

4-Axis Stepping/Pulse-type Servo Motor Control Card



Agenda

- 功能及規格介紹
- 卡片安裝與信號連接
- 驅動程式安裝
- Utility之操作
- DLL Driver介紹
- 範例程式

功能及規格介紹



Features

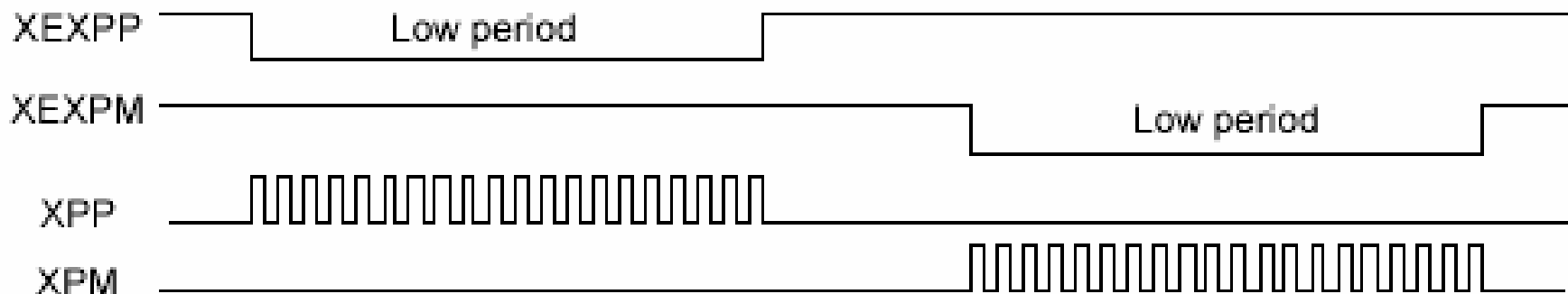
- *Support hand wheel and jog function*
- *Independent 4-axis motion control*
- *2/3-axis linear interpolation function*
- *2-axis circular interpolation function*
- *Continuous interpolation function*
- *Constant speed control*

Specifications

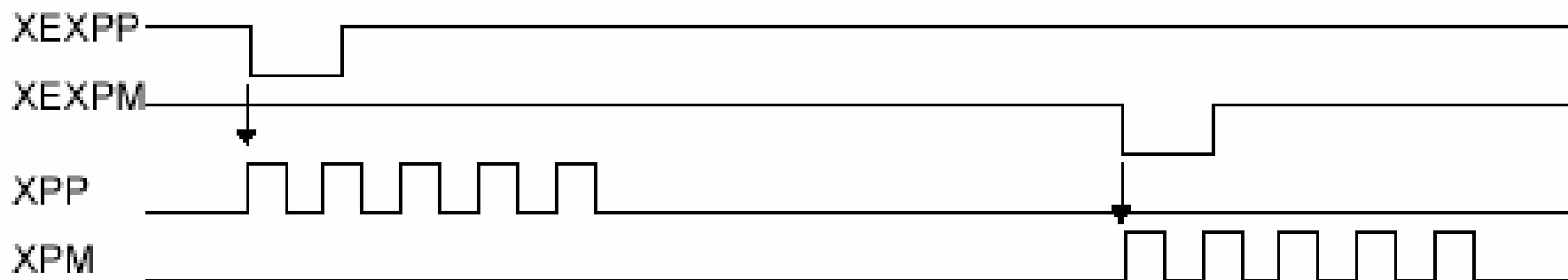
- *Up to 4MPPS pulse output for each axis*
- *Up to 2MPPS in continuous interpolation function*
- *Two pulse output types: Up/Down or Pulse/Direction*
- *Up to 1 MHz encoder input for each axis*
- *Two encoder pulse input types: A/B phase or Up/Down*
- *Board ID*

功能及規格介紹

Continuous Pulse Driving Mode (JOG)

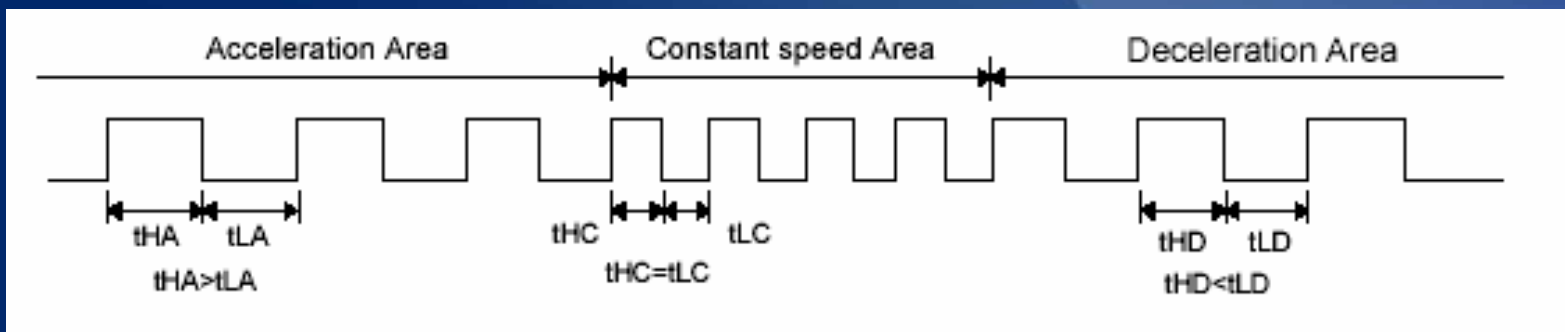
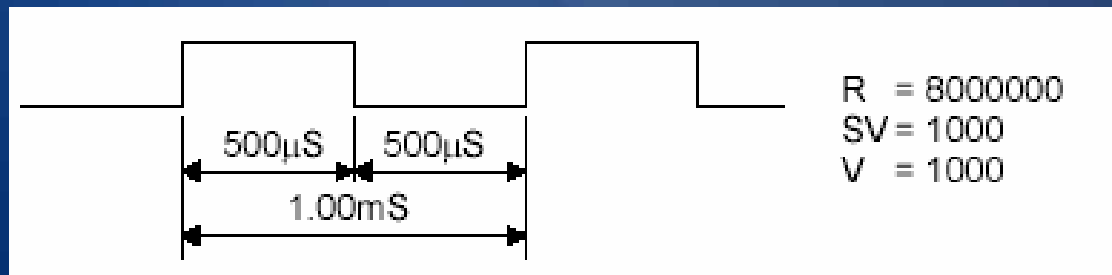


Fixed Pulse Driving Mode (Hand Wheel)



功能及規格介紹

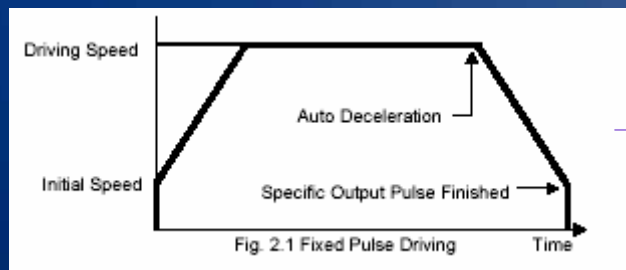
Duty Ratio of Driving Pulse



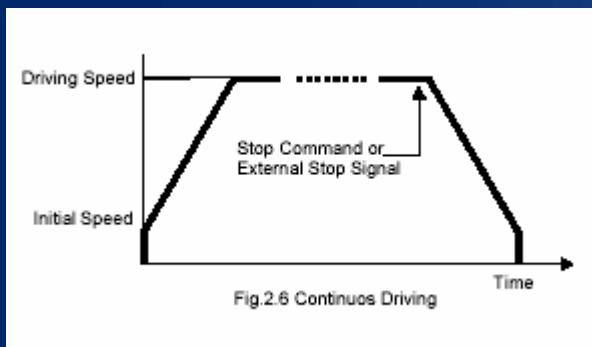
Comparison of Drive Pulse Length in Acceleration / Deceleration

功能及規格介紹

Pulse Output Command

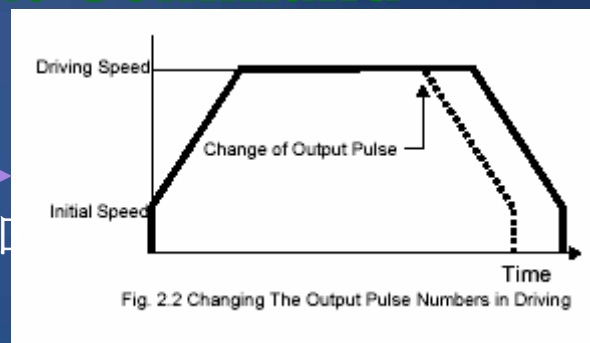


定量輸出

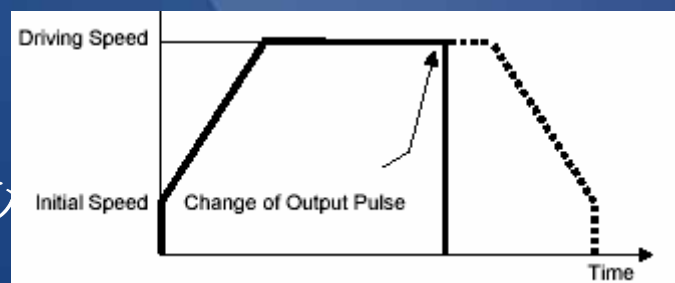


連續輸出

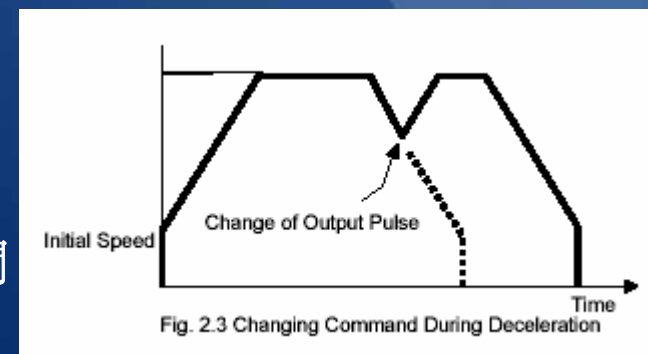
行進間
增加



減少

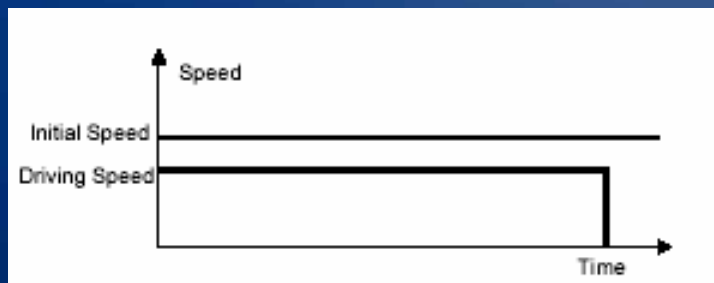


減速間
增加

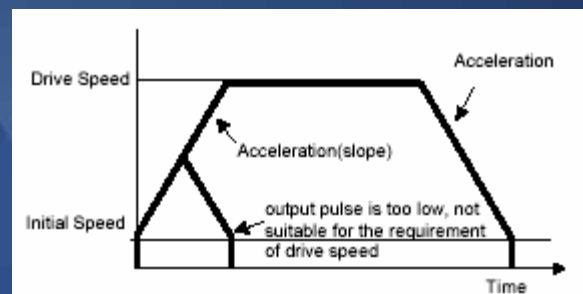


功能及規格介紹

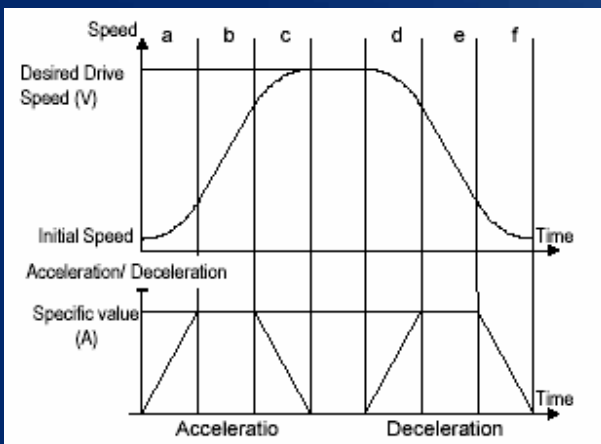
Speed Curve



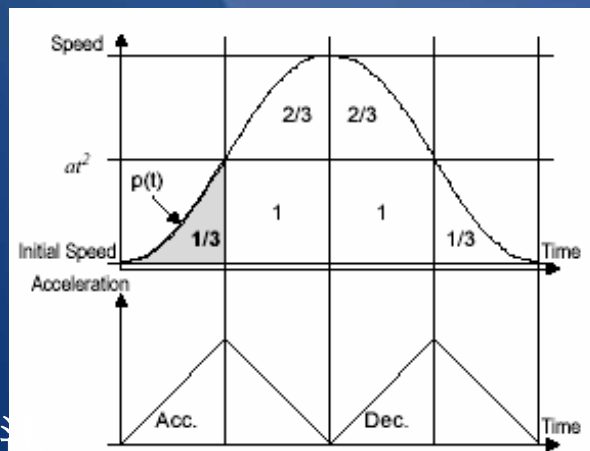
定速驅動



梯形加減速



S型加減速



功能及規格介紹

Linear Interpolation

Axis : Any 2/ 3 of 4 axes

Range : -8,388,608 and +8,388,607, ($-2^{23} \sim 2^{23} - 1$)

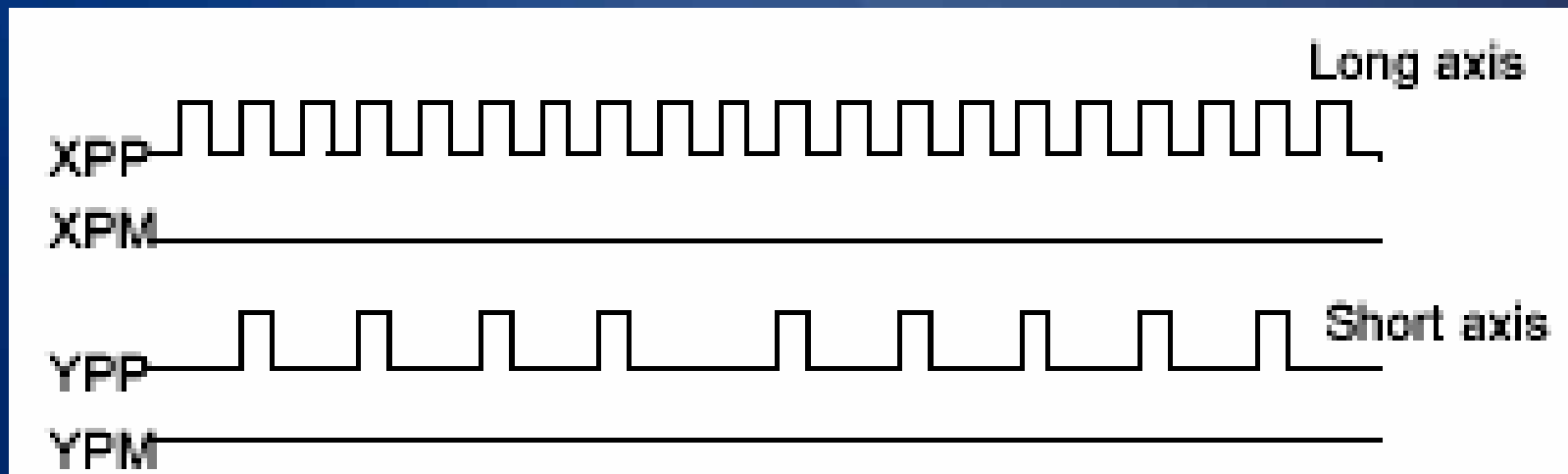
Linear error : +/- 0.5 LSB (Least Significant Bit)

