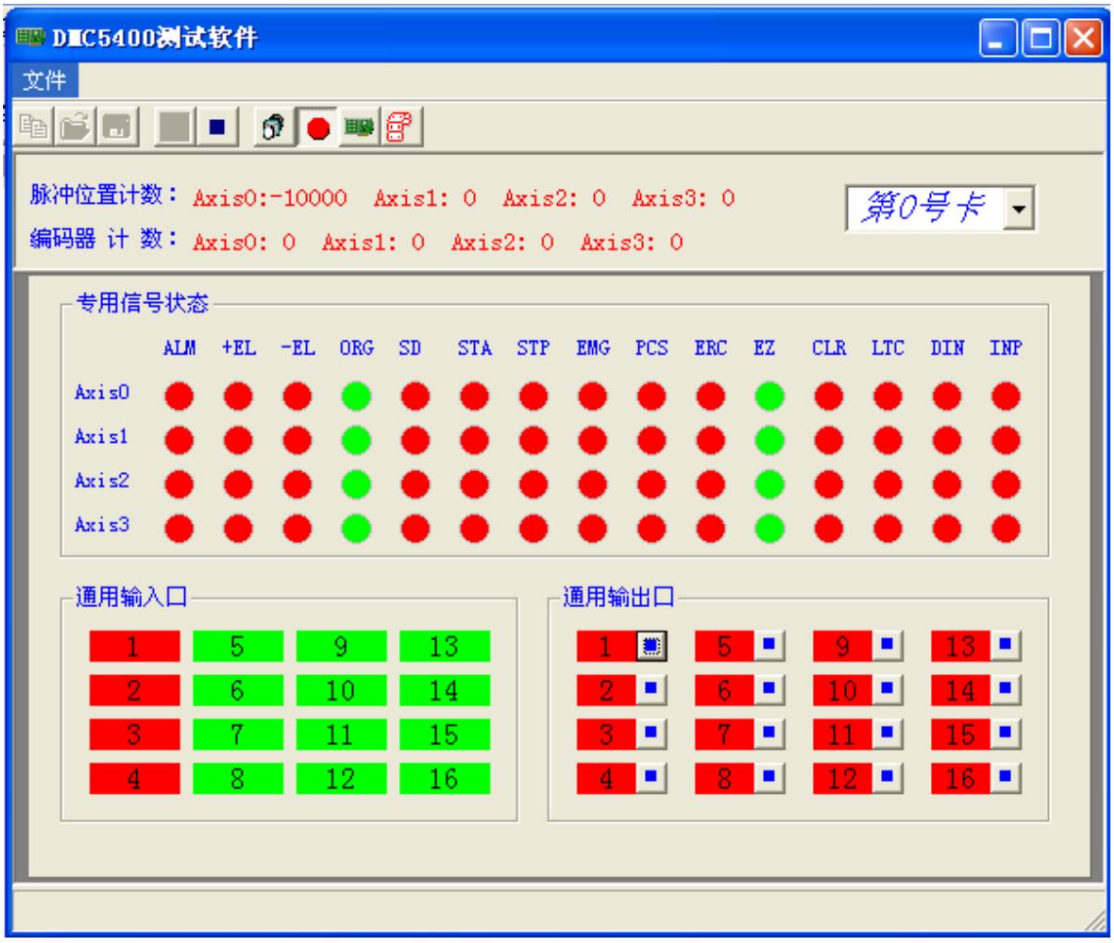


Figure 6-9 I/O detection interface

When the parameter interface window is opened, the program will automatically load the current control card parameters.

setting 6.4 Motion control card parameter

The parameter setting of the motion control board consists of four interfaces, namely pulse parameter setting, servo setting, origin setting and limit setting.

Machine Translated by Google

6.4.1 Pulse parameter setting

Pulse parameter settings include: pulse output type setting, pulse effective level setting and direction control logic level setting, as shown in Figure 6-10.

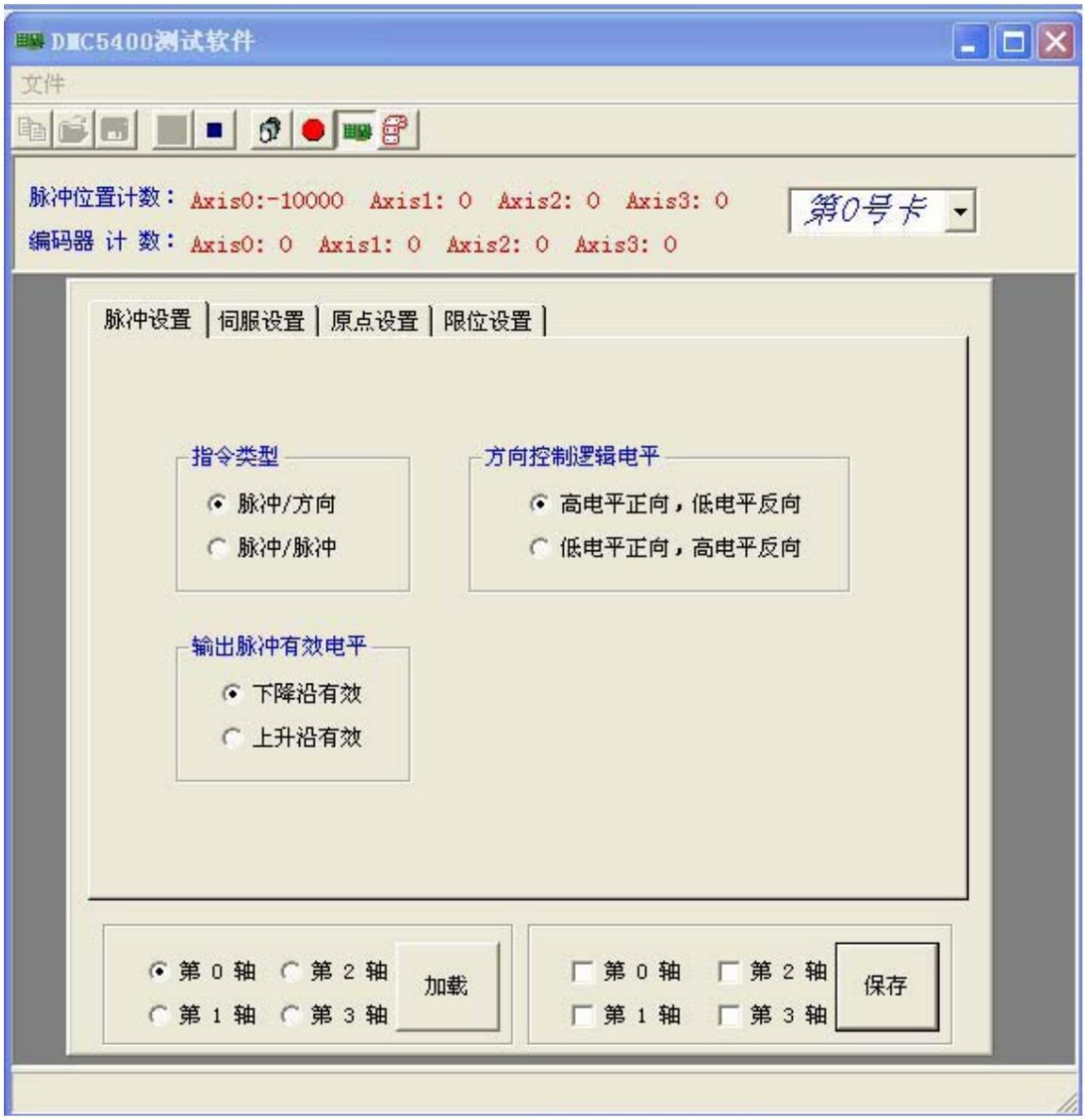


Figure 6-10 Pulse signal setting sub-interface

Command pulse type: that is, the pulse output type, the user can set it as positive pulse/negative pulse mode (CW/CCW mode) or pulse/direction mode (pulse/dir mode). This parameter depends on the type of pulses received by the motor driver used. Pulse output valid level: when the falling edge is selected to be valid, the pulse signal is high level when the pulse stops; when the rising edge is selected to be valid, the pulse signal is low level when the pulse is stopped. Direction control logic level: The user can set a certain level state to change the direction of the motor. Setting this parameter can change the direction of the motor to move forward or reverse without changing the motor wiring.

Press the "Load" button, the current settings are saved to the sports card;

Machine Translated by Google

Press the "Save" key, the current settings are saved in the DMC5400 test software.

6.4.2 Servo motor parameter setting

The servo motor parameter setting interface is shown in Figure 6-11. How the INP and ALM signals work

You can also set the encoder return pulse count mode.

Press the "Load" button, the current settings are saved to the sports card;

Press the "Save" key, the current settings are saved in the DMC5400 test software.

Figure 6-11 Servo setting sub-interface

6.4.3 Origin parameter setting

Origin parameter settings include: origin signal valid level, return-to-origin speed mode and return-to-origin operation mode,

As shown in Figure 6-12.

Machine Translated by Google

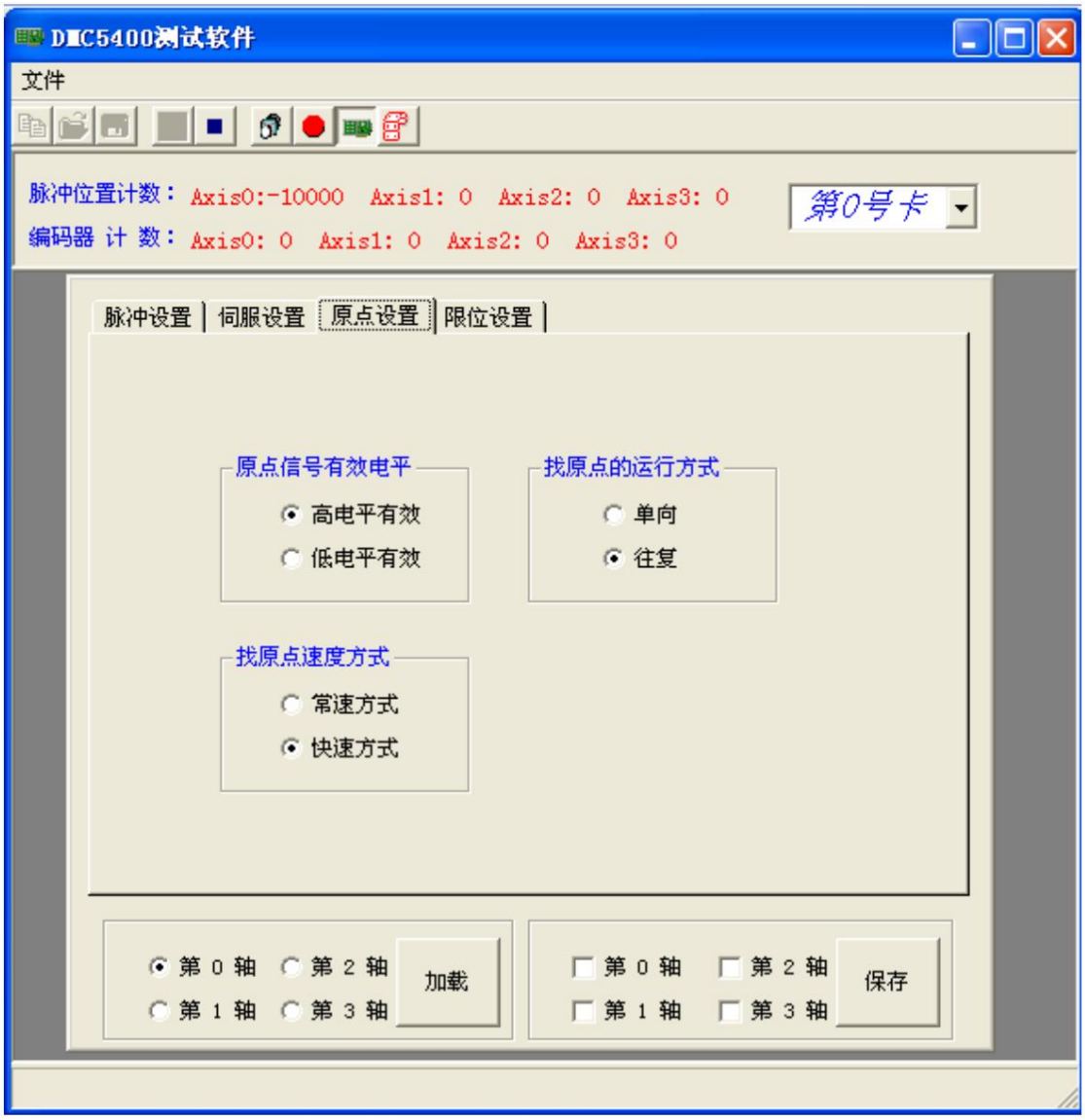


Figure 6-12 Origin setting sub-interface

Origin signal effective level: Set its effective level according to the actual circuit of the origin sensor.

Return-to-origin speed mode: divided into two modes: normal speed mode and fast mode.

Back-to-origin operation mode: there are two modes: one-way and reciprocating. One-way mode is to return from a default direction Origin, stop immediately after finding the origin; reciprocating mode is to return to the origin from a default direction, and stop after finding the origin Stop, and then return to a certain distance at a slow speed, and then return to the origin signal again, and then stop.

