Hardware Manual

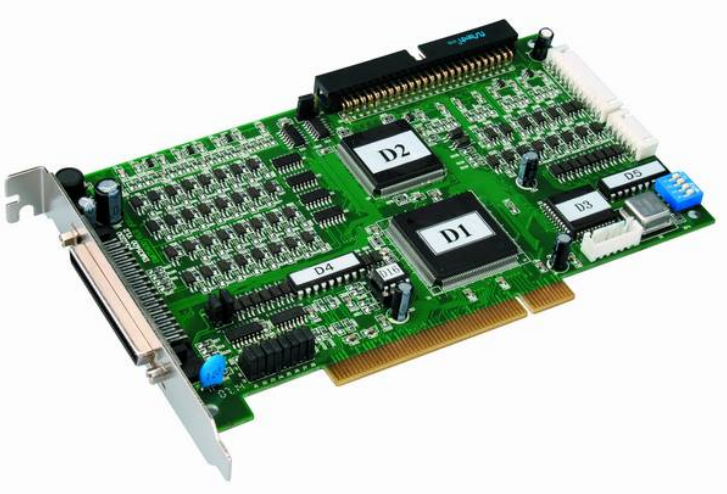
For

DMC5400

4-axis Servo/Stepping Motion Control Card

Revision 1.2

Attention: Please read this manual carefully before using the card!



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Chapter 1 General Information

1.1 Introduction

The DMC5400 is an advanced 4 axes motion controller card with PCI interface. It can generate pulse control signal (up to 6.5MHz) to control stepping and digital servo systems. As a motion controller, it provides any 2-axis circular interpolation, 4-axis linear interpolation, continuous interpolation with velocity continuity in multi-axes operation. In single axis operation, change position and speed on the fly are available. Multiple DMC5400 cards can be used in one system. Incremental encoder interface on all four axes provide the ability to correct positioning errors generated by inaccurate mechanical transmissions, and with the help of on board FIFO, the DMC5400 can also perform precise and extremely fast position compare and trigger function without consuming CPU resource. In addition, mechanical sensor interface, servo motor interface and general-purpose I/O signals are provided for system integration.

Figure 1.1 shows the function block diagram of the DMC5400 card. The DMC5400 uses one ASIC to perform 4 axes motion control. The motion control functions include trapezoidal and S-curve velocity profiles acceleration/deceleration, circular interpolation between two axes, linear interpolation between 2~4 axes, continuous motion, in positioning and 13 home return modes are done by the ASIC. Since these functions needing complex computations are done internally on the ASIC, the PC's CPU is free to supervise and perform other tasks.

The Motion5000 Demo software, a Microsoft Windows based software is equipped with the DMC5400 card for supporting application development. The Motion5000 Demo software is very helpful for verifying and testing a motion control system during the design phase of a project. Besides this demo software, a Windows version function library is included for programmers using VB/VC/LabVIEW languages. Several sample programs are given to illustrate how to use the function library.

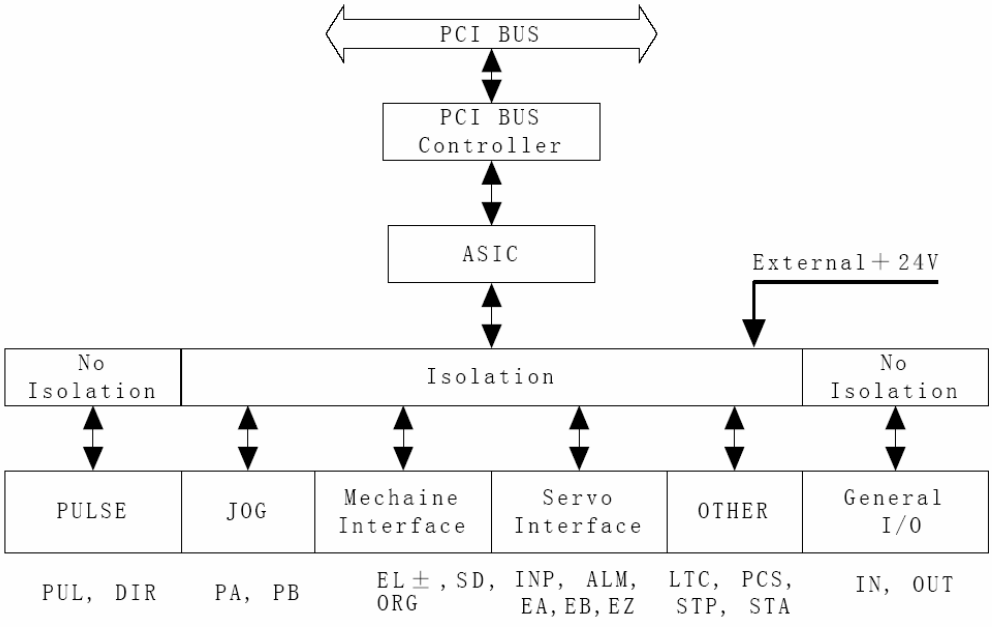


Figure 1.1: Function block diagram of the DMC5400

1.2 Features

The following lists summarize the main features of the DMC5400 motion control card.

- ✧ 32-bit PCI-Bus plug and play.
- ✧ 4 axes of pulse and direction signal output for controlling stepping or digital servo.
- ✧ Maximum output frequency is up to 6.5 Mpps.
- ✧ Control signal types: PUL/DIR, CW/CCW.
- ✧ Trapezoidal and S-curve velocity profiles.
- ✧ Programmable acceleration and deceleration time.
- ✧ Any 2 of 4 axes circular interpolation.
- ✧ 2~4 axes linear interpolation.
- ✧ Continuous interpolation.
- ✧ Change position and speed on the fly.
- ✧ Software limit function.
- ✧ 28-bit up/down counters for incremental encoder feedbacks.
- ✧ Home switch, index signal, positive and negative limit switches interface provided for all axes.
- ✧ 4 axes high speed position latch input.
- ✧ Programmable interrupt sources.
- ✧ Simultaneous start/stop motion on multiple axes.
- ✧ Manual pulser input interface.
- ✧ Software supports up to 5 pieces DMC5400 operation in one computer.
- ✧ Motion5000 Demo software for verifying and testing a motion control system.
- ✧ DMC5400.DLL for API function calling in Windows 95/98/NT/2000/XP systems with VB/VC/LabVIEW

1.3 Specifications

1.3.1 Performances

- ✧ Number of controllable axes: 4 axes.
- ✧ Internal reference clock: 19.6608 MHz
- ✧ Pulse output frequency: 1 pps ~ 6.5 Mpps
- ✧ Position setting range: -134,217,728 ~ +134,217,728 pulses (28-bit).
- ✧ Up/down counter counting range: -134,217,728 ~ +134,217,727(28-bit).
- ✧ Linear and circular interpolation accuracies: ±0.5 LSB
- ✧ Maximum manual pulser input frequency: 100KHz
- ✧ Maximum encoder input frequency: 4MHz (×4)

1.3.2 I/O Signals

- ✧ Number of general purpose digital input: 16 (Isolated)
- ✧ Number of general purpose digital output: 16 (Isolated)
- ✧ Command signals: PUL and DIR (Non-isolated)
- ✧ Incremental encoder signals input pins: EA and EB (Isolated)
- ✧ Encoder index signal input pin: EZ (Isolated)
- ✧ Mechanical limit/switch signal input pins: ±EL, SD, PCS and ORG (Isolated)
- ✧ Servo motor interface I/O pins: INP, ALM and ERC (Isolated)

- ✧ Position latch input pin: LTC (Isolated)
- ✧ Pulser signal input pin: PA and PB (Non-isolated)
- ✧ Simultaneous start/stop signal I/O pins: STA and STP

1.4 Environment

- ✧ Operating temperature: 0℃～50℃
- ✧ Storage temperature: -20℃～80℃
- ✧ Humidity: 5%RH ~ 85%RH

1.5 Power Consumption

- ✧ PCI slot: +5VDC±5% @ 1100mA (Max)
- ✧ External power supply: +12 ~ 24VDC±5% @ 500mA (Max)

1.6 Dimension

- ✧ 177mm (L) × 106mm (H)

1.8 Applications

- ✧ Electronic assembly, measurement
- ✧ Semiconductor, LCD manufacturing
- ✧ Laser processing
- ✧ Laboratory automation
- ✧ Vision & photocomposition automation
- ✧ Biotech sampling and handing
- ✧ Robotics
- ✧ CNC machines

1.9 Application software development

The features of the DMC5400 are made accessible by using the functions provided in the DMC5400.dll (for Windows 95/98/2000/XP). Motion5000 demo software assists the system developer in verifying and testing hardware systems. User applications may utilize the DMC5400 by calling provided functions in the DMC5400's Dynamic Link Library (DLL) with Visual C++, Visual Basic, LabVIEW, and etc. The users can follow Figure 1.2 to build an intended application system.

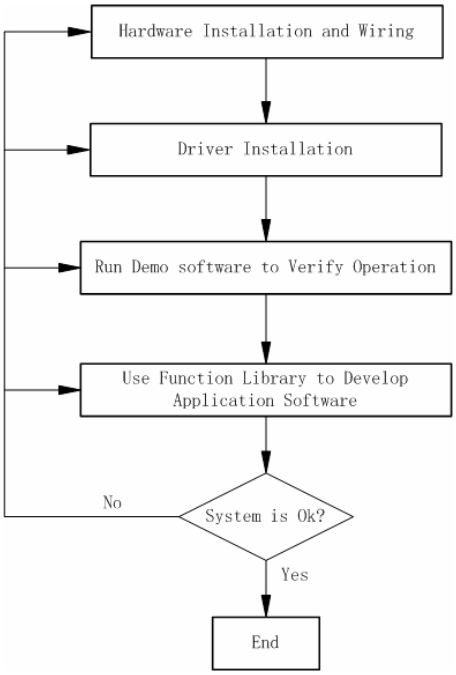


Figure 1.2: Application systems development flow chart

Chapter 2 Installation

This chapter describes how to install the DMC5400. The DMC5400 automatically configures the port and BIOS addresses. It is not necessary to configure the addresses, hence avoiding addressing conflicts.

2.1 Package Contents

Besides this ***User's Manual*** (Electronic Edition), the package also includes the following items:

• DMC5400 4-axis Servo/Stepping Motion Control Card (1 piece)

• TB68 Terminal Board (1 piece)

• Cable68-2.0 (1 piece)

• TB50 Terminal Board (optional)

• Cable50-2.0 (optional)

• 50-pin IDE to 50-pin MCR connector with bracket (Optional)

• Leadshine All-in-one CD

See “Order Information” section for more information about package contents.

If any of these items are missing or damaged, contact the dealer from whom you purchased the product or Leadshine.

2.2 Unpacking

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the DMC5400 from its packaging, ground yourself to eliminate any stored static charge. The card contains electro-static sensitive components that can be easily damaged by static electricity. Therefore, the card should be handled on a grounded anti-static mat. Inspect the card module carton for obvious damage. Shipping and handling may cause damage to your module. Be sure there is no shipping and handling damage on the carton before continuing.

Note: Do not attempt to install a damaged board in the computer.

2.3 Hardware Installation

The DMC5400 is equipped with Plug and Play PCI controllers. It can request base addresses according to PCI standards. The system BIOS will install the system resources based on the PCI cards’ configuration registers and system parameters (also can be set by the system BIOS). The DMC5400 can be inserted into any PCI slot without any configuration modification to the system resources. Please note that the PCI system board and slot must provide bus-mastering capabilities to operate at optimum level. See “Power Consumption” section in page 3.

Installation Procedures

1. Turn off your computer.

2. Remove the cover from your computer.

3. Before handling the PCI card, discharge any static buildup on your body by touching the metal case of the computer. Hold the edge of the card and do not touch the components.

4. Set the jumpers on the DMC5400 card. See “Jumper & Switch Settings” section for more information. Connect X2, X3 or X4 before installing the DMC5400 if it’s necessary. See “DMC5400 Connectors” section for more information.

5. Select a 32-bit PCI slot.

6. Position the board into the PCI slot you have selected.

7. Secure the card in place at the rear panel of the system.

2.4 Jumper & Switch Settings

There are 11 jumpers (J1~J11) and one 4-bit DIP switch on the board for setting command signal types, EMG signal, EL signals, and selecting external power supply or internal power supply. See figure 2.1 for distributions of these Jumpers and Switch.

