HIWIN PCI-4P
Hardware Manual

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Chapter 1 Introduction

1.1 Function introduction

HIWIN PCI-4P 4 axes motion control card, uses DDA (Digital Differential Analyzer) method sending out incremental pulses to each axis, perform 4 axes position and synchronized motion control. It sends pulses for control, and it can also read back encoder's value through encoder input terminal, suitable for pulse type servo or stepping motor control.

There is one set of sensor input point for every axis's control. It includes home position, stroke upper limit and stroke lower limit, besides it includes position ready signal output point and emergency stop input point.

- 32 bits PCI interface.
- 4 channels for pulses output .
- 4 sets 32 bits encoder input terminals.
- 13 input points and 5 output points all for digital use especially.

1.2 Software support

- MCCL --- motion control function library

  Provides linear, arc, circular etc. point to point motion control functions. User can set mechanism and motion parameters. There are 98 functions available for calling. Please refer to MCCL--- motion library user's manual.

1.3 HIWIN PCI-4P wiring diagram

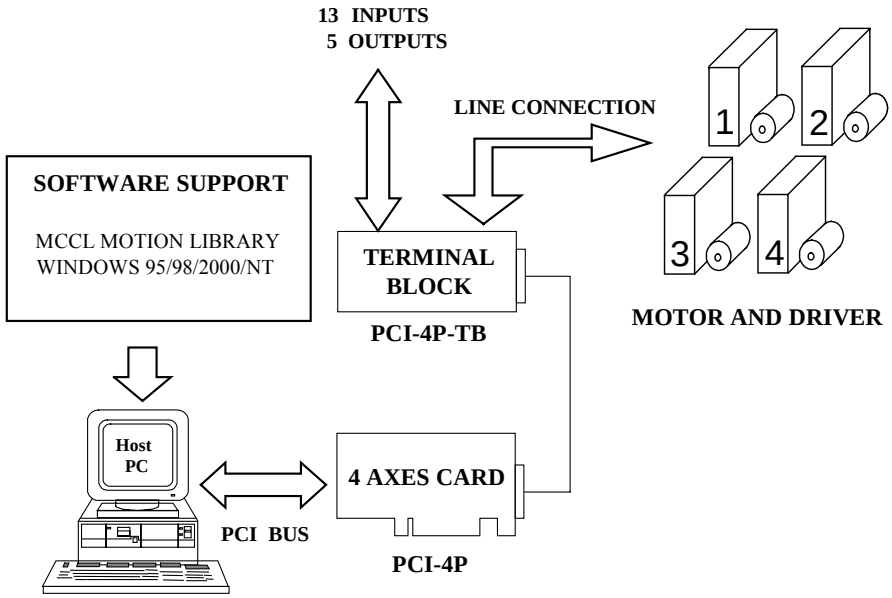


FIG. 1-1

- Plug HIWIN PCI-4P into the PCI slot of X86 series compatible computer.
- Use terminal block HIWIN PCI-4P-TB and wiring to drive 4 axes motor and process near end I/O signals（13 input points and 5 output points in all）

1.4 HIWIN PCI-4P pulse output format

The pulse commands sent out by DDA generator are PULSE/DIR, CW/CCW and A/B PHASE 3 kinds of selectable pulse format. They are outputted in the differential signal format as in Fig.1-2

