ADT-09 Series Motion Control Card

User Manual

- ADT-8949C1/H1
- ADT-8969C1/H1
- ADT-8989C1/H1

Basic Information

This Manual is written by Adtech (Shenzhen) Technology Co., Ltd. This Manual is mainly written by: Ai Xiaoyun.

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Chapter 1 Overview

1.1. Introduction

The ADTECH 09 Series Motion Control Card is of a high-performance multi-axis (4/6/8) motion control card based on PCI bus and dual-core platform as manufactured by Adtech.

The 09 Series Motion Control Card follows the high-precision design. Compared with other similar products, it enjoys powerful hardware performances, with its receiving frequency up to 8Mpps, and 33.3M high-speed PCI bus. It has a larger number of configurable expanded IO and interruptible IO. It also supports hardware serial code, allows third-party encryption, as well as high-speed pulse frequency output up to 5Mbps.

The characteristics such as small line blocks and large cache of the 09 Series High-performance Motion Control Card are designed for engraving machines or cutting applications, to help the data after CAM discretization be well restored to the machining model. Its 3-dimensional circular interpolation (spherical interpolation) would produce arcs in arbitrary spatial planes, as well as spherical arcs. It is useful for simplifying the complex graphics. By using 33.3M PCI communication, up to 10 control cards can be expanded on one PC. Furthermore, with the PC platform, complex occasions such as distributed motion control can be realized. 09 Series PCI-based pulse motion control card is suitable for control occasions such as engraving, cutting, turn-milling, milling, drilling, etc. 5Mpps pulse control mode and AB phase decoding can be used for step open-loop control, and also for servo closed-loop control. The speed adaptive model is applied to high-precision control applications such as milling machines and abrasive machining, which, from the speed planning, make the motor work within a reasonable error range.

Four major technological creative highlights

1) Stable asymmetric acceleration/deceleration running, and low motor running noise

   Asymmetric acceleration/deceleration planning is adopted to make the motor run very stably and minimizing the running noise, which is suitable for industrial sites with high-noise requirements.

2) Hardware-level interpolation supports spatial curve interpolation

The hardware interpolation technology is integrated into the spatial curve interpolation, and the T/S/E/COS type acceleration/deceleration curve can be quickly calculated based on the set acceleration/deceleration mode.

2) Adaptive speed model, ensuring high speed under high precision

The adaptive speed model guarantees both high speed and high precision, which satisfies needs of high precision and high efficiency in the industry.

3) Hardware can also be upgraded to create the maximum value

Use of the FPGA + dual-DSP multi-embedded system, and the key performance is guaranteed by hardware-level real-time processing. The upgrade of the hardware enables the control card to be downward compatible, and the new product corresponded can be fully compatible with the old version, to create the maximum value to the customer.

1.2. Model designation

Function and Performance			ADT-8949		ADT-8969		ADT-8989	
			C1	H1	C1	H1	C1	H1
Hardware Performance	Control mode		32-bit PCI bus, plug and play					
	Number of axes		4	4	6	6	8	8
	Maximum pulse output frequency		5MHz					
	Number of supporting encoder axes		4	4	6	6	8	8
	Encoder feedback frequency		4MHz					
	DIP switch		0~9					
	Platform performance		A9 dual core					
	Universal digital input		42					
	Universal digital output		24					
	Servo enable output		4	4	6	6	8	8
	Alarm clear output		4	4	6	6	8	8
	Servo alarm input		4	4	6	6	8	8
	Fast input port		2					
	Fast output port		2					
Control Function	Hardware Signal	Hardware emergency stop	√					
		Limit signal stop	√					
		Mechanical origin stop	√					
		Encoder Z-phase signal stop	√					
		Input filter	√					
	Programming mode / pulse equivalent		√					
	Software limit		√					
	Logic variable loop mode		√					
	User encryption		√					
	Acceleratio	S	√					

	n Mode	T	√					
		EXP	√					
		COS	√					
	Asymmetric acceleration and deceleration		√					
	Speed multiplier		√					
	High-precision zero return		√					
	Drive Mode	PT drive	√					
		Continuous drive / JOG	√					
		Linear interpolation	√					
		Plane arc interpolation	√					
		Space arc interpolation	√					
		Spiral interpolation	√					
		Synchronous follow	√					
	Change the drive speed in motion		√					
	Change the target position in motion		√					
High-speed IO	High-speed position latch		√					
	1D/2D/3D High-speed position comparison		√					
Advanced Cache Control	Speed look-ahead		-	√	-	√	-	√
	Cache interpolation capacity		-	10000	-	10000	-	10000
	Cache IO event capacity		-	1000	-	1000	-	1000
	Cache output control		-	√	-	√	-	√
	Cache delay		-	√	-	√	-	√
	Cache PWM		-	√	-	√	-	√
	NURBS		-	√	-	√	-	√

1.3. Software support:

- Operating system: DOS, WINDOWS95/98/NT/2000/XP, WINCE, WIN7
- Programming environment: C/BC++/VC/VB/C#/C++Builder/ Delphi/ LabVIEW/ EVC
- Application examples of open-DOS and Windows

1.4. Industry Applications

- Machine vision, automatic test equipment, AOI;
- Biological, medical automatic sampling equipment;
- Cutting equipment: diamond cutter, sponge cutting machine;
- Dispensing industry;
- Semiconductor packaging industry: Bonder;
- Advertising industry: CNC bending machine;
- Packaging and printing equipment: printer, pad printer;
- Engraving equipment;
- Industrial robot equipment;
- PCB processing, SMT and other industries;

Chapter 2 Quick Start

2.1. Packing list

2.1.1. ADT-8949 series

Product Model	Name	Description	Dimension Parameters
ADT-8949C1 ADT-8949H1	Motion control card	ADT-8949C1/ADT-8949H1	135 mm × 110 mm × 1
	Wiring board	ADT-9140	248 mm × 154 mm × 30 mm × 1
	Data cable	ADT-D62GG	1.5 M × 1
	User's Manual	Instructions	1
	User CD	Electronic files such as SDK, examples and Instructions.	1

2.1.2. ADT-8969 series

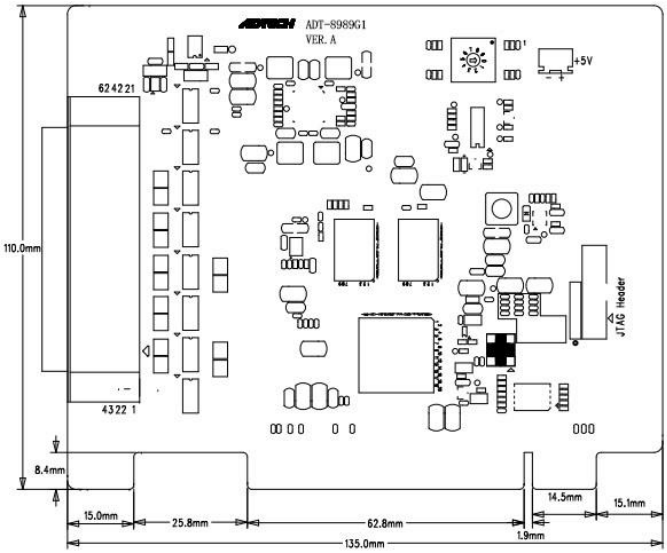
Product Model	Name	Description	Dimension Parameters
ADT-8969C1 ADT-8969H1	Motion control card	ADT-8969C1/ADT-8969H1	135 mm × 110 mm × 1
	Wiring board	ADT-9160	248 mm × 154 mm × 30 mm × 1
	Data cable	ADT-D62GG	1.5 M × 1
	User's Manual	Instructions	1
	User CD	Electronic files such as SDK, examples and Instructions.	1

2.1.3. ADT-8989 series

Product Model	Name	Description	Dimension Parameters
ADT-8989C1 ADT-8989H1	Motion control card	ADT-8989C1/ADT-8989H1	135 mm × 110 mm × 1
	Wiring board	ADT-9180	248 mm × 154 mm × 30 mm × 1
	Data cable	ADT-D62GG	1.5 M × 1
	User's Manual	Instructions	1
	User CD	Electronic files such as SDK, examples and Instructions.	1

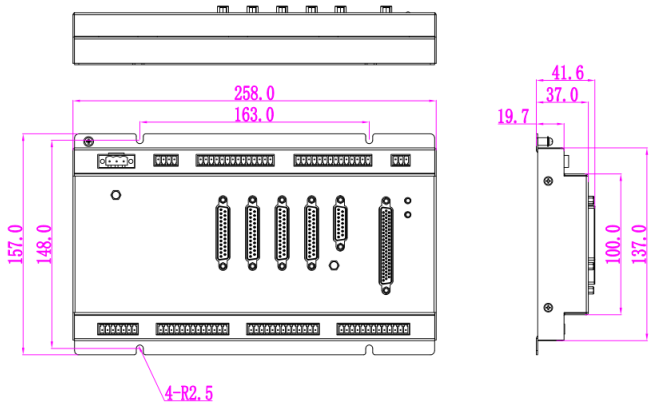
2.2. Installation dimensions

2.2.1. 09 series motion control card

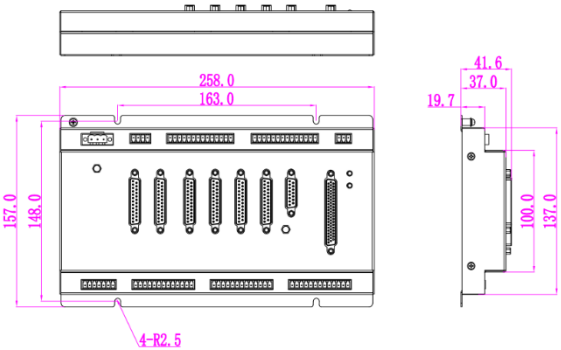


2.2.2. ADT-9140 terminal block of ADT-8949

Dimensions chart of ADT-9140 terminal block

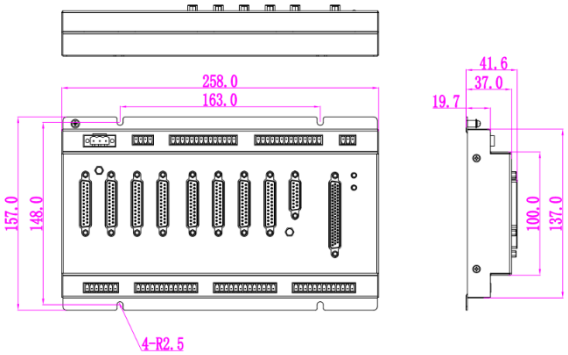


2.2.3. ADT-9160 terminal block of ADT-8969



Dimensions chart of ADT-9160 terminal block

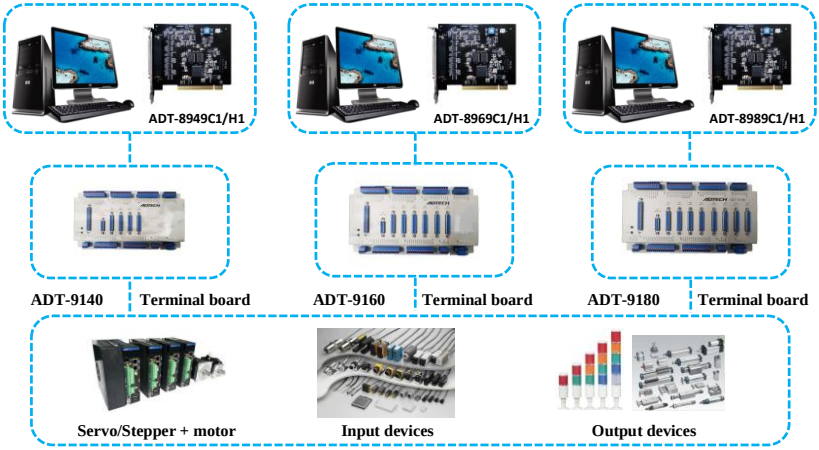
2.2.4. ADT-9180 terminal block of ADT-8989



Dimensions chart of ADT-9180 terminal block

2.2.5. ADT-D62GG data transmission line

2.3. System structure diagram



2.4. Steps to install control card

2.4.1. Board installation

1) Power off the computer (Note: turn off the main power of ATX);
2) Open the back cover of the computer case;
3) Select an unoccupied PCI slot and insert the motion control board;
4) Make sure the gold finger of the motion control board is completely inserted into the PCI slot, and tighten the screws.

