WPC-MCX-H-Motion
4 axis motion controller

WPC Systems Ltd.

Justin Wu

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產品介紹(1/2)

- WPC-MCX-H-Motion 是一款高效能 4 軸軸卡，專門為了 LabVIEW 開發者所設計。設計概念源自於 NI 7390、NI 7354 這兩款軸卡（已於2019年停產），同時具備上述這兩款軸卡的優點於一身。
- 8M pulse/sec 的高速脈波輸出能力可應用於高精度平台的定位控制。10MHz 的 Encoder 讀取速度也可在高精度應用之下避免讀取失步。
- 所有的輸出入前端電路（front-end）皆為對地光隔離介面，可以保護上層控制器（GECO、STEM、USB）免於工業環境的危害（雷擊、靜電…等）。

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產品介紹(2/2)

- 對於移動穩定度有要求的應用使用者可以開啟 S 曲線、Jerk 設定功能避免過大的移載震動。
- 直線、圓弧、螺旋補間功能則可滿足於廣大工具機、加工設備的應用。
- LabVIEW driver API 設計則承襲了 NI Motion 的設計概念，是市面上最接近 NI 軸卡的運動控制替代方案。

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Specification (1/2)

Pulse command output	Axis count	4 axis
	Control type	Open loop or P-command
	Control mode	Absolute, relative, velocity modes
	Signal type	RS-422 or Line-driver output
	Step output mode	Step/direction or CW/CCW
	Maximum pulse rate	8MHz
	Voltage range	0 to 5V optical isolated
	Active state	Programmable, active high or active low
	Trajectory function	S-curve, position blending, velocity blending
	Contouring function	2D, 3D contouring
	Interpolation function	Linear, circular, helical interpolation
Encoder input	Sensor type	Quadrature encoder input (A,B, Z)
	Signal type	Differential (RS-422 compatible)
	Maximum count rate	10MHz
	Voltage range	0 - 5V optical isolated
Limit switch input	Sensor type	Forwared, Reverse, Home
	Number of inputs	12 (3 per axis)
	Signal type	Sinking or sourcing (configured by 0R resistors on the top of breakout board)
	Voltage level	24V
	Active state	Programmable, active high or active low

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Specification (2/2)

Servo on output	Output type	Open-collector output, NPN or PNP
	Number of outputs	4 (1 per axis)
	Signal type	Sinking or sourcing (configured by 0R resistors on the top of breakout board)
	Voltage level	24V
	Current range	400mA maximum
	Active state	Programmable, active high or active low
Alarm clear output	Output type	Open-collector output, NPN or PNP
	Number of outputs	4 (1 per axis)
	Signal type	Sinking or sourcing (configured by 0R resistors on the top of breakout board)
	Voltage level	24V
	Current range	400mA maximum
	Active state	Programmable, active high or active low
Break-point output (position compare)	Signal type	TTL output
	Number of inputs	4 (1 per axis)
	Signal type	Single-ended
	Maximum count rate	1MHz
	Voltage range	0 - 5V optical isolated
Capture input (position trigger)	Signal type	TTL input
	Number of inputs	4 (1 per axis)
	Signal type	Single-ended
	Maximum count rate	1MHz
	Voltage range	0 - 5V optical isolated

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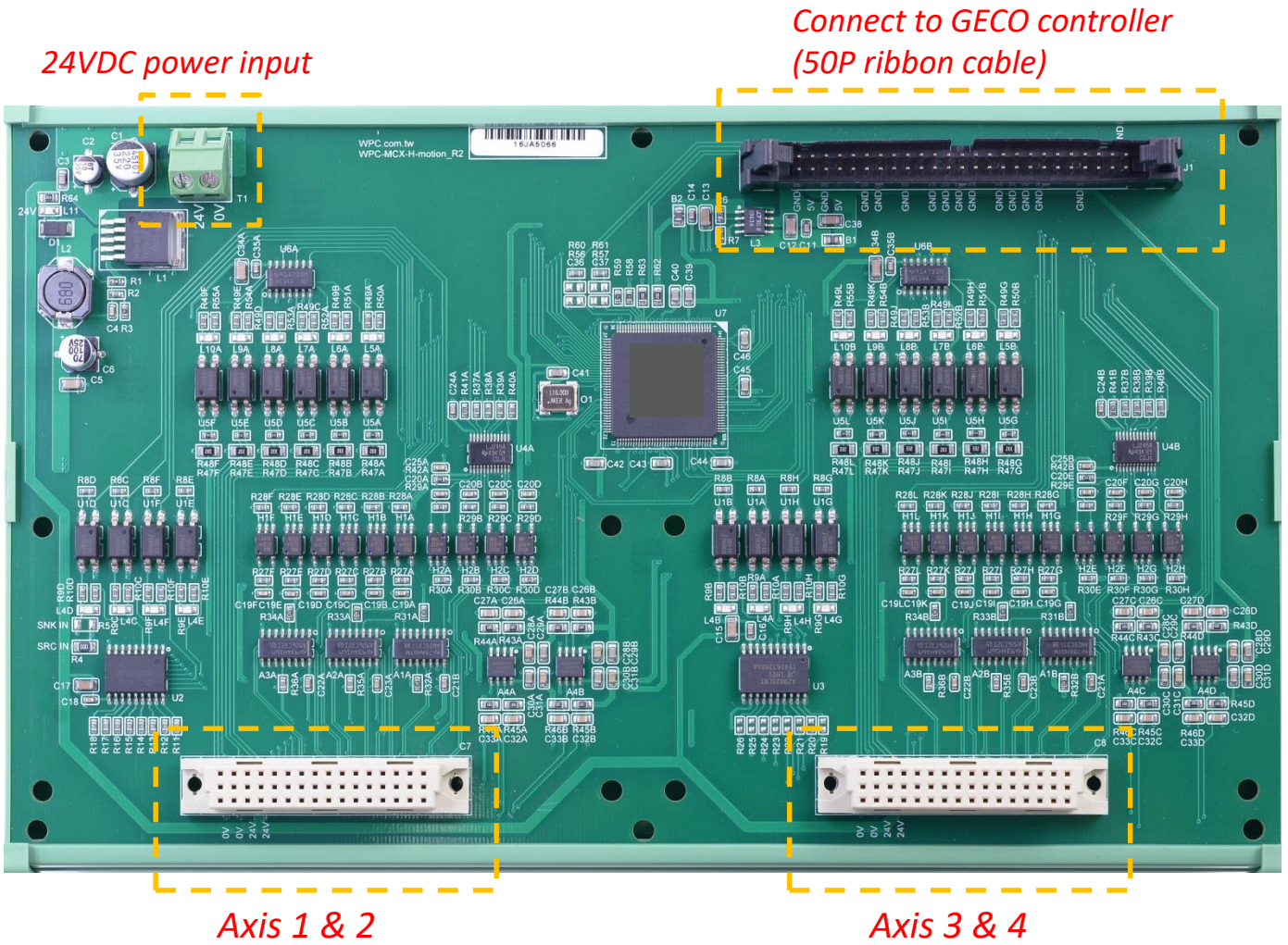
Module appearance (1/3)



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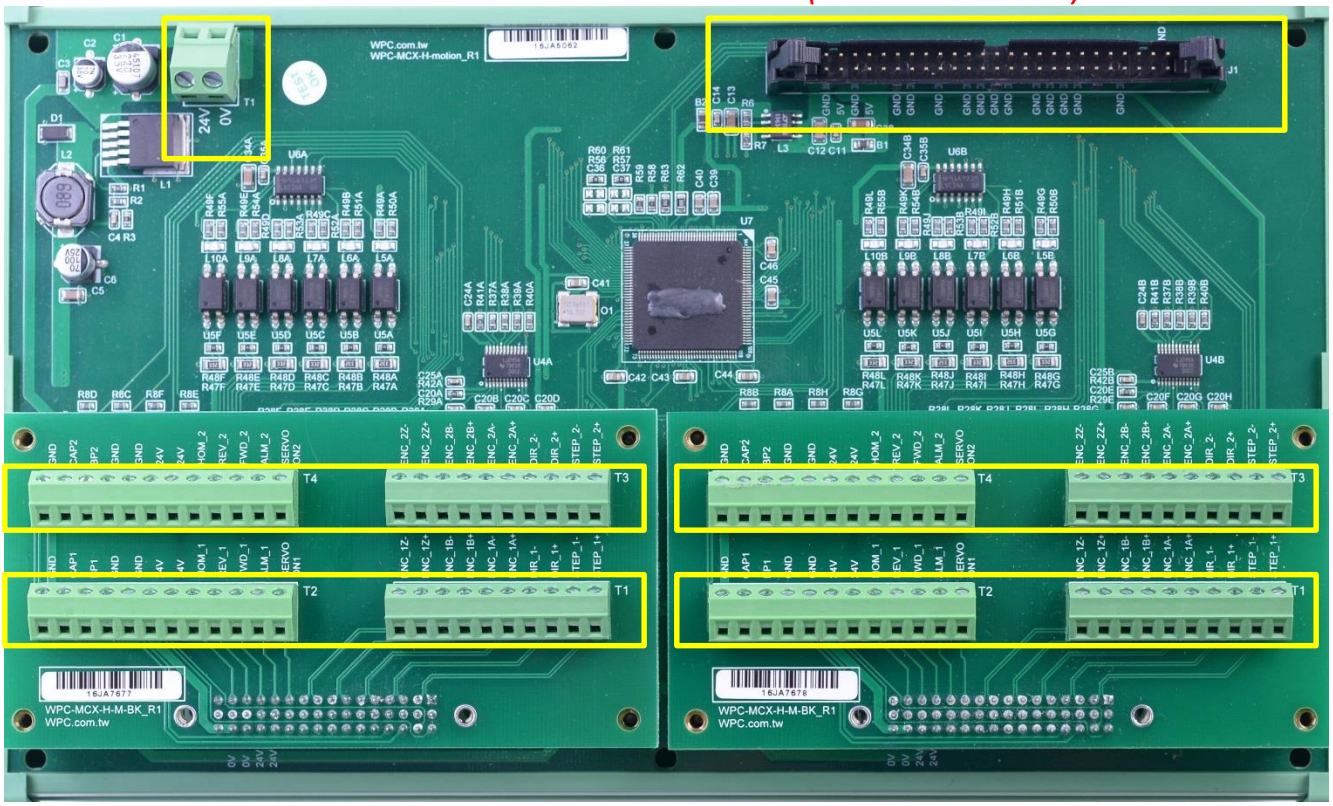
Module appearance (2/3)

*24VDC power input (*required)*

Connect to controller (50P ribbon cable)



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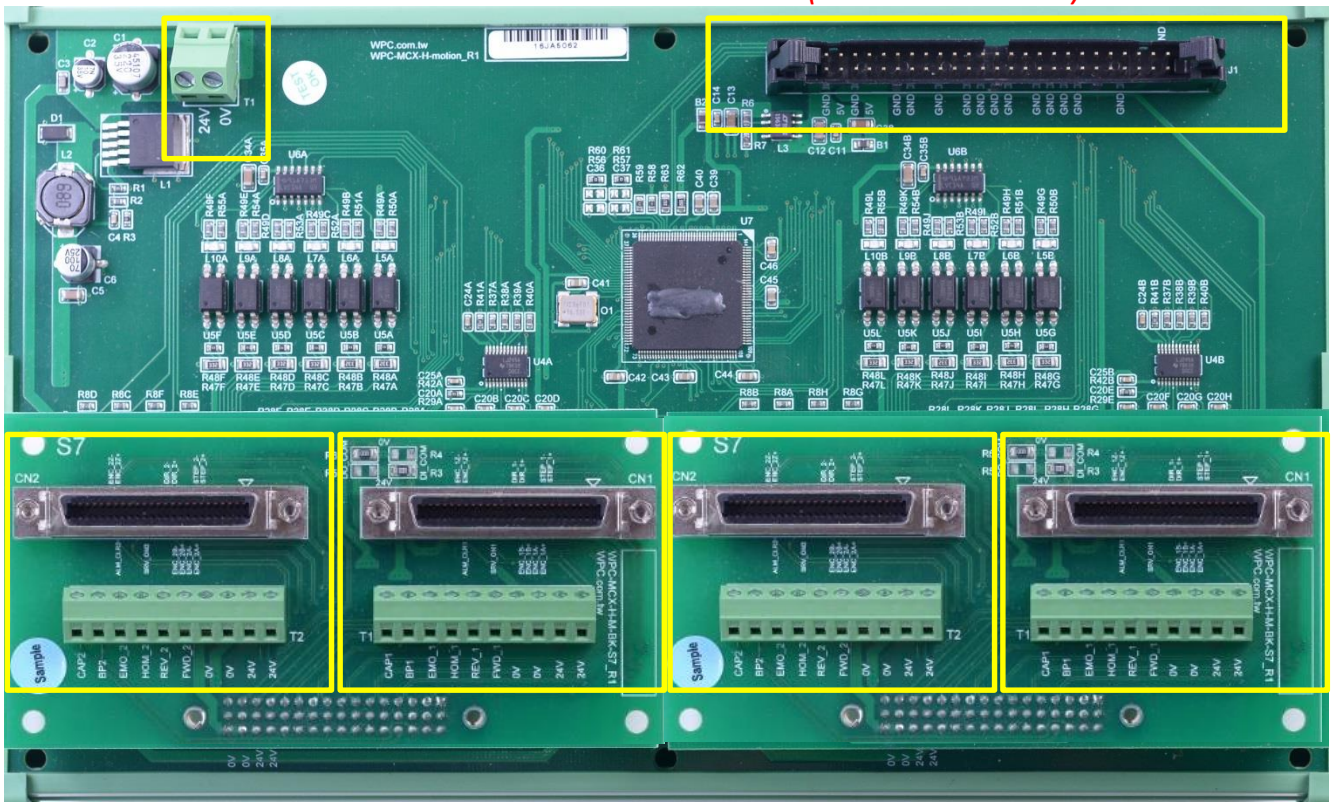
Module appearance (3/3)

*24VDC power input (*required)*

Connect to controller (50P ribbon cable)



Axis 2 *Axis 1* *Axis 4* *Axis 3*

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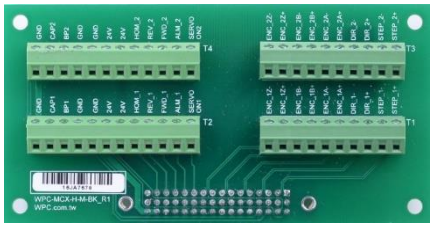
外觀說明

- WPC-MCX-H-Motion 使用時需要外部供電24VDC（左上）。
- IDC 50P 牛角連接器（黑色）用來連接 GECO、STEM 等控制器。
- 下方兩個 DIN41612 48P連接器（白色）會用來連接模組化端子台。左下方(C7)用來控制軸 1 與軸 2，右下方(C8)用來連接到軸 3 及軸 4。
- 模組化端子台目前支援 1 種通用端子台及 4 種台灣常見品牌專用端子台：
  1. 通用端子台
     - 任何支援脈波列輸入之伺服／步進馬達
     - 東方步進馬達（限脈波列輸入）
  2. 專用端子台(簡易配線端子台)
     - Delta ASDA-B2/A2 台達電
     - Yaskawa SigmaV/Sigma7 安川電機
     - Panasonic Minas A4/A5/A6 國際
     - Mitsubishi MR-J4/JE 三菱
     - Mitsubishi MR-J2S 三菱

1.



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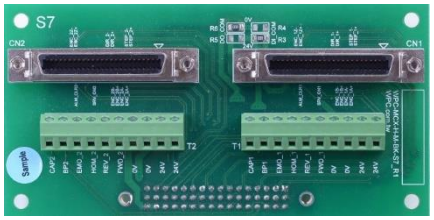

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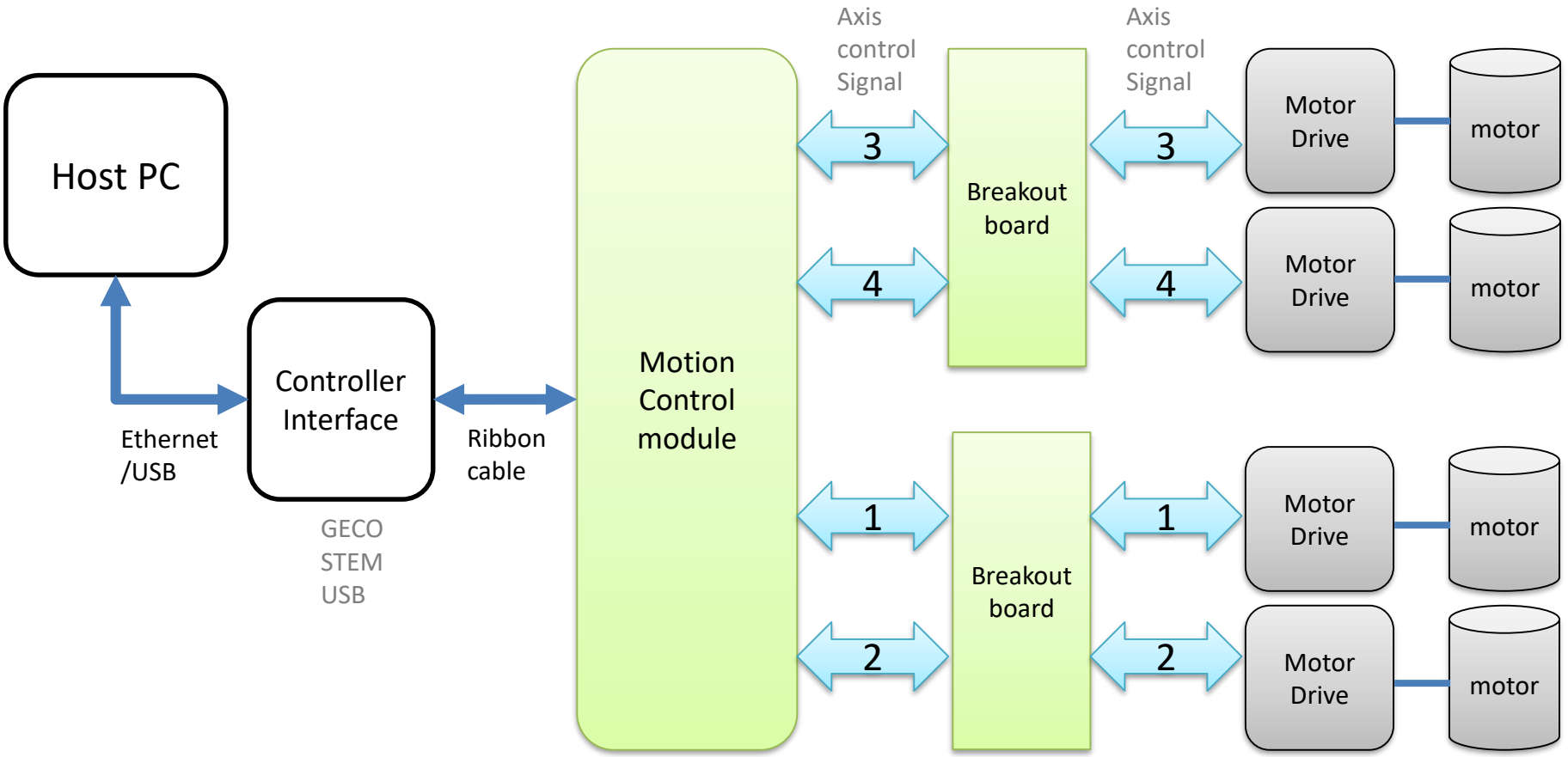
Signal connection block diagram



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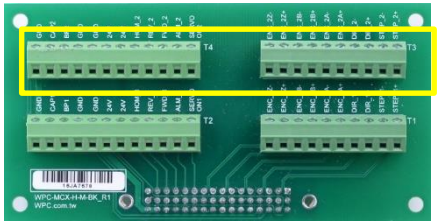
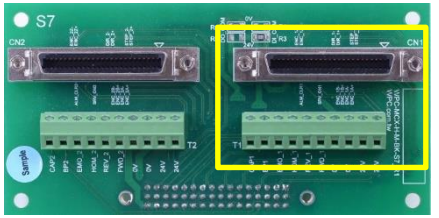
Axis control signal description

Name	Level	Type	Dir.	Description
Step+	5V	Differential	Out	Step /Pulse /CW output signal
Step-	5V	Differential	Out	Step /Pulse /CW output signal
Dir+	5V	Differential	Out	Direction / CCW output signal
Dir-	5V	Differential	Out	Direction / CCW output signal
Enc_A+	5V	Differential	In	Encoder Phase A+
Enc_A-	5V	Differential	In	Encoder Phase A-
Enc_B+	5V	Differential	In	Encoder Phase B+
Enc_B-	5V	Differential	In	Encoder Phase B-
Enc_Z+	5V	Differential	In	Encoder Phase Z+
Enc_Z-	5V	Differential	In	Encoder Phase Z-





Name	Level	Type	Dir.	Description
Servo on	24V	Open-collector	Out	Servo on output signal / inhibit out
ALM	24V	Open-collector	Out	Alarm clear output signal
FWD	24V	Optocoupler	In	Forward limit switch input signal
REV	24V	Optocoupler	In	Reverse limit switch input signal
HOM	24V	Optocoupler	In	Home limit switch input signal
24V		Power	Out	Power output for limit switch
24V		Power	Out	Power output for limit switch
GND		Power	Out/Ref	Power output for limit switch /Signal reference
GND		Power	Out/Ref	Power output for limit switch /Signal reference
BP	5V	Single-ended	Out	Break-point output signal
CAP	5V	Single-ended	In	Capture input signal
GND		Power	Out/Ref	Signal reference for BP / CAP

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Controller / Interface Selection guide

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System diagram

遙控/獨立運行

GECO Uno

LabVIEW

遙控

GECO STEM

LabVIEW

遙控

USB cable

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Controller performance comparison

GECO 控制器	主要由 NI sbRIO 所構成的控制器，內建 32-bit 微處理器以及 FPGA 晶片，分別透過 LabVIEW Real-time module 以及 LabVIEW FPGA module 進行開發。
	可透過 Ethernet 介面完全使用 LabVIEW 進行開發、佈署。
	可以透過 PC 遙控或者完全獨立運行（stand-alone）
	上方有 4 個插槽，可用於擴充 GECO 模組。
	有四個插槽可以支援各式 GECO 模組。一台控制器最高可以同時支援 4 張 WPC-MCX-H-motion 軸控卡，最多可同時控制 16 軸。
	支援 Single breakpoint, Periodic breakpoint, Single capture
	支援 8 點以上的 contouring
	支援 on-fly measurement 功能
STEM 控制器	主要由 32-bit 微處理器所構成的控制器，使用 100M Ethernet 進行遠端控制。
	上方有 4 個插槽，其中 3 個插槽可以支援 WPC-MCX-H-Motion 軸控卡或 24ch AIO 模組，每台最高可以一次控制 12 軸。 剩下 1 個插槽僅能用來擴充數位 DIO 模組。
	支援 Single breakpoint, Periodic breakpoint, Single capture
	支援 8 點以下的 contouring
USB 控制器	低價位運動控制方案
	僅能支援 1 張 WPC-MCX-H-Motion 軸控卡，最高可一次控制 4 軸。
	支援 Single breakpoint, Periodic breakpoint, Single capture
	支援 8 點以下的 contouring

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Advance feature comparison

	GECO	STEM	USB
Single breakpoint	◯	◯	◯
Multiple breakpoint (Periodic)	◯	◯	◯
Multiple breakpoint (Arbitrary Array)	X	X	X
Single capture	◯	◯	◯
Multiple capture (Array)	X	X	X
Contouring (<= 8 points)	◯	◯	◯
Contouring (> 8 points)	◯	X	X
On-fly measurement (Sync with AI)	◯	X	X

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Controller operating comparison

- GECO
  - 使用 LabVIEW PC/RT /FPGA 進行開發、佈署。
  - 可以不開發 RT 直接透過 Host PC 以Ethernet 介面進行遙控。
  - 可獨立運作（stand-alone）
- STEM
  - 使用 LabVIEW PC 透過 Ethernet 進行遙控。
  - 不可獨立運行。
  - 可擴充模組
- USB
  - 透過 USB 介面進行控制。
  - 不可獨立運行
  - 不可擴充其他模組

	GECO Uno	STEM	USB
PC Remote	●	●	●
Stand-alone	●		
Multi-motion module	●	●	

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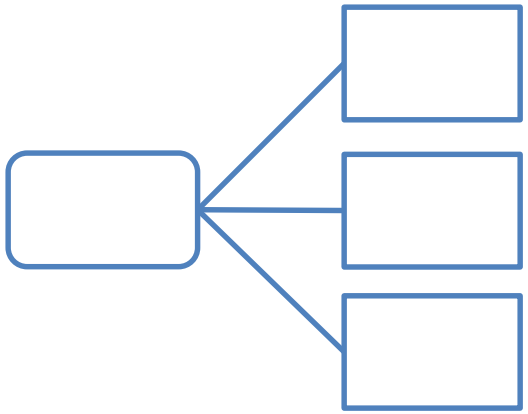
Multi-module support guide



