

# Motion Creator Pro 2

## 使用手冊 (繁體中文)

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# 前言

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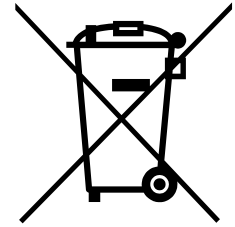
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### 修訂記錄

修訂	發佈日期	變更說明
0.1	2022-12-30	Preliminary release
0.2	2023-03-01	2 <sup>nd</sup> edition for technical writer

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# 1 概述

ADLINK 為運動控制卡提供一個視覺化的使用者介面軟體 Motion Creator Pro 2，讓使用者可快速、方便的操作 ADLINK 各類運動控制卡。Motion Creator Pro 2 簡稱 MCP2，所支援的運動控制功能有單軸運動、軸參數設定、補間、監控、回 Home...等頁面，將依不同卡片所能支援的功能呈現，本章節將主要以 PCIe-8338 所支援的功能做介紹。

## 注意事項

MCP2 軟體的執行路徑為：開始->程式集->ADLINK->ADLINK APS-SDK Utility-> Motion Creator Pro 2，點選即可開啟 MCP2。另外本軟體之畫面尺寸是以 1920X1080 設計，請盡量使用大於此尺寸的解析度，以得到最佳的顯示效果。

## 1.1 主畫面(Main Form)

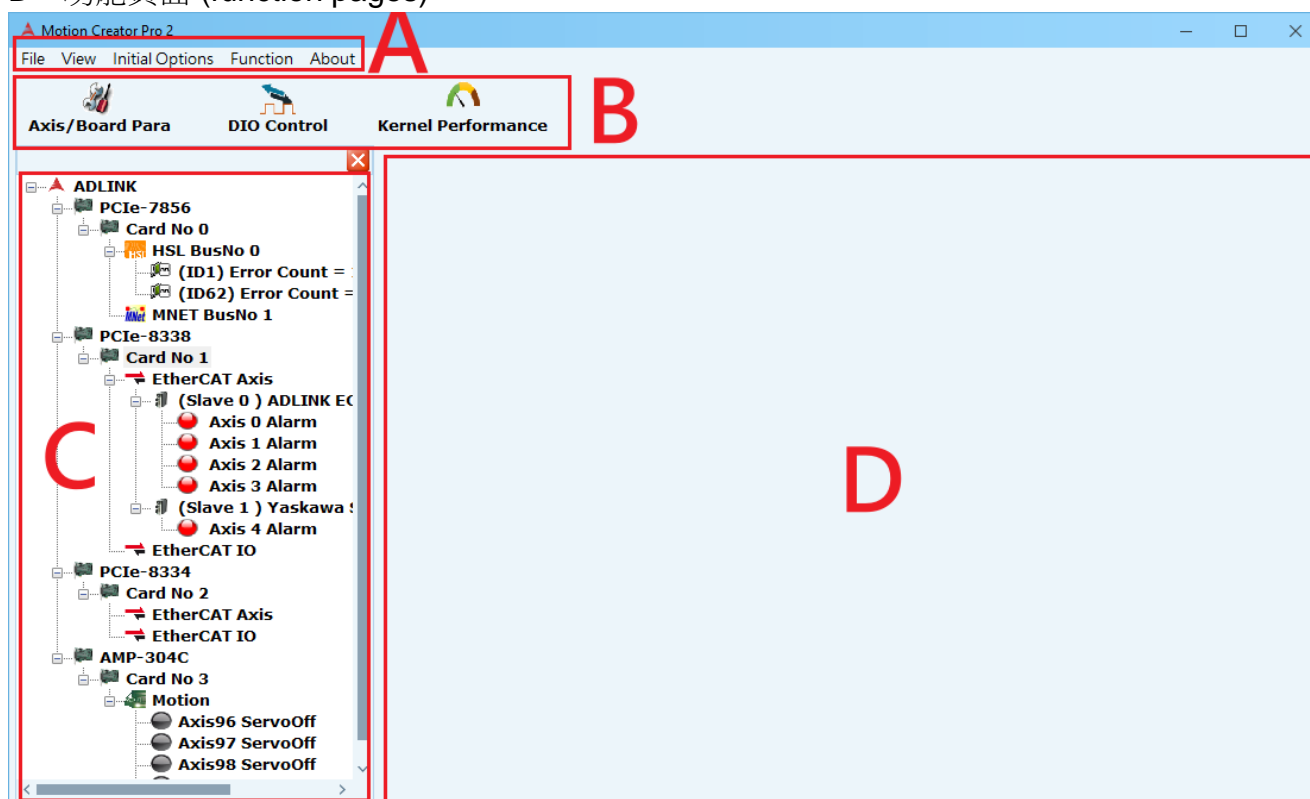
MCP2 軟體執行後會出現如下畫面，總共可分為 4 大區塊。

A：功能表 (Menu)