Press the "Load" button, the current settings are saved to the sports card;

Press the "Save" key, the current settings are saved in the DMC5400 test software.

6.4.4 Limits Bit parameter setting

Limit parameter settings include: hardware braking mode, software limit braking and position comparison selection settings, as shown in the figure 6-13.

Hardware limit braking mode: you can set whether to stop immediately or decelerate after the external limit switch is triggered

Machine Translated by Google

stop.

Software limit braking: The software limit value of positive and negative directions can be set by software. Soft Limits and Limit Sensing

It has nothing to do with the controller, and is valid after returning to the origin.

Position comparison selection: select whether the position signal adopts the command pulse position signal or the encoder detection.

Measured position signal.

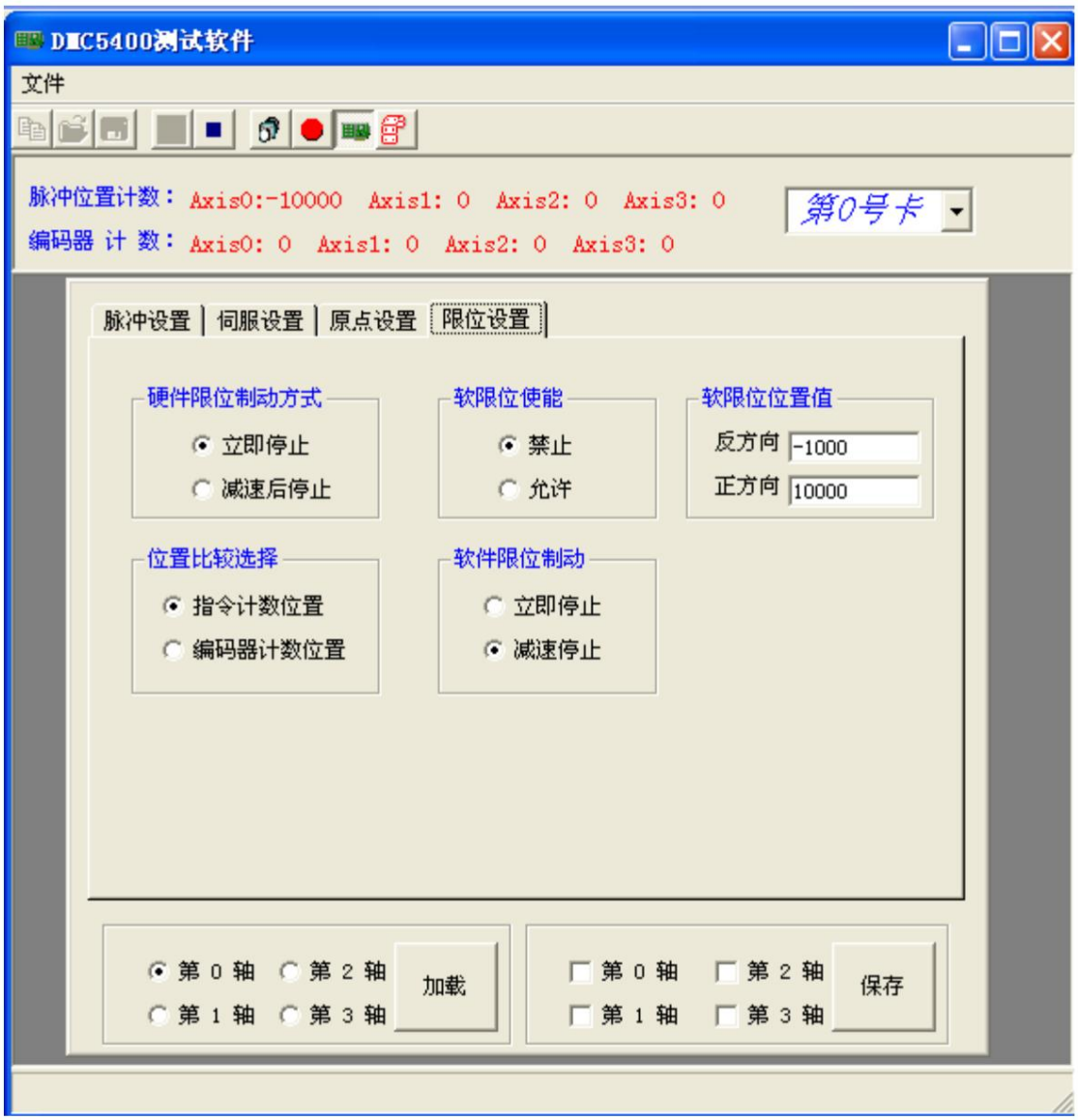


Figure 6-13 Limit setting sub-interface

6.5 programming operation

The programming operation interface shown in Figure 6-14 can be used to call and execute motion control functions.

convenient.

Machine Translated by Google

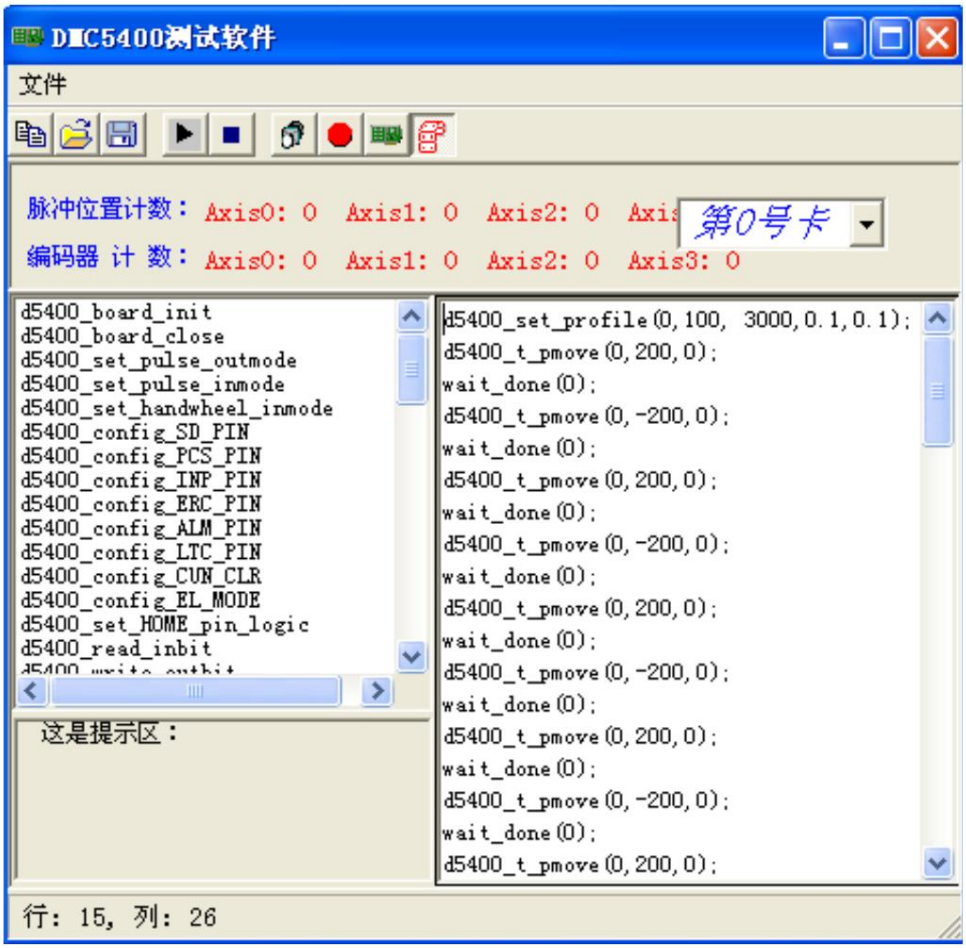


Figure 6-14 Programming interface

Through the shortcut keys, the following functions can be realized respectively:

(1) Create a test instance;

(2) Open a test instance;

(3) Save the existing test instance;

(4) Start the test;

(5) Stop the test.

There are three ways to call the Motion control function:

one. The user can directly input the function name and parameters in the program editing box on the right;

two. Click the function in the function list box on the left, drag and drop it into the program edit box, and then fill in the relevant parameters.

number.

three. Open an existing test instance.

motion controlThe parameters of the control function have prompt information below the dialog box, and the user fills in the parameters according to the prompt information.

Machine Translated by Google

7 User system development

If you have no knowledge of programming languages such as C, C++, Visual Basic, etc., we recommend that you first Take a few days to read at least one training material in the language and learn the basic skills of the language through practice Skills, such as how to write simple programs, how to create forms and call functions. If you have used C, C++, Visual Basic and other programming languages have developed motion control software and have rich experience, so you can To browse the functions in the index and find the desired function description page, go to "Motion functions in the appendix" "Library" for the required function information.

Leadtech DMC5400 motion control card user control software can be used in Visual Bisic and Develop in a development environment such as Visual C++.

7.1 Application software structure based on windows platform

Figure 7-1 shows the structure of the machine control system using the Leitai control card:

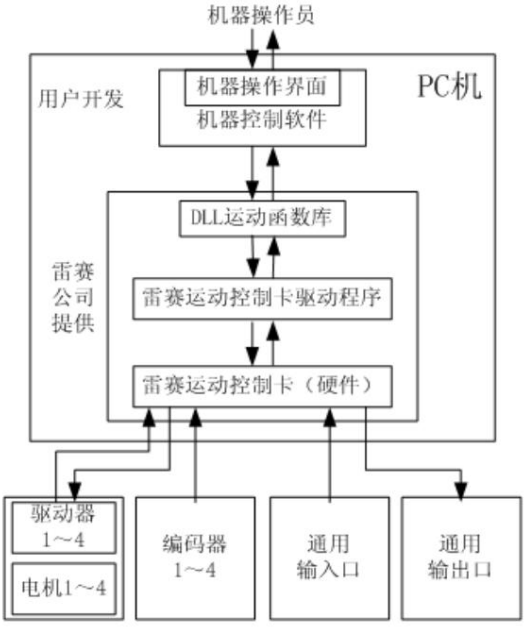


Figure 7-1 Architecture of machine control system based on Leitai control card

As can be seen from the above schematic diagram, the working principle of the control system can be simply described as:

1. The operator's operation information is transmitted to the machine control software through the operation interface (including the display screen and keyboard). piece;

2. The machine control software converts the operation information into motion parameters and calls D according to these parameters Shipping in LL library 3. The motion function calls the Leitai motion control card driver to send control commands to the control card; 4. Leitai motion The control card then sends out the corresponding drive signal (such as pulse, direction signal) according to the control command to drive Actuator and motor, read encoder data, read and write general input and output ports. The user's experience in developing application software (ie machine control software) All you need to do in the process is to

Said steps 1 and 2 for programming. Lacey has provided hardware drivers and DLL motion function libraries that support DMC5400 motion [illegible] programming languages to call these functions to quickly develop their own application software without knowing more about the details of the hardware circuit and the calculation details of motion and interpolation.

A typical flow of user-written machine control software is shown in Figure 7-2:

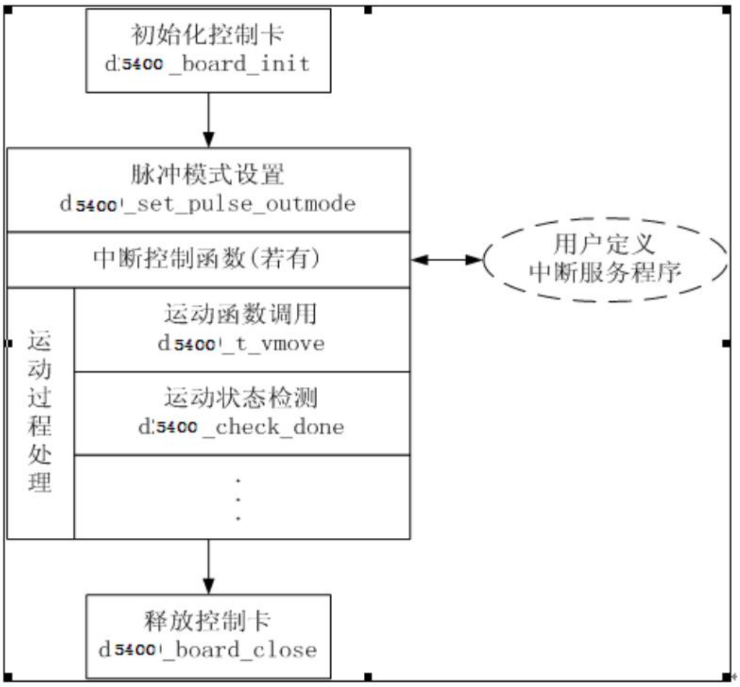


Figure 7-2 Typical flow of control software

7.2 Programming in Visual Basic

7.2.1 Introduction to software development under the Visual Basic environment

Please make sure the DMC5400 motion control card has been inserted into the slot of your computer, install the driver, Motion5000 test software and VB, before calling the DMC5400 motion function, you need to do the following work: 1. Start the Motion5000 test software and perform a simple test of the required functions, such as: single-axis fixed length

Motion to confirm that the DMC5400 motion control platform has been working normally; 2. Create your own working directory, such as: d:\vb\Motion (This directory name can be specified by yourself); 3. Copy the DMC5400.bas file to this directory (this file can be found in the Motion5000 installation directory); 3. 5. Run VB, and create a project, then save the project in the directory; Link the motion function library to your project: a. Select "Add Module" in the "Project (P)" menu of the VB compiler;

Machine Translated by Google

b. Select "Existing";

c. Select "DMC5400.bas";

d. Select OK.