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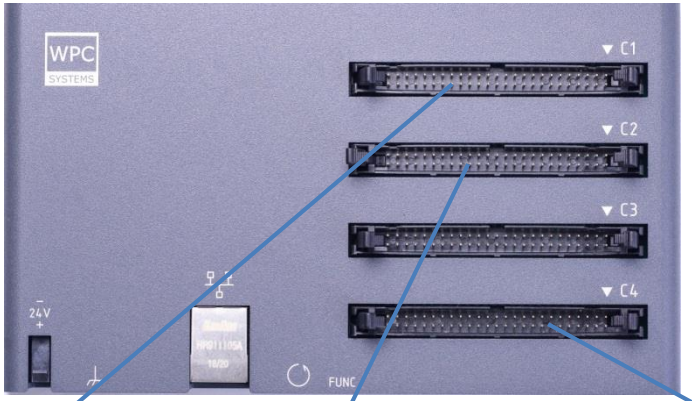
STEM controller

STEM 控制器



STEM 控制器的 C3
不支援軸控模組

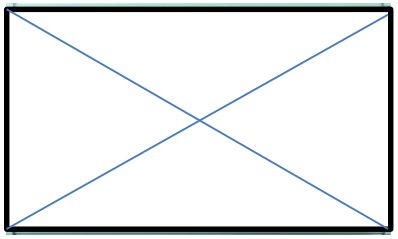
C1

WPC-MCX-H-motion 軸控模組

C2

WPC-MCX-H-motion 軸控模組

C3



C4

WPC-MCX-H-motion 軸控模組

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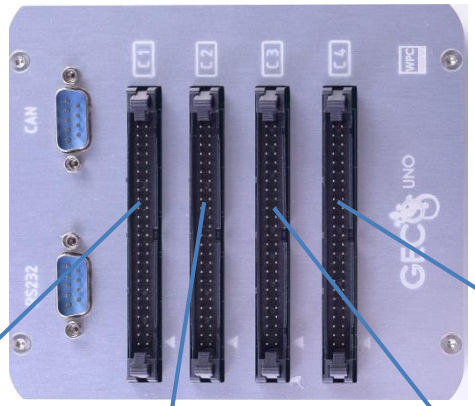
GECO controller



GECO UNO DB9 控制器

C1

WPC-MCX-H-motion 軸控模組

C2

WPC-MCX-H-motion 軸控模組

C3

WPC-MCX-H-motion 軸控模組

C4

WPC-MCX-H-motion 軸控模組

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USB interface

USB 控制器

16pin IDC connector

WPC-MCX-H-motion 軸控模組

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安裝與配線

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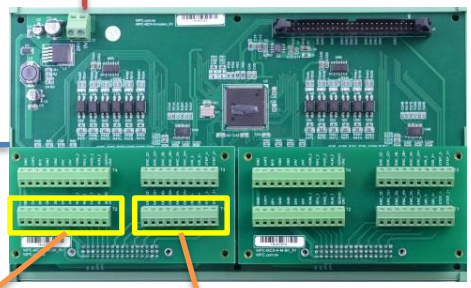
System diagram (GECO)

24V power supply

Ethernet cable

Ribbon cable



遙控/獨立運行

Host PC / Laptop

開發環境/遙控

Forward/Reverse/Home
limit switches

Stepper Motors / drives
Servo Motors / drives

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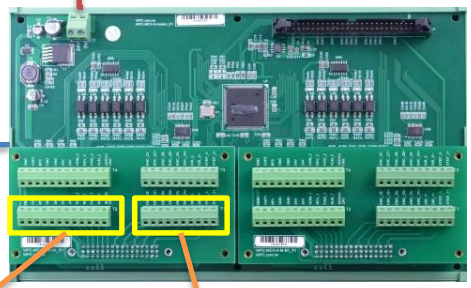
System diagram (STEM)

24V power supply

Ethernet cable

遙控

Ribbon cable



Host PC / Laptop

Forward/Reverse/Home
limit switches

Stepper Motors / drives
Servo Motors / drives

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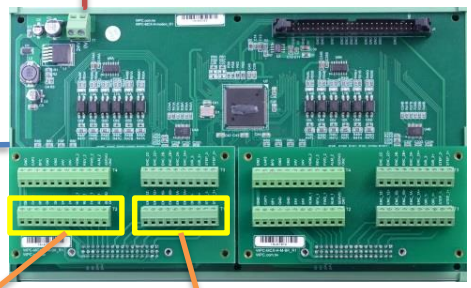
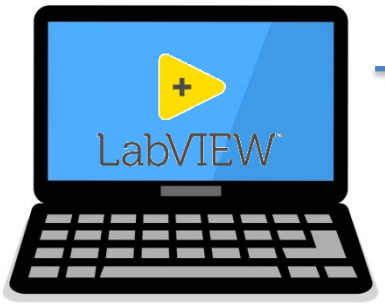
System diagram (USB)

USB cable

遙控

Ribbon cable





Host PC / Laptop

Forward/Reverse/Home
limit switches

Stepper Motors / drives
Servo Motors / drives

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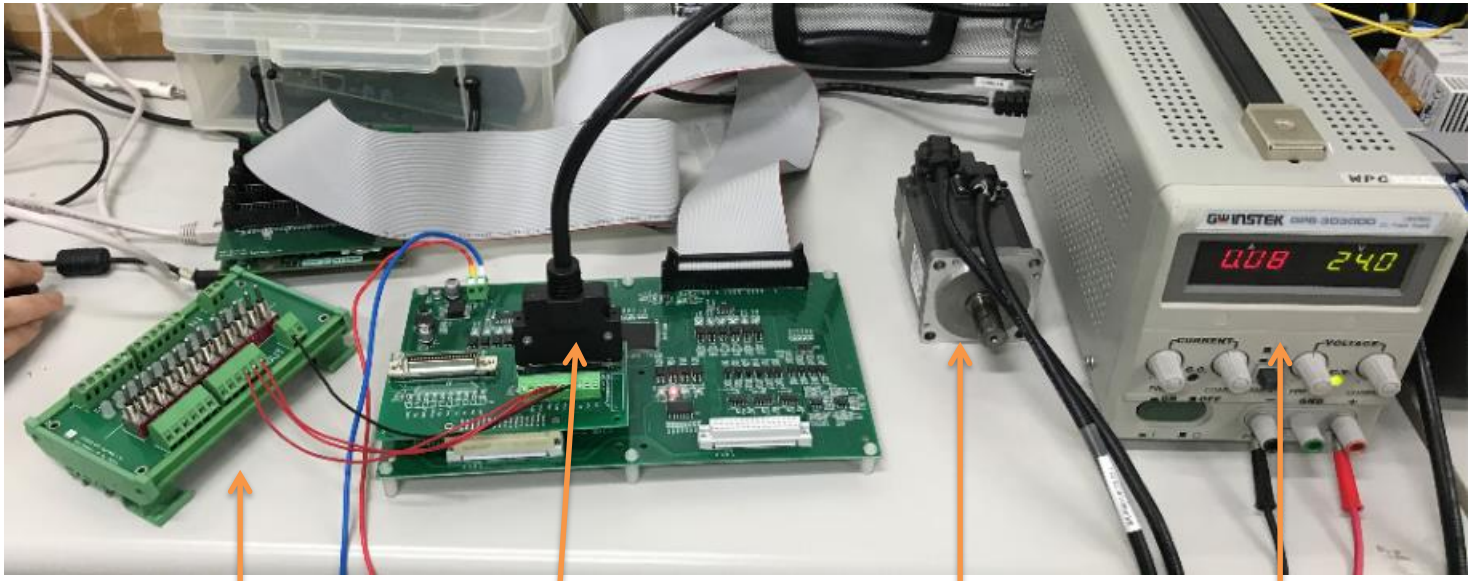
Connection example for MR-J4A servo motor



SCSI-50P MR-J4 servo drive (CN1)

Limit switch simulator

Servo motor

24V power supply

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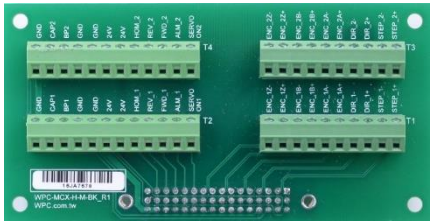
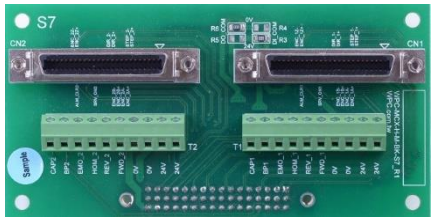
轉接子板說明

1. 通用接線端子台
2. 簡易配線端子台

1. 

2. 

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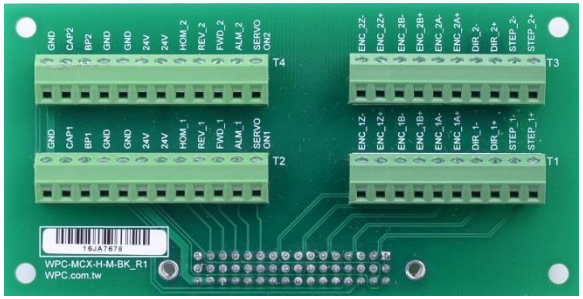
通用接線端子台
(General purpose breakout)

可適用一般常見的步進馬達、伺服馬達



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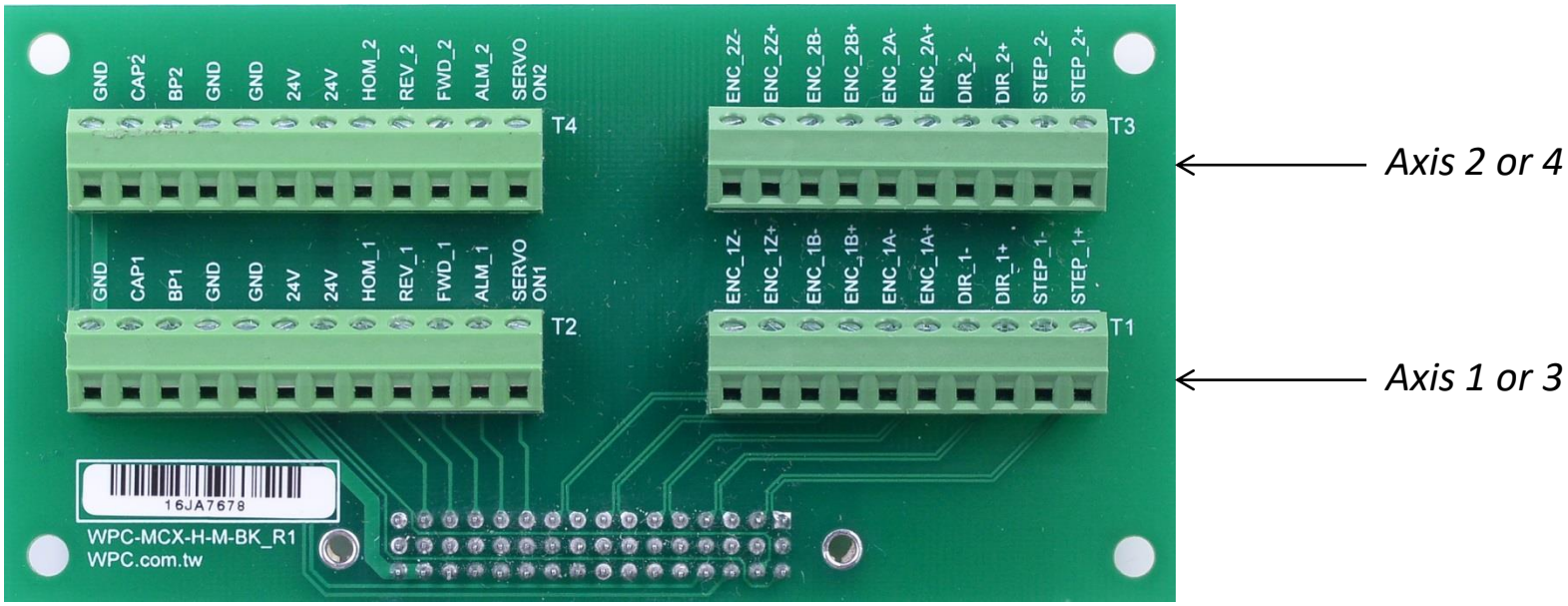
General-purpose breakout board

(Sinking output configuration only)



For more detail about pin description, please refer to next page.

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通用端子台說明

- 可適用一般常見的步進馬達、伺服馬達
- 下排歐規端子連接器(T1, T2) 可用來控制第 1 軸或第 3 軸。
- 上排歐規端子連接器(T3, T4) 可以用來控制第 2 軸或第 4 軸。
- 端子(T1, T3) 為高速差動輸出(differential output)及輸入(differential input)。
- 端子(T2, T4) 前半段Servo-on, alarm clear, limit switches 為開集極輸出入(open-collector)，中間為 24V 對外供電，後半段capture, breakpoint為 5V TTL。
- 所有的 GND 共通、相連，可做為差動輸出入的參考。

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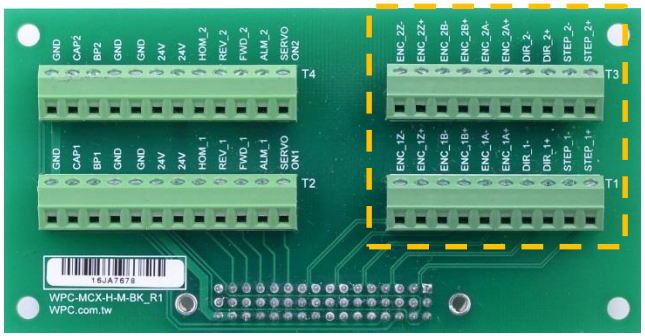
Pin description (1/2)

Conn.	Pin#	Name	Level	Type	Dir.	Description
T1/T3	1	Step+	5V	Differential	Out	Step /Pulse /CW output signal
	2	Step-	5V	Differential	Out	Step /Pulse /CW output signal
	3	Dir+	5V	Differential	Out	Direction / CCW output signal
	4	Dir-	5V	Differential	Out	Direction / CCW output signal
	5	Enc_A+	5V	Differential	In	Encoder Phase A+
	6	Enc_A-	5V	Differential	In	Encoder Phase A-
	7	Enc_B+	5V	Differential	In	Encoder Phase B+
	8	Enc_B-	5V	Differential	In	Encoder Phase B-
	9	Enc_Z+	5V	Differential	In	Encoder Phase Z+
	10	Enc_Z-	5V	Differential	In	Encoder Phase Z-



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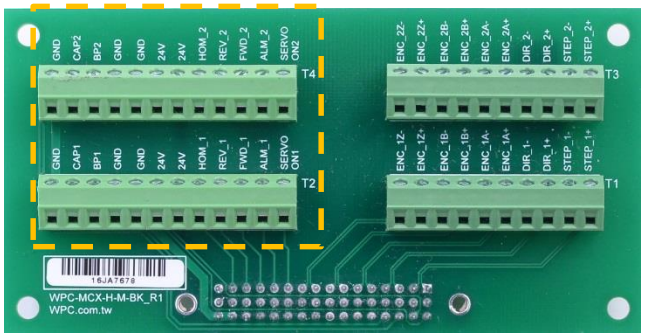
Pin description (2/2)

Conn.	Pin#	Name	Level	Type	Dir.	Description
T2/T4	1	Servo on	24V	Open-collector	Out	Servo on output signal / inhibit out
	2	ALM	24V	Open-collector	Out	Alarm clear output signal
	3	FWD	24V	Optocoupler	In	Forward limit switch input signal
	4	REV	24V	Optocoupler	In	Reverse limit switch input signal
	5	HOM	24V	Optocoupler	In	Home limit switch input signal
	6	24V		Power	Out	Power output for limit switch
	7	24V		Power	Out	Power output for limit switch
	8	GND		Power	Out/Ref	Power output for limit switch /Signal reference
	9	GND		Power	Out/Ref	Power output for limit switch /Signal reference
	10	BP	5V	Single-ended	Out	Break-point output signal
	11	CAP	5V	Single-ended	In	Capture input signal
	12	GND		Power	Out/Ref	Signal reference for BP / CAP



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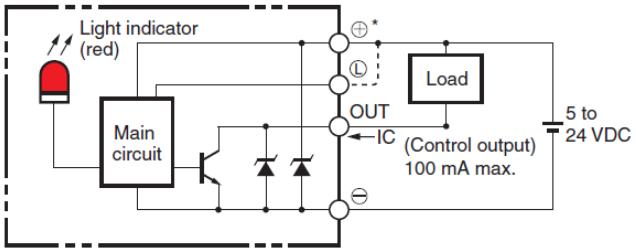
Limit switch wiring example
OMRON EE-SX67x

NPN Output

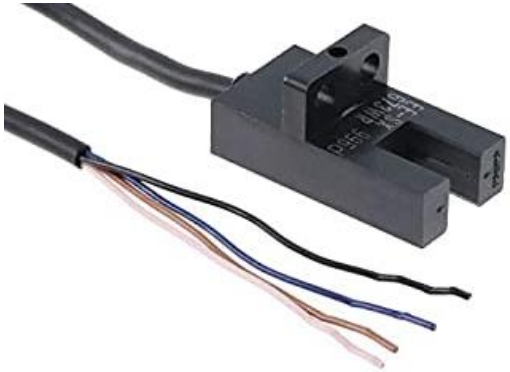
Model	Output configuration	Timing charts	Terminal connections	Output circuit
EE-SX67□ EE-SX67□-WR	Light-ON	Incident / Interrupted Light indicator (red) ON / OFF Output transistor ON / OFF Load (e.g., relay) Operates / Releases	Short-circuited between Ⓛ terminal and positive ⊕ terminal	EE-SX67□ EE-SX67□A
	Dark-ON	Incident / Interrupted Light indicator (red) ON / OFF Output transistor ON / OFF Load (e.g., relay) Operates / Releases	Open between Ⓛ terminal and positive ⊕ terminal *1 *2	



*The terminal arrangement depends on the model. Check the dimensional diagrams.

Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L*
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)



Terminal Arrangement

Brown	Vcc
Pink	L
Blue	GND (0 V)
Black	OUTPUT

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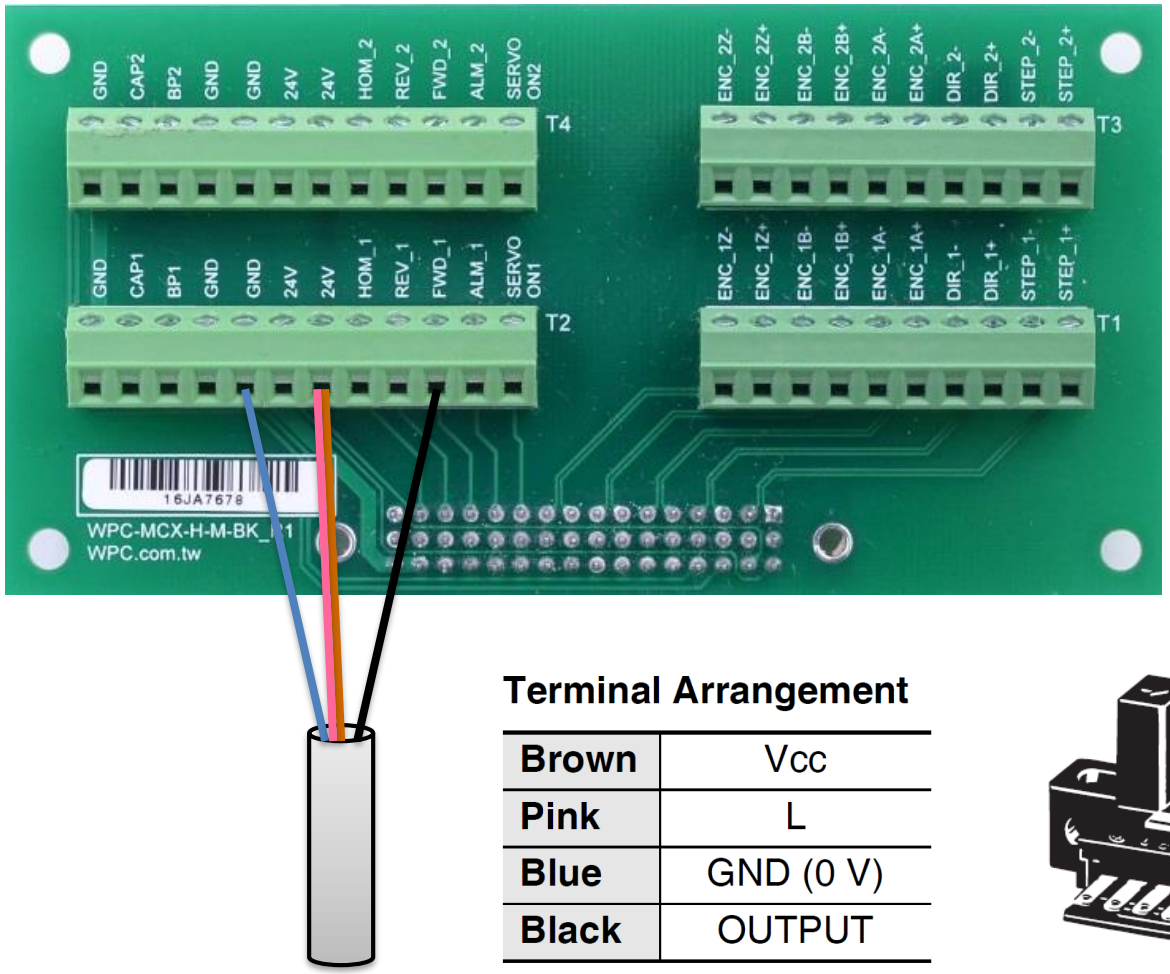
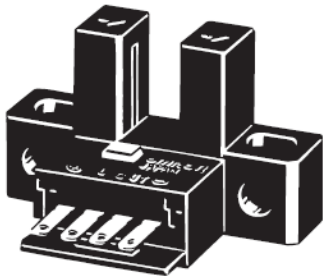
Light-ON wiring



Terminal Arrangement

Brown	Vcc
Pink	L
Blue	GND (0 V)
Black	OUTPUT



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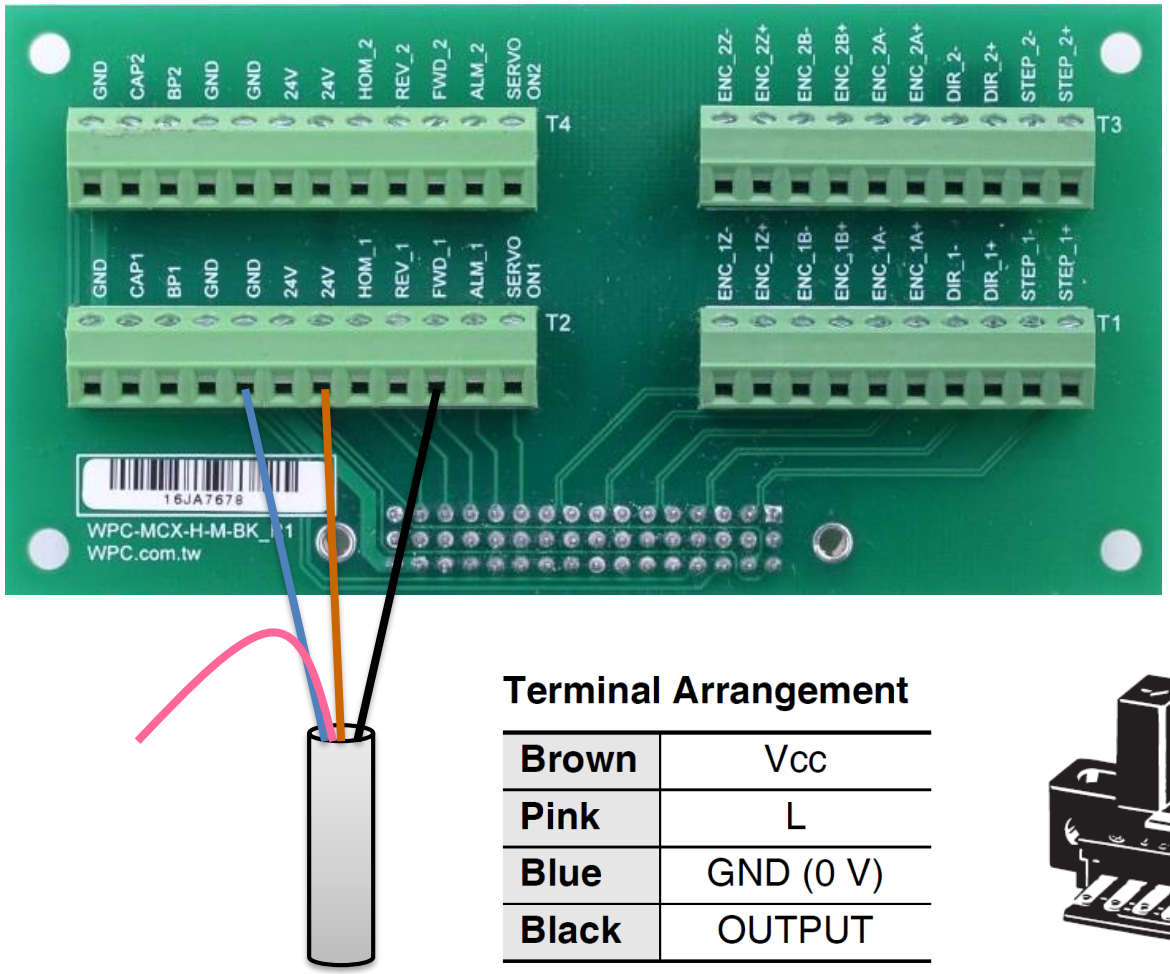
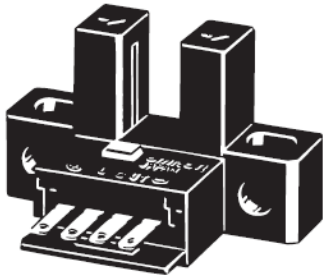
Dark-on wiring