Speed range : 1 PPS to 4 MPPS



功能及規格介紹

Linear Interpolation Pulse Output

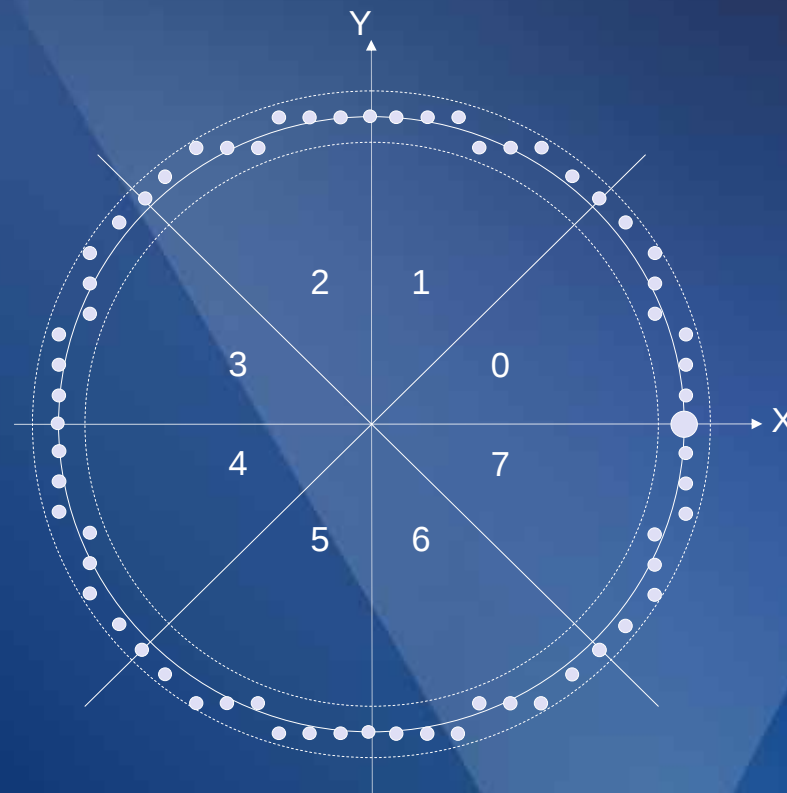


define the longest distance movement in interpolation is the “ long axis” . And the other is “ short axis” . The long axis outputs an average pulse train. The driving pulse of the short axis depends on the long axis and the relationship of the two axes.

功能及規格介紹

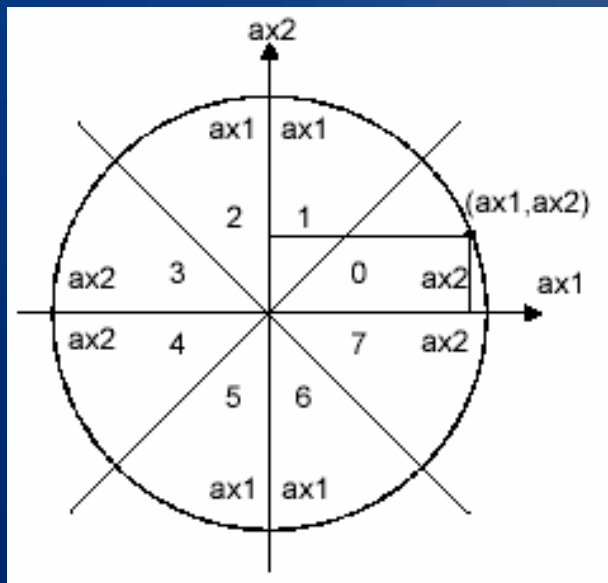
Circular Interpolation

Axis : Any 2 of 4 axes
Range : -8,388,608 ~ +8,388,607,
Linear error : +/- 1.0 LSB
(Least Significant Bit)
Speed range : 1 PPS to 4 MPPS.

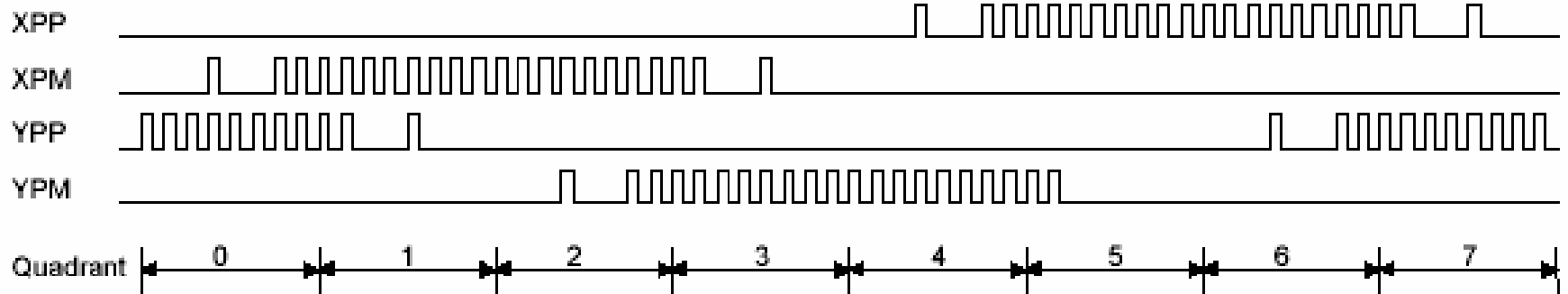
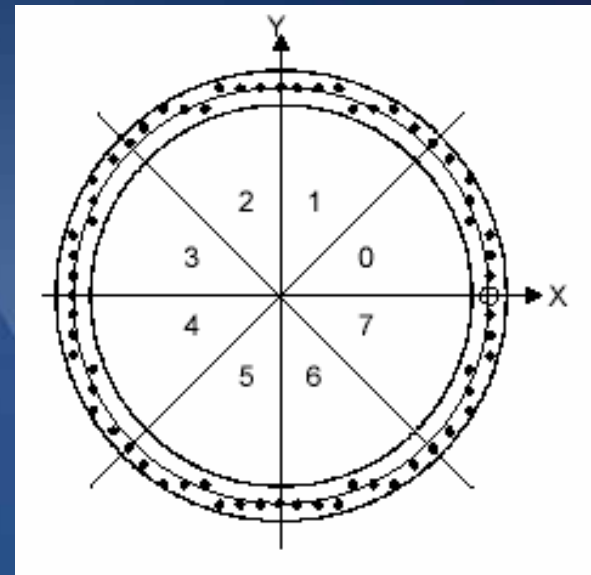


Solid line : radius
Dash line : radius $\pm$ 1

功能及規格介紹



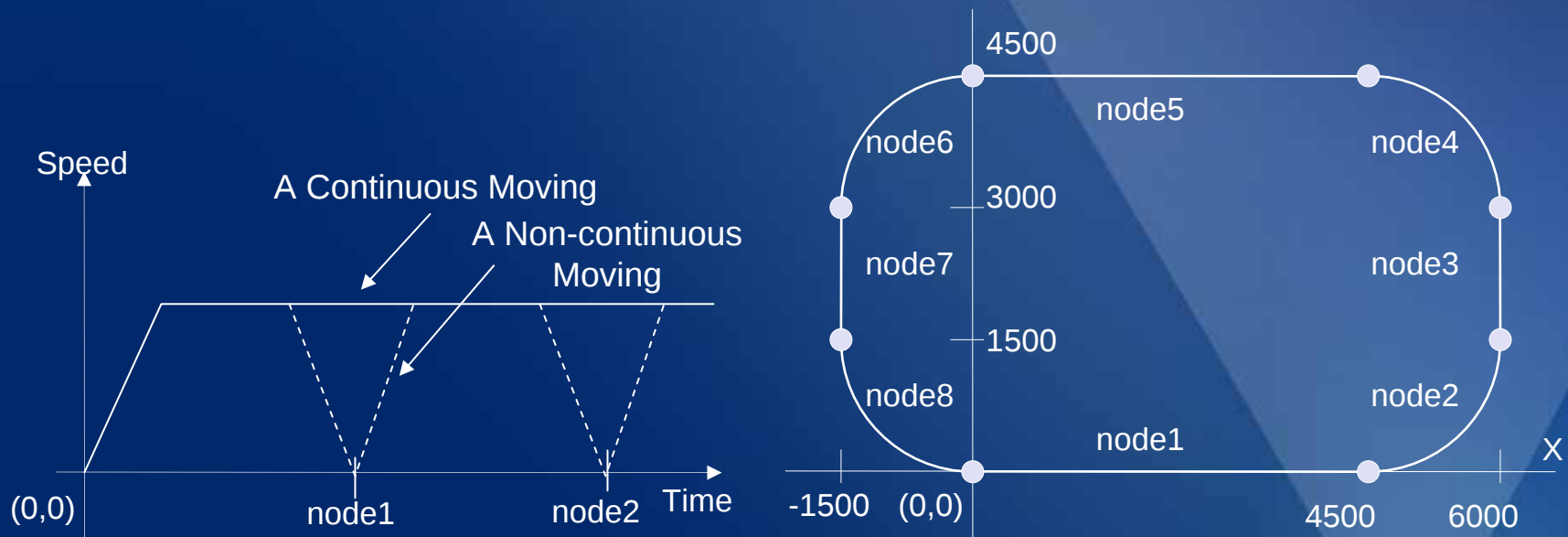
Short Axes in
Circular
Interpolation
Calculation



功能及規格介紹

Continuous Interpolation

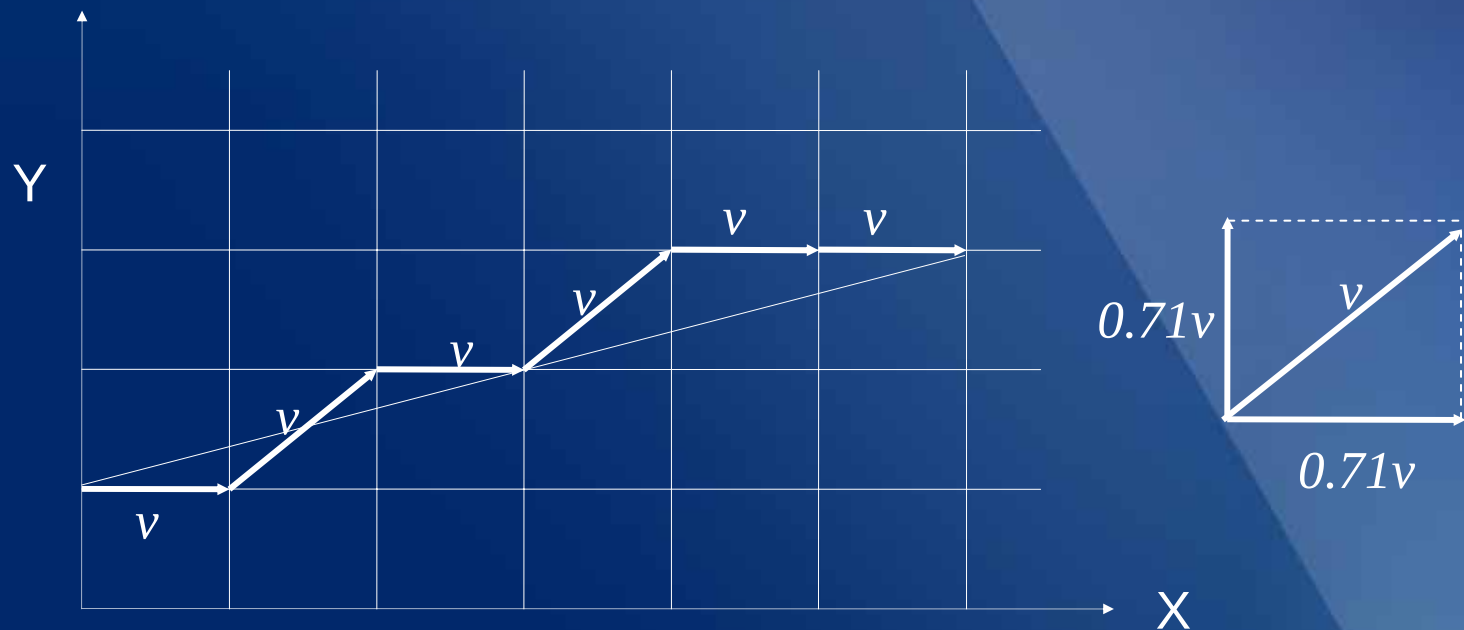
A continuous uninterrupted motion can be maintained between circular, linear, and simple command move profiles. The maximum interpolation speed is 2 MHz.



功能及規格介紹

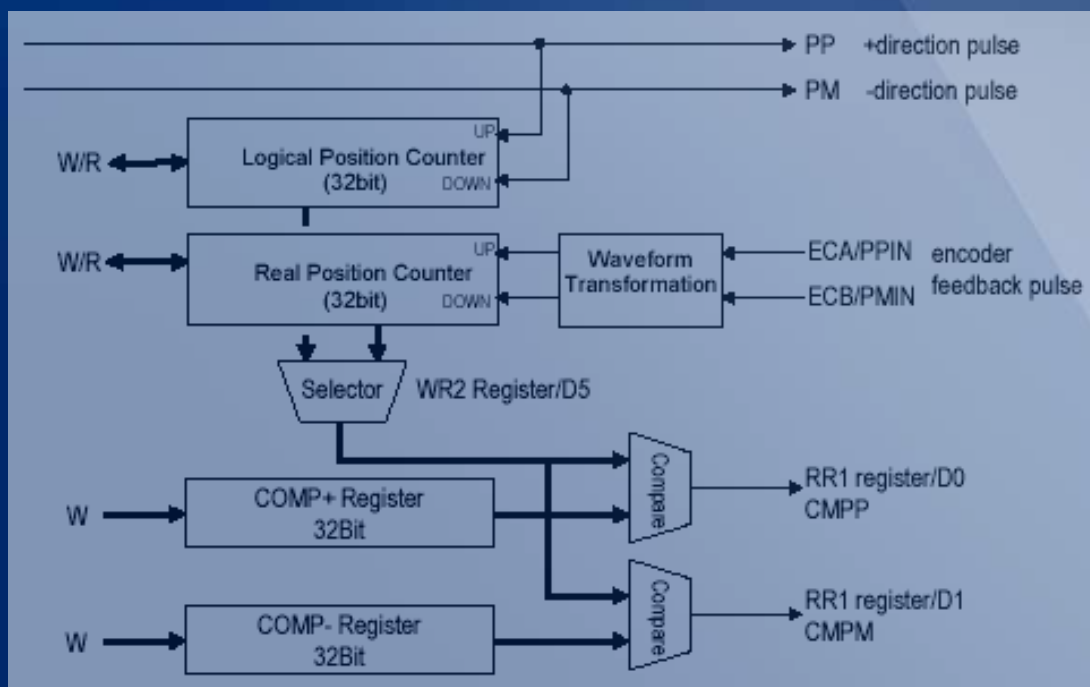
Constant Speed Control

The PCI-1240 can set a 1.414 times pulse cycle for 2-axis simultaneous pulse output, and a 1.732-time pulse cycle for 3-axis simultaneous pulse output.