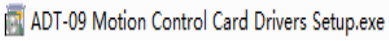
When the 09 Series Motion Control Card is properly installed, the green LED on the back of the board will light up, which means that the FPGA chip is running normally. When the red LED on the front will light up, it means that the board is powered normally. If the above LED indicators do not work, there may be a hardware failure occurred in the board. Please return it to the factory for repair or replacement timely.

2.4.2. One-click setup of driver

Tips	**Most users choose to install the control card driver by "one-click setup of driver". When the driver cannot be installed by one-click setup, you can consider the** 2.4.3 Manual Installation of Driver.

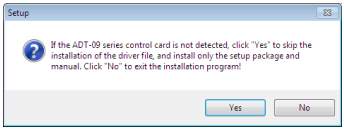
The "**One-click setup of driver**" of 09 Series Motion Control Card is as follows:

1. Open the computer case, insert the control card, then power on and enter the windows system;

2. Double click 

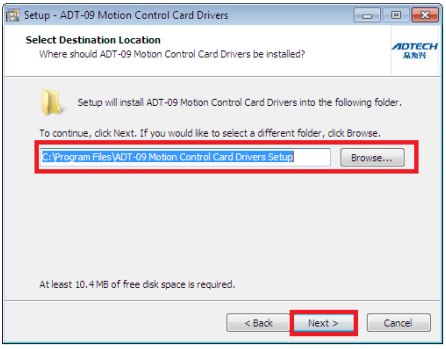
and open the driver installation package.

3. If a dialog box "ADT-09 series control card not detected" as shown in the figure below appears, please check that the control card is still plugged in, and try again.

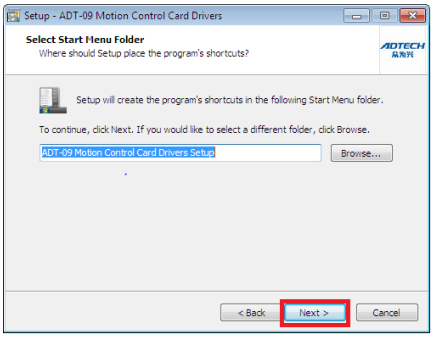


4. The computer can detect the card by displaying the following screen:

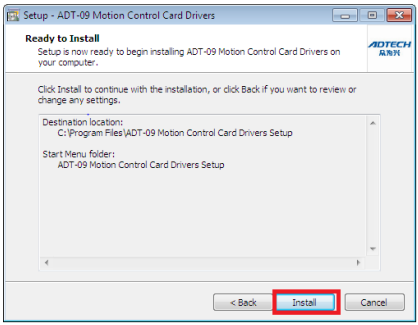
5. Click Next, you can then enter the following screen:



6. Select the installation path (it is recommended to choose the default installation path), and click Next;

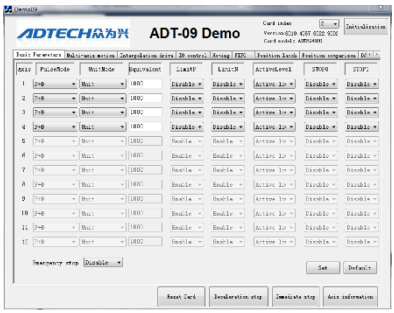


7. Click Next;



8. Click Install and wait for the installation process to complete;

9. After the installation is completed, checking “Run VC DEMO” and Finish, you can then test the driver installation, which is shown in the figure below;

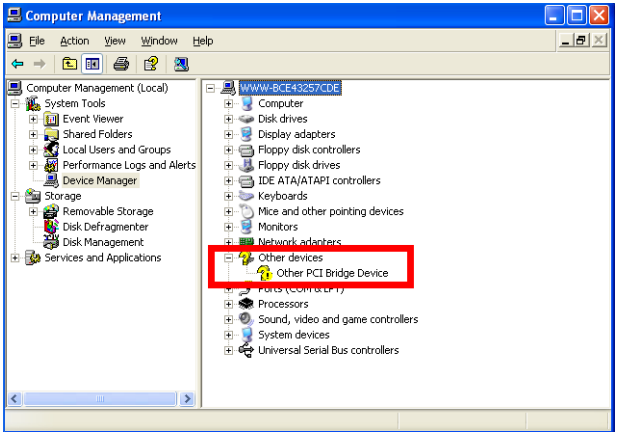


2.4.3. Manual installation of driver

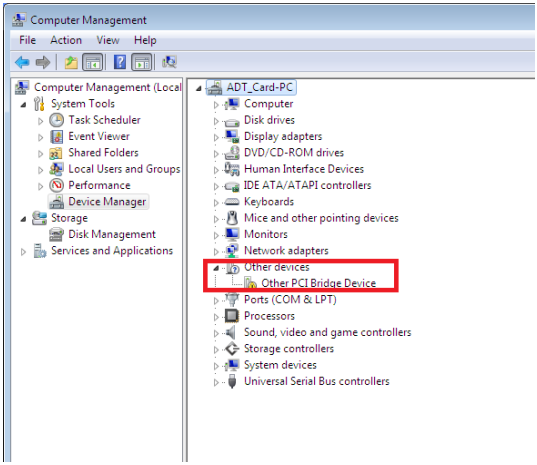
1) Premise

After the board is installed, only the operating system recognizes an unknown PCI device, then can the driver be installed.

As for the XP system, the wizard for new hardware will pop up automatically after startup, or an unknown PCI device will be found in the device manager.



Unknown PCI devices are found in the Device Manager for WIN7 systems.



The number of unknown PCI devices should be no less than the number of boards installed in the current system.

It is similar to other systems, and no more detailed description will be given herein.

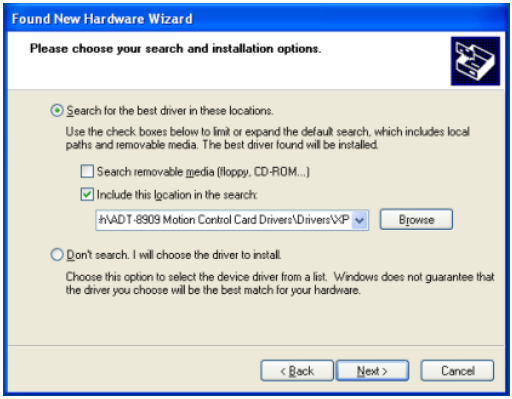
If there's prompt for the new hardware wizard by the system, and no abnormal device is found in the device manager, it means that there's no board information detected by the current operating system. Possible problem descriptions and solutions can be found in the 5.1 Driver Installation FAQs.

2) Driver installation under Windows XP

When the system starts, if the PCI detects an unknown hardware device, the prompt below appears.

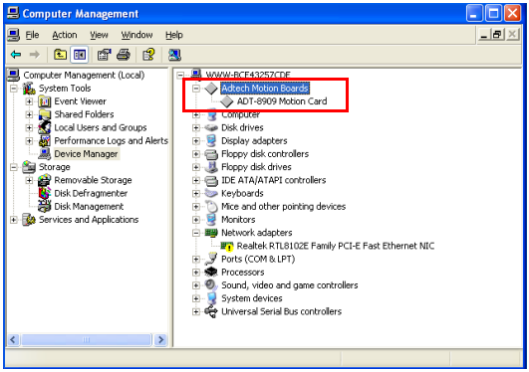
Select in above figure to pop up the following screen

Select in above figure and click Next to pop up the following screen



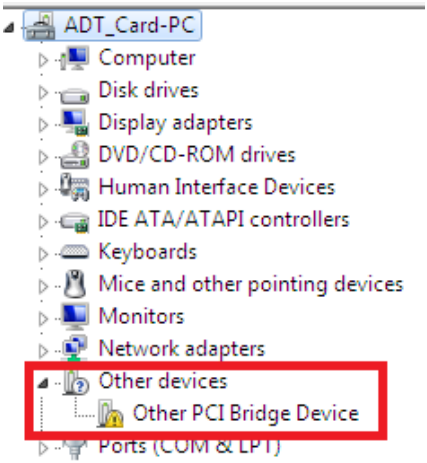
Click "Browse", select CD "Development Kits\Drivers\Control Card Drivers" to locate the driver file path, and click Next to pop up the following screen

Click “Finish” to finish the installation of The ADT-09 Series control card.



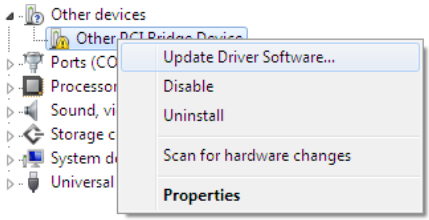
3) Installing drivers on Win7

Insert the control card into PCI slot, right click "My Computer" and select "Properties" to enter Device Manager, as shown below:

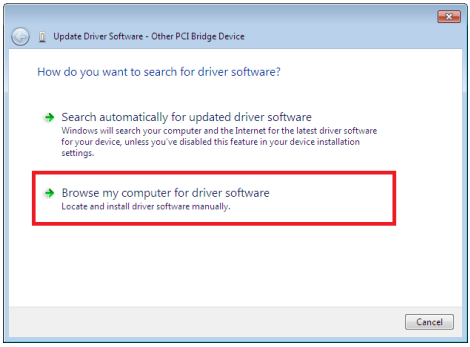


Expand "Other devices", select "PCI Bridge Device" (Different systems may have different unknown device names), and right click, as shown below:

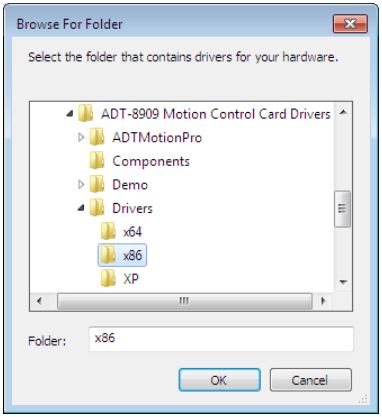
In the popup dialog box, click "Update Driver Software" to show the following dialog box:



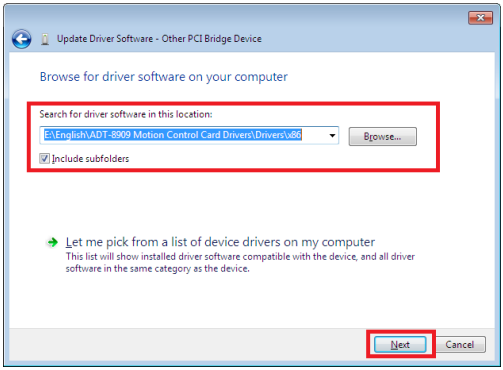
Select the option "Browse my computer for driver software"



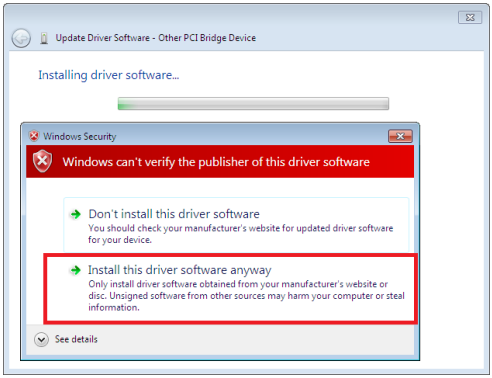
Click the "Browse" button to specify the path for the driver, and select the appropriate system file.