Terminal Arrangement

Brown	Vcc
Pink	L
Blue	GND (0 V)
Black	OUTPUT



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常見的伺服馬達接線圖

1. Mitsubishi MR-J4/JE
2. Delta ASDA-B2
3. Panasonic A4/A5/A6
4. Yaskawa SGDV/SGD7

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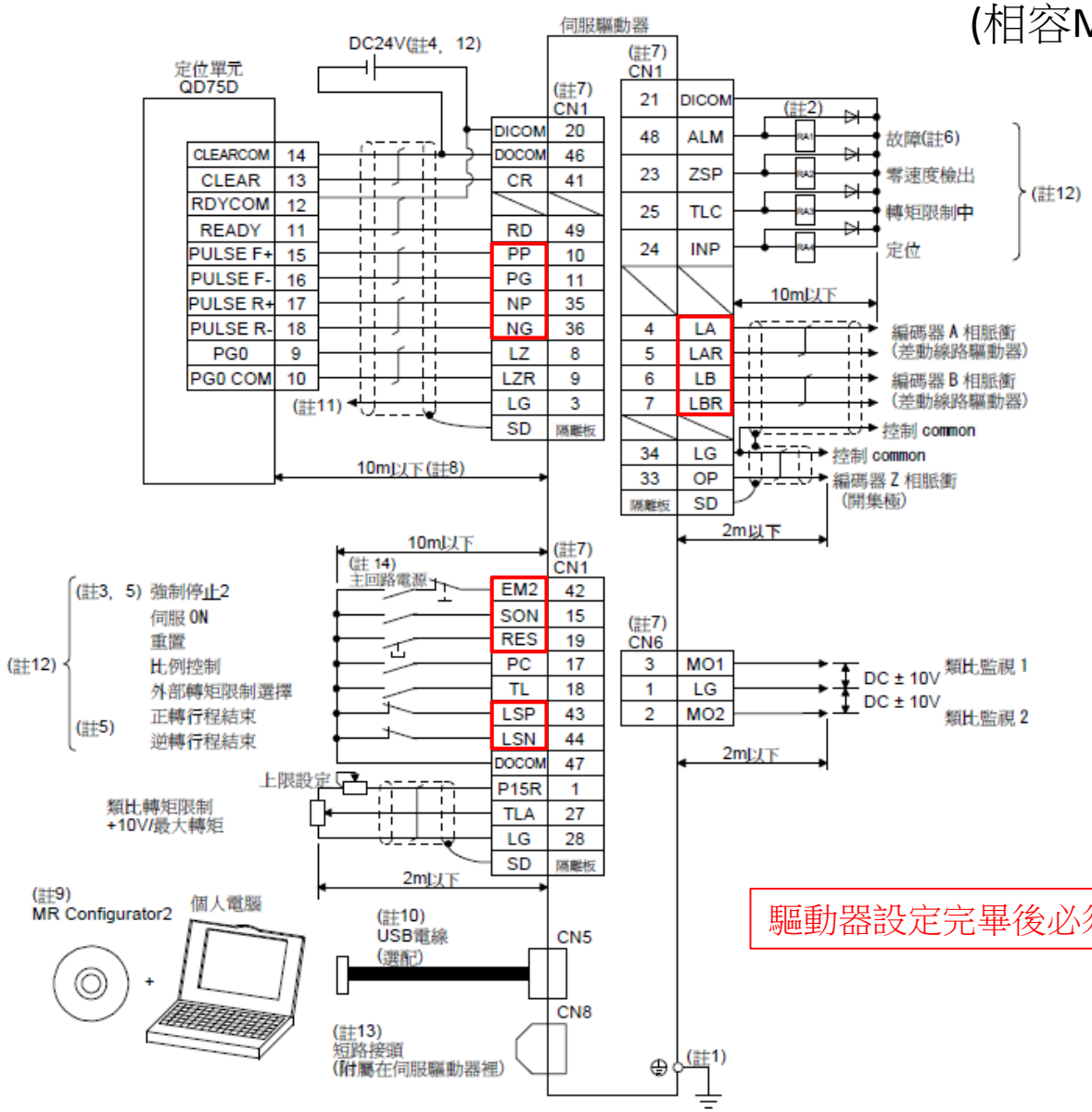
Mitsubishi MR-J4/JE 位置控制模式接線圖 (相容MR-JE系列)

3.2 輸出入信號的連接例

3.2.1 位置控制模式



驅動器設定完畢後必須斷電重啟

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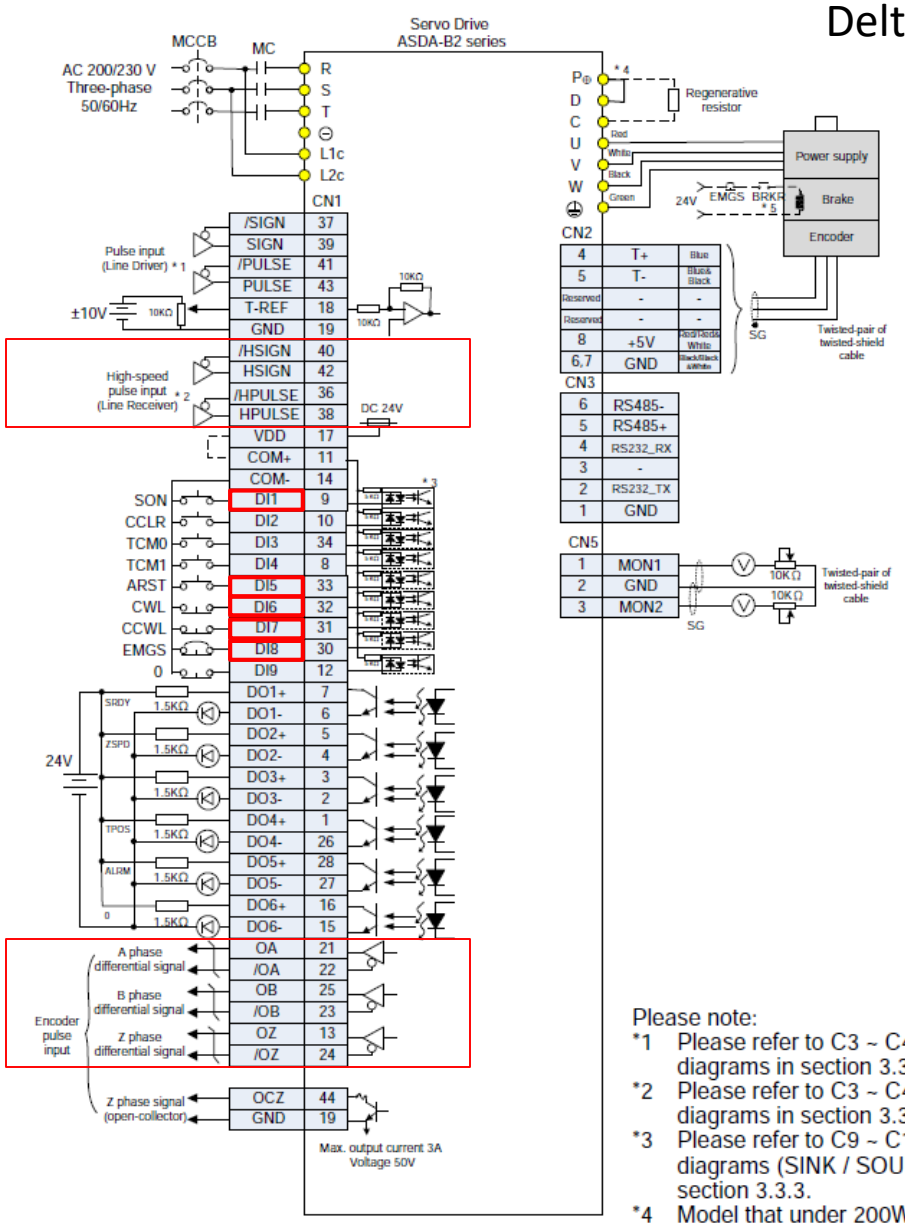
Delta ASDA-B2 位置控制模式接線圖

驅動器設定完畢後必須斷電重啟



Please note:

*1 Please refer to C3 ~ C4 wiring diagrams in section 3.3.3.

*2 Please refer to C3 ~ C4 wiring diagrams in section 3.3.3.

*3 Please refer to C9 ~ C12 wiring diagrams (SINK / SOURCE mode) in section 3.3.3.

*4 Model that under 200W has no built-in regenerative resistor.

*5 The brake coil has no polarity.

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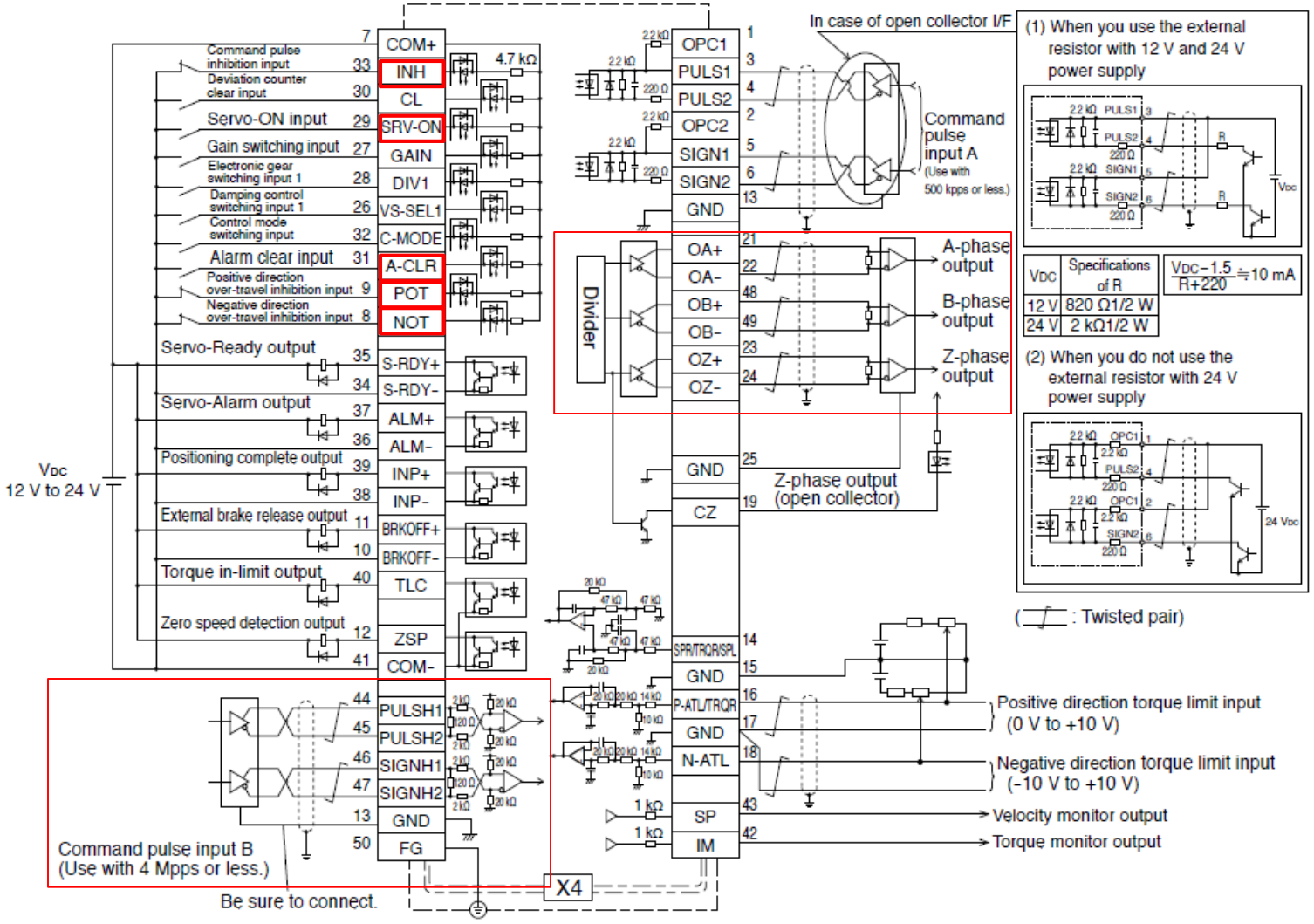
Panasonic Minas A4/A5/A6 位置控制模式接線圖

驅動器設定完畢後必須斷電重啟



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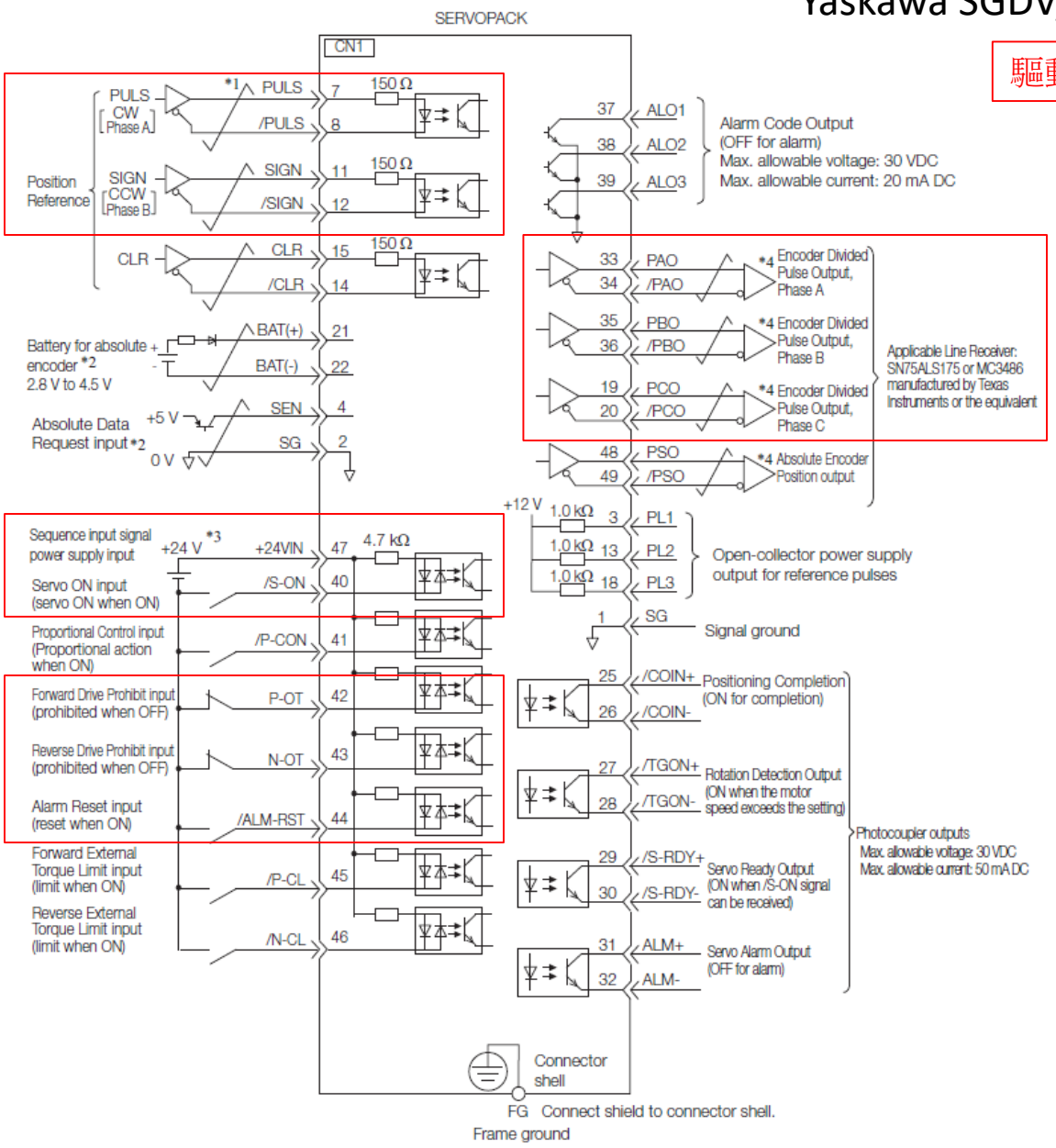
Yaskawa SGDV/7位置控制模式接線圖

驅動器設定完畢後必須斷電重啟



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簡易配線端子台

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支援伺服馬達專用端子模組

廠牌	型號	WPC 專用端子模組	備註
Yaskawa	SGDV/SGD7	S7	SGDV/SGD7 腳位相同
Mitsubishi	MR-J4/JE	J4	J4/JE 腳位相同
	MR-J2S	J2S	舊款, 與 J4/JE 腳位不同
Panasonic	Minas A4/A5/A6	A5	A4/A5/A6 腳位相同
Delta	ASDA-B2	B2	與 A2 腳位不同
	ASDA-A2	A2	與 B2 腳位不同

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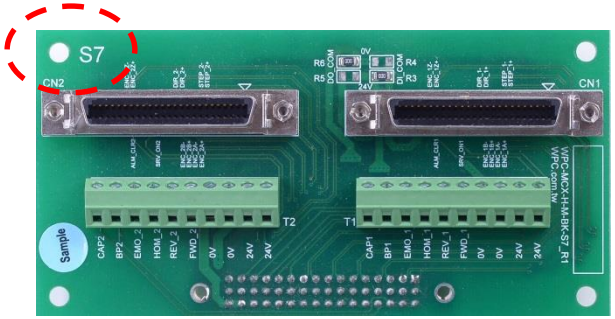
Breakout board (Yaskawa SGDV/SGD7)

外觀識別



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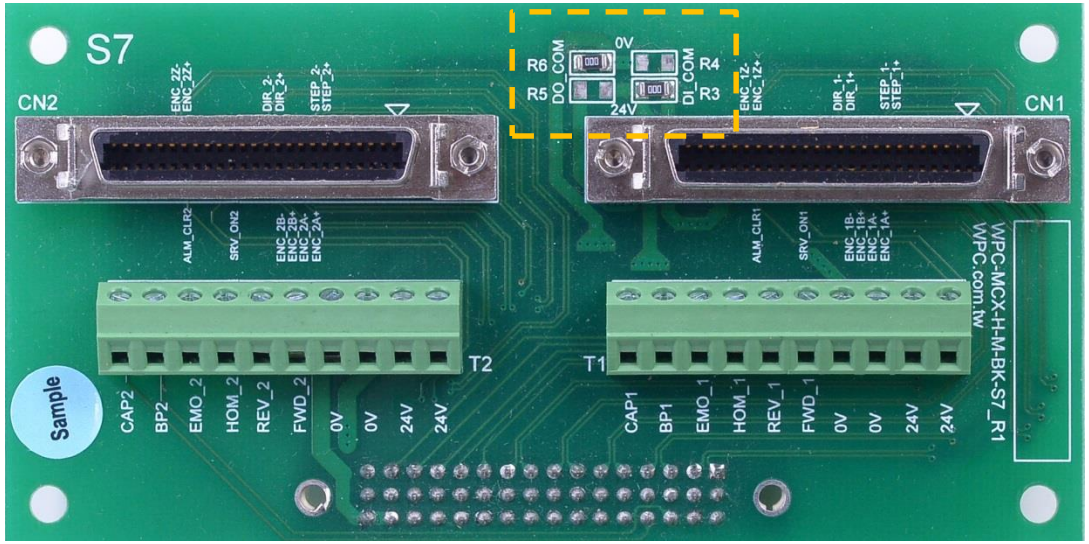
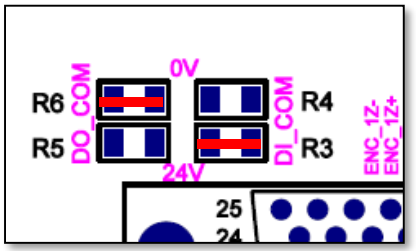
Breakout board for Yaskawa SGDV/SGD7

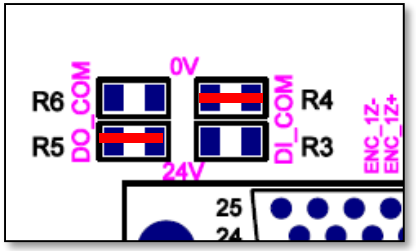


Sinking output configuration



0R resistor installed

Sourcing output configuration



0R resistor installed

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Yaskawa SGDV/SGD7 專用端子模組說明

- 出廠預設值：
  - 輸出訊號：sinking output
  - 輸入訊號：sourcing input
  - 緊急停止訊號：enable (不須外接）
- 一個專用端子台可以控制 2 軸。每張 WPC-MCX-H-motion 軸卡可以安裝兩個端子台，可同時控制 4 軸。
- CN1、CN2 的 SCSI-50P 連接器可以透過pin-to-pin SCSI-50P cable 線直接連接到 Yaskawa SGDV/SGD7 伺服驅動器，兩者的接線圖相容。
- T1、T2 的歐規端子台，可以拿來連接到極限開關（Limit switches），上方的 24V 可以拿來供應極限開關電源。Capture, breakpoint 為 5V TTL 訊號格式，可以拿來跟外部裝置（比如：相機、 DAQ 卡…等）同步用。

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Breakout board (Mitsubishi MR-J4/JE)

外觀識別

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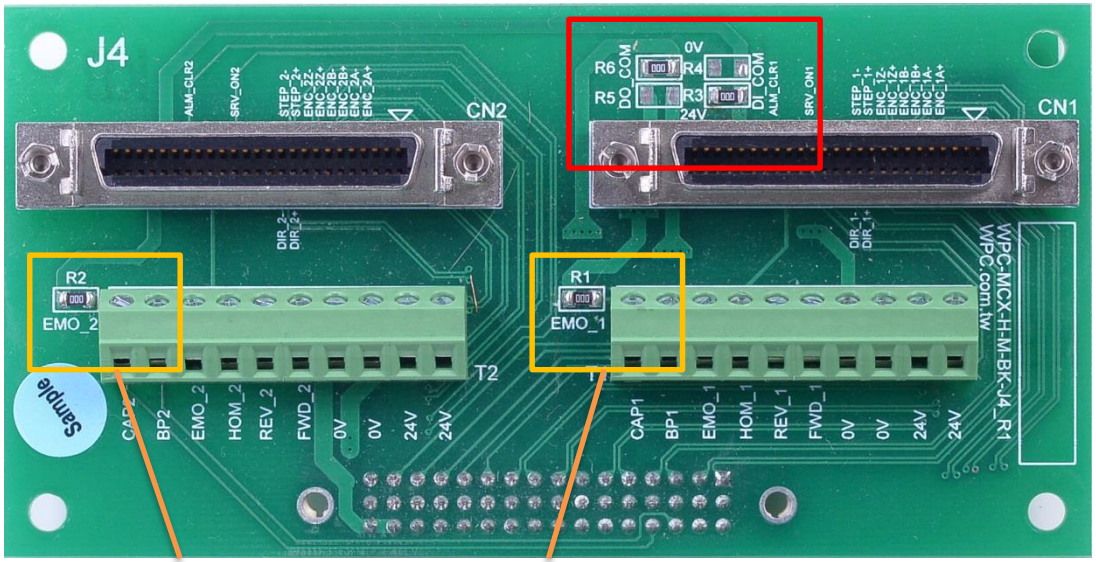
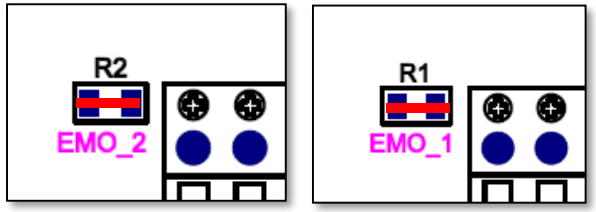
Breakout board for Mitsubishi MR-J4/JE



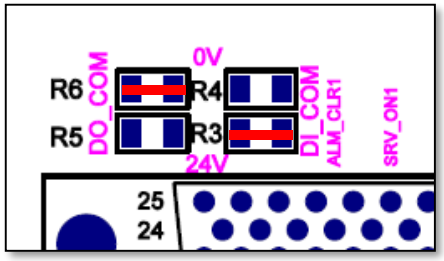
PS.有電阻就可以不用接 EMO 腳位

Disable external EMO control pins



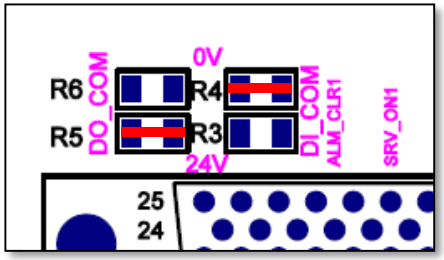
0R resistor installed

Sinking output configuration



0R resistor installed

Sourcing output configuration



0R resistor installed

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Mitsubishi MR-J4/JE 專用端子模組說明

- 出廠預設值：
  - 輸出訊號：sinking output
  - 輸入訊號：sourcing input
  - 緊急停止訊號：enable (不須外接）
- 一個專用端子台可以控制 2 軸。每張 WPC-MCX-H-motion 軸卡可以安裝兩個端子台，可同時控制 4 軸。
- CN1、CN2 的 SCSI-50P 連接器可以透過 pin-to-pin SCSI-50P cable 線直接連接到 Mitsubishi MR-J4/JE 伺服驅動器。
- T1、T2 的歐規端子台，可以拿來連接到極限開關（Limit switches），上方的 24V 可以拿來供應極限開關電源。Capture, breakpoint 為 5V TTL 訊號格式，可以拿來跟外部裝置（比如：相機、 DAQ 卡…等）同步用。