When you link the motion function to your project, you can call other API functions directly

Then call the motion function, the specific function of each function, please refer to 8.2.2 function description, of course, you can also open

The module file DMC5400.bas understands the specific definition of each function.

In the programming process, you can refer to the motion function programming examples we provide: we provide VB

The programming example source code is stored in the Samples directory of the CD. As long as you install the control card and its driver software

Installed, and installed the VB compiler, you can directly run these source codes.

7.2.2 Programming example in Visual Basic environment

Programming in Visual Basic6.0 environment, take fixed-length motion as an example:

(1) Create a new directory on the disk, such as E:\test1 (2)

Open Visual Basic 6.0, Create a new "label E" XE" project, add a button on the dialog

button" Start" (name changed to CB_Start) and “Stop” (name changed to CB_Stop), as shown in Figure 7-3

shown:

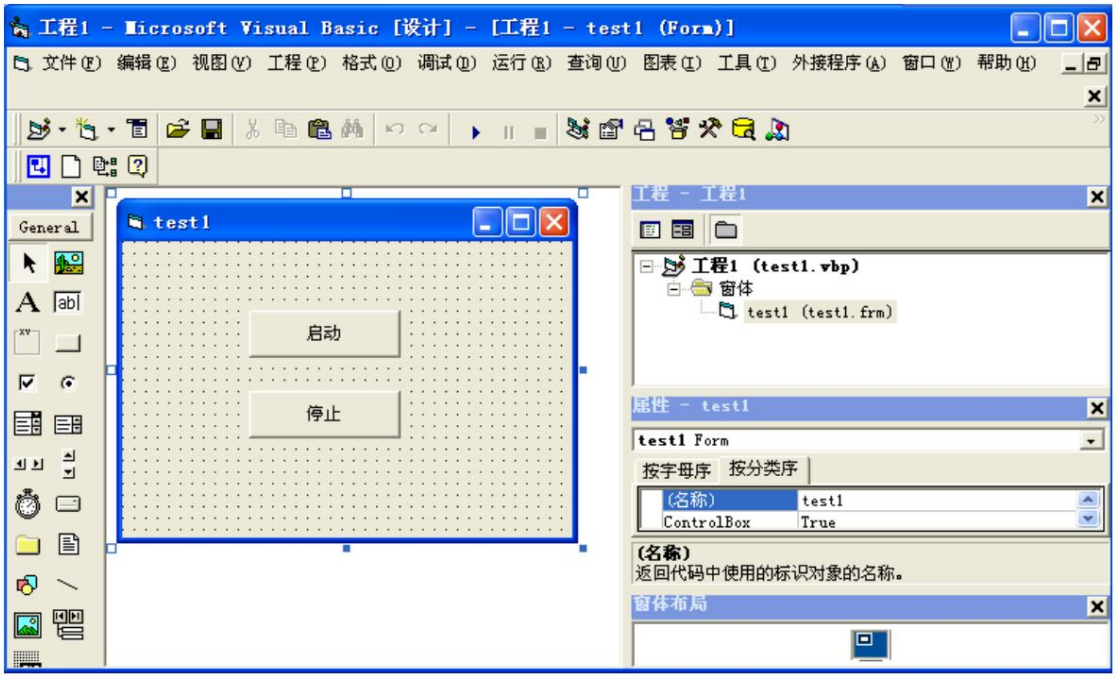


Figure 7-3 Modify dialog (VB)

(3) The project is saved in the E:\test1 directory;

(4) Find the DMC5400.bas file in the corresponding directory of the data CD and copy it to the test1 directory;

(5) Select "Project" -> "Add Module" -> "Existing", find the test1 directory

The DMC5400.bas file is added to the project, as shown in Figure 7-4:

Machine Translated by Google

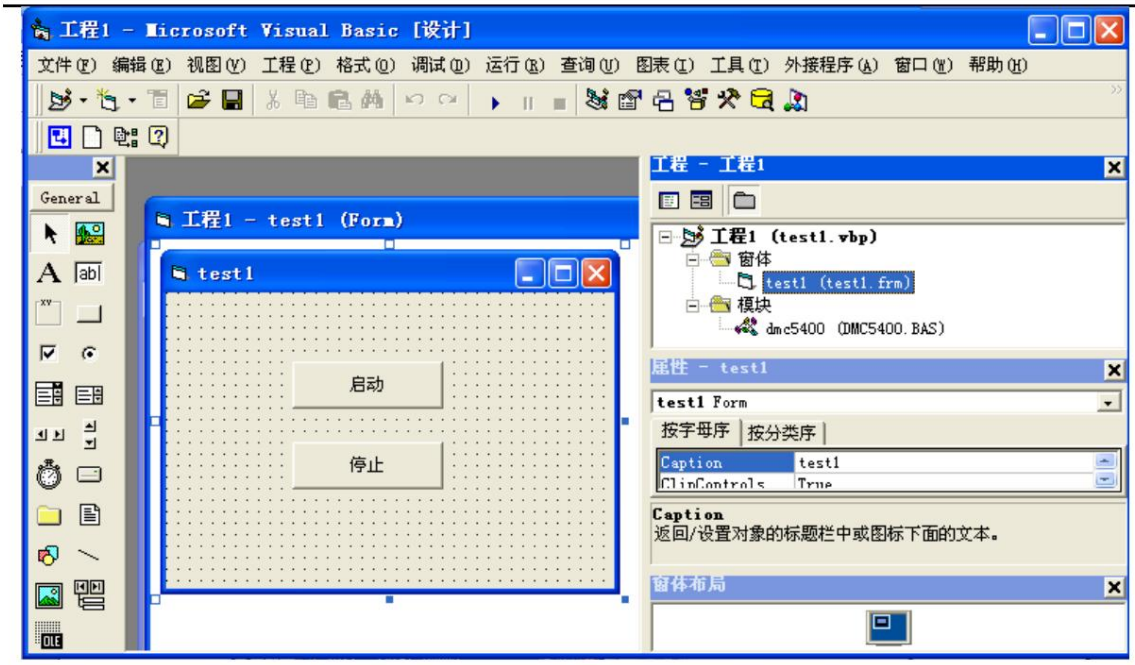


Figure 7-4 Adding header files

(6) As shown in Figure 7-5, double-click the window control and add code in the Form_Load event d5400_board_init selects the UnLoad event, in Add code to the Form_Unload event d540 0_board_close Double-click the "Start" button, add code in the CB_Start_Click event

d5400_set_profile 0,500,5000, 0.01,0.01

d5400 _t_pmove 0,200000,0

Double-click the "Stop" button and add code in the CB_Stop_Click() event

d5400_decel_stop 0, 0.01

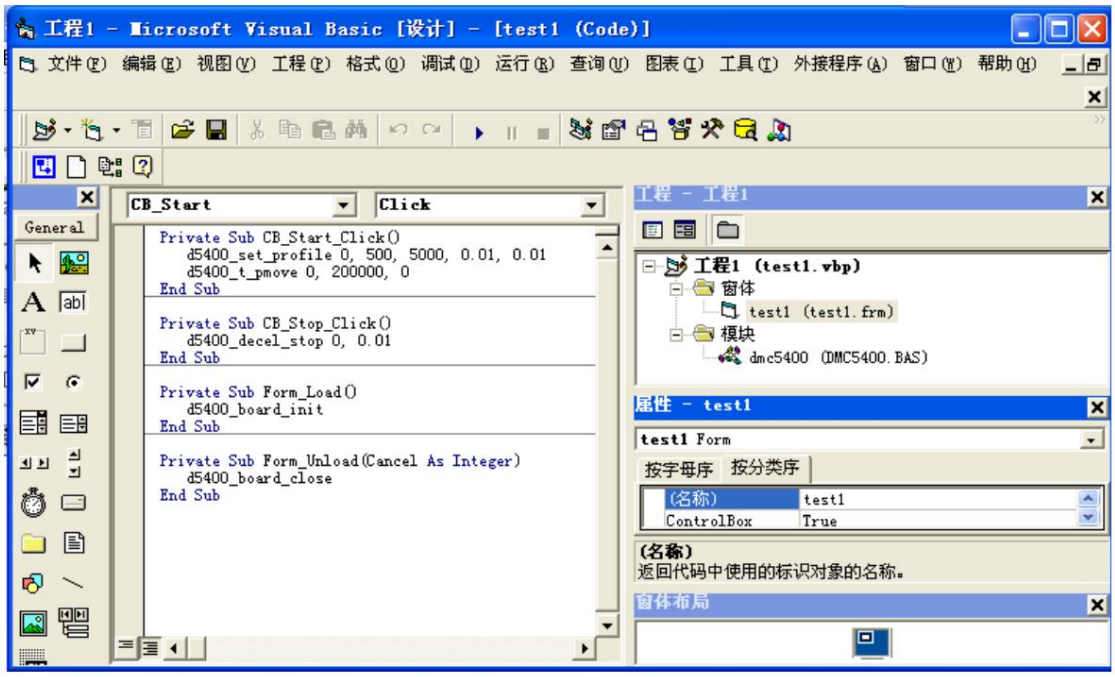


Figure 7-5 Call motion control card library function (VB) in the program

Machine Translated by Google

(7) Run, press the "Start" button, the 0th axis will output a pulse with a length of 20000, and the movement

You can press the "Stop" button to decelerate and stop the pulse output, as shown in Figure 7-6:

Figure 7-6 Program running interface (VB)

7.3 Programming in Visual C++

7.3.1 Introduction to Software Development in Visual C++ Environment

Please make sure that the DMC5400 motion control card has been inserted into the slot of your computer, install the driver, Motion5000 test software and VC. Before calling the DMC5400 motion function, you need to do the following tasks: 1. Start the Motion5000 test software, and perform all Simple tests of functions are required, such as: single-axis fixed-length motion to confirm that the DMC5400 motion control platform is working normally; 2. Run VC, and create a project, name the project files to this directory (this file is in the Motion5000 directory); 4. Link the motion function to your project and add DMC5400.h DMC5400.lib 5. Add the #include “DMC5400.h” statement to the header code of the file calling the motion function. After you link the motion function to your project, you can call the motion function just like other API functions. For the specific function of each function, please refer to 8.2.2 Function Description , of course, you can also open the header file DMC5400 .h for the specific definition of each function.

In the programming process, you can refer to the motion function programming example we provide: we provide the VC programming example source code, which is stored in the Samples directory of the CD. As long as you install the control card and its driver software, and install the VC compiler, you can run these source codes directly.

7.3.2 Programming example in Visual C++ environment

(1) Open Visual C++ 6.0;

Machine Translated by Google

(2) Create a new project;

(3) Select MFC APPWizard(exe);

(4) Select the project save path, such as: E:\;

(5) Enter the project name, such as: test1. As shown in Figure 7-7:

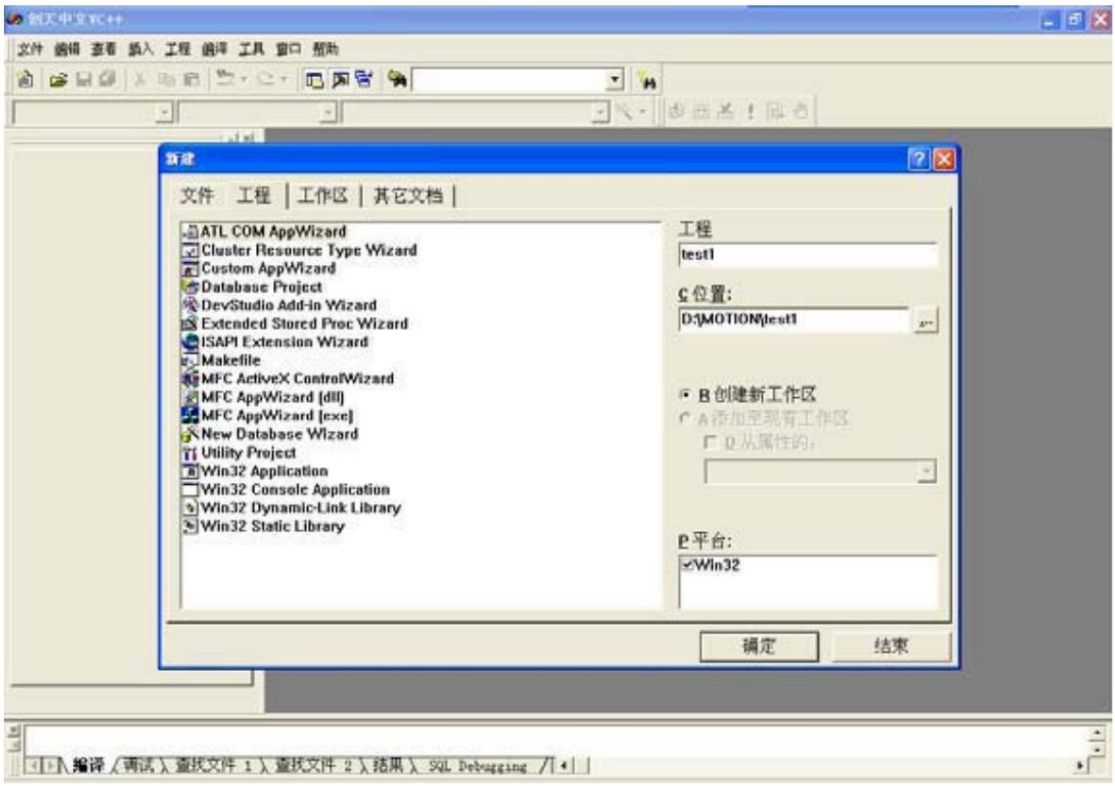


Figure 7-7 Create a new project

(6) Select "Dialog-based" in the application type, and press the "Finish" button to create the project;

