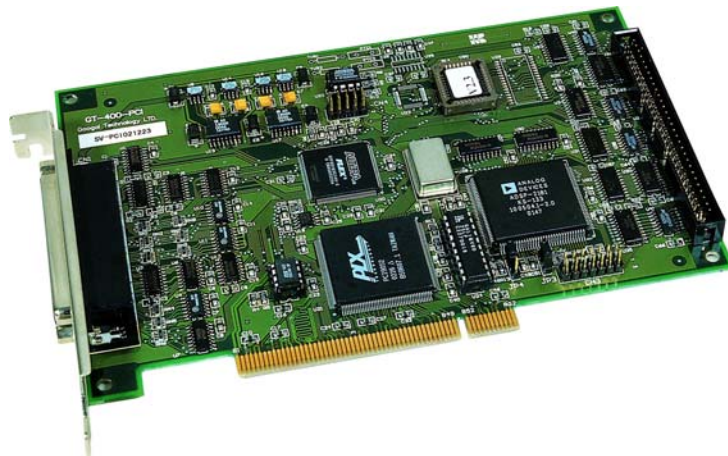




GOOGOL TECHNOLOGY (HK) LTD

User's Guide For GE Series Motion Controller



Version 1.0: 16 Dec., 2004

Part Number: GE-X00-M-E-10-1216-001

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注意

Warning

Machinery in motion can be dangerous! It is the responsibility of the user to design effective error handling and safety protection as part of the machinery. Googol Technology shall not be liable or responsible for any incidental or consequential damages.

Foreword

Thank you for choosing Googol Technology motion controller

We will help you set up your own control system, by providing our first-class motion controller, complete with after-sale service, and technical support.

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Please visit our website at <http://www.googoltech.com> for more information about our company and products.

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Use of This User's Guide

This guide helps the user to understand the basic architecture of GE series of motion controllers, and to learn how to install the motion controller, wire the controller with the motor control system and conduct the basic debugging of the motion control system.

Users

This guide is suitable to those engineering personnel who are having the basic knowledge of hardware and good understanding of motion control.

Main Topics

This guide consists of three chapters and some appendixes.

Chapter One “Overview” introduces GE series of motion controllers and how to implement the motor control system. Chapter Two “Quick Start” explains how to install the controller card, configure components and install the driver program. Chapter Three “Test and Tune the System” introduces how to use the supplied software controller to tune the system. The appendixes provide the usage description of technical parameters of controller, setting position, velocity and acceleration, typical wiring, troubleshooting and use of GE Commander, the software provided.

Related Documents

For the programming of GE series motion controller, please refer to "**Programming Manual of GE Series Motion Controller**"

provided together with the product.

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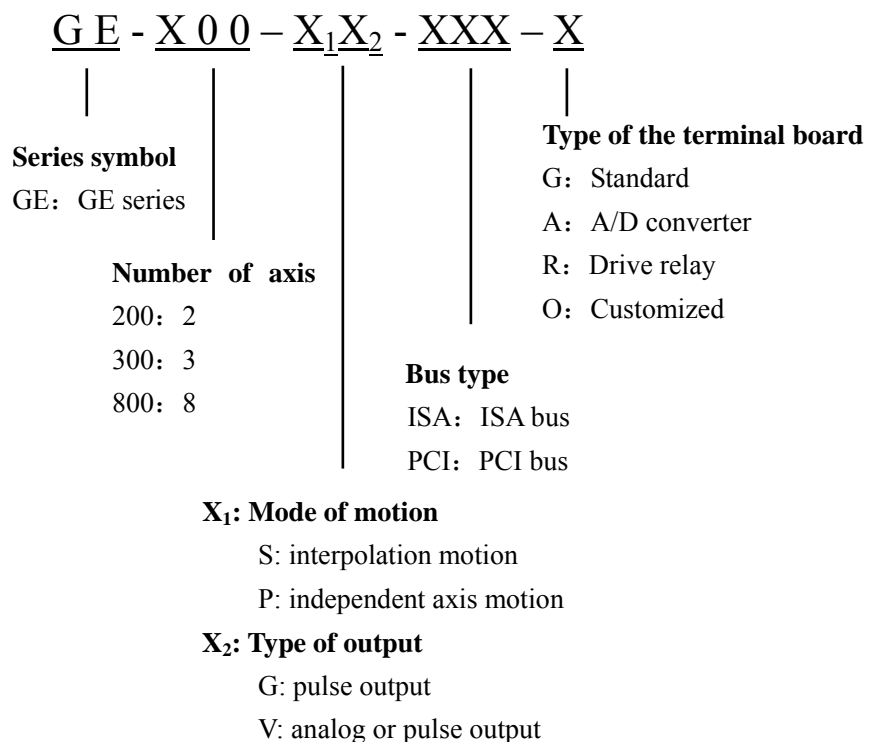
Chapter 1: Overview

1.1 Introduction

GE series motion controllers consists of GE-X00-PX which can control at most eight axes at synchronous, and GE-X00-SX which can realize interpolation motion at most three axes. The cores of these controllers consist of DSP and FPGA, which process high-performance control computation. GE series motion controllers find applications in a wide range of industries including robotics, CNC machinery, carpentry machinery, printing machinery, assembly lines, processing equipments in electronics, laser processing equipments.

GE motion controller uses PC as its host, and offers two types of bus in products - ISA and PCI bus. For either kind of product, RS232 serial communication and PC104 interface socket are optional to facilitate users in configuring their systems. The C function library and Windows DLL are also provided to accomplish more complicated control functions. User may combine these control functions with the data processing, user interface and other application modules as required by some specific control system, to implement a control system of specific application requirements. To operate the motion controller, user is required to have the programming experience with C language or DLL in Windows environment.

1.2 Terminology of GE Series Motion Controllers



1.3 Function List of GE Series Motion Controllers

✓ Included

– Excluded

* Optional

Features		SV	SG	PV	PG
Bus	ISA/PC104	✓	✓	✓	✓
	PCI	✓	✓	*	*
	RS232	*	*	*	*
Program memory	64K Byte ROM	*	*	*	*
	512K Byte SRAM	*	*	*	*
Sampling rate	200us (invariable) GE-800-PX: 400us (invariable)	✓	✓	✓	✓
Analog output	Scale: -10V~+10V	✓	–	✓	–
Pulse output	2/3/4/8 axes	✓	✓	✓	✓
Encoder channel	2/3/4/8 channels of quadrature incremental encoder. Max. Counting frequency: 8MHz (GE-X00-PX); 4MHz (GE-X00-SX).	✓	✓	✓	✓
Auxiliary encoder	1 channel of quadrature incremental encoder. Max. Counting frequency: 4MHz.	✓	✓	–	–
Limit switch	Positive and negative limit switch of each axis	✓	✓	✓	✓
Home switch	1 channel of home switch of each axis	✓	✓	✓	✓
Driver alarm signal	1 channel of driver alarm signal of each axis	✓	✓	✓	✓
Driver enable signal	1 channel of driver enable signal of each axis	✓	✓	✓	✓
Driver reset signal	1 channel of driver reset signal of each axis	✓	✓	✓	✓
Uncommitted digital input	16 channels	✓	✓	✓	✓
Uncommitted digital output	16 channels	✓	✓	✓	✓
A/D	8 channels	*	*	*	*
Watchdog	Monitor DSP work status in real time.	✓	✓	✓	✓
linear and circular interpolation	On-board	✓	✓	–	–
Independent axis motion	S-curve, T-curve, jogging motion and electronic gear motion modes	–	–	✓	✓
Program memory	Motion code compiling	✓	✓	–	–

Features		SV	SG	PV	PG
Filter	PID + Velocity feed-forward + Acceleration feed-forward	√	-	√	-
Hardware capture	Index signal of encoder	√	√	√	√
	Home switch signal	√	√	√	√
Safety	Specify following error limit.	√	-	√	-
	Specify Controller output limit.	√	-	√	-

1.4 Configuration of Motion Control System

1. Motion controller.
2. PC with ISA or PCI or PC104
3. Servo motor with incremental encoder or stepper motor.
4. Motor driver matched with motor
5. +12V to +24V DV power (for terminal board)
6. Home switch, positive/negative limit switches (optional as needed).

GE controller works with both AC and DC servo motors.

To control the servo motor:

If GE-X00-XG motion controller is selected, the driver should be set to position control mode. The pulse output mode of the driver and motion controller must be same.

If GE-X00-XV motion controller is selected and the pulse out mode is enabled, the driver should be set position control mode. The pulse output mode of the driver and motion controller must be same.

If GE-X00-XV motion controller is selected and the analog out mode is enabled, the driver should be set velocity control mode. If there is still any question, please consult your motor supplier or contact with us.

To control a stepper motor:

The motion controller provides two kinds of control signals, one is positive/negative pulse signal, and the other is pulse and direction signal. Thus, the controller can be used to work with any stepper motor currently available in the market. When controlling a stepper motor, the control mode is open loop and no encoder is needed. The controller provides channels to read encoder input. GE-X00-XG disables the encoder input by default. If user wants to detect the actual position with the encoder, corresponding command can be called to enable input.

A typical connection of motion control system using GE series motion controller is illustrated in Fig.1-1.

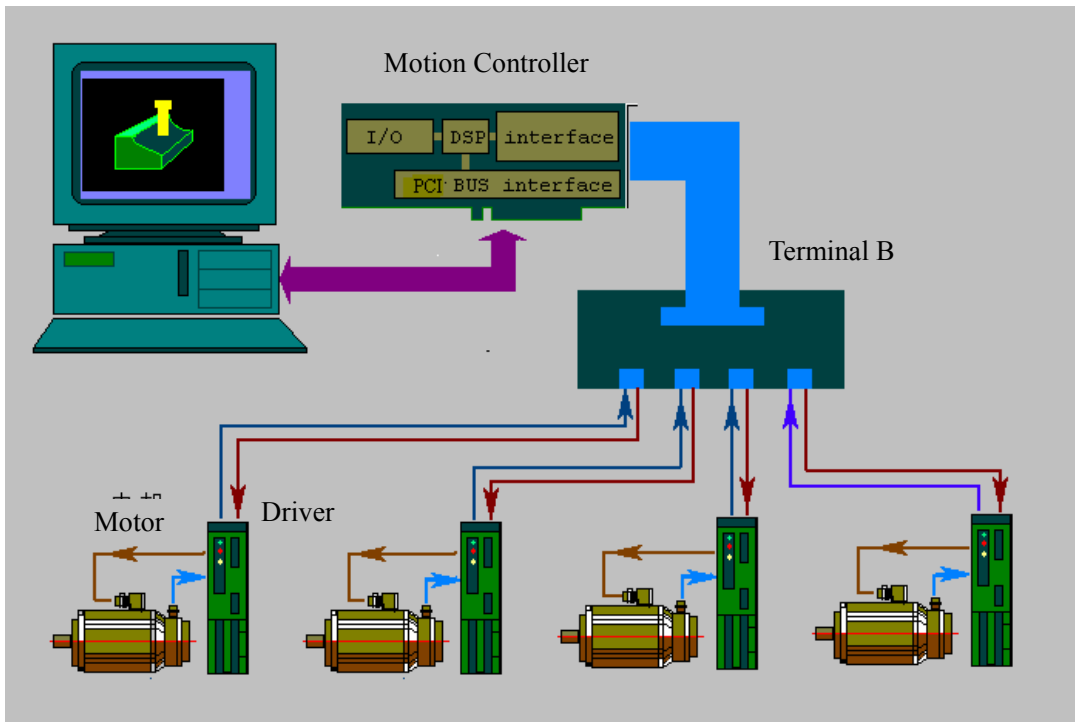


Fig. 1-1 Schematic Diagram of Motion Control system using GE motion controller

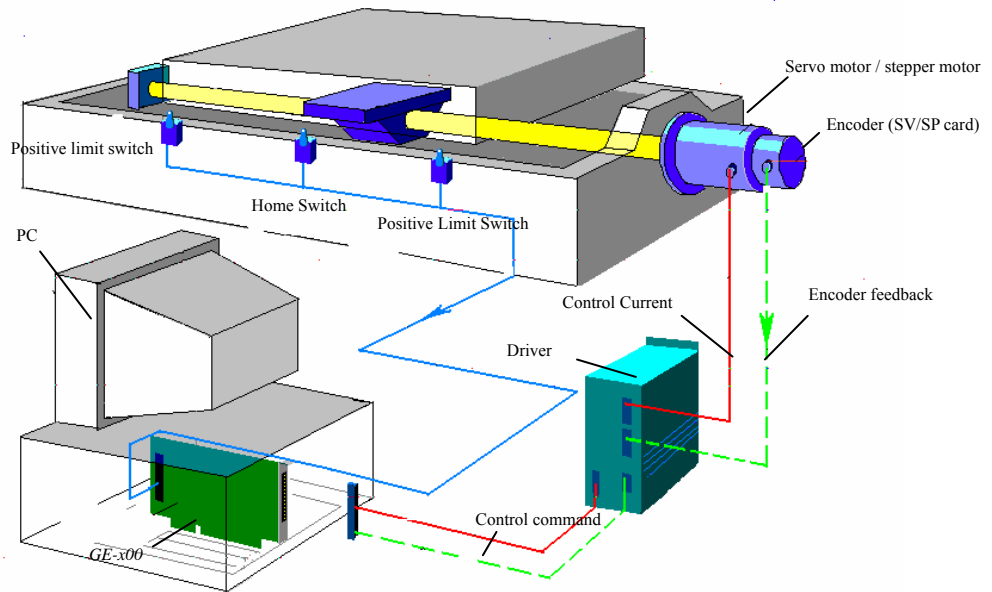



Fig. 1-2 Typical Application of GE Series Motion Controller

Chapter 2: Quick Start

2.1 Open the Package and Check

Before opening the package, please check whether the product type marked on the package is consistent with your purchase. After opening the package, first check whether there is any mechanical damage on the motion controller. Then check carefully whether the accessories are complete. If there is mechanical damage on the controller, or any item is missing in the package, please do not use the product and contact Googol Technology or our distributor immediately.

 注意 Warning	<i>To avoid any electrostatic from damaging the motion controller, please discharge static in your body before touching the controller or inserting/removing the controller to/from a slot of PC.</i>
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List of GE series motion controller:

- GE series motion controller
- accessory board (ACC1)
- terminal board (ACC2)
- 62-pin flat cable

2.2 Layout of GE Series Motion Controller

2.2.1 GE-X00-SX Motion Controller

ISA series GE-X00-SX motion controller is illustrated in Fig. 2-1.

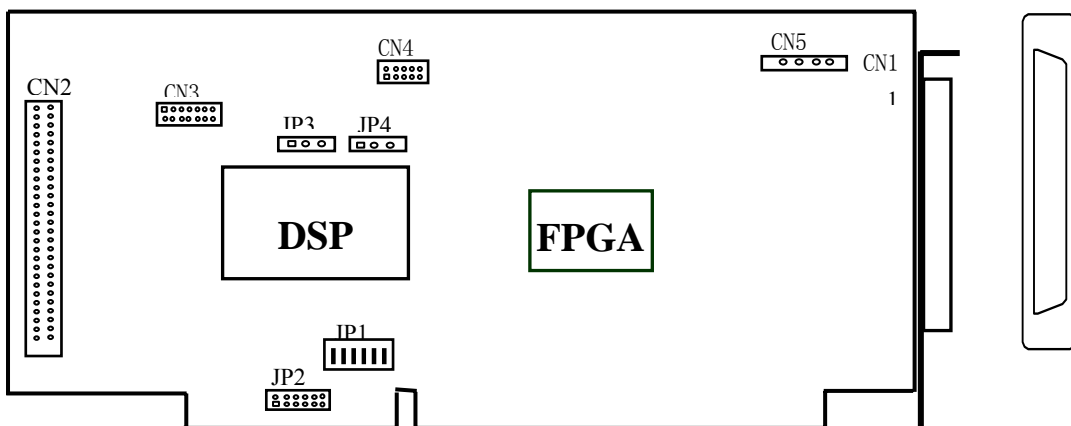


Fig. 2-1 ISA Series GE-X00-SX Motion Controller

PCI series GE-X00-SX motion controller is illustrated in Fig. 2-2.