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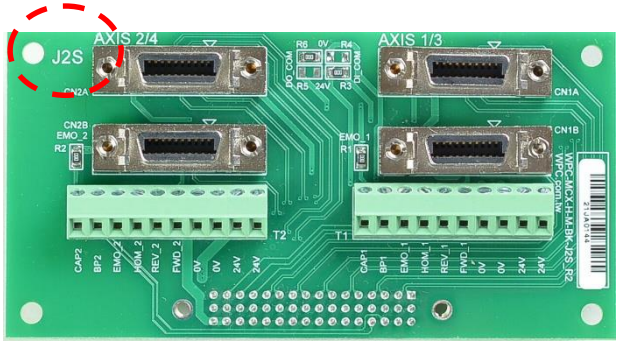
Breakout board (Mitsubishi MR-J2S)

外觀識別



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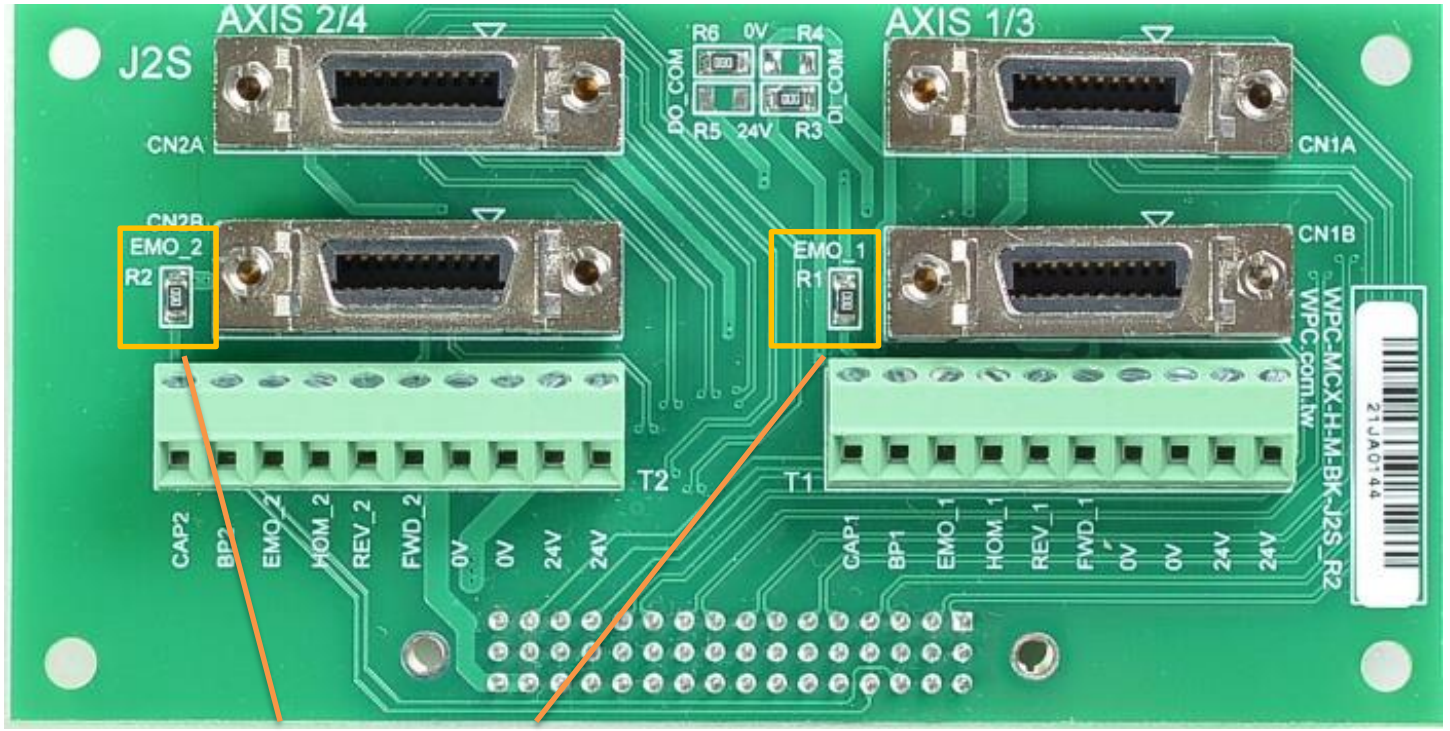
Mitsubishi MR-J2S

Sinking out/sourcing in
R6/R3 = 0R
R5/R4 = NC

Sourcing out/sinking in
R6/R3 = NC
R5/R4 = 0R



PS.有電阻就可以不用接 EMO 腳位

R1/R2 = 0R , EMO disable
R1/R2 = NC, EMO ext. control

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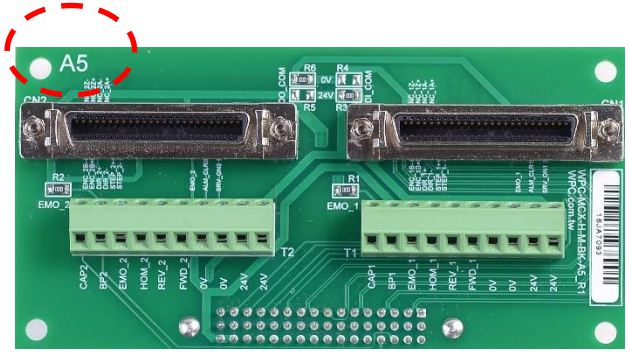
Breakout board
(Panasonic Minas A4/A5/A6)

外觀識別



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Panasonic Minas A4/A5/A6 專用端子模組說明

- 出廠預設值：
  - 輸出訊號：sinking output
  - 輸入訊號：sourcing input
  - 緊急停止訊號：enable (不須外接）
- 一個專用端子台可以控制 2 軸。每張 WPC-MCX-H-motion 軸卡可以安裝兩個端子台，可同時控制 4 軸。
- CN1、CN2 的 SCSI-50P 連接器可以透過 pin-to-pin SCSI-50P cable 線直接連接到 Panasonic Minas A4/A5/A6 伺服驅動器。
- T1、T2 的歐規端子台，可以拿來連接到極限開關（Limit switches），上方的 24V 可以拿來供應極限開關電源。Capture, breakpoint 為 5V TTL 訊號格式，可以拿來跟外部裝置（比如：相機、 DAQ 卡…等）同步用。

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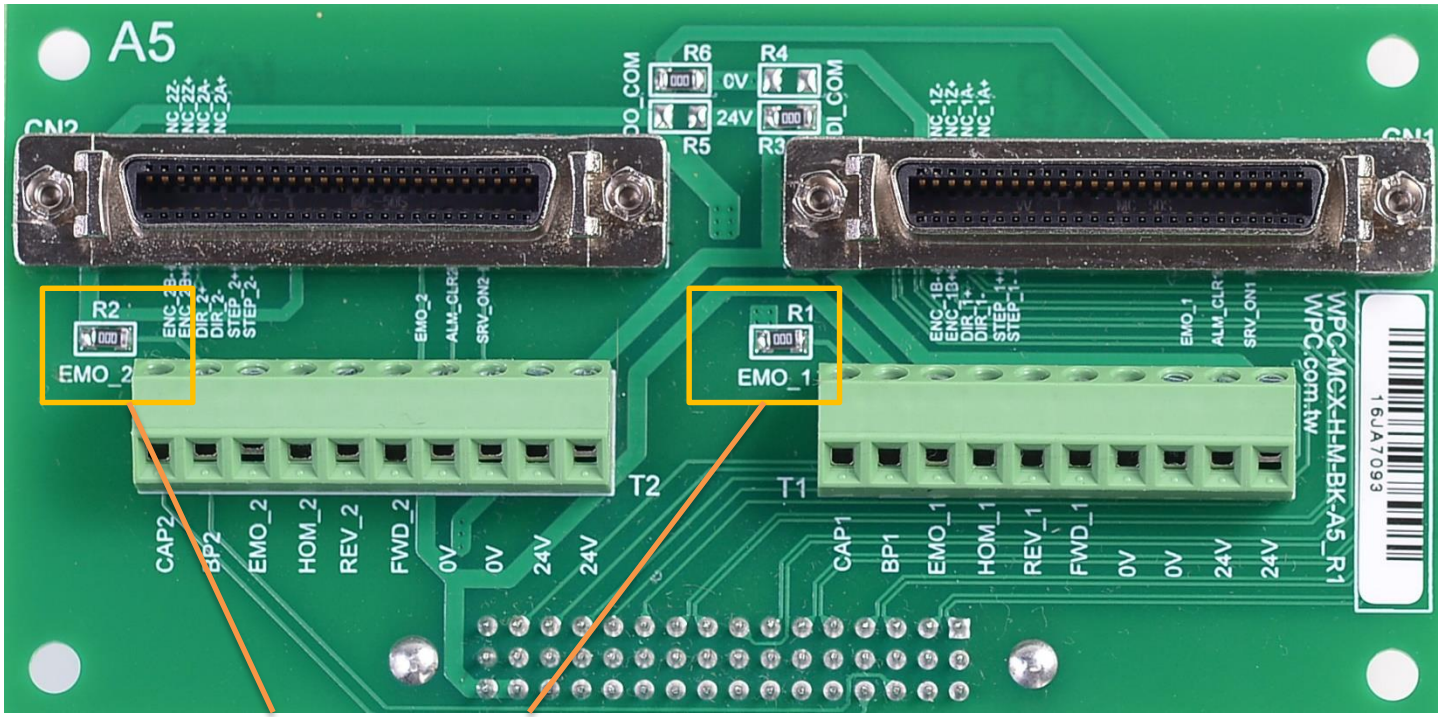
Panasonic A4/A5/A6

Sinking out/sourcing in
R6/R3 = 0R
R5/R4 = NC

Sourcing out/sinking in
R6/R3 = NC
R5/R4 = 0R



PS.有電阻就可以不用接 EMO 腳位

R1/R2 = 0R , EMO disable
R1/R2 = NC, EMO ext. control

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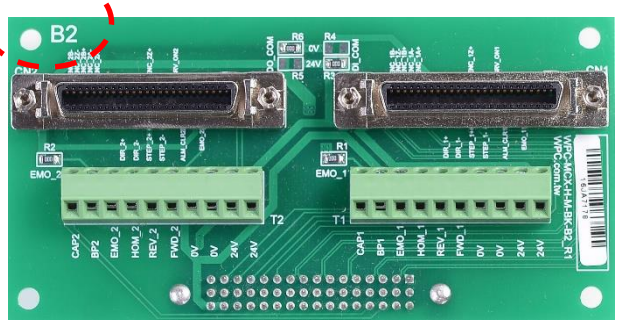
Breakout board (Delta ASDA-B2)

另有型號可支援 A2

外觀識別



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Delta ASDA-B2
專用端子模組說明

- 出廠預設值：
  - 輸出訊號：sinking output
  - 輸入訊號：sourcing input
  - 緊急停止訊號：enable (不須外接）
- 一個專用端子台可以控制 2 軸。每張 WPC-MCX-H-motion 軸卡可以安裝兩個端子台，可同時控制 4 軸。
- CN1、CN2 的 SCSI-50P 連接器可以透過 pin-to-pin SCSI-50P cable 線直接連接到 Delta ASDA-B2 伺服驅動器。
- T1、T2 的歐規端子台，可以拿來連接到極限開關（Limit switches），上方的 24V 可以拿來供應極限開關電源。Capture, breakpoint 為 5V TTL 訊號格式，可以拿來跟外部裝置（比如：相機、 DAQ 卡…等）同步用。

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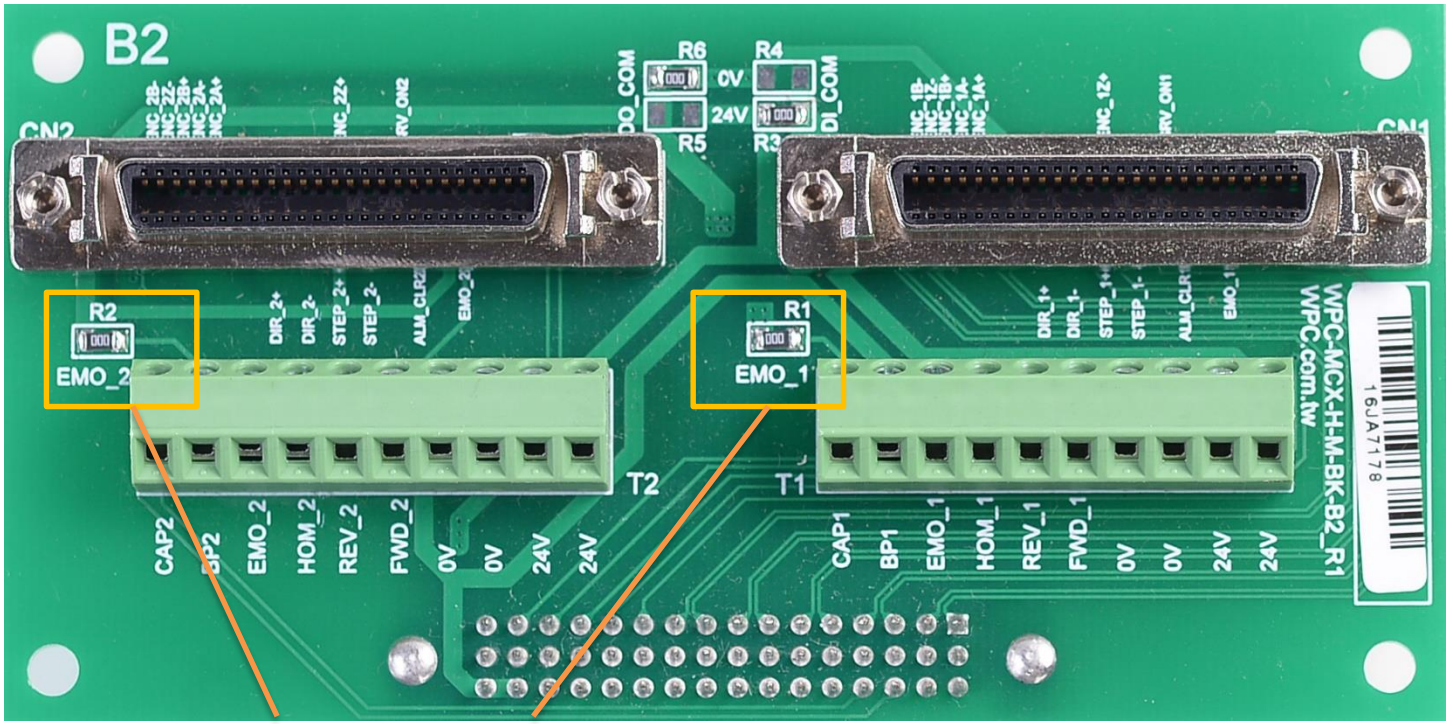
Delta ASDA-B2

Sinking out/sourcing in
R6/R3 = 0R
R5/R4 = NC

Sourcing out/sinking in
R6/R3 = NC
R5/R4 = 0R



PS.有電阻就可以不用接 EMO 腳位

R1/R2 = 0R , EMO disable
R1/R2 = NC, EMO ext. control

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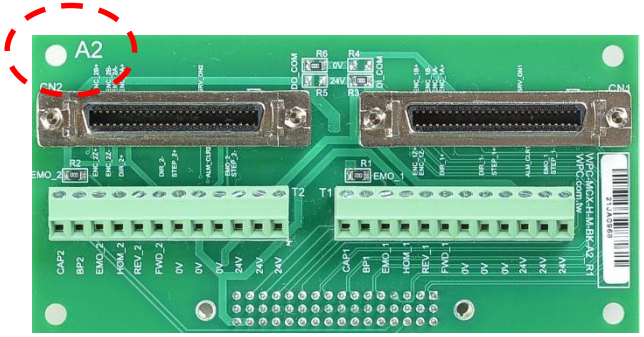
Breakout board (Delta ASDA-A2)

外觀識別



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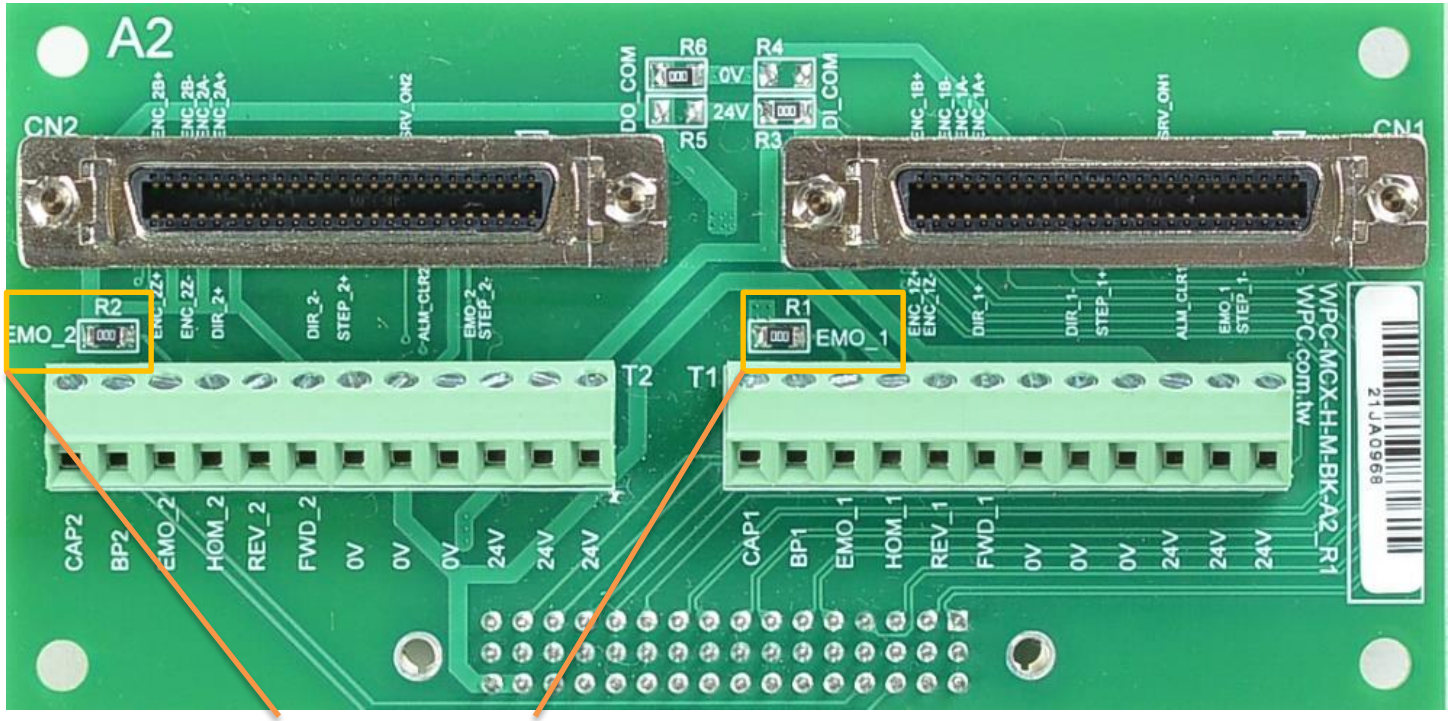
Delta ASDA-A2

Sinking out/sourcing in
R6/R3 = 0R
R5/R4 = NC

Sourcing out/sinking in
R6/R3 = NC
R5/R4 = 0R



PS.有電阻就可以不用接 EMO 腳位

R1/R2 = 0R , EMO disable
R1/R2 = NC, EMO ext. control

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WPC SYSTEMS

GECO Driver API, example project and Test panel portal

Download and installation

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名詞解釋

- GECO Example project
  - 透過 NI example finder 查詢關鍵字 ”GECO”
  - 範例程式的專案，支援 Host PC & RT 模式
  - 支援 3 種控制器 (GECO, STEM, USB)
  - 支援各種 GECO 模組
- GECO Driver API
  - GECO driver 驅動程式，使用 Example project 必須安裝
  - 透過 VIPM 來安裝
- GECO Testpanel portal
  - 軟體公用程式執行檔(EXE)
  - 需要安裝 LabVIEW Run-time Engine 15.0 以上
  - 可以用來測試、評估、搜尋、設定裝置或模組。

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LabVIEW / RT / FPGA
Software development
Custom hardwares
Embedded systems

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驅動程式、範例程式、裝置管理程式下載 (2022-02-17更新)

驅動程式下載

圖形化嵌入式控制器（GECO）

GECO UNO 控制器
支援 LabVIEW Real-time
支援 LabVIEW FPGA
可獨立運行（Stand-alone）
4 組 24-DIO 插槽可使用
一體成形散熱設計、無風扇電腦

GECO UNO-MIO-DB 控制器
支援 LabVIEW RT / FPGA
可獨立運行（Stand-alone）
4 組 24-DIO 插槽可使用
一體成形散熱設計、無風扇電腦
RS-232 x 1, CAN x 1
MIO 端子台（16-bit 類比輸出入）

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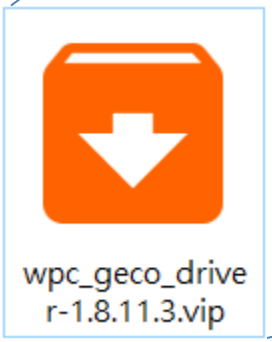
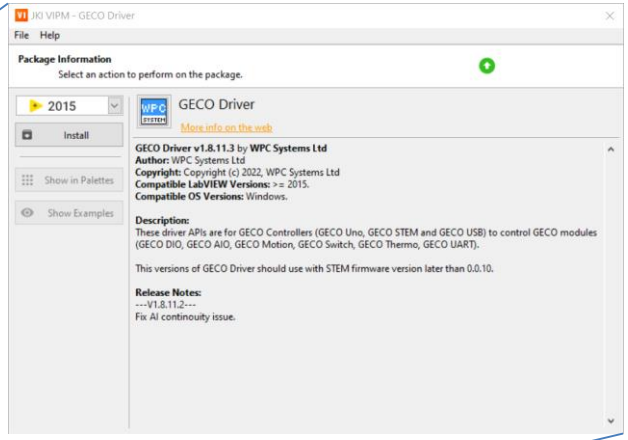
Install GECO driver via VIPM

1.





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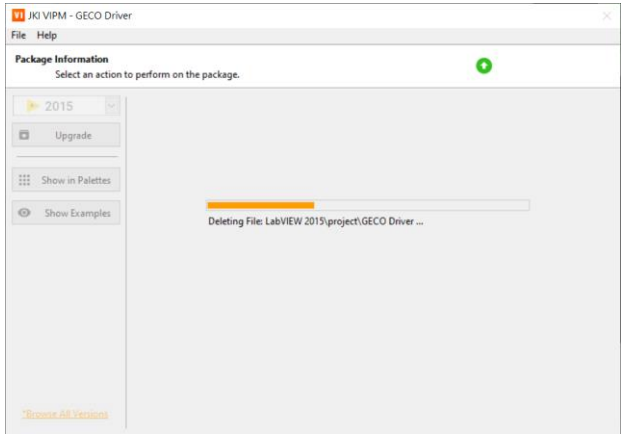
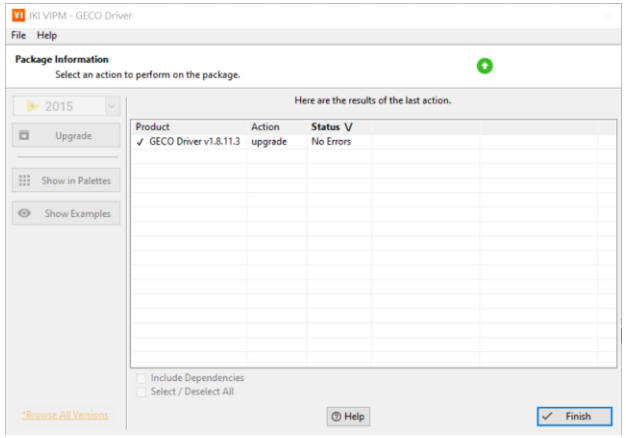


3.