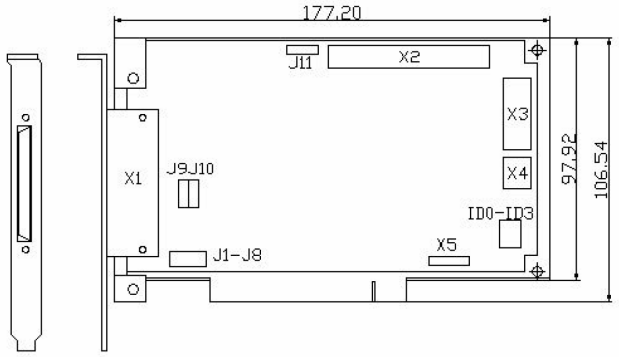


Figure 2.1: Sketch drawing of the DMC5400

2.4.1 Command Signal Type Settings (J1~J8)

There are 8 jumpers (J1~J8) on the DMC5400 specifically for command signal type settings. The user can use these jumpers to set PUL/DIR command signals of 1~4 axis to either single-ended (open collector) or differential. The default setting is the single-ended mode. (J1~J8 are short circuit between pin2 and pin3.)

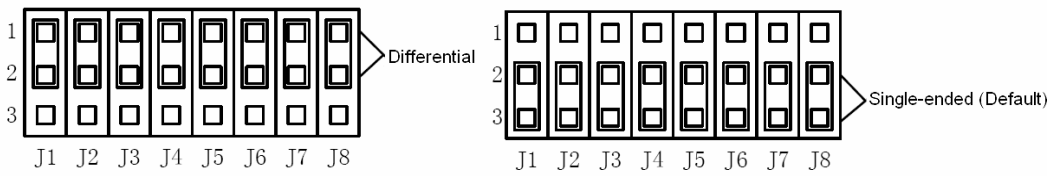


Figure 2.2: J1~J8 jumpers

Table 2-1: Command signal type settings

Pin Number of X1	Signal	Differential Output	Single-ended (Open collector) output
1	PUL0+	J1: short circuit between pin1 and pin2	J1: short circuit between pin2 and pin3
3	DIR0+	J2: short circuit between pin1 and pin2	J2: short circuit between pin2 and pin3
21	PUL1+	J3: short circuit between pin1 and pin2	J3: short circuit between pin2 and pin3
23	DIR1+	J4: short circuit between pin1 and pin2	J4: short circuit between pin2 and pin3

55	PUL2+	J5: short circuit between pin1 and pin2	J5: short circuit between pin2 and pin3
57	DIR2+	J6: short circuit between pin1 and pin2	J6: short circuit between pin2 and pin3
Pin Number of X2	Signal	Differential Output	Single-ended (Open collector) output
1	PUL3+	J7: short circuit between pin1 and pin2	J7: short circuit between pin2 and pin3
3	DIR3+	J8: short circuit between pin1 and pin2	J8: short circuit between pin2 and pin3

Note: Differential signals are preferred due to their excellent noise immunity. Recommend use differential output if possible.

2.4.2 Choosing External or Internal Power Supply (J9~J10)

J9 and J10 on the DMC5400 are used for choosing external or internal power supply for the card. Choosing external power supply for the card can offer higher noise immunity performances and full functions of the card. While choosing internal power supply is easier for the user to set up the system (no external power supply is needed.), but with lower noise immunity performances and no I/O functions. Here we recommend the user choosing external power supply for the card. The default mode is choosing external power supply for the card, see Figure2.3.

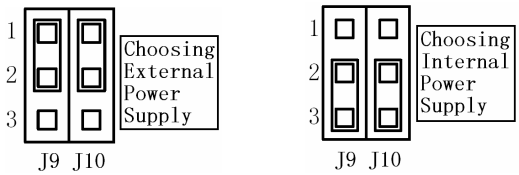


Figure 2.3: J9~J10 jumpers

2.4.3 Emergency Stop Input Signal Setting (J11)

J11 on the DMC5400 is specially used for setting effective logic level of the emergency stop signal. Jumper settings and their relative effective logic levels are shown in the Table 2-2. The default setting of the J11 is pin1 and pin2 short circuit, namely the emergency stop signal is effective when it is pulled to low level. Please check the input signal and the setting of emergency stop signal when the DMC5400 can not operate properly.

Table 2-2: Emergency stop input signal setting

Effective Level	J11 Settings
Low (EMG and EXGND is in conducting state.)	Pin 1 and pin2 short circuit
High (EMG and EXGND is in disconnection state.)	Pin 2 and pin3 short circuit

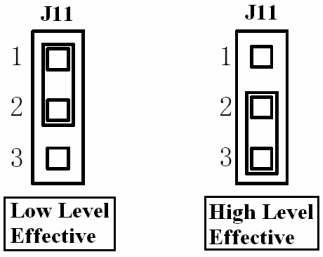


Figure 2.4: J11 jumper

2.5 Power Supply Connections

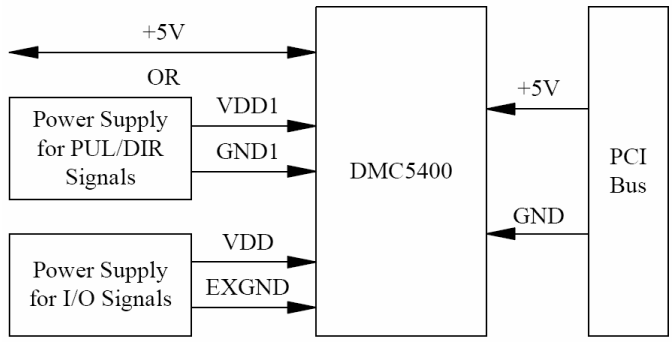


Figure 2.5: Power supply connections

In order to improve the anti-interference performances of the controller, the user can use two separate power supplies for PUL/DIR control signals and I/O signals of the DMC5400. VDD1-GND1 or 5V-GND1 is the power supply input ports for PUL/DIR control signals (5V-GND1 ports can be used as a power supply for customer use when use VDD1-GND1), and VDD-EXGND is the power supply input ports for I/O signals. If I/O devices generate little interference signal, then the user can use only one power supply for both PUL/DIR control signals and I/O signals. If the user has one 12~24VDC and one 5VDC power supplies, then the 12~24VDC supply can be connected to the VDD&EXGND ports and 5VDC supply can be connected to 5V&GND1 ports, while left VDD1 NOT CONNECTED (NC).

Chapter 3 Connectors

3.1 X1 Connector

X1 connector is a 68pin SCSI-II connector, and it contains the following signals:

All signals of Axis0, Axis1, Axis2, power supply input ports for the DMC5400 and EMG input, except encoder1 and encoder2 signals, LTC1, LTC2, ERC2, 4 digital inputs and 4 digital outputs.

Table 3-1: X1 connector

Pin	Signal	IN/OUT	Description (Axis)	Pin	Signal	IN/OUT	Description (Axis)
1	PUL0+	O	Pulse signal(+), Axis0	35	EL0+	I	End limit signal(+), Axis0
2	PUL0-	O	Pulse signal(-), Axis0	36	EL0-	I	End limit signal(-), Axis0
3	DIR0+	O	Direction signal(+), Axis0	37	SD0	I*	Slow down signal, Axis0
4	DIR0-	O	Direction signal(-), Axis0	38	ORG0	I	Origin position signal, Axis0
5	EA0+	I	Encoder A+, Axis0	39	ALM0	I	Alarm signal, Axis0
6	EA0-	I	Encoder A-, Axis0	40	INP0	I*	In-position signal, Axis0
7	EB0+	I	Encoder B+, Axis0	41	LTC0	I	Position latch input, Axis0
8	EB0-	I	Encoder B-, Axis0	42	PCS0	I*	Position change signal, Axis0
9	EZ0+	I	Encoder Z+, Axis0	43	INPUT1	I	Digital input 1
10	EZ0-	I	Encoder Z-, Axis0	44	INPUT2	I	Digital input 2
11	OUT1	O	Digital output 1	45	INPUT3	I	Digital input 3
12	OUT2	O	Digital output 2	46	INPUT4	I	Digital input 4
13	OUT3	O	Digital output 3	47	INPUT5	I	Digital input 5
14	OUT4	O	Digital output 4	48	INPUT6	I	Digital input 6
15	OUT5	O	Digital output 5	49	INPUT7	I	Digital input 7
16	OUT6	O	Digital output 6	50	INPUT8	I	Digital input 8
17	OUT7	O	Digital output 7	51	OUT8	O	Digital output 8
18	OUT9	O	Digital output 9	52	OUT11	O	Digital output 11
19	OUT10	O	Digital output 10	53	OUT12	O	Digital output 12
20	ERC1	O	Error cleared signal, Axis1	54	ERC0	O	Error cleared signal, Axis0
21	PUL1+	O	Pulse signal(+), Axis1	55	PUL2+	O	Pulse signal(+), Axis2
22	PUL1-	O	Pulse signal(-), Axis1	56	PUL2-	O	Pulse signal(-), Axis2
23	DIR1+	O	Direction signal(+), Axis1	57	DIR2+	O	Direction signal(+), Axis2
24	DIR1-	O	Direction signal(-), Axis1	58	DIR2-	O	Direction signal(-), Axis2
25	ALM1	I	Alarm signal, Axis1	59	ALM2	I	Alarm signal, Axis2
26	INP1	I*	In-position signal, Axis1	60	INP2	I*	In-position signal, Axis2
27	EL1+	I	End limit signal(+), Axis1	61	EL2+	I	End limit signal(+), Axis2
28	EL1-	I	End limit signal(-), Axis1	62	EL2-	I	End limit signal(-), Axis2
29	SD1	I*	Slow down signal, Axis1	63	SD2	I	Slow down signal, Axis2
30	ORG1	I	Origin position signal, Axis1	64	ORG2	I	Origin position signal, Axis2
31	PCS1	I*	Position change signal, Axis1	65	PCS2	I*	Position change signal, Axis2

32	VDD1	I	PUL/DIR power 1	66	EXGND	-	External power ground
33	5V	I/O	PUL/DIR power 2 / 5V Output	67	VDD	I	External power 12~24VDC
34	GND1	-	PUL/DIR power 1 or 2 ground	68	EMG	I	Emergency stop signal
	EXGND	-	External power ground		EXGND	-	External power ground

* When the function is disabled, it can be use as a general purpose input.

3.2 X2 connector

X2 connector is a 50pin SCSI-II connector, and it contains the following signals:

All signals of Axis3, encoder1 signals, encoder2 signals, LTC1, LTC2, ERC2, VDD/EXGND, 4 digital inputs and 4 digital outputs.

Table 3-2: X2 connector

Pin	Signal	IN/OUT	Description (Axis)	Pin	Signal	IN/OUT	Description (Axis)
1	PUL3+	O	Pulse signal(+), Axis3	26	EL3+	I	End limit signal(+), Axis3
2	PUL3-	O	Pulse signal(-), Axis3	27	EL3-	I	End limit signal(-), Axis3
3	DIR3+	O	Direction signal(+), Axis3	28	SD3	I*	Slow down signal, Axis3
4	DIR3-	O	Direction signal(-), Axis3	29	ORG3	I	Origin position signal, Axis3
5	EA3+	I	Encoder A+, Axis3	30	ALM3	I	Alarm signal, Axis3
6	EA3-	I	Encoder A-, Axis3	31	INP3	I*	In-position signal, Axis3
7	EB3+	I	Encoder B+, Axis3	32	LTC3	I	Position latch input, Axis3
8	EB3-	I	Encoder B-, Axis3	33	PCS3	I*	Position change signal, Axis3
9	EZ3+	I	Encoder Z+, Axis3	34	INPUT16	I	Digital input 16
10	EZ3-	I	Encoder Z-, Axis3	35	INPUT15	I	Digital input 15
11	OUT16	O	Digital output 16	36	INPUT14	I	Digital input 14
12	OUT15	O	Digital output 15	37	INPUT13	I	Digital input 13
13	OUT14	O	Digital output 14	38	OUT13	O	Digital output 13
14	ERC3	O	Error cleared signal, Axis3	39	ERC2	O	Error cleared signal, Axis2
15	EA1+	I	Encoder A+, Axis1	40	EA2+	I	Encoder A+, Axis2
16	EA1-	I	Encoder A-, Axis1	41	EA2-	I	Encoder A-, Axis2
17	EB1+	I	Encoder B+, Axis1	42	EB2+	I	Encoder B+, Axis2
18	EB1-	I	Encoder B-, Axis1	43	EB2-	I	Encoder B-, Axis2
19	EZ1+	I	Encoder Z+, Axis1	44	EZ2+	I	Encoder Z+, Axis2
20	EZ1-	I	Encoder Z-, Axis1	45	EZ2-	I	Encoder Z-, Axis2
21	LTC1	I	Position latch input, Axis1	46	LTC2	I	Position latch input, Axis2
22	INPUT9	I	Digital input 9	47	INPUT11	I	Digital input 11
23	INPUT10	I	Digital input 10	48	INPUT12	I	Digital input 12
24	EXGND	-	External power ground	49	EXGND	-	External power ground
25	VDD	I	External power 12~24VDC	50	EXGND	-	External power ground
	EXGND	-	External power ground		EXGND	-	External power ground

* When the function is disabled, it can be use as a general purpose input.

