

LSI3188

**Application Specific
Quadrature Encoder/Linear Scale
Counter Card**

User's Manual (V1.0)

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Correction record

Version	Record
V1.0	firmware version 1.0 up

Contents

1.	Forward.....	4
2.	Features.....	5
2.1	Main card	5
2.2	Din rail mounted wiring board.....	5
3.	Specifications.....	6
3.1	LSI3188 Main card	6
3.2	Din rail mounted wiring board.....	8
4.	Layout and dimensions	9
4.1	LSI3188 Main card	9
4.2	ADP3101DIN Din rail mounted wiring board.....	9
4.3	ADP9201DIN Din rail mounted wiring board.....	10
4.4	JS51053 for ADP9201_JM1 20PM Din rail mounted dummy wiring board	10
4.5	JS51050 for JM1 25PM Din rail mounted dummy wiring board	11
5.	Pin definitions for main card connectors	12
5.1	JF1 pin definitions.....	12
5.2	JM1 pin definition.....	13
5.3	ADP9201_JM1 pin definitions	13
6.	I/O Interface diagram.....	14
6.1	JF1 ADP3101DIN	14
6.2	JM1 JS51050.....	15
6.3	ADP9201_JM1 ADP9201DIN.....	15
7.	Using wiring board	17
7.1	ADP3101DIN wiring board	17
7.2	ADP9201DIN wiring board	18
8.	Main card hardware settings	19
8.1	Card ID setting	19
8.2	JP1 Hot reset jumper	19
9.	Applications.....	20
10.	Ordering information	21

Notes on hardware installation

Please follow step by step as you are installing the control cards.

Be sure your system is power off.

Be sure your external power supply for the wiring board is power off.

Plug your control card in slot, and make sure the golden fingers are put in right contacts.

Fasten the screw to fix the card.

Connect the cable between the card and wiring board.

Connect the external power supply for the wiring board.

Recheck everything is OK before system power on.

External power on.

Congratulation! You have it

For more detail of step by step installation guide, please refer the file “installation.pdf” on the CD come with the product or register as a member of our user’s club at:

<http://automation.com.tw/>

to download the complementary documents.

1. **Forward**

Thank you for your selection of PCI bus LSI3188 Application specific quadrature encoder/linear scale interface card.

In the field of automation, encoder and linear scale as feedback or measuring element is common used in the microprocessor control system. But for the versatile application in PC based control, only a few selections you can make.

With the state of the art technology of FPGA chip, photo/magnetic coupler isolation and experienced application specific functions for the inspection trigger control of rotary inspection station or in line production inspection makes LSI3188 is the best choice of such application.

Other encoder/linear scale interface card:

- LSI3101/3101A single axis quadrature encoder/linear scale counter card with FIFO compare function(PCI bus)
- LSI3123A 3 axes quadrature encoder/linear scale counter card with fast coordinate rebuild function (PCI bus)
- LSI3144A 4 axes quadrature encoder/linear scale counter card with 2 axes FIFO compare and PWM FIFO output mode (PCI bus)
- LSI3181 single axis quadrature encoder/linear scale counter card with 8 position offset on FIFO / auto increment compare mode(PCI bus)
- LSI5123 3 axes quadrature encoder counter interface (USB)
- LSI5123L 3 axes quadrature encoder counter interface (no external trigger latch mode) (USB)
- LSI5123A 3 axes quadrature encoder counter interface (High noise immunity , Accurite linear scale absolute coordinate mode) (USB)

Any comment is welcome,

please visit our website

<http://www.automation.com.tw/>

<http://www.automation-js.com/> for the up to date information.

2. Features

2.1 Main card

- 2.1.1 PCI plug and play function with card ID for 16 identical cards
- 2.1.2 High noise immunity with magnetic/photo-coupler isolation
- 2.1.3 Supports DIN rail mounted wiring board
- 2.1.4 32bit timer based on 1us time base

DIO block

- 2.1.5 8 photo isolated digital input
- 2.1.6 8 photo isolated digital output
- 2.1.7 Software debounce for digital input
- 2.1.8 Software programmable I/O polarity
- 2.1.9 Interrupt from IN07~IN00

Quadrature counter block

- 2.1.10 32-bit counter
- 2.1.11 16 MHz max. Quadrature input rate
- 2.1.12 Quadrature, pulse/direction and up/down counting
- 2.1.13 Programmable multiple rate at X1, X2, X4
- 2.1.14 Software debounce for input signals
- 2.1.15 Multiple counter reset (homing) modes
- 2.1.16 Differential or single-end input signal

Application specific compare function block

- 2.1.17 Station to station distance: 16bit
- 2.1.18 Max stations: 8
- 2.1.19 Station to station FIFO: 7 (max)
- 2.1.20 Programmable duration for Compare output
- 2.1.21 Interrupt on compare equal

2.2 Din rail mounted wiring board

- 2.2.1 LED display for digital I/O
- 2.2.2 Application specific connectors
- 2.2.3 Step down s.p.s. for external 5V