(7) Simple for the dialog box modification, adding a button "Start" (named IDC_BUTTON_Start) and Stop (named IDC_BUTTON_Stop), as shown in Figure 7-8:

Machine Translated by Google

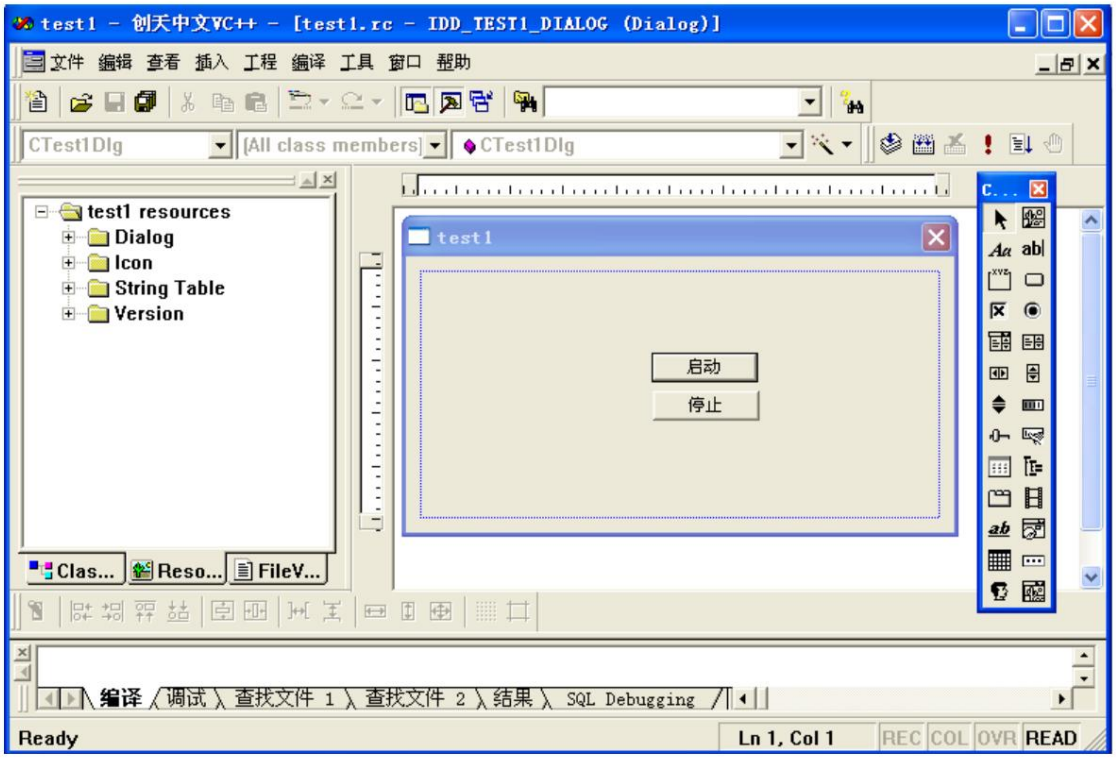


Figure 7-8 Modify dialog

(8) Find the DMC5400.h and DMC5400.lib files in the corresponding directory and copy them to E:\tes1 content;

(9) Select "Project" -> "Add Project" -> "File", select the DMC5400.lib file to add into the project;

(10) Open the test1.cpp file, and add the corresponding statement at the beginning of the program: #include “DMC5400.h”, as shown in Figure 7-9:

Machine Translated by Google

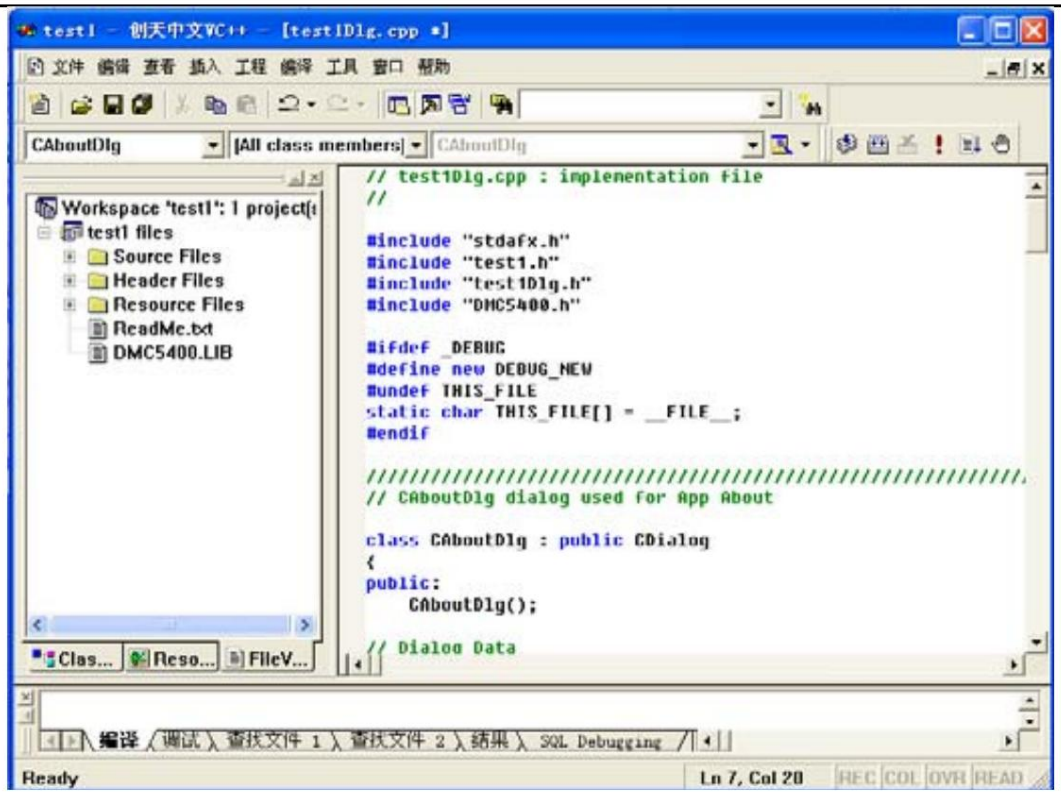


Figure 7-9 Adding header files to the program

(11) Add code in the CTest1Dlg::OnInitDialog() function: d5400_board_init(); as shown in the figure 7-10ÿ

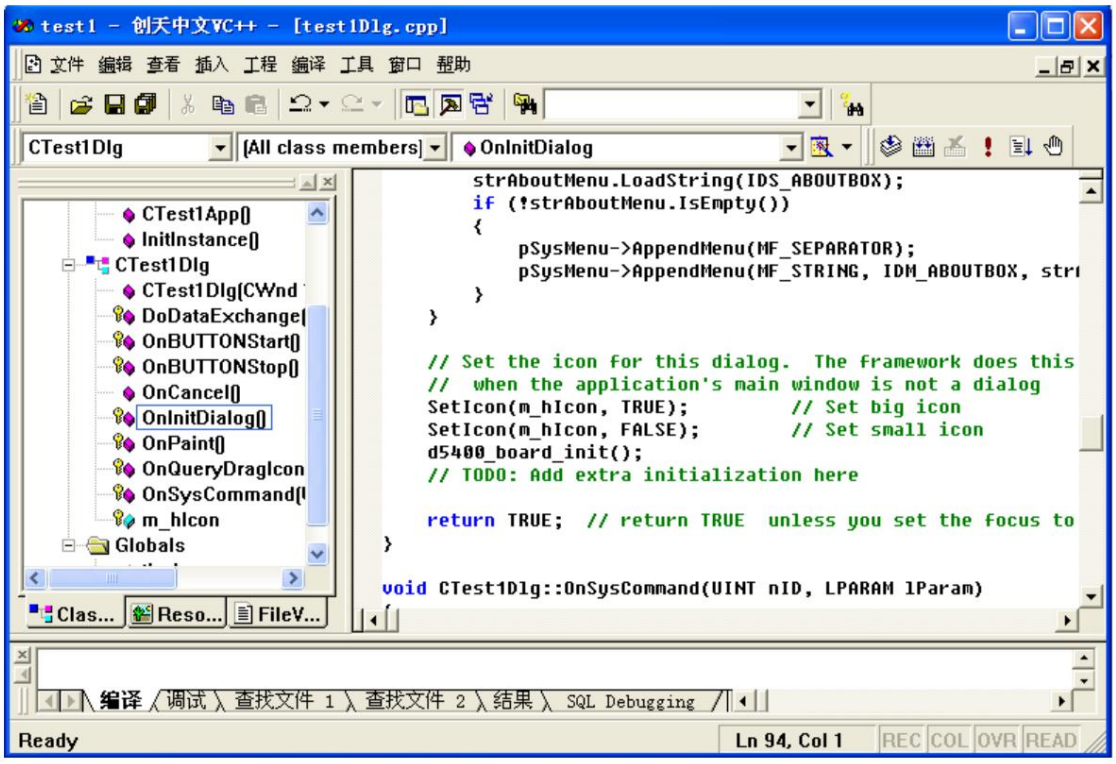


Figure 7-10 Add initialization function to the program

(12) Add a member function OnCancel to Ctest1Dlg, and add a code to the OnCancel function

Machine Translated by Google

code:

D5400_board_close();

CDialog::OnCancel(); As shown

in Figure 7-11:

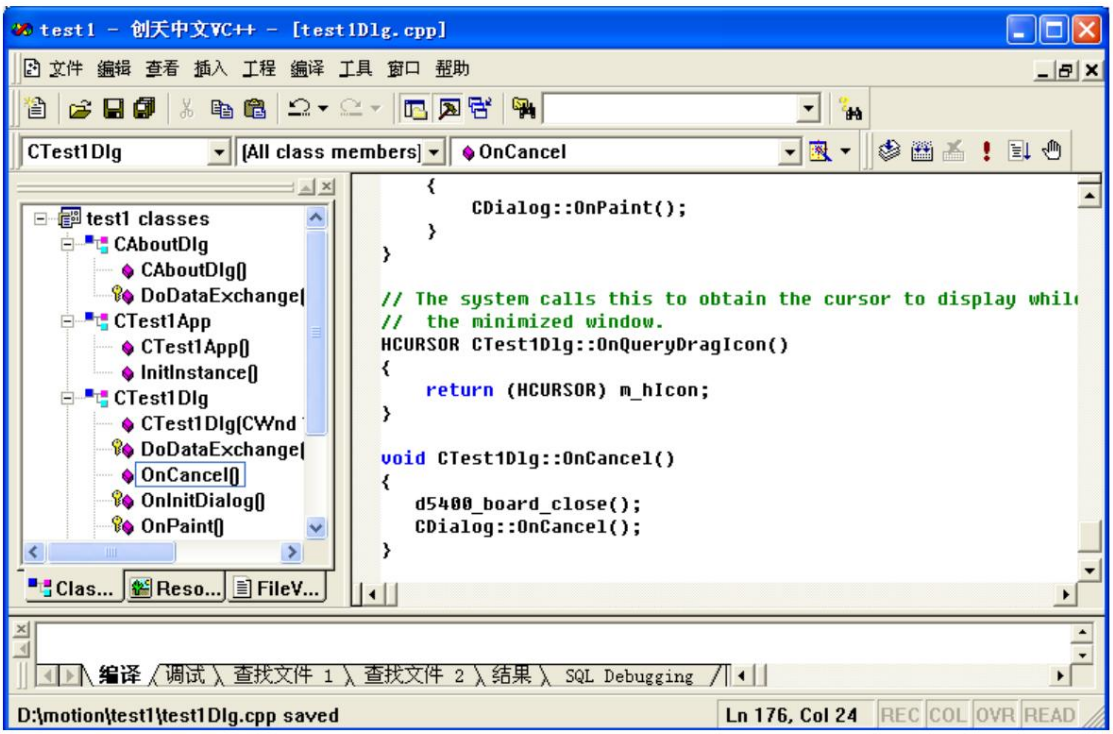


Figure 7-11 Add OnCancel function to the program

(13) Double-click the "Start" button to enter the code in the button click event:

d5400_set_profile(0,500,5000, 0.01,0.01);

d5400_t_pmove(0,200000,0); Double click the "Stop" button

and enter the code in the button click event:

d5400_decel_stop(0,0.01); As shown

in Figure 7-12:

Machine Translated by Google

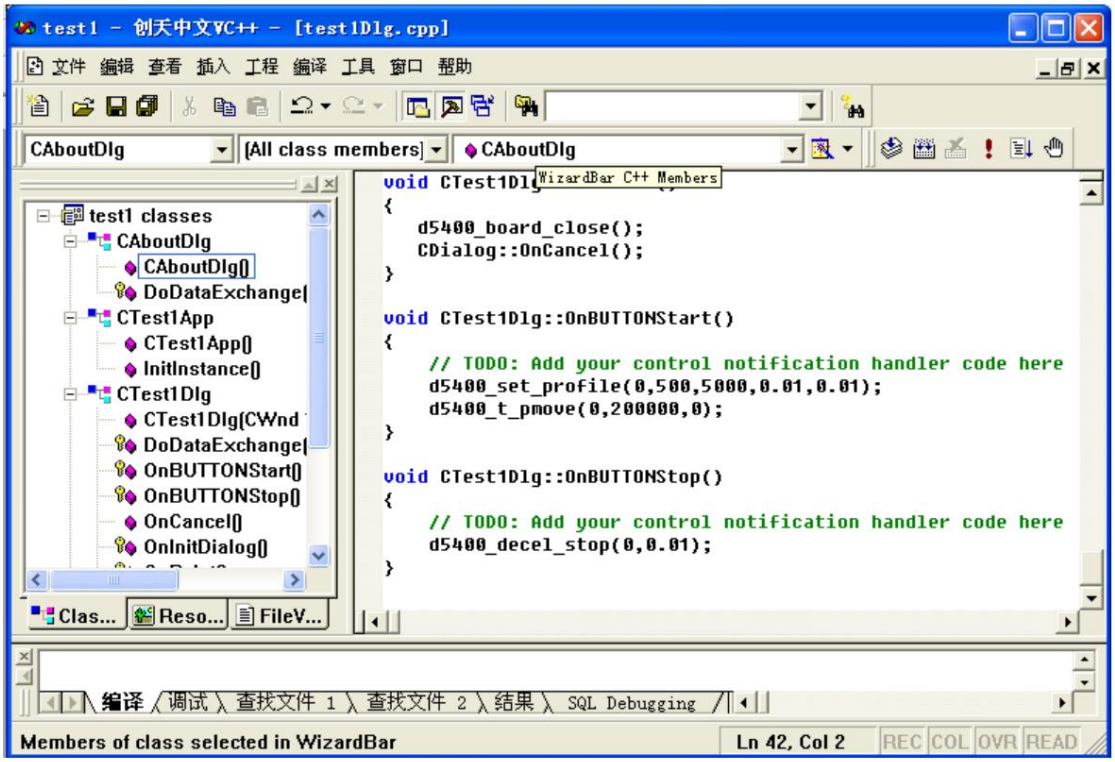


Figure 7-12 Calling the motion control card library function in the program

(14) Compile, run, press the "Start" button, the 0th axis will output a pulse with a length of 200000

During the movement, you can press the “Stop” button to decelerate and stop the pulse output, as shown in Figure 7-13:

Figure 7-13 Program running interface

Machine Translated by Google

8 Appendix

8.1 Host Connection

8.11 Connector X1 Introduction

As shown in Figure 8-1, the interface X1 is the motor control and signal I/O type II 68-pin socket. include: first axis (full signal X axis) part; second axis (Y axis) signal, except encoder, main signal outside of C2 signal (axis signal; Z axis signal, main signal except encoder, TC-C3E power supply, power supply 8-. ground and the corresponding relationship of its pin signal is shown in

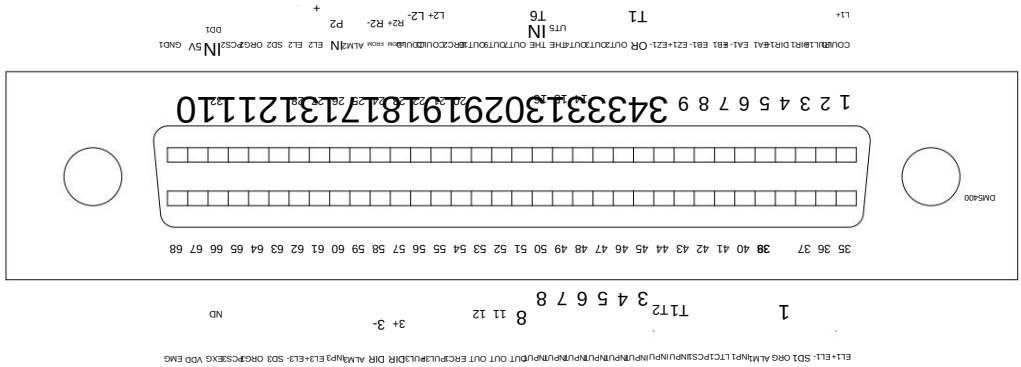


图8-1 接口X1示例

Table Interface 8-1 X1 pin number and signal relationship table

Pin No.	Name	I/O	Features	Pin No.	Name	I/O	Features
1	PUL1+	O	1st axis pulse signal (+)	35	EL1+	I	Positive limit signal of the first axis
2	PUL1-	O	1st axis pulse signal (-)	36	EL1-	I	Negative limit signal of the first axis
3	DIR1 +	O	1st axis direction signal (+)	37	SD1	I*	First axis deceleration signal
4	DIR1-	O	1st axis direction signal (-)	38	ORG1	I	First axis origin signal
5	EA1 +	I	Phase A of the first axis encoder (+)	39	ALM1	I	First axis alarm signal
6	EA1-	I	Phase A of the first axis encoder (-)	40	INP1	I*	1st axis in-position signal
7	EB1 +	I	Phase B of the first axis encoder (+)	41	LTC1	I	First axis latch signal
8	EB1-	I	First axis encoder phase B (-)	42	PCS1	I*	The first axis position change trigger signal
9	EZ1+	I	first axis encoder Z phase (+)	43	INPUT1	I	Universal input signal 1
10	EZ1-	I	First axis encoder Z phase (-)	44	INPUT2	I	Universal input signal 2
11	OUT1	O	General purpose output signal 1	45	INPUT3	I	Universal input signal 3
12	OUT2	O	General purpose output signal 2	46	INPUT4	I	Universal input signal 4
13	OUT3	O	General purpose output signal 3	47	INPUT5	I	Universal input signal 5
14	OUT4	O	General purpose output signal 4	48	INPUT6	I	Universal input signal 6
15	OUT5	O	General purpose output signal 5	49	INPUT7	I	Universal input signal 7
16	OUT6	O	General purpose output signal 6	50	INPUT8	I	Universal input signal 8

Machine Translated by Google

Pin No.	Name I/O		Features	Pin No.	Name I/O		Features
17	OUT7 O General purpose output signal 7			51	OUT8	O General purpose output signal 8	
18	OUT9 O General purpose output signal 9			52	OUT11 O General-purpose output signal 11		
19	OUT10 O General-purpose output signal 10			53	OUT12 O General-purpose output signal 12		
20	ERC2 O Second axis error clear signal 54				ERC1	O 1st axis error clear signal	
21	PUL2+ O 2nd axis pulse signal (+) 55				PUL3+ O 3rd axis pulse signal (+)		
22	PUL2-	O 2nd axis pulse signal (-) 56			PUL3- O 3rd axis pulse signal (-)		
23	DIR2+	O Second axis direction signal (+) 57			DIR3+ O 3rd axis direction signal (+)		
24	DIR2-	O Second axis direction signal (-) 58			DIR3-	O 3rd axis direction signal (-)	
25	ALM2 I Second axis alarm signal 59				ALM3	I 3rd axis alarm signal	
26	INP2	I* Second axis in-position signal 60			INP3	I* The third axis in-position signal	
27	EL2+	I Second axis positive limit signal 61			EL3+	I Positive limit signal of the third axis	
28	EL2-	I Second axis negative limit signal 62			EL3-	I The third axis negative limit signal	
29	SD2	I* 2nd axis deceleration signal 63			SD3	I* 3rd axis deceleration signal	
30	ORG2	I Second axis origin signal 64			ORG3	I 3rd axis origin signal	
31	PCS2	I* Second axis position change trigger signal 65			PCS3	I* 3rd axis position change trigger signal	
32	VDD I Same definition as 67PIN (can not be connected) 66 EXGND I External isolated power supply ground input						
33	VCC O Internal non-isolated 5V power output 67				VDD	I External isolated power input (24V)	
34	GND O Internal non-isolated GND output 68				EMG	I Emergency stop (for all axes)	

Note: Pins with I* can be used as general purpose inputs when the function is disabled.

8.1 .2 Interface X2 pin definition

As shown in Figure 8-2, the interface X2 is the motor control I/O signal and SCSI-CS II type 50-pin socket, including the second axis, third axis, encoder, LT 3 RC3; fourth axis (U Z) code C, E axis Y) encoder LTC2; All signals; power, power ground. The corresponding relationship between the pin number and signal is shown in the table.

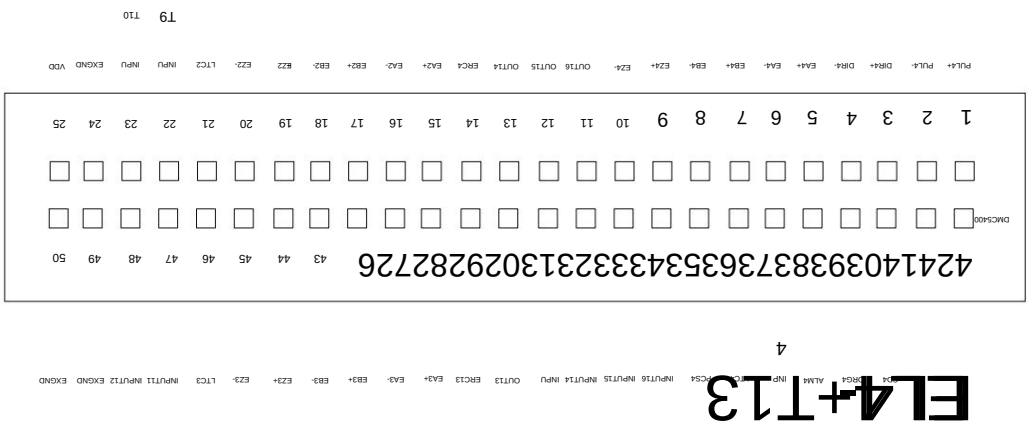


Figure 8-2 Example of interface X2

Table 8-2 Interface X2 pin number and signal relationship

Pin No.	Name I/O		Features	Pin No.	Name I/O		Features
1	PUL4+ O Fourth axis pulse signal (+) 26				EL4+	I Fourth axis positive limit signal	

Machine Translated by Google

Pin No.	Name	I/O	Features	Pin No.	Name	I/O	Features
2	PUL4-	THE	Fourth axis pulse signal (-)	27	EL4-	I	Fourth axis negative limit signal
3	DIR4+	O	Fourth axis direction signal (+)	28	SD4	I*	Fourth axis deceleration signal
4	DIR4-	THE	Fourth axis direction signal (-)	29	ORG4	I	Fourth axis origin signal
5	EA4+	I	Fourth axis encoder A phase (+)	30	ALM4	I	Fourth axis alarm signal
6	EA4-	I	Fourth axis encoder A phase (-)	31	INP4	I*	Fourth axis in-position signal
7	EB4+	I	Fourth axis encoder phase B (+)	32	LTC4	I	Fourth axis latch signal
8	EB4-	I	Fourth axis encoder B phase (-)	33	PCS4	I*	Fourth axis position change signal
9	EZ4+	I	Fourth axis encoder Z phase (+)	34	INPUT16	I	Universal input 16
10	EZ4-	I	Fourth axis encoder Z phase (-)	35	INPUT15	I	Universal input 15
11	OUT16	O	Universal output port 16	36	INPUT14	I	Universal Input 14
12	OCT15	O	Universal output port 15	37	INPUT13	I	Universal input 13
13	OUT14	O	Universal output port 14	38	OUT13	O	Universal output port 13
14	ERC4	O	Fourth axis error clear signal	39	ERC3	O	3rd axis error clear signal
15	EA2+	I	Second axis encoder A phase (+)	40	EA3+	I	3rd axis encoder A phase (+)
16	EA2-	I	Second axis encoder A phase (-)	41	EA3-	I	3rd axis encoder A phase (-)
17	EB2+	I	Second axis encoder phase B (+)	42	EB3+	I	3rd axis encoder B phase (+)
18	EB2-	I	Second axis encoder B phase (-)	43	EB3-	I	3rd axis encoder B phase (-)
19	EZ2 +	I	Second axis encoder Z phase (+)	44	EZ3+	I	3rd axis encoder Z phase (+)
20	EZ2-	I	Second axis encoder Z phase (-)	45	EZ3-	I	3rd axis encoder Z phase (-)
21	LTC2	I	Second axis latch signal	46	LTC3	I	3rd axis latch signal
22	INPUT9	I	General purpose input 9	47	INPUT11	I	Universal input 11
23	INPUT10	I	Universal input port 10	48	INPUT12	I	Universal input port 12
24	EXGND	I	External isolated power ground input	49	EXGND	I	External isolated power ground input
2	VDD	5	I External isolated power input	50	EXGND	I	External isolated power ground input

Note: Pins with I* can be used as general purpose inputs when the function is disabled.