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GECO test panel portal

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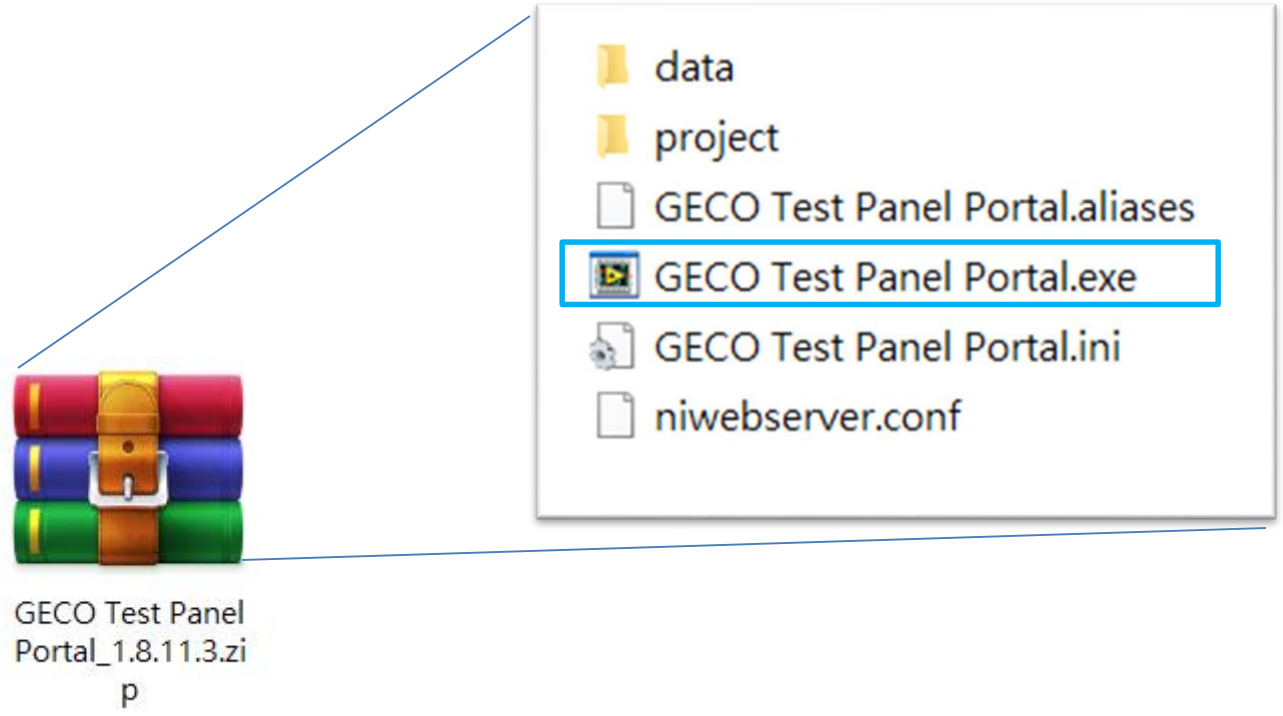
Unzip downloaded file



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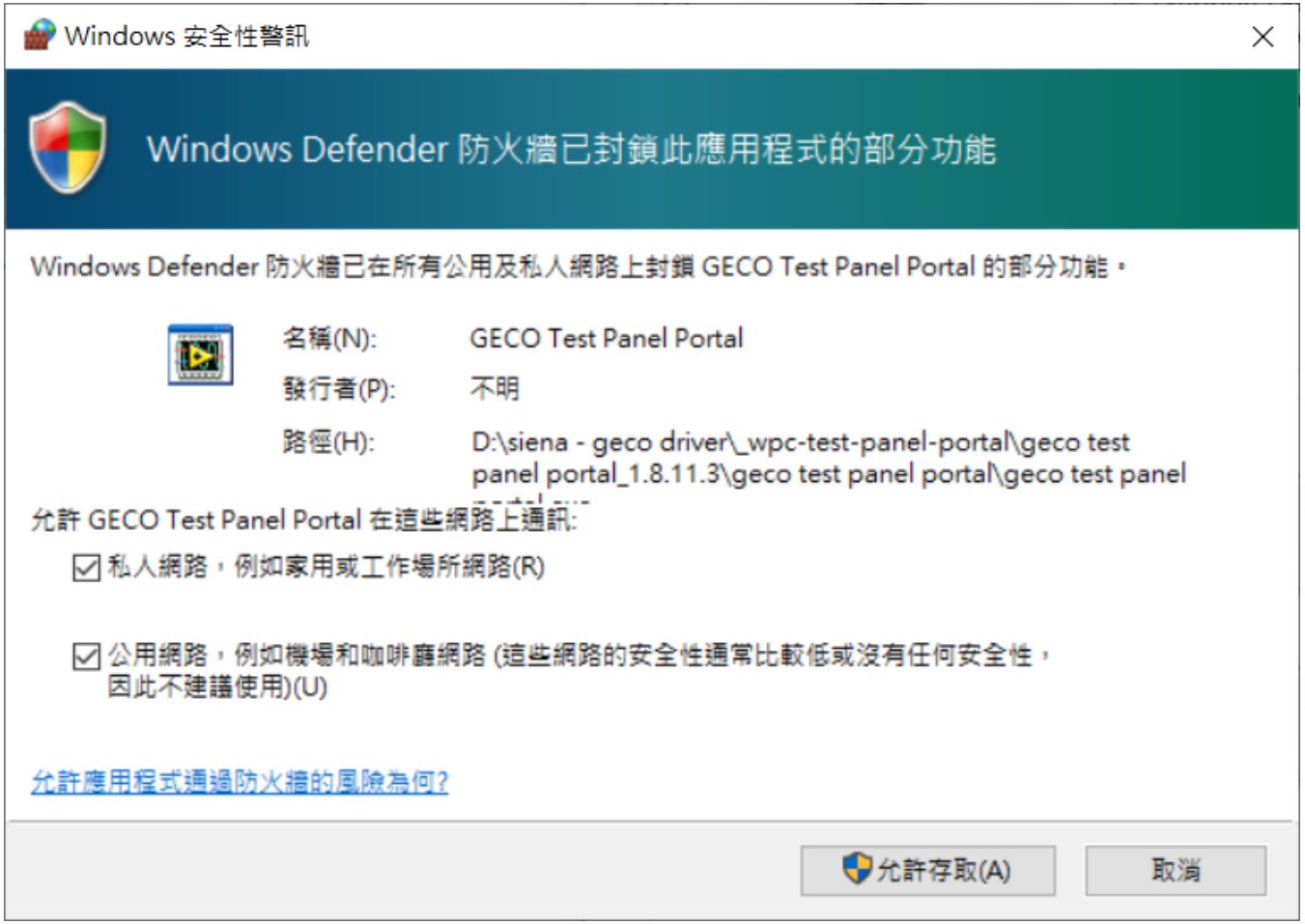
Open test panel portal → Allow network access



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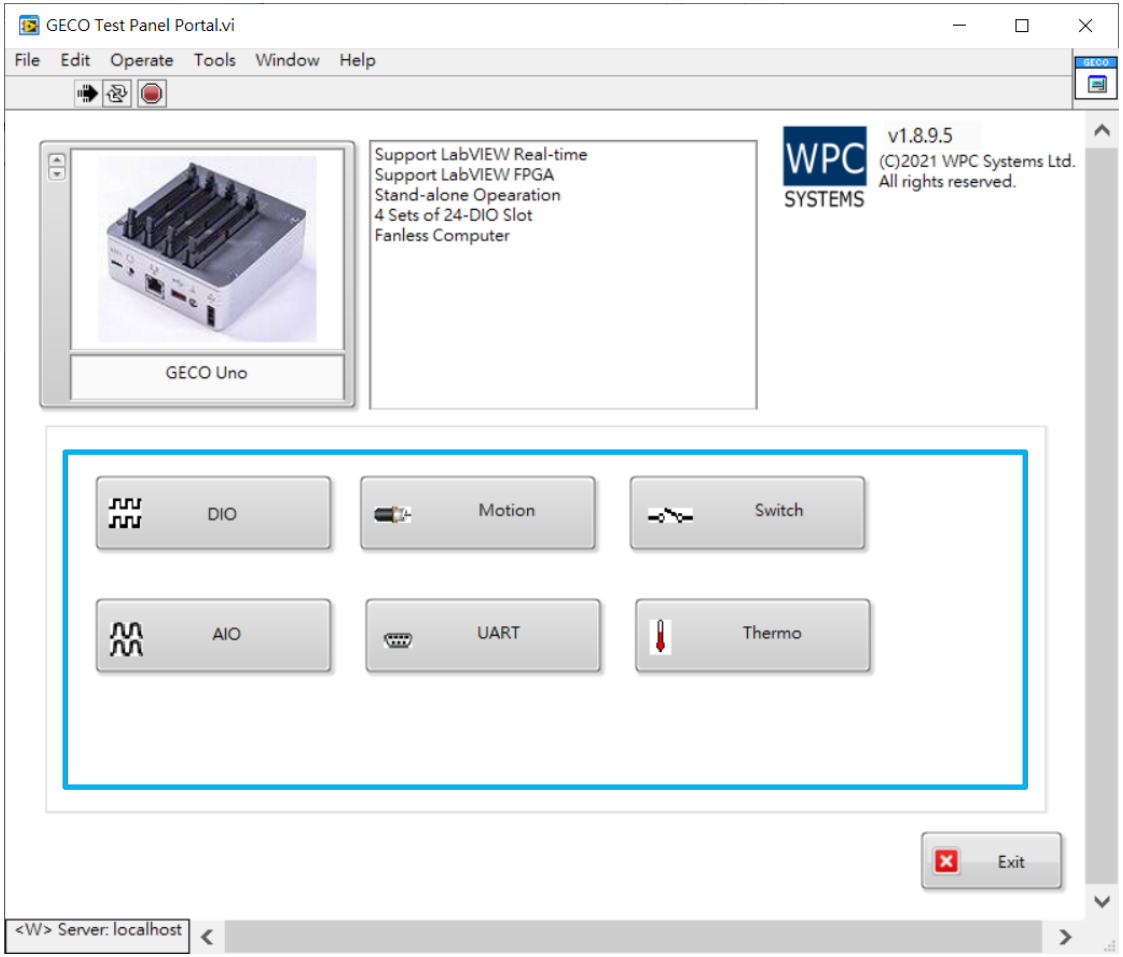
Test panel portal (front panel)

Controller selection

Support Test panel



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Select proper controller

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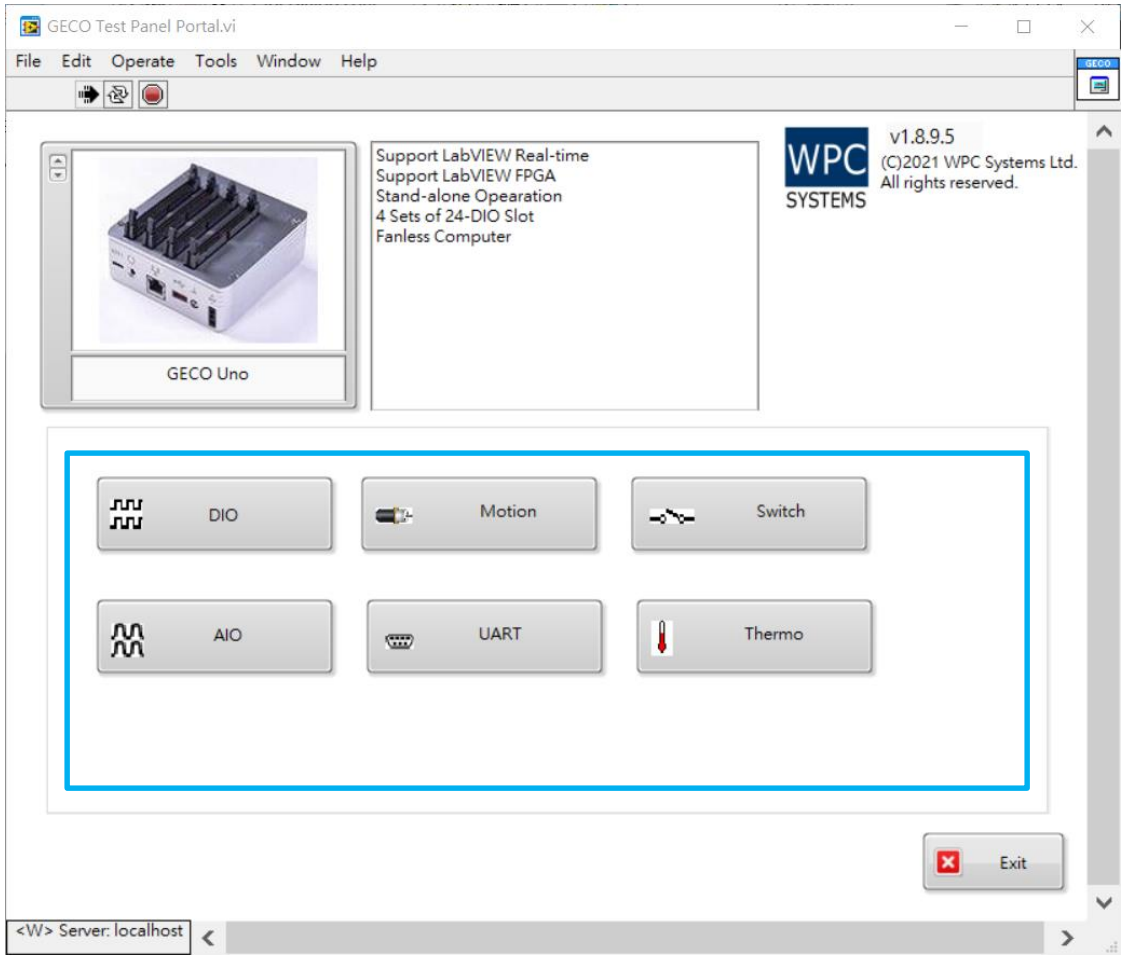
Supported test panel (GECO)



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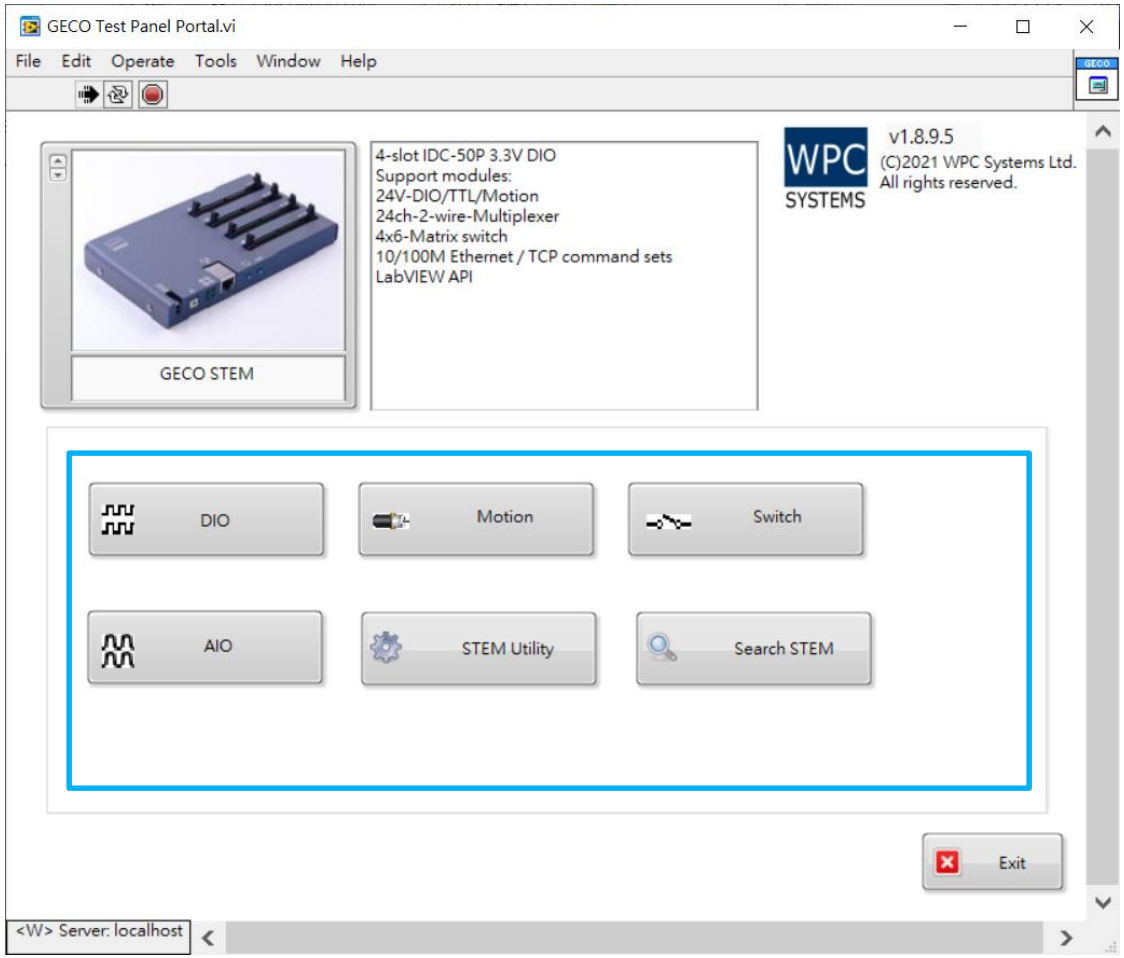
Supported test panel (STEM)



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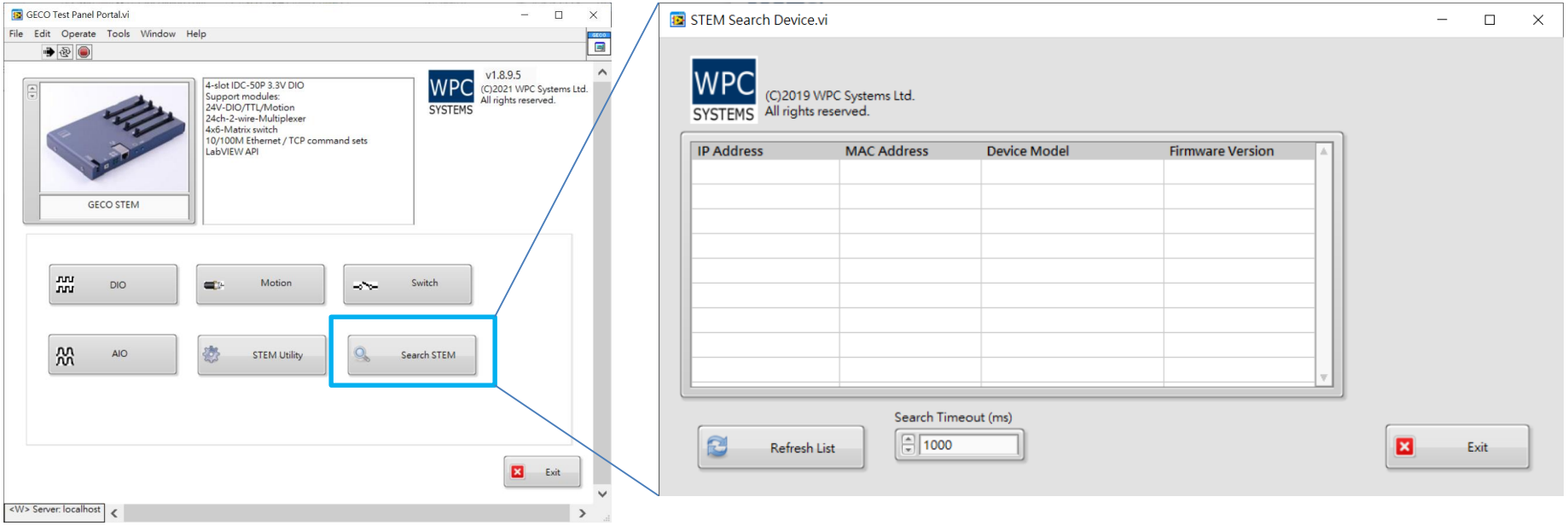
STEM Search devices



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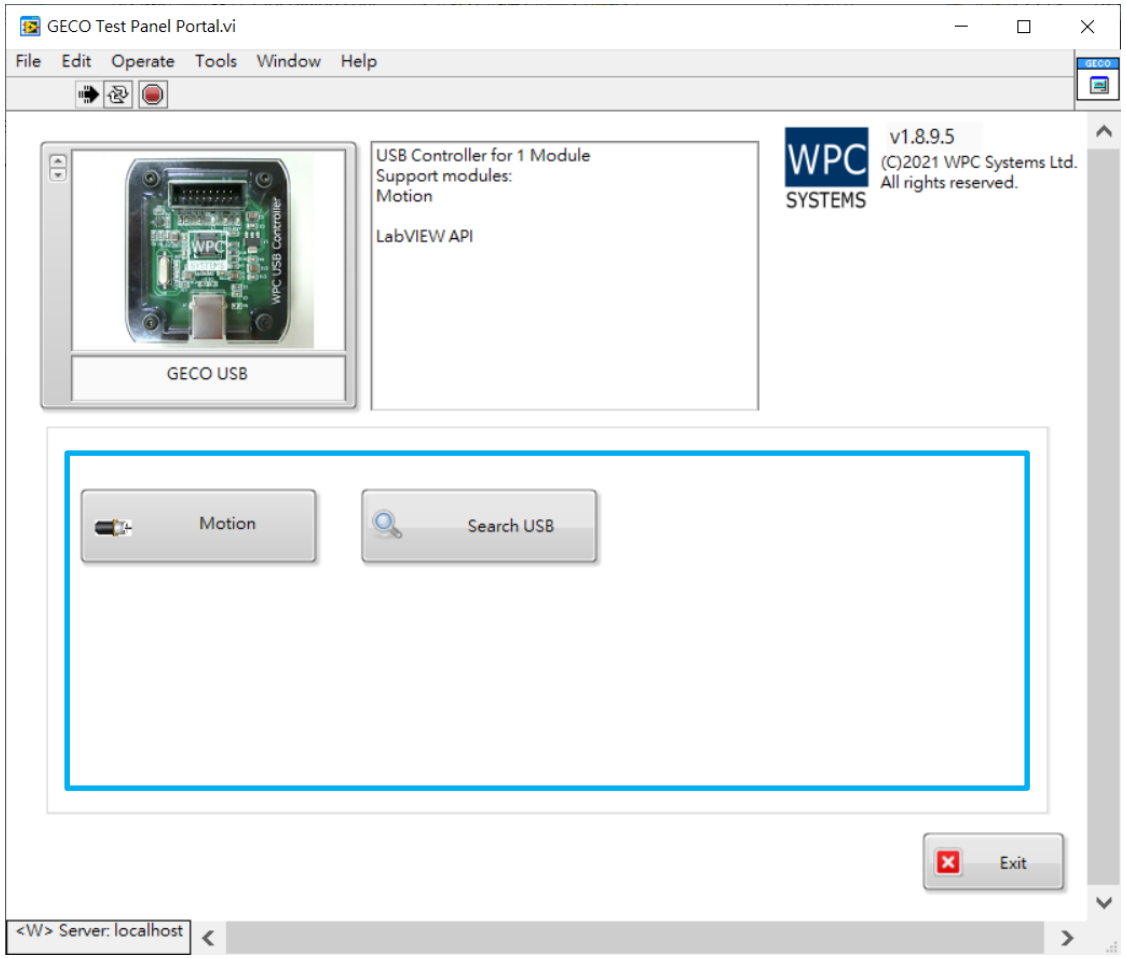
Supported test panel (USB)



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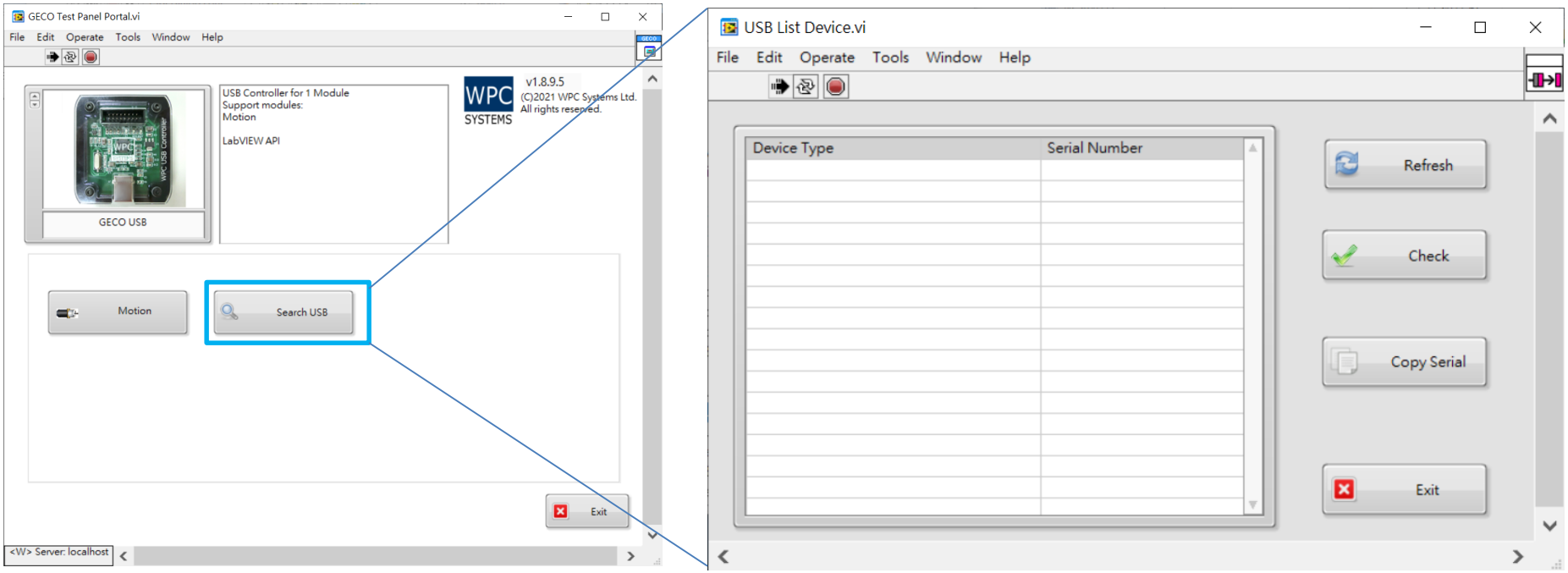
USB list devices