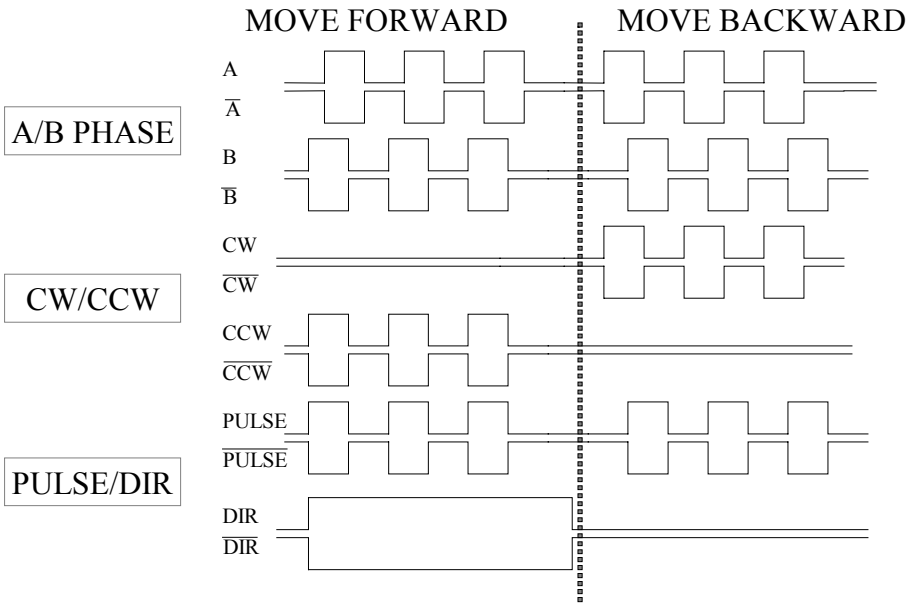
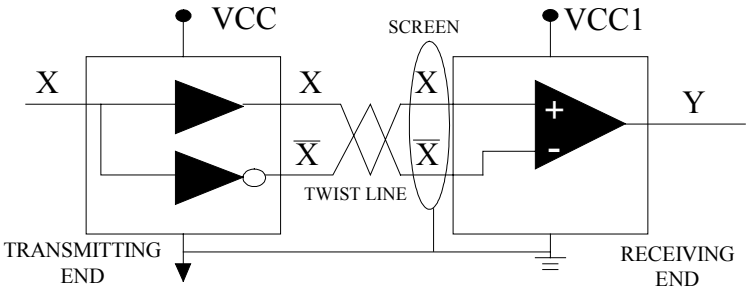


FIG. 1-2

Differential signal transmission type is explained as Fig.1-3 below:



TRANSMITTING END	SIGNAL IN TRANSMISSION LINE		RECEIVING END
X	X	$\overline{X}$	Y
0	0	1	0
1	1	0	1

FIG. 1-3 Truth Table

❖Use differential method to send the signal so the common mode noise will be eliminated effectively.

❖The reference grounds of sending end and receiving end have to be connected to avoid possible potential difference and thus damaged by the leakage current.

❖Recommend using twist line method to send signals, and add the screen to the signal lines.

Chapter 2 Hardware set up and usage

2.1 System basic set up procedure:

A. When setting up, please turn off system power, including motor, and computer.
B. Plug HIWIN PCI-4P into PCI BUS and tight up the screws.
C. Set up peripheral circuit via plugging SCSI II 68PIN in HIWIN PCI-4P card, tight up the screws. (peripheral circuit wiring, please refer to other sections in this chapter)
D. Confirm computer, the driven motor, I/O module etc. all have been connected to the ground firmly. Set computer, motor and I/O etc. peripheral modules all to the same reference potential. Otherwise the system may be damaged in the starting due to different reference potentials.
E. Turn on computer, it will find new hardware.
F. Use test program Motion Maker accompanied with this card, can do the testing and more familiar with HIWIN PCI-4P.