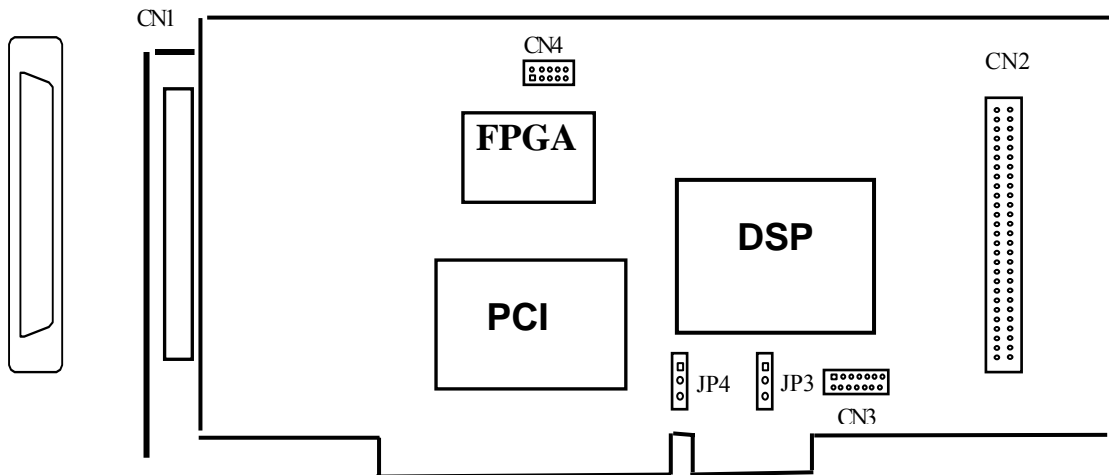


Fig 2-2 PCI Series GE-X00-SX Motion Controller

GE-X00-SX terminal board is illustrated in Fig.2-3:

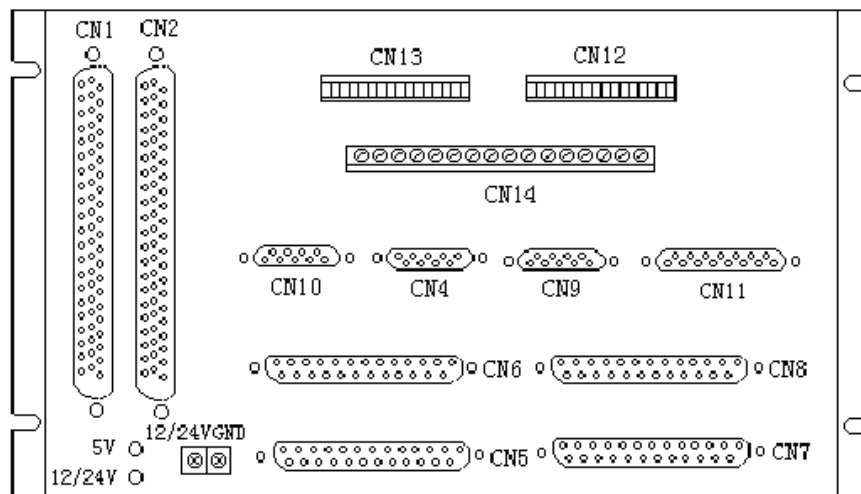


Fig. 2-3 GE-X00-SX terminal board

The definition of each connector in terminal board for GE-X00-SX is illustrated in table 2-1:

Table 2-1 Definitions of Connectors

Definition	Description
CN1	Connect to the motion controller
CN2	Connect to the motion controller
CN5 (CN6, CN7)	Control axis connector
CN8	Reserved
CN9	Reserved
CN10	Auxiliary encoder interface
CN12	Dedicated digital input interface
CN13	Uncommitted digital input interface

CN14	Uncommitted digital output interface
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2.2.2 GE-X00-PX Motion Controller

ISA series GE-X00-SX motion controller is illustrated in Fig. 2-4.

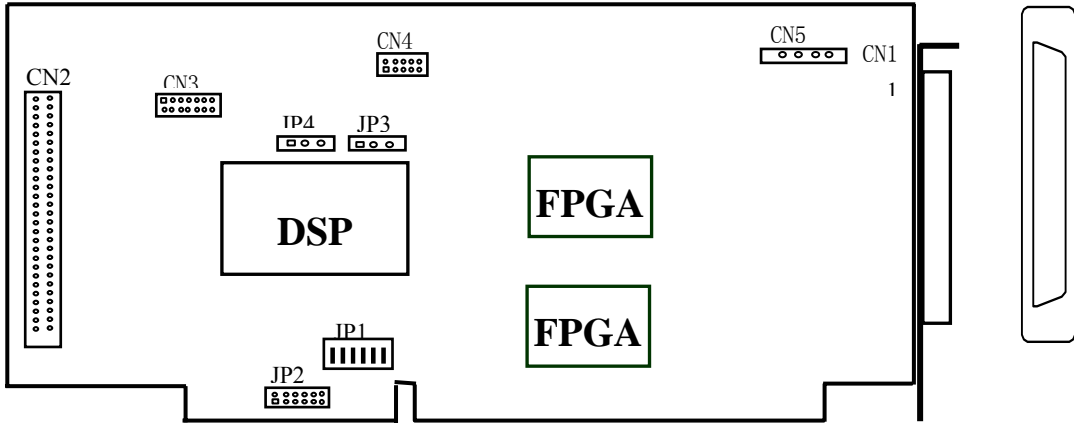


Fig. 2-4 ISA Series GE-X00-PX Motion Controller

GE-X00-PX terminal board is illustrated in Fig.2-5:

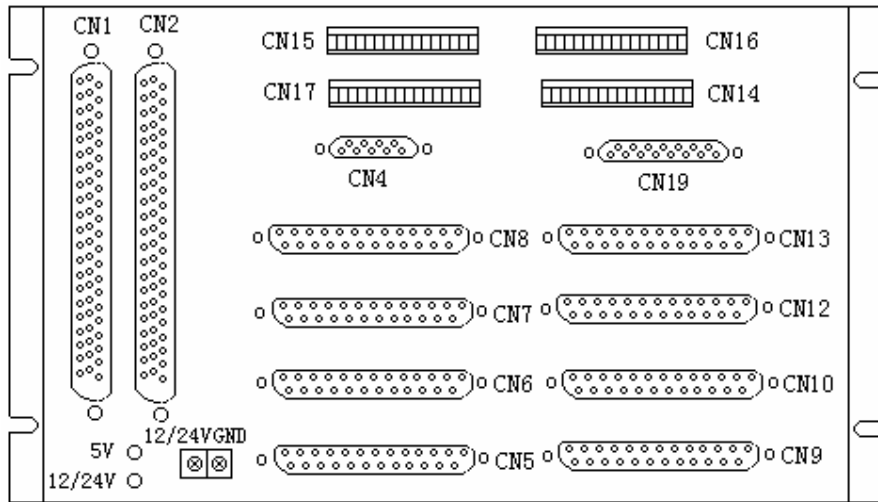


Fig. 2-5 GE-X00-PX terminal board

The definition of each connector in terminal board for GE-X00-SX is illustrated in table 2-2:

Table 2-2 Definitions of Connectors

Definition	Description
CN1	Connect with CN1 of the motion controller
CN2	Connect with CN1 of the motion controller
CN4	RS232 connector
CN5 (CN6, CN7, CN8, CN9, CN12, CN13)	Control axis connector

CN14	Uncommitted digital output connector
CN15	LIMIT signal input connector
CN16	Uncommitted digital input connector
CN17	HOME signal input connector
CN19	Analog input connector

Table 2-3 lists the description of each connector and jumper in GE series motion controller. Please locate their positions and know their functions. The following section on Installation Procedures will describe these connectors and jumpers in details.

Table 2-3 Definitions of Connectors and Jumpers

Definition	Description
JP1	Base address switch (only for ISA/PC104)
JP2	Jumper of IRQ (only for ISA/PC104)
JP3	Jumper of watchdog
JP4	For debugging (not user Jumper)
CN1	Connect with CN1 of the terminal board
CN2	Connect with CN2 of the terminal board
CN3	Debugging port (not for user)
CN4	Debugging port (not for user)
CN5	Connector of power supply (for PC104 modules)

2.3 Installation Procedures

Install the controller according to the following 7 procedures.

[Step 1: Set jumper on motion controller \(only for ISA bus controller. Skip to Step 2 for PCI bus controller\).](#)

[Step 2: Insert the controller into PC.](#)

[Step 3: Install the Windows driver of the controller \(only for Windows environment\).](#)

[Step 4: Establish communication between the host and controller.](#)

[Step 5: Connect the motor with driver.](#)

[Step 6: Connect the controller with terminal board.](#)

[Step 7: Connect the driver and system I/O with terminal board.](#)

2.3.1 Step 1: Set Jumpers on Motion Controller (Only for ISA bus controller).

2.3.1.1 Set base address by Dip switch JP1

To establish communication between the host PC and motion controller, user must select and set the base address of the controller. JP1 is the base address-selecting switch of the motion controller. For its location, please see Fig. 2-1 (GE-X00-SX) or Fig. 2-4 (GE-X00-PX). The factory default base address

of the controller is 0x300 (hex), as shown in Fig. 2-6. From this address, the controller occupies 14 consecutive I/O addresses to communicate with the host PC. Please check the address occupation of the host to avoid conflict on address and the influence on system operation. Table 2-4 is a list for selecting base address Dip switch of the motion controller. Table 2-5 lists the I/O addresses occupied by PC, for reference when setting base address.

Suggest that user do not change the initial setting of base address when installing the motion controller for the first time, because this address is idle for most computers. If communication problem is encountered in the following test, please refer to Table 2-4 and 2-5 to modify the setting of base address.

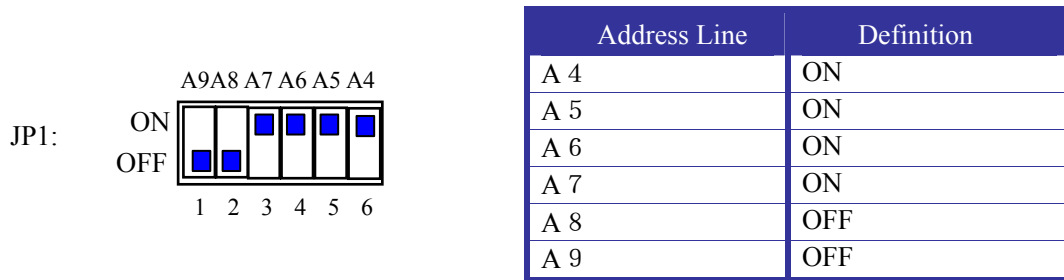


Fig. 2-6 Default setting of Dip switch JP1

Table 2-4 Lists of Base Address and Setting of Dip Switch

Hex Address	Decimal Address	A 9	A 8	A 7	A 6	A 5	A 4
0x100	256	ON	OFF	ON	ON	ON	ON
0x120	288	ON	OFF	ON	ON	OFF	ON
0x140	320	ON	OFF	ON	OFF	ON	ON
0x160	352	ON	OFF	ON	OFF	OFF	ON
0x180	384	ON	OFF	OFF	ON	ON	ON
0x1a0	416	ON	OFF	OFF	ON	OFF	ON
0x1c0	448	ON	OFF	OFF	OFF	ON	ON
0x1e0	480	ON	OFF	OFF	OFF	OFF	ON
0x200	512	OFF	ON	ON	ON	ON	ON
0x220	544	OFF	ON	ON	ON	OFF	ON
0x240	576	OFF	ON	ON	OFF	ON	ON
0x260	608	OFF	ON	ON	OFF	OFF	ON
0x280	640	OFF	ON	OFF	ON	ON	ON
0x2a0	672	OFF	ON	OFF	ON	OFF	ON
0x2c0	704	OFF	ON	OFF	OFF	ON	ON
0x2e0	736	OFF	ON	OFF	OFF	OFF	ON
0x300 (Default)	768	OFF	OFF	ON	ON	ON	ON
0x320	800	OFF	OFF	ON	ON	OFF	ON
0x340	832	OFF	OFF	ON	OFF	ON	ON
0x360	864	OFF	OFF	ON	OFF	OFF	ON

Hex Address	Decimal Address	A 9	A 8	A 7	A 6	A 5	A 4
		0x380	896	OFF	OFF	OFF	ON
0x3a0	928	OFF	OFF	OFF	ON	OFF	ON
0x3c0	960	OFF	OFF	OFF	OFF	ON	ON
0x3e0	992	OFF	OFF	OFF	OFF	OFF	ON



Table 2-5 Typical Mappings of Addresses


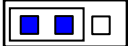
Allocation of ISA Bus Addresses		Uses
Hex	Decimal	
000~01F	00~31	DMA controller 1
020~03F	32~63	Interrupt controller 1
040~05F	64~95	Timer
060~06F	96~111	Keyboard
070~07F	112~127	Real-time clock NMI
080~09F	128~159	DMA page register
0A0~0BF	160~191	Interrupt controller 2
0C0~0DF	192~223	DMA controller 2
0F0~0FF	240~255	Math co-processor
1F0~1F8	496~504	Hard disk drive
200~20F	512~527	Game port
210~217	528~535	Expansion unit
278~27F	630~639	Parallel port 2
2B0~2DF	688~735	Optional EGA
2F8~2FF	760~767	Asynchronous communication port 2
300~31F	768~799	Prototype card
360~36F	864~879	PC network card
378~37F	888~895	Parallel port 1
380~38F	896~911	SDLC communication port 2
390~393	912~915	Reserved
3A0~3A9	928~937	SDLC communication port 1
3B0~3BF	944~959	IBM single-color monitor
3C0~3CF	960~975	EGA
3D0~3DF	976~991	Color monitor/Graphic monitor
3F0~3F7	1008~1015	Floppy driver
3F8~3FF	1016~1023	Asynchronous communication port 2
X2E1		GPIB adaptor
X390~X393		Asynchronous communication port 1

2.3.1.2 Set watchdog by JP3


The motion controller provides a watchdog to monitor its work status in real time. JP3 is the jumper selector of the watchdog. After the watchdog is set to be enabled with the jumper, when the controller

downs, the watchdog will automatically reset the controller after a delay time of 150ms. The watchdog is disabled by default.