功能及規格介紹

Positioning Control, Compare Register and Software Limit



- 包括邏輯位址計數與實際位址計數兩種

- 範圍(-2,147,483,648 ~ +2,147,483,647.)

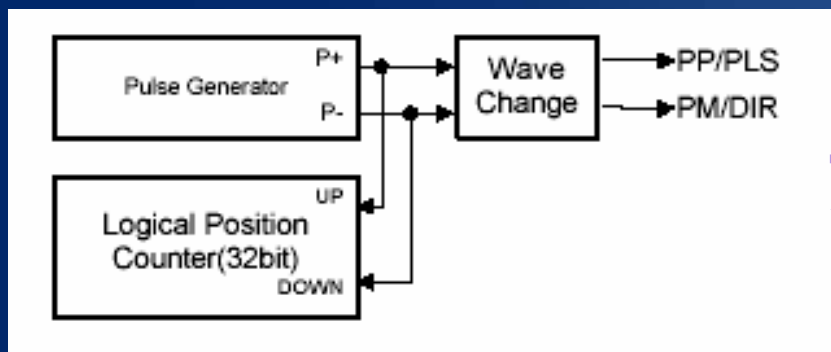
與Compare Register 搭配使用成為軟體極限
(When D0 and D1bits of register WR2 are set to 1, it enables the software limit.)

功能及規格介紹

Pulse Output Type

(pulse / direction is set on the positive logical level)

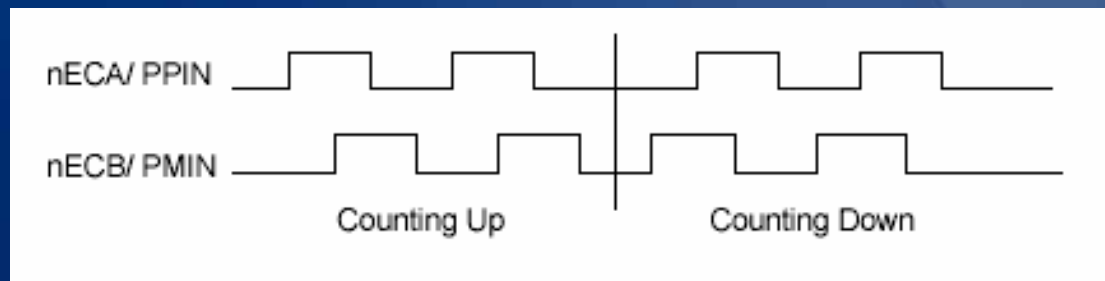
Pulse Output Type	Drive Direction	Pulse Output Waveform	
		nPP/PLS Signal	NPM/DIR Signal
Independent 2-pulse	+Direction		Low level
	- Direction	Low level	
1-pulse 1-direction	+Direction		Low level
	- Direction		Hi level



Type, Pulse level 及 direction 都可以設定

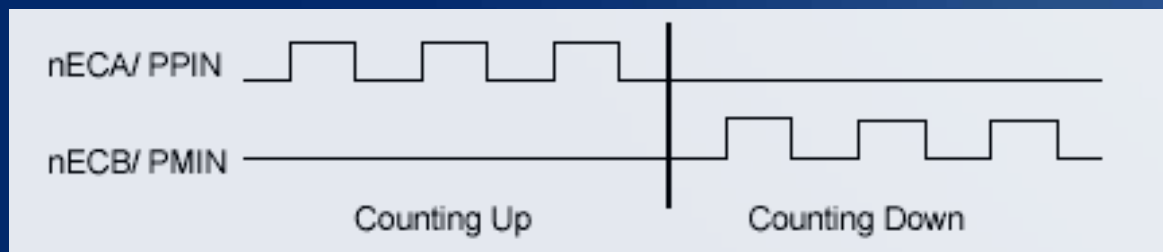
功能及規格介紹

Pulse Input Type Selection



A/B quadrature pulse

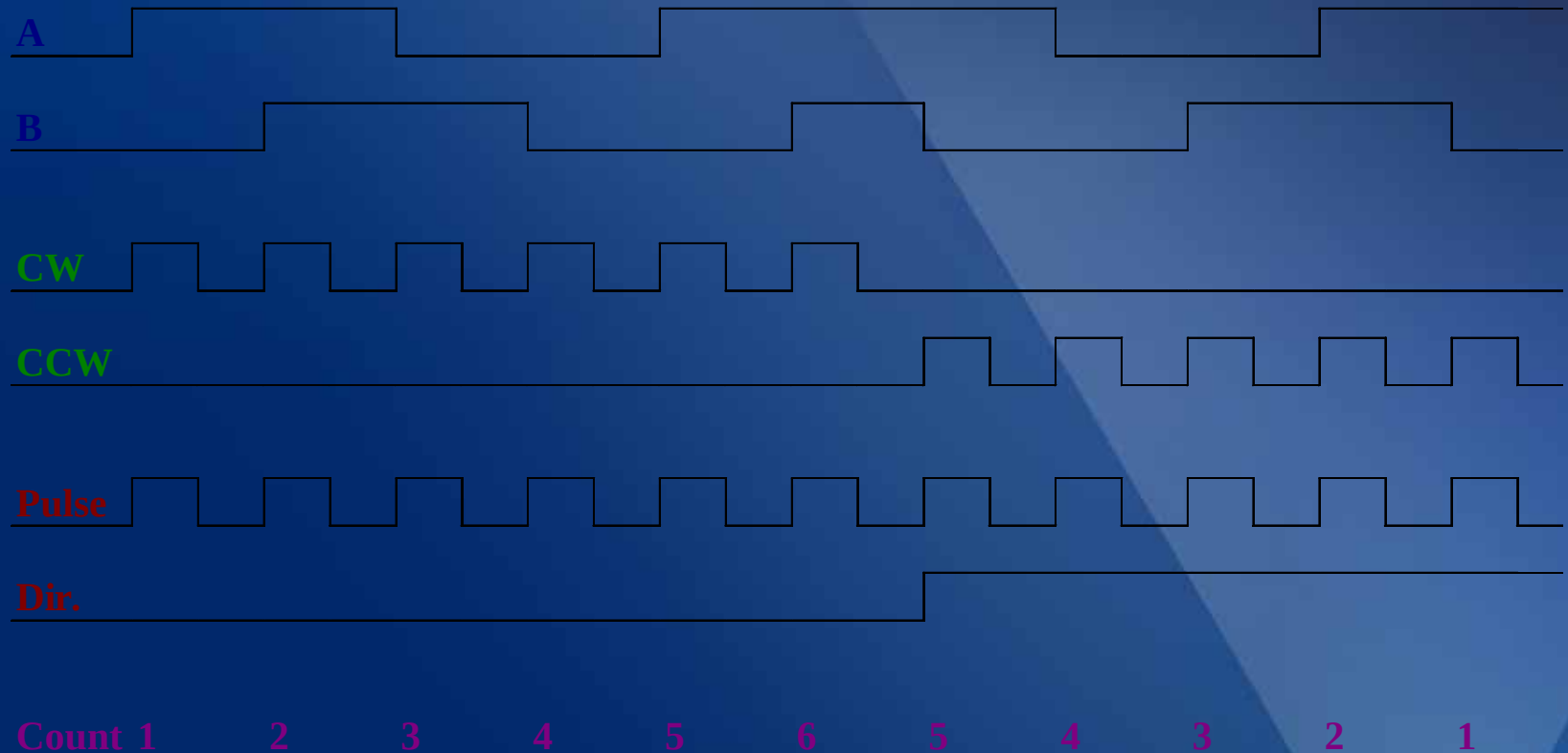
A/B pulse可以在做 x1,x2
及 x4 處理



Up / Down pulse type

功能及規格介紹

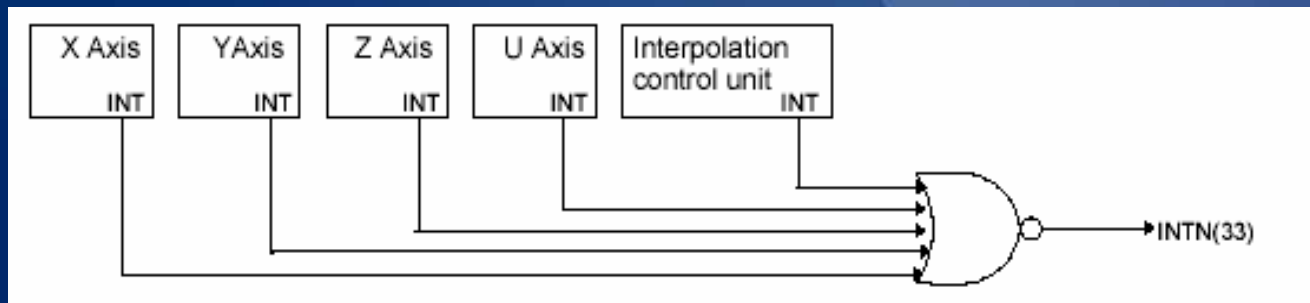
A/B Phase、CW/CCW、Pulse/Direction



功能及規格介紹

- Interrupt Signals

Start/End of consistent speed, End of driving, Trigger from compare register, etc.



每個中斷可以各別致能(Enable)或失能(Disable).

電源重置(Reboot)後, 所有上列中斷將Disable.

功能及規格介紹

Appendix A. Specification

Axis:

Number of Axis	4 Axis	
2/3-Axis Linear Interpolation	Range	-8,388,608~+8,388,607 for each axis
	Speed	1PPS~4MPPS
	Precision	±0.5LSB
2-Axis Circular Interpolation	Range	-8,388,608~+8,388,607 for each axis
	Speed	1PPS~4MPPS
	Precision	±1LSB
Continuous Interpolation	Speed	1PPS~2MPPS
Drive Output Pulses	Output Signal*	nP+P/N, nP-P/N
	Range	1PPS~4MPPS
	Precision	±0.1%
	Jerk for S Curve	954~31.25 x 10 ⁹ PPS/sec ²
	Acceleration/Deceleration	125~500 x 10 ⁶ PPS/sec
	Initial Velocity	1PPS~4MPPS
	Drive Speed	1PPS~4MPPS
	Number of Output Pulses	0~268,435,455 (fixed pulse driving mode)
	Pulse Output type	Pulse/Direction(1-pulse, 1-direction type) or CW/CCW(2-pulse type)
	Output Signal Modes	Differential line driving output/ Single-ended output
	Speed Curve	T/S-curve
		Acceleration/Deceleration

功能及規格介紹

Encoder Input:

Encoder Interface	Input Signal*	nECAP/N, nECBP/N, nINOP/N	
	Encoder Pulse Input Type	Quadrature (A/B phase) or Up/Down	
	Counts per Encoder Cycle	x1, x2, x4 (A/B phase only)	
	Max. Input Frequency	1 MHz	
	Input Voltage	Low	Low 3 VDC max.
		High	10 VDC min.
			30 VDC max.
Protection		2,500 VDC isolation	

External Driving:

External Signals Driving	Input Signal*	nEXOP+, nEXOP Max.	
	Max. Input Frequency	100 Hz	
	Input Voltage	Low	3VDC max.
		High	10 VDC min.
			30 VDC max.
	Driving Mode	Fixed pulse driving or continuous Driving Supports Hand Wheel / Jog	
	Protection	2,500 VDC photo coupler isolation	

功能及規格介紹

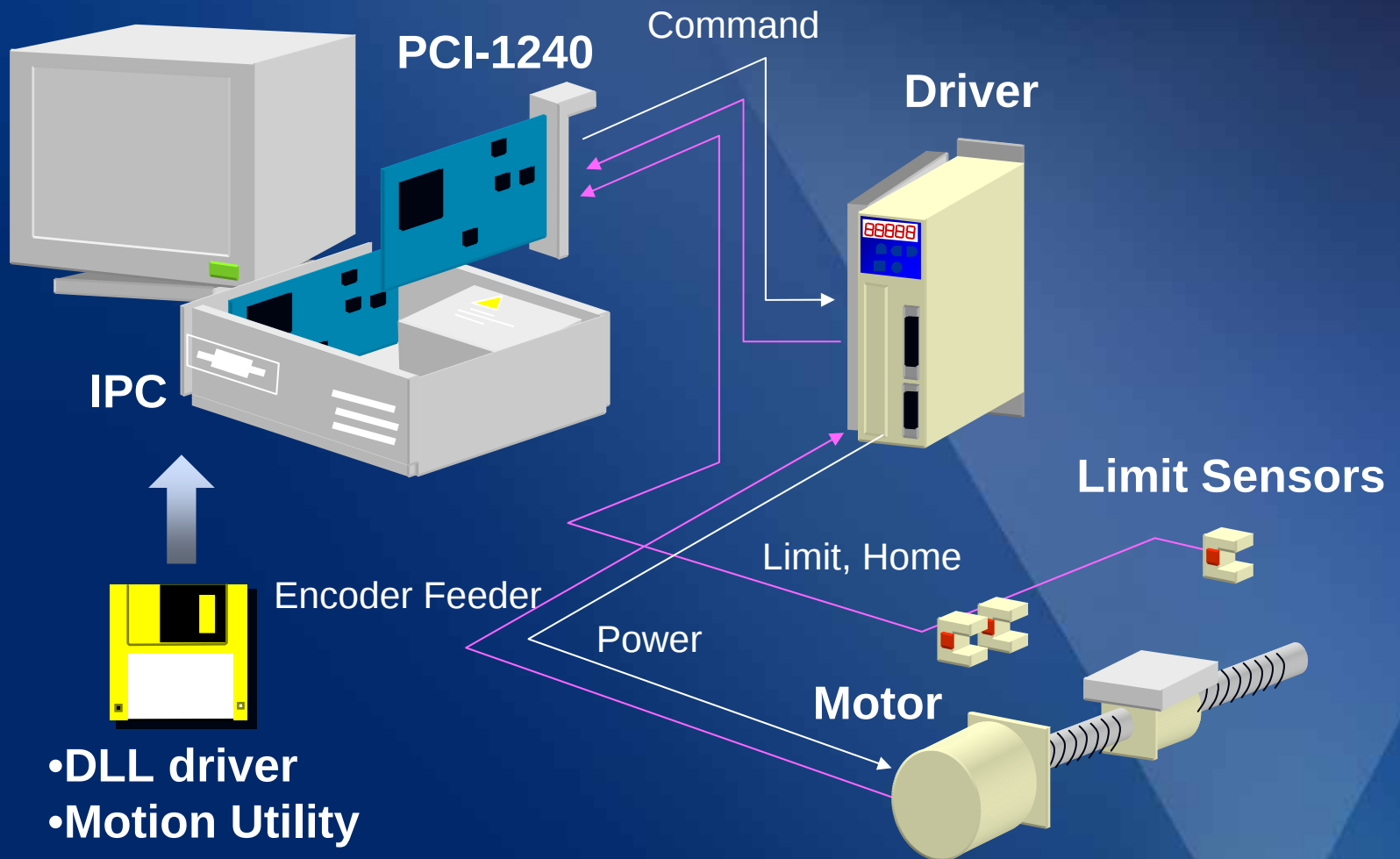
Digital Input/Output:

Input Signal	Over Traveling Limit Switch Input*	nLMT+ and nLMT-	
	External deceleration/instantaneous Stop Signal*	nIN1 ~ 3	
	Input Signal for Servo Motor Drives*	nALARM (servo alarm); INPOS (position command completed)	
	Emergency Stop	EMG - one emergency stop input	
	Max. Input Frequency	4 kHz	
	Input Voltage	Low	3 VDC max.
		High	10 VDC min. 50 VDC max.
	Input Current	10 VDC	1.70 mA (typical)
		12 VDC	2.10 mA (typical)
		24 VDC	4.40 mA (typical)
		48 VDC	9.00 mA (typical)
		50 VDC	9.40 mA (typical)
	Protection	2,500 VDC photo coupler isolation and RC filtering	
General Purposed Output Signal	Output Signal*	nOUT4 ~ 7	
	Output Voltage	Open Collector 5 ~ 40 VDC	
	Sink Current	200 mA max./channel	
	Protection	2,500 VDC photo coupler isolation	

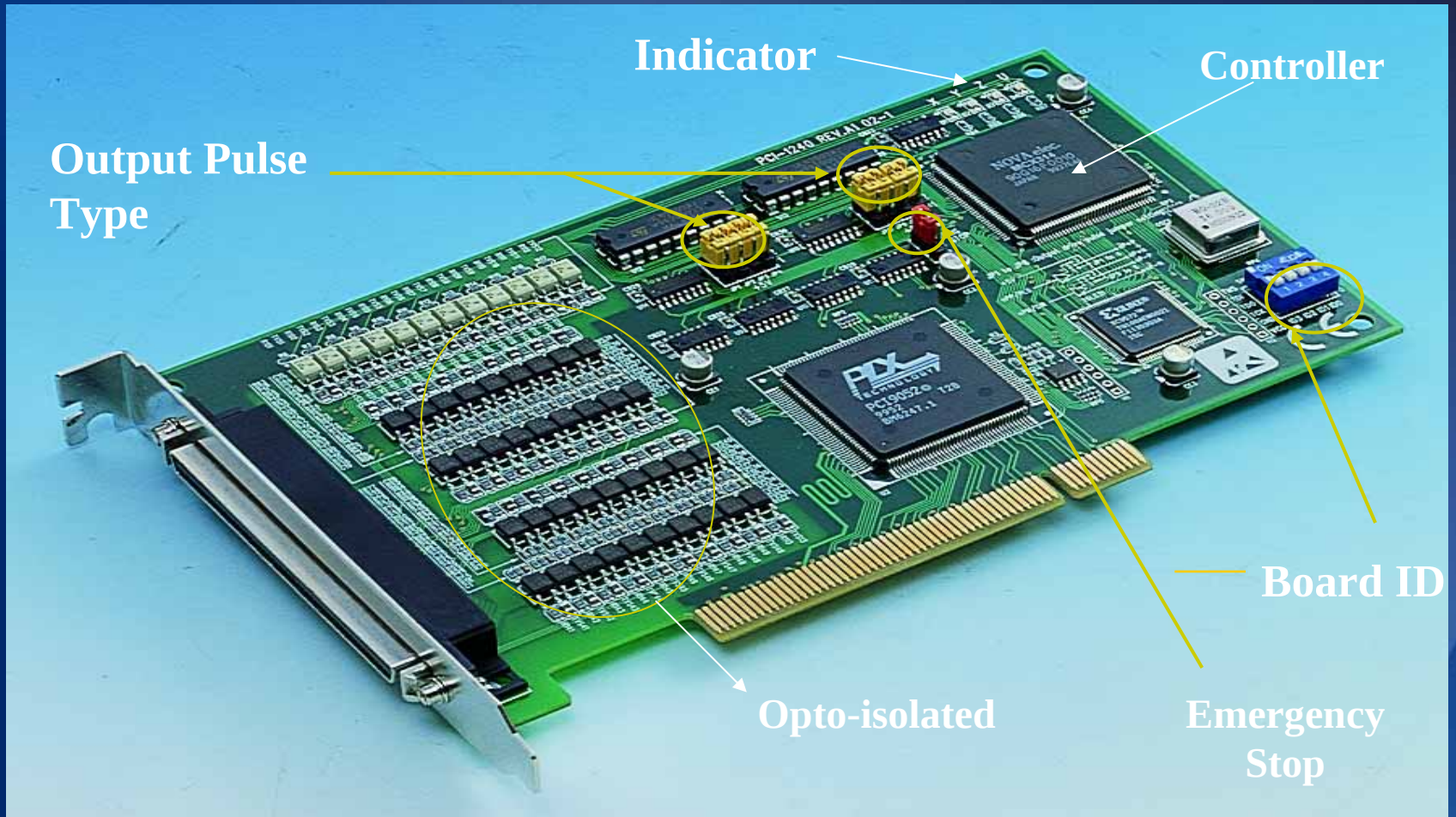
Agenda

- 功能及規格介紹
- 卡片安裝與信號連接
- 驅動程式安裝
- Utility之操作
- DLL Driver介紹
- 範例程式

卡片安裝與信號連接

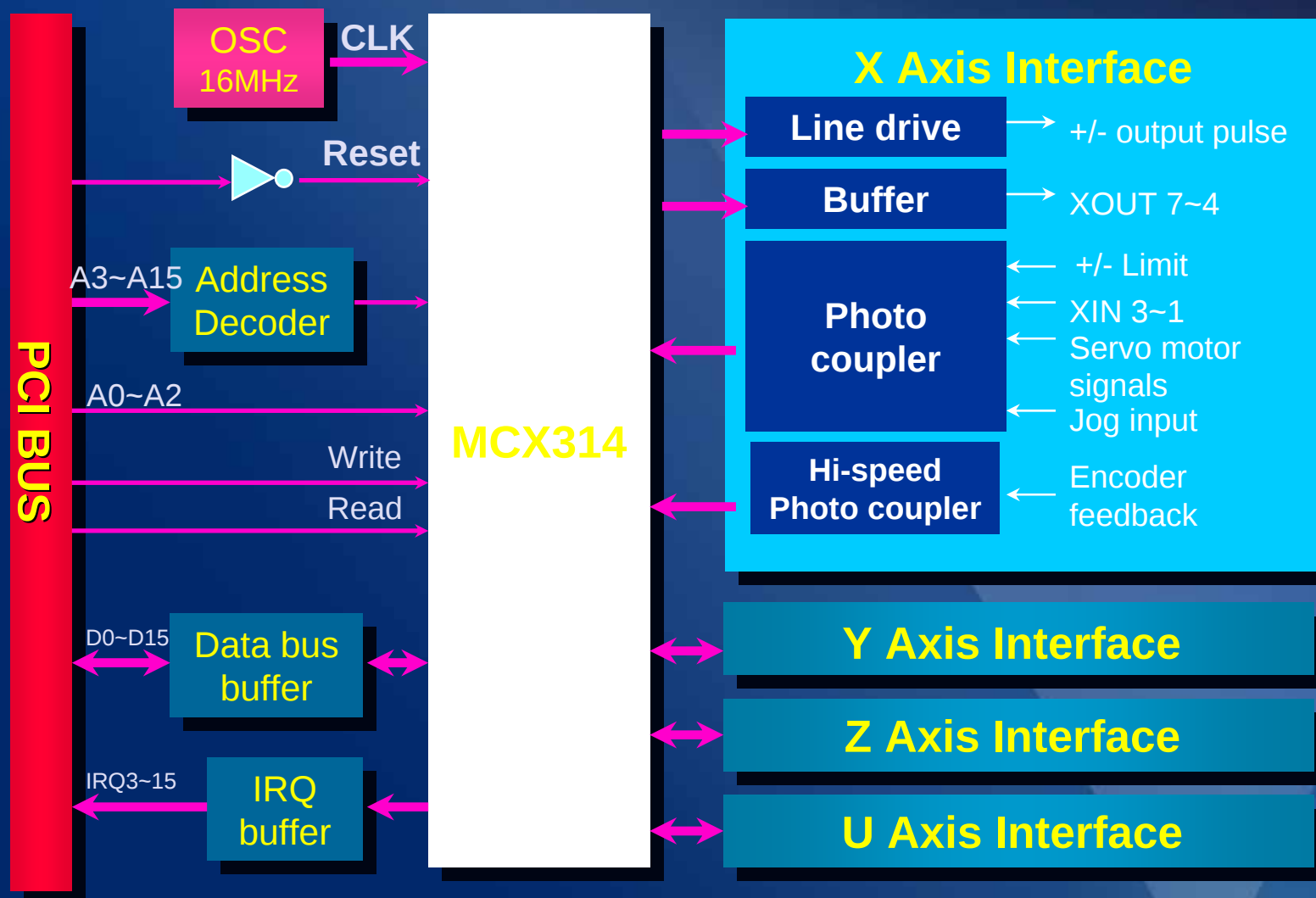


卡片安裝與信號連接

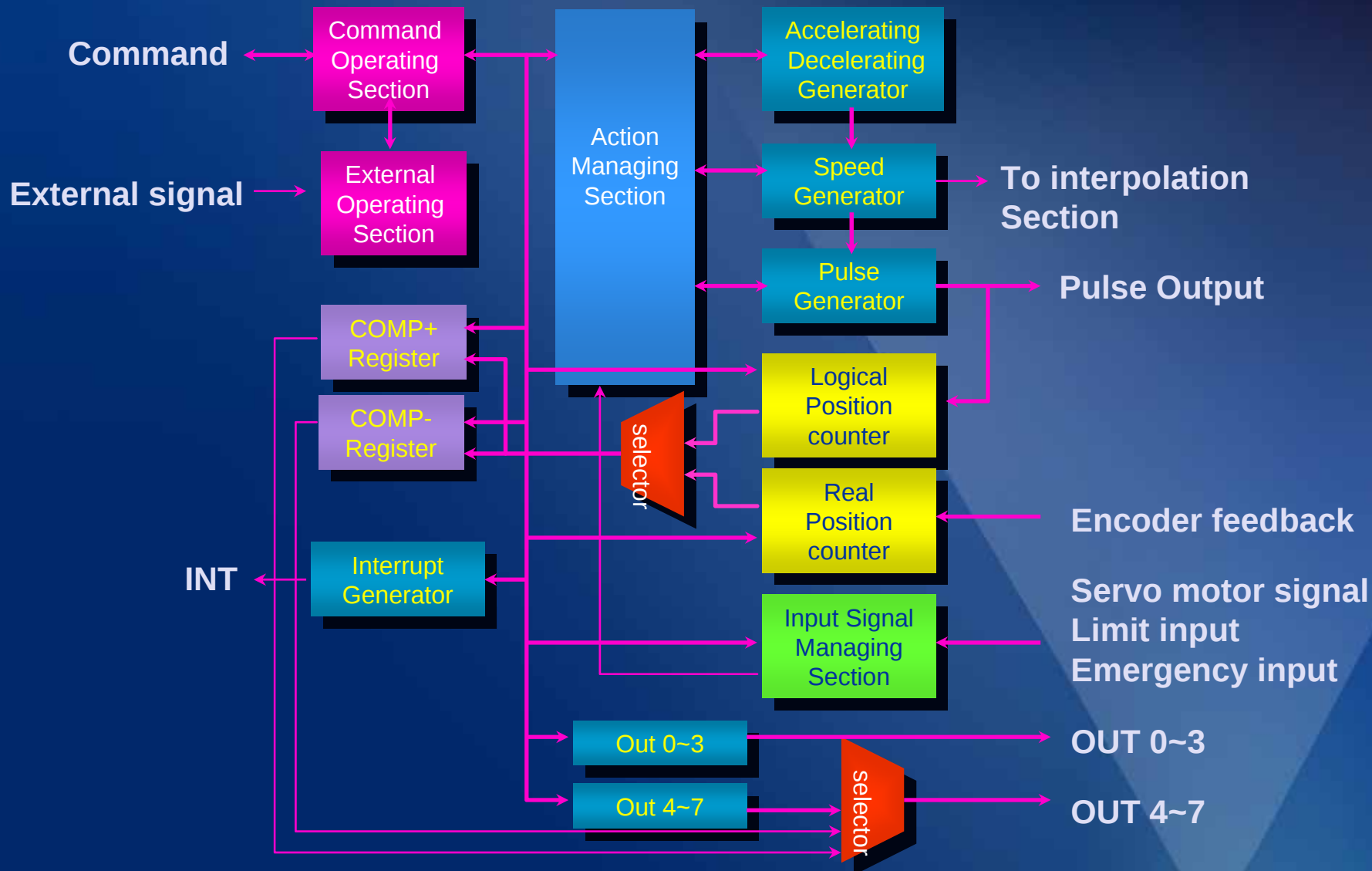


Location of Jumpers and DIP switch

PCI-1240 Block Diagram



MCX314 Axis Interface



卡片安裝與信號連接

Board ID Setting – SW1

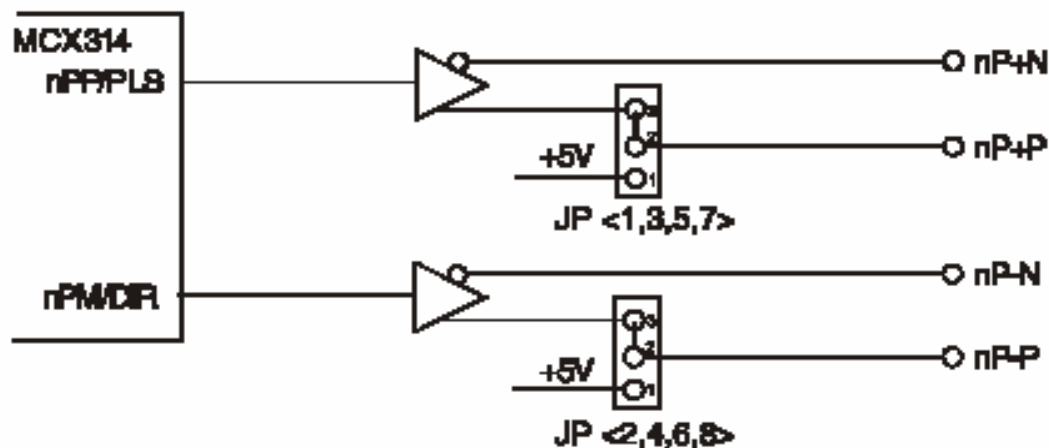
SW1	Board ID register			
Base Add.+12 _h	3	2	1	0
Abbreviation	BDID3	BDID2	BDID1	BDID0

Board ID setting (SW1)

Board ID (Dec.)	Switch Position			
	ID3	ID2	ID1	ID0
*0	●	●	●	●
1	●	●	●	○
:				
14	○	○	○	●
15	○	○	○	○
○ = Off ● = On * = default				

卡片安裝與信號連接

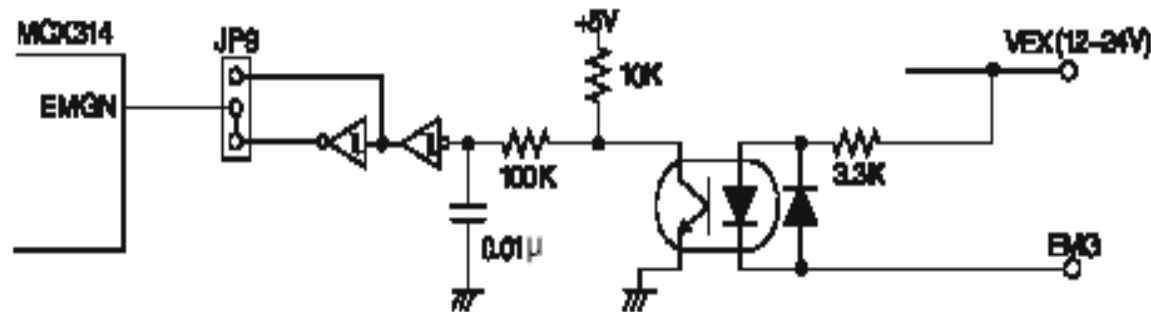
Output Pulse Type Setting – JP1~8



Jumper	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8
Output Signal	XP+P	XP-P	YP+P	YP-P	ZP+P	ZP-P	UP+P	UP-P
IC Output (Line Driver Output)	Pin2 and Pin 3 short (Default)							
+5V Output	Pin1 and Pin 2 short							