8.1.3 Pin Definition of Interface X3

As shown in Figure 8-3, interface X3 is used for handwheel input, and the corresponding relationship between pin numbers and signals is shown in Table 8-3.

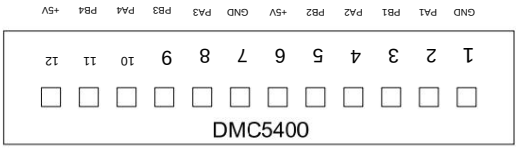


Figure 8-3 Example of interface X3

Table 8-3 Interface X3 pin number and signal relationship

serial number	name	illustrate
1	GND	PC power ground
2	PA1	Phase A pulse input of the first axis handwheel
3	PB1	B-phase pulse input of the first axis handwheel

Machine Translated by Google

4	PA2	Phase A pulse input of the second axis handwheel
5	PB2	Phase B pulse input of the second axis handwheel
6	+5V	PC power supply, +5V provided by PC
7	GND	PC power ground
8	PA3	Phase A pulse input of the third axis handwheel
9	PB3	Phase B pulse input of the third axis handwheel
10	PA4	Fourth-axis handwheel A-phase pulse input
11	PB4	4th axis handwheel B-phase pulse input
12	+5V	PC power supply, +5V provided by PC

8. 1.4 Pin Definition of Interface X4

As shown in Figure 8-4, interface X4 is used to connect multiple cards to start and stop signals at the same time. Its pin number and signal

The corresponding relationship is shown in Table 8-4.

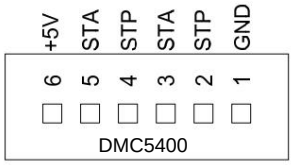


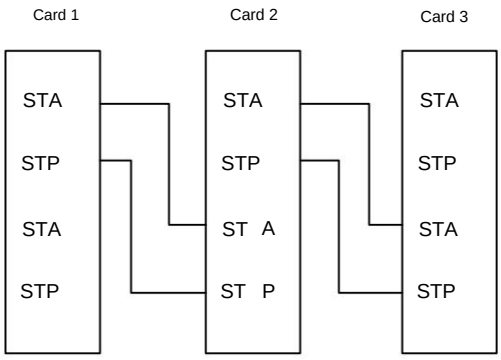
Figure 8-4 Interface X4 example

Table 8-4 Interface X number pin and signal relationship

serial number	name	illustrate
1	GND	PC power ground
2	STP	Simultaneous stop signal input/output
3	STA	Simultaneous start signal input/output
4	STP	Simultaneous stop signal input/output
5	STA	Simultaneous start signal input/output
6	+5V	PC power supply, +5V provided by PC

If there are more than two cards to start and stop at the same time, the corresponding pins in the X4 interface of the relevant control card should be connected.

together. Taking three DMC5400 motion control cards as an example, the wiring method is shown in Figure 8-5:



picture 8-5 Simultaneous activation of multiple cards stop connection

8. 2 Motion Control function library

thunder The motion control function library of Thai DMC-5400 motion control card has 15 categories and more than 60 library functions.

Machine Translated by Google

In this section, we describe these functional categories in detail. As mentioned earlier, users are very

It may only be necessary to call a small number of functions in the function library to meet its actual needs.

8.2.1 List of functions

	Function name	describe
initialization function	d5400_board_init	Initialize the control card
	d5400_board_close	Turn off the control card
Pulse mode setting set function	d5400_set_pulse_outmode	Set pulse output mode
back-to-origin movement function	d5400_set_HOME_pin_logic	Set the level and filter enable of the origin signal
	d5400_config_home_mode	Set Home Mode
	d5400_home_move	Start homing motion
motion status check Test and stop letter number	d5400_check_done	Read the motion state of the specified axis
	d5400_read_current_speed	Read the current speed of the specified axis
	d5400_reset_target_position Change the target position in motion	
	d5400_change_speed	Change the movement speed of the specified axis online
	d5400_variety_speed_range	Speed range setting and online speed change enable or disable
	d5400_imd_stop	Single axis stops immediately
	d5400_decel_stop	Single axis deceleration stop
	d5400_emg_stop	Emergency stop all axes
single axis position motion control function	d5400_set_profile	Set the trapezoidal velocity curve
	d5400_set_s_profile	Set up S-shaped speed curve
	d5400_t_vmove	Single axis trapezoidal acceleration continuous motion
	d5400_s_vmove	Single-axis S-shaped acceleration continuous motion
	d5400_t_pmove	Single-axis trapezoidal fixed-length motion (symmetric T-shaped acceleration and deceleration)
	d5400_ex_t_pmove	Single-axis trapezoidal fixed-length motion (asymmetric T-shaped acceleration and deceleration)
	d5400_s_pmove	Single-axis S-shaped fixed-length motion (symmetric S-shaped acceleration and deceleration)
	d5400_ex_s_pmove	Single-axis S-shaped fixed-length motion (asymmetric S-shaped acceleration and deceleration)
Linear interpolation function number	d5400_set_vector_profile	Set the vector velocity curve for multi-axis interpolation motion
	d5400_t_line2	Arbitrary 2 axes perform linear interpolation with symmetrical trapezoidal acceleration and deceleration
	d5400_t_line3	Arbitrary 3 axes perform linear interpolation with symmetrical trapezoidal acceleration and deceleration
	d5400_t_line4	Specify 4 axes to perform linear interpolation with symmetrical trapezoidal acceleration and deceleration
Two-axis arc insert Complement function	d5400_arc_move	Absolute position circular interpolation of any two axes
	d5400_rel_arc_move	Circular interpolation of relative positions of any two axes
Continuous Imputation Function number	d5400_prebuff_status	read cache status

Machine Translated by Google

	Function name	describe
location count with Latch function	d5400_get_position	Read the current position of the specified axis
	d5400_set_position	Set the current position of the specified axis
	d5400_get_position_deviation Read position deviation value	
	d5400_cls_position_deviation Clear position deviation value	
	d5400_set_latch_trigger_source Set position latch trigger source	
	d5400_get_rcun_latch_value Read position latch value	
	d5400_config_LTC_PIN	Set LTC Signal
Encoder related function	d5400_set_pulse_inmode	Set the encoder return pulse input mode
	d5400_get_encoder	Read encoder feedback pulse count value
	d5400_set_encoder	Set encoder feedback pulse count value
drive specific interface signal control related letter number	d5400_config_SD_PIN	Set SD signal
	d5400_config_PCS_PIN	Set PCS signal
	d5400_config_INP_PIN	Set INP signal
	d5400_config_ERC_PIN	Set ERC signal
	d5400_config_ALM_PIN	Set ALM Signal
	d5400_config_CUN_CLR	Set CUN signal
	d5400_config_EL_MODE	Set EL signal
	d5400_axis_io_status	Read the state of the motion signal of the specified axis
	d5400_get_rsts	Read the state of the external signal of the specified axis
Hand wheel motion control make a letter number	d5400_set_handwheel_inmode Set handwheel pulse input mode	Mode
	d5400_handwheel_move	Start handwheel movement
	d5400_get_handwheel_pulse	Read the number of handwheel pulses
Common I / O control control function	d5400_read_inbit	Read the status of the input port
	d5400_write_outbit	Set the state of the output port
	d5400_read_outbit	Read the status of the output port
	d5400_read_inport	Read the value of the input port
	d5400_read_outport	Read the value of the output port
software limit setting definite function	d5400_config_softlimit	Function to set software limit
	d5400_enable_softlimit	The function of enabling soft limit
	d5400_set_softlimit_data	Set the data of the software limit
interrupt function number	d5400_set_board_isr	set interrupt event
	d5400_set_int_enable	interrupt enable
	d5400_set_int_disable	Interrupt disable
	d5400_set_int_factor	Specify the interrupt source of the DMC5400 card

Machine Translated by Google

	Function name	describe
	d5400_read_event_int_factor interrupt factor for read events	
	d5400_read_error_int_factor Interrupt factor for read error stop	

8.2.2 Function description

Below we describe these function categories in detail.

8.2.2.1 Initialize and close the motion control card

WORD d5400_board_init(void) function: allocate system resources to the control card and initialize the control card

Parameters: none

Return value: number of cards (0 - 5), where 0 means no card

void d5400_board_close(void) function: close the control card, Free up system resources

Parameters: none

Return value: none

8.2.2.2 Pulse mode setting function

void d5400_set_pulse_outmode(WORD axis, WORD outmode) function: set the pulse output mode of the specified axis

Parameters: axis specifies the axis number

outmode pulse output mode selection, its value is shown in the following table

Output pulse type / outmode	Positive direction pulse		Negative direction pulse	
	OUT output	DIR output	OUT output	DIR output
0		高电平		低电平
1		高电平		低电平
2		低电平		高电平
3		低电平		高电平
4		高电平	高电平	
5		低电平	低电平	

Return value: none

Note: Before calling motion functions (such as: d5400_t_vmove, etc.) to output pulses, be sure to The mode in which the drive receives the pulses, call d5400_set_pulse_outmode to set the control card pulses output mode.

8.2.2.3 Origin motion function

void d5400_set_HOME_pin_logic(WORD axis,WORD org_logic,WORD filter)

Machine Translated by Google

Function: Set the effective level of the ORG signal, and enable/disable the filtering function

Parameters: axis specifies the axis number

Active level of org_logic ORG signal: 0 - low Active level, 1 - active high level

filter Enable/disable filter function : 0-disable, 1-enable

Return value: none

void d5400_config_home_mode(WORD axis,WO RD mode, WORD EZ_count) function: set the return-to-origin mode of the specified axis

Parameters: axis specifies the axis number

against Signal mode for homing:

0 - stop when encountering the origin signal,

1 - stop after encountering the origin signal, and press the opposite direction away from the origin, then press the original After the direction is slow and the origin is accurately found, the EZ_count EZ signal appears The number of times, in the process of returning to the origin, after capturing the origin signal After the EZ The number of times the signal occurs. The value range of the parameter: 1 to 16; for example, value is 2, it means that the In the process of returning to the origin, when the origin signal is found, The motor continues to move until EZ stops after two consecutive occurrences.

Return value: none

void d5400_home_move(WORD axis,WORD home_mode,WORD vel_mode) function: single axis back to origin sports

Parameters: axis Specify the axis number

home_mode Return to origin mode : 1 - back to the origin in the positive direction, 2 - back to the origin in the negative direction

3ÿLeaving the origin in the positive direction, and just after the origin signal is turned off position stand stop now, 4ÿLeaving the origin in the negative direction, when the origin signal is just turned off stop immediately

vel_mode Return Return to origin speed: 0 - back to origin at low speed, 1 - back to origin at high speed value: None

8.2.2.4 Position counting and latching

8.2.2.4.1 Position Counter Control Function

long d5400_g et_position(WORD axis) function: read the command pulse of the specified axis punch position

Parameters: axis specifies the axis number

Return value: the number of command pulses of the specified motion axis, unit: pulse

void d5400_set_pos ition(WORD axis, long current_position) function : Set the command pulse position parameter of the specified axis: axis Specify the axis number

current_position absolute position value

Machine Translated by Google

Return value: none

long d5400_get_postion_deviation(WORD axis) function: read the deviation

value between the command position and the encoder count position

parameter : axis Specify the axis number

Return value: current command position value and coded feedback position value deviation between

void d5400_cls_postion_deviation(WORD axis) function: clear the deviation of

the command position and encoder count position Parameter: axis refers to

Fixed axis number

return value: none

8.2.2.4.2 Encoder related functions number

void d5400_set_pulse_inmode(WORD axis, WORD inmode,WORD count_dir) encoder feedback input mode

Function: set

Parameters: axis specifies the axis number

inmode encoding	Feedback Input Mode
0	1× A/B
1	2× A/B
2	4× A/B
3	CW/CCW

Return value: none

long d5400_get_encoder(WORD axis) function: read the

feedback position pulse count of the specified axis encoder value, range: 28-bit signed number

Parameters: axis specifies the axis number

Return value: position feedback pulse value, unit: number of pulses

void d5400_set_encoder(WORD axis, long encoder_value) Function: Set the feedback pulse

count value of the encoder of the specified axis, range: 28-bit signed number

Parameters: Specify the axis number axis

encoder_value Return Encoder setting value.

value: None

8.2.2.4.3 Location Latch Correlation Function

void d5400_set_latch_trigger_source(WORD axis, WORD **sel)** function: specify an external trigger signal

for the position latch of the specified axis

Parameters: axis axis number

sel Select trigger signal (0: LTC signal trigger; 1: ORG signal trigger)

Return value: none

Machine Translated by Google

long d5400_get_rcun_latch_value (WORD axis, WORD **sel)** function: read the value latched to the position latch triggered by an external signal value

Parameters: axis axis number

sel Latch select (1: refers to command position; 2: encoder counting position)

Return value: return the latch position value (unit pulse number)

void d5400_c onfig_LTC_PIN (WORD axis, WORD **enable, WORD ltc_logic)** function: set allow/disable LTC Signals and How to Trigger

Parameters: axis specifies the axis number

enable Enable/disable signal function: 0-invalid; 1-valid.

ltc_logic Trigger of LTC signal Mode:

0 - falling edge trigger

1 - rising edge trigger

Return value: none

8.2.2.5 Single axis position motion control function

8.2.2.5.1 Trapezoidal motion function

void d5400_set_profile(WORD axis, double M in_Vel, double Max_Vel, double Tacc, double Tdec) function: set the starting speed, running speed, acceleration time, deceleration time of the trapezoidal curve

Parameters: axis axis number to set

Min_Vel start speed, unit pps

Max_Vel running speed, unit pps total acceleration time,

Tacc unit s total deceleration time, unit s

Tdec

Return value: none

void d5400_t _pmove(WORD axis, long Dist, WORD posi_mode) function: make the specified axis perform fixed-length displacement movement with a symmetrical trapezoidal velocity curve.