JP3: Watchdog is enabled  Watchdog is disabled (By default): 
1 2 3

 注意 Warning	<i>JP4 is the selector of debugging jumpers of the controller. It has been set before leaving the factory and cannot be changed.</i>
	<i>JP4 (By default):</i>  1 2 3

2.3.2 Step 2: Insert the controller into the PC

 注意 Warning	<i>Please be careful when handling. Discharge static in your body before touching the controller circuit or inserting/removing the controller, to avoid any static from damaging the motion controller.</i>
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1. Connect the CN2 connector of the controller and the accessory board (ACC1) with a 62-pin flat cable provided with the board.
2. Turn off the PC.
- 3a. For ISA bus controller, select a free ISA slot in the PC.
- 3b. For PCI bus controller, select a free PCI slot in the PC. .
4. Insert the controller card into this slot firmly
5. Fix the controller card in the slot by tightening the screw.
6. Remove the cover of a nearby slot. Fix the accessory board (ACC1) on the PC frame with screws.
7. Close the PC cover and restart the PC.

2.3.3 Step 3: Install the Windows driver of the controller (for Windows environment)

If you are using DOS, skip this step and go to Step 5 directly.

For ISA Card:

1. Insert the product CD into the CD-ROM.
2. Run **WinSetupEN.exe** from the directory “CD-ROM: \Windows\setup\ISA driver”.
3. Restart the computer when prompted.

For PCI Card:

Install the driver in Windows98/2000

1. After installing hardware and starting computer, Windows98/2000 will detect automatically the motion controller, and start **Add hardware** wizard. Click **Next** when prompted.
2. At the prompt of **What do you want “Windows” to operate?** select **Search the driver of equipment (recommended)**. Then click **Next**.
3. Insert the product CD into the CD-ROM.
4. Select **Appoint position**. Use **Browse** to select the appropriate directory “CD-ROM: \Windows\Setup\PCI driver”. Then click **Next**.

-
5. Follow **Add hardware** wizard. Click **Next** until installation is finished.

2.3.4 Step 4: Establish communication between the PC and controller (for Windows)

If you are in DOS environment, skip this step and go to Step 5 directly.


The demo program for GE-X00-SX is Engrave Demo, Engrave Demo is used under Windows operating system. With the Engrave Demo program, user can test whether communication between the motion controller and the host has been set up.

The demo program for GE-X00-PX names demo, user can use this program to establish communication between the PC and the motion controller.

For the detail operation, please see the teaching software in the product CD.


If the program runs normally, it proves that the motion controller *successfully communicates with the host PC*. If an information box “Fail to open GE equipment” appears, it proves that the motion controller *fails to communicate with the host PC*. If and only if the controller *successfully communicates with the PC*, then user can do next step. Otherwise, please refer to [Appendix C Troubleshooting](#). If needed, please contact us.

2.3.5 Step 5: Connect the motor with driver.

 注意 Warning	<p><i>For the purpose of safety, we suggest that user do not connect the motor with any mechanical device before installing and debugging the control system. Please check that there is really no load in the motor.</i></p>
------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Before connecting the driver to the controller, connect the driver with the motor. For correct wiring, please refer carefully to the manual of the driver. Test the driver and the motor as required in the manual to ensure they are working properly.

2.3.6 Step 6: Connect the controller with the terminal board.

 注意 Warning	<p><i>Refer carefully to the signal description of the connectors in the controller and the pin description of the connectors in motor driver. Wire them correctly and avoid connecting them when power is on. Otherwise, wrong connection may cause the positive feedback of the system and operation with power may cause damage on hardware, so as to make the system unable to work properly.</i></p>
------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Turn off the PC. Take out the two-shielded cables supplied with the controller. Connect CN1 on the controller with CN1 on the terminal board, and CN2 on the accessory board with CN2 on the terminal board. (Fig. 2-7).

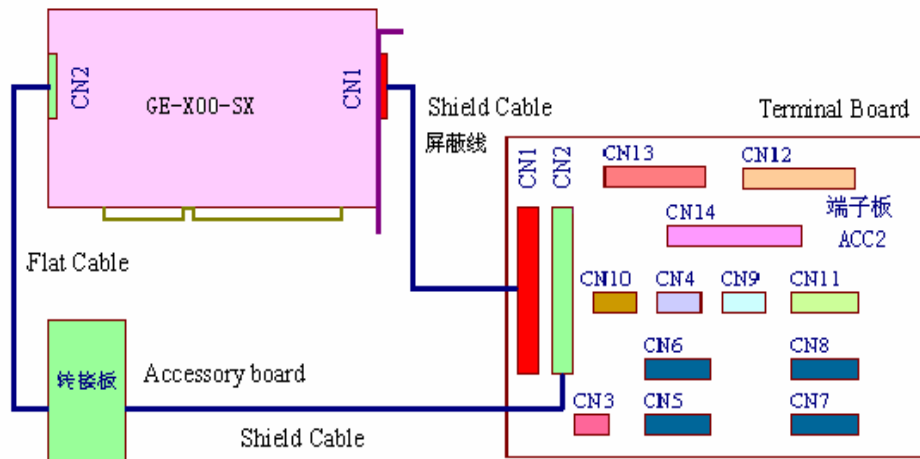


Fig 2-7 Wiring of the Motion Controller and

2.3.7 Step 7: Connect the driver and system I/O with terminal board.

2.3.7.1 Connecting external power to the terminal board

CN3 on the terminal board connects to the external power supply (user-supplied). The connector marked “+12V - +24V” on the board wires to the power of +12V - +24V, and that marked OGND wires to the ground of external power supply. The value of voltage of the external power to be used depends on the requirements of the sensors and switches in the equipment. For the wiring diagram, refer to Fig. 2-8.

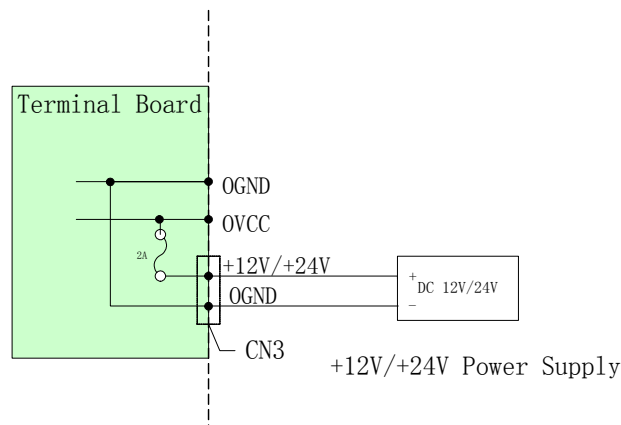


Fig. 2-8 Wiring Power Supply to the Terminal Board

2.3.7.1 Connect Dedicated Inputs/Outputs

For GE-X00-SX motion controller:

Dedicated input include: servo driver ALARM signal, HOME signal and LIMIT signal which are connected with the driver and sensors through CN5 (CN6, CN7) and CN12 on the terminal board. For the definition of pins of CN5, please see Table 2-6. For the definition of pins of CN12, please see Table 2-7. For wiring, please see Fig. 2-9.

Dedicated outputs include: enable driver signal and reset of driver alarm, which are also connected to

the driver through CN5, CN6 and CN7 on the terminal board. CN 5, CN6 and CN7 are for axis 1 to 3 respectively. The definitions of pins of CN 5 to CN7 are the same (Table 2-6).

For GE-X00-PX motion controller:

Dedicated input include: servo driver ALARM signal, HOME signal and LIMIT signal, which are connected with the driver and sensors through CN5 (CN6, CN7, CN8, CN9, CN10, CN12, CN13), CN15, CN17 on the terminal board. For the definition of pins of CN5, please see Table 2-6. For the definition of pins of CN17, please see Table 2-8. For wiring, please see Fig. 2-9.

Dedicated outputs include: enable driver signal and reset of driver alarm, which are also connected to the driver through CN5, CN6, CN7, CN8, CN9, CN10, CN12, CN13 on the terminal board. CN5, CN6, CN7, CN8, CN9, CN10, CN12 and CN13 are for axis 1 to 8 respectively. The definitions of pins of CN 5 to CN13 are the same (Table 2-6).


 注意 Warning	<i>According to safety standard:</i>	
	1.	<i>The alarm signal of driver is in normally closed status (If user doesn't use it, please wire this input signal to OGND.).</i>
	2.	<i>The limit switch of the system shall be in normally closed status.</i>
	3.	<i>The home switch is in normally open status.</i>

Table 2-6 Definition of pins of CN5 (CN6, CN7, CN8, CN9, CN10, CN12, CN13) On the terminal board

Pin	Signal	Description	Pin	Signal	Description
1	OGND	Ground of external power supply	14	OVCC	+12V/+24V external power
2	ALM	Driver alarm	15	RESET	Reset driver alarm
3	ENABLE	Enable driver	16	Reserved	Reserved
4	A-	Phase A- of Encoder signal	17	A+	Phase A+ of Encoder signal
5	B-	Phase B- of Encoder signal	18	B+	Phase B+ of Encoder signal
6	C-	Phase C- of Encoder signal	19	C+	Phase C+ of Encoder signal
7	+5V	Power	20	GND	Digital ground
8	DAC	Analog output	21	GND	Digital ground
9	DIR+	Direction+ signal	22	DIR-	Direction- signal
10	GND	Digital ground	23	PULSE+	Pulse+ signal
11	PULSE-	Pulse- signal	24	GND	Digital ground
12	Reserved	Reserved	25	Reserved	Reserved

Pin	Signal	Description	Pin	Signal	Description
13	GND	Digital ground			

Table2-7 Definition of pins of CN12 on Terminal Board (GE-X00-SX)

Pin	Signal	Description
1	HOME0	Home switch signal of axis 1
2	HOME1	Home switch signal of axis 2
3	HOME2	Home switch signal of axis 3
4		
5	LIMIT0+	Positive limit switch signal of axis 1
6	LIMIT0-	Negative limit switch signal of axis 1
7	LIMIT1+	Positive limit switch signal of axis 2
8	LIMIT1-	Negative limit switch signal of axis 2
9	LIMIT2+	Positive limit switch signal of axis 3
10	LIMIT2-	Negative limit switch signal of axis 3
11		
12		
13	EXI0	Uncommitted input
14	EXI1	Uncommitted input
15	OGND	Ground of external power supply
16	OVCC	+12V/+24V power

Table2-8 Definition of pins of CN17 on Terminal Board (GE-X00-PX)

Pin	Signal	Description
1	HOME0	Home switch signal of axis 1
2	HOME1	Home switch signal of axis 2
3	HOME2	Home switch signal of axis 3
4	HOME3	Home switch signal of axis 4
5	HOME4	Home switch signal of axis 5
6	HOME5	Home switch signal of axis 6
7	HOME6	Home switch signal of axis 7
8	HOME7	Home switch signal of axis 8
9	EXI0	Reserved
10	EXI1	Reserved
11	EXO0	Reserved
12	EXO1	Reserved
13	OGND	Ground of external power supply
14	OGND	Ground of external power supply
15	OVCC	external power , +12V/+24V
16	OVCC	external power , +12V/+24V

Table 2-9 Definition of pins of CN15 on Terminal Board (GE-X00-PX)

Pin	Signal	Description
1	LIMIT0+	Positive limit switch signal of axis 1
2	LIMIT0-	Negative limit switch signal of axis 1
3	LIMIT1+	Positive limit switch signal of axis 2
4	LIMIT1-	Negative limit switch signal of axis 2
5	LIMIT2+	Positive limit switch signal of axis 3
6	LIMIT2-	Negative limit switch signal of axis 3
7	LIMIT3+	Positive limit switch signal of axis 4
8	LIMIT3-	Negative limit switch signal of axis 4
9	LIMIT4+	Positive limit switch signal of axis 5
10	LIMIT4-	Negative limit switch signal of axis 5
11	LIMIT5+	Positive limit switch signal of axis 6
12	LIMIT5-	Negative limit switch signal of axis 6
13	LIMIT6+	Positive limit switch signal of axis 7
14	LIMIT6-	Negative limit switch signal of axis 7
15	LIMIT7+	Positive limit switch signal of axis 8
16	LIMIT7-	Negative limit switch signal of axis 8

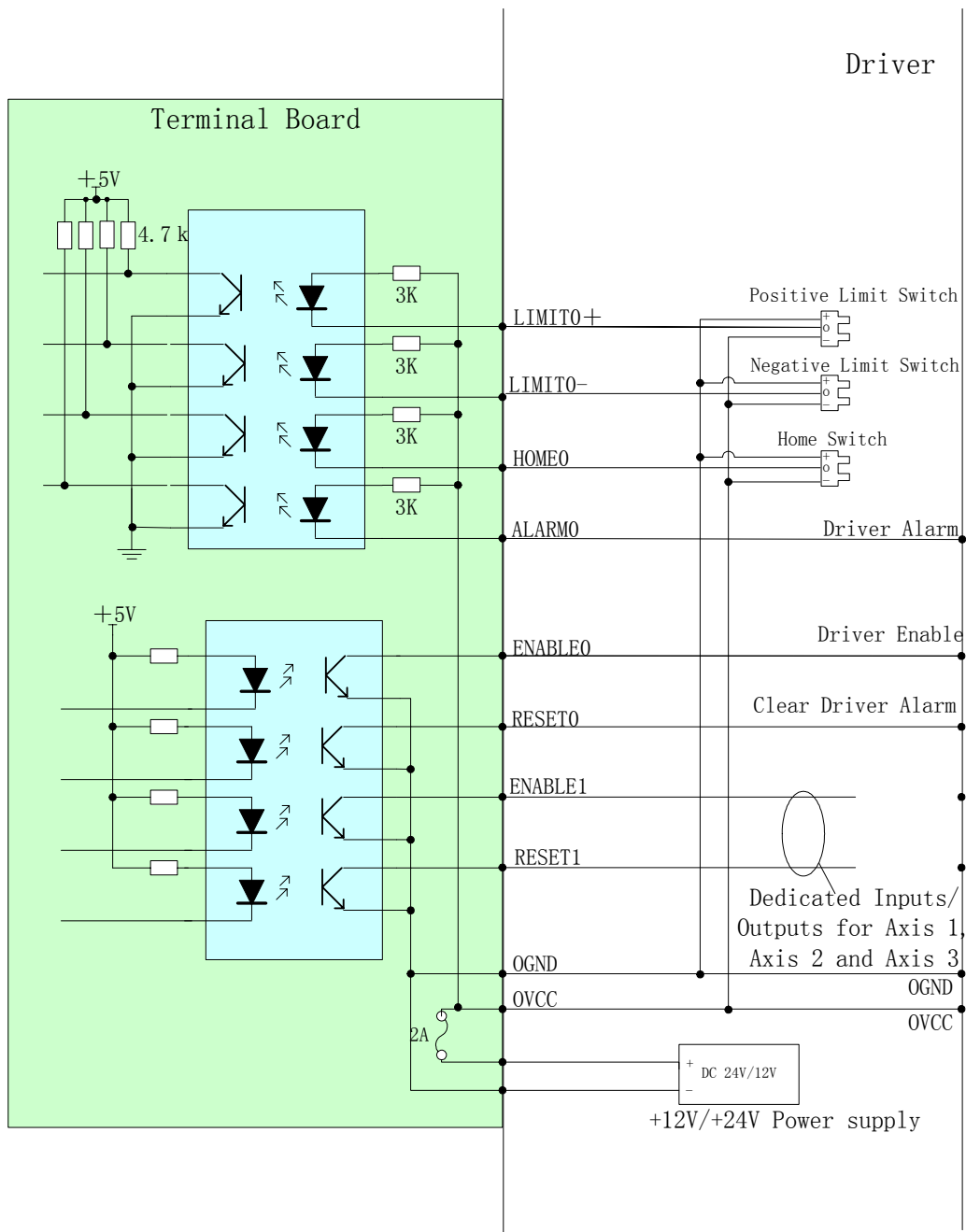


Fig. 2-9 Wiring Diagram of Dedicated Input/Output Signals

2.3.7.3 Wiring of Auxiliary encoder input signals (only for GE-X00-SX)

The auxiliary encoder input ports CN10. For the definition of pins of CN10, please see Table 2-10 a. For wiring, please see Fig. 2-10 and 2-11.