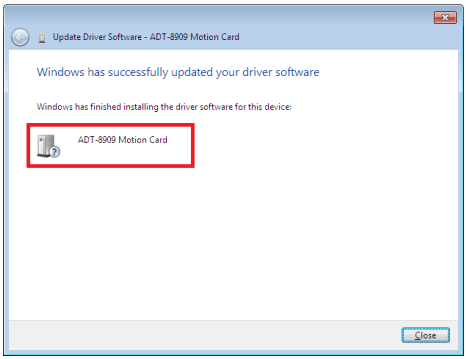
Next



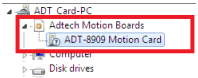
Always install this driver software



Follow the installation instructions until installation is complete



The ADT-09 Series control card has been installed by this time, and the device manager will update of the device details.



For WIN7 and above system, after the driver is installed normally, there will be a blue small question mark appeared in the icon of the control card device. This is because the control card driver has not passed the official logo certification of Microsoft, resulting in that the company's logo cannot be normally displayed by the icon. However, this will not affect the normal use, function and performance of the control card.

2.4.4. Communication setup

The purpose to set up a communication is to ensure that the control card is installed correctly and available in real time.

For actual operation, refer to 4.1 Establishing a Communication herein.

For problems appeared during the communication setup process, refer to 5.1 Control Card Initialization Failure.

Tips	**Administrator rights shall be given to WIN7 system to load the PCI driver. If you run the control card application directly for the first time by double clicking, the control card initialization will then be failed. Therefore, after the first installation is completed, right click the control card application (i.e. VC demonstration program "DEMO.EXE") and select "Run as administrator (A)" program (as shown below), then start the application by double clicking.**

2.4.5. Motors and drivers

Before the peripherals such as the driver are connected to the control card, be sure to read the key documentation such as the driver's instruction manual carefully, and test the driver and motor according to the manual to ensure that they work properly.

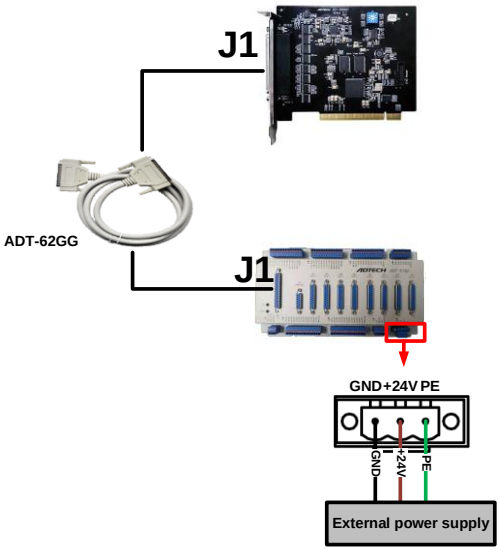
Tips	**During the debugging process, please temporarily disconnect the control card and the terminal block from the load if there's no special requirement. After the offline debugging, and make sure that the peripheral parameters are set correctly, restore the connection between the control card, the terminal block and the load. In case that drive control is required, run it at low speed first**

	then high to prevent device fault or damage due to operational errors during debugging.

2.4.6. Terminal board connection and power supply

Connect one end of the D62GG cable to the J1 connector of the control card, and the other end to the J1 connector if ADT-9180 board. The ADT-9180 terminal block is powered by an external 24V power supply. Wire the external power supply +24V VCC and the external power supply +24V GND as per the terminal board silkscreen print.

After D62GG is properly connected to the board and terminal board J1, and the board is powered on, the POWER green indicator in the lower left corner of the terminal board will work, indicating that the terminal board and the board are connected normally; when the external 24V power supply supplies power to the terminal board, the RUN green indicator on the lower left corner of the terminal block will flash, which means that the terminal board is powered normally. If the above indicator does not work properly or flashes after the terminal board is properly connected and powered, the terminal board may have a hardware failure. Please return the product to the factory for repair or for replacement.



2.4.7. Terminal boards and drivers

Connect the terminal board to the driver based upon actual needs. 4/6/8 sets of drivers can be connected to the terminal board.

AXIS is a 25-pin DB port. For terminal definition, refer to 3.1.1 25-pin DB port definition.

For the servo driver, you can refer to 5.3 Common Servo Wiring Diagram.

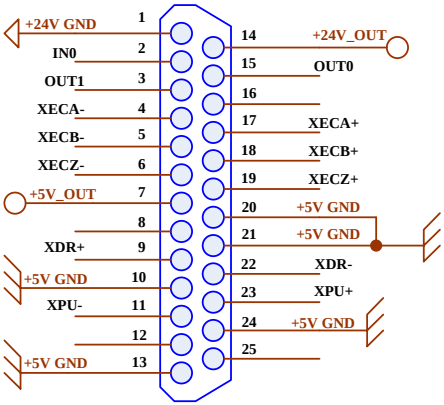
Chapter 3 Hardware Connection

3.1. Port Description

3.1.1. 25-pin DB Port Definition

(CN1\CN2\CN3\CN4\CN5\CN6\CN7\CN8)

The ADT-9180 has eight DB heads corresponding to eight axes (XYZABCDE), the ADT-9160 has six DB heads corresponding to six axes (XYZABC), and the ADT-9140 has four DB heads corresponding to four axes (XYZA). The following takes X axis as an example. (Note: All input and output signals are active low.)



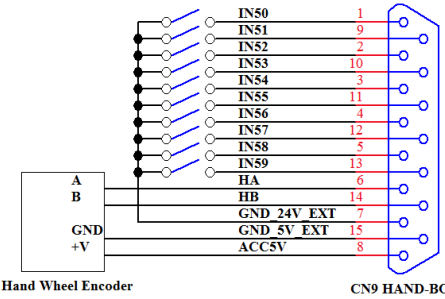
25-pin DB Port Definition

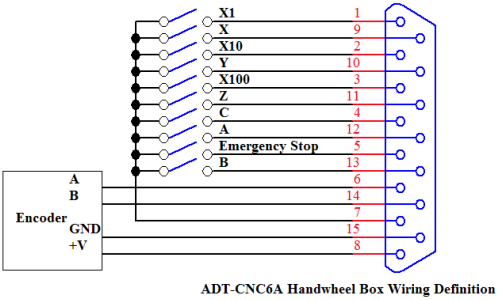
S/N	Port name	Definition
1	**+24V_GND**	24V power output ground
2	**EXT_IN0**	External input, active low, and does not support two-wire sensor connection. It is usually used as a servo alarm input, Y axis, Z axis, A axis, B axis, C axis, D axis, E axis, corresponding to IN1, IN2, IN3, IN4, IN5, IN6, IN7.
3	**EXT_OUT1**	Output control signal, opto-isolated output, active low. It is usually used as servo enable, Y axis, Z axis, A axis, B axis, C axis, D axis, E axis, corresponding to OUT3, OUT5, OUT7, OUT9, OUT11, OUT13, OUT15.
4	**XECA-**	X-axis encoder phase-A input negative. It can be used as a normal input point, corresponding to the sample program input point IN68,

		Y axis, Z axis, A axis, B axis, C axis, D axis, E axis, corresponding to IN69, IN70, IN71, IN72. IN73, IN74, IN75. When the IN75 is used as a normal input point, please refer to 3.4 Digital Input Connection for wiring mode, and the encoder signal is used as a graphic description of the general input.
5	**XECB-**	X-axis encoder phase-B input negative. It can be used as a normal input point, corresponding to the sample program input point IN76, Y axis, Z axis, A axis, B axis, C axis, D axis, E axis, corresponding to IN77, IN78, IN79, IN80, IN81, IN82. When the IN83 is used as a normal input point, please refer to 3.4 Digital Input Connection for wiring mode, and the encoder signal is used as a graphic description of the general input.
6	**XECZ-**	X-axis encoder phase-Z input negative. It can be used as a normal input point, corresponding to the sample program input point IN60, Y axis, Z axis, A axis, B axis, C axis, D axis, E axis, corresponding to IN61, IN62, IN63, IN64. IN65, IN66. When the IN67 is used as a normal input point, please refer to 3.4 Digital Input Connection for wiring mode, and the encoder signal is used as a graphic description of the general input.
7	**VCC**	+5V power output (can't be connected to external power supply)
8	**NC**	
9	**XDR+**	X axis direction positive signal
10	**GND**	5V power grounding
11	**XPU-**	X axis pulse negative signal
12	**NC**	
13	**GND**	5V power grounding. If the servo pulse signal uses the high-speed pulse port of the differential output, the internal ground (this pin) of the control card must be connected to the ground of the servo pulse input port.
14	**OVCC**	+24V power output (not allowed to connect 24V + externally)
15	**EXT_OUT0**	Output control signal, opto-isolated output, active low. It is usually used as servo alarm clear, Y axis, Z axis, A axis, B axis, C axis, D

		axis, E axis, corresponding to OUT2, OUT4, OUT6, OUT8, OUT10, OUT12, OUT14.
16	**NC**	
17	**XECA+**	X-axis encoder phase A input positive
18	**XECB+**	X-axis encoder phase B input positive
19	**XECZ+**	X-axis encoder phase Z input positive
20	**GND**	5V power grounding
21	**GND**	5V power grounding
22	**XDR-**	X axis direction negative signal
23	**XPU+**	X axis pulse positive signal
24	**GND**	5V power grounding
25	**NC**	

3.1.2. 15-pin Hand Wheel Port Definition (CN9)



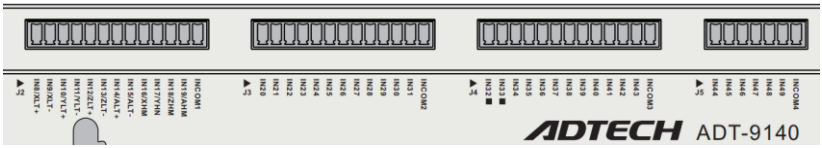


CN9 wiring diagram wiring definition **ADT-CNC6A Handwheel Box Wiring Definition**

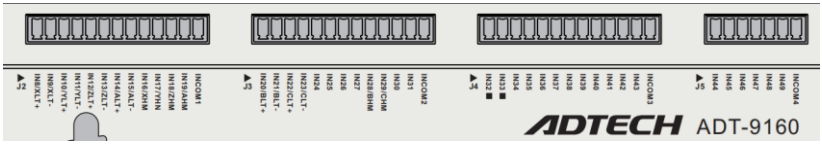
Pin No.	Pin Definitions	Function
1	**IN50**	Hand wheel general input (for gear X1 with ADT-CNC6A hand-held box)
2	**IN52**	Hand wheel general input (for gear X10 with ADT-CNC6A hand-held box)
3	**IN54**	Hand wheel general input (for gear X100 with ADT-CNC6A hand-held box)
4	**IN56**	Hand wheel general input (for switching to C axis with ADT-CNC6A hand-held box)

5	**IN58**	Hand wheel general input (for emergency stop with ADT-CNC6A hand-held box)
6	**HA**	Hand wheel output phase A signal
7	**GND_24V_EXT**	24V power output ground~~ing~~
8	**VCC 5V**	5V power output
9	**IN51**	Hand wheel general input (for switching to X axis with ADT-CNC6A hand-held box)
10	**IN53**	Hand wheel general input (for switching to Y axis with ADT-CNC6A hand-held box)
11	**IN55**	Hand wheel general input (for switching to Z axis with ADT-CNC6A hand-held box)
12	**IN57**	Hand wheel general input (for switching to A axis with ADT-CNC6A hand-held box)
13	**IN59**	Hand wheel general input (for switching to B axis with ADT-CNC6A hand-held box)
14	**HB**	Hand wheel output phase B signal
15	**GND_5V_EXT**	5V power output ground~~ing~~
Note: Before using the hand wheel, please confirm that the INCOM, OUTCOM, and +EX24V of the input and output ports are connected to the DC24V power supply.		