3.3 X3 connector

X3 connector is a 12pin connector, and it contains 4 axes pulser input signals.

Table 3-3: X3 connector

Pin	Signal	Description (Axis)	Pin	Signal	Description (Axis)
1	GND	PC power ground	7	GND	PC power ground
2	PA0	A phase signal of pulser, Axis0	8	PA2	A phase signal of pulser, Axis2
3	PB0	B phase signal of pulser, Axis0	9	PB2	B phase signal of pulser, Axis2
4	PA1	A phase signal of pulser, Axis1	10	PA3	A phase signal of pulser, Axis3
5	PB1	B phase signal of pulser, Axis1	11	PB3	B phase signal of pulser, Axis3
6	+5V	+5V PC power supply	12	+5V	+5V PC power supply

3.4 X4 connector

X4 connector is a 6pin connector, and it contains simultaneous start/stop control signals for multi-card operation.

Table 3-4: X4 connector

Pin	Signal	Description (Axis)
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	+5V PC power supply

If there are two or more DMC5400 controllers, cascade X4 connectors of all cards for simultaneous start/stop control on all concerned axes is possible. In this case, connect X4 as follows.

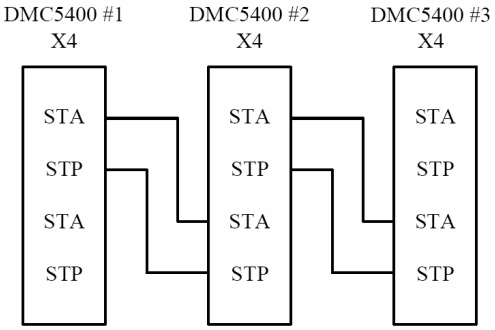


Figure 3.1: Simultaneous start/stop connections

Chapter 4 Interface Circuits

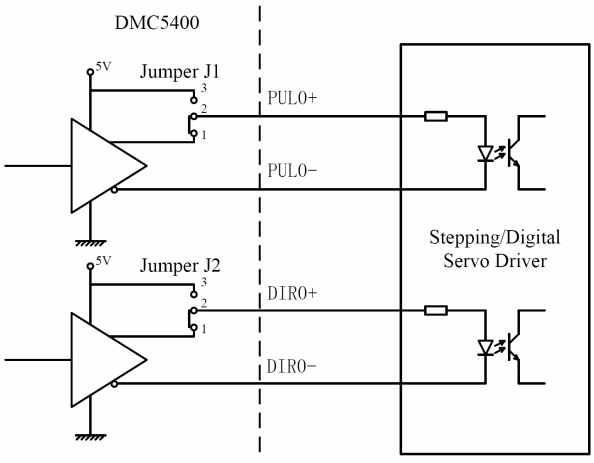
4.1 Pulse and Direction Signals PUL/DIR

The DMC5400 can output 4 axes PUL/DIR signals to control 4 stepping/digital servo motor drivers. For every axis, two pairs of PUL and DIR signals are used to send the pulse train and to indicate the direction. The PUL and DIR signals can also be programmed as CW and CCW signals pair, see "Software Manual for the DMC5400 Motion Controller" for more information. The interface circuit of the PUL and DIR signals is shown as figure 4.1. Each signal consists of a pair of differential signals. For example, the PUL0 is consisted of PUL0+ and PUL0- signals. The following table shows all the PUL/DIR output signals on X1 and X2 connectors.

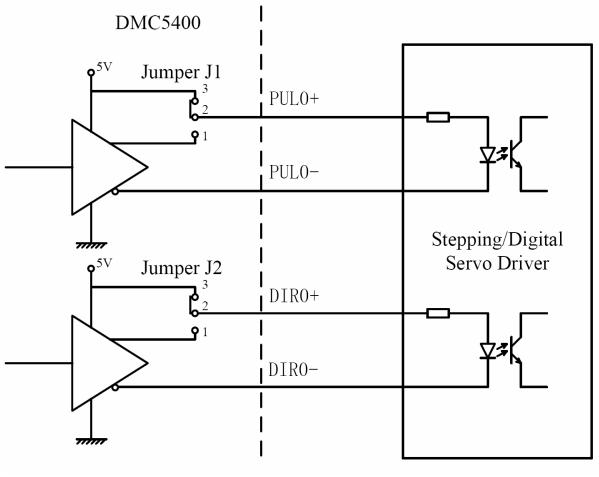
Table 4-1: PUL/DIR pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
1	PUL0+	Pulse signal(+), Axis0	1	PUL3+	Pulse signal(+), Axis3
2	PUL0-	Pulse signal(-), Axis0	2	PUL3-	Pulse signal(-), Axis3
3	DIR0+	Direction signal(+), Axis0	3	DIR3+	Direction signal(+), Axis3
4	DIR0-	Direction signal(-), Axis0	4	DIR3-	Direction signal(-), Axis3
21	PUL1+	Pulse signal(+), Axis1			
22	PUL1-	Pulse signal(-), Axis1			
23	DIR1+	Direction signal(+), Axis1			
24	DIR1-	Direction signal(-), Axis1			
55	PUL2+	Pulse signal(+), Axis2			
56	PUL2-	Pulse signal(-), Axis2			
57	DIR2+	Direction signal(+), Axis2			
58	DIR2-	Direction signal(-), Axis2			

There are 8 jumpers (J1~J8) on the DMC5400 which can be used to set PUL/DIR command signals to either single-ended (open collector) or differential. The default settings are the single-ended modes (J1~J8 are short circuit between pin2 and pin3.). Differential signals are preferred due to their excellent noise immunity. Recommend use differential output if possible. See page6 of this manual.



(a) Differential output



(b) Single-ended output

Figure4.1: PUL/DIR interface circuit

If the PUL/DIR is set to the open collector (Single-ended) output mode, the PUL- and DIR- are used to send out signals. Please take care that the current sink to PUL- and DIR- pins must not exceed 20mA. The current may provide by the +5V PUL/DIR power source, and most of motor driver's opto-couplers can work properly when the current is about 10mA. Have current limiting resistors in series at the PUL&DIR terminals if necessary.

4.2 Origin Position Signal ORG

The origin position signals (ORG0~ORG3) are used as input signals for origin position detecting devices or mechanisms. The following table lists the relative signal name, pin number, and the axis number.

Table 4-2: ORG pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
38	ORG0	Origin position signal, Axis0	29	ORG3	Origin position signal, Axis3
30	ORG1	Origin position signal, Axis1			
64	ORG2	Origin position signal, Axis2			

The input circuits of the ORG signals are shown as Figure 4.2. Usually, a switch is used to indicate the origin of one axis. The specifications of the limit switches should with contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. When the motion controller is operated at the home return mode, the ORG signal is used to stop the output signals (PUL/DIR). See "Software Manual for the DMC5400 Motion Controller" for more detail operation of the ORG.

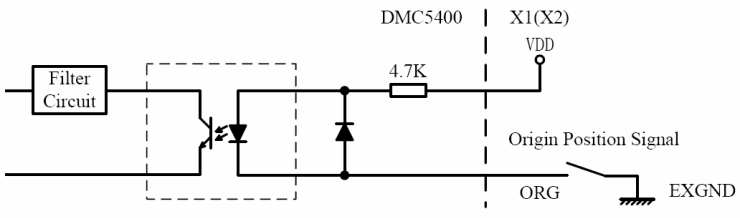


Figure4.2: ORG signal interface circuit

4.3 Slow Down Signal SD

The slow down signals (SD0~SD3) are used as input signals for slowing down the speed to the initial speed when necessary. The following table lists the relative signal name, pin number, and the axis number.

Table 4-3: SD pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
37	SD0	Slow down signal, Axis0	28	SD3	Slow down signal, Axis3
29	SD1	Slow down signal, Axis1			
63	SD2	Slow down signal, Axis2			

The input circuits of the SD signals are shown as Figure 4.3. Usually, a switch is used to indicate the position where slowing down is necessary. The specifications of the switches should with contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. See "Software Manual for the DMC5400 Motion Controller" for more detail operation of the SD.

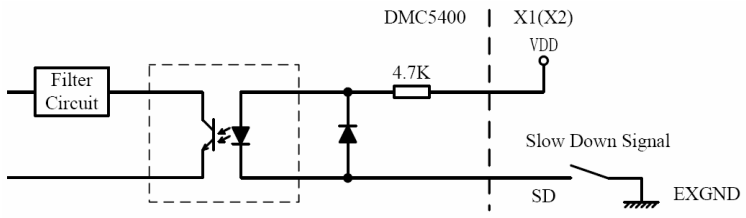


Figure4.3: SD signal interface circuit

4.4 End Limit Signal EL+ & EL-

There are two end-limit signals EL+ and EL- for each axis. EL+ indicates end limit signal in positive direction and EL- indicates end limit signal in minus direction. The relative signal name, pin number and axis number are shown in the following table.

Table 4-4: EL pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
35	EL0+	Positive end-limit signal, Axis0	26	EL3+	Positive end-limit signal, Axis3
36	EL0-	Minus end-limit signal, Axis0	27	EL3-	Minus end-limit signal, Axis3
27	EL1+	Positive end-limit signal, Axis1			
28	EL1-	Minus end-limit signal, Axis1			
61	EL2+	Positive end-limit signal, Axis2			
62	EL2-	Minus end-limit signal, Axis2			

The switch S1 is used to set the types of EL limit switches, see Table 4-5. The default setting of EL switch type is "normal open" type limit switch. The switch OFF is to use the "normal closed" type limit switch. The default setting is set as normal open type.

Table 4-5: End limit signal setting switch

DIP	ON/OFF	End Limit Switch Type
0	ON	EL0± Normal Open
	OFF	EL0± Normal Close
1	ON	EL1± Normal Open
	OFF	EL1± Normal Close
2	ON	EL2± Normal Open
	OFF	EL2± Normal Close
3	ON	EL3± Normal Open
	OFF	EL3± Normal Close

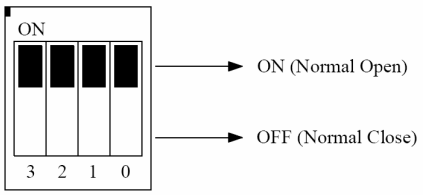


Figure 4.4: End limit signal setting switch

The signals connection and relative circuit diagram is shown in the following diagram. The external limit switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. You can use either normal open switch or normal closed switch by setting the DIP switch S1. The default setting is set as normal open type. See “Software Manual for the DMC5400 Motion Controller” for more detail operation of the EL.

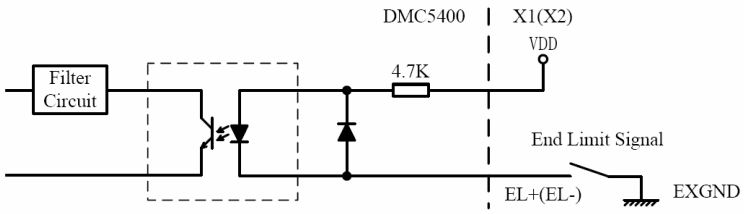


Figure 4.5: EL signal interface circuit

4.5 Encoder Feedback Signal EA, EB and EZ

The encoder feedback signals include the EA, EB, and EZ. Every axis has six pins for three differential pairs of phase-A (EA), phase-B (EB) and index (EZ) inputs. The EA and EB are used for position counting, and the EZ is used for zero position index. The relative signal names, pin numbers and the axis number are shown in the following tables.