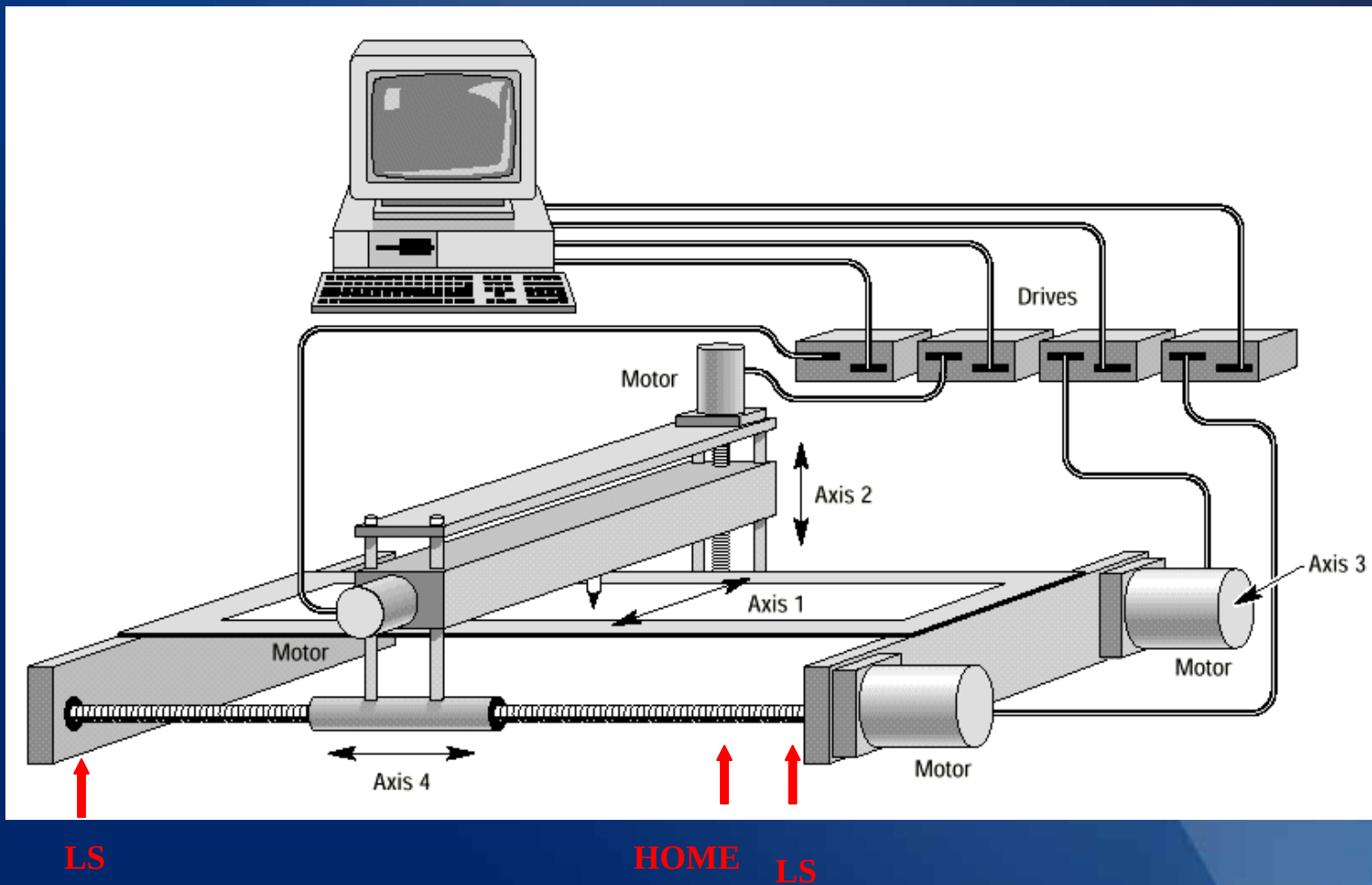
卡片安裝與信號連接

EMG Setting – JP9

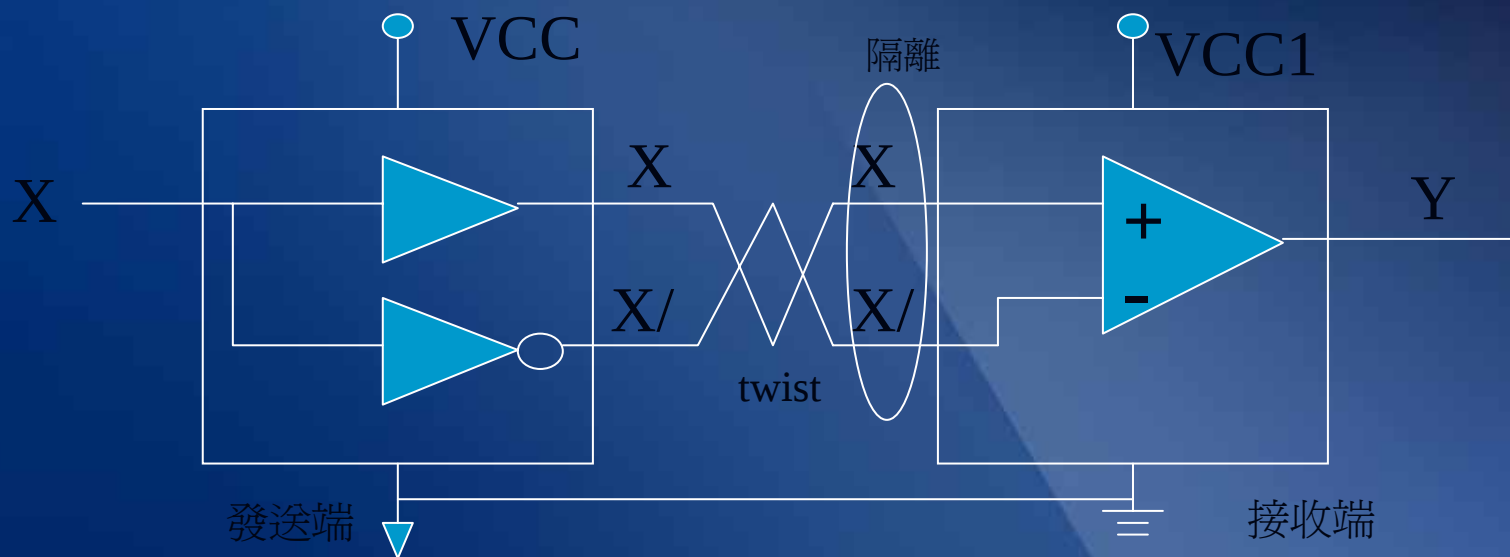


Jumper	JP9
Emergency stop function enabled when emergency stop signal (EMG) and external GND short	Pin 1 and Pin 2 short (Default)
Emergency stop function enabled when emergency stop signal (EMG) and external GND open	Pin 2 and Pin 3 short

卡片安裝與信號連接



Why differential(差動傳輸) ?

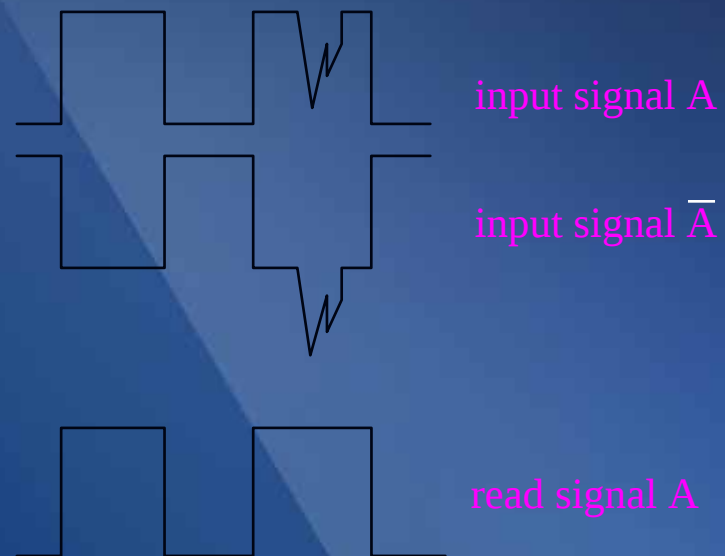
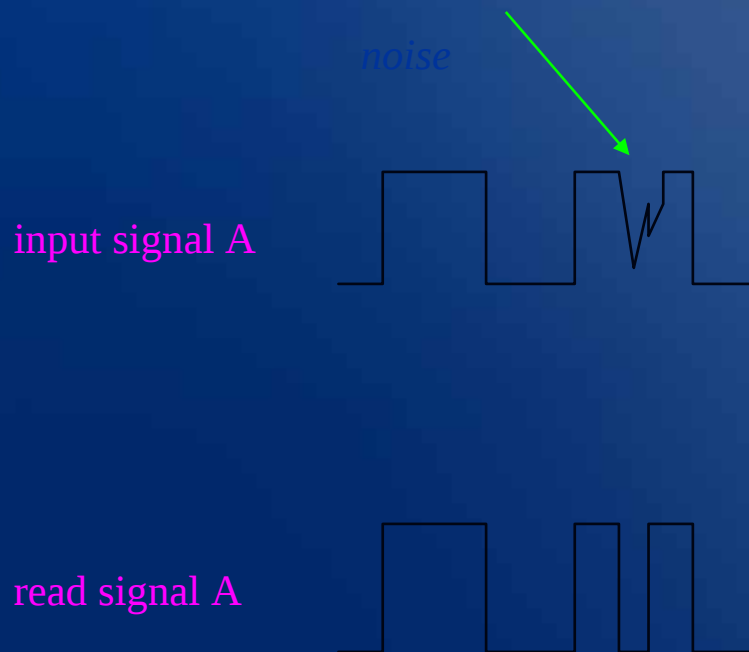


發送端	傳輸線中之訊號		接收端
X	X	X/	Y
0	0	1	0
1	1	0	1

- ❖ 發送端將輸入訊號X轉換成X及X/輸出
- ❖ 接收端將輸入之X及X/比較後得Y
- ❖ 真值表如左圖
- ❖ 以DIFFERENTIAL 方式傳送可有效消除共模雜訊

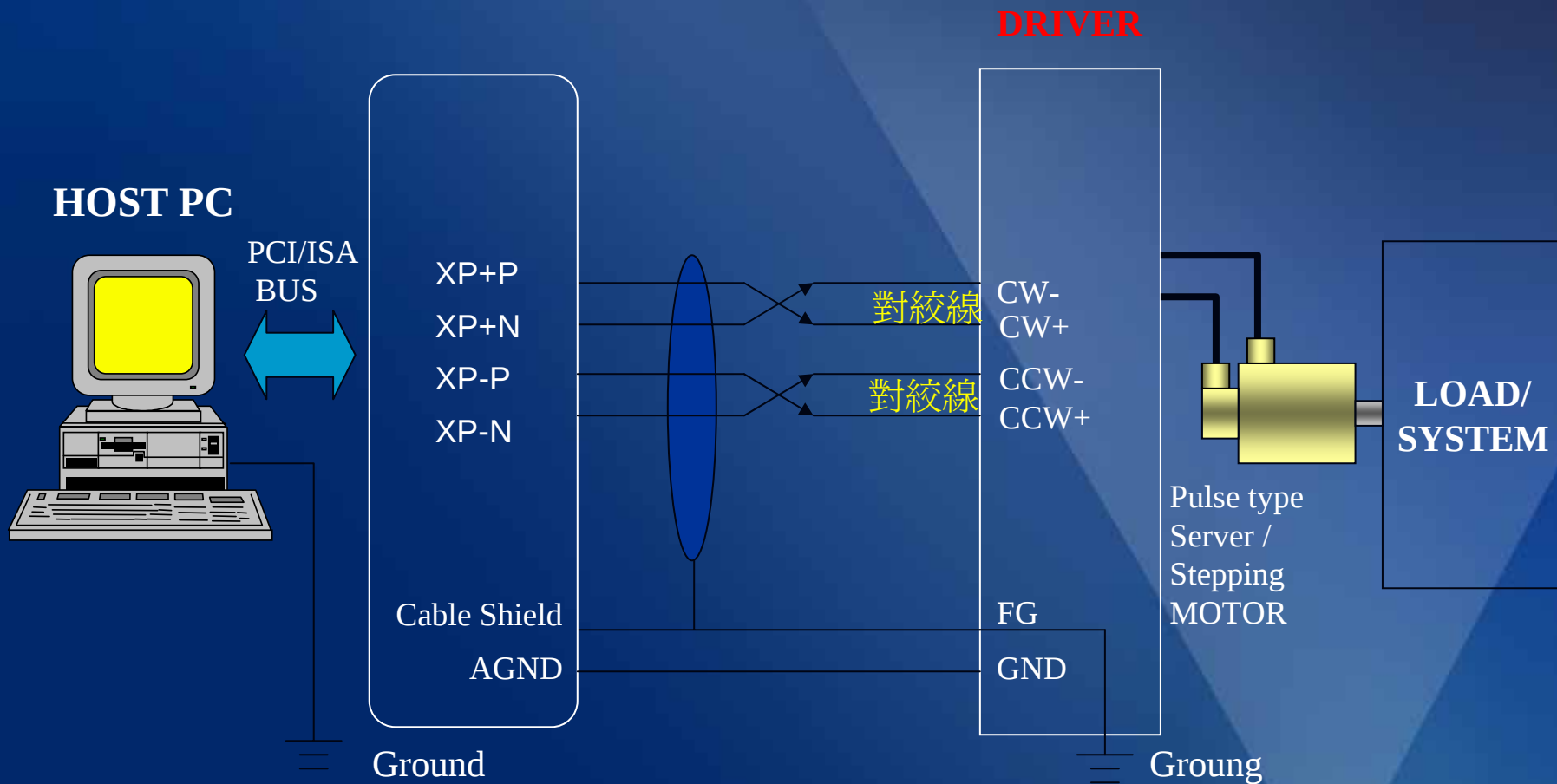
卡片安裝與信號連接

■ 爲了消除共模雜訊



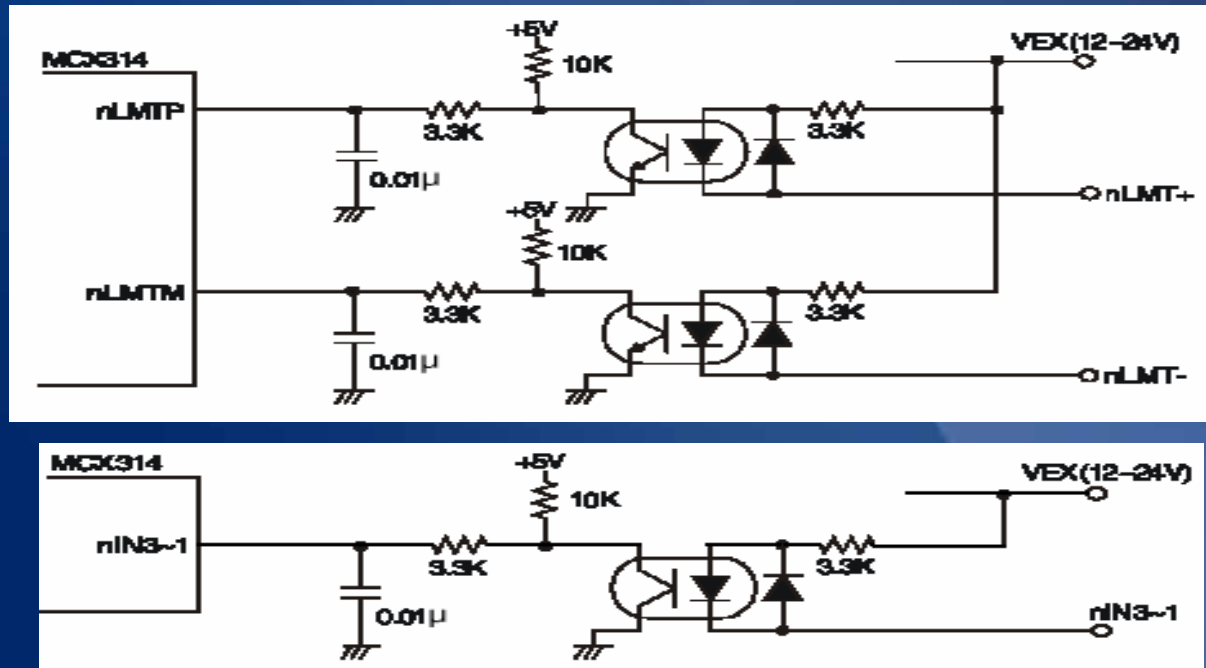
卡片安裝與信號連接

脈波輸出控制配線



卡片安裝與信號連接

Signal Input (nLMT+,nLMT-,nIN3~1)