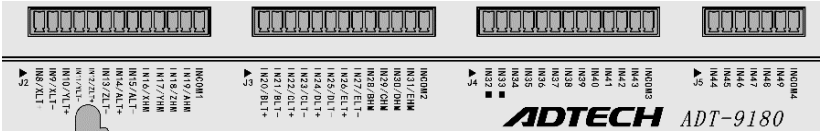
3.1.3. ADT-9140Input Port Definition ofADT-8949 Terminal Board



3.1.4. ADT-9160 Input Port DefinitionofADT-8969 Terminal Board



3.1.5. ADT-9180Input Port Definition ofADT-8989 Terminal Board



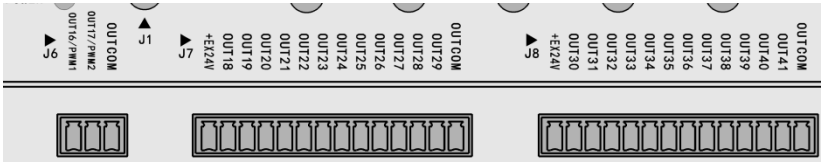
3.1.6. ADT-9140\60\80 Input Port Definition

Port	Pin No.	Pin Definitions	Function
J2	1	IN8/XLT+	X positive limit signal, can be used as general input
	2	IN9/XLT-	X negative limit signal, can be used as general input
	3	IN10/YLT+	Y positive limit signal, can be used as general input
	4	IN11/YLT-	Y negative limit signal, can be used as general input
	5	IN12/ZLT+	Z positive limit signal, can be used as general input
	6	IN13/ZLT-	Z negative limit signal, can be used as general input
	7	IN14/ALT+	A positive limit signal, can be used as general input
	8	IN15/ALT-	A negative limit signal, can be used as general input
	9	IN16/XHM	X origin signal (alias STOP0), can be used as general input, position latch
	10	IN17/YHM	Y origin signal (alias STOP0), can be used as general input, position latch
	11	IN18/ZHM	Z origin signal (alias STOP0), can be used as general input, position latch
	12	IN19/AHM	A origin signal (alias STOP0), can be used as general input, position latch
	13	INCOM1	IN8-IN19 input public terminal, access DC12-24V+
J3	1	IN20/BLT+	B positive limit signal, can be used as general input (ADT-9140\60 for general input)
	2	IN21/BLT-	B negative limit signal, can be used as general input (ADT-9140\60 for general input)
	3	IN22/CLT+	C positive limit signal, can be used as general input (ADT-9140\60 for general input)
	4	IN23/CLT-	C negative limit signal, can be used as general input (ADT-9140\60 for general input)

	5	**IN24/DLT+**	D positive limit signal, can be used as general input (ADT-9140\60 for general input)
	6	**IN25/DLT-**	D negative limit signal, can be used as general input (ADT-9140\60 for general input)
	7	**IN26/ELT+**	E positive limit signal, can be used as general input (ADT-9140\60 for general input)
	8	**IN27/ELT-**	E negative limit signal, can be used as general input (ADT-9140\60 for general input)
	9	**IN28/BHM**	B origin signal (alias STOP0), can be used as general input, position latch (ADT-9140\60 for general input)
	10	**IN29/CHM**	C origin signal (alias STOP0), can be used as general input, position latch (ADT-9140\60 for general input)
	11	**IN30/DHM**	D origin signal (alias STOP0), can be used as general input, position latch (ADT-9140\60 for general input)
	12	**IN31/EHM**	E origin signal (alias STOP0), can be used as general input, position latch (ADT-9140\60 for general input)
	13	**INCOM2**	IN20-IN31 input public terminal, access DC12-24V+
J4	**1**	**IN32**	General input, can be used for hardware emergency stop function, position latch
	2	**IN33**	General input, can be used for position latch
	3	**IN34**	General input
	4	**IN35**	General input
	5	**IN36**	General input
	6	**IN37**	General input
	7	**IN38**	General input
	8	**IN39**	General input
	9	**IN40**	General input
	10	**IN41**	General input
	11	**IN42**	General input
	12	**IN43**	General input
	13	**INCOM3**	IN32-IN43 input public terminal, access DC12-24V+

J5	1	IN44	General input
	2	IN45	General input
	3	IN46	General input
	4	IN47	General input
	5	IN48	General input
	6	IN49	General input
	7	INCOM4	IN44-IN49 input public terminal, access DC12-24V+
Note: All input signals are active low.			

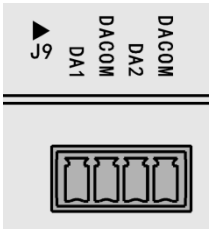
3.1.7. ADT-9140\60\80 Output Port Definitions



Port	Pin No.	Pin definitions	Function
J6	1	OUT16/PWM1	High-speed output control signal, active low, PWM, position comparison dedicated output
	2	OUT17/PWM2	High-speed output control signal, active low, PWM, position comparison dedicated output
	3	OUTCOM	OUT16, OUT17 output public terminal, access DC12-24VGND
J7	1	+EX24V	OUT18-OUT29 output port power DC24V+ input
	2	OUT18	Output control signal, opto-isolated output, active low
	3	OUT19	Output control signal, opto-isolated output, active low
	4	OUT20	Output control signal, opto-isolated output, active low
	5	OUT21	Output control signal, opto-isolated output, active low
	6	OUT22	Output control signal, opto-isolated output, active low
	7	OUT23	Output control signal, opto-isolated output, active low
	8	OUT24	Output control signal, opto-isolated output, active low
	9	OUT25	Output control signal, opto-isolated output, active low
	10	OUT26	Output control signal, opto-isolated output, active low
	11	OUT27	Output control signal, opto-isolated output, active low

	12	OUT28	Output control signal, opto-isolated output, active low
	13	OUTCOM	OUT18-OUT28 output port power DC24V GND input
J8	1	+EX24V	OUT29-OUT41 output port power DC24V+ input
	2	OUT29	Output control signal, opto-isolated output, active low
	3	OUT30	Output control signal, opto-isolated output, active low
	4	OUT31	Output control signal, opto-isolated output, active low
	5	OUT32	Output control signal, opto-isolated output, active low
	6	OUT33	Output control signal, opto-isolated output, active low
	7	OUT34	Output control signal, opto-isolated output, active low
	8	OUT35	Output control signal, opto-isolated output, active low
	9	OUT36	Output control signal, opto-isolated output, active low
	10	OUT37	Output control signal, opto-isolated output, active low
	11	OUT38	Output control signal, opto-isolated output, active low
	12	OUT39	Output control signal, opto-isolated output, active low
	13	OUT40	Output control signal, opto-isolated output, active low
	14	OUT41	Output control signal, opto-isolated output, active low
	15	OUTCOM	OUT29-OUT41 output port power DC24V GND input

3.1.8. DA Port Definition

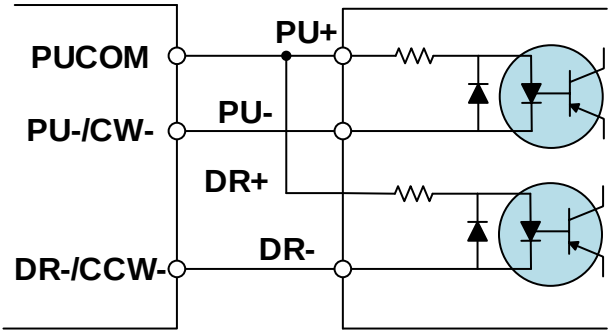


Pin No.	Pin definitions	Function
1	DA1	DA1 output, 0 ~ 10 V output
2	DACOM	DA output signal ground~~ing~~
3	DA2	DA2 output, 0 ~ 10 V output
4	DACOM	DA output signal ground

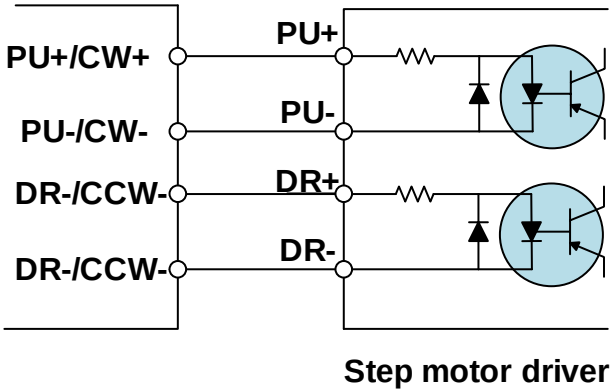
3.2. Connecting pulse/direction output signal

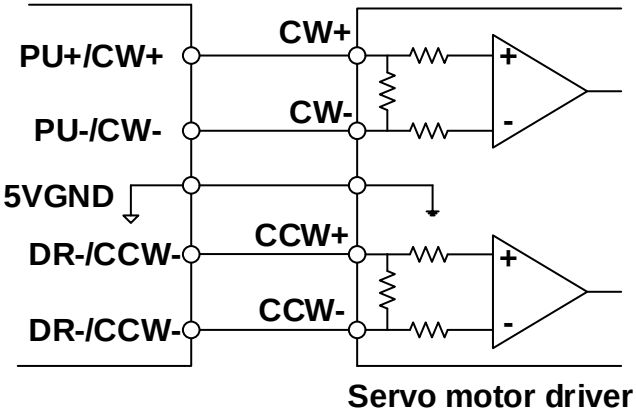
Pulse output is differential output, and can be easily connected to the stepper / servo drives.

The figure below shows the connection between the pulse and the anode of the direction. PUCOM is the 7th pin of the 25-pin DB connector (+5V power output). To enhance the anti-interference ability of the common anode connection, it is recommended to connect the DB side +5V GND (Pin 10/13/20/21/24) to the driver terminal ground wire.



Below is independent connection of pulse and direction signal. Differential connection is recommended due to strong anti-interference.

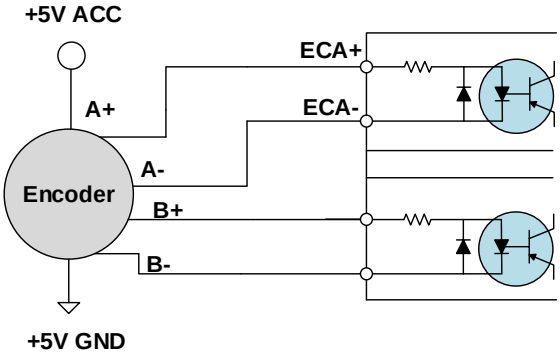




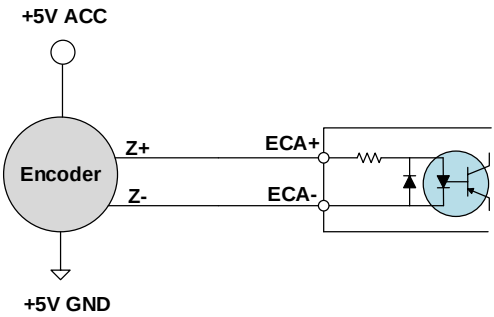
If the servo pulse signal uses the high-speed pulse port of the differential output, the Pin 13 of the 25-pin DB connector pin in the control card must be connected to the ground wire of the servo pulse output port.

3.3. Connecting encoder input signal

OPEN-CONNECT Output Encoder Wiring Diagram as below. For +5V power, R can be omitted; for +12V power, R = 1 kΩ; for +24V power, R = 2 KΩ.

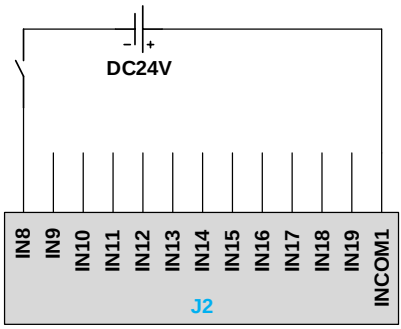


Encoder Z phase connection as below



3.4. Digital input connection

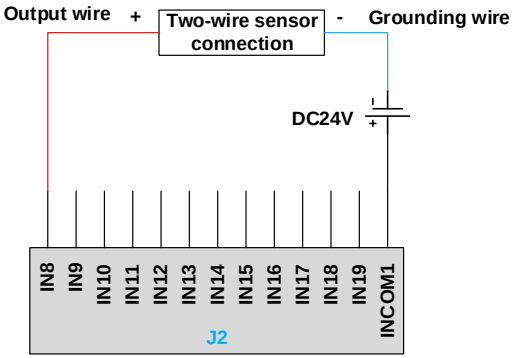
The mechanical switch connection of the general input IN8 (as an example) is as shown in the figure below, for which, the switch polarity is no longer needed to be considered.