Table 4-6: EA, EB and EZ pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
5	EA0+	Encoder A+, Axis0	15	EA1+	Encoder A+, Axis0
6	EA0-	Encoder A-, Axis0	16	EA1-	Encoder A-, Axis0
7	EB0+	Encoder B+, Axis0	17	EB1+	Encoder B+, Axis0
8	EB0-	Encoder B-, Axis0	18	EB1-	Encoder B-, Axis0

9	EZ0+	Encoder Z+, Axis0	19	EZ1+	Encoder Z+, Axis0
10	EZ0-	Encoder Z-, Axis0	20	EZ1-	Encoder Z-, Axis0
			40	EA2+	Encoder A+, Axis0
			41	EA2-	Encoder A-, Axis0
			42	EB2+	Encoder B+, Axis0
			43	EB2-	Encoder B-, Axis0
			44	EZ2+	Encoder Z+, Axis0
			45	EZ2-	Encoder Z-, Axis0
			5	EA3+	Encoder A+, Axis0
			6	EA3-	Encoder A-, Axis0
			7	EB3+	Encoder B+, Axis0
			8	EB3-	Encoder B-, Axis0
			9	EZ3+	Encoder Z+, Axis0
			10	EZ3-	Encoder Z-, Axis0

Connection to Line Driver Output (Differential Encoder)

To drive the encoder input, the driver output must provide at least 3.5V across the differential pairs with at least 6 mA driving capability. The ground level of the two sides must be tight together too.

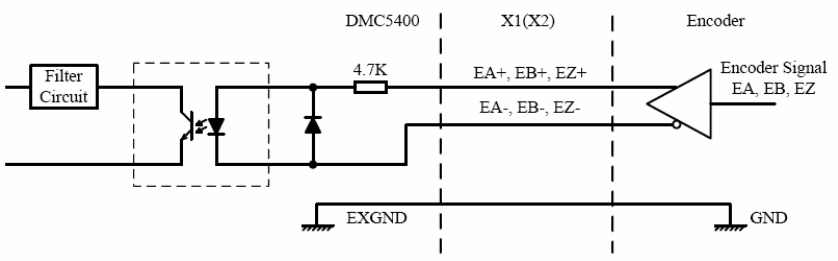


Figure 4.6: Connection to line driver output (differential encoder)

Connection to Open Collector Output (Single-ended Encoder)

To connect with open collector output, an external power supply is necessary. Some motor drivers also provide the power source. The connection between the DMC5400, encoder, and the power supply is shown in the following diagram. Please note that the external current limiting resistor R is necessary to protect the DMC5400 input circuit. Table 4-7 lists the suggested resistor value according to the encoder power supply.

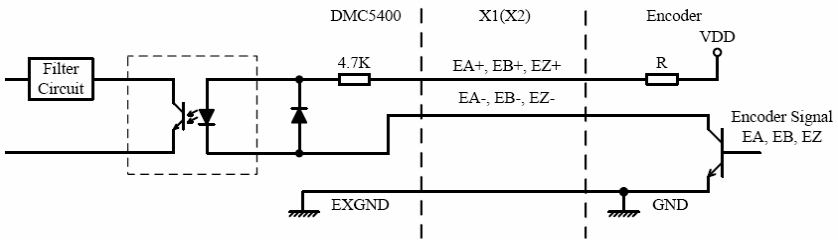


Figure 4.7: Connection to open collector output (single-ended encoder)

Table 4-7: External resistor for open collector output (single-ended encoder)

VDD	External Resistor R
+5V	0Ω
+12V	1.8KΩ
+24V	4.3KΩ

4.6 Alarm Signal ALM

The alarm signal ALM is used to indicate the alarm status from the servo driver. When the ALM signal is active, the DMC5400 will stop the output signals (PUL/DIR). The following table lists the relative signal name, pin number, and the axis number. When the function is disabled, these ports can be use as general purpose inputs.

Table 4-8: ALM pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
39	ALM0	Alarm signal, Axis0	30	ALM3	Alarm signal, Axis3
25	ALM1	Alarm signal, Axis1			
59	ALM2	Alarm signal, Axis2			

The input circuit of alarm signal is shown in the following diagram. The external switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. See “Software Manual for the DMC5400 Motion Controller” for more detail operation of the ALM.

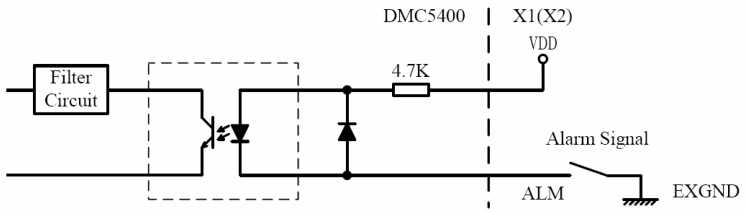


Figure 4.7: ALM signal interface circuit

4.7 In-Position Signal INP

The in-position signal INP from the servo motor driver indicates the deviation error is zero. That is the servo position error is zero. The following table lists the relative signal name, pin number, and the axis number. When the function is disabled, these ports can be use as general purpose inputs.

Table 4-9: INP pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
40	INP0	In-position signal, Axis0	31	INP3	In-position signal, Axis3
26	INP1	In-position signal, Axis1			
60	INP2	In-position signal, Axis2			

The in-position signals are usually from servomotor drivers. The external switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. See “Software Manual for the DMC5400 Motion Controller” for more detail operation of the

INP.

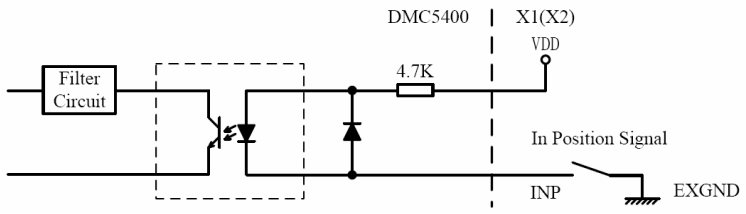


Figure 4.8: INP signal interface circuit

4.8 General Purpose Digital Input INPUT

The DMC5400 provides 16 general purpose digital inputs, which can be used to accept signals from switches, sensors and other devices. For example, the user can assign one general purpose digital input for servo driver's RDY (motor driver ready) feedback signal. The following table lists the relative signal name, pin number, and the axis number. The input circuit of general purpose digital input is shown as figure 4.9.

Table 4-10: General purpose digital input pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
43	INPUT1	Digital input 1	22	INPUT9	Digital input 9
44	INPUT2	Digital input 2	23	INPUT10	Digital input 10
45	INPUT3	Digital input 3	47	INPUT11	Digital input 11
46	INPUT4	Digital input 4	48	INPUT12	Digital input 12
47	INPUT5	Digital input 5	37	INPUT13	Digital input 13
48	INPUT6	Digital input 6	36	INPUT14	Digital input 14
49	INPUT7	Digital input 7	35	INPUT15	Digital input 15
50	INPUT8	Digital input 8	34	INPUT16	Digital input 16

The external switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. See "Software Manual for the DMC5400 Motion Controller" for more detail operation of the INPUT.

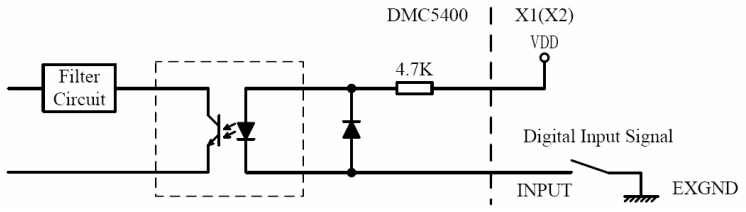


Figure 4.9: Digital input interface circuit

4.9 General Purpose Digital Output OUT

The DMC5400 provides 16 general purpose digital outputs, which can be used for controlling relays, magnetic valves and other devices. For example, the user can assign one general purpose digital output for servo driver's SVON (servo on) control signal. The following table lists the relative signal name, pin number, and the axis number. The output circuit of general purpose digital output is shown as figure 4.10.

Table 4-11: General purpose digital output pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
11	OUT1	Digital output 1	38	OUT13	Digital output 13
12	OUT2	Digital output 2	13	OUT14	Digital output 14
13	OUT3	Digital output 3	12	OUT15	Digital output 15
14	OUT4	Digital output 4	11	OUT16	Digital output 16
15	OUT5	Digital output 5			
16	OUT6	Digital output 6			
17	OUT7	Digital output 7			
51	OUT8	Digital output 8			
18	OUT9	Digital output 9			
19	OUT10	Digital output 10			
52	OUT11	Digital output 11			
53	OUT12	Digital output 12			

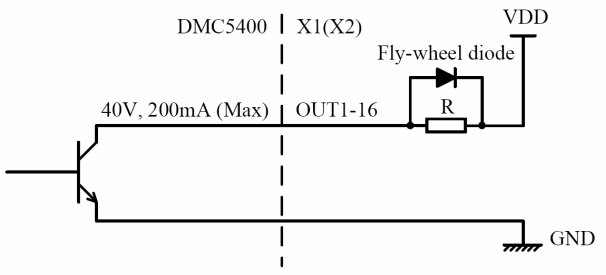


Figure 4.10: Digital output interface circuit

Note: Do please to add a fly-wheel diode for R to protect the OUTPUT port from failure, if it's an inductance load.

4.10 Position Change Signal PCS

The position change signal PCS is used for changing target position during the motor is running. When it's effective, the controller will change the current target position setting to the new target position setting. Namely, it's a trigger signal for changing target position. The following table lists the relative signal name, pin number, and the axis number. When the function is disabled, these ports can be use as general purpose inputs.

Table 4-12: PCS pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
42	PCS0	Position Change Signal, Axis0	33	PCS3	Position Change Signal, Axis3
31	PCS1	Position Change Signal, Axis1			
65	PCS2	Position Change Signal, Axis2			

The input circuit of position change signal is shown as figure 4.11. The external switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. See "Software Manual for the DMC5400 Motion Controller" for more detail operation of the PCS.

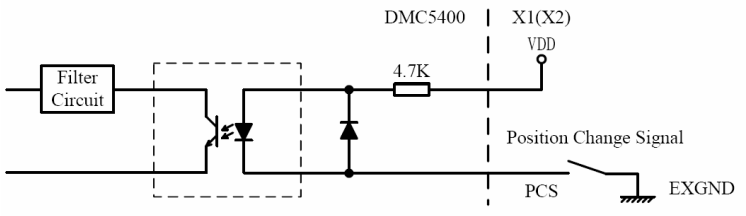


Figure 4.11: PCS signal interface circuit

4.11 Pulser Input Signals PA and PB

The DMC5400 can accept the input signals from pulser or JOG device signals through connector X3. The behavior of pulser or JOG device is as an encoder. The signals are usually used to generate the position information which guides the motor to follow. The interface circuits are shown as Figure 4.12.

The X3 contains two +5V power supplies for pulser, if the signal voltage of pulser is not +5V or if the pulser is distantly placed, it is recommended to put an optocoupler or line driver in between. Also, +5V and GND power lines of X3 are direct from the PCI bus. Please carefully use these signals because they are not isolated.

Table 4-13: PA and PB pins

X3 Pin	Signal	Description (Axis)	X3 Pin	Signal	Description (Axis)
2	PA	Phase A Signal, Axis0	8	PA	Phase A Signal, Axis2
3	PB	Phase B Signal, Axis0	9	PB	Phase B Signal, Axis2
4	PA	Phase A Signal, Axis1	10	PA	Phase A Signal, Axis3
5	PB	Phase B Signal, Axis1	11	PB	Phase B Signal, Axis3

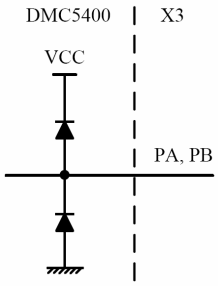


Figure 4.12: PA and PB signals interface circuit

4.12 Position Latch Signal LTC

The DMC5400 provides 4 position latch inputs, which can trigger the DMC5400 to capture the counter values. It gives a precise position determination. The following table lists the relative signal name, pin number, and the axis number.

Table 4-13: LTC pins

X1 Pin	Signal	Description (Axis)	X2 Pin	Signal	Description (Axis)
41	LTC0	Position Latch Signal, Axis0	21	LTC1	Position Latch Signal, Axis1
			46	LTC2	Position Latch Signal, Axis2
			32	LTC3	Position Latch Signal, Axis3

The input circuit of position latch signal is shown as Figure 4.13. The external switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation. See “Software Manual for the DMC5400 Motion Controller” for more detail operation of the LTC.