3. Specifications

3.1 LSI3188 Main card

Counter block

- 3.1.1 Number of axes: 1
- 3.1.2 Input : 5 magnetic isolation (A,B,Z,HOME input), TTL level
- 3.1.3 Output : 8 differential position compare out
- 3.1.4 Encoder Type: Single-end or differential (with ADP3101 DIN wiring board)
- 3.1.5 Input software debounce: 512k, 1M, 2M, 4M, 8M,10M,16M (programmable)
- 3.1.6 Input multiple rate: X1, X2, X4 programmable (quadrature signal only)
- 3.1.7 Maximum quadrature input frequency : 16MHz @X4
- 3.1.8 Counter Mode : (QUADRATURE) , (CLOCK/DIRECTION) ,
(UP CLOCK/ DOWN CLOCK)
- 3.1.9 Position counter length : 32 Bits
- 3.1.10 Station to station distance: 16 Bits
- 3.1.11 Under inspection device FIFO: 7 (Station to station)
- 3.1.12 Allowable station: 1~8(max)
- 3.1.13 Trigger out pulse width: 16 Bits @1us
- 3.1.14 Sample clock frequency: 198MHz
- 3.1.15 PCI data width : 32 Bits

Digital block

- 3.1.16 Input : 8 photo-isolated ,
- 3.1.17 ON state : 2.8Vdc(max) 4.5mA(min)
- 3.1.18 OFF state : 8Vdc(min) 3mA(max)
- 3.1.19 Switching speed : 10KHz max. (limit by photo coupler speed and debounce filter)
- 3.1.20 Software debounce: 100Hz, 200Hz, 1KHZ, No debounce (programmable)
- 3.1.21 Interrupt at IN07 ~ IN00
- 3.1.22 Output : 8 photo-isolated,
- 3.1.23 Output range : Open collector 0 ~ 45 Vdc (on card)
- 3.1.24 Output rating : (With ADP3101 DIN wiring board)
 - 3A @250Vac, 30Vdc (Relay)
 - 1A @ 24Vdc (PMOS)
 - 2A @ 240Vac (SSR)
- 3.1.25 Sink current : 500mA(peak) per channel (on card)
- 3.1.26 Switching speed : 20KHz(max)(MOS out only)

Timer block

- 3.1.27 Timer time base: 1us
- 3.1.28 Timer/counter length: 32 bit

General

- 3.1.29 Card ID : 4 bits, 16 position
- 3.1.30 Insulation resistance : 1000Mohm (min) at 1000Vdc
- 3.1.31 Isolation voltage : 2500Vac 1 min
- 3.1.32 Connector : one 20 pin SCSI-II female connector
 one 20 pin flat cable connector
- 3.1.33 Operation temperature : 0 to +70 degree C
- 3.1.34 Storage temperature : -20 to +80 degree C
- 3.1.35 Operation humidity : 5-95% RH, non-condensing
- 3.1.36 Dimension : 130(W) * 102(H)mm , 5.2(W) * 4.1(H)in

3.2 Din rail mounted wiring board

ADP3101DIN DIN rail mounted wiring board

- 3.2.1 External Supply : DC 24V \pm 4V
- 3.2.2 Single end/ differential signal : jumper select
- 3.2.3 Connector: SCSI-II 20P cable to connect main and wiring board
- 3.2.4 On board build-in s.p.s. : DC+5V 500mA (max)
- 3.2.5 Dimension : 86(W) * 103(L) *45(H)mm;
3.4(W)*4.1(L)*1.8(H)in

ADP9201DIN DIN rail mounted wiring board

- 3.2.6 External Supply : DC 24V \pm 4V
- 3.2.7 Input : 8 with LED indicator
- 3.2.8 Output : ADP9201DIN(R) : 8 relays (3A @250Vac, 3A @30Vdc) with LED indicator
ADP9201DIN(S) : 8 SSR (2A @240Vac) with LED indicator
ADP9201DIN(P) : 8 PMOS (Source 1A @24Vdc) with LED indicator
- 3.2.9 Connector: One 20-pin male flat-cable connector
- 3.2.10 Operation Temperature: 0 to +70 degree C
- 3.2.11 Operation Humidity: RH5~95%, non-condensing
- 3.2.12 Dimension: ADP9201DIN(R) / (P) : 86(W) * 103(L) *45(H)mm;
3.4(W)*4.1(L)*1.8(H)in
ADP9201DIN(S) : 86(W) * 103(L) *50(H)mm
3.4(W)*4.1(L)*2.0(H)in