2.2 Hardware panel layout and definition of pins of connectors

1. Hardware panel layout

HIWIN PCI-4P Card

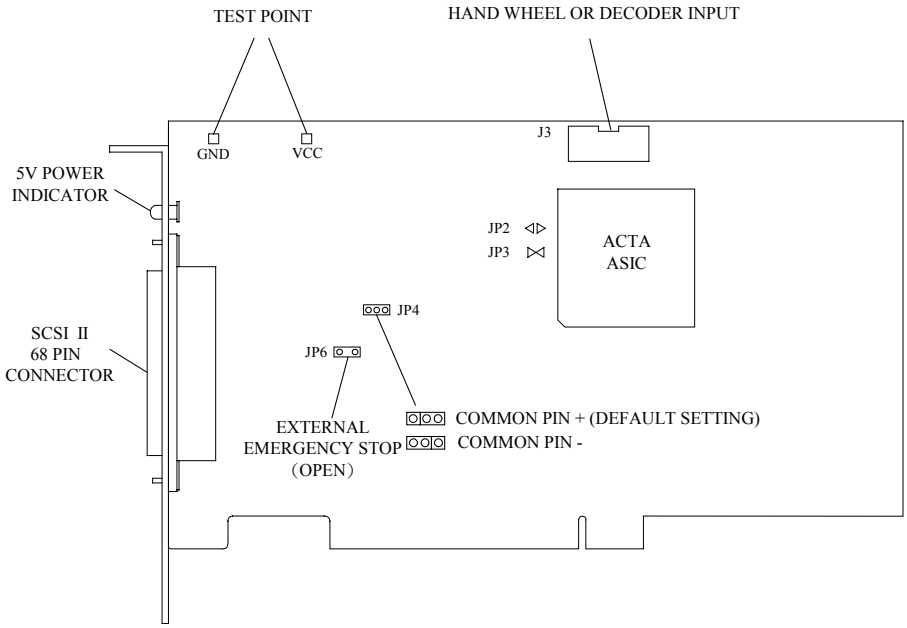


FIG. 2-1

HIWIN PCI-4P-TB Terminal Block

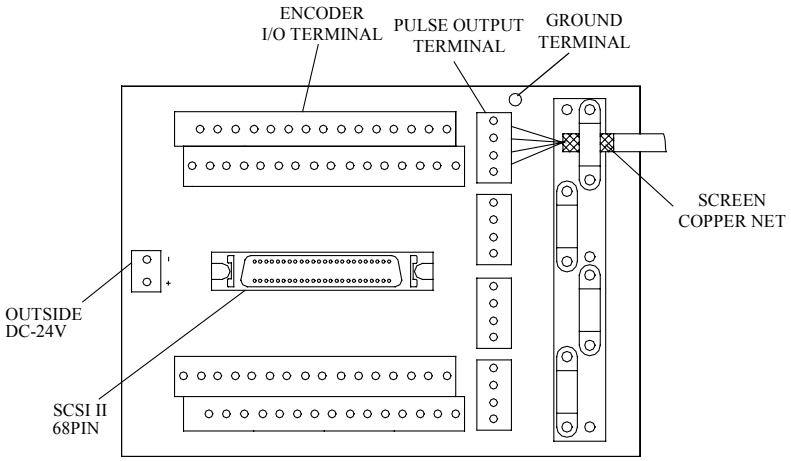


FIG. 2-2

2. SCSI II 68PIN connector assignment

SCSI II-68Pin Connector			
PIN definition	No.	No.	PIN definition
AGND	1	35	AGND
AGND	2	36	DAC0
DAC1	3	37	DAC2
DAC3	4	38	+5V
COM+	5	39	COM-
ESTOP	6	40	PRDY
HOM0	7	41	HOM1
OT0+	8	42	OT1+
OT0-	9	43	OT1-
SVN0	10	44	SVN1
HOM2	11	45	HOM3
OT2+	12	46	OT3+
OT2-	13	47	OT3-
SVN2	14	48	SVN3
EA0+	15	49	EA1+
EA0-	16	50	EA1-
EB0+	17	51	EB1+
EB0-	18	52	EB1-
EZ0+	19	53	EZ1+
EZ0-	20	54	EZ1-
EA2+	21	55	EA3+
EA2-	22	56	EA3-
EB2+	23	57	EB3+
EB2-	24	58	EB3-
EZ2+	25	59	EZ3+
EZ2-	26	60	EZ3-
ST0+	27	61	ST1+
ST0-	28	62	ST1-
DR0+	29	63	DR1+
DR0-	30	64	DR1-
ST2+	31	65	ST3+
ST2-	32	66	ST3-
DR2+	33	67	DR3+
DR2-	34	68	DR3-

■ Explanation

◆ Pulse Outputs

Signal	Explanation
ST0+ and ST0- ST1+ and ST1- ST2+ and ST2- ST3+ and ST3-	Phase A of pulse output for channel 0,1,2,3
DR0+ and DR0- DR1+ and DR1- DR2+ and DR2- DR3+ and DR3-	Phase B of pulse output for channel 0,1,2,3

◆ ENCODER input signal

Signal	Explanation
EA0+ and EA0- EA1+ and EA1- EA2+ and EA2- EA3+ and EA3-	Phase A of encoder input for channel 0,1,2,3
EB0+ and EB0- EB1+ and EB1- EB2+ and EB2- EB3+ and EB3-	Phase B of encoder input for channel 0,1,2,3
EZ0+ and EZ0- EZ1+ and EZ1- EZ2+ and EZ2- EZ3+ and EZ3-	Phase Z of encoder input for channel 0,1,2,3