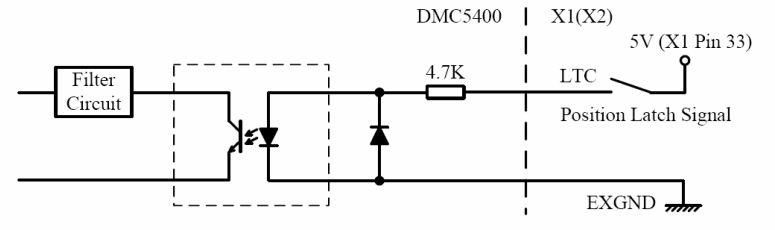


Figure 4.13: LTC signal interface circuit

4.13 Emergency Stop Signal EMG

The emergency stop signal EMG is used to stop motion of all axes. Please check the EMG signal logic setting (J11 jumper) and the EMG signal when the card can not work properly. The interface circuits are shown as Figure 4.14. The external switches featuring a contact capacity of +24V, 6mA minimum. An internal filter circuit is used to filter out the high frequency spike, which may cause wrong operation.

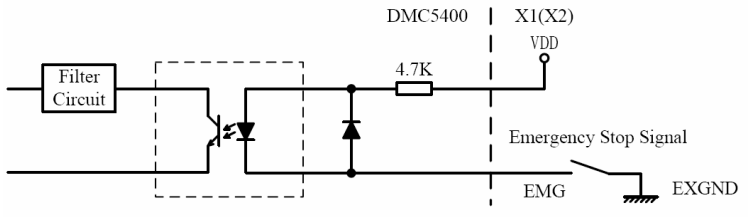


Figure 4.14: EMG signal interface circuit

4.14 Typical Connection for One Axis

The DMC5400 has 2 end limit signal, 1 slow down signal, and 1 Origin position signal for each axis. For reliable response and better anti-interference performances, all of these signals have filter circuits in their input circuits. A typical connection for one axis is shown as Figure 4.15.

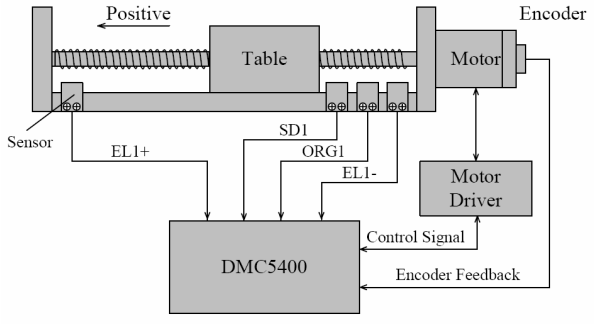


Figure 4.15: Typical connection for one axis

Chapter 5 Connection to Drivers

5.1 Connection to Single-ended Stepping Driver

Figure 5.1 shows how to connect the DMC5400 to a single-ended stepping driver. Here take Leadshine M325 stepping driver for example. Please refer to user's manual of the driver for more information about wirings.

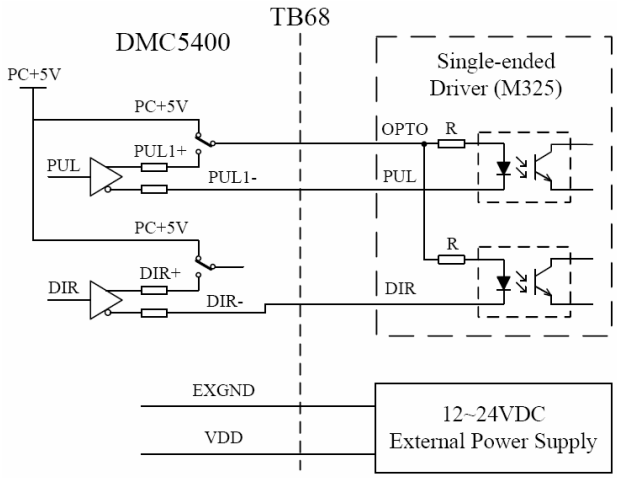


Figure 5.1: Connection to single-ended stepping driver

5.2 Connection to Differential Stepping Driver

Figure 5.2 shows how to connect the DMC5400 to a differential stepping driver. Here take Leadshine M880 stepping driver for example. Please refer to user's manual of the driver for more information about wirings.

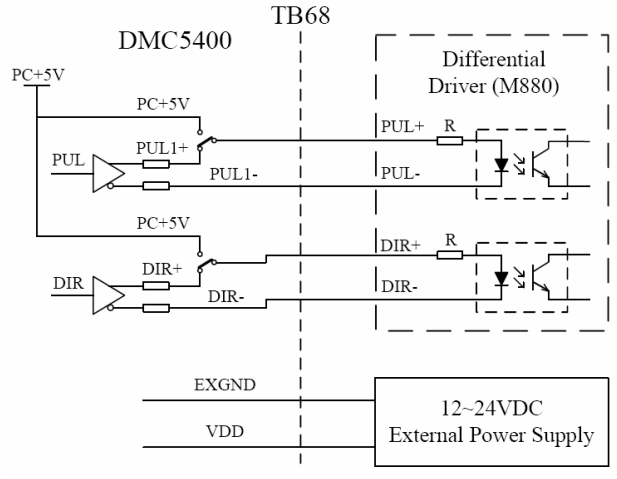


Figure 5.2: Connection to differential stepping driver

5.3 Connection to Servo Driver

Figure 5.3 shows how to connect the DMC5400 to a differential servo driver. Here take Panasonic servo driver for

example. Please refer to user's manual of the driver for more information about wirings.

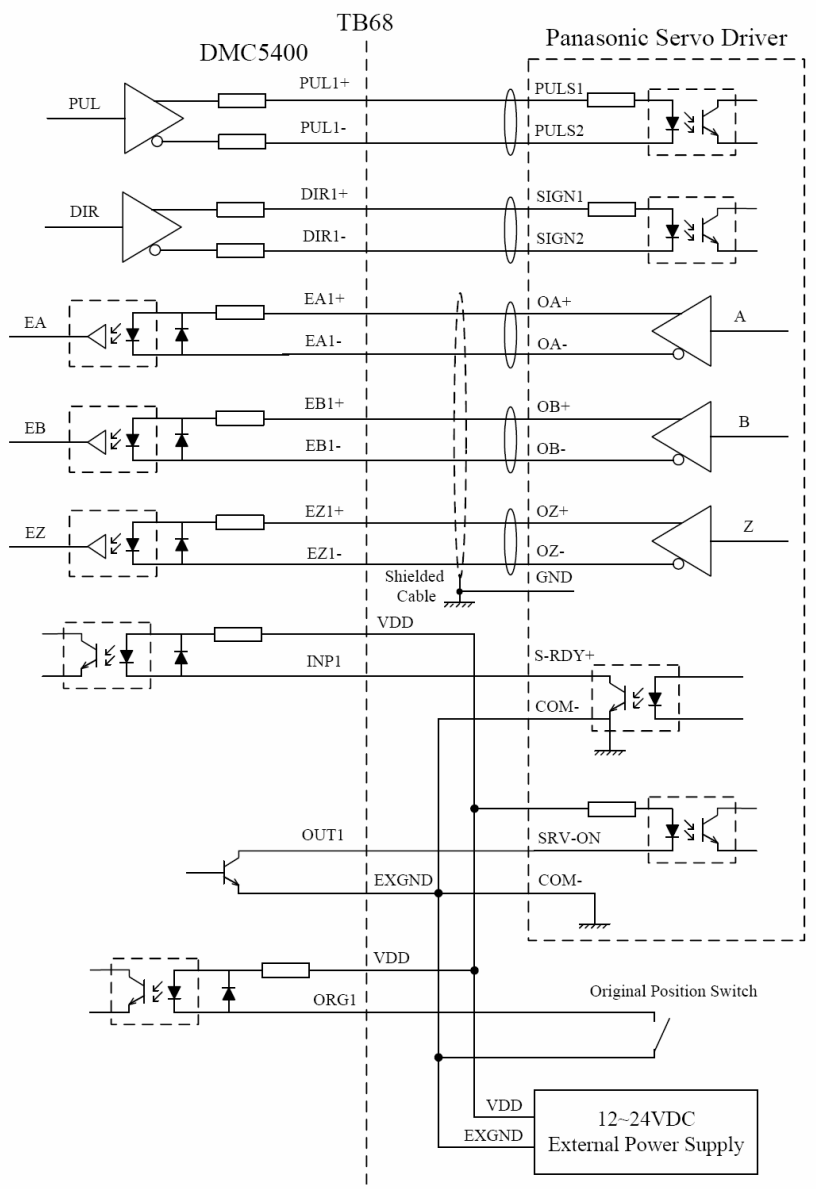


Figure 5.3: Connection to servo driver

Please consult user's manual for the driver and this manual when wiring the system. Welcome to contact us at tech@leadshine.com, if you have any question or meet any problem.

Chapter 6 Motion5000 Demo Software

The Motion5000 Demo software, a Microsoft Windows based software is equipped with the DMC5400 card for supporting application development. The Motion5000 Demo software is very helpful for verifying and testing a motion control system during the design phase of a project.

You will see the default window, namely Motion Configuration Window like Figure6.1 after running the Motion5000 demo software. The Motion5000 includes 4 main windows. They are Motion Configuration Window, I/O Status/Control Window, Controller Configuration Window and Function Testing Window. There are four buttons on the Main Toolbar  which can be used to switch these four windows.

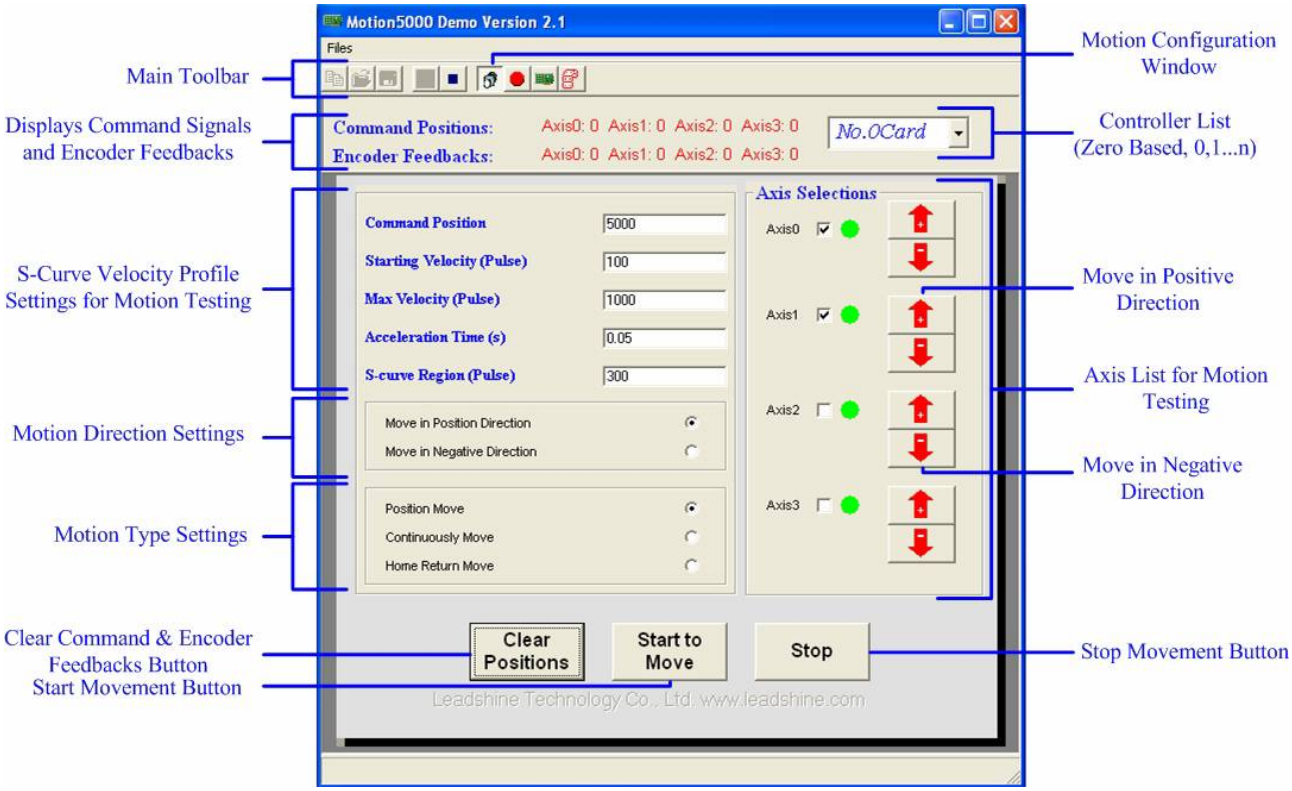


Figure 6.1: Motion5000 demo software (the Motion Configuration Window, the default window)

Main Toolbar

1. New File Button. It can be used to open a new program file, and it's only active in the Function Testing Window.
2. Open File Button. It can be used to open an existed program file, and it's only active in the Function Testing Window.
3. Save File Button. It can be used to save a program file, and it's only active in the Function Testing Window.
4. Run Program Button. It can be used to run a program file, and it's only active in the Function Testing Window.
5. Emergency Stop Button. It can be used to stop a running a program file.