JS51053 20PM Din rail mounted dummy wiring board

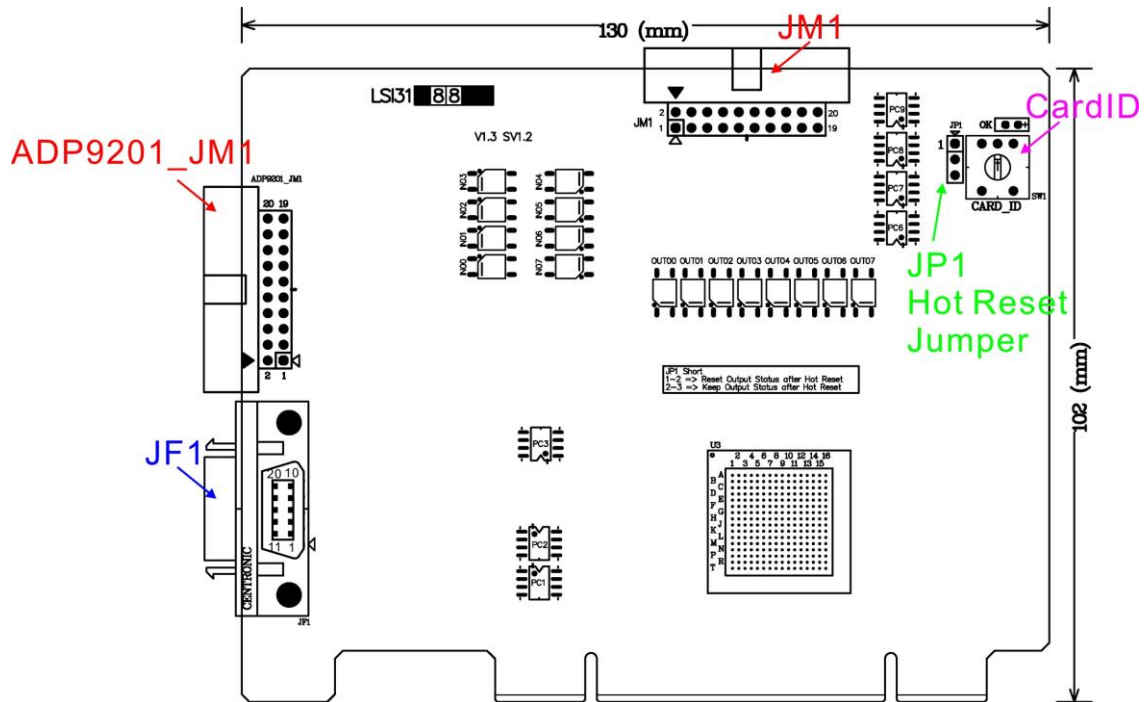
- 3.2.13 Dimension: 86(W)*79(L)*52(H)mm, 3.4(W)*3.2(L)*2.1(H)in

JS51050 for JM1 pulse handler interface

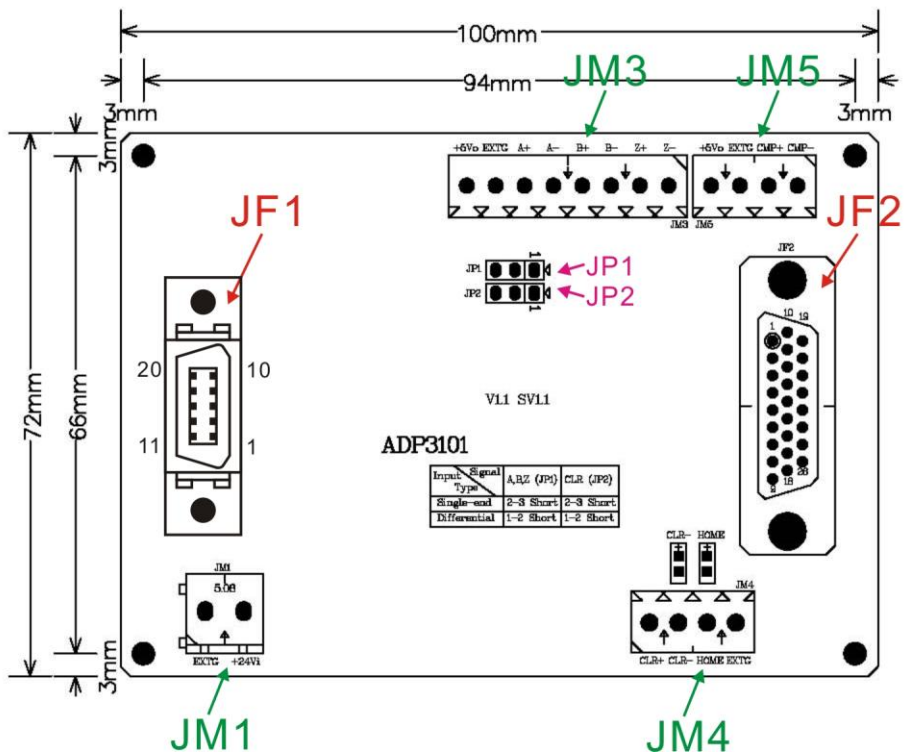
- 3.2.14 Connection cable — D-type 25P cable to connect main and wiring board
- 3.2.15 Dimension — 86(W)*79(L)*52(H)mm, 3.4(W)*3.2(L)*2.1(H)in