◆ Local I/O

Signal	Explanation
OT0+, OT1+, OT2+, OT3+	Upper limit switch input signal of 0,1,2,3 axis
OT0-, OT1-, OT2-, OT3-	Lower limit switch input signal of 0,1,2,3 axis
HOM0, HOM1, HOM2, HOM3	Home input signal of 0,1,2,3 axis
SVN0, SVN1, SVN2, SVN3	Servo on output signal of 0,1,2,3 axis
ESTOP	Emergency stop input signal
PRDY	Position ready output
COM+	Positive end of local digital output
COM-	Negative end of local digital output

3. Hand wheel or encoder input (HIWIN PCI-4P J5)

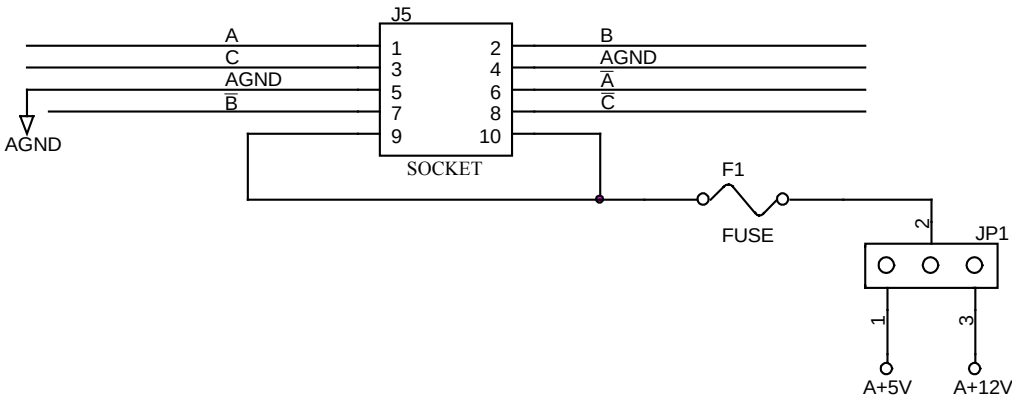


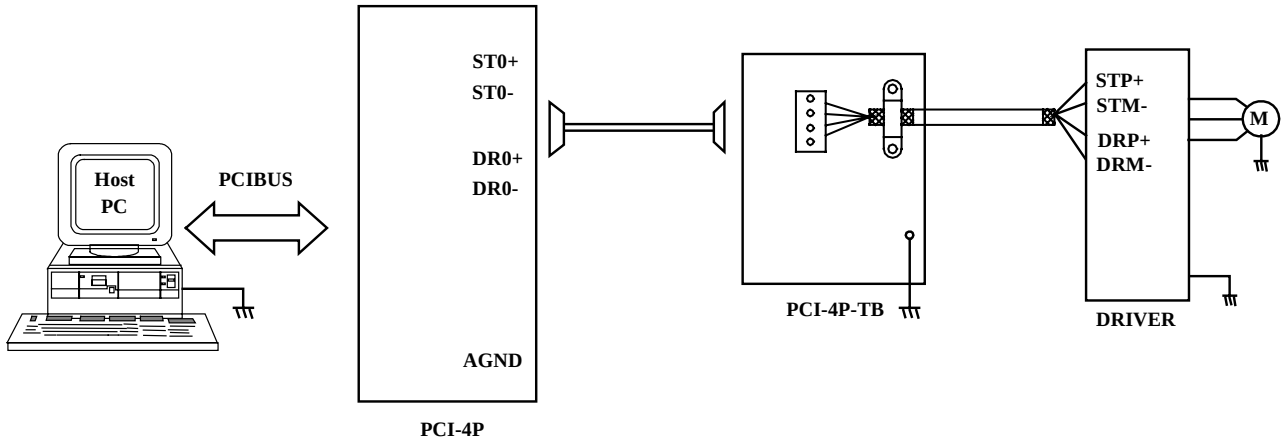
FIG. 2-3

■ Explanation

Signal	Explanation
A and $\overline{A}$	Encoder A-Phase differential input signal
B and $\overline{B}$	Encoder B-Phase differential input signal
C and $\overline{C}$	Encoder Z-Phase differential input signal
A+5V / A+12V	Via JP1 supply encoder with +5volt or +12 v power Positive terminal
AGND	Via JP1 supply encoder with +5 volt or +12volt power Negative terminal
AGND	Analog GND is VCC_OUT, DAC output & ADC common ground, with DGND (Digital Ground) single point connection, DGND connect with computer's BUS

2.3 Wiring of 4 axes card

HIWIN PCI-4P and pulse control type servo motor/ stepping motor system connection as shown below:

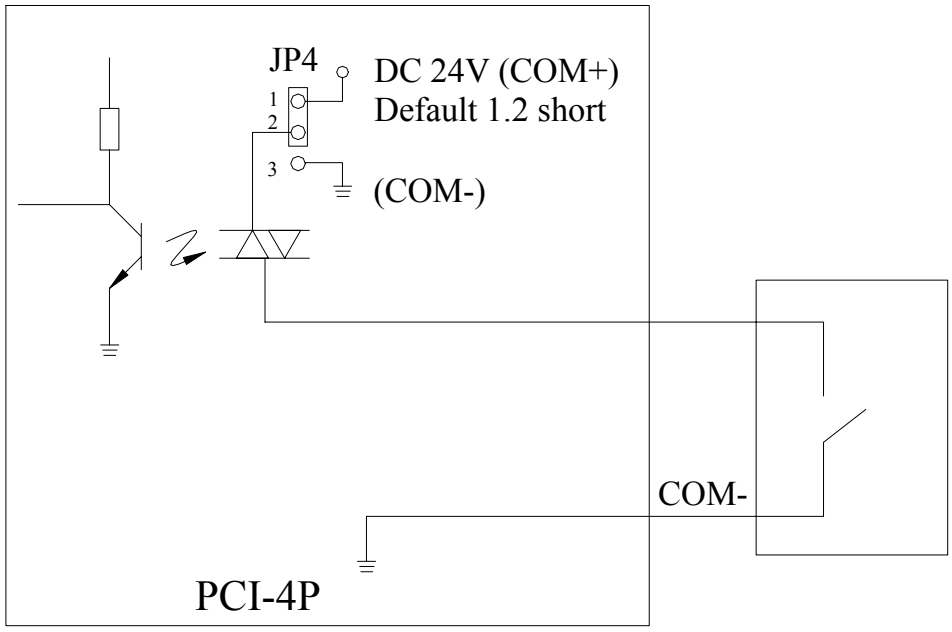


The notion above shows the 0th axis only.
(ST1+, ST1-, DR1+, DR1-); (ST2+, ST2-, DR2+, DR2-); (ST3+, ST3-, DR3+, DR3-) with their own corresponding (STP+, STM-, DRP+, DRM-) respectively are for the 1st, 2nd, 3rd axes.

- ST0+， ST0-， DR0+， DR0- are the 0th set pulse command output point, need to connect to the corresponding STP(+)，STM(-)，DRP(+) and DRM(-) of MOTOR DRIVER as shown in the figure (Please refer to motor driver user's manual)
- Suggest the 4 lines above all use twisted pair wiring to lower common mode noise, besides shield the 4 lines with the outside to lower the disturbance from the environment as shown in the figure.
- Connect one side of shielding net with connector's outside case on SCSI II 68PIN of HIWIN PCI-4P , the other side with FG(Frame Ground)of MOTOR DRIVER, and confirm that PC and SERVO DRIVER all connected to the ground.(Notice: connector of SCSI II68PIN outside case connect with PC outside case, outside case is connect to ground usually)
- Important---Need one ground line to connect GND of servo driver and AGND of HIWIN PCI-4P (It is very important since it may cause fatal damage if fail to do so.)