Table2-10 Definition of pins of CN10 on Terminal Board (GE-X00-SX)

Pin	Signal	Description	Pin	Signal	Description
1	A4+	Phase A+ signal of auxiliary encoder 1	6	A4-	Phase A_ signal of auxiliary encoder 1 signal
2	B4+	Phase B+ signal of auxiliary encoder 1	7	B4-	Phase B- signal of auxiliary encoder 1
3			8		
4			9	GND	Digital ground
5	+5V	Power			

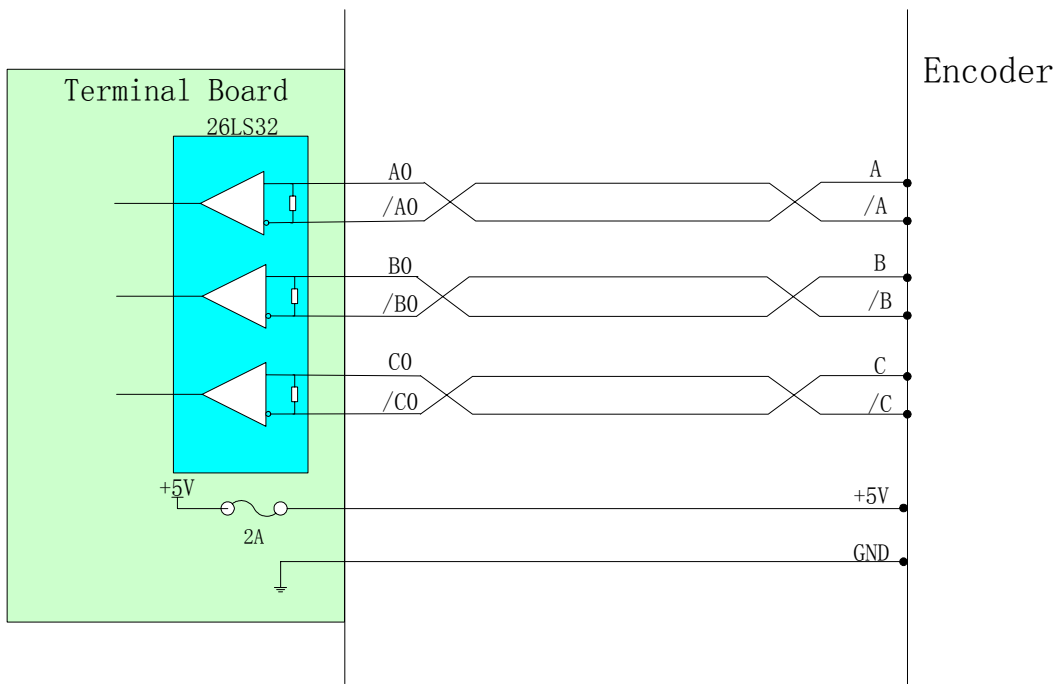


Fig.2-10 Wiring Diagram of Encoder with differential signals

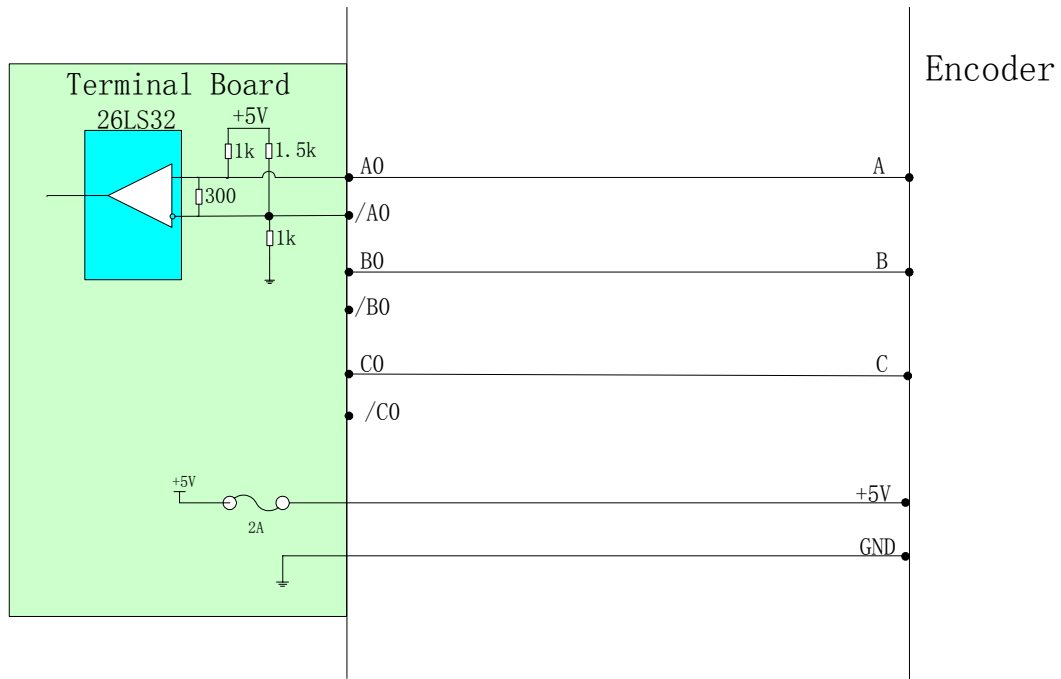


Fig.2-11 Wiring Diagram of Encoder with single signal

2.3.7.4 Wiring of controller output signal

The GE-X00-XV model of controller can output two kinds of signals, analog or pulse signal. By default, the GE-X00-XV controller outputs analog signal. When an axis or some axes are used to control stepper motors (or servo motor in position control mode), user can use the command `GE_CtrlMode (axis, 1)` to set the output of the specified axis as pulse signal output.

1. Wiring of Pulse Output

There are two kinds of pulse signal output mode. One is the pulse/direction signal mode and the other is the positive/negative pulse signal mode. By default, the controller operates in the pulse/direction signal mode. Using the command `GE_StepPulse`, user can set the axis operating in the positive/negative pulse signal mode, and use the command `GE_StepDir` to set the axis operating in the pulse/direction signal mode.

In the pulse/direction signal mode, Pins 23 and 11 output differential pulse signals and Pins 9 and 22 output differential motion direction signals.

In the positive/negative pulse output mode, Pins 9 and 22 output differential positive pulse trains and Pins 23 and 11 output differential negative pulse trains.

If the signals needed by the driver are not differential signals, wire the corresponding signal with the positive signal pins (i.e. Pins 9 and 23) of the above differential signal output, and **suspend the negative signal pins**. For the output wave, please see Fig. 2-12.

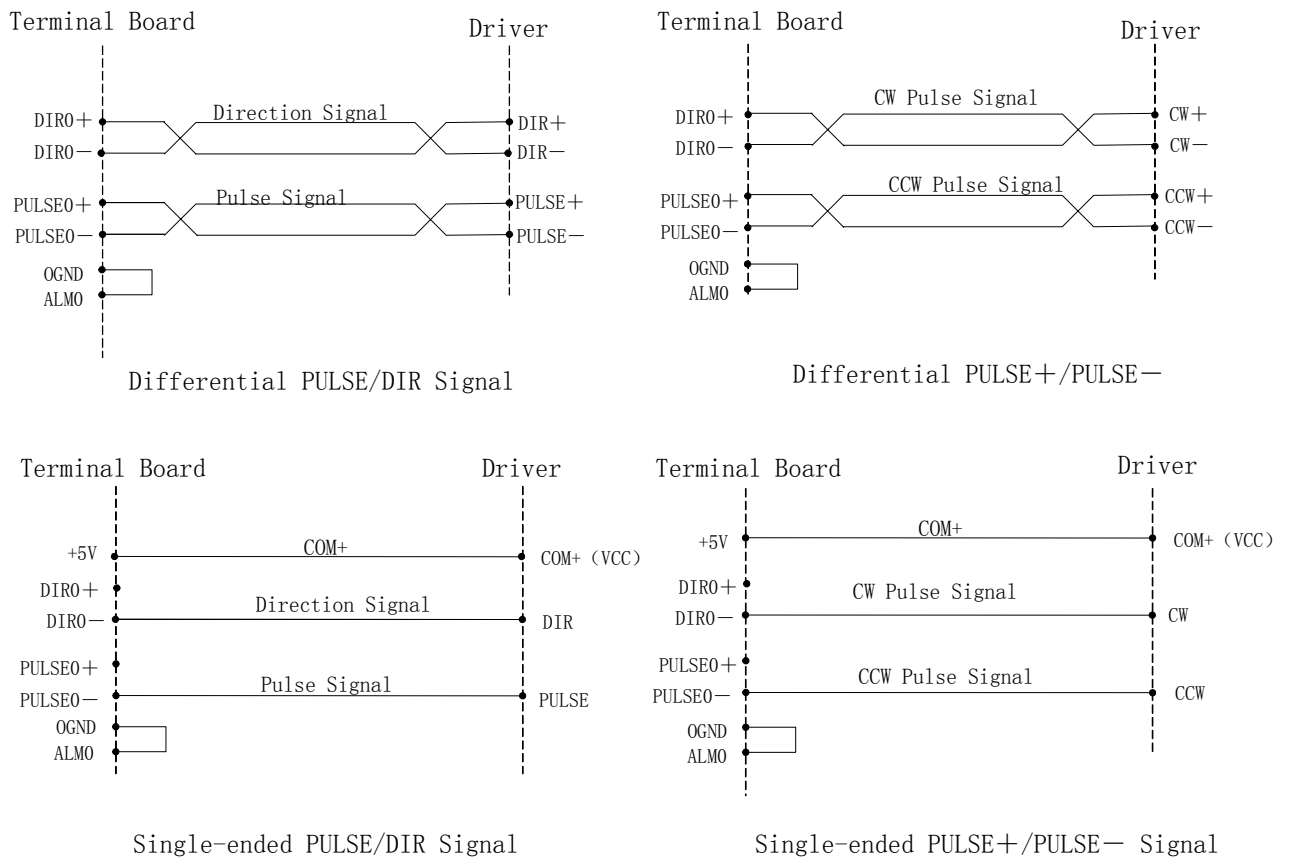


Fig. 2-12 Wiring diagram of pulse output signal

Output mode	Pin	CW	CCW
-PULSE + +PULSE	23-11		
	9-22		
PULSE + DIR	23-11		
	9-22		

Fig. 2-13 Wave of Pulse and Direction Output

2. Wiring of Analog Output

The analog control output signal is output through Pin 8 of CN5 (CN6, CN7, CN8, CN9, CN10, CN12, CN13) on the terminal board. The ground is the digital ground Pin. For the definition of pins of CN5, please see Table 2-6. For wiring, please see Fig. 2-14.

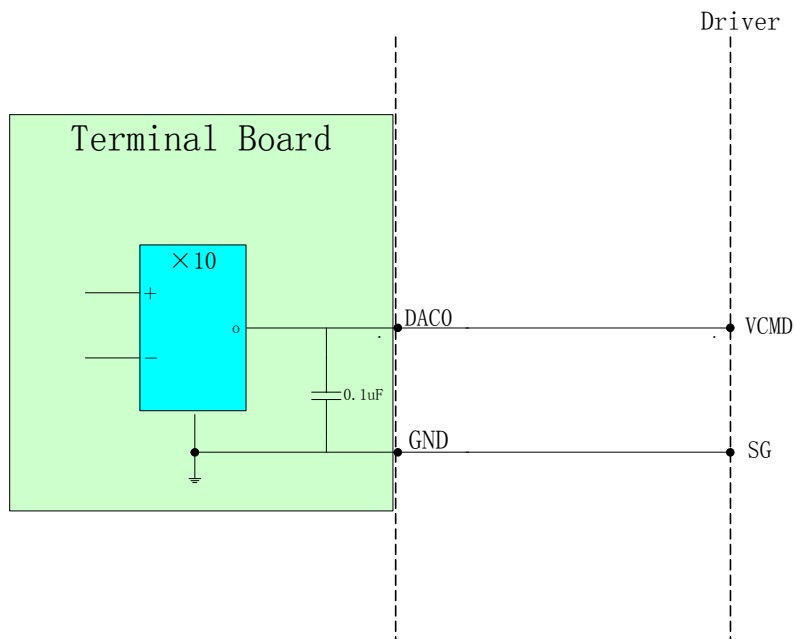


Fig. 2-14 Wiring Diagram of Analog Voltage

2.3.7.5 Wiring of uncommitted Digital Input/Output

For GE-X00-SX motion controller:

The uncommitted digital inputs are connected through CN12 and CN13 on the terminal board. For the definition of pins of CN12, please see Table 2-7. For the definition of pins of CN13, please see Table 2-11. For wiring, please see Fig. 2-15.

The uncommitted digital outputs are connected through CN14 on the terminal board. For the definition of pins of CN14, please see Table 2-12. For wiring, please see Fig. 2-15. The power supply for uncommitted outputs can be provided through CN12 or CN13

For GE-X00-PX motion controller:

The uncommitted digital inputs are connected through CN16 on the terminal board. For the definition of pins of CN16, please see Table 2-13. For wiring, please see Fig. 2-15.

The uncommitted digital outputs are connected through CN14 on the terminal board. For the definition of pins of CN14, please see Table 2-12. For wiring, please see Fig. 2-15. The power supply for uncommitted outputs can be provided through CN17, see table 2-8.