6. Motion Configuration Window Button. It can be used to switch back to the Motion Configuration Window (the default window) when in other windows.
7. I/O Status/Control Window Button. It can be used to switch to the I/O Status/Control Window.
8. Controller Configuration Window Button. It can be used to switch to the Controller Configuration Window.
9. Function Testing Window Button. It can be used to switch to the Function Testing Window.

Command Signal and Encoder Signal Display Labels

The Command Signal and Encoder Signal Display Labels display current command signals and encoder signals of all axes in all windows. The unit is pulse.

Controller List

The Controller List will list all controllers in the current system, and the user can select which controller is going to be operated in the Motion5000. Zero based, No. 0 Card, No.1 Card, ···, No.n Card.

Motion Configuration Window

In the Motion Configuration Window, the user can configure some key parameters for a motion testing, such as S-Curve velocity profile, motion direction, motion type, which axis/axes to move, and etc. And can start a motion testing, stop a motion testing and clear command & encoder counters. See Figure 6.1.

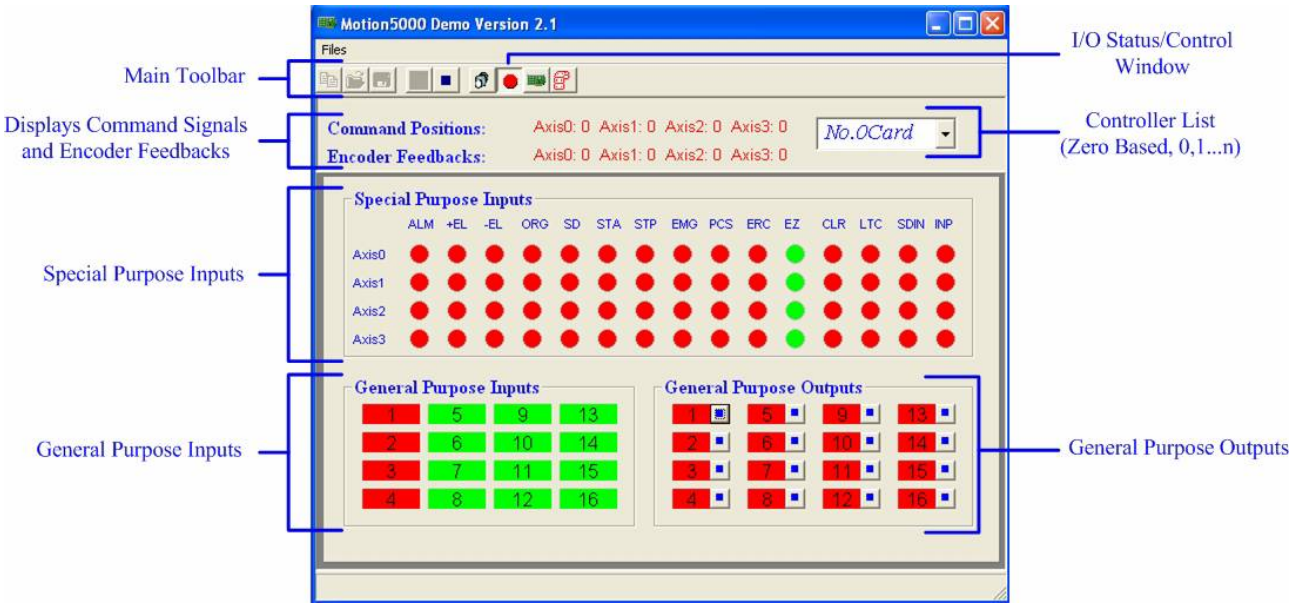


Figure 6.2: I/O Status/Control Window

I/O Status/Control Window

In the I/O Status/Control Window, the user can see the current status of special purpose inputs, general purpose inputs and general purpose outputs. Also, the user can use the small buttons on the right side of outputs to change the status of outputs. Green means ON, and Red means OFF. See Figure 6.2.

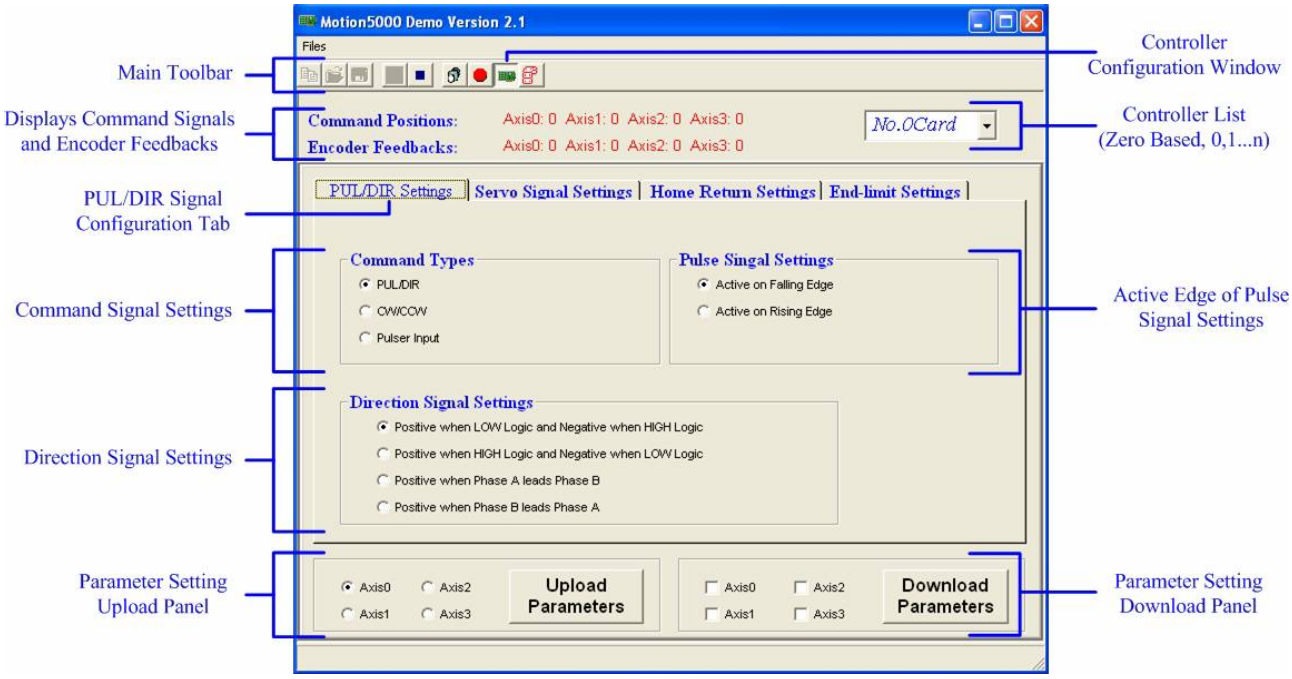


Figure 6.3: PUL/DIR signal configuration tab (the Controller Configuration Window)

PUL/DIR Signal Configuration Tab (Controller Configuration Window)

In the PUL/DIR signal configuration tab of the Controller Configuration Window, the user can configure pulse signals and direction signals of all axes.

1. Select appropriate **Command Signal Settings**

   a. Select **PUL/DIR** means select PUL/DIR (Pulse/Direction) mode.
   b. Select **CW/CCW** means select CW/CCW (clock wise/counter clock wise) mode.
   c. Select **Pulser Input** means select pulser input mode.

2. Select appropriate **Pulse Signal Settings**

   a. Select **Active on Falling Edge** means the active edge of pulse signal is falling edge.
   b. Select **Active on Rising Edge** means the active edge of pulse signal is rising edge.

3. Select appropriate **Direction Signal Settings**

   a. Select **Positive when LOW Logic and Negative when HIGH Logic** means the pulse counter will increases when direction signal is at LOW level and will decreases when direction signal is at HIGH level.

   b. Select **Positive when HIGH Logic and Negative when LOW Logic** means the pulse counter will increases when direction signal is at HIGH level and will decreases when direction signal is at LOW level.

   c. Select **Positive when Phase A leads Phase B** means the pulse counter will increases when the controller receives pulse input signal from A phase input port and will decreases when the controller receives pulse input signal from B phase input port. Only active when select **Pulser Input** in Command Types panel.

   d. Select **Positive when Phase B leads Phase A** means the pulse counter will increases when the controller receives pulse input signal from B phase input port and will decreases when the controller receives pulse input signal from A phase input port. Only active when select **Pulser Input** in Command Types panel.

See more information about PUL/DIR configuration and **d5400_set_pulse_outmode** function descriptions in

"Software Manual for the DMC5400 Motion Controller Motion Controller".

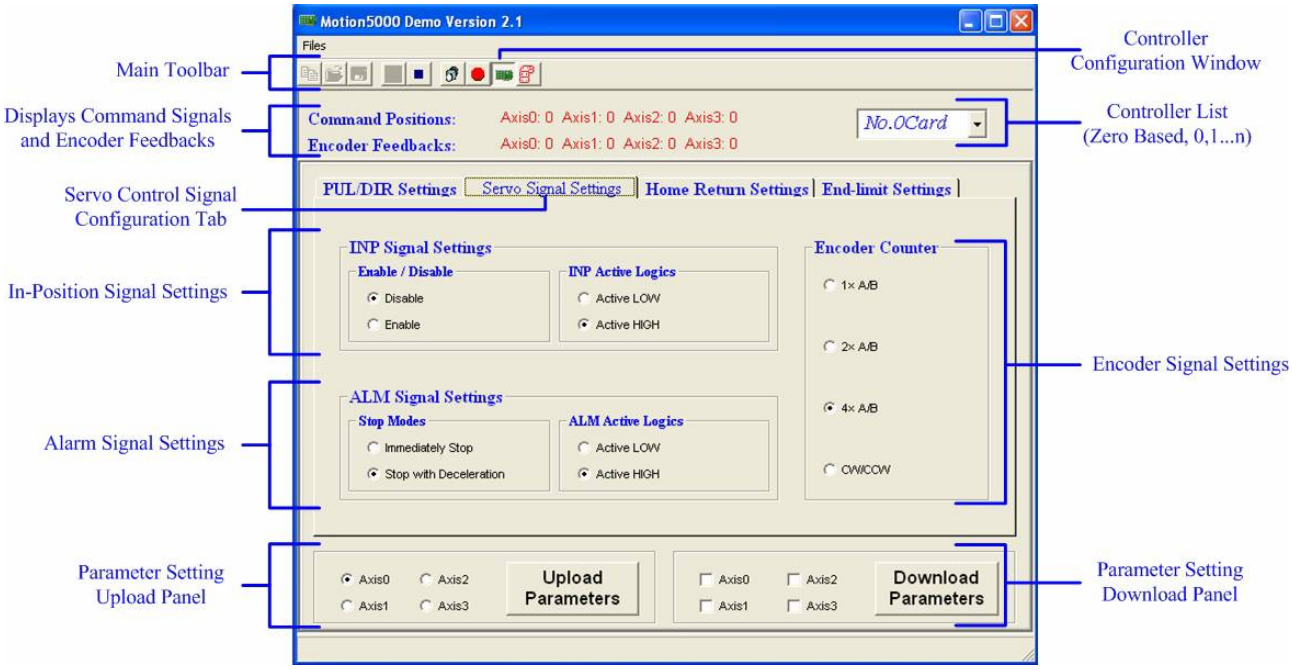


Figure 6.4: Servo control signal configuration tab (the Controller Configuration Window)

Servo Control Signal Configuration Tab (Controller Configuration Window)

In the Servo Control signal configuration tab of the Controller Configuration Window, the user can configure in-position signals, alarm signals and encoder signals of all axes.

1. Select appropriate **INP Signal Settings**

a. Select **Disable** in INP signal panel means disable In-Position feedback function, and the INP input port can be used as a general purpose input when disable In-Position feedback function.

b. Select **Enable** in INP signal panel means enable In-Position feedback function. In this situation, the motion status flag, namely the result from the **d5400_check_done** function has to wait for INP to be active before turning into 1(motion stop status flag), even the controller has stopped output pulses actually.

c. Select **Active LOW** in INP signal panel means the active logic level of the In-Position signal is LOW level.

d. Select **Active HIGH** in INP signal panel means the active logic level of the In-Position signal is High level.