4. Layout and dimensions

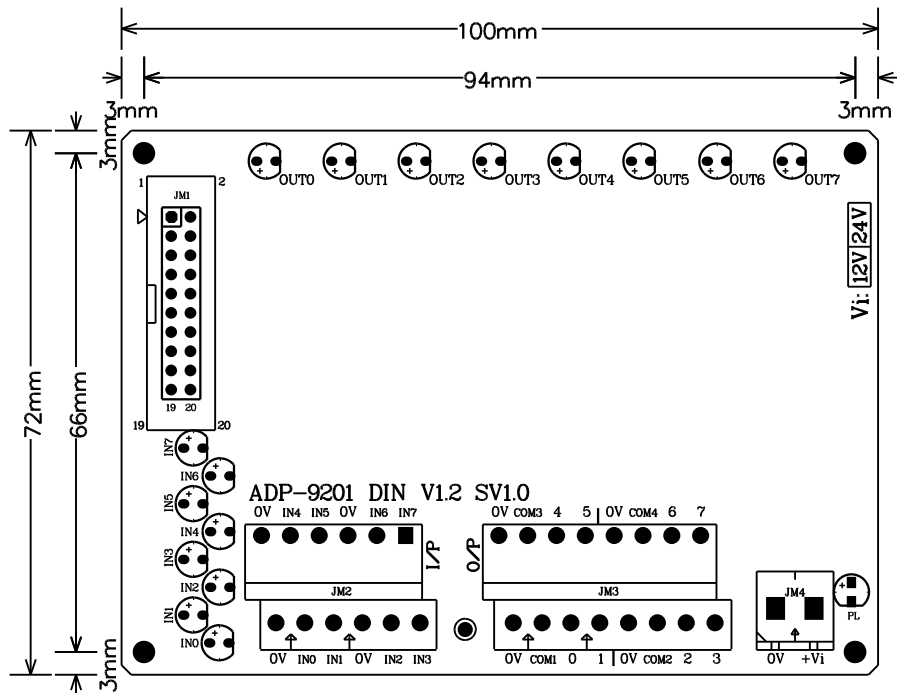
4.1 LSI3188 Main card



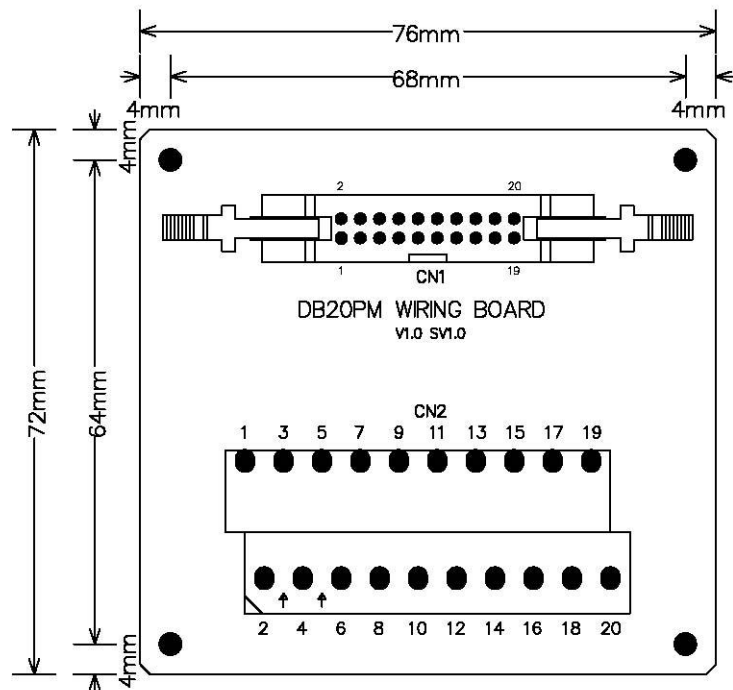
4.2 ADP3101DIN Din rail mounted wiring board



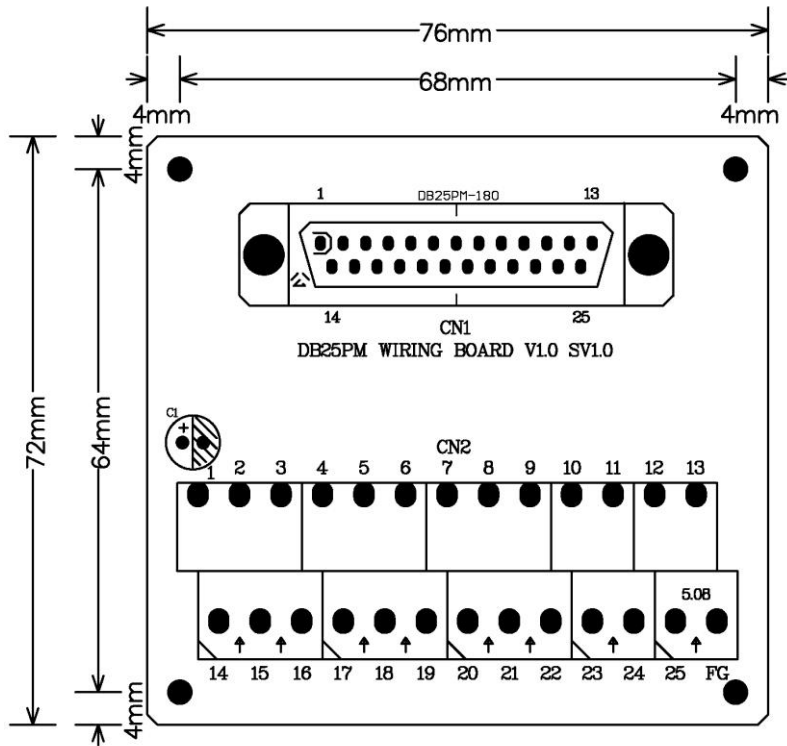
4.3 ADP9201DIN Din rail mounted wiring board