 提示	<p><i>When these output driving inductive load, consider a linkage circuit of EMF.</i></p>
Hint	

Table 2-11 Definition of pins of CN13 on Terminal Board

Pin	Signal	Description
1	EXI2	Uncommitted input
2	EXI3	Uncommitted input
3	EXI4	Uncommitted input
4	EXI5	Uncommitted input
5	EXI6	Uncommitted input
6	EXI7	Uncommitted input
7	EXI8	Uncommitted input
8	EXI9	Uncommitted input
9	EXI10	Uncommitted input
10	EXI11	Uncommitted input
11	EXI12	Uncommitted input
12	EXI13	Uncommitted input
13	EXI14	Uncommitted input
14	EXI15	Uncommitted input
15	OGND	Ground of the extern power
16	OVCC	+12V/+24V output

Table 2-12 Definition of pins of CN14 on Terminal Board

Pin	Signal	Description
1	EXO0	Uncommitted output
2	EXO1	Uncommitted output
3	EXO2	Uncommitted output
4	EXO3	Uncommitted output
5	EXO4	Uncommitted output
6	EXO5	Uncommitted output
7	EXO6	Uncommitted output
8	EXO7	Uncommitted output
9	EXO8	Uncommitted output
10	EXO9	Uncommitted output
11	EXO10	Uncommitted output
12	EXO11	Uncommitted output
13	EXO12	Uncommitted output
14	EXO13	Uncommitted output
15	EXO14	Uncommitted output
16	EXO15	Uncommitted output

Table 2-13 Definition of pins of CN16 on Terminal Board

Pin	Signal	Description
1	EI0	Uncommitted input
2	EI1	Uncommitted input
3	EI2	Uncommitted input
4	EI3	Uncommitted input
5	EI4	Uncommitted input
6	EI5	Uncommitted input
7	EI6	Uncommitted input
8	EI7	Uncommitted input
9	EI8	Uncommitted input
10	EI9	Uncommitted input
11	EI10	Uncommitted input
12	EI11	Uncommitted input
13	EI12	Uncommitted input
14	EI13	Uncommitted input
15	EI14	Uncommitted input
16	EI15	Uncommitted input

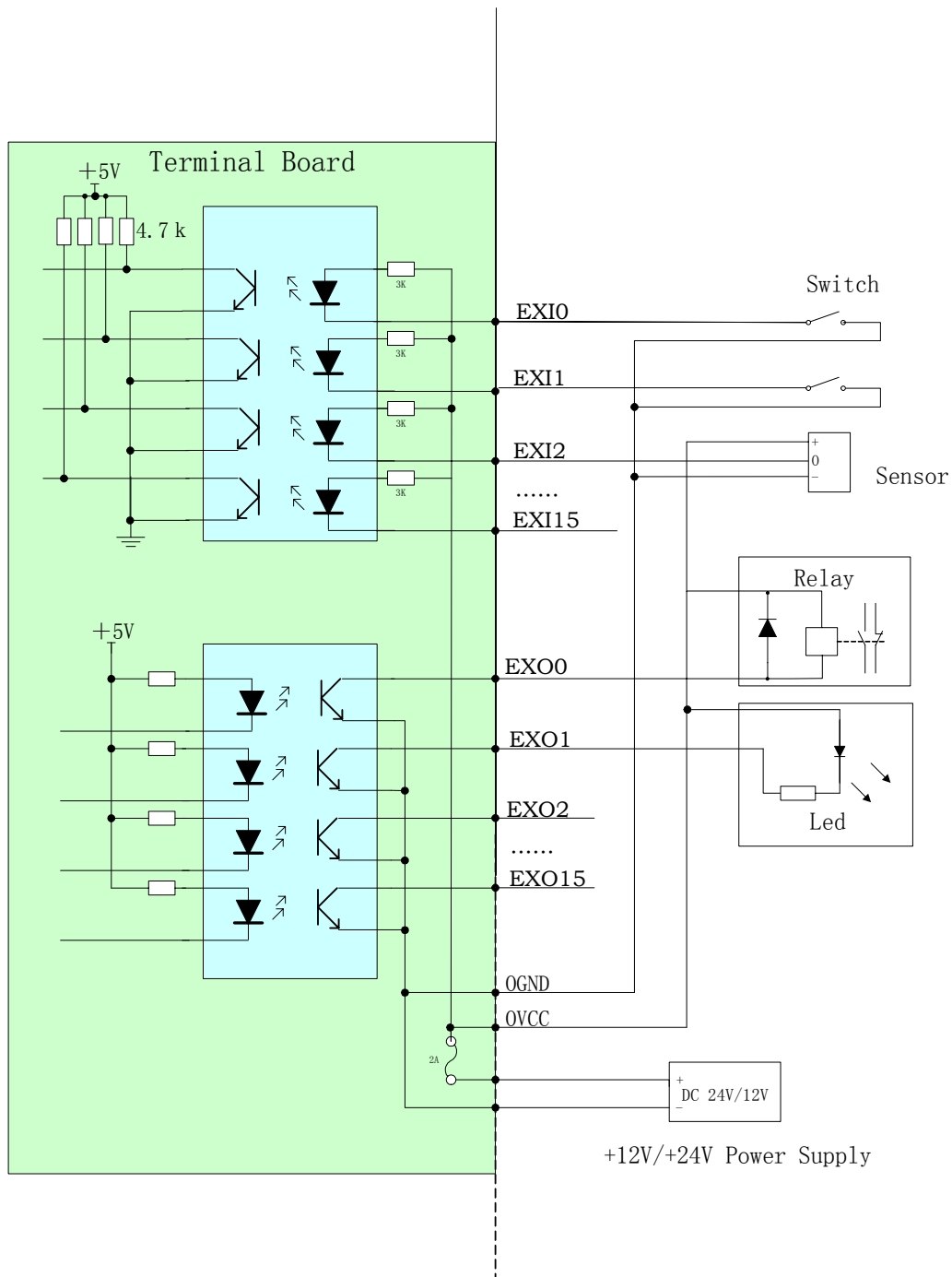


Fig.2-15 Wiring Diagram of Uncommitted Input/Output Signal

2.3.7.6 RS-232 Interface (optional)

The motion controller provides a serial communication port to transfer information with the host, which is through CN4 on the terminal board. For the definition of pins of CN4, please see Table 2-14. For wiring, please see Fig. 2-16.

Table 2-14 Definition of pins of CN4 on Terminal

Pin	Signal	Description	Pin	Signal	Description
1			6		

2	RX	RS-232 receiver	7		
3	TX	RS-232 transmitter	8		
4			9		
5	GND	Digital ground			

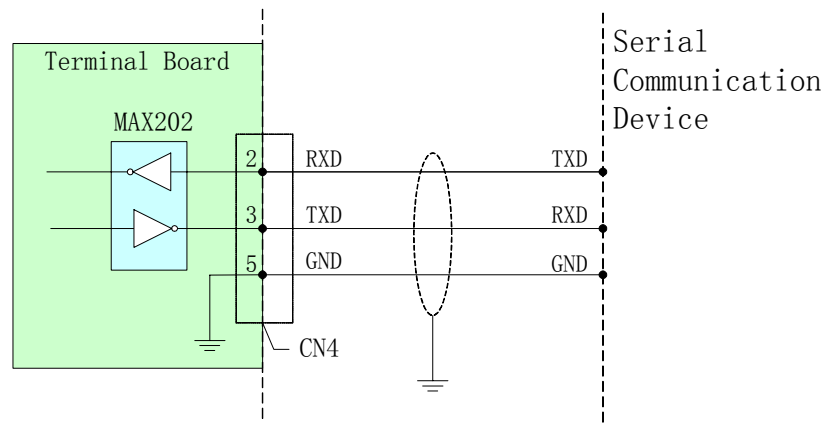


Fig. 2-16 Wiring Diagram of Serial Communication

2.3.7.7 Wiring of Analog Input (optional)

The motion controller provides optional analog input module, which is through CN11 (GE-X00-SX) or CN19 (GE-X00-PX) on the terminal board. For the definition of pins of CN11 (CN19), please see Table 2-15. For wiring, please see Fig. 2-17.

Table 2-15 Definition of CN11 (GE-X00-SX) or CN19 (GE-X00-PX) Pin on Terminal Board

Pin	Signal	Description	Pin	Signal	Description
1	AIN0	Channel 0	9	AGND	Analog ground
2	AIN1	Channel 1	10	AGND	Analog ground
3	AIN2	Channel 2	11	AGND	Analog ground
4	AIN3	Channel 3	12	AGND	Analog ground
5	AIN4	Channel 4	13	AGND	Analog ground
6	AIN5	Channel 5	14	AGND	Analog ground
7	AIN6	Channel 6	15	AGND	Analog ground
8	AIN7	Channel 7			

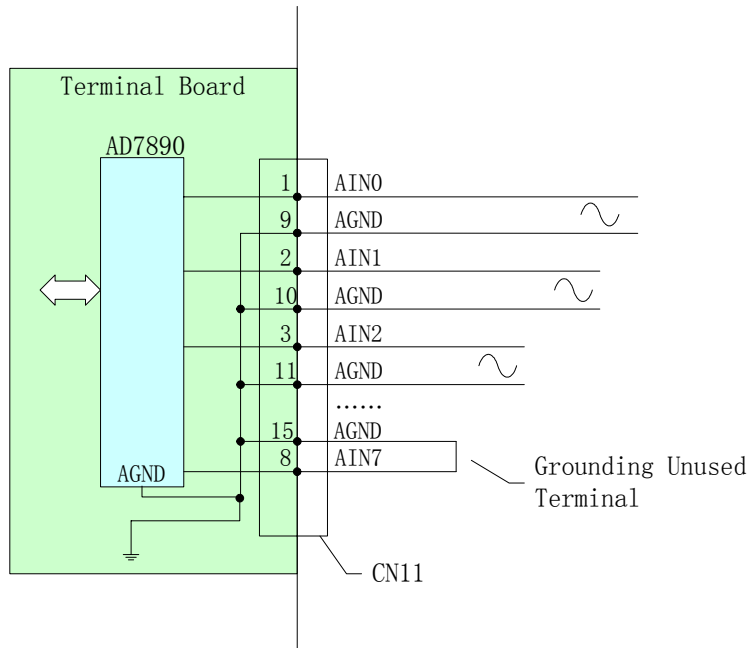


Fig. 2-17 Wiring Diagram of Analog Input Signal

Chapter3: Test and Tune Motion Control System

After configuring the motion control system, user can now test the system with the software Engrave Demo (for GE-X00-SX) or Demo (for GE-X00-PX). During debugging the system, we can check whether the controller is installed correctly, and whether the controller operates properly and performs a simple single-axis motion. For detail on using the Engrave Demo and Demo, please see the teaching software in the product CD.



注意

Warning

*For safety, we suggest that user **do not** connect the motor with any mechanical device when debugging the system. Please check that there is really no load in the motor.*

Appendix A: Technical Specification

Bus

PC/AT bus: ISA/PC104 or PCI bus

Program Memory

ROM 64K Byte

SRAM 512K Byte

Sampling Rate

GE-X00-SX : 200 us (3 axes)

GE-X00-PX : 400 us (8 axes), 200 us (4 axes)

Analog Output

Number of axes: 2,3,4,8

Voltage Range: -10V to +10V

Resolution: 16bit

Analog Input

8 channels

Resolution: 12 bit

Pulse Signal Output

2,3,4,8 axes

GE-X00-SX: Frequency of output pulse train: 256K Hz (maximum)

GE-X00-PX: Frequency of output pulse train: 1M Hz (maximum)

RS-422 line driver, +/-20mA

Duty cycle: 50%

Nonlinear: <1%

Encoder Signal Interface

Axis quadrature incremental encoder inputs: 2,3,4,8 channels for A, B, C

1 channel quadrature incremental encoder inputs for A, B (GE-X00-SX).

GE-X00-PX: Maximum counting frequency: 8MHz

GE-X00-SX: Maximum counting frequency: 4MHz

Asynchronous Serial Port

1 channel of RS-232 (RX, TX, GND)

I/O: 56 channels, TTL compatible, no Pull-up Resistor

Dedicated input: Positive limit switch	2,3,4,8 channels
Negative limit switch	2,3,4,8 channels
Home switch	2,3,4,8 channels

Dedicated output: Enable signal	2,3,4,8 channels
Reset alarm signal	2,3,4,8 channels

Uncommitted input: 16 channels

Uncommitted output: 16 channels

Power Consumption

+5V	I _{cc} =1.5A
+12V	I _{cc} =30mA
-12V	I _{cc} =30mA

Dimension

122mm X 185mm

Operating Temperature

0-60°C (32°F-140°F)

Relative Humidity

5%-90%, no dew

Terminal board

Optical-Isolated I/O

Specification for optical-isolated input

Isolation voltage: 5000V RMS
Input voltage: +12V~+24VDC
Input current: 3.7mA~7.6mA
Transfer delay: H→L 5us
L→H 3us

Specification for opto-isolated output:

Isolation voltage: 5000V RMS
Open-Collector output, without **pull-up resistor**
V_{ceo} ≤ 50V
V_{eco} ≤ 5V
I_c ≤ 30mA
Average set time: 8us

A/D

Channel: 8 (single ended and bipolarity)
Voltage scale: -10V~+10V
Resolution: 12bit
Accuracy: +/-1bit
Maximum sample rate: 4K Hz for 8 channels (GE-X00-PX)
6K Hz for 1 channels (GE-X00-SX)