Mechanical switch connection

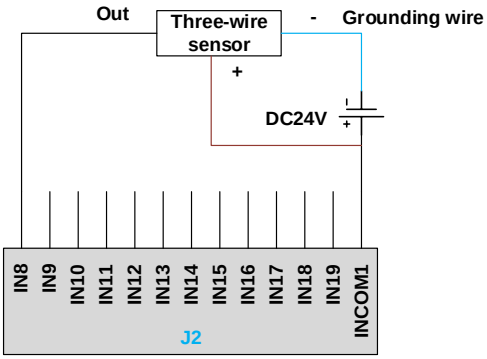
The figure below shows the two-wire sensor connection. The polarity of the two-wire sensor must be considered. In general, the ground line is in blue, and output line is brown.

The input port IN0 ~ IN5 in the 25-pin DB port does not support the 2-wire sensor connection.



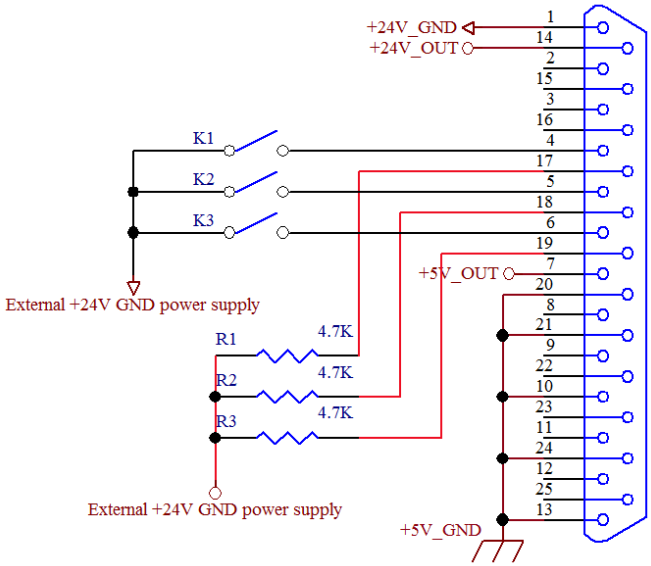
Two-wire sensor connection

The three-wire sensor is connected as shown in the figure below. The polarity of the three-wire sensor must be considered. The colors corresponded to the polarity is provided in the instructions for the corresponding three-wire sensor.



Three-wire sensor connection

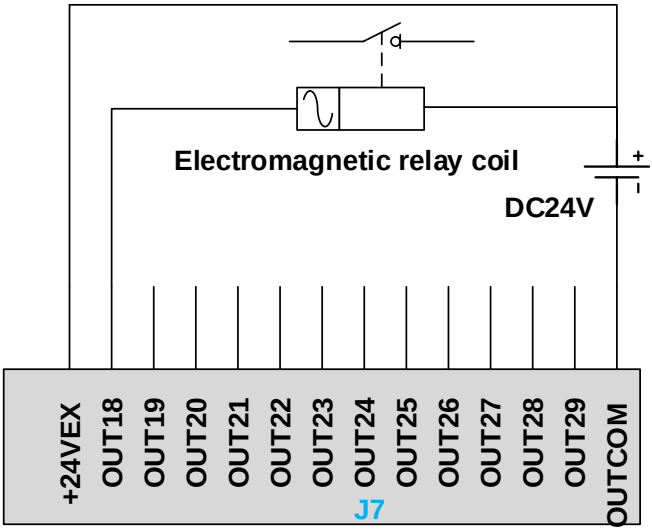
When the AB-phase signal of encoder is used as a universal input point. Taking X-axis is taken as an example, with its wiring method shown below. The K1/K2/K3 in the figure are connected using the mechanical switch.



3.5. Digital output connection

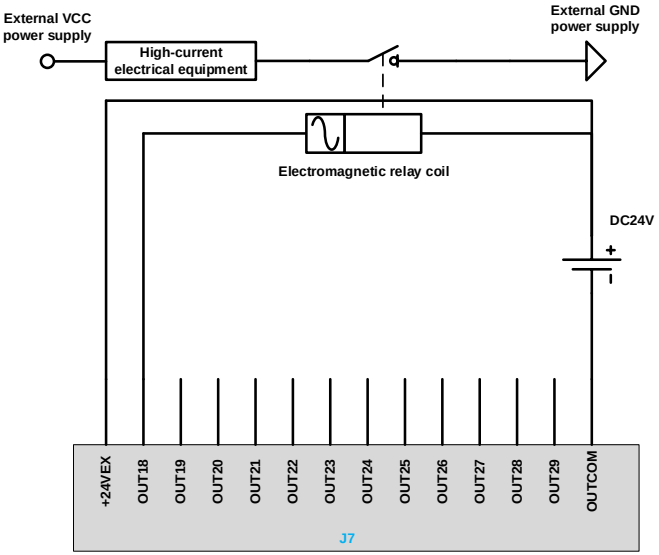
All universal output ports are of open-drain output ports, and the drive current of the output port is within 1.5A (if only one-way output port is used, the drive current can reach 2A), make sure if the output port drive current meet the requirements when using. If the current drive capability is insufficient, an external relay can be used for current expansion, and the follow-current protection diode shall also be connected.

Taking OUT18 as an example. The general electromagnetic relay of output port drives is connected as below. The polarity of the electromagnetic relay coil is not required to be considered if special instructions are provided.



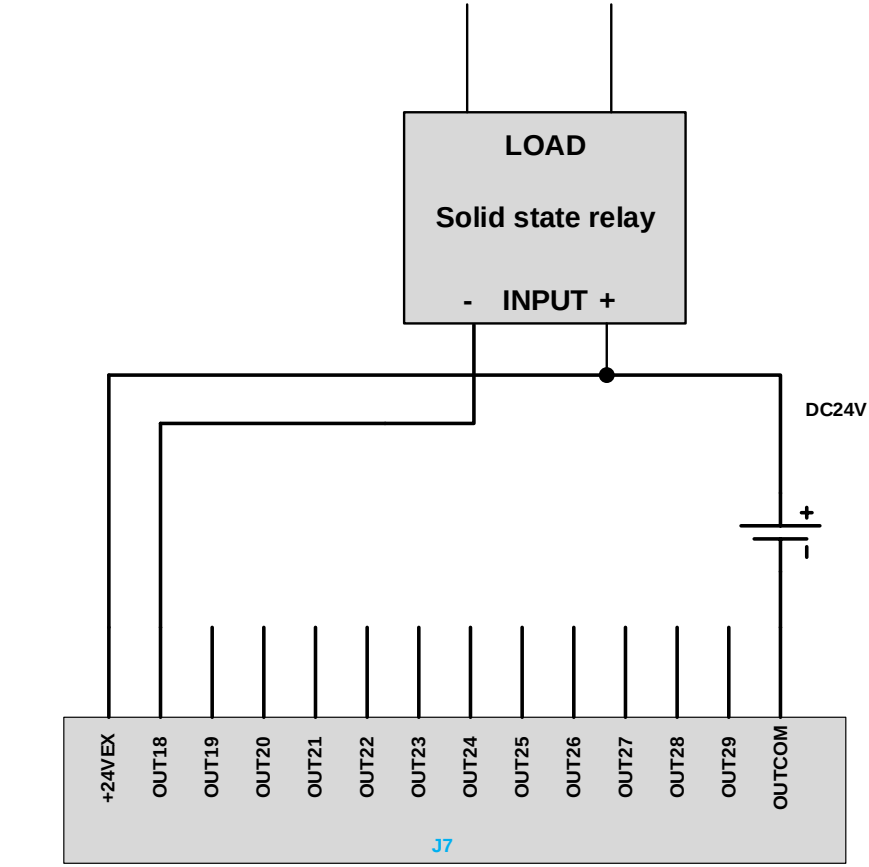
Connection of electromagnetic relay

When expand the current with an external relay, a NO relay must be used, as shown in the figure below



Current expansion connection of electromagnetic relay

Figure below shows the way the output port of the solid-state relay is connected. Pay attention to the polarity of the control terminal of the solid-state relay.



Solid state relay connection

3.6. Electrical specifications

- **Digital input**

  Input channel: 42-channel, all opto-isolated

  Servo alarm input channel (25-pin DB port): 1 channel for each axis, opto-isolated

  Input voltage: DC12-24V

  High level: >4.5V

  Low level: <1.0V

  Isolation voltage: 2,500V DC

- **Digital output**

  Output channel: 24-channel, all opto-isolated

  Servo enable output channel (25-pin DB port): 1 channel for each axis, opto-isolated

  Alarm clear output channel (25-pin DB port): 1 channel for each axis, opto-isolated

  Output type: NPN open collector 12-24V DC; the single-channel maximum output current of common output port 1A, and single-channel maximum output current of 25-pin DB port is 50 mA

- **Count input**

  Channel: 4/6/8 AB-phase encoder input, all opto-isolated

  Maximum counting frequency: 4MHz

  Input voltage: 5V

  High level: >4.5V

  Low level: <1.0V

  Isolation voltage: 2500V DC

- **Pulse output**

  Channel: 4/6/8-axis pulse, 4/6/8-axis direction, all opto-isolated

  Maximum pulse frequency: 5MHz

  Output type: 5V differential output

  Output mode: pulse + direction, double pulse, 90 ° phase difference two-phase pulse

3.7. Work environment

- Working temperature 0 ~ 60°C
- Storage temperature -20 ~ 80°C
- Working humidity 20% ~ 95%
- Storage humidity 0% ~ 95%

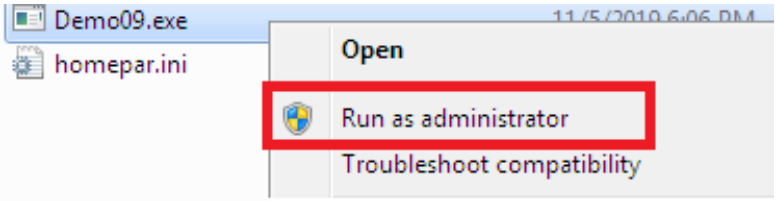
Chapter 4 Basic Debugging

The 09 series motion control card also provides users with a variety of platform sample applications such as VC/VB/C# with open source, which can either be available for debugging by users in field, or be used as development reference for programmers.

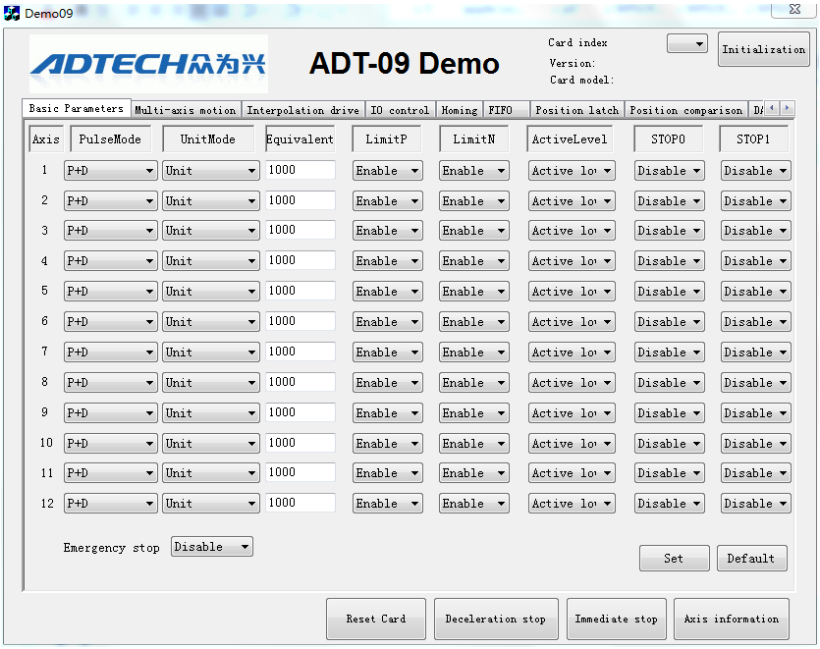
The user interface and operation of sample application under each platform are essentially the same. The basic debugging process of the 09 Series 8-axis Motion Control Card is described below by taking the VC sample application as an example to.