4.4 JS51053 for ADP9201_JM1 20PM Din rail mounted dummy wiring board



4.5 JS51050 for JM1 25PM Din rail mounted dummy wiring board



5. Pin definitions for main card connectors

5.1 JF1 pin definitions

PIN	DESCRIPTIONS		PIN	DESCRIPTIONS
1	+5Vin: 5V input from wiring board	<p> +5Vin 1 11 EXTG +5Vin 2 12 EXTG A+ 3 13 A- B+ 4 14 B- Z+ 5 15 Z- CLR_IN+ 6 16 CLR_IN- NC 7 17 NC HOME 8 18 NC NC 9 19 CMP_OUT NC 10 20 NC </p>	11	EXTG: common of +5Vin
2	+5Vin: 5V input from wiring board		12	EXTG: common of +5Vin
3	A+: phase A+ input		13	A-: phase A- input
4	B+: phase B+ input		14	B-: phase B- input
5	Z+: phase Z+ input		15	Z-: phase Z- input
6	CLR_IN+: *trigger_in+		16	CLR_IN-: *trigger_in-
7	NC		17	NC
8	HOME: home limit switch input		18	NC
9	NC		19	CMP_OUT: *trigger_pulse
10	NC		20	NC

*trigger_in+/trigger_in-: the differential signal of under inspection device trigger input.

*trigger_pulse: the trigger output pulse at fixed 5us pulse width of any of the trigger_0 ~trigger_7.

5.2 JM1 pin definition

PIN	DESCRIPTIONS		PIN	DESCRIPTIONS
1	CMP0_OUT+: Trigger_out0+	CMP0_OUT+	14	CMP0_OUT-: Trigger_out0-
2	CMP1_OUT+: Trigger_out1+	CMP1_OUT+	15	CMP1_OUT-: Trigger_out1-
3	CMP2_OUT+: Trigger_out2+	CMP2_OUT+	16	CMP2_OUT-: Trigger_out2-
4	CMP3_OUT+: Trigger_out3+	CMP3_OUT+	17	CMP3_OUT-: Trigger_out3-
5	CMP4_OUT+: Trigger_out4+	CMP4_OUT+	18	CMP4_OUT-: Trigger_out4-
6	CMP5_OUT+: Trigger_out5+	CMP5_OUT+	19	CMP5_OUT-: Trigger_out5-
7	CMP6_OUT+: Trigger_out6+	CMP6_OUT+	20	CMP6_OUT-: Trigger_out6-
8	CMP7_OUT+: Trigger_out7+	CMP7_OUT+	21	CMP7_OUT-: Trigger_out7-
9	EXTG: external ground	EXTG	22	NC
10	EXTG: external ground	EXTG	23	NC
11	NC	NC	24	NC
12	NC	NC	25	NC
13	NC	NC		

5.3 ADP9201_JM1 pin definitions

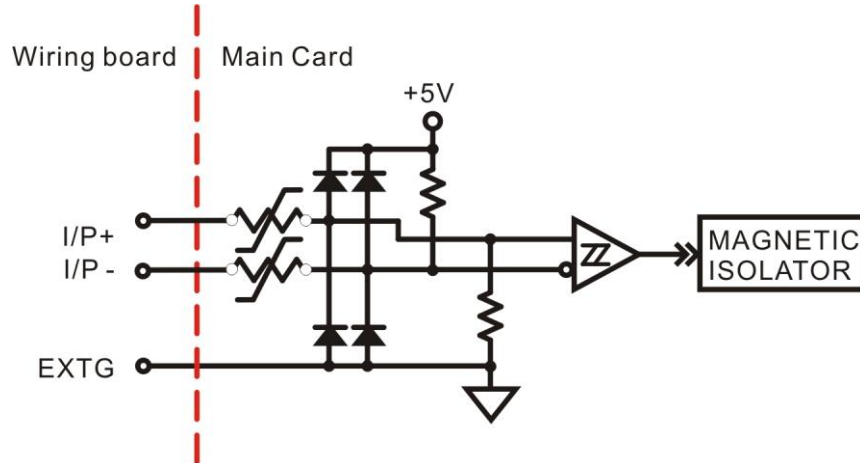
PIN	Descriptions		PIN	Descriptions
1	EXT_IN00 (compare out gate input)	EXT_IN00	2	EXT_OUT00
3	EXT_IN01	EXT_IN01	4	EXT_OUT01
5	EXT_IN02	EXT_IN02	6	EXT_OUT02
7	EXT_IN03	EXT_IN03	8	EXT_OUT03
9	EXT_IN04	EXT_IN04	10	EXT_OUT04
11	EXT_IN05	EXT_IN05	12	EXT_OUT05
13	EXT_IN06	EXT_IN06	14	EXT_OUT06
15	EXT_IN07	EXT_IN07	16	EXT_OUT07
17	EXTG	EXTG	18	EXTG
19	+24Ve	EXT +24Vin	20	+24Ve