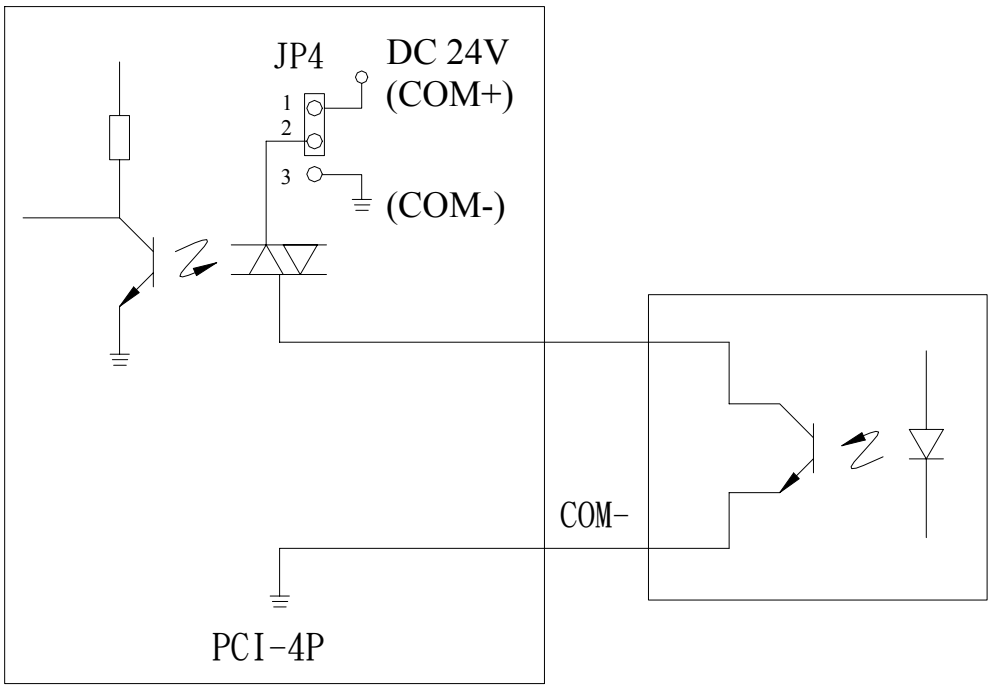
2.3.1 Input wiring

- Wiring for switch input

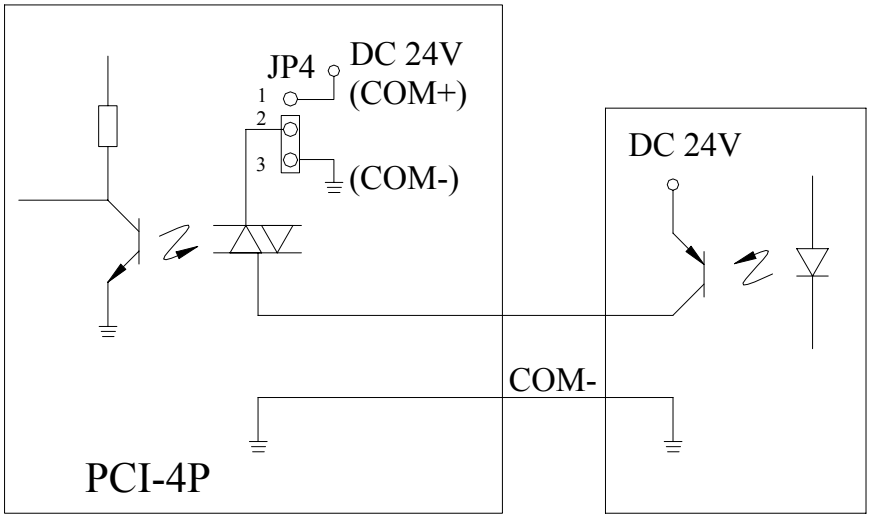


- When switch is ON, PCI-4P inside read value is 0.
- When switch is OFF, PCI-4P inside read value is 1.
- On site need +24VDC power supply.