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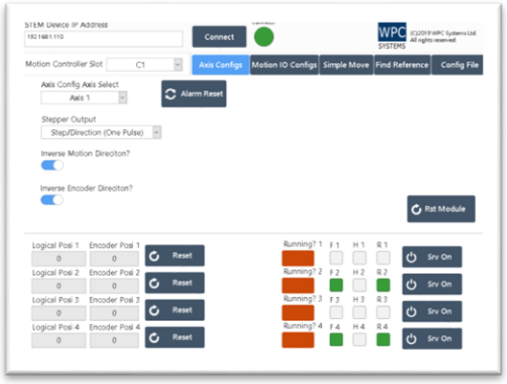
H-Motion test panel



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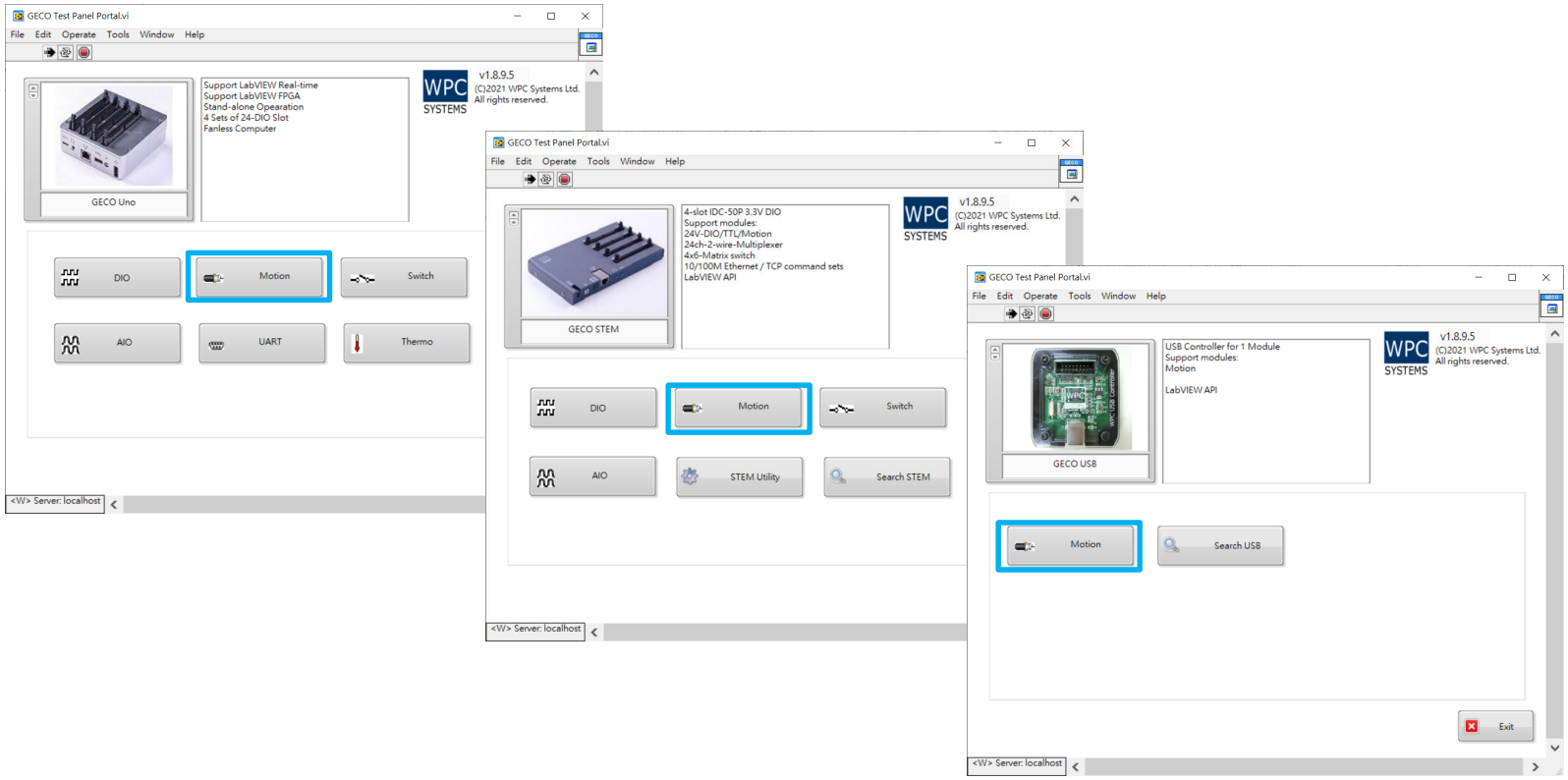
Open Motion Test panel from GECO test panel portal (EXE)



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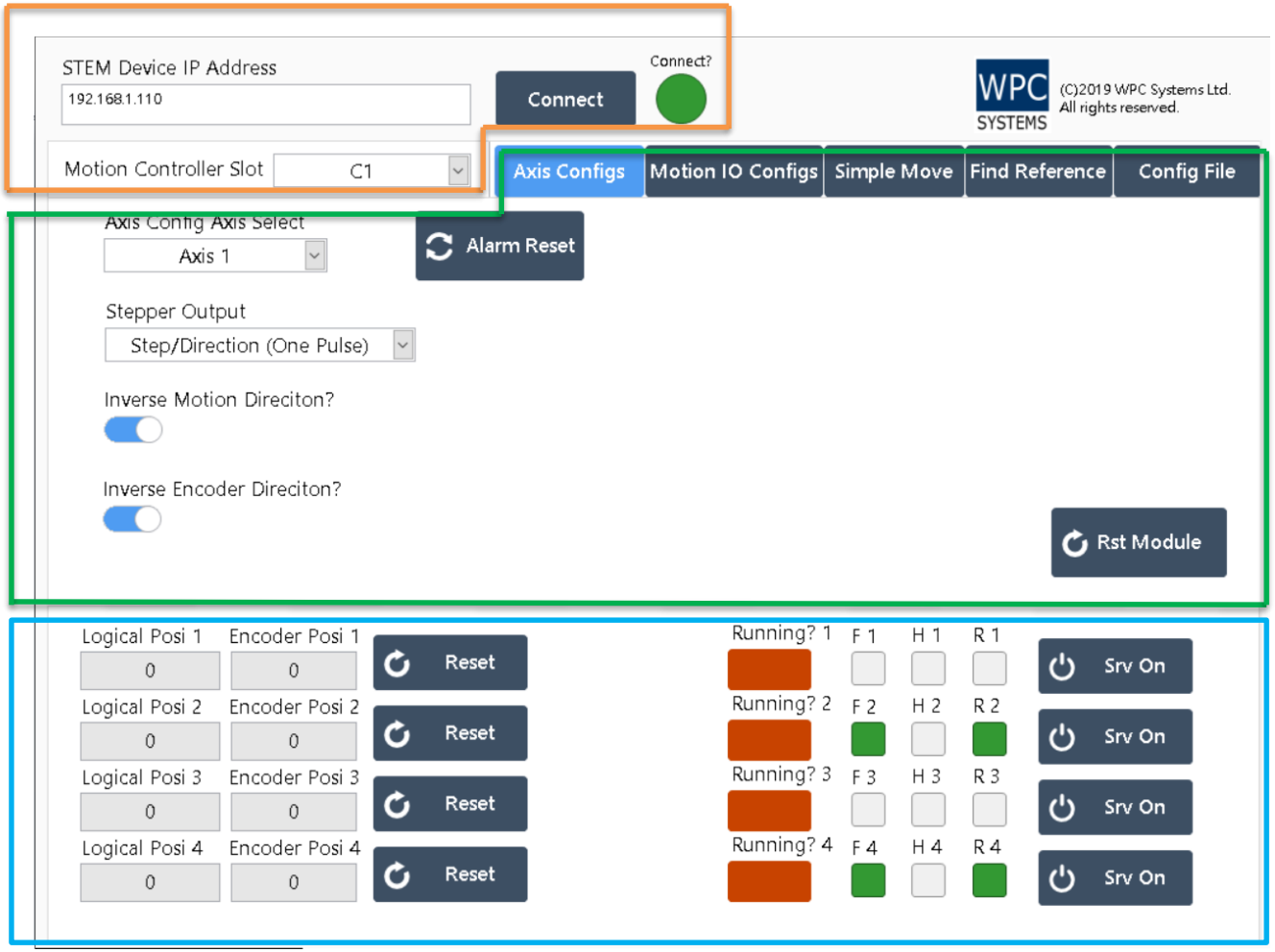
Motion test panel layout

Connection

Setting

Axis status



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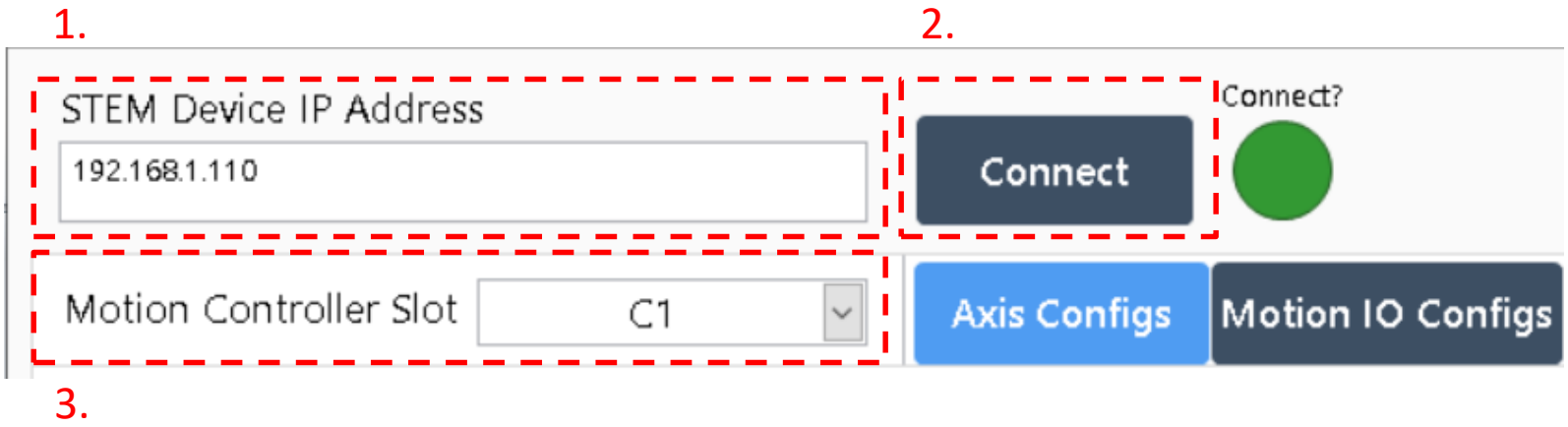
Connection via Ethernet

Factory default IP address: 192.168.1.110 (STEM controller)



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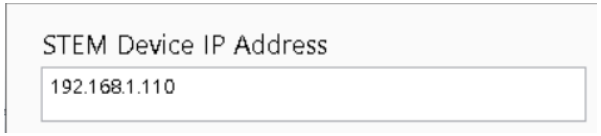
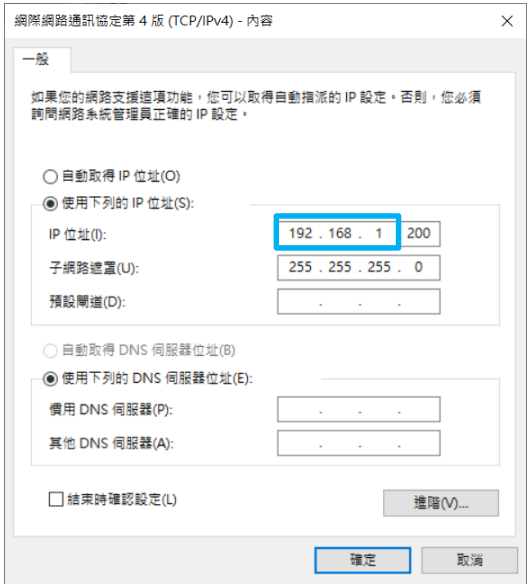
透過 Ethernet 進行連接(1/2)

- 使用 GECO/STEM 控制器。
- 確認 Host PC 與 GECO/STEM 控制器在相同的網域之下。
- 設定控制器正確的 IP 位址。



GECO Uno 使用 NI MAX 更改 IP 位址



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透過 Ethernet 進行連接(2/2)

- 將 WPC-MCX-H-Motion 軸控卡連接至 GECO/STEM 插槽(Slot)，並設定正確的插槽編號。

- 按下 Connect 按鈕，連接成功後。Connect? 綠燈會亮起。

請注意 STEM 控制器的 C3 插槽並不支援 WPC-MCX-H-Motion 軸控卡！

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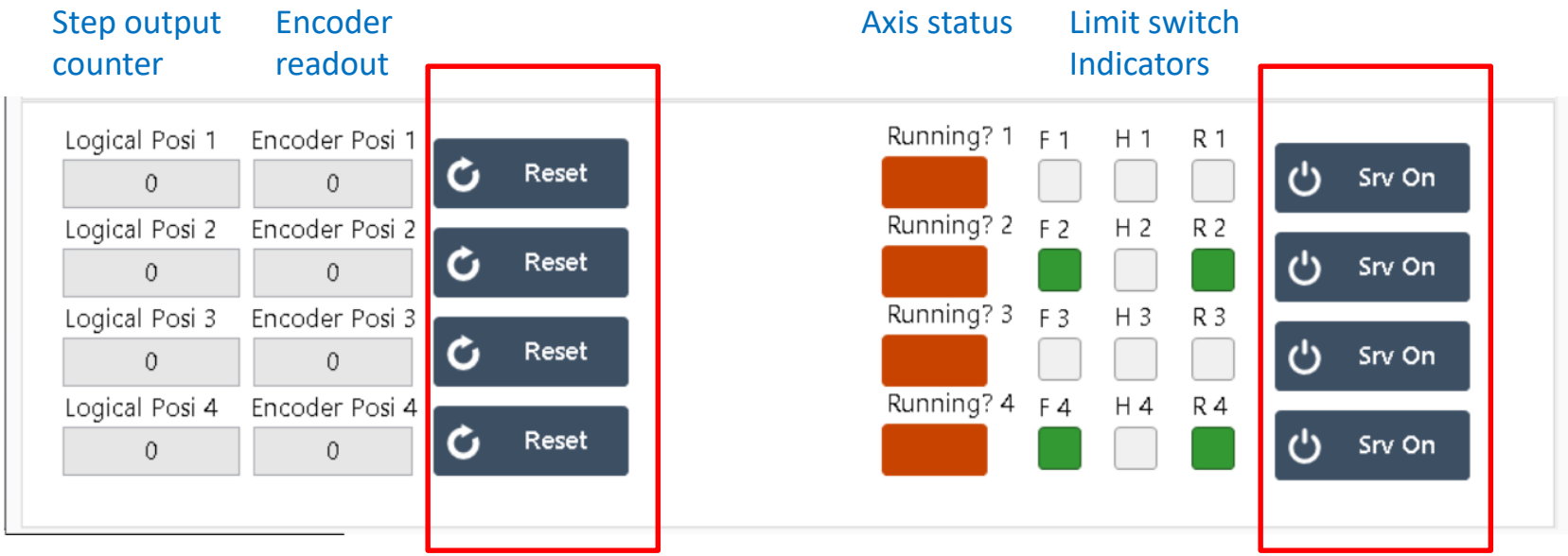
Axis status



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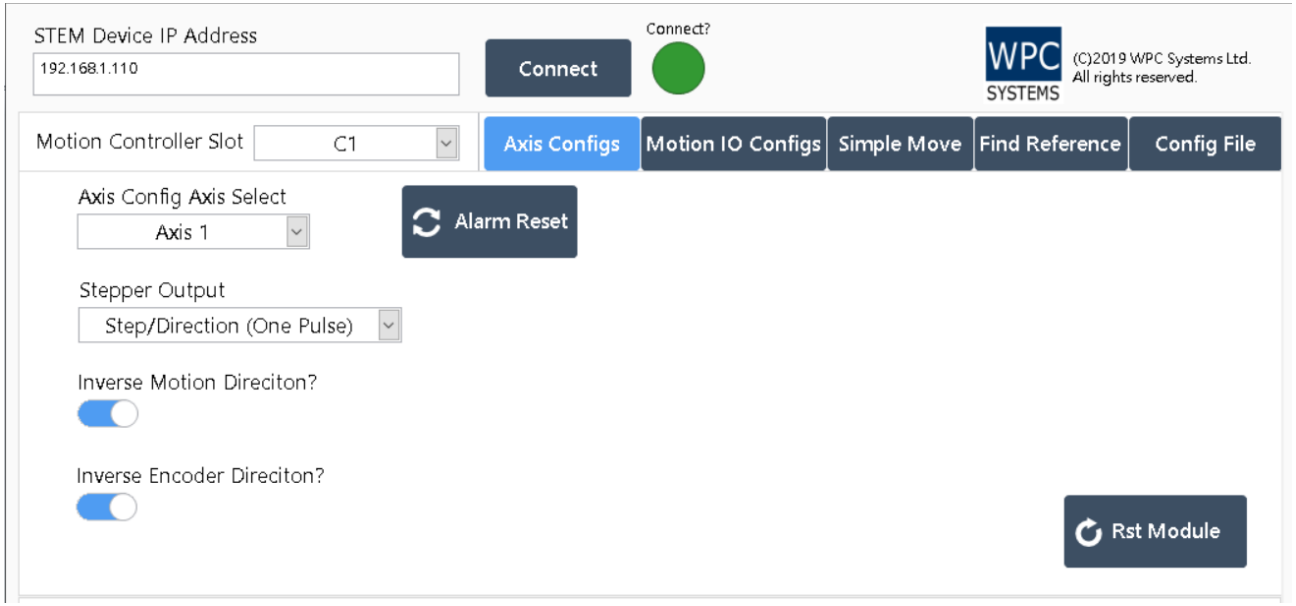
Axis configuration



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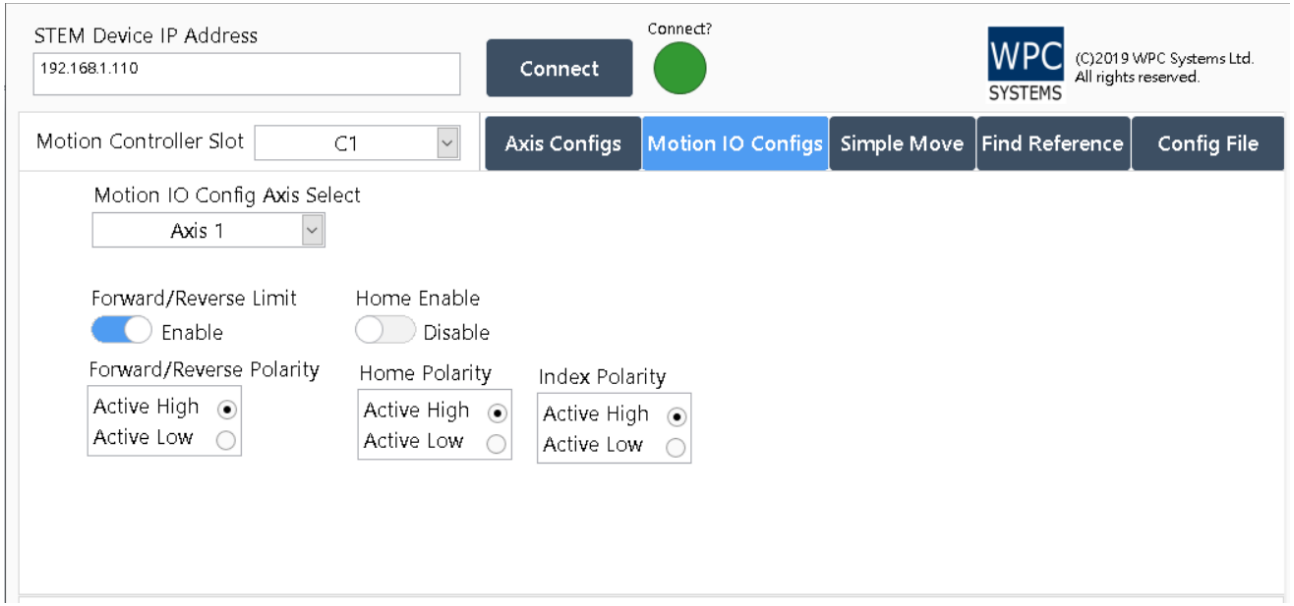
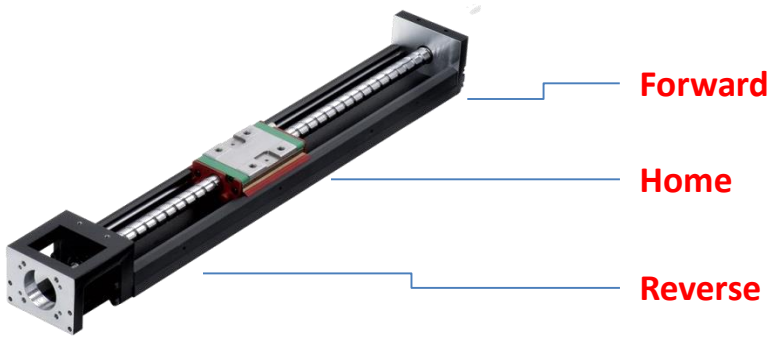
Motion I/O configurations





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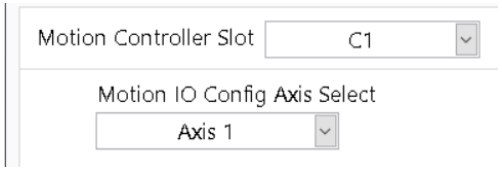
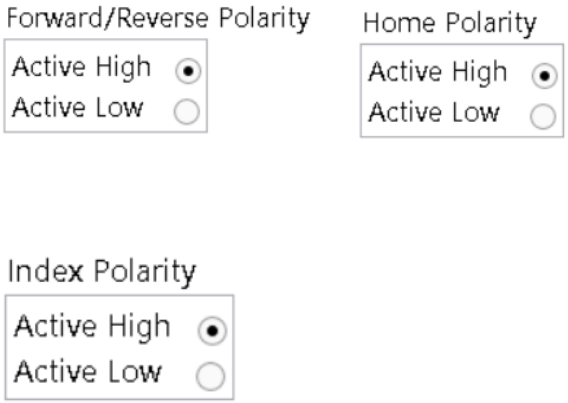
Motion IO configuration

- 選擇欲設定的插槽與軸號（比如 Axis1）
- 選擇是否啟用 F/R 極限開關或者 H 點開關。
  - 選擇啟用極限開關的話，遮蔽到極限開關則會停止。包含 Home 點也是。
- 選擇正確的開關極性。
  - Normal Open (NO) 請選擇 Active High。
  - Normal Close (NC) 請選擇 Active Low。
- Index polarity 表示 Encoder Z 的極性。





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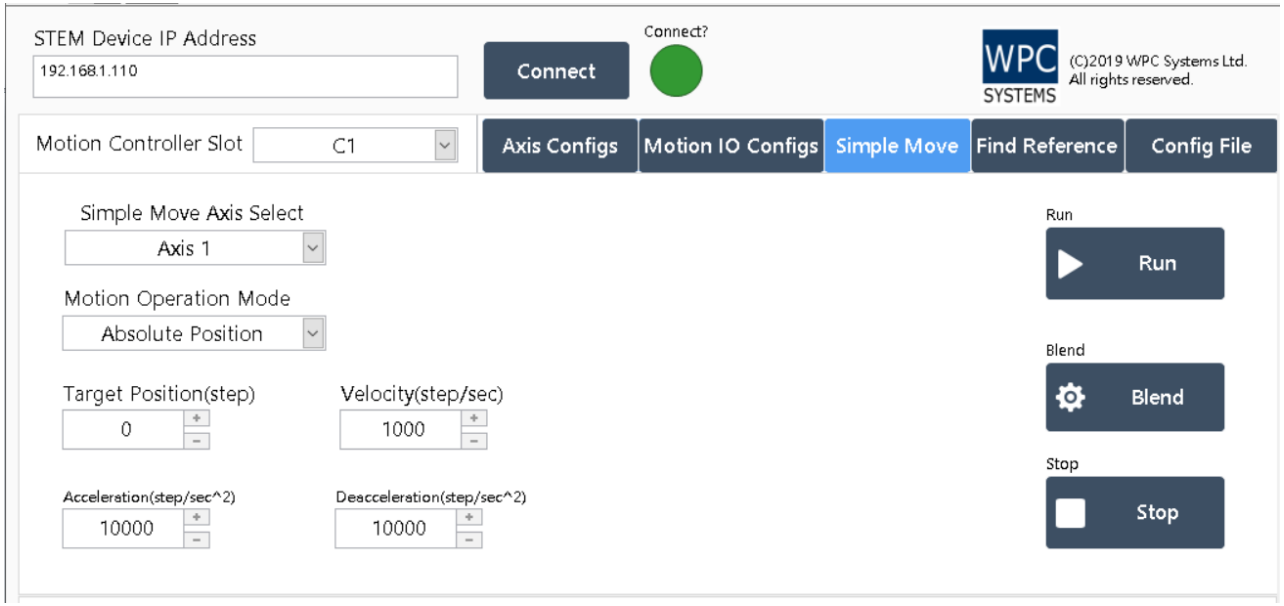
Simple Move (operation)