2. Select appropriate **Alarm Signal Settings**

a. Select **Immediately Stop** in ALM signal panel means the controller stops output pulse command signals immediately when the ALM signals are active.

b. Select **Stop with Deceleration** in ALM signal panel means the output PUL signals will decelerate at the deceleration values specified by velocity profile setting functions when the ALM signals are active.

c. Select **Active LOW** in ALM signal panel means the active logic level of the Alarm signal is LOW level.

d. Select **Active HIGH** in ALM signal panel means the active logic level of the Alarm signal is High level.

3. Select appropriate **Encoder Counter Settings**

a. Select 1×**A/B** means count increments once every four quad states, ×1 A/B

b. Select 2×**A/B** means count increments once every two quad states, ×2 A/B

c. Select 4×**A/B** means count increments once every quad state, ×4 A/B

d. Select **CW/CCW** means pulse from EA causes the counter to count up, whereas pulse from EB causes the

counter to count down.

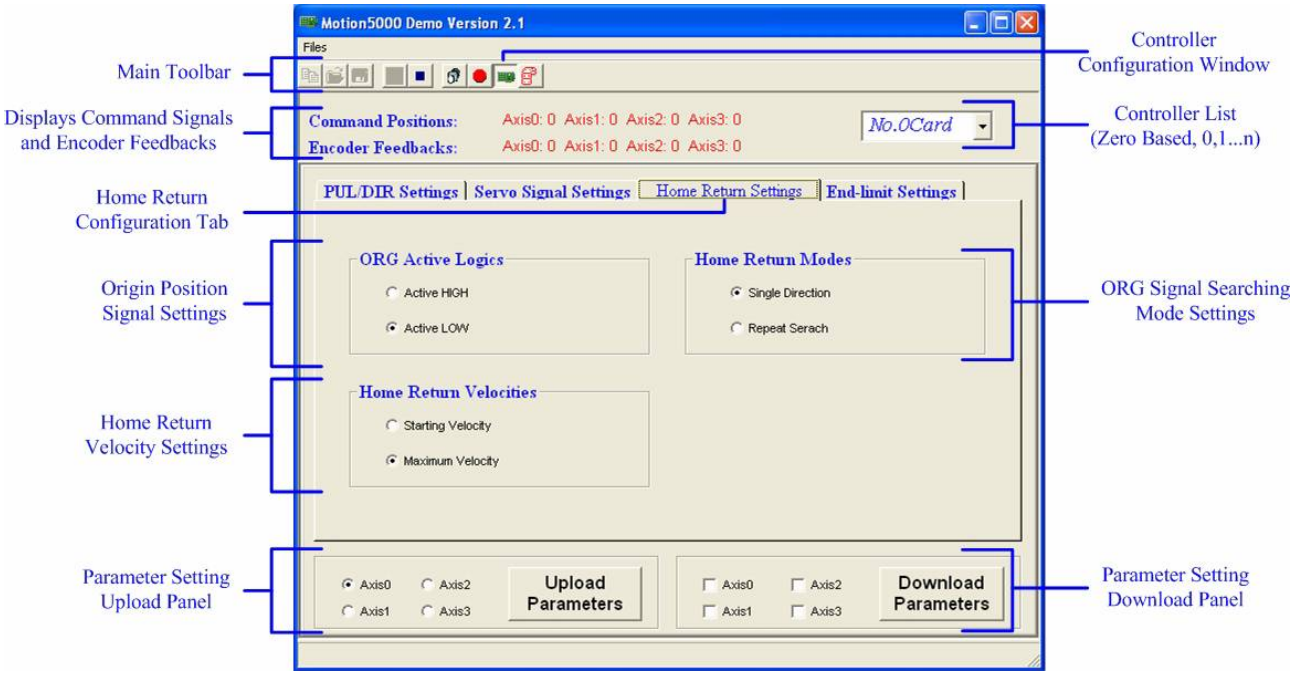


Figure 6.5: Home return configuration tab (the Controller Configuration Window)

Home Return Configuration Tab (Controller Configuration Window)

In the Home Return Configuration Tab of the Controller Configuration Window, the user can configure origin position signals, home return speed for searching origin position signals and searching origin position modes of all axes.

1. Select appropriate **ORG Active Logics**

a. Select **Active HIGH** in ORG Active Logics panel means the effective logic level of the origin position signal is High level.

b. Select **Active LOW** in ORG Active Logics panel means the effective logic level of the origin position signal is LOW level.

2. Select appropriate **Home Return Velocity Settings**

a. Select **Starting Velocity** in Home Return Velocity panel means the controller will search origin position signals at the Starting Velocity specified by velocity profile setting functions.

b. Select **Maximum Velocity** in Home Return Velocity panel means the controller will search origin position signals at the Maximum Velocity specified by velocity profile setting functions.

3. Select appropriate **ORG Signal Searching Mode Settings**

a. Select **Single Direction** in Home Return Modes panel means the controller will stop output pulses once it receives the origin position signals.

b. Select **Repeat Search** in Home Return Modes panel means the controller will return back for a litter distance when it receives the origin position signals at the Starting Velocity specified by velocity profile setting functions, and then search the origin position signals again at the Starting Velocity values.

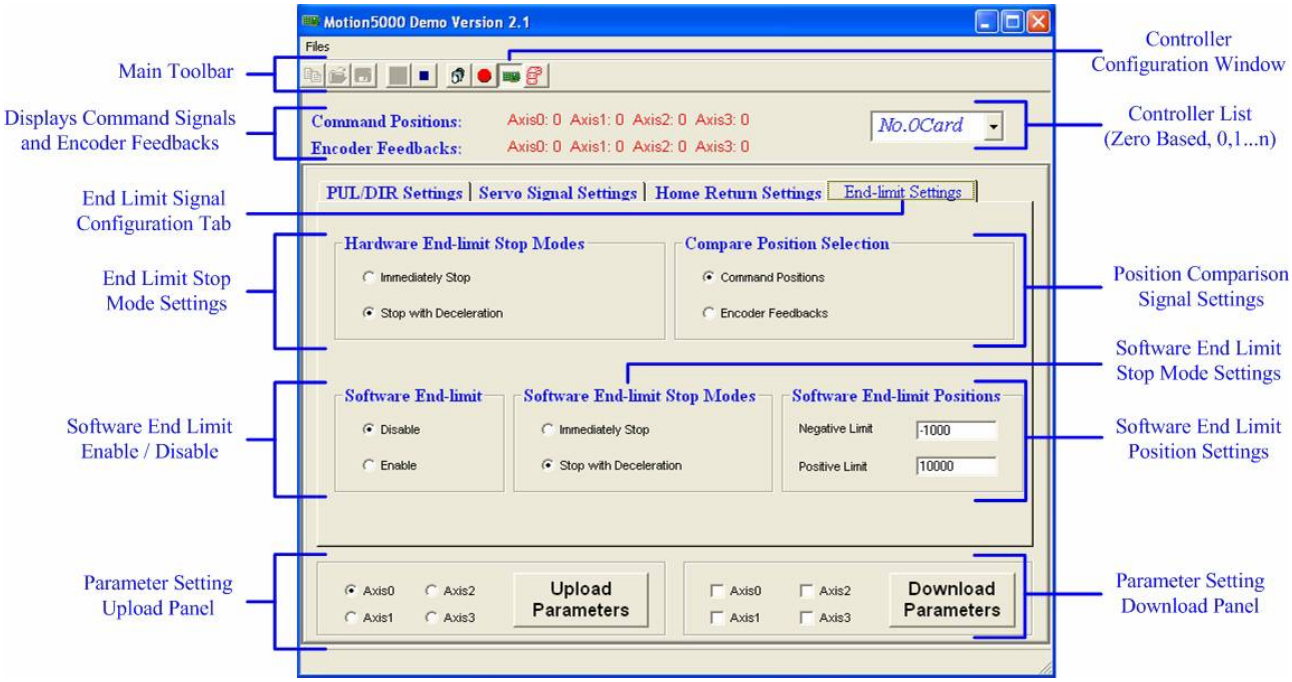


Figure 6.6: End limit signal configuration tab (the Controller Configuration Window)

End Limit Signal Configuration Tab (Controller Configuration Window)

In the End Limit Signal Configuration Tab of the Controller Configuration Window, the user can configure end limit stop mode, position comparison signal and software limit of all axes.

1. Select appropriate **End Limit Stop Mode Signal Settings**

a. Select **Immediately Stop** in Hardware End-limit Stop Modes panel means the controller will stop output pulse command signals immediately when the EL signals are active.

b. Select **Stop with Deceleration** in Hardware End-limit Stop Modes panel means the output pulse signals will decelerate at the deceleration values specified by velocity profile setting functions when the EL signals are active.

2. Select appropriate **Position Comparison Signal Settings**

a. Select **Command Positions** in Compare Position Selections panel means the controller will compare command positions to software limit position settings to detect whether the system has reaches the software limits or not.

b. Select **Encoder Feedbacks** in Compare Position Selections panel means the controller will compare encoder feedbacks to software limit position settings to detect whether the system has reaches the software limits or not.

3. Select appropriate **Software Limit Enable/Disable Settings**

a. Select **Disable** in Software End Limit panel means disable the software limit function.
b. Select **Enable** in Software End Limit panel means enable the software limit function.

4. Select appropriate **Software End Limit Stop Mode Settings**

a. Select **Immediately Stop** in Software End Limit Stop Modes panel means the controller will stop output pulse command signals immediately when negative overtravel or positive overtravel appears.

b. Select **Stop with Deceleration** in Software End Limit Stop Modes panel means the output pulse signals will decelerate at the deceleration values specified by velocity profile setting functions when negative overtravel or

positive overtravel appears.

5. Select appropriate **Software Limit Position Settings**

a. **Negative Limit** in Software End Limit Positions panel means the software limit position in negative direction.

b. **Positive Limit** in Software End Limit Positions panel means the software limit position in positive direction.

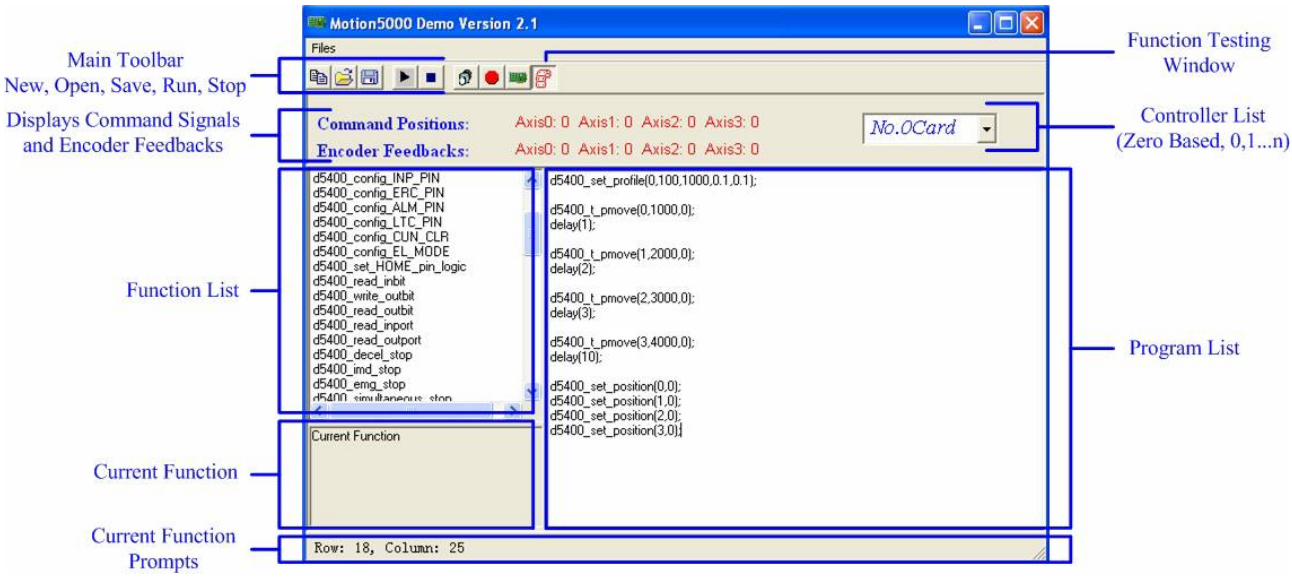


Figure 6.7: Function Testing Window

Function Testing Window

In the Function Testing Window, the user can test most functions of the DMC5400 except the functions which have array variables.

1. **Function List**

Function List Panel shows most API functions of the DMC5400 to help user to program.

2. **Current Function**

Current Function Panel shows the function that the user selected or the closest function that match the user enters.