6. I/O Interface diagram

6.1 JF1 ADP3101DIN

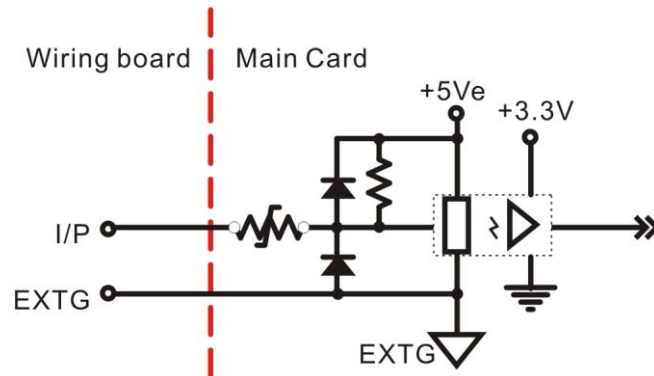
6.1.1 Input diagram

Type1 input: Differential



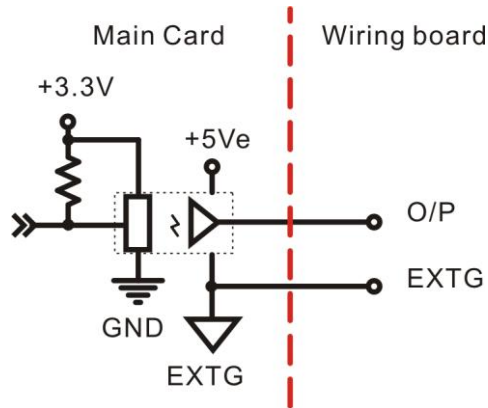
For A+/A-, B+/B-, C+/C-, CLR_IN+/CLR_IN-

Type2 input : Home



For Home

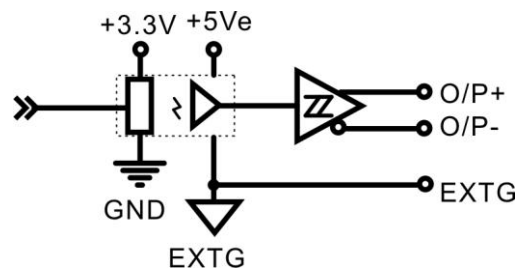
6.1.2 Output diagram



For compare equal output mTRIGGER_OUT (CMP_OUT)

6.2 JM1 JS51050

6.2.1 Output diagram

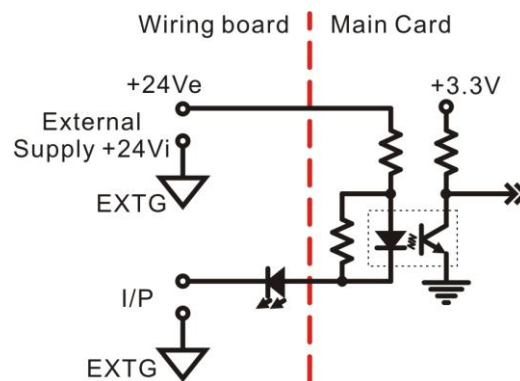


For position offset compare equal output (TRIGGER_OUT7 ~ TRIGGER_OUT0)

6.3 ADP9201_JM1 ADP9201DIN

6.3.1 Input diagram

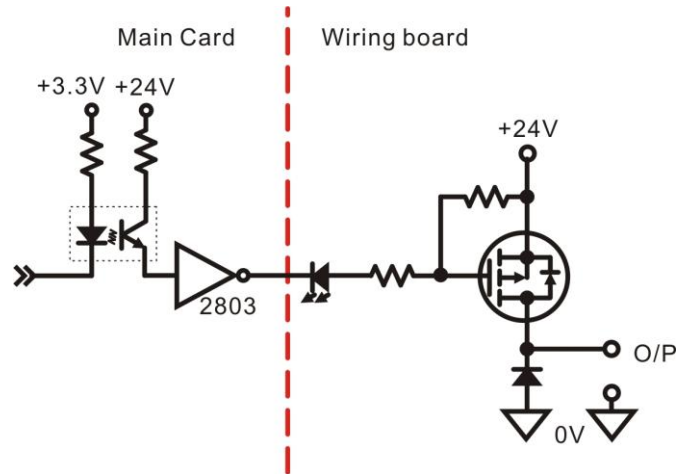
Type 1 Input:



For IN07~IN00

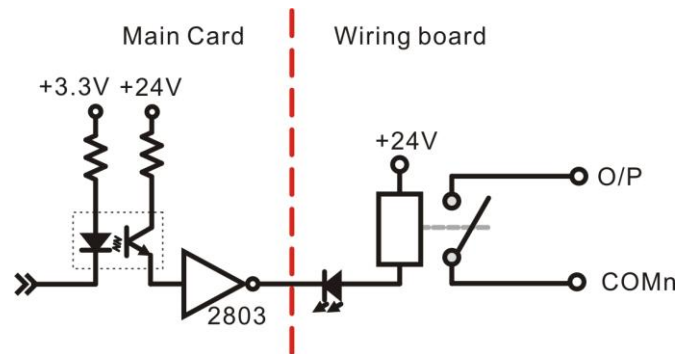
6.3.2 Output diagram

Type 1 output : (PMOS)