After locating the VC sample program DEMO09.exe, right click to choose “Run as administrator”.

After locating the VC sample program DEMO09.exe, right click to choose “Run as administrator”.



The main interface preview is shown below.



Tips	**During the debugging process, please temporarily disconnect the control card and the terminal block from the load if there's no special requirement. After the offline debugging, and make sure that the peripheral parameters are set correctly, restore the connection between the control card, the terminal block and the load. In case that drive control is required, run it at low speed first then high to prevent device fault or damage due to operational errors during debugging.**

4.1. Establishing a communication

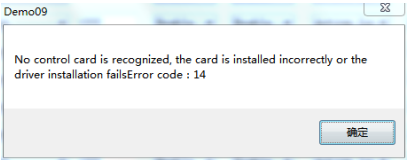
The communication between the PC and the control card can be the initialization of the control card, which can be established by debugging the control card initialization of the software. You can try to establish communication between the PC and the 09 series motion control card by clicking the "Control Card Initialization" button in the upper right corner.

The user interface will change as follows if the communication is successfully established.

1) Completion of control card basic information. For example, the control card index can be used, that is, the front dial switch number of the control card will be listed in the drop-down box control; the version information of control card is used as the basis for the control card program upgrade, and will be displayed under the available control card index.

2) The system will get the number of available axes of the current control card as per the card number, while allocate the controllable axis number data control. Taking the basic parameter property page as an example. The No. 0 control card (i.e., the current index of the control card) is the 09 series 8-axis motion control card, and the property page will intelligently disable the No. 9 ~ 12 axis, and will intelligently read the emergency stop signal mode of current control card, as well as the default basic parameter of axis 1 ~ 8, which will be displayed in the corresponding parameter drop-down box control. The remaining property pages will also open 1 ~ 8 axis data control and read default parameters for them or provide default settings for controllable parameters.

If the communication between the PC and the control card is failed to be established, the software will then identify different exception and give the error messages. There are many causes for the failure of communication establishment. For details of the problems and solutions, please refer to 5.2 Control card initialization failure in appendix. For example, error prompt interface as follows will appear if the motion control card is not recognized.



4.2. Basic parameters

Basic parameters are defined as, when the motion control card is connected to the peripheral device, the control card should be configured accordingly to ensure the normal execution of the control function based on the actual configuration of the peripheral device.

After the communication is successfully established, the basic configuration of the 09 Series Motion Control Card is mainly embodied in the property page “Basic Configuration”, which covers the pulse mode, programming mode, pulse equivalent, hardware positive/negative limit mode and active level, mechanical origin (STOP0) signal mode, encoder Z-phase (STOP1) signal mode, ES signal mode, etc.

- Pulse mode

It includes the pulse + direction mode, double pulse mode, and analog encoder AB-phase mode. In this mode, the pulse logic and direction output signal of pulse signal can be set. These parameters, dependent on the actual parameter settings of the peripherals. Only they match with peripheral parameters, can the drive control be made in right accuracy and consistent direction.

- Programming mode

Generally, there are two programming modes for each axis of the control card, one is mm unit programming mode based on the pulse equivalent, and the other is pulse-based unit system programming mode. The difference between the two programming modes lies in the counting unit (mm or pulse) of the specified target position parameter when driving control. The mm-based programming mode is more convenient for device development and debugging. It is defaulted as mm unit-based programming mode.

- Pulse equivalent

When the programming mode of the axis is mm unit-based pulse equivalent, this parameter will determine that 1mm=x pulse. By default, 1mm = 1000pulse, and this parameter depends on the pulse subdivision parameter settings of the peripheral. A matched pulse equivalent setting should be used so as to guarantee the accurate drive position.

- Limit mode

The limit mode here refers to the hardware limit mode. Whether it is enabled and the active level are rested with the wiring method and process requirements of the

positive/negative limit sensors or other signal components at both ends of the corresponding module.

- STOP0 mode

The STOP0 mode sets the working mode of the STOP0 signal sensor or other types of signal components after the device homing. If the device is wished to stop driving at this signal after homing, it can then be set to be valid, and the active level as per the wiring form. In general, this signal mode is enabled mostly to multiplex the STOP0 signal as a hardware limit signal in a direction after homing. It is defaulted as invalid.

- STOP1 mode

The encoder Z-phase signal is only used for high-precision homing or universal input signals of the device, and is usually set to be invalid after homing is done. It is defaulted as invalid, and default setting can be used.

After the communication is successfully done, the default value of the basic parameter attribute is the current actual configuration that is read from the control card and each axis, and that is also the default configuration of the control card and each axis.

In this mode, only the non-debugging stage of the control card function verification will be performed, that is, the control card will not be connected to the peripheral during trial stage. Do not change the default setting of the control card at this time. By default, the positive/negative limit low level is active, the mechanical origin (STOP0) and the encoder Z-phase (STOP1) signal are invalid, and the emergency stop signal is invalid for 09 Series Motion Control Card. Since the above signal terminals of the 09 Series Control Card are in the h l state by default (can be observed from the property page "4.3 IO control"). If the following settings are made when an original card is used, the configuration axis drive may be abnormal (observed in the "Stop Information" in the "Axis Information Monitoring" interface):

1) Positive/negative limit active high

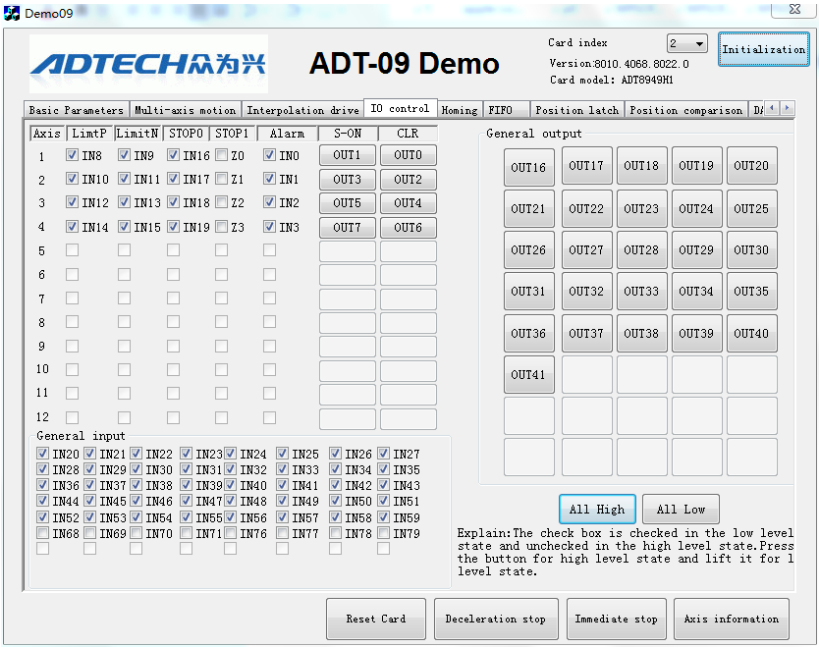
2) STOP0/STOP1 active high

3) Emergency stop signal active high

4.3. IO control

When the device is normally driven, it is necessary to strictly check whether the I/O ports of the device are normal, especially before homing. If the signal is abnormal, it may cause abnormal conditions when the device is driven, or even a collision.

The IO monitoring window of the current control card can be found on the property page "IO Control". Take the 4-axis motion control card as an example.

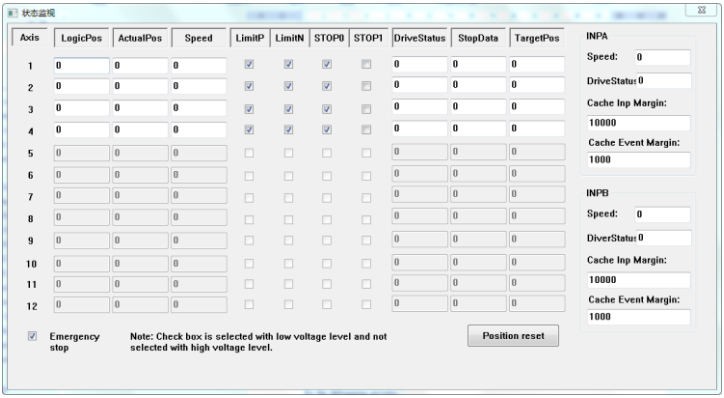


This panel monitors all input/output states of the ADT-09 motion control card in real time.

It is necessary to verify hardware input signals of the "Function Port" panel one by one, including hardware positive/negative limit, STOP0 and so on. In the case of wiring support, the encoder Z-phase signal ECZ-(STOP1) and the servo alarm signal must also be verified. Also, the servo alarm clear port and servo enable port of each axis can be verified one by one.

4.4. Axis information monitoring

Open the axis drive status monitoring window by pressing the "Axis Information Monitoring" button in the lower right corner of the sample application.

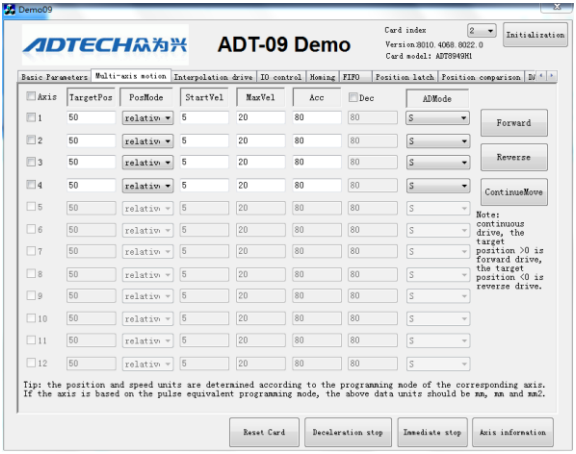


The panel monitors the logical position, actual position, current speed, drive status, stop information and target position information of all axes available of the current control card. It also offers convenient monitoring of critical hardware signals for the debugging process.

Meanwhile, the panel offers information such as the current speed, drive status, interpolation margin, etc. of the interpolation axis of 09 Series Motion Control Card.

By opening the panel, the following basic debugging operations can be done easily.

4.5. Multi-axis motion

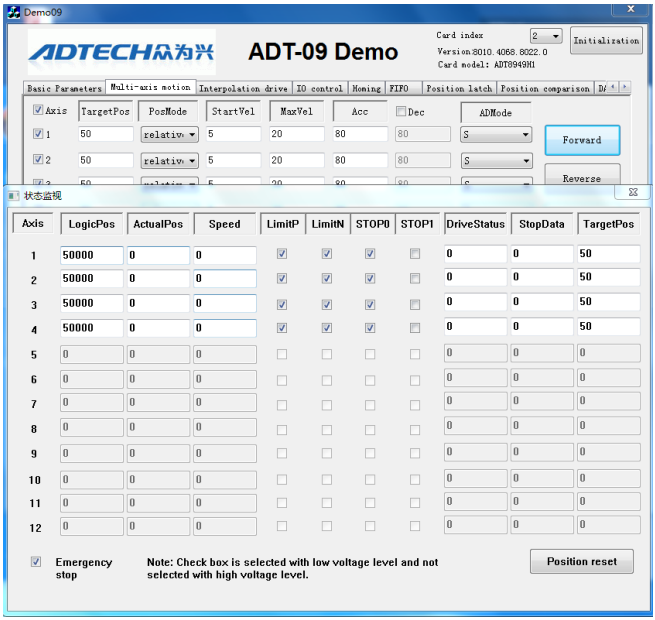


The panel offers basic drive for each axis, including PT drive, continuous drive, and so on.