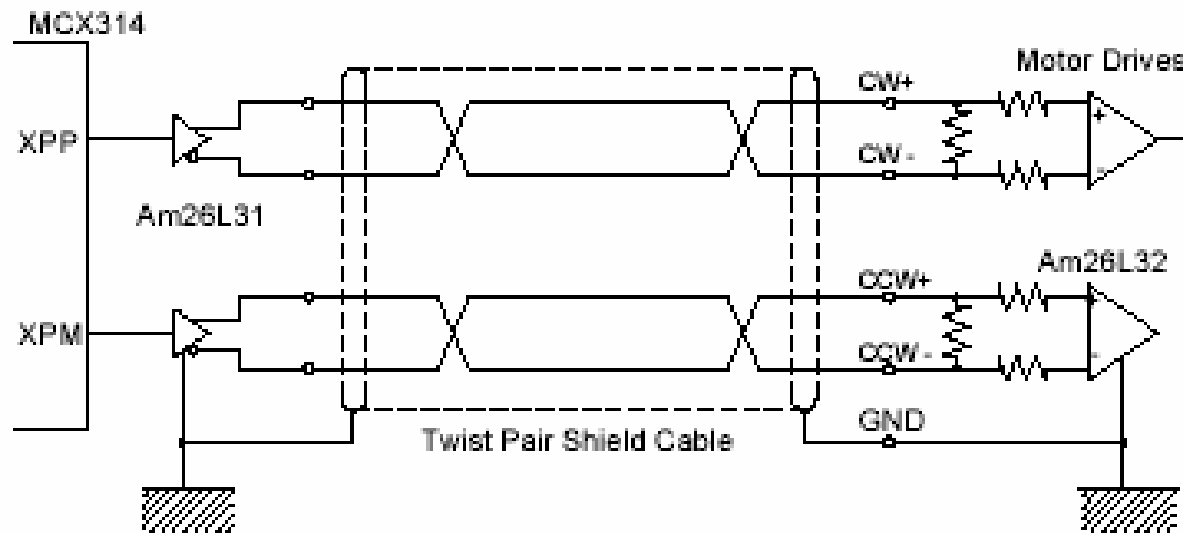


Notes :

The response time of this circuit should take about 0.2 ~ 0.4 msec because of the delay of photo coupled and RC filter.

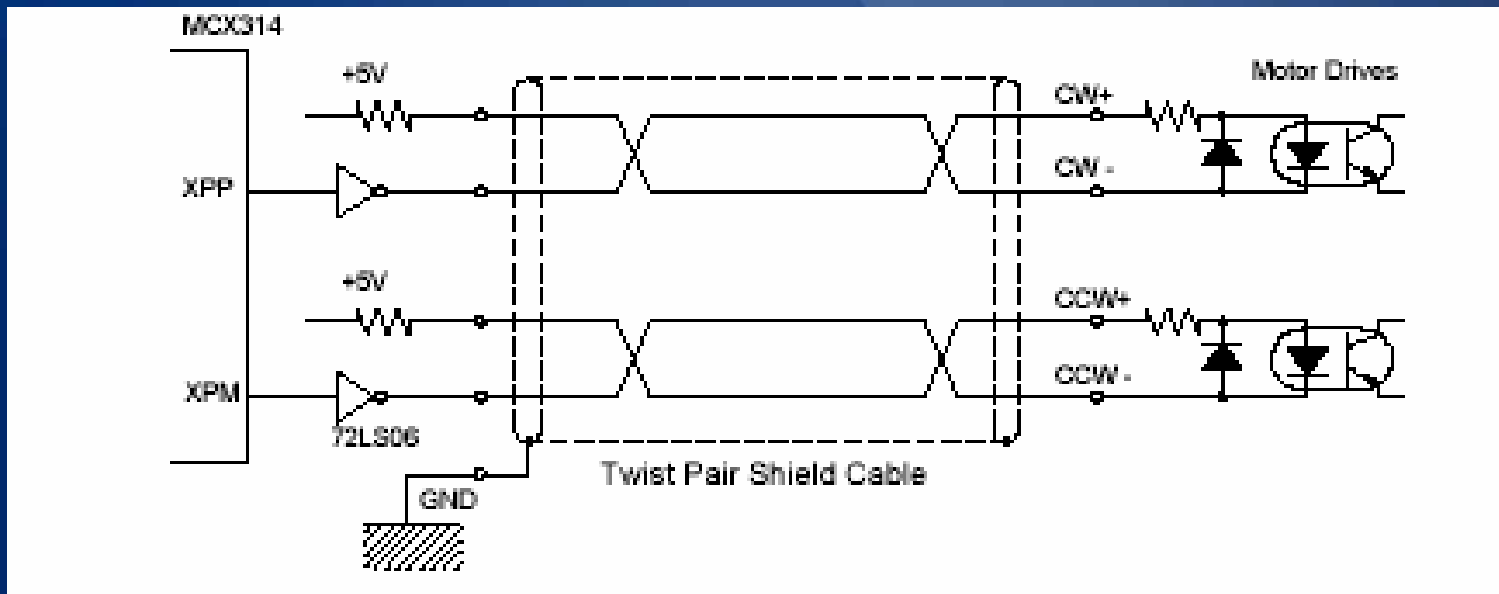
卡片安裝與信號連接

Output to Motor Drivers in Differential Circuit

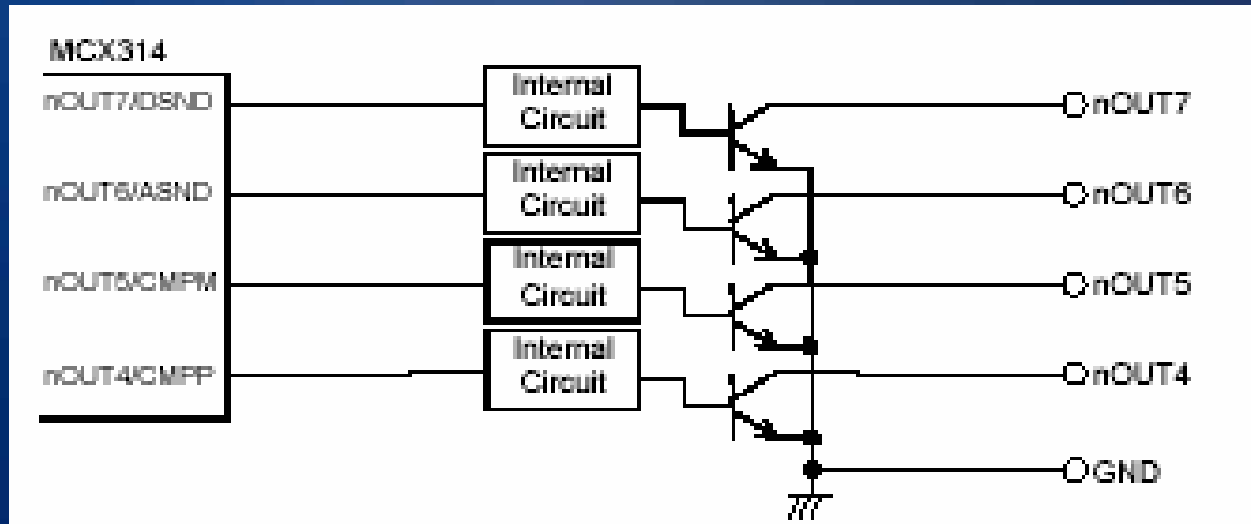


卡片安裝與信號連接

Open Collector TTL Output

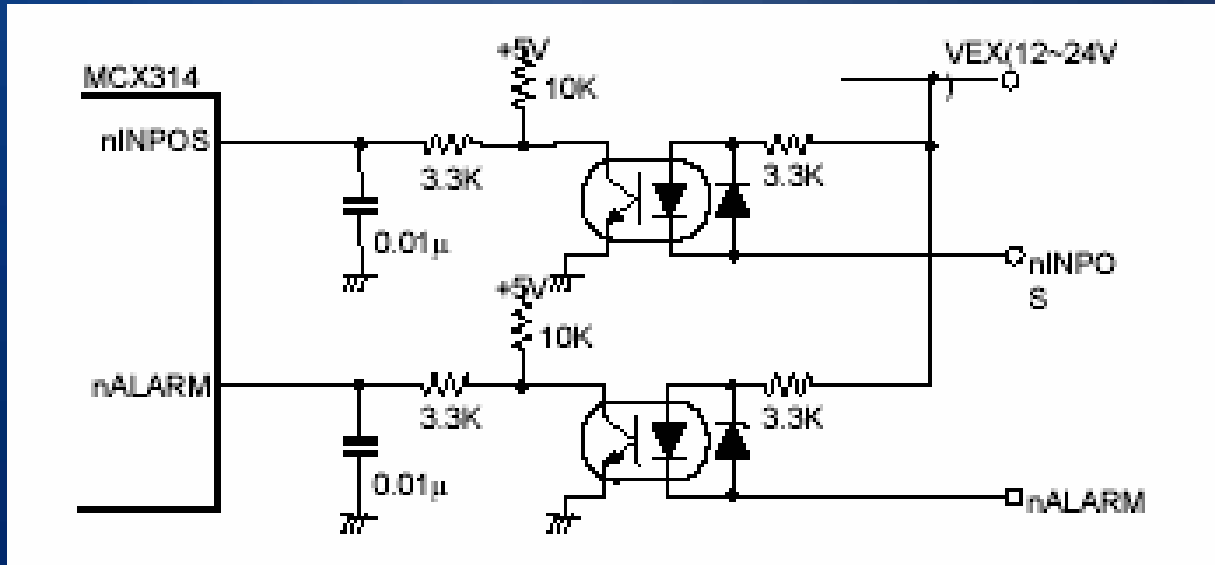


卡片安裝與信號連接



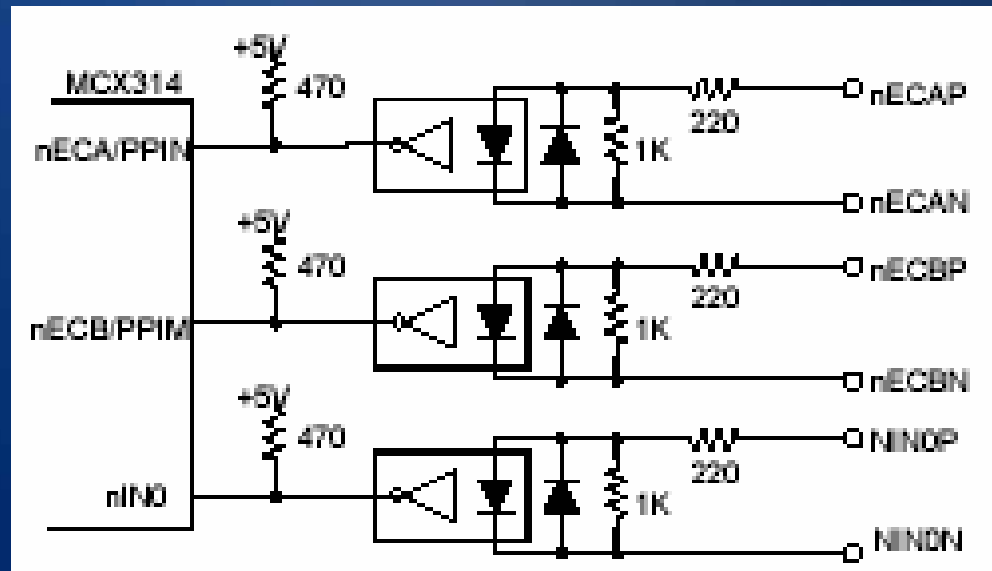
1. each output signal is OFF status after system reset.
2. sink current of each input is 200mA max.
3. Adding a diode is required when the load is a relay.

卡片安裝與信號連接



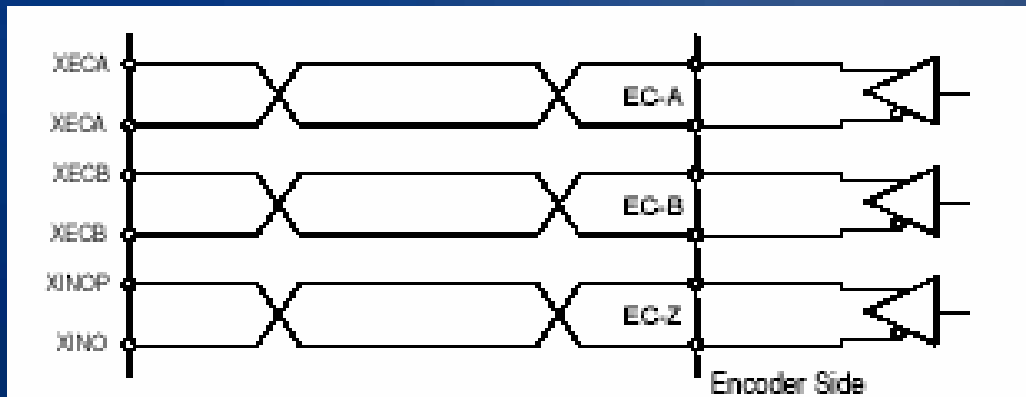
- This signal must be supplied from the external source DC12 ~ 24V.
- The response time of this circuit should take about 0.25 msec because of the delay of photo coupled and RC filter.
- If PCI-1240 is driving pulses output, the output pulses will stop immediately when nALARM active.