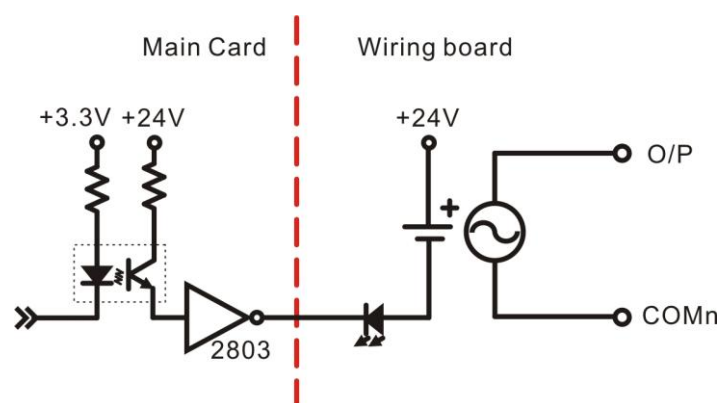
For OUT07~OUT00

Type 2 output : (Relay)



For OUT07~OUT00

Type 3 output : (SSR)



For OUT07~OUT00

7. Using wiring board

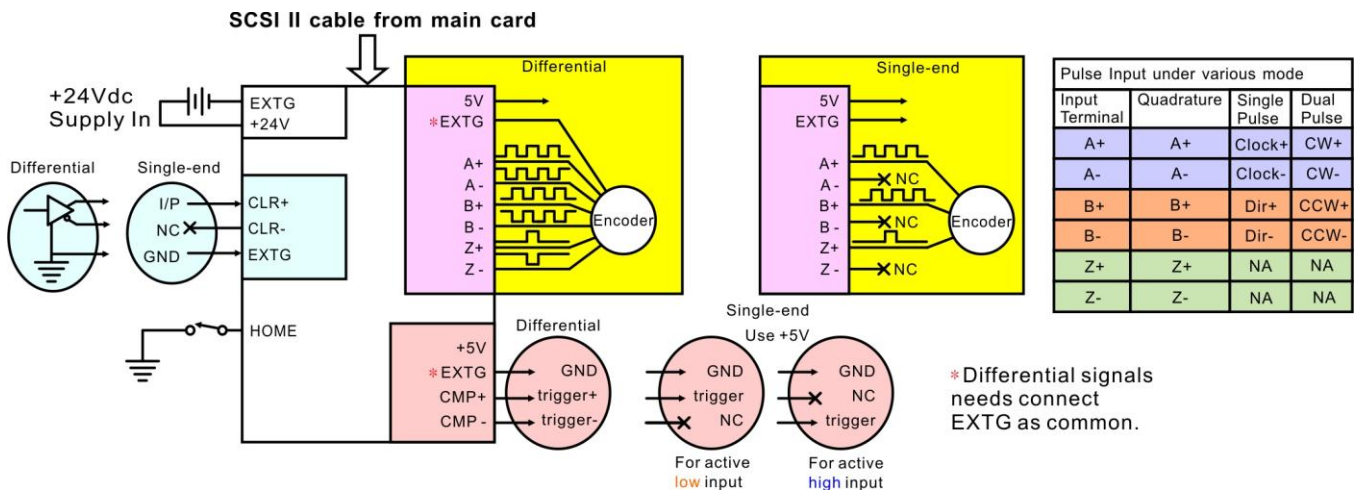
The matched wiring board provides easy interfacing between under control devices and the main control card. For different kind of under control devices, you can choose the wiring board of different interface type or just jump the selection jumper (if the wiring board have optional jumper selection).

7.1 ADP3101DIN wiring board

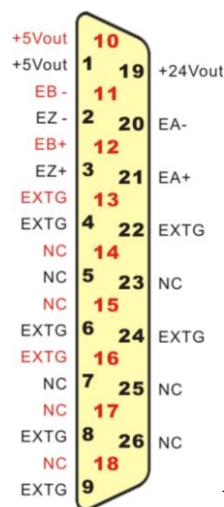
The ADP3101DIN wiring board is used for quadrature related functions, it can be set as differential input or single end input by jumper setting.