Power Consumption

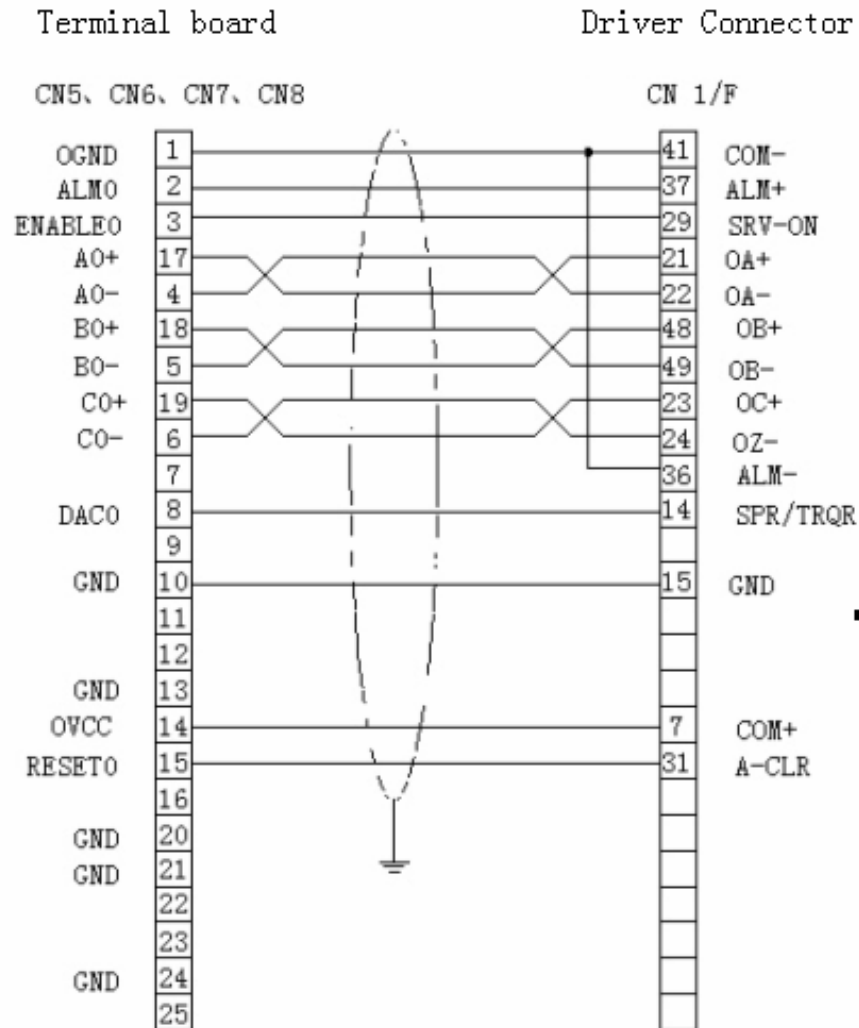
+12V DC I_{cc}=1A
+24V DC I_{cc}=1.8A

Dimension

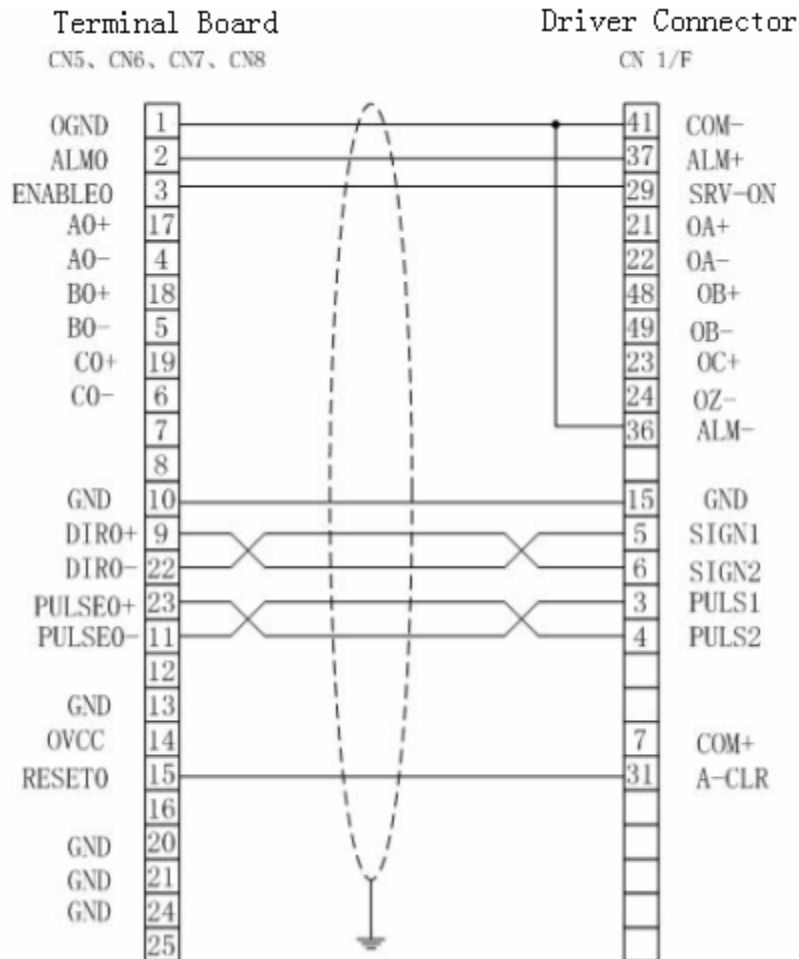
220mm × 132mm

Appendix B: Typical Wiring

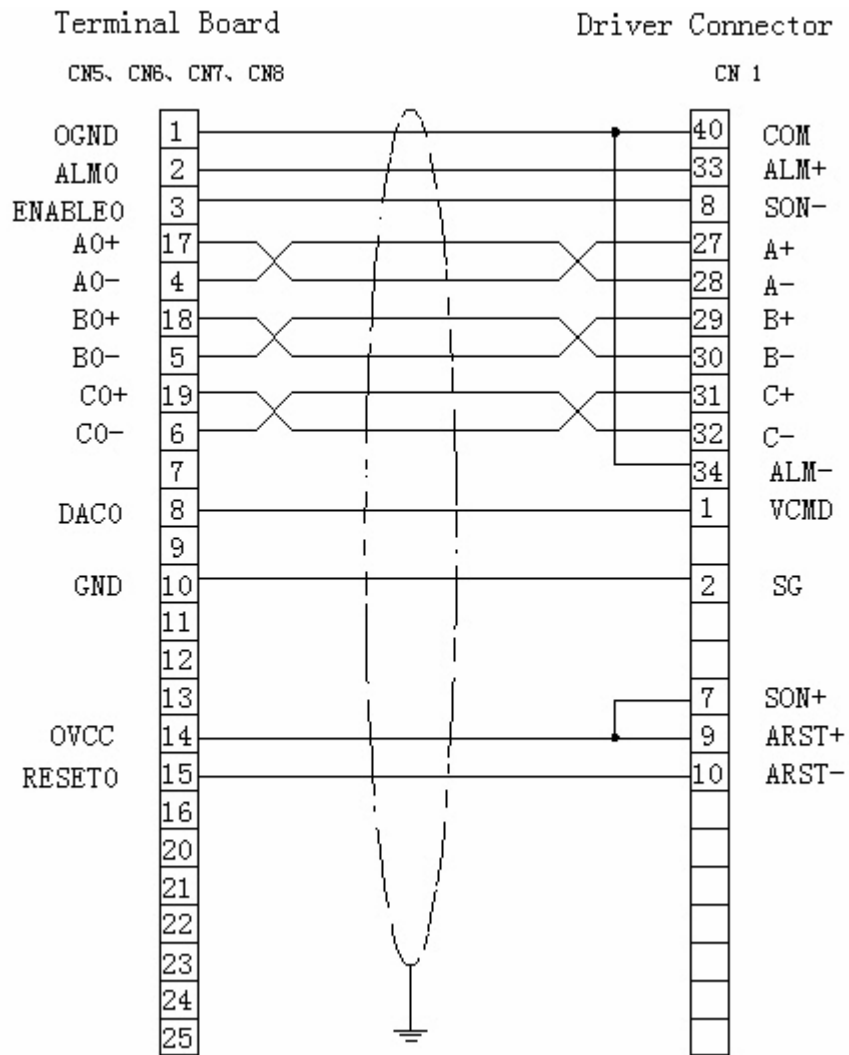
B.1 Wiring diagram of Panasonic MSDA series driver in velocity control mode.



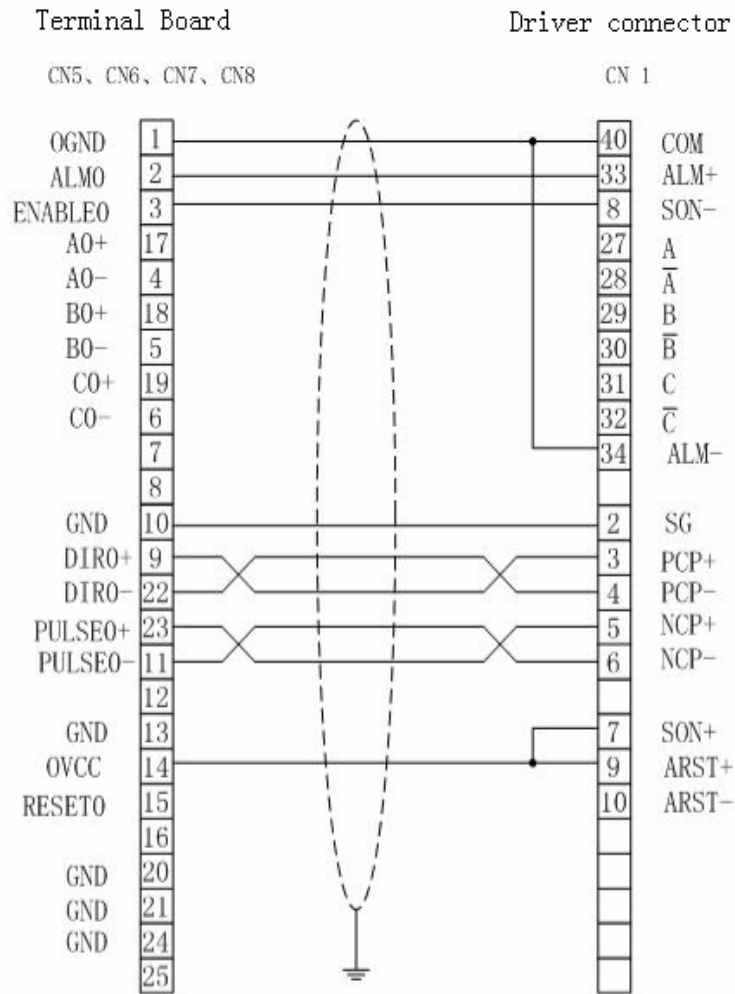
B.2 Wiring diagram of Panasonic MSDA series driver in position control mode.



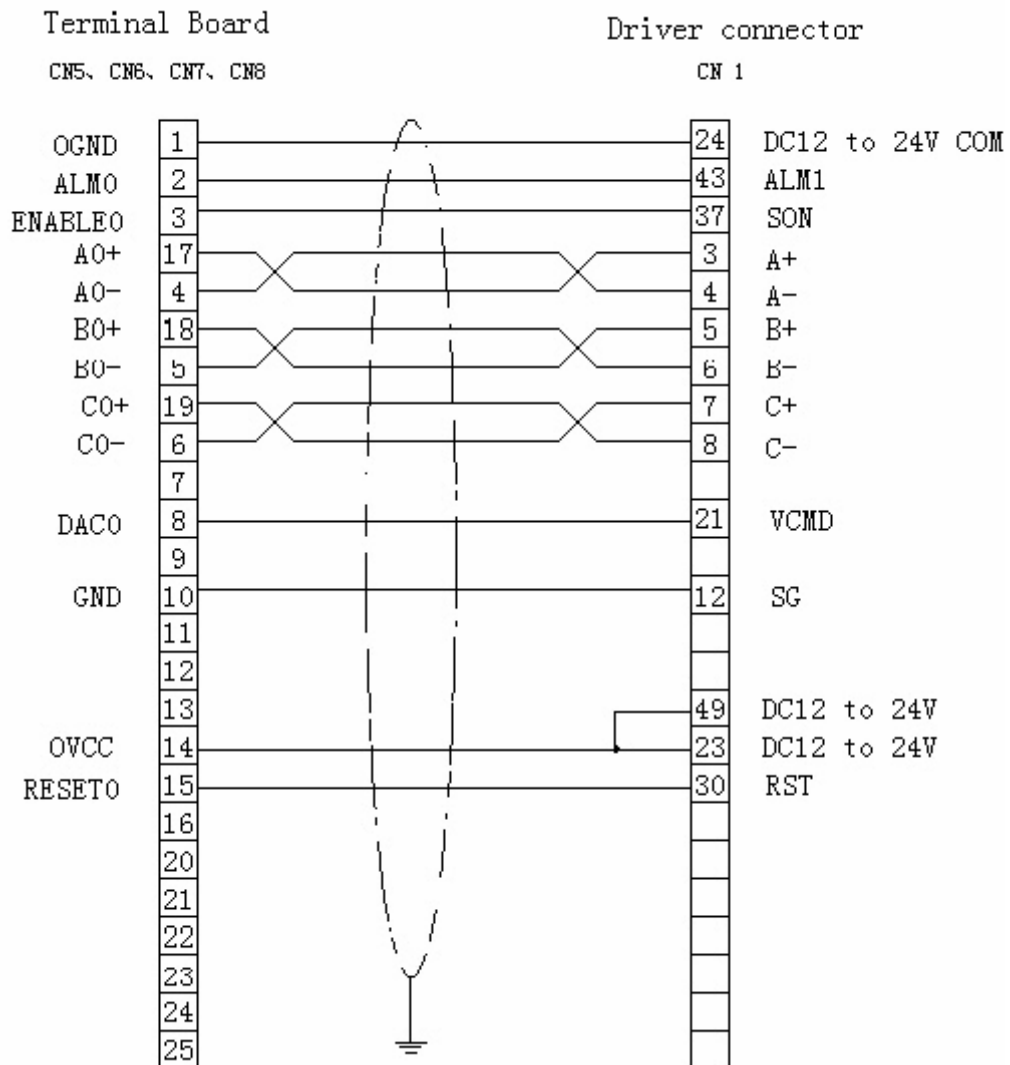
B.3 Wiring diagram of SANYO DENKI PV1 series driver in velocity control



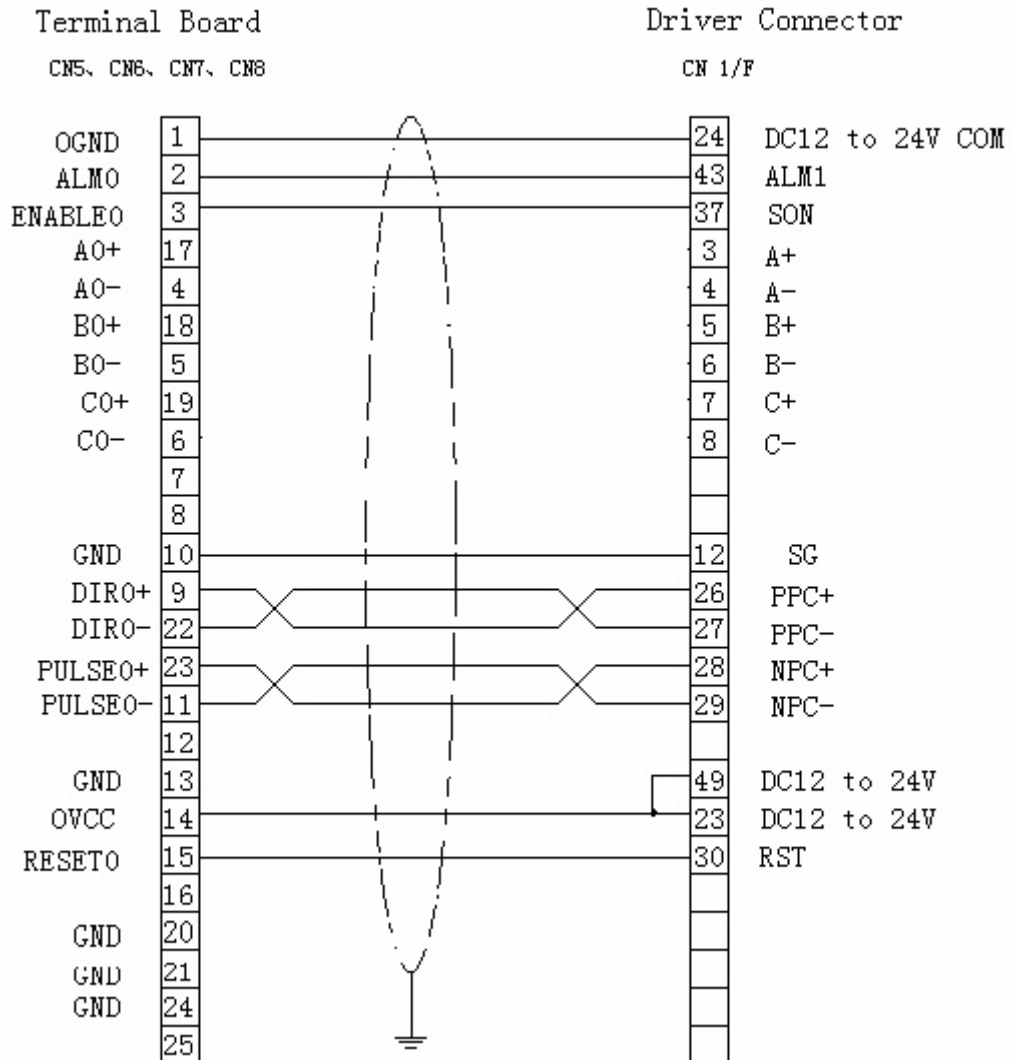
B.4 Wiring diagram of SANYO DENKI PV1 series driver in position control mode