卡片安裝與信號連接

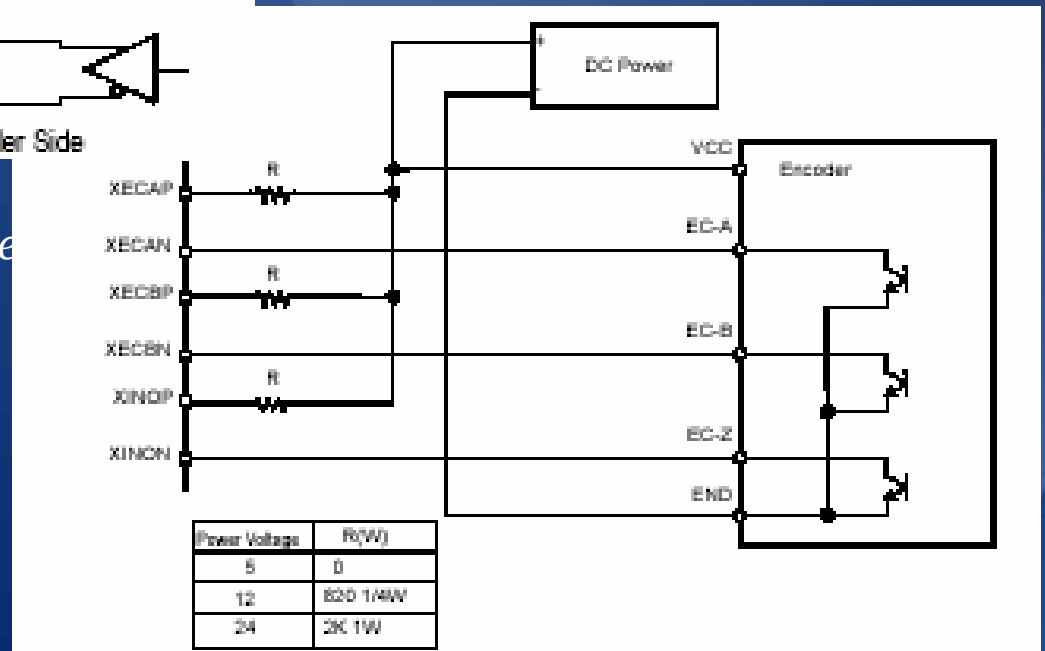


To approach high speed(1MHz) application, the PCI-1240 use high speed photo coupler for isolation.

卡片安裝與信號連接

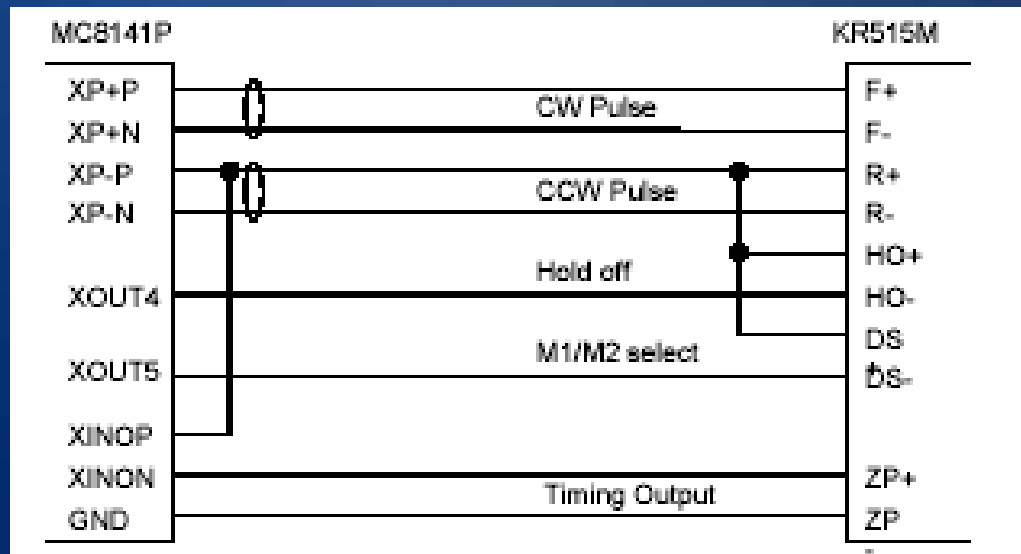


differential-output line drive



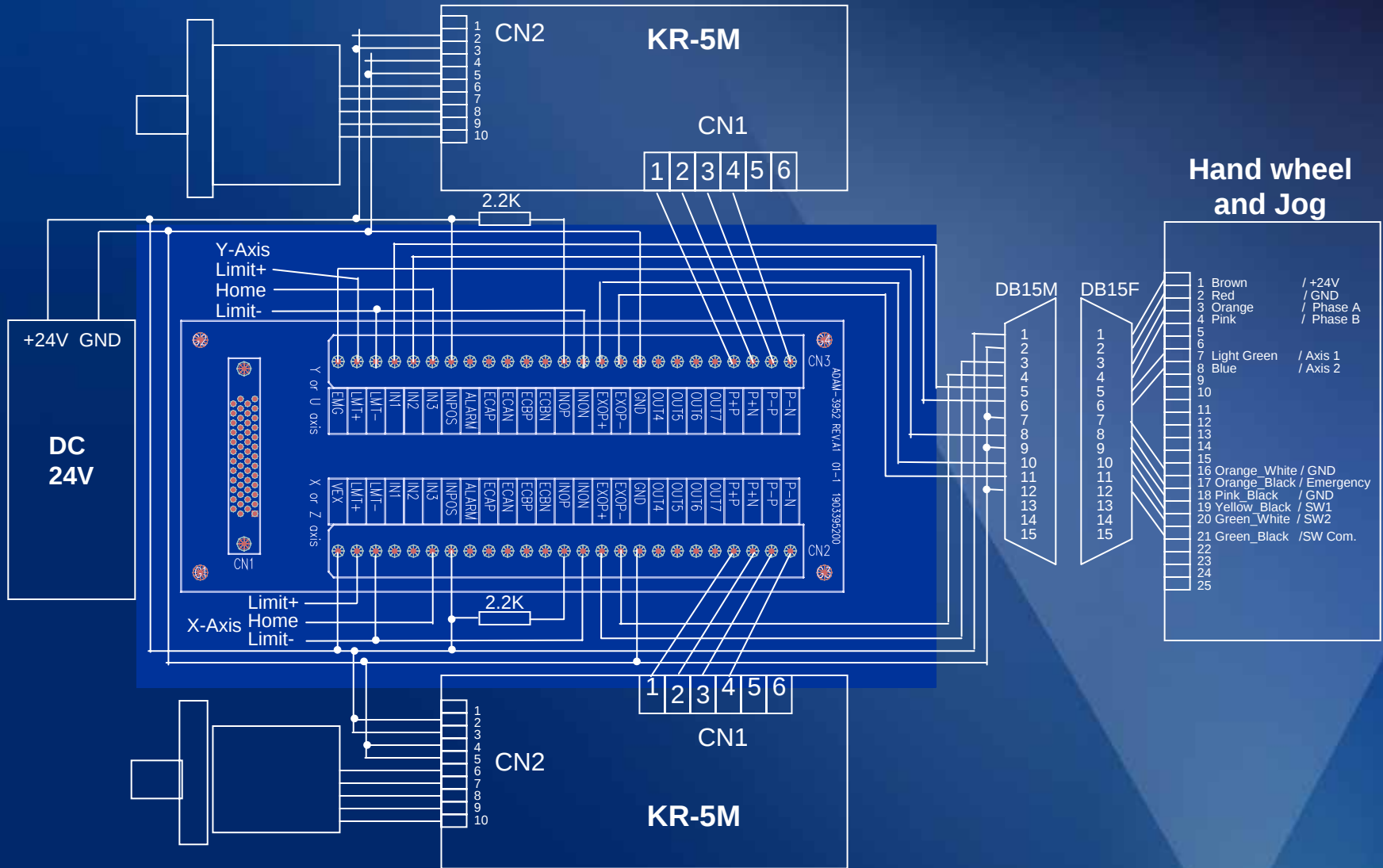
the connection for open collector output encoder

卡片安裝與信號連接

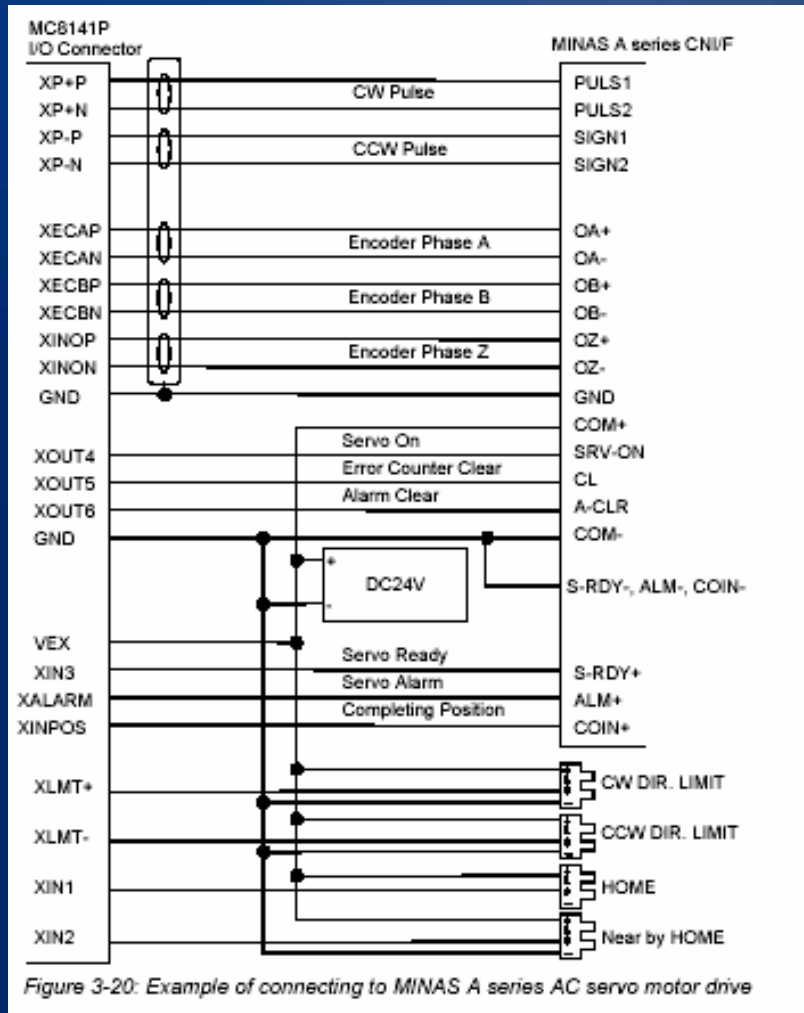


Example of connecting to KR515M drive

卡片安裝與信號支連接



connected to MINAS A series AC servo motor

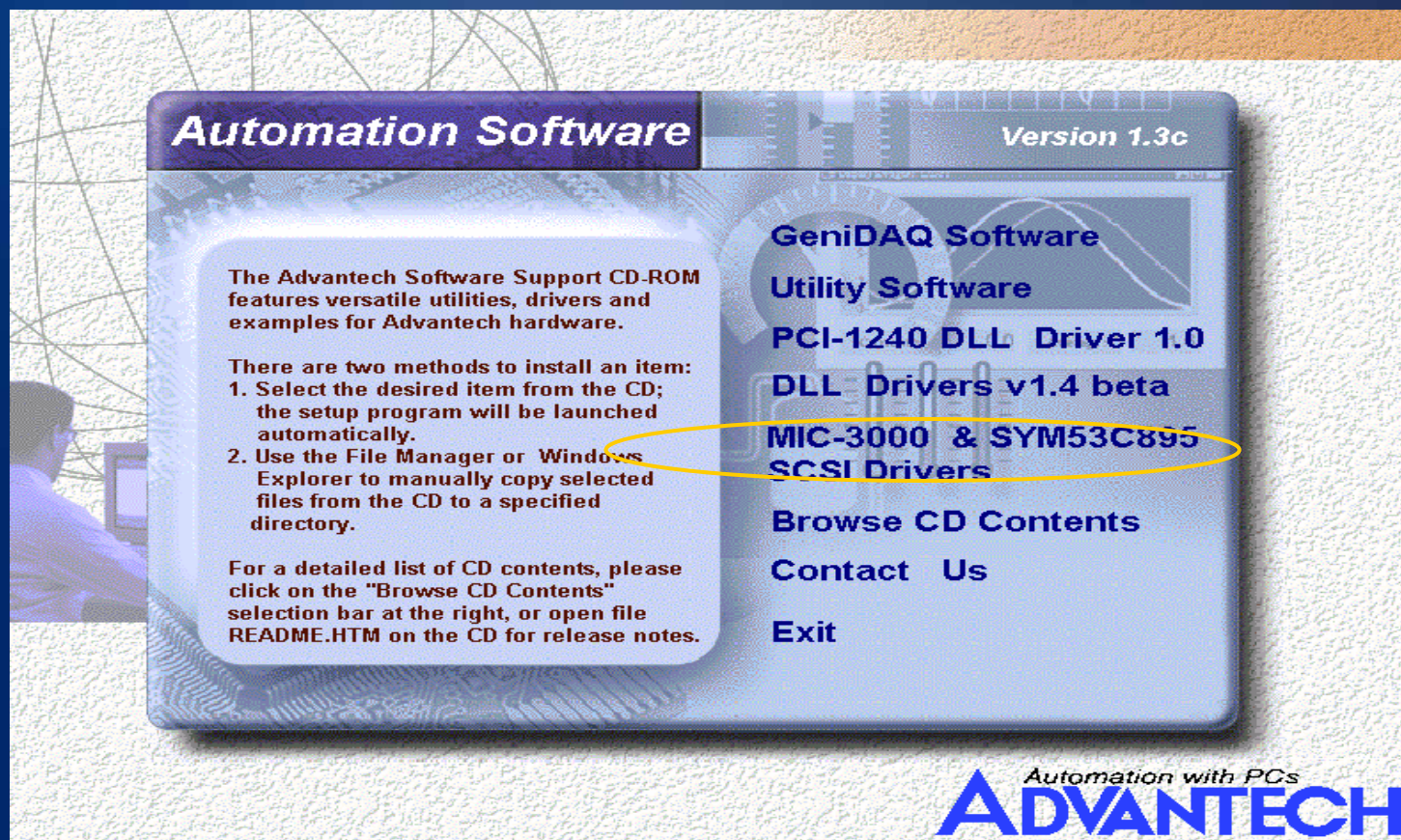


- The servo drive must be set in pulse-control drive mode
- the type of pulse input is CW/CCW mode.