Parameters: axis specifies the axis number

Dist (absolute/relative) displacement value, unit: number of pulses

posi_mode displacement mode setting: 0 means relative displacement, 1 means absolute displacement

Return value: none

void d5400_e x_t_pmove(WORD axis, long Dist, WORD posi_mode) function: make the specified axis use the asymmetric trapezoidal velocity curve as a fixed length displacement movement

Parameters: axis specifies the axis number

Dist (absolute /relative) displacement value, unit: number of pulses

posi_mode displacement mode setting: 0 means relative displacement, 1 means absolute displacement

Machine Translated by Google

Return value: none

void d5400_t_vmove(WORD axis, WORD dir) function: make the specified

axis accelerate to high speed and keep going.

Parameters: axis specifies the axis number

dir specifies the transport The direction of movement, where 0 represents the negative direction and 1 represents the positive direction

Return value: none

8.2.2.5.2 S-shaped motion function

void d5400_set_s_profile(WORD axis, double Min_Vel, double Max_Vel, double Tacc, double Tdec, long Sacc, long Sdec) Function:

Set the starting point of S-curve motion

Start speed, running speed, acceleration time, S-segment acceleration and deceleration pulse number.

For the meaning of specific parameters, please refer to Section 4.2.5.1.2 S-shaped speed curve motion mode 》

Parameters: axis axis number to set

Min_Vel initial speed, unit pps Max_Vel running speed, unit

pps total acceleration time, unit s total deceleration time,

Tacc

Tdec Unit s S

Sacc Acceleration segment pulse number

Sde c S Number of pulses in deceleration section

Return value: none

void d5400 _s_pmove(WORD axis, long Dist, WORD posi_mode)

Function: Make the specified axis do a fixed-length displacement movement with a symmetrical S-shaped velocity curve

Parameters: axis Specify the axis number

Dist (absolute/relative) displacement value, unit: number of pulses

posi_mode displacement mode setting: 0 means relative displacement, 1 represents absolute displacement

Return value: none

void d5400_ex_s_pmove(WORD axis, long Dist, W ORD posi_mode) function:

make the specified axis move at asymmetric S-shaped speed Curve to do fixed-length displacement motion

Parameters: axis number Specify the axis

Dist (absolute/relative) displacement value, unit: number of pulses

posi_mode displacement mode setting: 0 means relative displacement, 1 means absolute displacement

Return value: none

void d5400_s_vmove(WORD axis, WORD dir) function: make the specified

axis curve at S-shape speed The line accelerates to high speed and continues to run.

Parameters: axis specifies the axis number

dir specifies the direction of movement, where 0 is negative and 1 is positive

Machine Translated by Google

Return value: none

8.2.2.5.3 Motion state detection and speed control function

WORD d5400_check_done(WORD axis) function: check the motion

state of the specified axis , stopped or running.

Parameters: axis Specify the axis number

Return value: 0 means the specified axis is positiveDuring operation, 1 means that the specified axis is stopped.

void d5400_reset_target_position(WORD axis, long dist) function: in single

Change the target position during relative axis motion. Note: This function can only be used in absolute position mode

use.

Parameters: axis specified axis number

dist relative position value

Return value: none

void d5400_ch ange_speed(WORD axis, double Curr_Vel) function: change the current

motion speed of the specified axis online. This function is only suitable for variable speed in single-axis motion, and

d5400_variety_ must be called before calling speed_range Set the speed range and enable.

Parameter: axis The axis number to be set

Curr_Vel new running speed, unit pps

Return value: none

void d5400 _variety_speed_range(WORD axis, WORD chg_enable, double

Max_Vel)

function: setting Specify the upper limit of the speed of the axis change, and the speed change enable.

Parameters: axis axis number to set

chg_enabl disable/enable speed change in continuous operation (reservation prohibited)

Max_Vel is the upper limit value of the speed change of the running speed, Unit pps None

return value:

double d5 400_read cur ent_speed(WORD axis) function: value

Read the current speed, the unit is pps, specify

Parameters: axis the axis number

Return value: the number of speed pulses of the specified axis

void d5400_d ecel_stop(WORD axis, double Tdec) function: the specified

axis decelerates to stop, when this function is called, it decelerates immediately and decelerates to Stop pulse output after starting speed

out.

ginseng Number: axis specifies the axis number

dec minus time, in s TFast

Machine Translated by Google

Return value: none

void d5400 _imd_stop(WORD axis) function: make

the finger The fixed axis stops immediately without any deceleration process

Parameters: axis specifies the axis number

Return value: none

void d5400_emg_stop() function: make

emergency stop of all motion axes.

ginseng Number: none

return value: none

8.2.2.6 More axis motion function

8.2.2.6.1 Number of linear interpolation movements

void d5400_ set_vector_profile(double Min_Vel, double Max_Vel, double Tacc, double Tdec) function: set the starting speed, running speed, acceleration time, deceleration time of the interpolation vector motion curve

parameter: Min_Vel start speed, unit pps

Max_Vel running speed, unit pps

Tacc Total acceleration time, unit s

Tdec Total deceleration time, unit s

Return value: none

void d5400_t_line2(WORD axis1, long Dist1, WORD axis2, long Dist2, WORD posi_mode)

function: specify

Arbitrary two axes do interpolation motion with symmetrical trapezoidal velocity curve

Parameter: axis1 specifies the first axis of the two-axis interpolation

axis2 Specify the second axis of the two-axis interpolation

Dist1 Specify the displacement value of axis1, unit: number of pulses

Dist2 specify The displacement value of axis2, unit: number of pulses

posi_mode displacement mode setting: 0 means relative displacement, 1 means absolute displacement

Return value: none

void d5400_t_line3(WORD *axis, long Dist1, long Dist2, long Dist3, WORD posi_mode)

function: specify

Arbitrary three axes do interpolation motion with symmetrical trapezoidal velocity curve

Parameter: axis specifies pointer to the list of axis numbers

Dist1 the displacement value of axis[0], unit: number of pulses

Dist2 Specifies the displacement of the axis[1] axis Value, unit: number of pulses

Machine Translated by Google

Dist3 Specify the displacement value of the axis[2] axis, unit: number of pulses

posi_mode none Displacement mode setting: 0 means relative displacement, 1 means absolute displacement

return value:

void d5400_t_line4(WORD cardno, long Dist 1, long Dist2, long Dist3, long Dist4, WORD p osi_mode)

function: specify four axes to perform interpolation motion with a symmetrical trapezoidal speed curve

Parameter: cardno specifies the card number of the interpolation motion . Range (0 - N - 1, N is the number of cards)

Dist1 Specify the displacement value of the first axis, unit: number of pulses

D ist2 Specify the displacement value of the second axis, unit: number of pulses

Dist3 Specify the displacement value of the third axis, unit: number of pulses

Dist4 Designated first Displacement value of four axes, unit: number of pulses

posi_mode displacement mode setting: 0 means relative displacement, 1 means absolute displacement

return value: none

8.2.2.6.2 Two-axis circular interpolation function

void d54 00_arc_move(WORD *axis, long *targ et_pos, long *cen_pos, WORD arc_dir)

function: specify any two axes with the current position as the starting point, according to the specified center, target Absolute position and orientation

Do circular interpolation sports,

Parameters: axis axis number list pointer target absolute position list

target_pos pos pointer, unit: number of pulses

cen_ Absolute position list pointer of the center of the circle, unit: number of pulses

arc_dir Arc direction: 0 means clockwise, 1 means counterclockwise

Return value: None

void d5400_rel_arc_move(WO RD *axis, long *rel_pos, long *rel_cen, WORD arc_dir) function: specify any two axes with the current position as the starting point, press the specified

The center of the circle, the relative position and direction of the target

Do circular interpolation sports,

Parameters: axis pos Axis number list pointer

rel_ target relative position list pointer, unit: number of pulses

cen_pos Relative position list pointer of the center of the circle, unit: number of pulses

arc_dir Arc direction: 0 means clockwise, 1 means counterclockwise

Return value: None

8.2.2.6.3 Continuous interpolation motion function

WORD d 5400_prebuff_status(WORD axis) function: read the status of the preset buffer of the specified axis

Machine Translated by Google

Parameters: axis specified axis number

Return value: preset buffer status

0 - Buffer 1 is empty, buffer 2 is empty, buffer 3 is empty

1 - Buffer 1 is not empty, buffer 2 is empty, buffer 3 is empty

2 - buffer 1 is not empty, buffer 2 is not empty , buffer 3 is empty

3 - buffer 1 is not empty, buffer 2 is not empty, buffer 3 is not empty

8.2.2.7 Setting function of driver-specific interface signal

void d5400_config_S D_PIN(WORD axisÿWORD **enable , WORD sd_logic, WORD sd_mode)**

function: set SD letter

valid logic levels and how they work

Parameter: axis Specify the axis number

enable enable/disable signal function: 0 - invalid; 1 - valid

sd_logic Set the SD signal with Effective logic level:

0 - active low level;

1 - Active high.

sd_m ode sets how the SD signal works:

0 - Decelerate to start speed, if SD signal is lost , starts to accelerate again;

1 - Latch SD signal and decrement speed to the starting speed;

2 - Decelerate to the starting speed and stop, if the deceleration is over process, SD signal lost, started to speed up again

3 - Latch the SD signal, decelerate to the initial speed and stop.

Return value: none

void d5400_config_PCS_PIN(W ORD axis, WORD **enable, WORD pcs_logic)** function: set to enable/disable PCS external signal to change during motion target location

Parameters: axis specifies the axis number

enable Enable/disable signal function: 0 - invalid; 1 - valid

pcs_logic sets the active level of the PCS signal:

0 - active low level;

1 - Active high.

Return value: none

void d5400_config_INP_PIN(WORD axis, WORD **enable, WORD inp_logic)** function: set enable/disable INP signal and its valid logic level

Parameters: axis specifies the axis number

enable enable/disable signal function Enable: 0 - invalid; 1 - valid

inp_logic is set to Set the INP signal to have Effective level:

0ÿ active low;

Machine Translated by Google

1ÿ Active high.

Return value: none

void d5400_config_ERC_PIN(WORD axisÿWORD **enableÿWORD erc_logicÿ**

WORD erc_width, WORD erc_off_time) function: set enable/

disable ERC signal and its effective level and output mode

Parameters: axis specifies the axis number

enable Enable/disable signal function:

0 - do not output ERC signal

1 - When receiving EL, ALM, CEMG and other signals stop, output ERC signal

2 - When receiving ORG signal, output ERC signal

3 - Satisfy both items 1 and 2 condition, output ERC signal

erc_logic set ERC letter The effective level of the number:

0 - active low level;

1 - Active high.

erc_width Error clear signal ERC has Effective output width:

0ÿ12us ÿ1ÿ102us ÿ2ÿ208us ÿ3ÿ1.6us ÿ4ÿ13 msÿ

5ÿ52 ms; 6: 104ms; 7: Level output

erc_off_ The off time of the time timer:

0ÿ0u sÿ 1ÿ12usÿ2ÿ1.6usÿ 3ÿ104m s

return value :none

void d5400_config_ALM_PIN(WORD axisÿWORD **alm_logic , WORD alm_action)** function:

set the logic level of ALM and its working mode

Parameters: Specify the axis number axis

arm _logic sets the active level of the ALM signal:

0 Level is valid;

1 Active level.

al The braking method of the m_action ALM signal:

0 - stop immediately;

1 - Decelerate to stop.