The data unit such as the speed, acceleration and deceleration, and target location of the driver is determined by the settings of the "Programming Mode" attribute in "Basic Parameters". When the programming mode of the axis is pulse equivalent based, the data unit of speed and location in the panel is expressed in mm, mm/s or mm/s²; when the pulse mode of the axis is pulse-based, the data unit of speed and location in the panel is in pulse, pulse/s, and pulse/s².

In the position mode, the relative position is the displacement of the target position relative to the current location, and the absolute position is the target position is a displacement point in relative to 0 in coordinate position. To verify the asymmetric acceleration/deceleration effect, you can enable the deceleration setting by checking the attribute “Deceleration”.

If the default speed and position parameters are inappropriate, just make appropriate adjustment. After the parameter configuration is confirmed, drive the selected axis by performing "Linkage Forward" or "Linkage Reverse". Drive information can be viewed through the “Axis Information Monitoring” panel. The effect is shown as follows.



To verify whether the configuration of the pulse mode, the limit mode, the pulse equivalent, the servo pulse subdivision and other parameters are reasonable and effective, observe the actual driving speed, the stop information when the driving is finished, and the position measurement after the driving is done.

The basic debugging of the control card has been verified at this time. Where there is no abnormality found in the above process, the control card hardware is correctly connected and the function is effective. For the rest of the functions, refer to the introduction of other functions in the "09 Series Motion Control Card Programming Manual.pdf" to enable configuration and debugging.

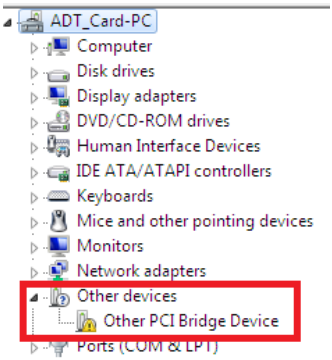
Chapter 5 Appendixes

5.1. Common problems for driver installation

5.1.1. The control card cannot be detected and the driver cannot be installed normally

In the process of using the control card, if the control card is not detected, you can make troubleshooting by following the method below:

1) Check if the MB driver of the operating system is installed properly before inserting the control card into the PCI slot. When the motherboard driver is not installed properly, the device manager will prompt that the "Other PCI Bridge Device" device runs abnormal, which may vary depending on the system version.



2) Check that the board and slot are in good contact. When the control card is powered on, a RED indicator will light on the front of the board. If the board is powered on improperly, or the system still cannot detect the board after normal power-on, it is then recommended to shut down and take out board, and clear the dirt on gold finger of the control card with eraser, clean the PCI slot or replace other available PCI slots, and finally reinstall the board.

3) Check to see if the operating system version matches the system version supported by the driver, and that the control card model is compatible with the driver model.

4) Some IPCs may conflict with other hardware due to PCI load limitations or constraints imposed by other hardware. It is recommended to shut down,

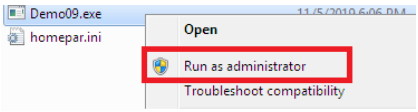
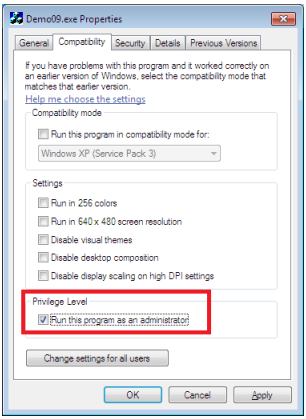
and remove sound card, network card, etc., to ensure that the board is properly tightened and installed. Then, restart it for verification.

5) If you check as per the above steps and the system still cannot detect the board, try to seek for technical support or consult us to ask for replacing the board.

5.2. Control card initialization failure

There are many reasons for the initialization failure of control card. The problem description and recommended solutions are listed below.

5.2.1. WinIO initialization failed, Error Code 9

Possible cause	Run the sample application not as an administrator
Solution	1. Close the sample application currently run by right clicking and choose to Run as administrator".  2. Close the sample application currently run by right clicking Properties --> Compatibility --> Privilege Level, and run this program as an administrator.  3. Upgrade the current user system level to the administrator

5.2.2. PCI bridge failed, Error Code 10

Possible cause	1. The PCI bridge is in poor contact with the board, and the PCI slot needs to be cleared or partially damaged.
Solution	1. Shut down and take out the control card; clean the PCI slot, and clear the

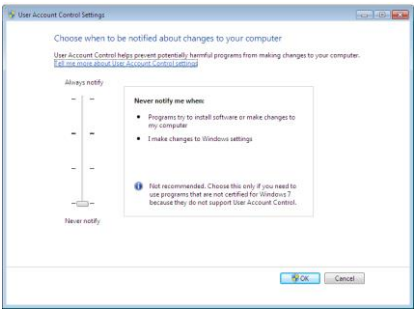
	gold finger with eraser. Reinstall it. 2. Shut down, clear the card gold finger with eraser, and replace with other available PCI slots.

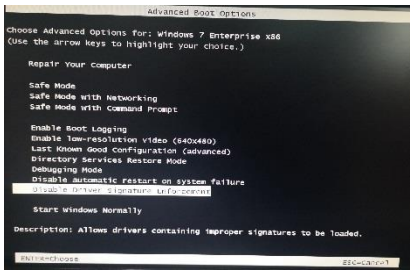
5.2.3. DIP switch repeated, Error Code 13

Possible cause	1. When multiple motion control cards of the same series are used, the DIP switch is repeated.
Solution	1. Close the sample application, dial the DIP switches of multiple control cards to different gears, and restart the sample program.

5.2.4. Motion Control Card Not Detected, Error Code 14

The motion control card not detected as mentioned here is only considered in the case where the control card has been properly assembled and the device manager has detected the motion control card of the specified model.

Possible cause	1. The control card driver is not installed properly. 2. Run the sample application not as an administrator.
Recommended solution	1. Uninstall and reinstall the motion control card driver. When uninstalling, locate the specified control card device through the device manager. Then right click and uninstall it. 2. Refer to 5.2.1 WinIO initialization failed, Error Code 9 for details. 3. For WIN7 and above system, Control Panel --> User Account and Family Safety--> Change User Account Settings Message to "Never Notify"  4. Uninstall the control card driver and restart the PC. Enter the Advanced Setup option by pressing F8 when booting; then select "Disable driver signature enforcement" before entering the system, reinstall the driver, and run the sample application as administrator



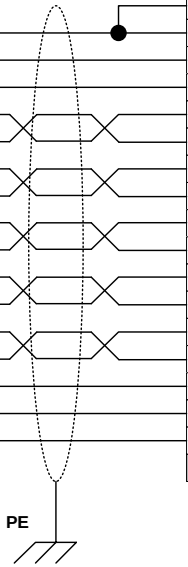
5.3. Common servo wiring diagram

Following general recommendations are put forward before the servo driver is connected to the 25-pin DB port of the terminal box.

1) It is recommended to use an external 24V DC power supply for servo drive to minimize interference that may occur on the control card power supply system while the servo drive is running.
2) The encoder signal, pulse signal, and direction signal are differential signals. Please use a twisted-pair connection.
3) When the pulse frequency is 0 ~ 500 Kpps, command pulse input applies the optocoupler input mode usually; when the pulse frequency is 0 ~ 4Mpps, the command pulse input uses private input mode of the long-distance driver. When the pulse frequency requirement is below 500 Kpps, the optocoupler input mode is recommended. Different command pulse input modes correspond to different pulse direction signal input terminals of the driver. Please refer to the corresponding driver instructions for details.
4) The control card end uses the differential pulse work mode. The driver-side GND pin (specific terminal number depends on different driver models) needs to be directly connected to the terminal box DB pin 13 GND to maximize the shielding of differential signal interference.

5.3.1. QX Series Servo Drive by Adtech

25-pin DB connector	
Pin Definitions	PIN
+24V GND	1
IN0	2
OUT1	3
ECA+	17
ECA-	4
ECB+	18
ECB-	5
ECZ+	19
ECZ-	6
DR+	9
DR-	22
PU+	23
PU-	11
+5V GND	13
+24V VCC	14
OUT0	15



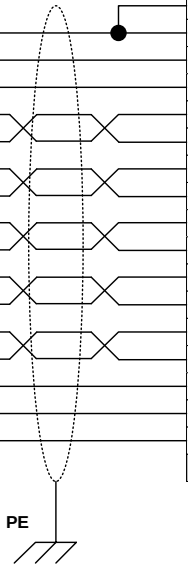
Driver CN1		Driver CN1	
PIN	Pin Definitions	PIN	Pin Definitions
24	OUT-COM	24	OUT-COM
25	OUT-COM	25	OUT-COM
39	ALM	39	ALM
37	SRV-ON	37	SRV-ON
3	OA+	3	OA+
4	OA-	4	OA-
5	OB+	5	OB+
6	OB-	6	OB-
7	OZ+	7	OZ+
8	OZ-	8	OZ-
16	DR+	26	DR+
15	DR-	27	DR-
14	PU+	28	PU+
13	PU-	29	PU-
23	+5V GND	23	+5V GND
50	COM+	50	COM+
36	A-CLR	36	A-CLR
Pulse frequency is 0 ~ 500Kpps		Pulse frequency is 0 ~ 4Mpps	

Note

1) When the pulse frequency is 0~500Kpps, the driver CN1 terminals DR+, DR-, PU+, PU- correspond to terminals 16, 15, 14,13, respectively;
2) when the pulse frequency is 0 ~ 4Mpps, the driver CN1 terminals DR+, DR-, PU+, PU- correspond to the terminals 26, 27, 28, 29, respectively.

5.3.2. A5/A6 series servo driver by Panasonic

25-pin DB connector	
Pin Definitions	PIN
+24V GND	1
IN0	2
OUT1	3
ECA+	17
ECA-	4
ECB+	18
ECB-	5
ECZ+	19
ECZ-	6
DR+	9
DR-	22
PU+	23
PU-	11
+5V GND	13
+24V VCC	14
OUT0	15



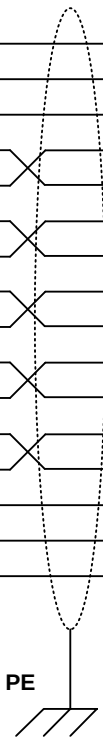
Driver CN1		Driver CN1	
PIN	Pin Definitions	PIN	Pin Definitions
36	ALM-	36	ALM-
41	OUT-COM	41	OUT-COM
37	ALM+	37	ALM+
29	SRV-ON	29	SRV-ON
21	OA+	21	OA+
22	OA-	22	OA-
48	OB+	48	OB+
49	OB-	49	OB-
23	OZ+	23	OZ+
24	OZ-	24	OZ-
5	SIGN1	47	SIGNH2
6	SIGN2	46	SIGNH1
3	PULS1	45	PULSH2
4	PULS2	44	PULSH1
13	GND	13	GND
7	COM+	7	COM+
37	A-CLR	37	A-CLR
Pulse frequency is 0 ~ 500Kpps		Pulse frequency is 0 ~ 4Mpps	

Note *

1) When the pulse frequency is 0~500Kpps, the CN1 terminals SIGN1, SIGN2, PULS1, and PULS2 of the driver correspond to terminals 5, 6, 3, and 4, respectively, that is, the command pulse input mode is the optocoupler input (Pr0.05=0);
2) when the pulse frequency is 0 ~ 4 Mpps, the CN1 terminals SIGN1, SIGN2, PULS1, and PULS2 of the driver correspond to terminals 46, 47, 44, and 45, respectively, that is, the command pulse input is a dedicated input for the long-distance driver (Pr0.05=1).