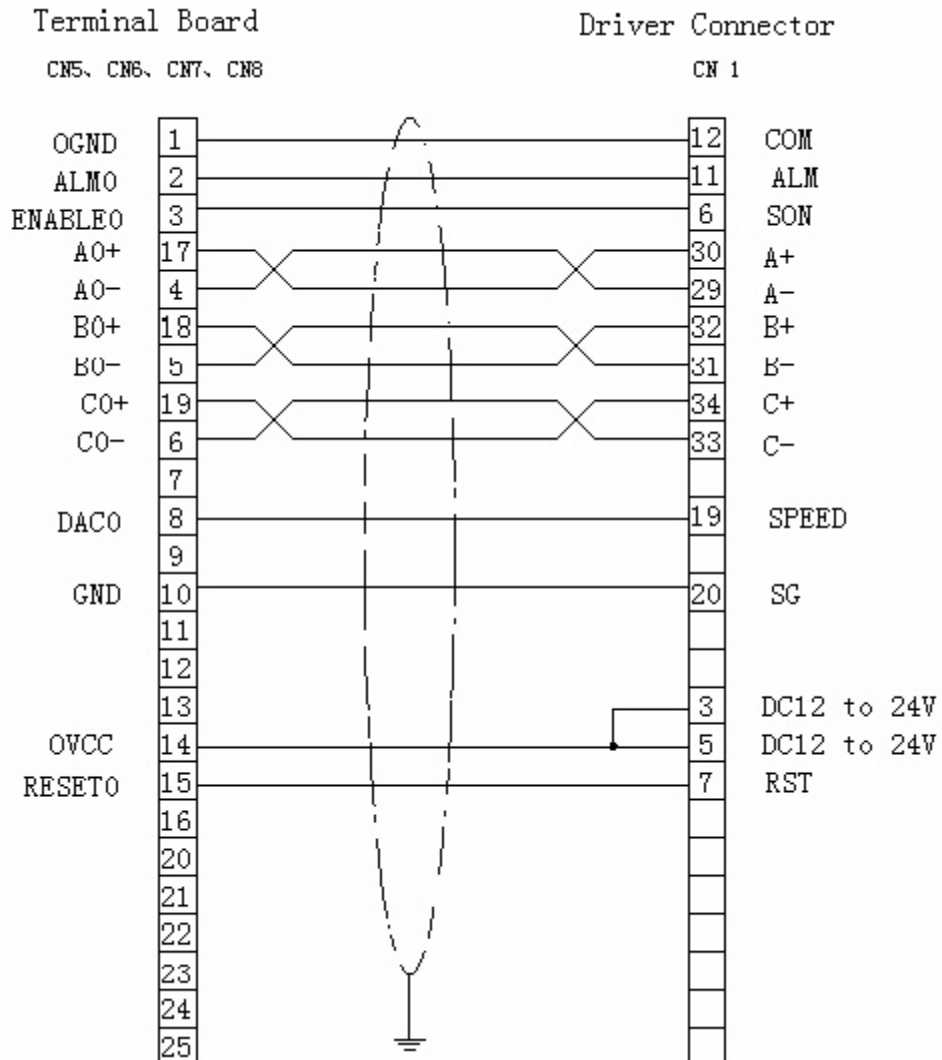
B.5 Wiring diagram of SANYO DENKI PY0/PY2 series driver in velocity control mode



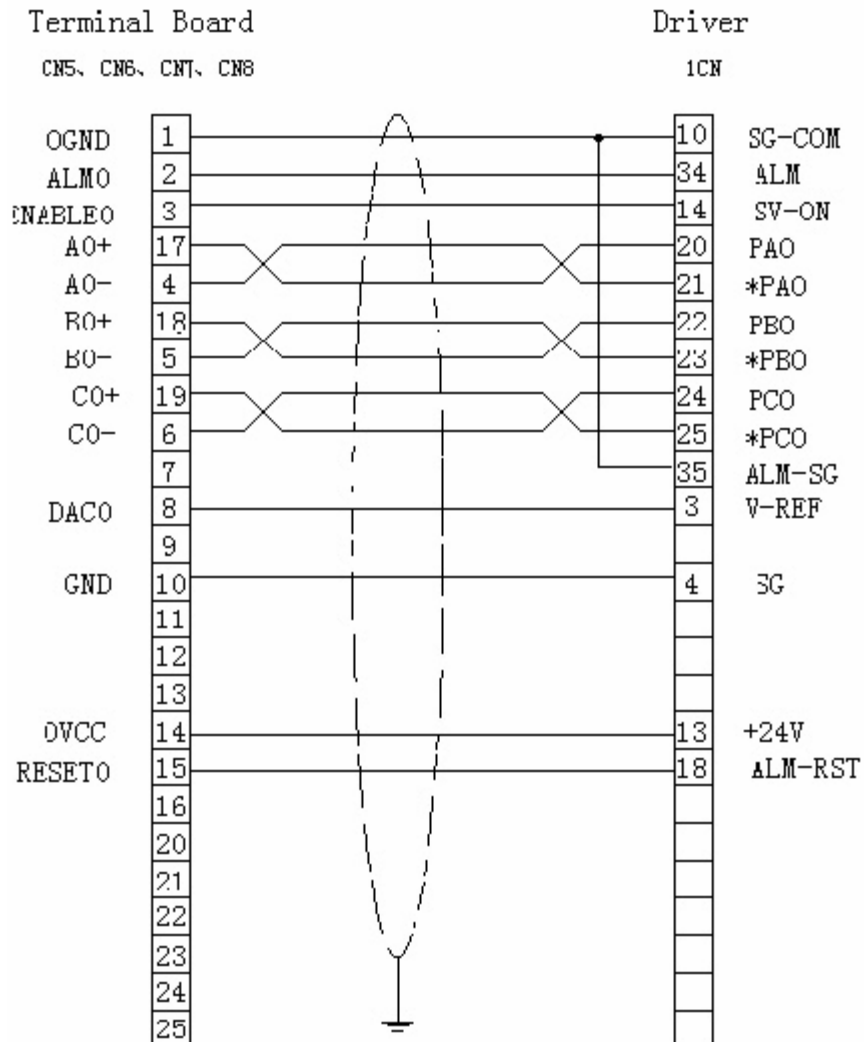
B.6 Wiring diagram of SANYO DENKI PY0/PY2 series driver in position control mode



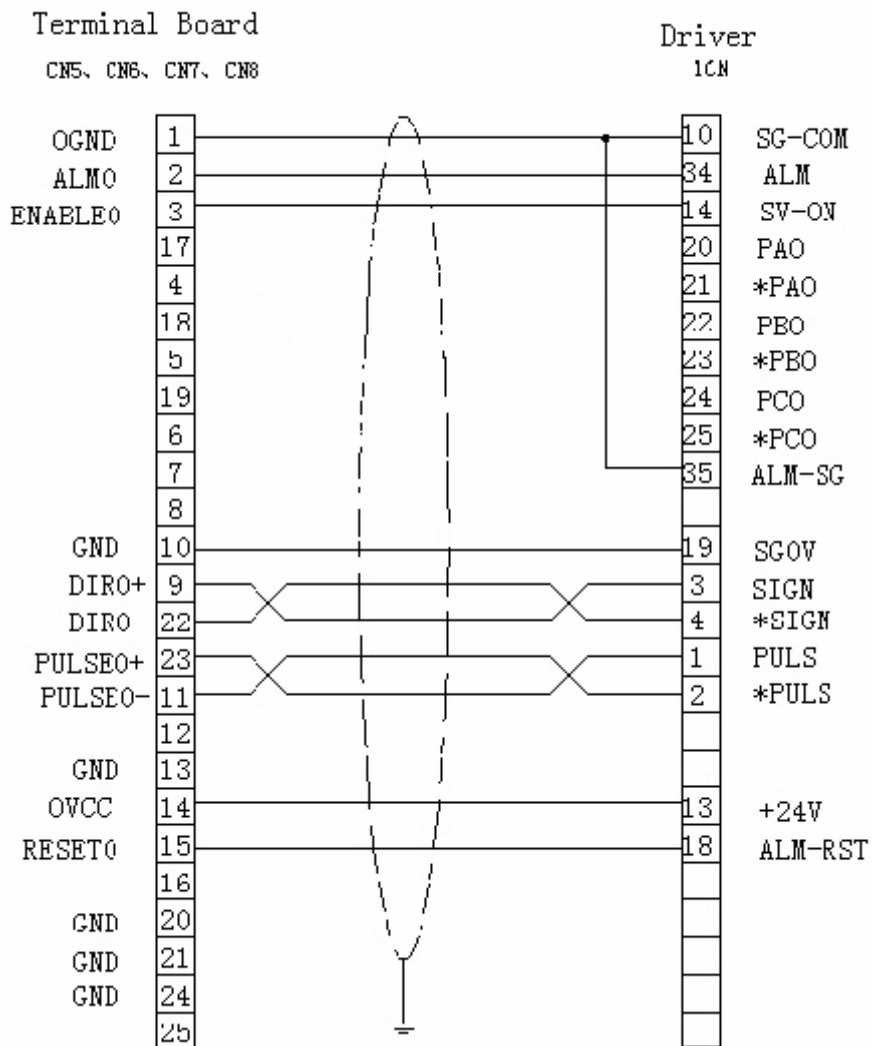
B.7 Wiring diagram of ANYO DENKI PU series driver in velocity control mode



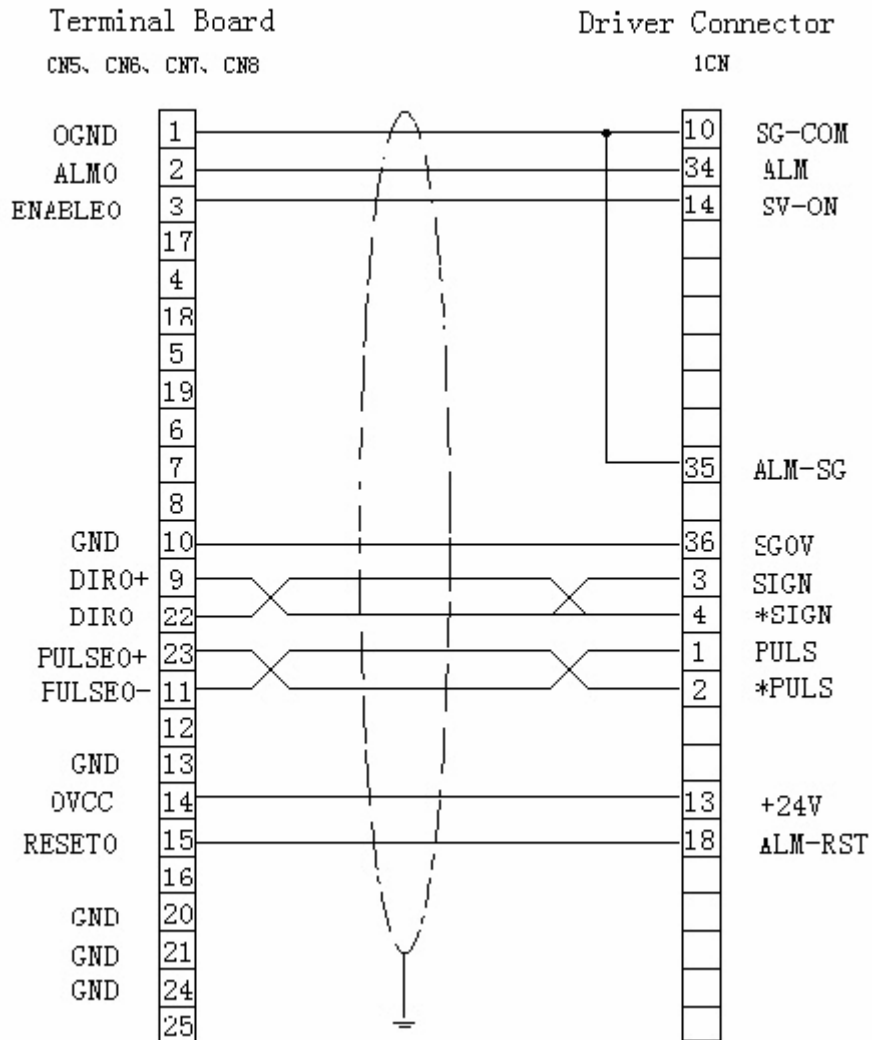
B.8 Wiring diagram of YASKAWA SERVOPACK series driver in velocity/Torque control mode



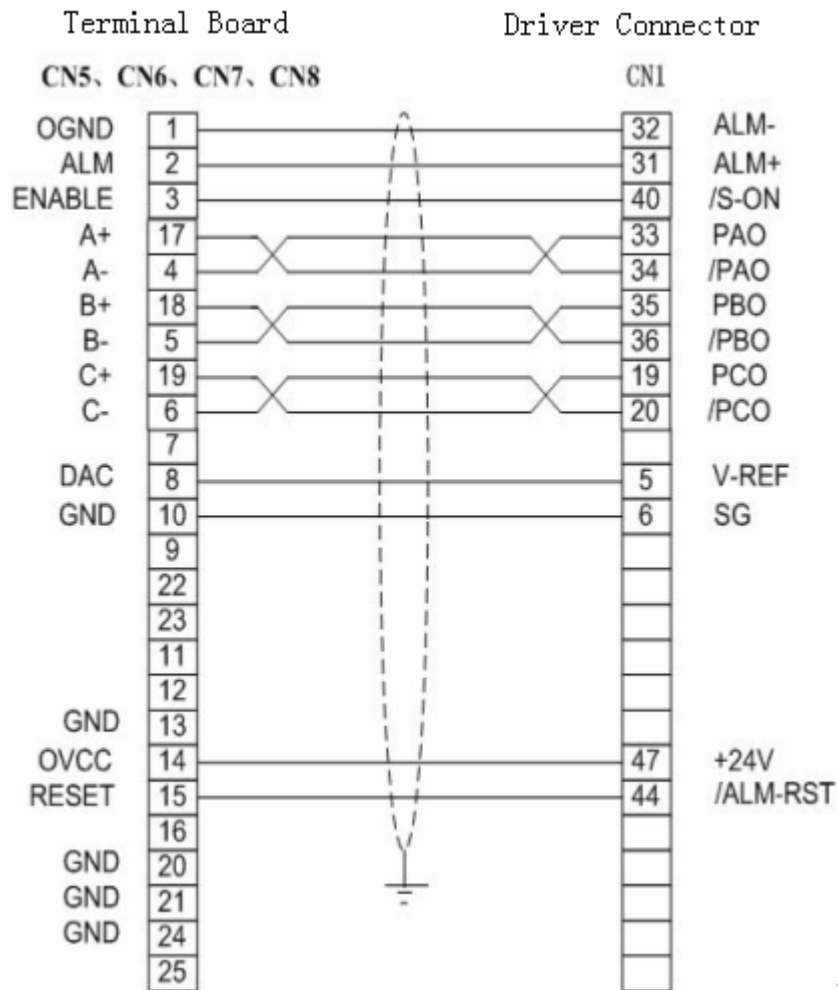
B.9 Wiring diagram of YASKAWA SERVOPACK series driver in position control mode



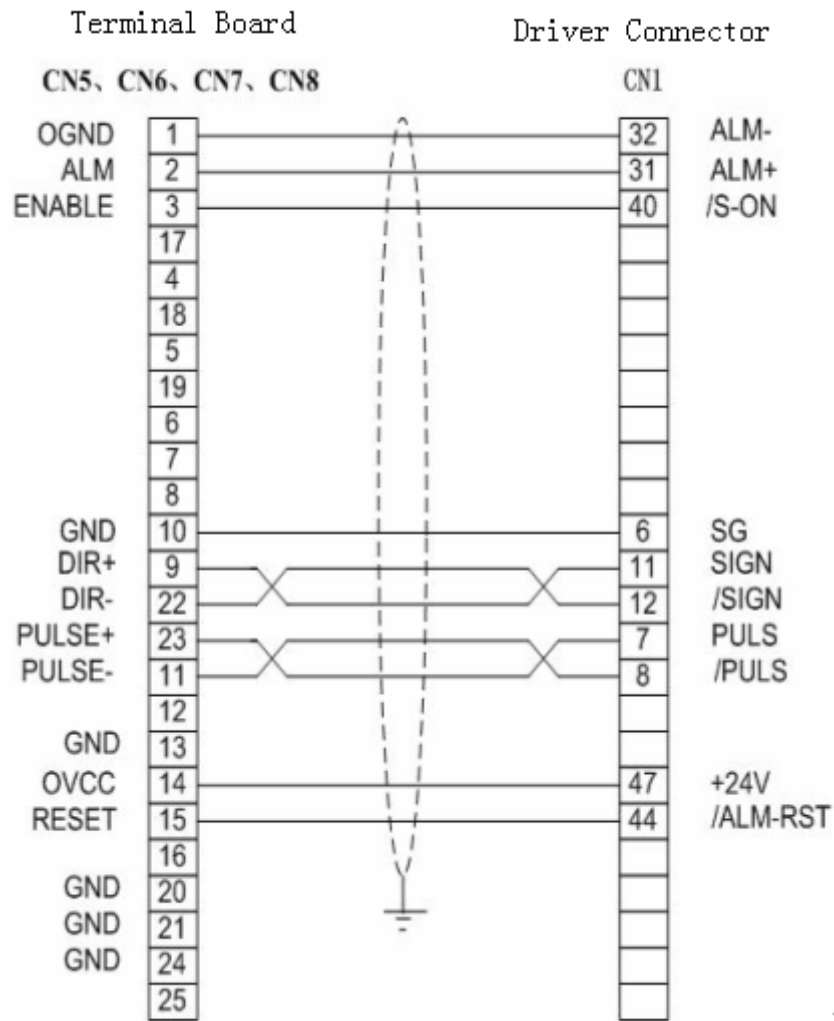
B.10 Wiring diagram of YASKAWA SGDE series driver in position control mode