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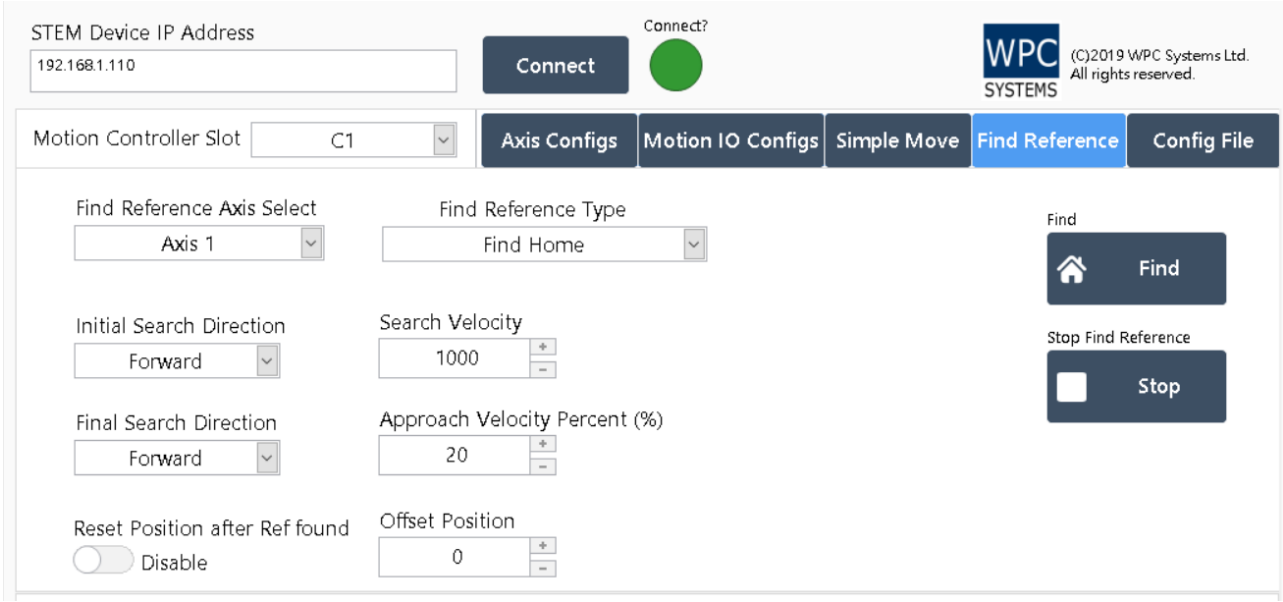
Find reference



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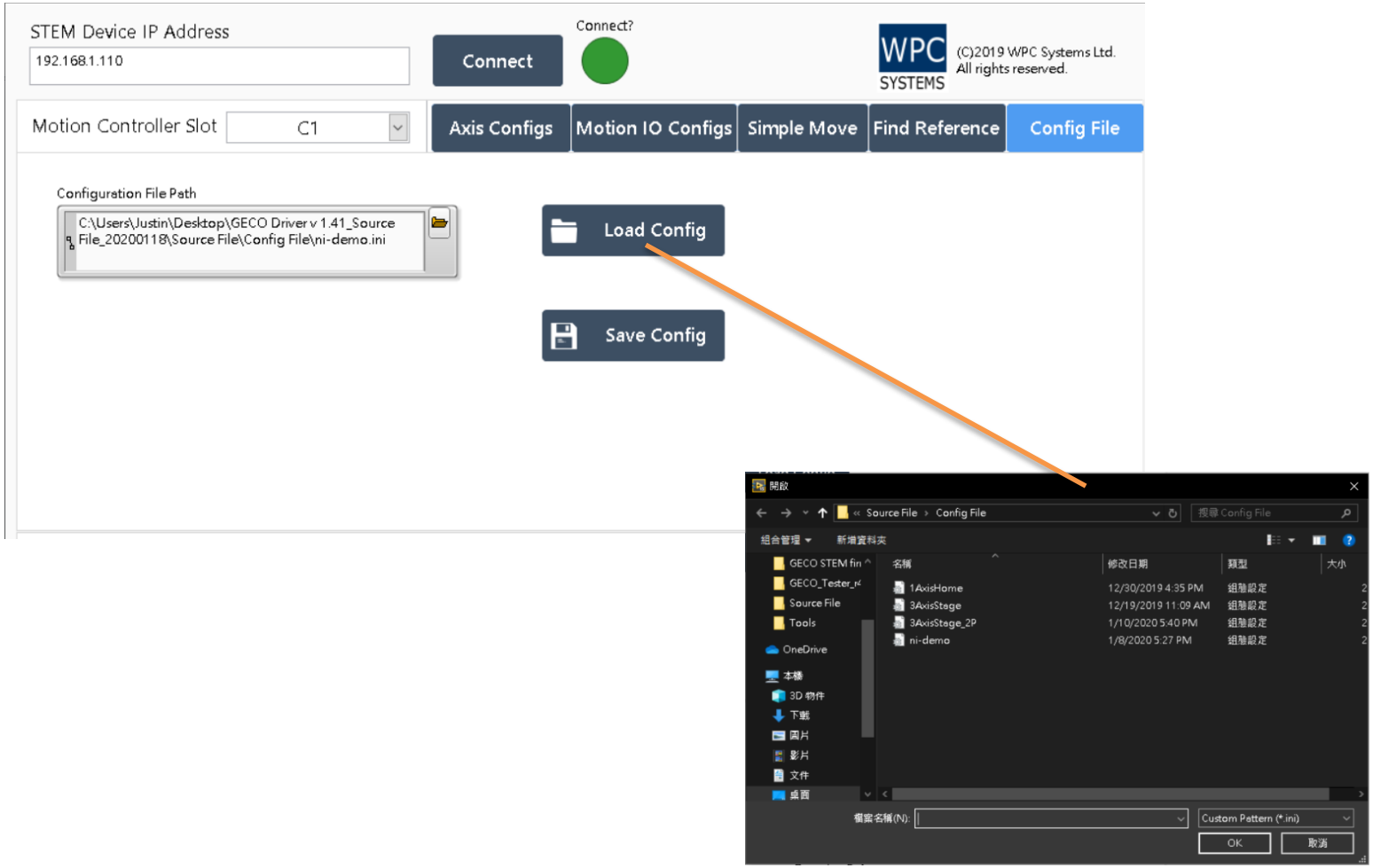
Configuration file



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WPC SYSTEMS

Using GECO driver motion API

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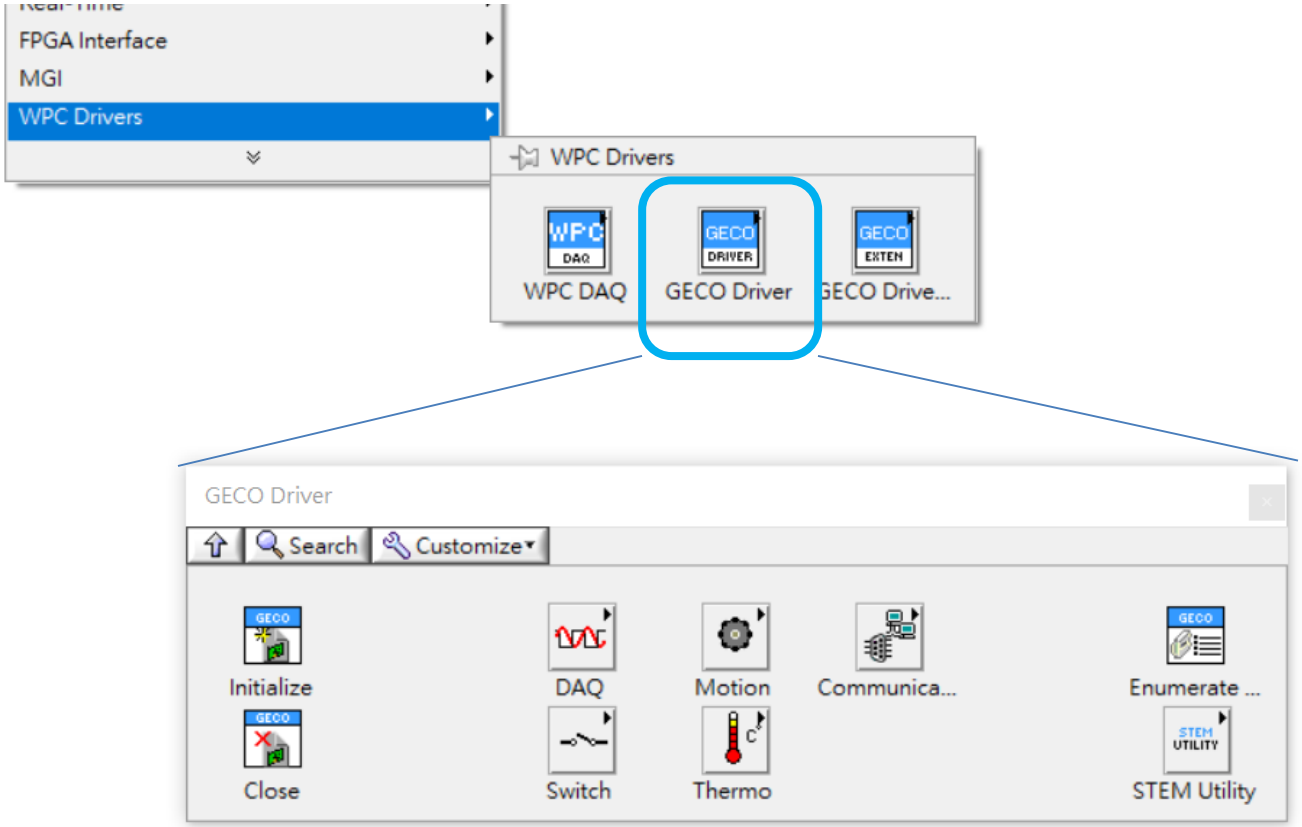
Function palette (block diagram)



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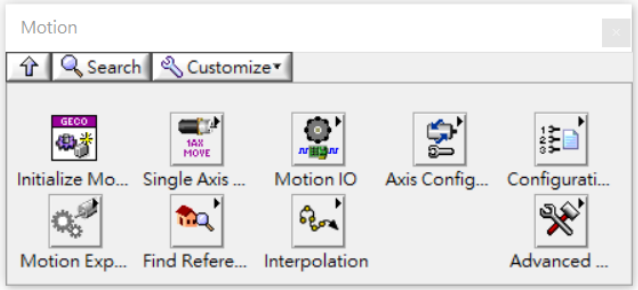
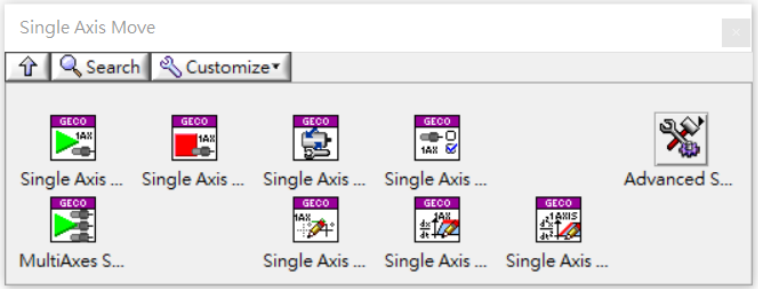
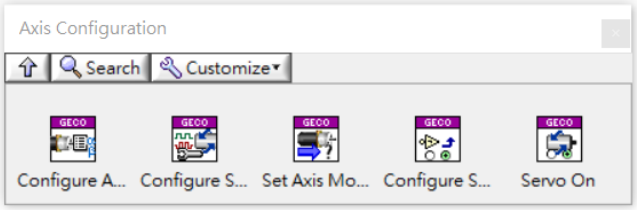
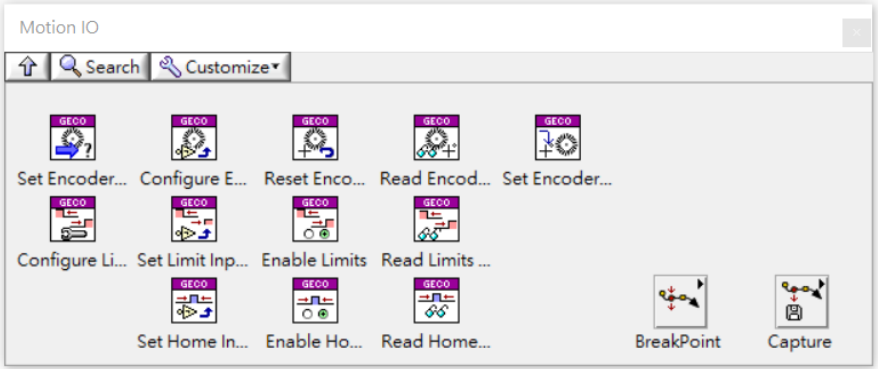
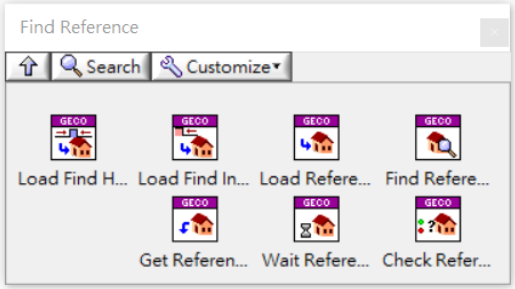
Motion APIs (1)











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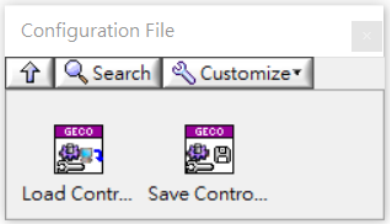
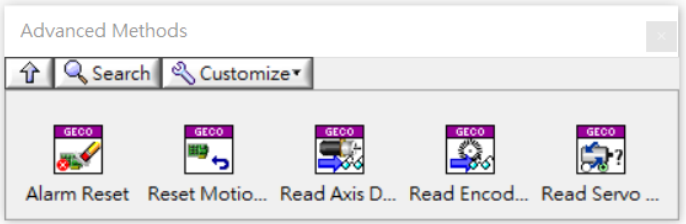
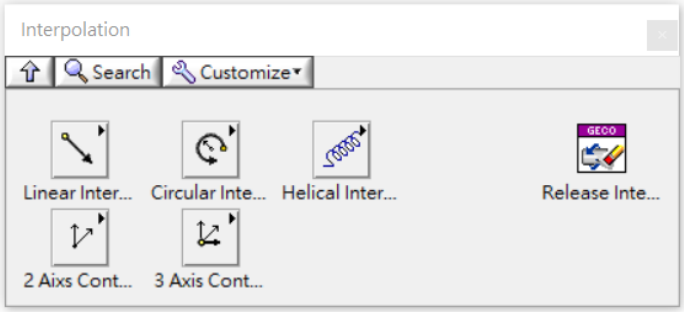
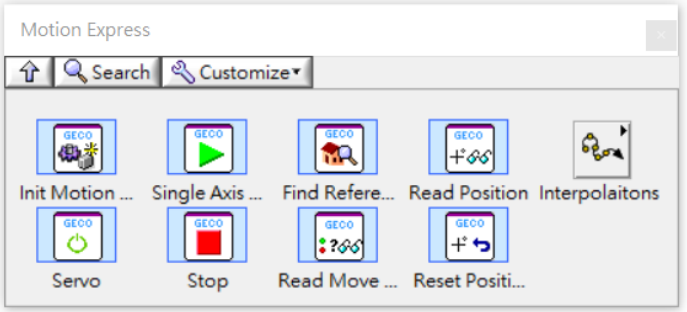
Motion APIs (2)









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Motion example project

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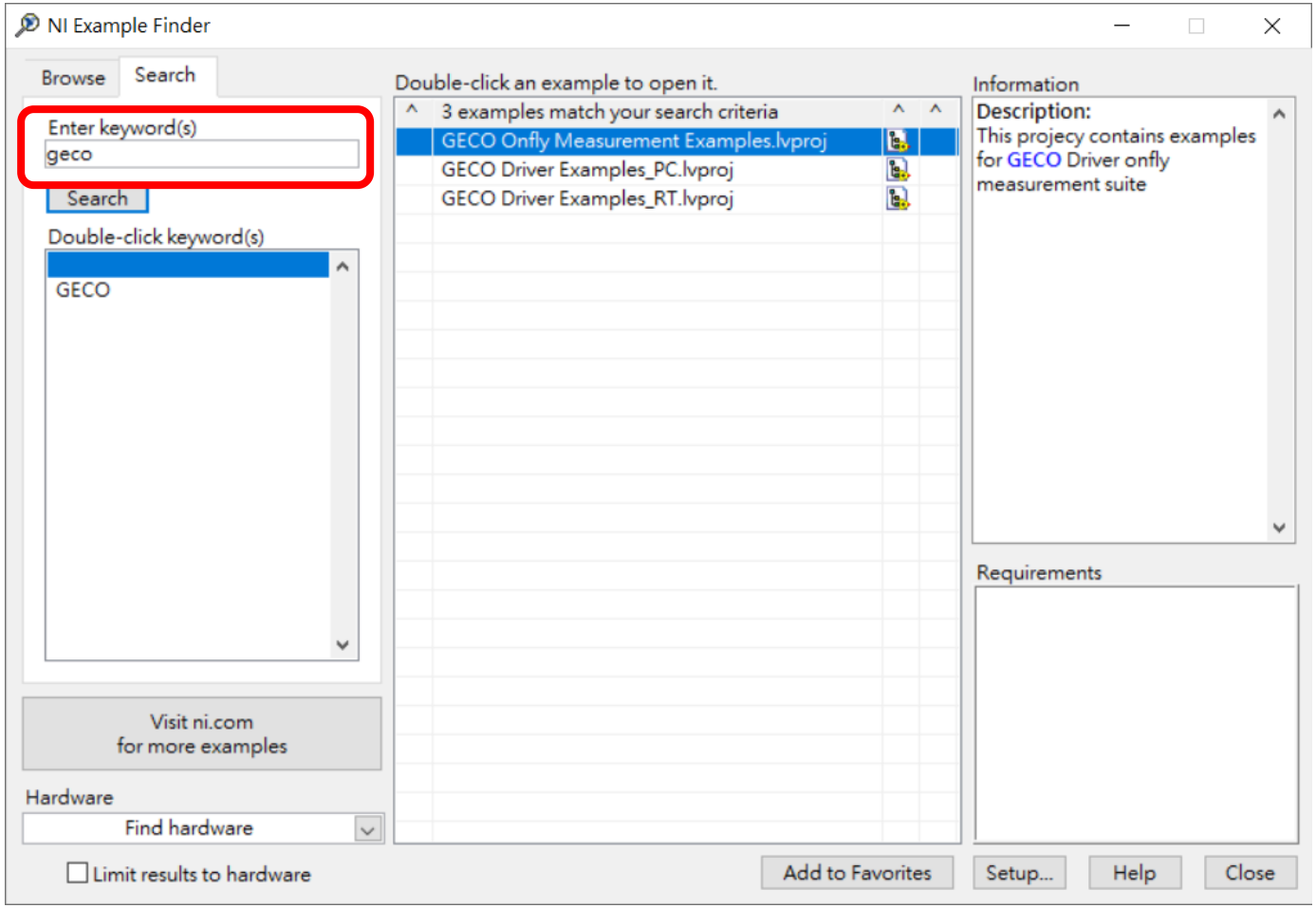
Find example via NI Example finder



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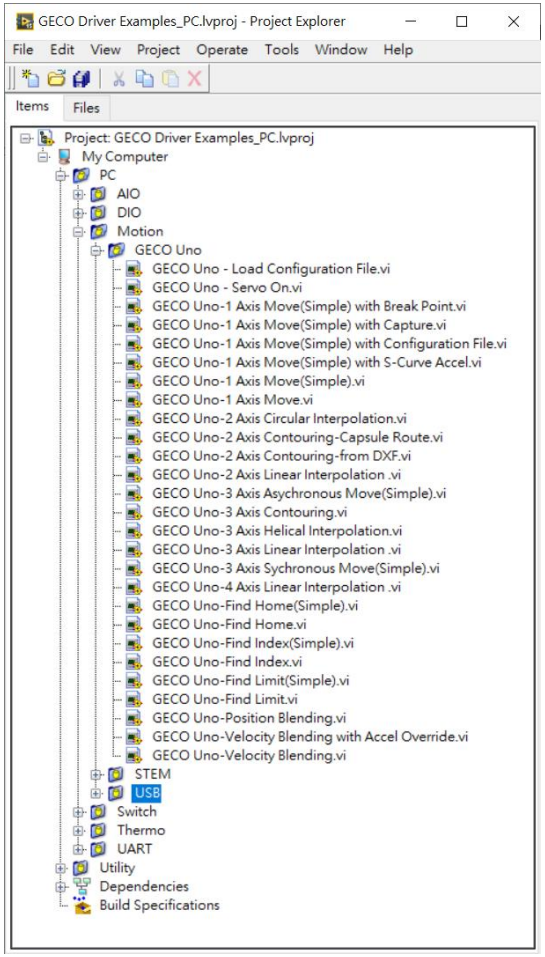
Example project

	GECO UNO	STEM	USB
GECO driver PC	●	●	●
GECO driver RT	●		



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Digital I/O

根目錄	子目錄	控制器	檔名	描述
Example	DIO	GECO STEM	GECO STEM-Digital Channel Write and Read.vi	數位單點 Line 輸出入
			GECO STEM-Digital Port Write and Read.vi	數位多點 Port 輸出入
			GECO STEM-Set and Read Powerup State.vi	數位開機狀態設定
		GECO Uno	GECO Uno-Digital Channel Write and Read.vi	數位單點 Line 輸出入
			GECO Uno-Digital Port Write and Read.vi	數位多點 Port 輸出入
	Utility	GECO STEM	GECO STEM-Set and Get IP Address.vi	設定 IP 及讀取 IP

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Motion (GECO Uno)

根目錄	子目錄	控制器	檔名	描述
Example	Motion	GECO Uno	GECO Uno - Load Configuration File.vi	載入軸卡設定檔
			GECO Uno - Servo On.vi	Servo On 訊號啟動、關閉
			GECO Uno-2 Axis Circular Interpolation.vi	二軸圓弧補間
			GECO Uno-2 Axis Contouring-Capsule Route.vi	二軸軌跡運動
			GECO Uno-2 Axis Linear Interpolation .vi	二軸直線補間
			GECO Uno-3 Axis Asychronous Move(Simple).vi	三軸非同步運動
			GECO Uno-3 Axis Contouring.vi	三軸軌跡運動
			GECO Uno-3 Axis Linear Interpolation .vi	三軸直線補間
			GECO Uno-3 Axis Sychronous Move(Simple).vi	三軸非同步運動（簡易）
			GECO Uno-Find Home(Simple).vi	極限開關 HOME 點復歸（簡易）
			GECO Uno-Find Home.vi	極限開關 HOME 點復歸
			GECO Uno-Find Index(Simple).vi	光學尺 Index 點復歸（簡易）
			GECO Uno-Find Index.vi	光學尺 Index 點復歸
			GECO Uno-Find Limit(Simple).vi	極限開關 FWD/REV復歸（簡易）
			GECO Uno-Find Limit.vi	極限開關 FWD/REV復歸
			GECO Uno-Position Blending.vi	一軸變位置混合運動
			GECO Uno-Single Axis Move(Simple) with Break Point.vi	一軸移動斷點輸出（簡易）
			GECO Uno-Single Axis Move(Simple) with Capture.vi	一軸移動位置擷取（簡易）
			GECO Uno-Single Axis Move(Simple) with Configuration File.vi	一軸運動、載入軸卡設定檔（簡易）
			GECO Uno-Single Axis Move(Simple).vi	一軸運動（簡易）
			GECO Uno-Single Axis Move.vi	一軸運動
			GECO Uno-Velocity Blending.vi	一軸變速度混合運動

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Motion (GECO STEM)

根目錄	子目錄	控制器	檔名	描述
Example	Motion	GECO STEM	GECO STEM-2 Axis Circular Interpolation.vi	二軸圓弧補間
			GECO STEM-2 Axis Contouring-Capsule Route.vi	二軸軌跡運動
			GECO STEM-2 Axis Linear Interpolation .vi	二軸直線補間
			GECO STEM-3 Axis Asychronous Move(Simple).vi	三軸非同步運動（簡易）
			GECO STEM-3 Axis Contouring.vi	三軸軌跡運動
			GECO STEM-3 Axis Linear Interpolation .vi	三軸直線補間
			GECO STEM-Find Home(Simple).vi	極限開關 HOME 點復歸（簡易）
			GECO STEM-Find Index(Simple).vi	光學尺 Index 點復歸（簡易）
			GECO STEM-Find Limit(Simple).vi	極限開關 FWD/REV復歸（簡易）
			GECO STEM-Single Axis Move(Simple) with Configuration File.vi	一軸運動、載入軸卡設定檔（簡易）
			GECO STEM-Single Axis Move(Simple).vi	一軸運動（簡易）
			GECO STEM-Velocity Blending.vi	一軸變速度混合運動