Return value: none

void d5400_config _CUN_CLR (WORD axis, WORD **trigger_mode, WORD enable) ,** and select register clear

Function: Set the trigger of CLR

parameter : specified axis number

tr trigger_mode mode:

0ÿ Falling edge valid

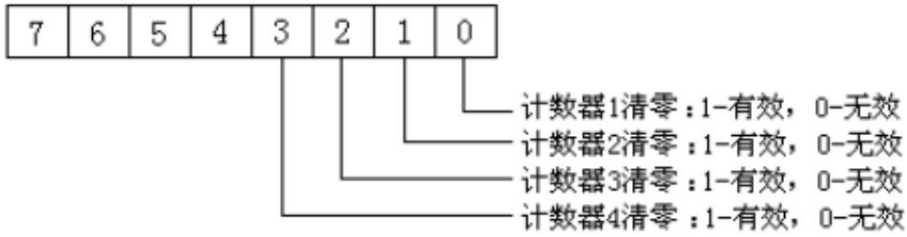
1ÿ Active on rising edge

Machine Translated by Google

2 - Active low

3ÿ Active high

in able select register:



Return value: none

void d5400_config_EL_MODE(WORD axis , WORD el_mode) function:

set the effective braking mode in response to EL

Parameters: axis specifies the axis No

el_mode Braking mode: 0 - stop immediately 1 - stop after deceleration

Return value: none

WORD d5400_axis_io_status(WORD axis) function: read the

motion information of the specified axis The status of the number, including the dedicated I/O status of the specified axis.

parameter: axis specifies the axis number

Return value: see the table below

Tag number	Signal name	describe
0ÿ7	reserve	
8	FU	1: Indicates that it is accelerating
9	FD	1: Indicates that it is decelerating
10	FC	1: Indicates running at low speed
11	ALM	1: Indicates that the servo alarm signal ALM is ON
12	PEL	1: Indicates that the positive limit signal +EL is ON
13	MEL	1: Indicates positive limit signal – EL is ON
14	ORG	1: Indicates that the origin signal ORG is ON
15	SD	1: Indicates that the SD signal is ON

DWORD d540 get_rsts(WORD 0_ axis) function: read

the specified axis External signal status

Parameters: axis specifies the axis number

Return value: see the table below

Tag number	Signal name	describe
0ÿ3	reserve	
4	CSD	1: Indicates simultaneous deceleration signal (CSD) is ON; 0: OFF
5	STA	1: Indicates that the simultaneous start signal (STA) is ON
6	STP	1: Indicates that the simultaneous stop signal (STP) is ON

Machine Translated by Google

Tag number	Signal name	describe
7	EMG	1: Indicates that the emergency stop signal (EMG) is ON
8	PCS	1: Indicates that the PCS signal is ON
9	ERC	1: Indicates that the error clear signal (ERC) is ON
10	NO	1: Indicates that the index signal (EZ) is ON
11	+ DR (PA)	1: Indicates +DR(PA) signal is ON
12	-DR(PB)	1: Indicates -DR(PB) signal is ON
13	reserve	
14	SD	1: Indicates that the SD signal is ON
15	INP	1: Indicates that the in-position signal is INP ON
16	DIR	Pulse output direction (0: indicates positive direction; 1: indicates negative direction)
17ÿ31	reserve	

8.2.2.8 Handwheel motion control function

void d5400_set_handwheel_inmode(WORD axis, WORD inmode, WORD count_dir) Function: set the counting mode of the input handwheel pulse signal

Parameters: axis specifies the axis number

inmode Set the pulse input mode:

0-A, B phase signal, 1 times count

1-A, B phase signal, double count

2-A, B phase signal , 4 times count

3 - Differential pulse signal

count_dir sets the counting direction of the counter:

0 - default PA/PB input count direction

1 - Opposite PA/PB input count direction

Return value: none

long d5400_get_handwheel_pulse(WORD axis) function: read handwheel pulse number

Parameters: axis specifies the axis number

Return value: number of handwheel pulses

void d5400_handwheel_move(WORD axis, double vh) function: start the handwheel pulse movement of the specified axis

Parameters: axis specifies the axis number

vh Maximum pulse input frequency, unit pps None

return value:

Machine Translated by Google

8.2.2.9 General IO control function

int d5400_read_inbit(WORD bitno) function: read the level

state of a certain input port of the specified control card

parameter: important Specify the input port number (value range: 1-16)

Return value: 1-4 Bit 0 means high level, 1 means low level. 5-16 Bit 1 means high level, 0 means low level

flat

void d5400_write_outbit (WORD bitno,WORD on_off) function: set a certain output port of

the specified control card

Parameters: bitno refers to Set the output port number (value range: 1-16)

on_off output level: 0 - table It means output low level, 1- means output high level.

return value: none

int d5400_read_outbit(WORD bitno) function: read the

specified control The level state of a certain output port of the card

Parameters: cardno specifies the control card number, range (0 - N - 1 , N is the number of cards)

important Specify the input port number (value range: 1-16)

return value: 0 means low level; 1 means high level.

Note: where the output port 1-12 The initial state is optional. When the corresponding bit of the DIP switch S1 is set to OFF, the read

output port level logic will be reversed.

long d5400_r ead_inport(WORD card) function: read

all general input ports of the specified control card port value (16 bits)

Parameter: cardn specifies the control card number, the range (0 - N - 1 , N number of cards)

Return value: 16-bit long integer

long d5400_read_outport(WORD card) function: read the full

Port value (16-bit) of the external general-purpose output port

Parameters: cardno specifies the control card number, range (0 - N - 1, N is the number of cards)

Return value: 16-bit long integer

8.2.2.10 Software limit function

void d5400_config_softlimit(WORD axisÿWORD **source_selÿ** **WORD SL_action)** function:

configure the software limit function, select the limit pulse source (internal command pulse or external encoder input pulse

rush).

parameter: axis axis number

source_sel location mode selection (0 - command position; 1 - encoder position)

SL_action braking method (0—stop immediately; 1—stop after deceleration)

Return value: none

Machine Translated by Google

void d5400_enable_softlimit(WORD axis, WORD **ON_OFF)** function: enable or disable the software limit

function of the specified axis.

Parameters: axis axis number

ON_OFF software limit enable/disable (0—disable; 1—allow)

Return value: none

void d5400_set_ ftlimit_data(WO RD axisÿ long N_limitÿ long P_limit)

function: set the software limit range of the finger axis, once the software limit is allowed, the specified Motion position only be used here

Run back and forth within the specified range.

Parameters: axis axis number

N_lim Negative direction limit minimum value

P_limit Positive limit maximum value

Return value: none

8.2.2.11 Interrupt function

void d5400_set_board_isr(void (* MyIsr)()) function: designate a regular

function as an interrupt response event, that is, when the hardware in the DMC5400 card

When the interrupt is triggered, the regular function specified by this function is automatically executed (Note: this function is limited to

VC+ +ÿÿ

Parameters: * MyIsr specifies the regular function

Return value: none

int d5400_set_int_in able(WORD cardno) function: allow

to specify The DMC5400 card with the card number applies to the PC for hardware interrupt

Parameters: c ardno card number

Return value: none

void d5400_set_int_disable() function: disable

all DMC54OO cards interrupt function

Parameters: none

Return value: none

void d5400_set_int_factor(WORD axis, DWORD int_factor) function: set the interrupt source of the

specified axis

Parameters: axis axis number

int_factor interrupt source, see the table below bright

int_fa tag ctor	describe
0	During normal stop, interrupt generation is allowed
1	Enables an interrupt to be generated when the next preload buffer operation begins
2	Enables an interrupt when the second location register becomes empty

Machine Translated by Google

int_factor bit number	describe
3	spare
4	When acceleration starts, an interrupt is allowed to be generated
5	When acceleration is complete, an interrupt is enabled
6	When deceleration starts, an interrupt is allowed
7	When deceleration is complete, an interrupt is allowed
8	When the software limit is exceeded in the positive direction, it is allowed to generate an interrupt
9	When the negative direction software limit is exceeded, it is allowed to generate an interrupt
10	spare
11	spare
12	spare
13	Interrupt is enabled when the CLR signal is active and the position counter is cleared
14	Interrupts are enabled when the LTC signal is active and the counter value is latched
15	When the ORG signal is active and the counter value is latched, an interrupt is enabled
16	When the SD signal is ON, interrupt generation is enabled
17	Enable interrupt generation when DIR signal changes
18	When the STA signal is ON, interrupt generation is enabled
19	spare
20	When stopped (including normal stop/emergency stop, etc.), it is allowed to generate an interrupt

Return value: none

DWORD d5400_read_event_int_factor(WORD axis) function: interrupt cause of

read event

Parameters: axis axis number

Return value: see the table below

int_factor bit number	describe
0	During normal stop, interrupt generation is allowed
1	Start the next preload buffer operation and generate an interrupt
2	Generate an interrupt when the second location pre-register becomes empty
3	spare
4	Interrupt when acceleration starts
5	Interrupt when acceleration completes
6	Interrupt when deceleration starts
7	Interrupt when deceleration completes
8	Generate an interrupt when the positive software limit is exceeded
9	Generate an interrupt when the negative software limit is exceeded
10	spare
11	spare
12	spare
13	An interrupt can be generated when the CLR signal is active and the position counter is cleared
14	An interrupt can be generated when the LTC signal is active and the counter value is latched

Machine Translated by Google

int_factor bit number	describe
15	An interrupt is generated when the ORG signal is active and the counter value is latched
16	Generates an interrupt when the SD signal is ON
17	Generate an interrupt when the DIR signal changes
18	Generates an interrupt when the STA signal is ON

DWORD d5400_r or_i ead_err nt_factor(WORD axis) function: read the interrupt

cause of error stop

ginseng Number: axis axis number

Return value: see the table below

return value tag	describe
0~4	spare
5	Interrupt generated when +EL signal is ON
6	- Interrupt generated when the EL signal is ON
7	Interrupt generated when ALM signal is ON
8	Interrupt generated when STP signal is ON
9	Interrupt generated when EMG signal is ON
10	Interrupt caused by SD signal decelerating and stopping
11~31	spare

8. See Question Bank

problem appear	Solution suggestion
After the board is inserted, the PC system cannot recognize the control card	Check if the board driver Correctly installed, device management in WINDOWS (see WIND OWS Help file) to view driver installation Is it normal. If sent Existing related yellow exclamation mark sign indicating installation If it is incorrect, you need to follow the installation instructions of the software part to reinstall; The compatibility of the computer motherboard is poor, please consult the motherboard supplier; Whether the PCI slot is in good condition; Check whether there are foreign objects in the PCI gold finger, which can be cleaned with alcohol.
The PC cannot communicate with the control card.	Check whether there are foreign objects in the PCI gold finger, which can be cleaned with alcohol; Refer to the software manual to check that the application software is written correctly.
After the board and the drive motor are connected, When a pulse is issued, the motor does not turn	The setting pulse sending mode on the board and the input pulse mode of the driver are: No match, whether the jumper J1-J8 is correct; It can be tested with the motion5400 demo software to observe the pulse count, etc. is normal; Whether the external power supply for pulse and direction has been connected.
control The business card has been working normally, normal Pulses are issued, but the motor does not turn	Check that the connection between the drive and motor is correct. can use motion5400 demo software Run the test. Make sure the drive is working properly and no alarms are present.
The motor can turn, but it is not working properly often	Check whether the control card and driver are properly grounded, and whether anti-interference measures have been taken it is good;

problem appear	Solution suggestion
	The current limiting resistor used in the photoelectric isolation circuit at the output end of the pulse and direction signals is too large, and the working current is too small.
The motor can be controlled, but the motor may be caused by improper driver parameter settings, check the driver parameter settings; if oscillation or overshoot occurs, the motor can be controlled, but when working, the back-to-origin position is inaccurate	The acceleration and deceleration time and motion speed settings in the application
	software are unreasonable. Check whether the shielded wire is grounded; whether the origin signal switch is working properly; whether all coding signals and origin signals are disturbed. The limit sensor is not working properly; the signal of the limit
Limit signal does not work	sensor is disturbed; the application program is disordered. Please check whether the encoder signal type is pulse TTL square wave; refer to the selected encoder manual to check whether the wiring is correct; whether the encoder power supply is normal;
The encoder signal cannot be read	check whether the function call is correct. Check the wiring of all encoders and trigger sources; do a good job of grounding and shielding the signal lines. Check the wiring of the trigger source; check that the function is called correctly. Check function calls; Whether debounce processing is performed in the program; Trigger signal setting. Is
Inaccurate reading of the encoder cannot latch the encoder reading	the wiring OK; check the function call. Is the wiring OK; check the function call.
Poor repeatability of latched data	
Digital input signal cannot be read	
The digital output signal is abnormal	

8.4 Anti-interference measures

This motion control card is carefully designed in strict accordance with the anti-interference rules, has high anti-interference ability, and has passed the electromagnetic compatibility CE certification. However, the industrial control environment is often harsh and complex. The main factors affecting the reliable and safe operation of the control system mainly come from various electrical disturbances inside and outside the system, as well as system structure design, installation and external environmental conditions. In applications with serious interference signals, it is recommended to take certain measures to enhance the anti-interference ability of the control system. Some anti-interference measures can be added in the three aspects of grounding, filtering and shielding: (1) The PC power supply of the DMC5400 motion control card must be separated from the power supply of the drive or other interfering machines. If a different power supply is used, the PC chassis must be directly grounded. (2) For some occasions with large interference, it is recommended to use a filter to filter the power supply. (3) It is recommended to use shielded cables for communication cables. For direction pulse signals and encoder return signals, it is recommended to use twisted-pair shielded cables for connection. For the pulse output signal in harsh working environment, it is recommended to use a separate

Machine Translated by Google

Power supply.

(4) It is recommended not to run the motor power cable and signal cable in parallel in the chassis.

(5) There needs to be a certain distance between the controller and the motor. The controller is best installed on the metal control cabinet.

When using an inverter, pay attention to a certain distance between the inverter and the controller.