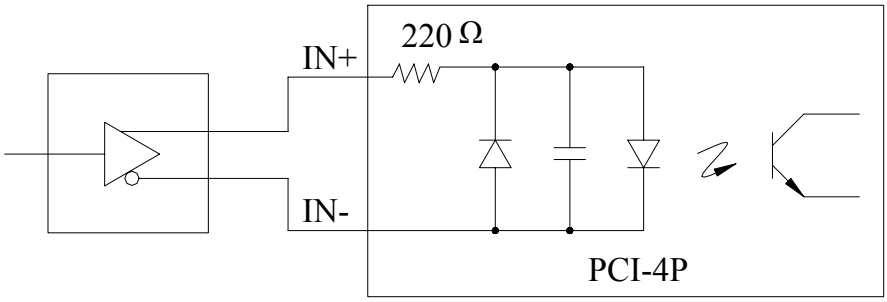
- Wiring for NPN interface



- Wiring for PNP interface

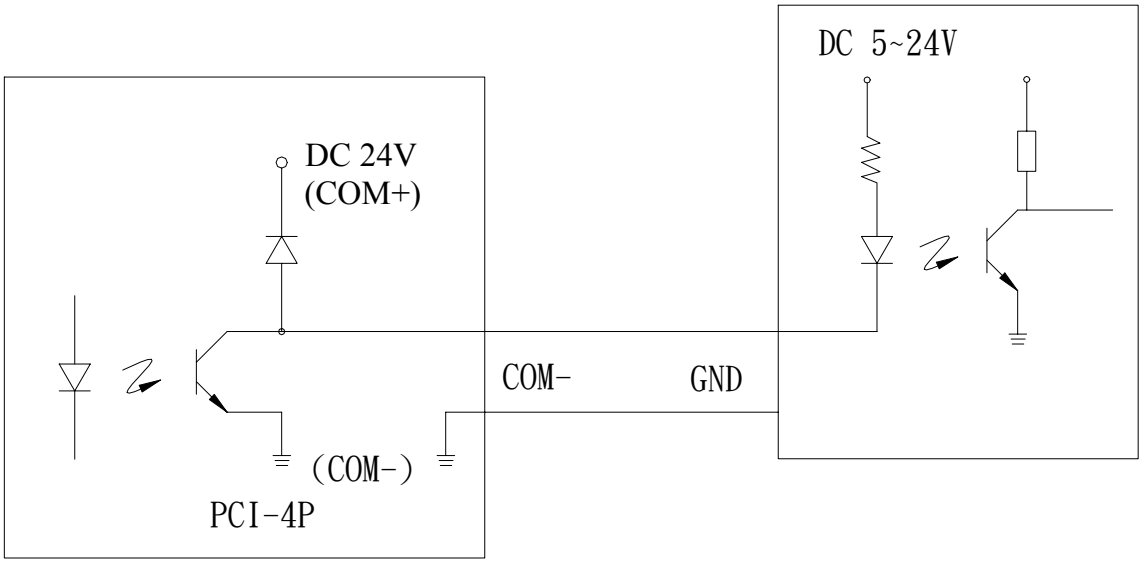


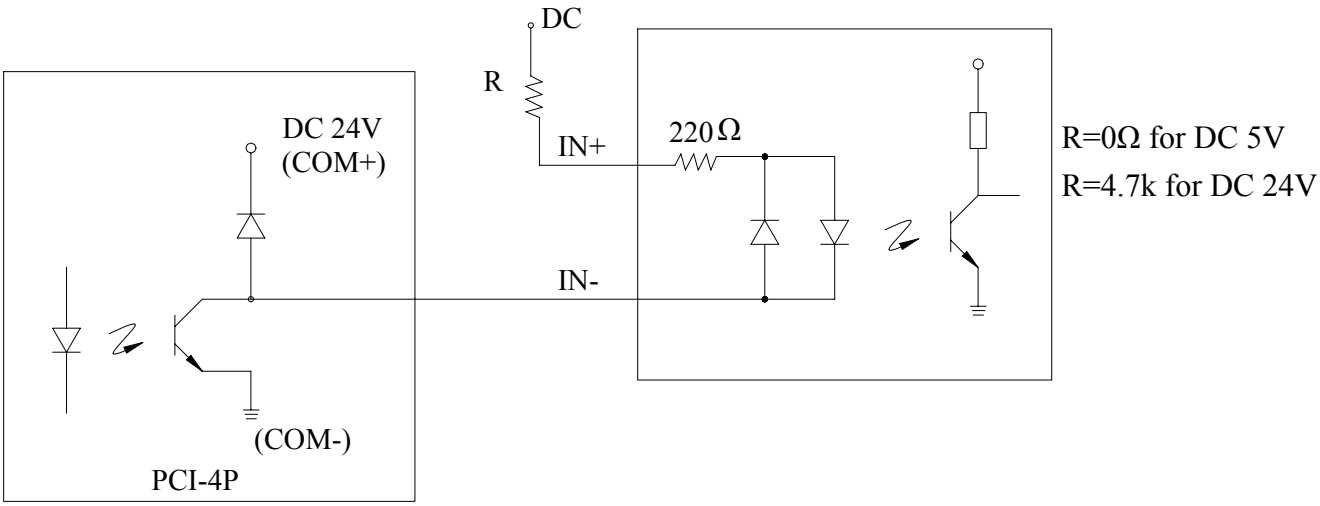
- Encoder input wiring



2.3.2 Output wiring

- Wiring for PLC interface max.DC30V/40mA



- When output signal is 0, transistor (Darlington driver) is on, load in operation.
- Every output point is driven with the maximum loading capacity of 60mA, when no load, please don't connect directly to 24V power.
- When the load is a RELAY, there is an instant over voltage protection diode, outside connection of protection diode to absorb this surge noise is not needed.

- Wiring for differential input interface