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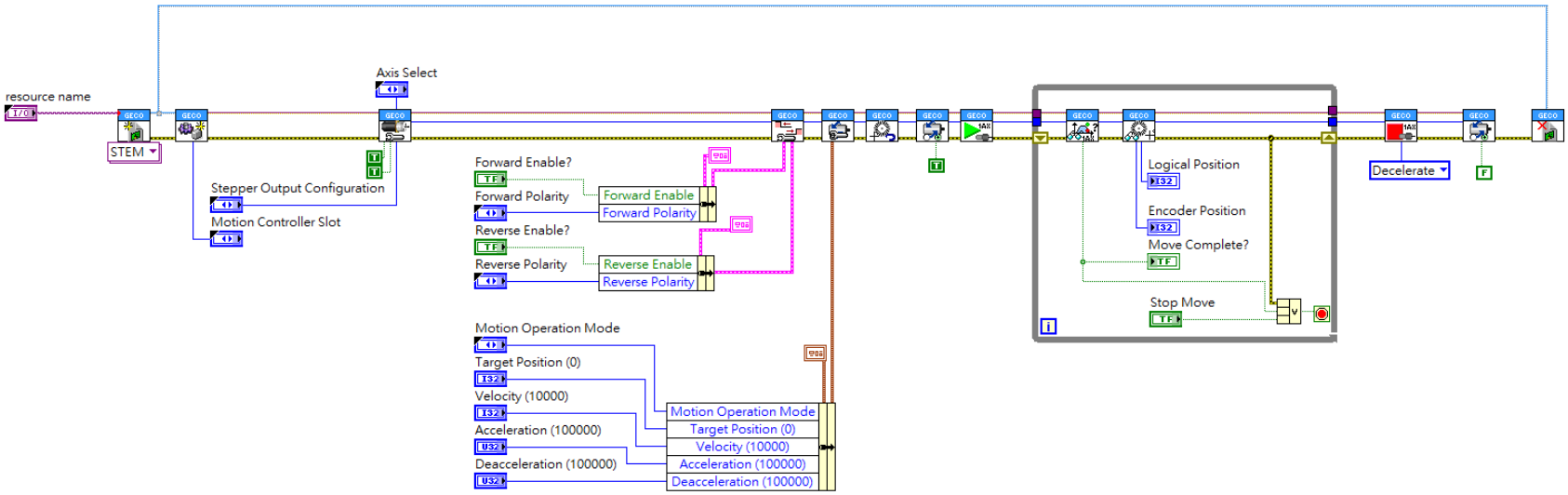
GECO Uno-Single Axis Move(Simple).vi



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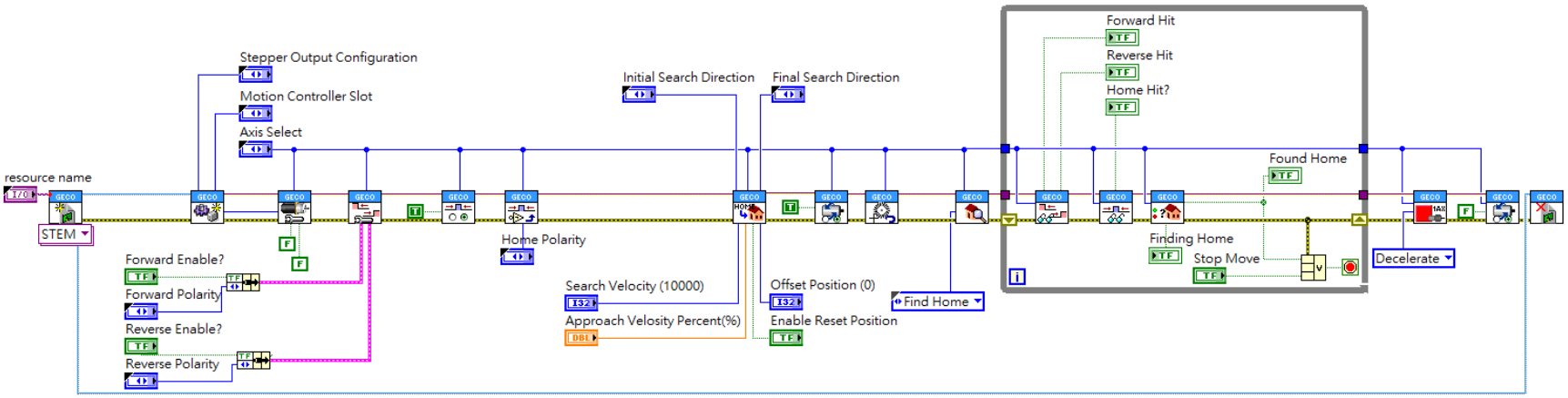
GECO Uno-Find Home(Simple).vi



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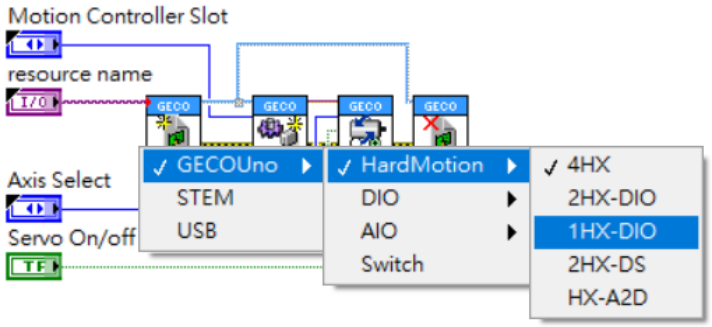
FPGA Personality selection

FPGA Personality Name	Slot1	Slot2	Slot3	Slot4
GECOUno_4HX	Motion	Motion	Motion	Motion
GECOUno_1HXDIO	Motion	DIO	DIO	DIO
GECOUno_1HXA2D	Motion	AIO	DIO	DIO
GECOUno_2HXDIO	Motion	Motion	DIO	DIO
GECOUno_2HXDS	Motion	Motion	DIO	UART
GECOUno_3DIO1AIO	DIO	DIO	DIO	AIO
GECOUno_AllDIO	DIO	DIO	DIO	DIO
GECOUno_AllAIO	AIO	AIO	AIO	AIO
GECOUno_AllSW	Switch	Switch	Switch	Switch
GECOUno_AllThermo	Thermo	Thermo	Thermo	Thermo



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Appendix

Principle of general motion control

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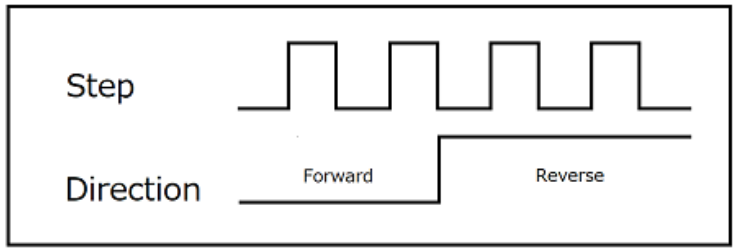
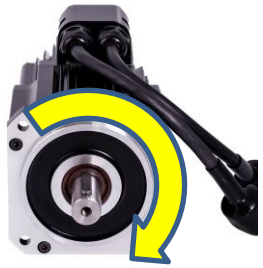
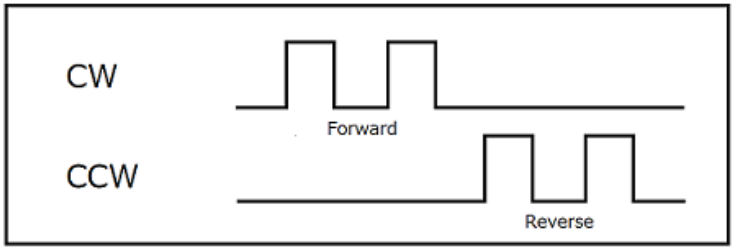
Pulse command signal

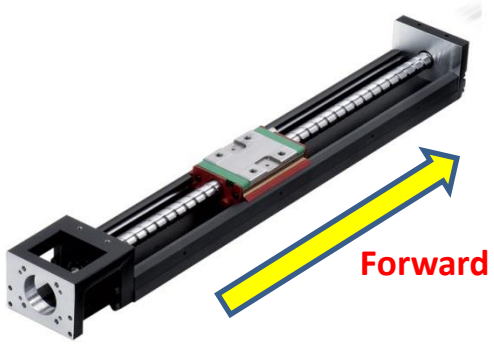


1-pulse mode





2-pulse mode



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單脈波(1P)與雙脈波(2P)

- 一般來說定位控制最常見的選擇就是步進馬達或伺服馬達。
- 控制馬達前進、後退最主要的訊號就是 step, direction 或者 clockwise(CW), counterclockwise(CCW)。
- 早期微處理器硬體資源有限，因此脈波產生功能相對珍貴，因此控制馬達多用單脈波，一個通道的 DO 負責輸出脈波，另外一個通道則是輸出 High / Low 來決定方向。
- 後來隨著硬體發展進步，越來越多人使用雙脈波控制，CW 控制順時針旋轉或前進，CCW 控制逆時針旋轉或者後退。
- 單脈波或雙脈波的選擇上面在實際應用上，可以從斷線時狀態來去看：
- 單脈波如果斷線的是 dir 訊號，則可能接收前進、後退指令時，都只會往同一個方向前進，有可能會造成撞機的危險。相反的 step 訊號如果斷線，則馬達完全不會動作。
- 雙脈波不管斷得是哪個通道，都會發生只有一個方向會動作的情況，但不至於會發生前進、後退命令時，結果都是加到同一個方向上面的情況。

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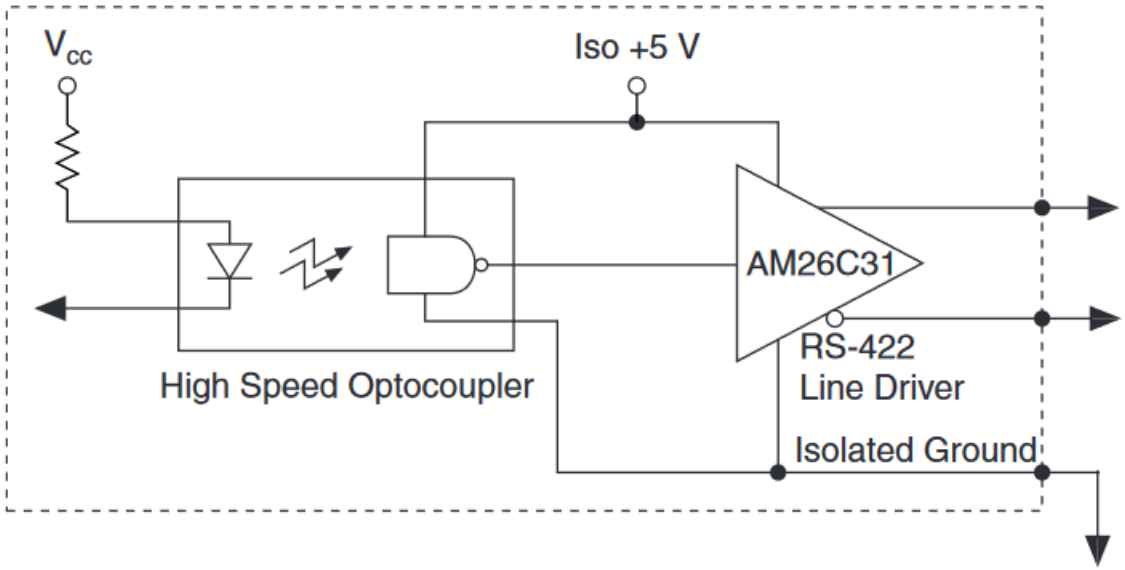
Pulse train diff. output



Step+ / Dir+ or CW+ /CCW+

Step- / Dir- or CCW- /CCW-

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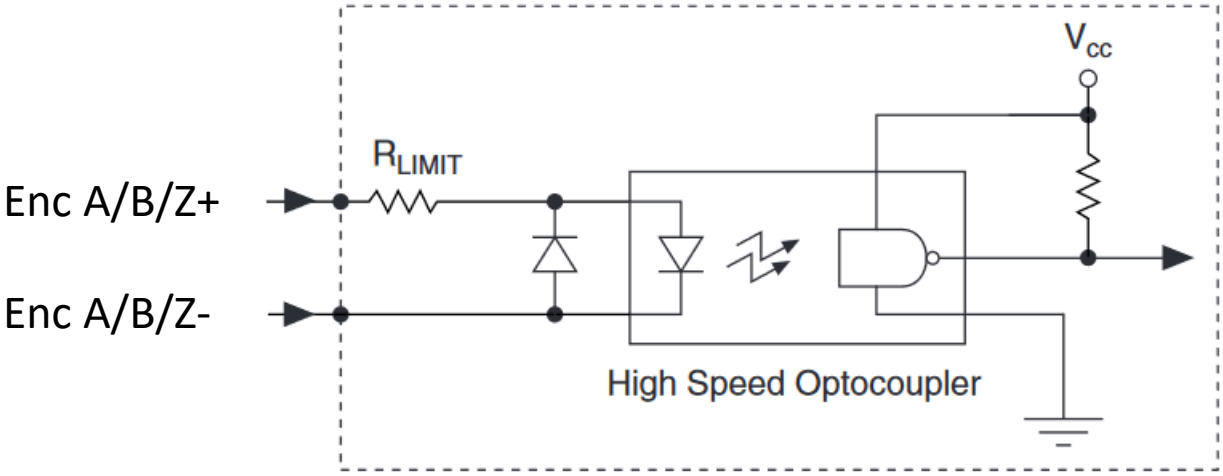
Encoder diff. input



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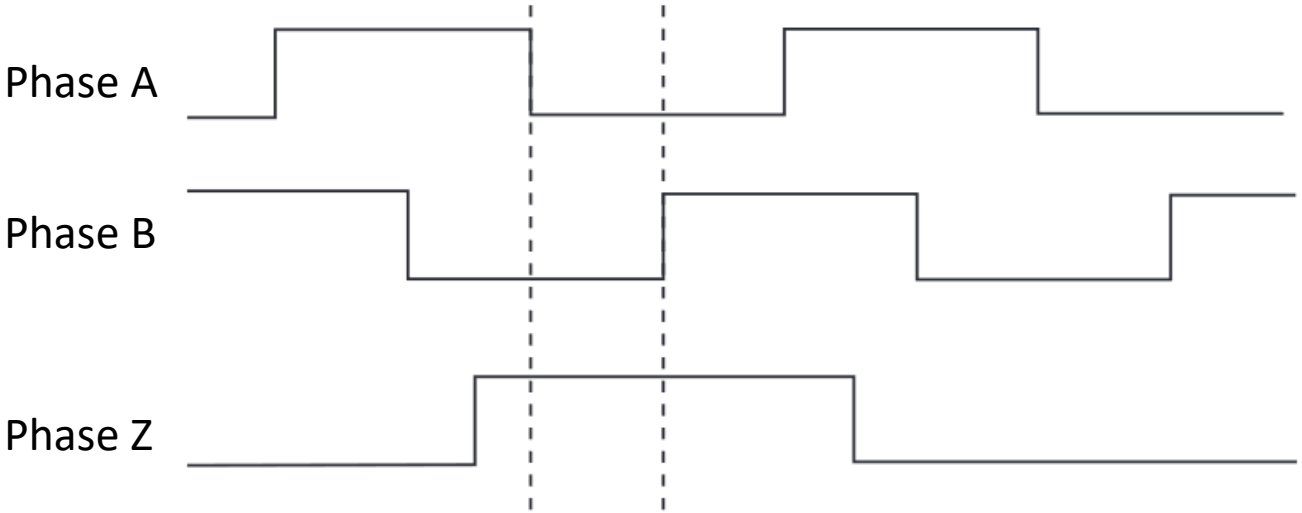
Encoder selection

- *Incremental encoder*
- *Line driver output*



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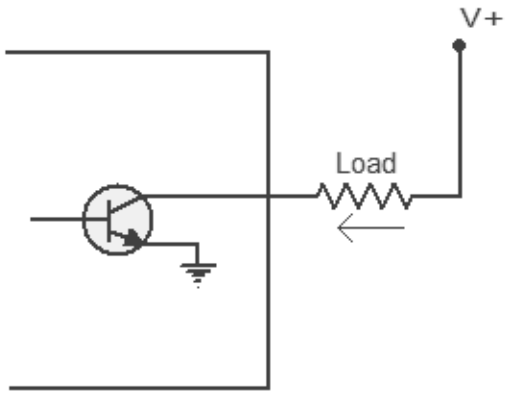
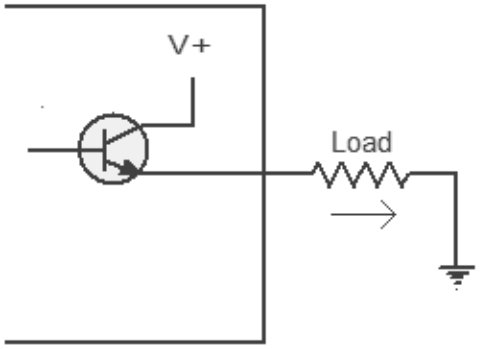
Servo on/Alarm clear signal



Sinking output



Sourcing output

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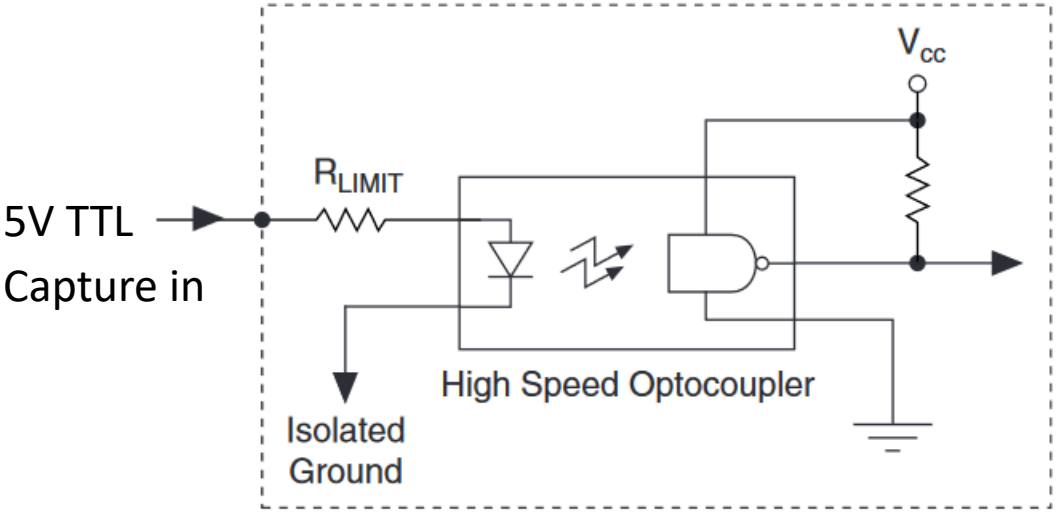
Capture signal



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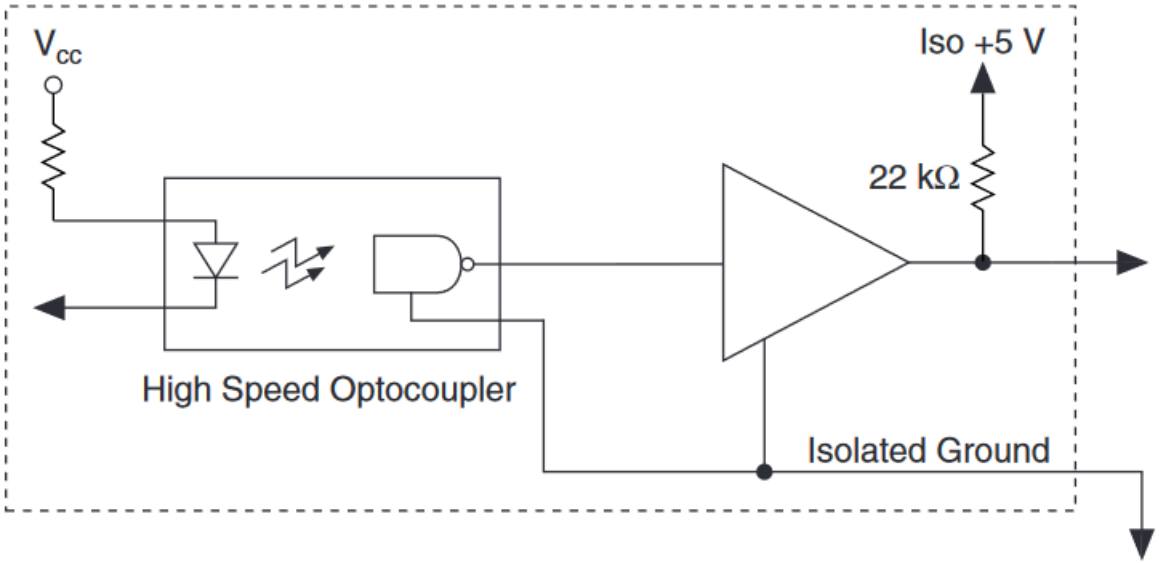
Break-point signal



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Sinking/sourcing explanation

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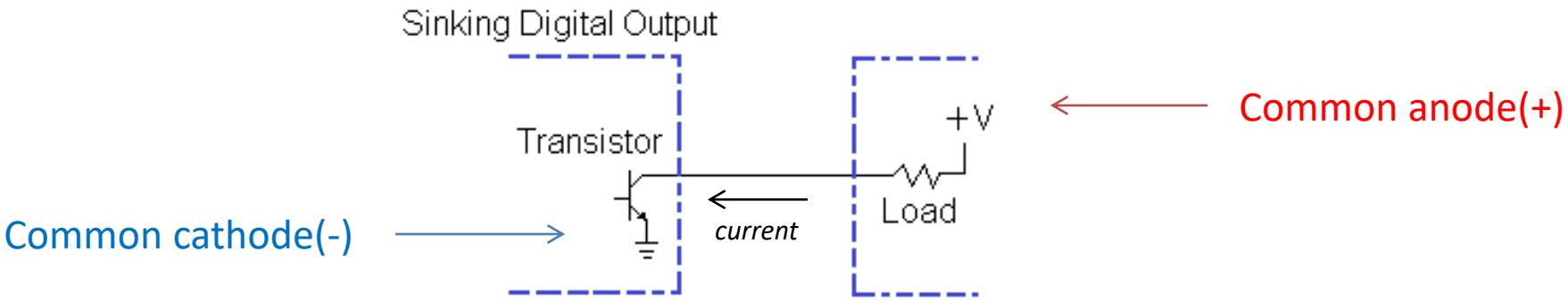
Sinking output – sourcing input (NPN)



Sinking output 意思就是輸出 port 的電流方向是屬於吸入式的（sinking）。
Sinking output 搭配 sourcing input 是屬於一種台灣最常見的訊號格式。
常在日系、日規設備上面看到，在台灣大概佔比 80% 以上。
俗稱NPN、輸出“地”，或者輸出 0 伏。輸出本身是不帶電的，因此 DO_COM 點都是共地。相反的，從輸入方面來看，DI_COM 就必須共陽極（24V）
輸出、輸入相連接時才能構成一個完整迴路。

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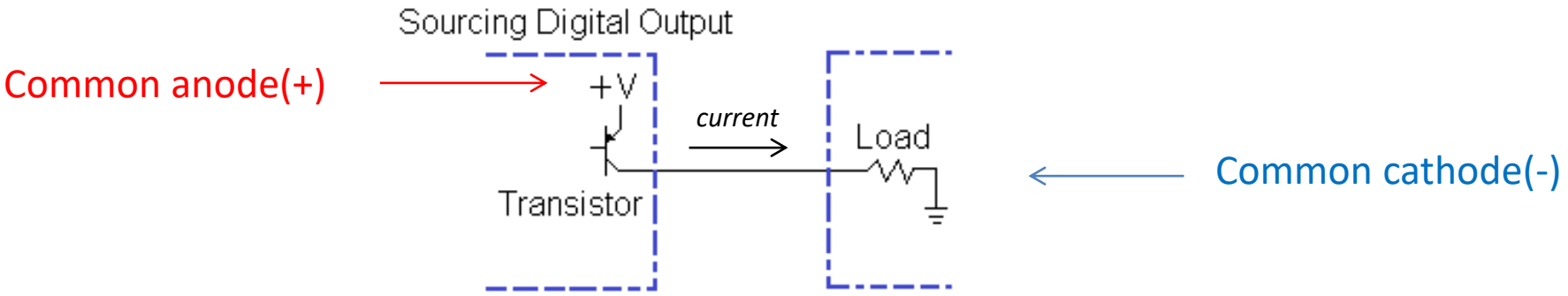
Sourcing output – sinking input (PNP)



sourcing output 意思就是輸出 port 的電流方向是屬於流出式的（sourcing）。
Sourcing output 搭配 sinking input 是屬於一種歐洲最常見的訊號格式。
常在歐系、歐規、俄規設備上面看到，在台灣大概佔比 20% 以下。
俗稱PNP、輸出“正電”，或者輸出 24 伏。輸出本身帶有 24V 正電，因此 DO_COM 點都是共陽。相反的，從輸入方面來看，DI_COM 就必須共陰極（0V）
輸出、輸入相連接時才能構成一個完整迴路。

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FAQ

- 接線完成後馬達不會動怎麼辦？
  - 軸卡需要供應 24V 電源，請先用電表確認電源供應是否正常？
  - 驅動器需要設定的部分主要包含
    - 透過驅動器面板操作或原廠工具軟體設定(通常是USB)
    - 模式：位置控制(Position control mode)
    - 訊號：單脈波(Step/dir or 1P)或雙脈波(CW/CCW, 2P)
    - 脈波極性：選擇正脈波(positive pulse)
    - 腳位選擇：選擇高速差動脈波輸入(High-speed line driver input)
    - 非開集極 (open-collector) 輸入，低速脈波輸入通常接收速度都小於 400kpps。
    - 馬達參數完成設定並儲存後，必須斷電重啟。

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