5.3.3. MR-J4 series servo driver by Mitsubishi

25-pin DB connector		Driver CN1	
Pin Definitions	PIN	PIN	Pin Definitions
		46\47	COM-
+24V GND	1	42	EMG
IN0	2	48	ALM
OUT1	3	15	SRV-ON
ECA+	17	4	OA+
ECA-	4	5	OA-
ECB+	18	6	OB+
ECB-	5	7	OB-
ECZ+	19	8	OZ+
ECZ-	6	9	OZ-
DR+	9	35	SING1
DR-	22	36	SING2
PU+	23	10	PULS1
PU-	11	11	PULS2
+5V GND	13	3	+5V GND
+24V VCC	14	20\21	COM+
OUT0	15	19	A-CLR

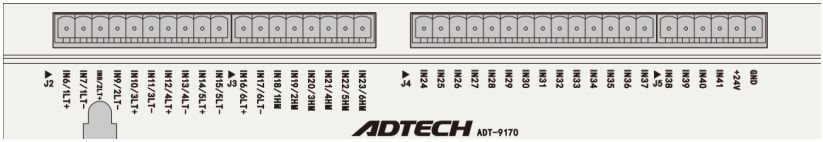


5.4. Wiring instructions for ADT-8969G1 with ADT-9170 terminal block

5.4.1. 25-pin DB port definition

Refer to 3.1.1 25-pin DB port definition for the definition of ADT-9170 25-pin DB port.

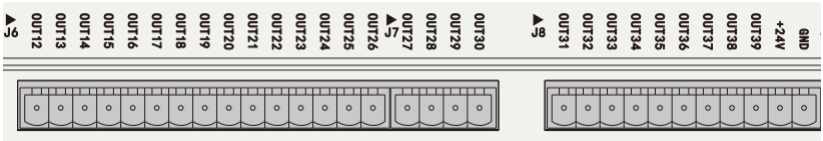
5.4.2. Definitions of J2/J3/J4/J5 input ports



Pin No.	Pin definitions	Function
1	IN6/XLT+	X positive limit signal, can be used as general input
2	IN7/XLT-	X negative limit signal, can be used as general input
3	IN8/YLT+	Y positive limit signal, can be used as general input
4	IN9/YLT-	Y negative limit signal, can be used as general input
5	IN10/ZLT+	Z positive limit signal, can be used as general input
6	IN11/ZLT-	Z negative limit signal, can be used as general input
7	IN12/ALT+	A positive limit signal, can be used as general input
8	IN13/ALT-	A negative limit signal, can be used as general input
9	IN14/BLT+	B positive limit signal, can be used as general input
10	IN15/BLT-	B negative limit signal, can be used as general input
11	IN16/CLT+	C positive limit signal, can be used as general input
12	IN17/CLT-	C negative limit signal, can be used as general input
13	IN18/XHM	X home signal (STOP0), can be used as general input
14	IN19/YHM	Y home signal (STOP0), can be used as general input
15	IN20/ZHM	Z home signal (STOP0), can be used as general input
16	IN21/AHM	A home signal (STOP0), can be used as general input
17	IN22/BHM	B home signal (STOP0), can be used as general input
18	IN23/CHM	C home signal (STOP0), can be used as general input
19	IN24/EMGN	Emergency stop signal, can be used as general input
20	IN25	General input
21	IN26	General input

22	IN27	General input
23	IN28	General input
24	IN29	General input
25	IN30	General input
26	IN31	General input
27	IN32	General input
28	IN33	General input
29	IN34	General input
30	IN35	General input
31	IN36	General input
32	IN37	General input
33	IN38	General input
34	IN39	General input
35	IN40	General input
36	IN41	General input
37	+24V GND	24V power grounding
38	+24V VCC	+24V power output (can't be connected to external 24V+)
Note: Both digital input and output signals are active low.		

5.4.3. Definitions of J6/J7/J8 output ports



Pin No.	Pin definitions	Function
1	OUT12	Output control signal, opto-isolated output, active low
2	OUT13	Output control signal, opto-isolated output, active low
3	OUT14	Output control signal, opto-isolated output, active low
4	OUT15	Output control signal, opto-isolated output, active low
5	OUT16	Output control signal, opto-isolated output, active low
6	OUT17	Output control signal, opto-isolated output, active low
7	OUT18	Output control signal, opto-isolated output, active low

8	OUT19	Output control signal, opto-isolated output, active low
9	OUT20	Output control signal, opto-isolated output, active low
10	OUT21	Output control signal, opto-isolated output, active low
11	OUT22	Output control signal, opto-isolated output, active low
12	OUT23	Output control signal, opto-isolated output, active low
13	OUT24	Output control signal, opto-isolated output, active low
14	OUT25	Output control signal, opto-isolated output, active low
15	OUT26	Output control signal, opto-isolated output, active low
16	OUT27	Output control signal, opto-isolated output, active low
17	OUT28	Output control signal, opto-isolated output, active low
18	OUT29	Output control signal, opto-isolated output, active low
19	OUT30	Output control signal, opto-isolated output, active low
20	OUT31	Output control signal, opto-isolated output, active low
21	OUT32	Output control signal, opto-isolated output, active low
22	OUT33	Output control signal, opto-isolated output, active low
23	OUT34	Output control signal, opto-isolated output, active low
24	OUT35	Output control signal, opto-isolated output, active low
25	OUT36	Output control signal, opto-isolated output, active low
26	OUT37	Output control signal, opto-isolated output, active low
27	OUT38	Output control signal, opto-isolated output, active low
28	OUT39	Output control signal, opto-isolated output, active low
29	+24V GND	24V power grounding
30	+24V VCC	+24V power output (can't be connected to external 24V+)

5.4.4. J9 DA port definition

Pin No.	Pin definitions	Function
1	DA1	DA1 output, 0 ~ 10 V output
2	DA2	DA2 output, 0 ~ 10 V output
3	GND	DA output signal ground (2-channel common-ground)

5.5. Wiring instructions of ADT-8949G1 with ADT-9192 terminal block

5.5.1. Definition of 25-pin DB port

Refer to 3.1.1 Definition of 25-pin DB port for the definition of ADT-9192 25-pin DB port.

5.5.2. Signal definition of J2 interface:

34-bit double dislocation terminal wiring is defined as below

1	**IN4/XLT+**	X positive limit signal, can be used as general input
2	**IN5/XLT-**	X negative limit signal, can be used as general input
3	**IN6/YLT+**	Y positive limit signal, can be used as general input
4	**IN7/YLT-**	Y negative limit signal, can be used as general input
5	**IN8/ZLT+**	Z positive limit signal, can be used as general input
6	**IN9/ZLT-**	Z negative limit signal, can be used as general input
7	**IN10/ALT+**	A positive limit signal, can be used as general input
8	**IN11/ALT-**	A negative limit signal, can be used as general input
9	**IN12/XHM**	X home signal (STOP0), can be used as general input
10	**IN13/YHM**	Y home signal (STOP0), can be used as general input
11	**IN14/ZHM**	Z home signal (STOP0), can be used as general input
12	**IN15/AHM**	A home signal (STOP0), can be used as general input
13	**IN16/EMGN**	Emergency stop signal, can be used as general input
14	**IN17**	General input
15	**IN18**	General input
16	**IN19**	General input
17	**IN20**	General input
18	**IN21**	General input
19	**IN22**	General input
20	**IN23**	General input
21	**IN24**	General input
22	**IN25**	General input
23	**IN26**	General input
24	**IN27**	General input
25	**IN28**	General input

26	**IN29**	General input
27	**IN30**	General input
28	**IN31**	General input
29	**IN32/EXTX+**	X manual forward rotation signal, can be used as general input
30	**IN33/EXTX-**	X manual reverse rotation signal, can be used as general input
31	**IN34/EXTY+**	Y manual forward rotation signal, can be used as general input
32	**IN35/EXTY-**	Y manual reverse rotation signal, can be used as general input
33	**EXT_+24V GND**	24V power grounding
34	**EXT_+24V VCC**	+24V power output (can't be connected to external 24V+)
Note: Both digital input and output signals are active low.		

5.5.3. J3 interface signal definition

26-bit double dislocation terminal wiring is defined as below

Wire No.	Name	Function
1	**EXT_OUT8**	Output control signal, opto-isolated output, active low
2	**EXT_OUT9**	Output control signal, opto-isolated output, active low
3	**EXT_OUT10**	Output control signal, opto-isolated output, active low
4	**EXT_OUT11**	Output control signal, opto-isolated output, active low
5	**EXT_OUT12**	Output control signal, opto-isolated output, active low
6	**EXT_OUT13**	Output control signal, opto-isolated output, active low
7	**EXT_OUT14**	Output control signal, opto-isolated output, active low
8	**EXT_OUT15**	Output control signal, opto-isolated output, active low
9	**EXT_OUT16**	Output control signal, opto-isolated output, active low
10	**EXT_OUT17**	Output control signal, opto-isolated output, active low
11	**EXT_OUT18**	Output control signal, opto-isolated output, active low
12	**EXT_OUT19**	Output control signal, opto-isolated output, active low
13	**EXT_OUT20**	Output control signal, opto-isolated output, active low

14	**EXT_OUT21**	Output control signal, opto-isolated output, active low
15	**EXT_OUT22**	Output control signal, opto-isolated output, active low
16	**EXT_OUT23**	Output control signal, opto-isolated output, active low
17	**EXT_OUT24**	Output control signal, opto-isolated output, active low
18	**EXT_OUT25**	Output control signal, opto-isolated output, active low
19	**EXT_OUT26**	Output control signal, opto-isolated output, active low
20	**EXT_OUT27**	Output control signal, opto-isolated output, active low
21	**EXT_OUT28**	Output control signal, opto-isolated output, active low
22	**EXT_OUT29**	Output control signal, opto-isolated output, active low
23	**EXT_OUT30**	Output control signal, opto-isolated output, active low
24	**EXT_OUT31**	Output control signal, opto-isolated output, active low
25	**EXT_+24V GND**	24V power grounding
26	**EXT_+24V VCC**	+24V power output (can't be connected to external 24V+)

5.6. Precautions

- **Transport and storage:**
  - Do not stack product package more than six layers;
  - Do not climb, stand on or place heavy stuff on the product package;
  - Do not pull the cable still connecting with machine to move product.
  - Forbid impact and scratch on the panel and display;
  - Prevent the product package from humidity, sun exposure, and rain.
- **Open-box inspection:**
  - Open the package to confirm the product to be purchased by you.
  - Check damages situation after transportation;
  - Confirm the integrity of parts comparing with the parts list or damages situation;
  - Contact our company promptly for discrepant models, shortage accessories, or transport damages.
- **Wiring**
  - Ensure the persons involved into wiring and inspecting are specialized staff;
  - Guarantee the product is grounded with less than 4Ω grounding resistance. Do not use neutral line (N) to substitute earth wire.
  - Ensure grounding to be correct and solid, in order to avoid product failures or unexpected consequences;
  - Connect the surge absorption diodes to the product in the required direction, otherwise, the product will be damaged;
  - Ensure the power switch is OFF before inserting or removing plug, or disassembling chassis.
- **Overhauling**
  - Ensure the power is OFF before overhauling or components replacement;
  - Make sure to check failures after short circuit or overloading, and then restart the machine after troubleshooting
  - Do not allow to frequently connect and disconnect the power,

and at least one minute interval between power-on and power-off.

- **Miscellaneous**
  - Do not open housing without permission;
  - Keep power OFF if not in use for a long time;
  - Pay close attention to keep dust and ferrous powder away from control;
  - Fix freewheel diode on relay coil in parallel if non-solid state relay is used as output relay. Check whether power supply meets the requirement to ensure not burning the control.
  - Install cooling fan if processing field is in high temperature, due to close relationship between service life of the control and environmental temperature. Keep proper operative temperature range for the control: 0℃ ~ 60℃.
  - Avoid using the product in the overheating, humid, dusty, or corrosive environments;
  - Add rubber rails as cushion on the place with strong vibration.
- **Maintenance**

Please implement routine inspection and regular check upon the following items, under the general usage conditions (i.e. environmental condition: daily average 30℃, load rate: 80%, and operating rate: 12 hours/ day)

Routine Inspection	Routine	● Confirm environmental temperature, humidity, dust, or foreign objects. ● Confirm abnormal vibration and noise;
Regular Check	One year	● Check whether solid components are loose ● Confirm whether terminal block is damaged

5.7. Document versions

Version No.	Revised date
1.0	6/11/2019