3. **Current Function Prompts**

Current Function Prompts Panel shows the prompts for the current function.

4. **Program List**

Program List shows the current program, and the user can edit the program in this panel. The user can run the program when finish programming or stop a running program with the button on the Main Toolbar.

Refer to "**Software Manual for the DMC5400 Motion Controller Motion Controller**" for more information about API functions of the DMC5400.

Chapter 7 Order Information

Besides this ***User's Manual*** (Electronic Edition), the package also includes the following items:

- DMC5400 4-axis Servo/Stepping Motion Control Card (1 piece)

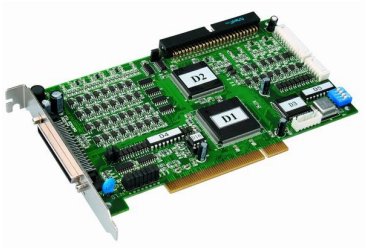


Figure 7.1: The DMC5400

- TB68 Terminal Board (1 piece)

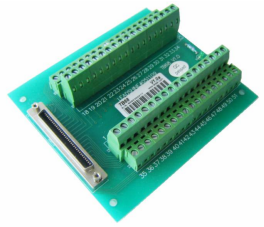


Figure 7.2: The TB68 terminal board

- Cable68-2.0 (1 piece)

Figure 7.3: The Cable68-2.0

- TB50 Terminal Board (optional)

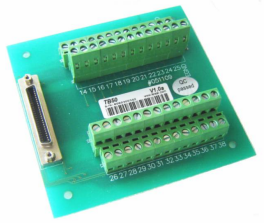


Figure 7.4: The TB50 Terminal Board

- Cable50-2.0 (optional)

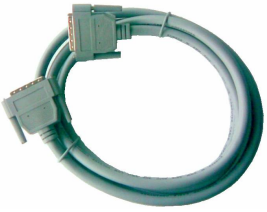


Figure 7.5: The Cable50-2.0

- 50-pin IDE to 50-pin MCR connector with bracket (Optional)

Figure 7.6: The 50-pin IDE to 50-pin MCR connector with bracket

- Leadshine All-in-one CD

If no Leadshine All-in-one CD was distributed with the DMC5400, then all materials are available on the internet, and the customers can download them from Leadshine's website at: www.leadshine.com.

- Connect the DMC5400 to the terminal boards.

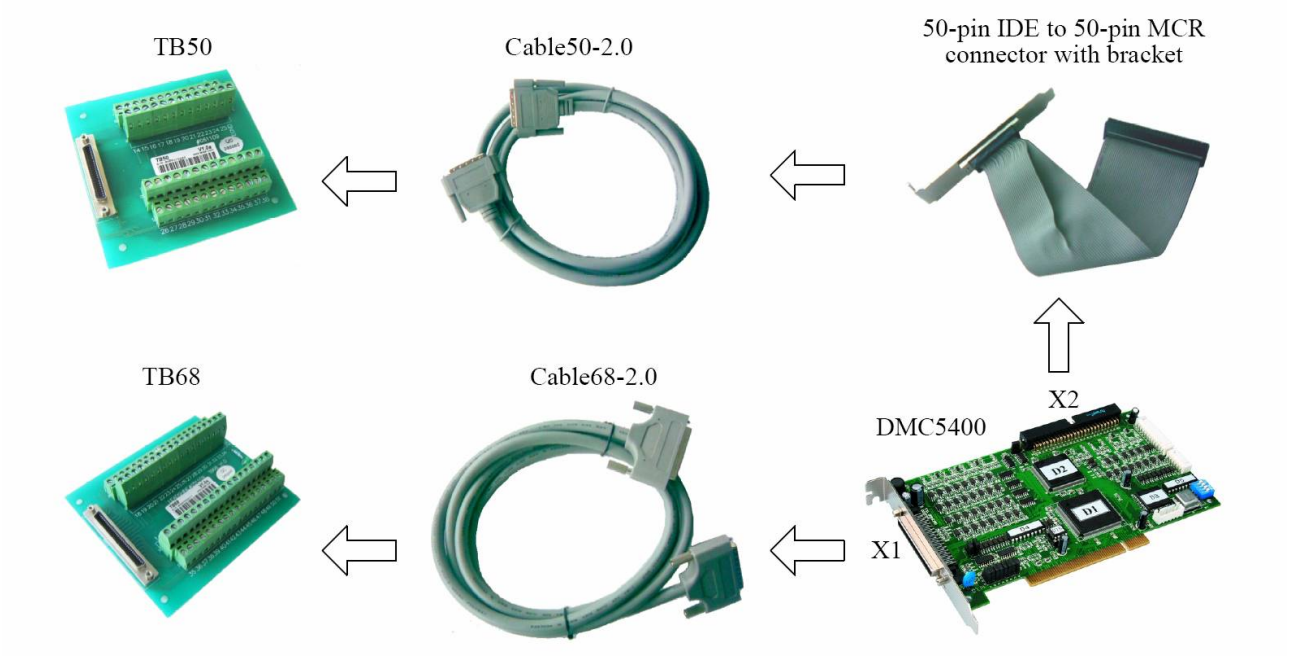


Figure 7.7: Connect the DMC5400 to the terminal boards

If any of these items is missing or damaged, contact the dealer from whom you purchased the product or Leadshine.

Chapter 8 Troubleshooting

Many of the problems that affect motion control systems can be traced to software errors, mistake in wiring, or electrical noise. In the event that your DMC5400 doesn't operate properly, the first step is to identify whether the problem is software or hardware in nature. The next step is to isolate the system component that is causing the problem. As part of this process you may have to disconnect the individual components that make up your system and verify that they operate independently. It is important to document each step in the troubleshooting process. You may need this documentation to refer back to at a later date, and these details will greatly assist our Technical Support staff in determining the problem should you need assistance.

If the DMC5400 still can't operate properly after following the troubleshooting form, please contact Leadshine Technical Support staff at: tech@leadshine.com.

Table 6-1: Troubleshooting form

Symptoms	Possible Problems
The host computer can't find the DMC5400.	1. The driver has not been installed correctly. Remove the driver and uninstall the DMC5400, then reinstall the driver according with "**Driver installation**" section in "Software Manual for the DMC5400 Motion Controller". 2. The DMC5400 has not been installed in PCI slot correctly. Make sure the DMC5400 is installed in a good PCI slot; clear the gold fingers and PCI slot if necessary and then reinstall the DMC5400. 3. Conflict with the computer mainboard or other hardware. 4. The DMC5400 failure; contact Leadshine for help or repair.
Can't communicate with the application software or can't call API functions	1. The host computer can't find the DMC5400, see above contents. 2. The DMC5400 has not been initialized before calling other functions. Please call d5400_board_init function to initialize the DMC5400 before calling other functions. 3. The DMC5400 failure; contact Leadshine for help or repair.
Motor doesn't move.	1. Wrong wiring. Wiring correctly and fix wires firmly. 2. Motor driver or motor failure. 3. The PUL/DIR control signal type has not been correctly set. See descriptions about J1-J8 jumpers and **d5400_set_pulse_outmode** function. 4. No PUL/DIR control signal output from the DMC5400, please check the J9&J10 setting and the power supply for PUL/DIR control signals. 5. The emergency stop signal EMG is effective. Please check the EMG signal logic setting (J11) and the EMG signal. 6. The alarm signal ALM is effective. Please check the ALM signal logic setting and the ALM signal. 7. The PUL/DIR control signal is too weak causing by too large current limit resistor in series with the driver. 8. The DMC5400 failure; contact Leadshine for help or repair.

Erratic motor motion or inaccuracy positioning	1. The PUL/DIR control signal is too weak causing by too large current limit resistor in series with the driver. 2. The PUL/DIR control signal is interfered. 3. Wrong motor connection. 4. Motor broken or something wrong with motor coil. 5. Current setting of the motor driver is too small. 6. The DMC5400 failure; contact Leadshine for help or repair.
Can't count correctly.	1. The encoder signal is not a TTL signal. Use an encoder whose signals are TTL compatible. 2. Encoder wiring is wrong. Wiring encoder correctly and fix wires firmly. 3. Encoder has not been powered correctly. Check the power supply for encoder. 4. The feedback signals are corrupted by noise signal (s). Please increase noise immunity of feedback signals, such as using shielded cable(s) and good grounding. 5. Called a wrong function or right function but with wrong parameter(s). Please call the correct function with correct parameter(s). 6. Encoder failure. 7. The DMC5400 failure; contact Leadshine for help or repair.
Fail to capture counter value or can but with poor reliability.	1. Wrong wiring. Wiring correctly and fix wires firmly. 2. Called a wrong function or right function but with wrong parameter(s). Please call the correct function with correct parameter(s). 3. Trigger signal is a dither signal. 4. The DMC5400 failure; contact Leadshine for help or repair.
Fail to read input signal(s).	1. Wrong wiring. Wiring correctly and fix wires firmly. 2. Called a wrong function or right function but with wrong parameter(s). Please call the correct function with correct parameter(s). 3. Input device(s)/sensor(s) failure. 4. Input signal is interfered. 5. The DMC5400 failure; contact Leadshine for help or repair.
Fail to control output port(s).	1. Wrong wiring. Wiring correctly and fix wires firmly. 2. Called a wrong function or right function but with wrong parameter(s). Please call the correct function with correct parameter(s). 3. The DMC5400 failure; contact Leadshine for help or repair.

Appendix

Encoder Input Signal:

Encoder Input Signal	Input Ports		EAn+/-, EBn+/-, EZn+/-	
	Encoder Counting		Up/down pulse	
			A/B phase pulse (X1,X2,X4)	
	Input Frequency (Max.)		1MHz (Before X4)	
	Encoder Supply	5V, then R=0Ω	Low Level: 0.8 VDC (Max)	High Level: 2.4 VDC (Min)
		12V, then R=1.8K	Low Level: 3.0 VDC (Max)	High Level: 10.0 VDC (Min)
		24V, then R=4.7K	Low Level: 3.0 VDC (Max)	High Level: 12.0 VDC (Min)
	Protection		2500VDC Optically Isolated	

External Pulse Input:

External Signal Drive	Input Ports	PA, PB	
	Input Frequency (Max.)	100Hz	
	Signal Type(TTL)	Low Level	0.8V (Max)
		High Level	2.4V (Min)
	Devices	Manual Pulser, JOG Devices, and etc.	

Digital Input and Output:

Input	End Limiting Signal	EL+, EL-	
	Slow Down and Origin Position Signal	SD,ORG	
	Servo Status Feedback	ALM(Alarm), INP(In Position)	
	Emergency Stop	EMG	
	Input Frequency	4KHz	
	Number of Input	16	
	Input Current	10VDC	1.70mA(Typical)
		12VDC	2.10mA(Typical)
		24VDC	4.40mA(Typical)
		48VDC	9.00mA(Typical)
		50VDC	9.40mA(Typical)
	Protection	2500VDC Optically Isolated and RC Filter	
Output	Number of Output	16	
	Output Voltage Capacity	Open Collector 5～40VDC	
	Output Current	60mA(Max)/channel	
	Protection	2500VDC Optically Isolated and RC Filter	

Electromagnetic Compatibility

Standards to which Conformity is Declared: EN61000-6-2:2005

EN55011:1997+A1:1999+A2:2002

EMTEK Access to the World

ilac-MRA CNAS 检测 CNAS L2291

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www.emtek.com.cn

Certificate of Conformity

NO.: E0708116E

The following products have been tested by us with the listed standards and found in conformity with the council EMC directive 2004/108/EC. It is possible to use CE marking to demonstrate the conformity with this EMC Directive.

Applicant	:	SHENZHEN LEADTECH CONTROL TECHNOLOGY CO., LTD.
Address	:	Floor 3, Block 2, Nanyou Tian'an Industrial Park, Nanshan District Shenzhen, China
Manufacturer	:	SHENZHEN LEADTECH CONTROL TECHNOLOGY CO., LTD.
Address	:	Floor 3, Block 2, Nanyou Tian'an Industrial Park, Nanshan District Shenzhen, China
EUT	:	Motion Control Card
M/N	:	DMC5400
Test Standards	:	EN 55011:1997+A1: 1999 +A2: 2002 EN61000-6-2: 2005

CE

EMTEK SHENZHEN EMTEK CO.,LTD

(Manager)

August 30, 2007

The test report was carried out from the submitted type samples of a product in conformity with the specification of the respective standards. The certificate holder has the right to fix the CE-mark for EMC directive on the product complying with the inspection samples.

Figure A1: CE certificate