Agenda

- 功能及規格介紹
- 卡片安裝與信號連接
- 驅動程式安裝
- Utility之操作
- DLL Driver介紹
- 範例程式

驅動程式安裝



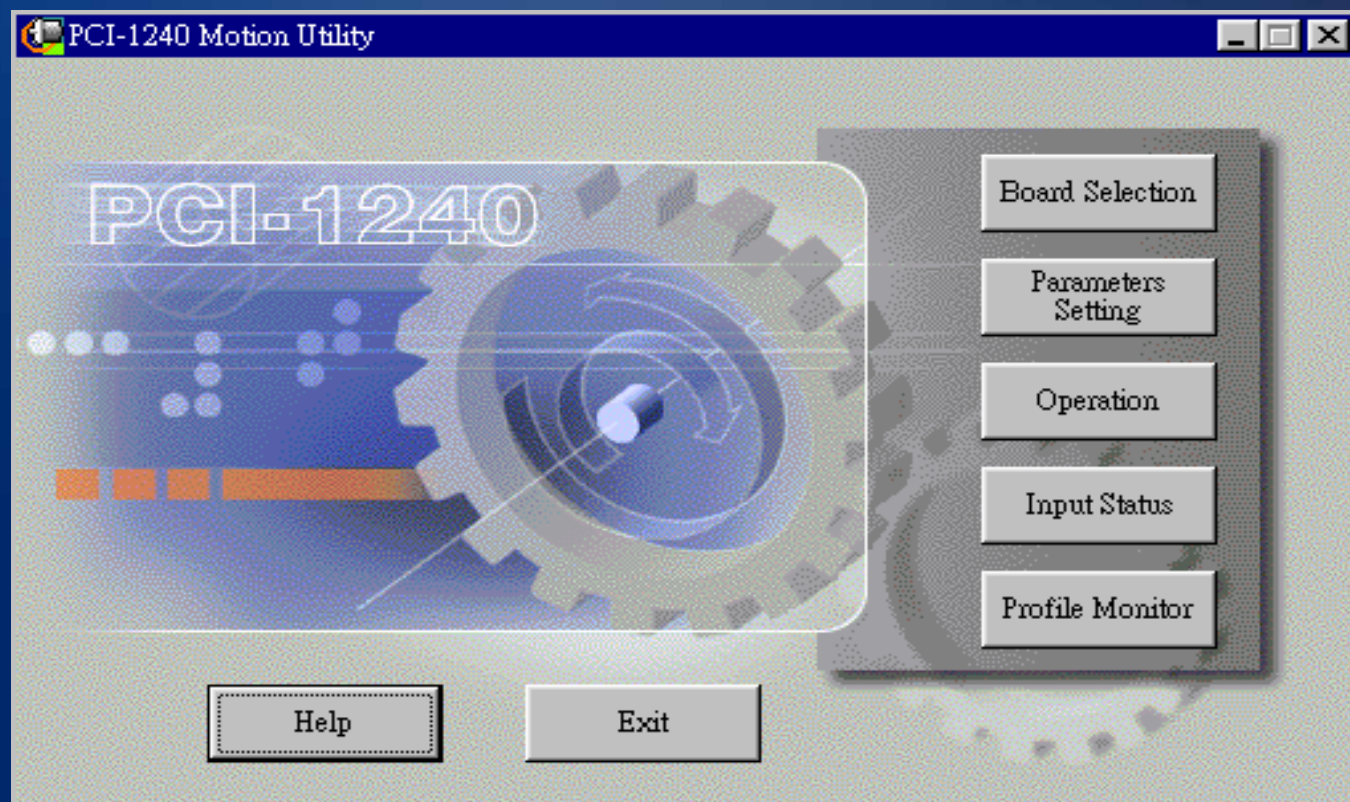
驅動程式安裝

- It has specific driver and is separated from the original DA&C device manager.
- The latest version is V1.10.
- It supports Win98/NT and Win2000 operation system.
- LabVIEW driver is available in our web site for free download.

Agenda

- 功能及規格介紹
- 卡片安裝與信號連接
- 驅動程式安裝
- Utility之操作
- DLL Driver介紹
- 範例程式

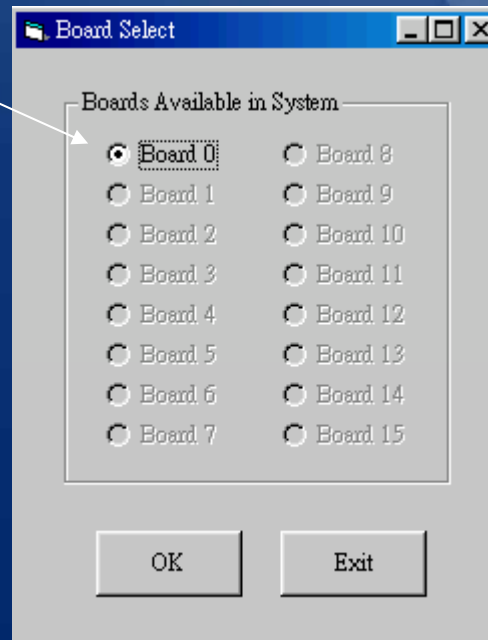
Utility之操作



Utility之操作

Select Board ID

Board ID



- Default is 0.

- Adjust the board ID switches setting when multiple modules will be place in together.

Utility之操作 -- Input Status

Input Status

Input Status

	LMT+	SLMT+	IN1	IN2/H	IN3	SLMT-	LMT-	INO/Z	ALM	INPOS	DRV	ERR	CNST
X	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
Y	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
Z	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
U	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

OUT4 ~ OUT7 Control and Status

	O4 / >=	O5 / <	O6 / AC	O7 / DC	OUT4	OUT5	OUT6	OUT7
X	☒	☒	☒	☒				
Y	☒	☒	☒	☒				
Z	☒	☒	☒	☒				
U	☒	☒	☒	☒				

Drive End Status

	IN	LMT+	LMT-	ALM	EMG
X	☒	☒	☒	☒	☒
Y	☒	☒	☒	☒	☒
Z	☒	☒	☒	☒	☒
U	☒	☒	☒	☒	☒

Position Counter and Compare Register Status

	Real Counter	Logical Counter	Error	COMP+ Reg.	COMP- Reg.
X	0	0	0	10000000	-10000000
Y	0	0	0	10000000	-10000000
Z	0	0	0	10000000	-10000000
U	0	0	0	10000000	-10000000

EMG IN

Edit

Exit

Utility之操作- Parameter Setting

PCI-1240 Motion Parameter setting

Group 1 | Group 2 | Group 3 | Group 4 | Home Parameter

EXOP+/EXOP- Pulse Output Mode

- ☒ CW/CCW pulse output mode
- ☐ Pulse/Direction output mode

EXOP+/EXOP- Pulse Output Level

- ☒ Pulse output active high
- ☐ Pulse output active low

EXOP- Direction Output Level

- ☒ Low for CW, High for CCW
- ☐ Low for CCW, High for CW

Acceleration Mode

- ☒ T curve mode
- ☐ S curve mode

Drive Speed Parameter Rang Reference

Range setting (1 ~ 500) :

Drive speed range (DV) :

Acceleration rang (AC) :

Rate of Acc. range (AK) :

Drive speed Parameter Setting

Initial speed (SV) : PPS

Drive speed (DV) : PPS

Max. drive speed (MDV) : PPS

Acc./Dec. (AC) : PPS/Sec

Rate of acceleration (AK) : PPS/Sec^2

Load Parameter from :

- ☒ Axis X
- ☐ Axis Y
- ☐ Axis Z
- ☐ Axis U

Save Parameter to :

- ☐ Axis X
- ☐ Axis Y
- ☐ Axis Z
- ☐ Axis U

Utility之操作 - Operation

Operation

Operation Axis

☐ X axis ☐ Z axis
☐ Y axis ☐ U axis

Drive Mode

☐ Home
☐ Continue Drive
☒ Point to Point Drive
☐ Line Profile Drive
☐ Arc Profile Drive

Movement Mode

☐ Absolute Mode
☒ Realtime Mode

Stopping Mode

☒ Slowdown Stop
☐ Immediate Stop

Continue and Ptp Drive Parameter Setting

	Drive Speed	End Position	Continue Drive Dir.
X	6000	0	CW
Y	6000	0	CW
Z	6000	0	CW
U	6000	0	CW

Line and Arc Drive Parameter Setting

Line / Arc speed :		Line End :	Arc Center Position :
SV :	1000	X : 6000	C1 : 3000
DV :	3000	Y : 6000	C2 : 3000
AC :	10000	Z : 6000	Arc End Position :
AK :	10000	U : 6000	E1 : 6000
			E2 : 6000

Acceleration Mode

☒ T Curve Mode
☐ S Curve Mode

Arc Direction

☒ CW direction ☐ Angle
☐ CCW direction

External Mode

Mode selected :
Disable

HW Pulses set :
100

Set

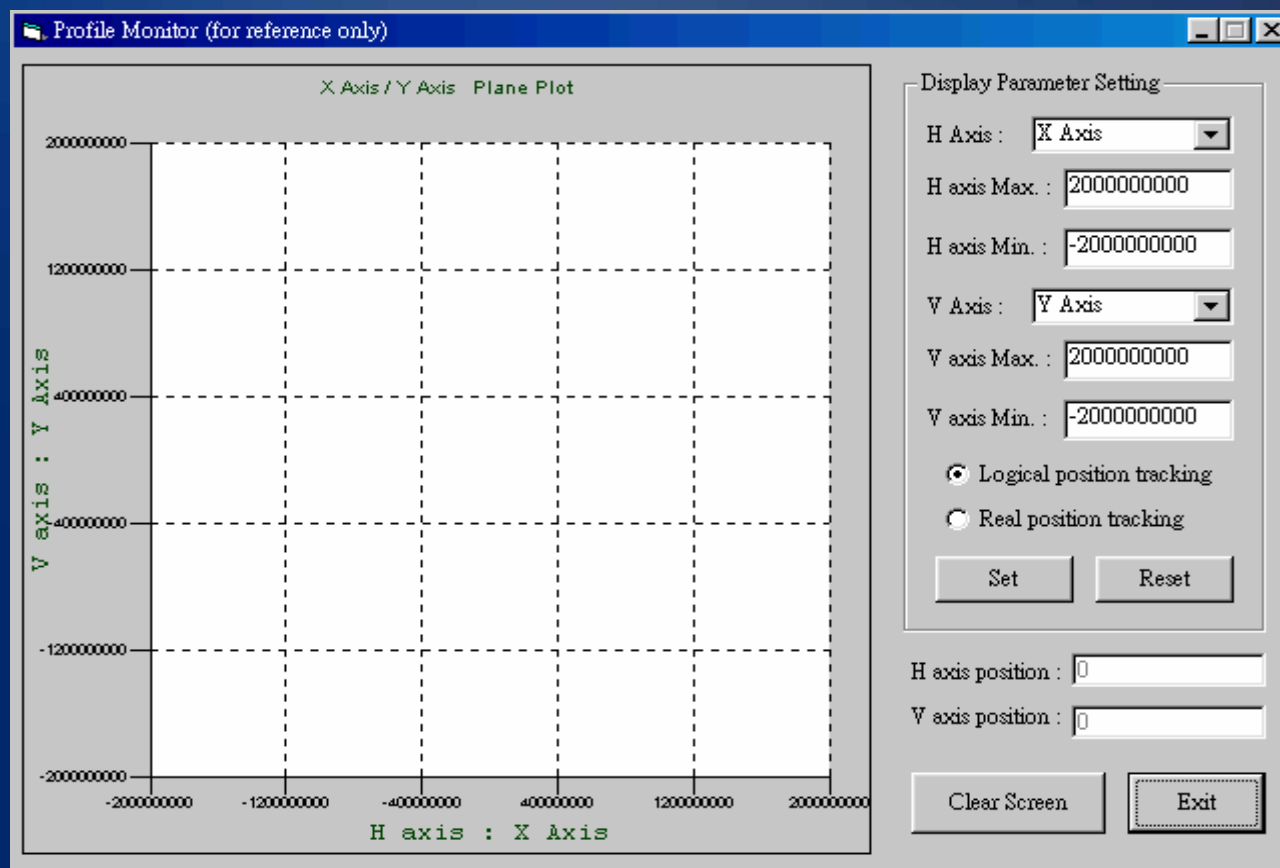
Start

Change DV

Stop

Exit

Utility之操作 – Profile Monitor



Agenda

- 功能及規格介紹
- 卡片安裝與信號連接
- 驅動程式安裝
- Utility之操作
- DLL Driver介紹
- 範例程式

DLL Driver介紹

On Line Help File

P1240Toc - Microsoft Internet Explorer

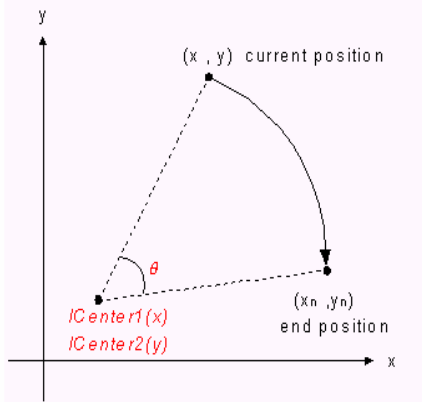
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H) 連結

DLL Function

- [P1240MotArc](#)
- [P1240MotArcTheta](#)
- [P1240MotAxisParaSet](#)
- [P1240MotChgDV](#)
- [P1240MotChgLineArcDV](#)
- [P1240MotCmove](#)
- [P1240MotDevAvailable](#)
- [P1240MotDevClose](#)
- [P1240MotDevOpen](#)
- [P1240MotDI](#)
- [P1240MotDO](#)
- [P1240MotExtMode](#)
- [P1240MotHome](#)
- [P1240MotHomeStatus](#)
- [P1240MotLine](#)
- [P1240MotPtp](#)
- [P1240MotRdMutiReg](#)
- [P1240MotRdReg](#)
- [P1240MotSavePara](#)
- [P1240MotStop](#)
- [P1240MotBusy](#)
- [P1240MotWrMutiReg](#)
- [P1240MotWrReg](#)
- [P1240MotReset](#)
- [P1240InitialContiBuf](#)
- [P1240FreeContiBuf](#)

P1240MotArcTheta

Function description: Move from current position to new position via arc interpolation.



Syntax

```
LRESULT P1240MotArcTheta(  
    BYTE    byBoardID    // Board ID number  
    BYTE    byMoveAxis    // Assign the operation axis, bit assignment  
    BYTE    byRA           // Assign movement operation is relative or absolute  
                        coordinate, bit assignment  
    BYTE    byMoveDirection // Assign the movement direction  
    LONG    ICenter1       // Center position for first axis  
    LONG    ICenter2       // Center position for second axis  
    ...  
)
```

Agenda

- 功能及規格介紹
- 卡片安裝與信號連接
- 驅動程式安裝
- Utility之操作
- DLL Driver介紹
- 範例程式

範例程式

- **Visual C++**
Console mode, MFC mode
- **Visual Basic**
- **BC++ Builder**
Console mode, VCL mode

範例程式- Console Mode

- P1240Arc - Demo program for X & Y-Axis arc interpolation function with
center/end position parameter.
- P1240ArcTheta - Demo program for X & Y-Axis arc interpolation function
with center/angle parameter.
- P1240Cmove - Demo program for X-Axis continuous moving function.
- P1240ContiDrive - Demo program for X & Y-Axis continuous interpolation
function.
- P1240DI - Demo program for X-Axis digital input function.
- P1240DO - Demo program for X-Axis digital output function.
- P1240Ext - Demo program for X-Axis external mode (jog,handwheel).
- P1240Home - Demo program for return home function.
- P1240Irq - Demo program for checking event function.
- P1240Line - Demo program for X & Y-Axis linear interpolation function.
- P1240Ptp - Demo program for XYZU-Axis point to point function.

範例程式– Visual Basic

- **BasicDrive** - Demo program for PCI-1240 basic motion control functions including 2-Axis linear/arc interpolation, continuous moving and point to point function.
- **ContiDrive** - Demo program for PCI-1240 continuous interpolation function combined with 2/3-Axis linear interpolation and 2-Axis arc interpolation.

PCI-1240 Applications

Dispensing Machine

Control: PC

PCI-1240 x 1

Drive:

Orient *3



Practice

- **Use VC/VB to create a simple program of PCI-1240.**
- **Function : Move CW / CCW direction and Stop**

Thank You

Web Site : <http://www.advantech.com.tw>

台北 : 0800-557799

台中 : (04)378-6250

高雄 : (07)229-3600