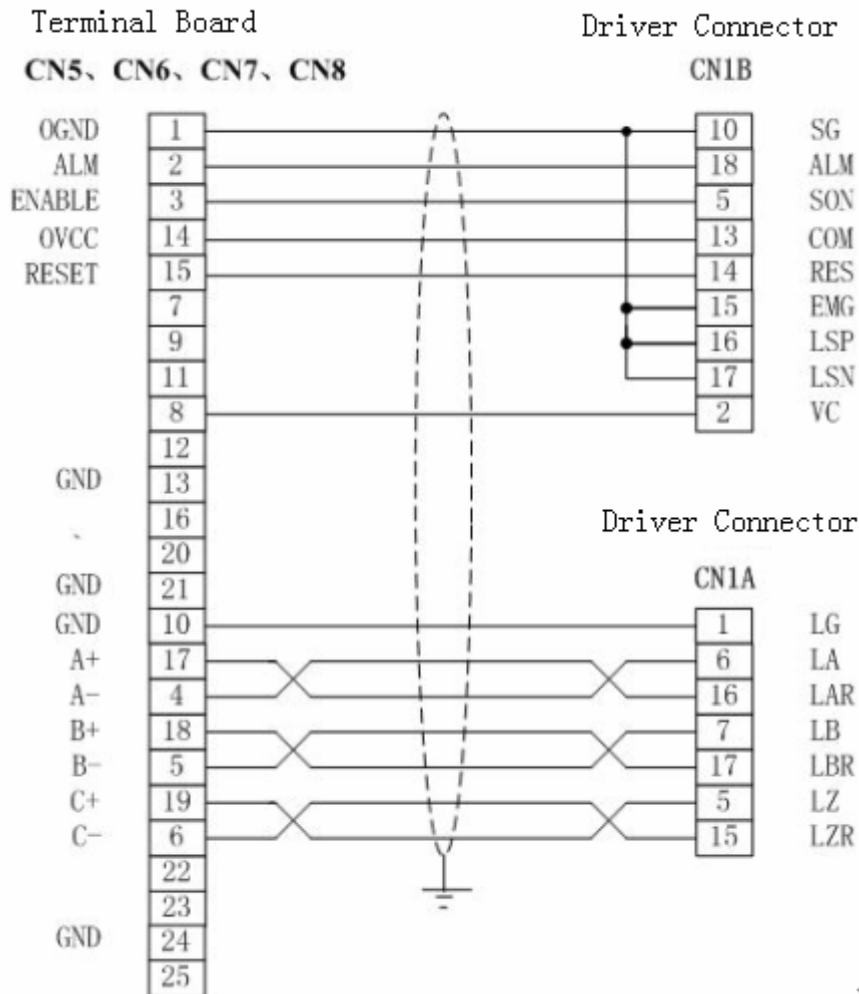
B11 Wiring diagram of YASKAWA SGDM series driver in velocity control mode



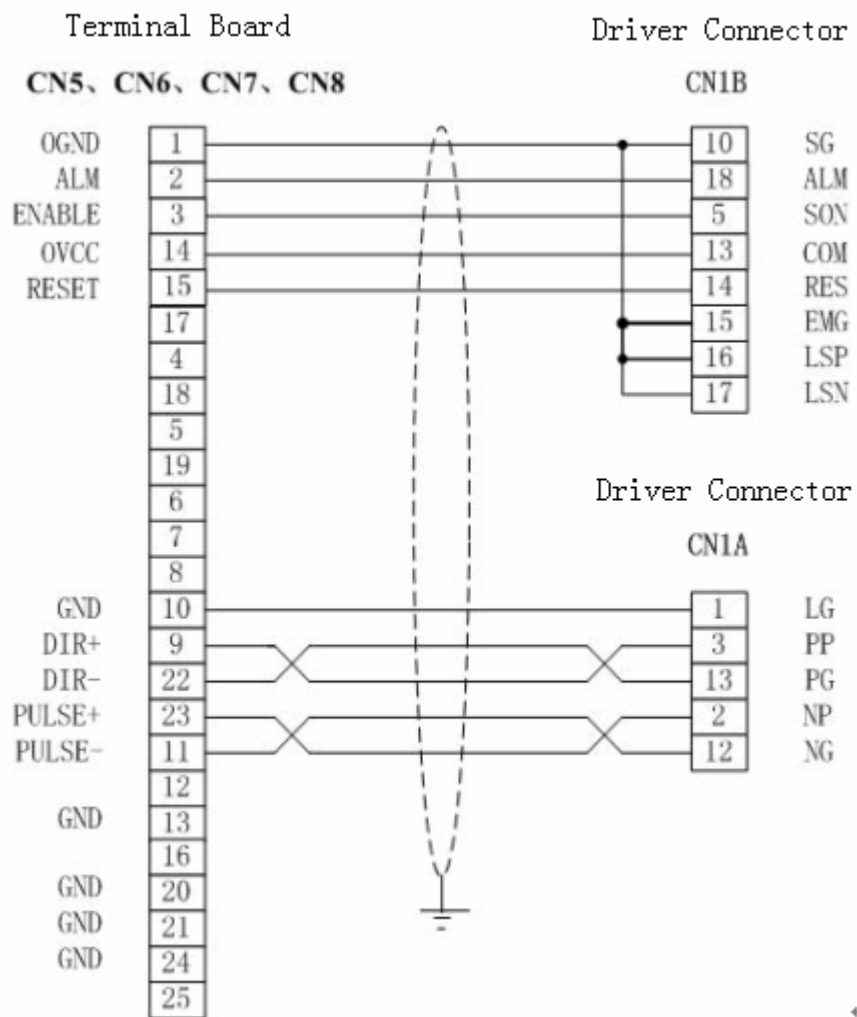
B12 Wiring diagram of YASKAWA SGDM series driver in position control mode



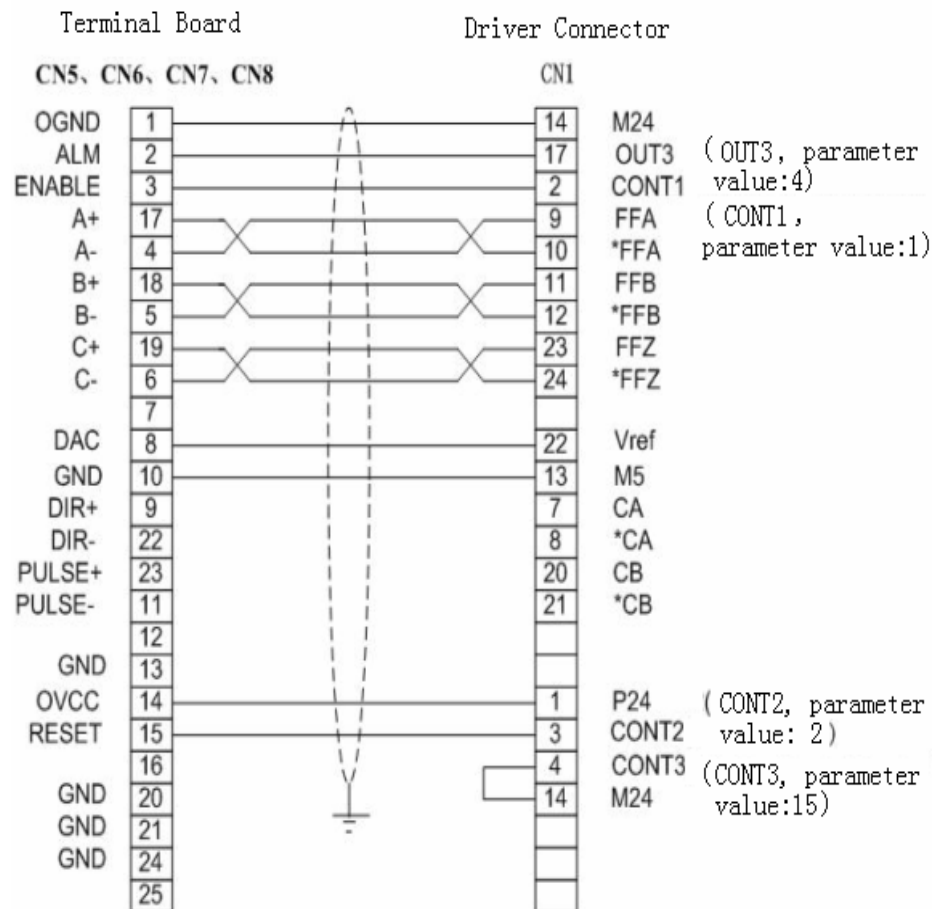
B13 Wring diagram of MELSERVO-J2-Super series driver in velocity control mode



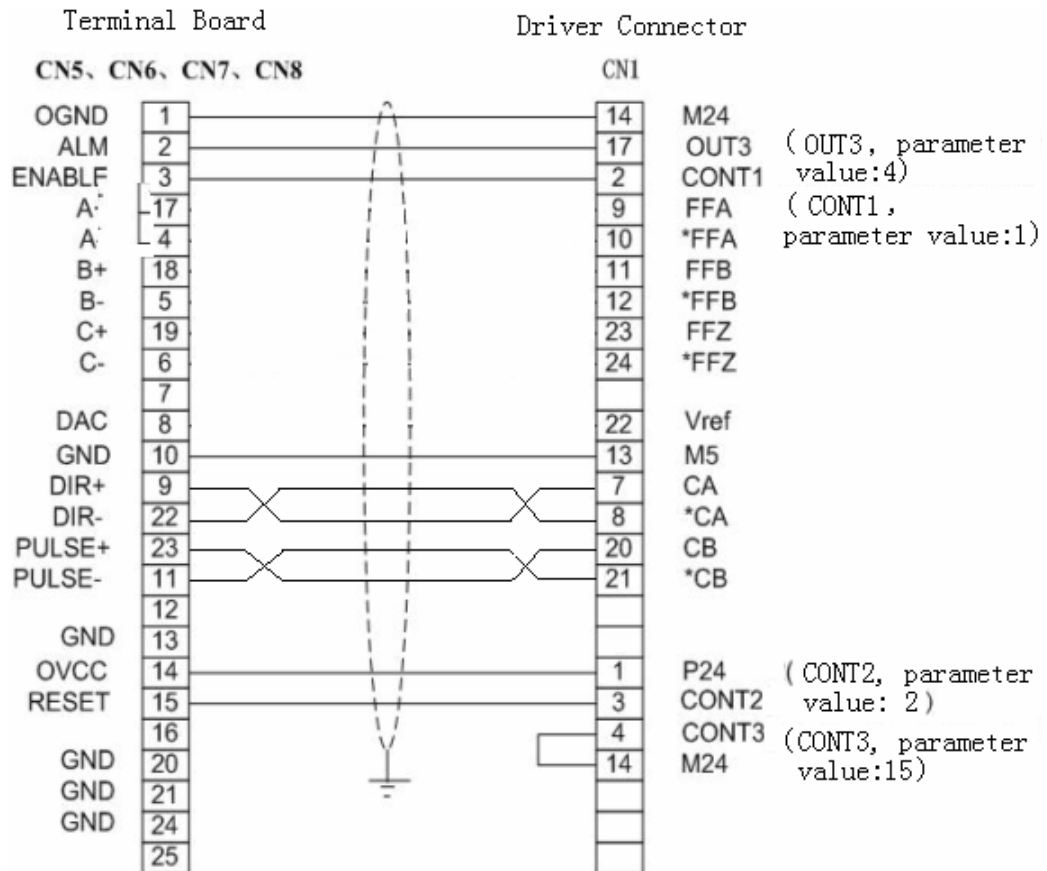
B14 Wiring diagram of MELSERVO-J2-Super series driver in position control mode



B.15 Wiring diagram of FALDIC-W series driver in velocity control mode



B.16 Wiring diagram of FALDIC-W series driver in position control mode



Appendix C Troubleshooting

Trouble		Reason	Handle
1	When installed the motion controller, the host can not start or other hardware working improperly	Address conflict (only for ISA bus)	Set base address
		Motion controller installed improperly	Reinstall the motion controller
		ISA/PCI bus interface is damaged	Change another slot or change another host or change another motion controller and retry.
2	Host and the motion controller communicate failure	See trouble 1	Same as above
		Chip on the motion controller is damaged	Replace motion controller
		Version of the motion controller is not correct	Replace motion controller or Windows driver, function library and dynamic link library (DLL)
4	Encoder signals can not be read properly	Wrong wiring of encoder	Check the wiring of the encoder
		Electric noise	Shield the connection wire of the encoder. Transfer the signal with differential mode. Shorten the wire length of the encoder wire
		Too high frequency of the encoder	The frequency of the encoder signal is above 8MHz. change another encoder with lower frequency.
		Encoder does not work	Check the signals that encoder output or change motion controller
5	The motor is out of control	The effective level of the limit switch is not correct	Set the correct effective level of limit switch by corresponding command
		The axis is not activated	Call the command GT_AxisOn to activate the axis
		Control mode of the motion controller and the driver are not matched	Check the control mode of the motion controller and driver, correct them

Trouble		Reason	Handle
		Motor driver alarm signal triggered	Check the reason of alarm and reset the driver. For GE-X00-XV, if the driver does not offer the alarm signal, user should call the command GE_AlarmOff to disable monitoring alarm signal
		Motor controller has abnormal work status	Check status and solve it
		Wiring of motor is wrong	Check the electric wiring of motor
		Connect to the ground incorrectly	Check the connection to the ground and correct
		The torque of the motor is too small	Check the motor driver
6	When motor driver (without servo on signal) powered on, power on host PC will cause motor to move suddenly.	Motion controller is in uncertain status at the time power on, while the motor is in working status	Before power on host PC, make sure motor driver has been powered off or disabled
7	Stepper motor lose step.	The output frequency of pulse is too high.	Decrease motion speed and set running parameters according to specification of stepper motor used.
8	Motor vibration	The output frequency of pulse is too low.	Increase motion speed and set running parameters according to the lowest frequency of the step motor used.
10	Input or output signals of the motion controller are abnormal	Incorrect wiring	Check the electric connection
		No external power is supplied.	Check external power supply.
		Wrong connection to the ground	Reconnect the ground
		The input/output interface is damaged	Replace motion controller
		5V or 24V fuse is break	Chang new fuse

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