JP1		JP2	
1-2 short	2-3 short	1-2 short	2-3 short
Differential input	Single end input	Differential input	Single end input
Use A+,A-, B+,B- Z+,Z-	Use A+,B+,Z+. Leave others unconnected	Use CLR+,CLR-	Use CLR+ only, leave CLR- unconnected

Jumper settings of ADP3101DIN wiring board



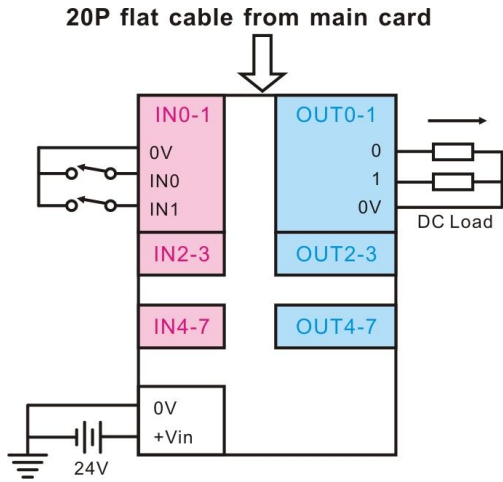
Sample wiring of ADP3101DIN



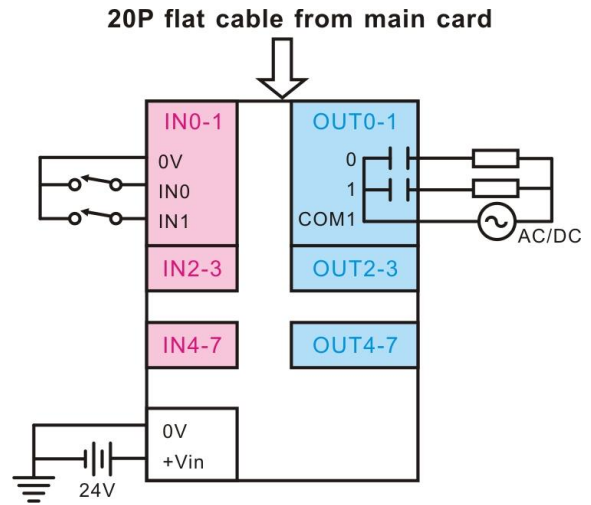
Wiring board DB26 specific connector

7.2 ADP9201DIN wiring board

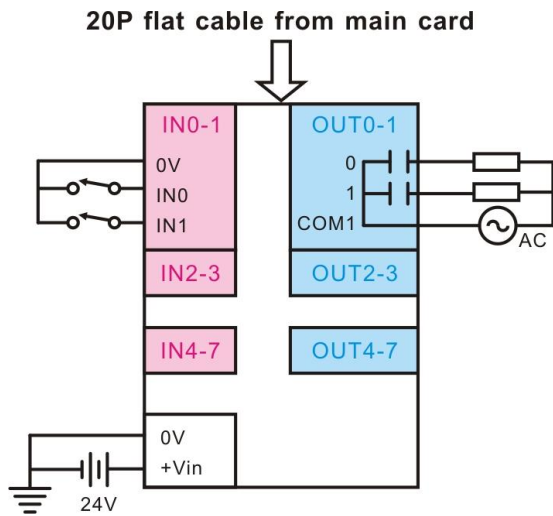
The ADP9201DIN wiring board is used for general purpose digital I/O, there are 3 output types can choose. The following diagram are sample wiring method for different output types.



wiring board with PMOS output



wiring board with Relay output

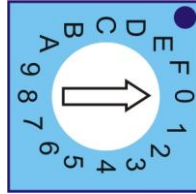


wiring board with SSR output



8. Main card hardware settings

8.1 Card ID setting

Since PCI cards have plug and play function, the card ID is required for programmer to identify which card he/she will control without knowing the physical address assigned by the Windows. A 4 bits rotary switch for extinguishing the 16 identical card. Do not select the same card ID number, if you use more than one same type card in your system.



8.2 JP1 Hot reset jumper

Output relay contact type setting (JP1)	
	
Reset output after hot reset	Keep output after hot reset

9. Applications

For counting pulses on the fly, such as:

- Encoder on various kinds of servo motor
- Encoder on DC/AC motor
- Optical scale output signal
- Magnetic linear scale output
- Timing disc
- Revolution sprocket
- Proximity sensor/detector with relative motion
- Timer counter

Compare position on the fly

Pulse signal receiver /display

X-Y Table linear Scale F/B

Application specific for inspection trigger on rotary or linear production line

10. Ordering information

<u>PRODUCT</u>	<u>DESCRIPTIONS</u>
LSI3188	magnetic isolated one-axis Quadrature Encoder Counter Card with position offset compare function (up to 16MHz quadrature input)
ADP3101DIN	DIN rail mounted wiring board for LSI3101/LSI3181/LSI3188 quadrature counter related function.
ADP9201DIN(P)	DIN rail mounted wiring board for general digital I/O, PMOS out
ADP9201DIN(R)	DIN rail mounted wiring board for general digital I/O, relay out
ADP9201DIN(S)	DIN rail mounted wiring board for general digital I/O, SSR out
JS51053	DIN rail dummy wiring board for general digital I/O, Transistor out
JS51050	DIN rail mounted dummy wiring board (D type 25p male to terminals) for JM1
M262020150	20-pin SCSI-II cable 1.5M
M262020300	20-pin SCSI-II cable 3.0M
M23207	20-pin flat cable 1.5M
M23209	20-pin flat cable 3.0M
M270325X4	D type 25p male-female cable 1.5M
M270325X4S	D type 25p male-female cable 1.5M,shielding
M270325X0	D type 25p male-female cable 3.0M
M270325X0S	D type 25p male-female cable 3.0M,shielding
SM23415	Extension kit for JM1 (bracket and flat cable for 25P female D type connector)