B：快速為多軸運動控制、取樣和設定參數等功能 (icon bar)

C：裝置樹狀圖 (Device tree)

D：功能頁面 (function pages)



## 1.2 功能表((Menu))

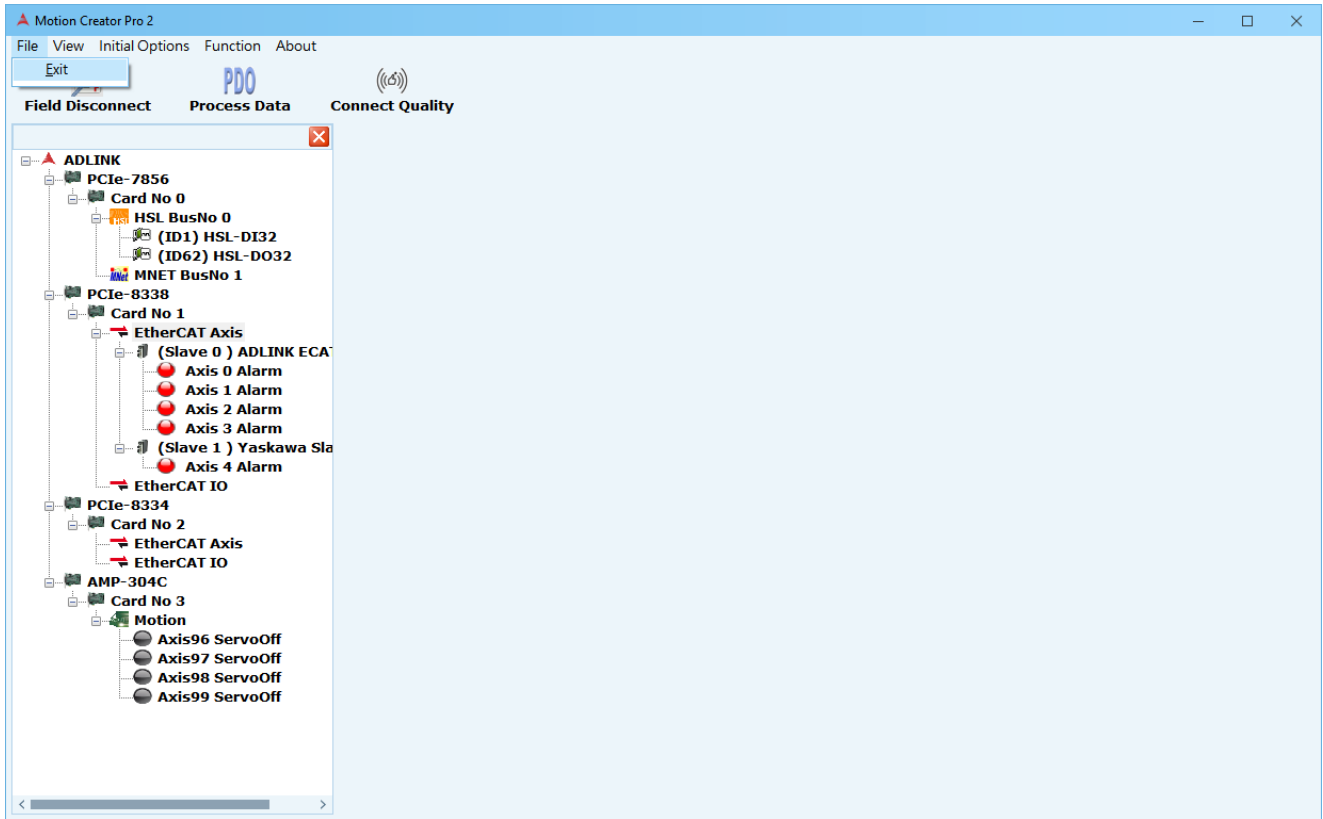
功能表內容包含下列五項:File (檔案)、View (檢視)、Initial\_Options (初始化設定)、Function (功能)、About (關於)。

**注意：**MCP2 開啟後，必須在裝置樹狀圖上點選 Card No 後 Function(功能)選項方能顯示。

以下為功能表展開之所有功能

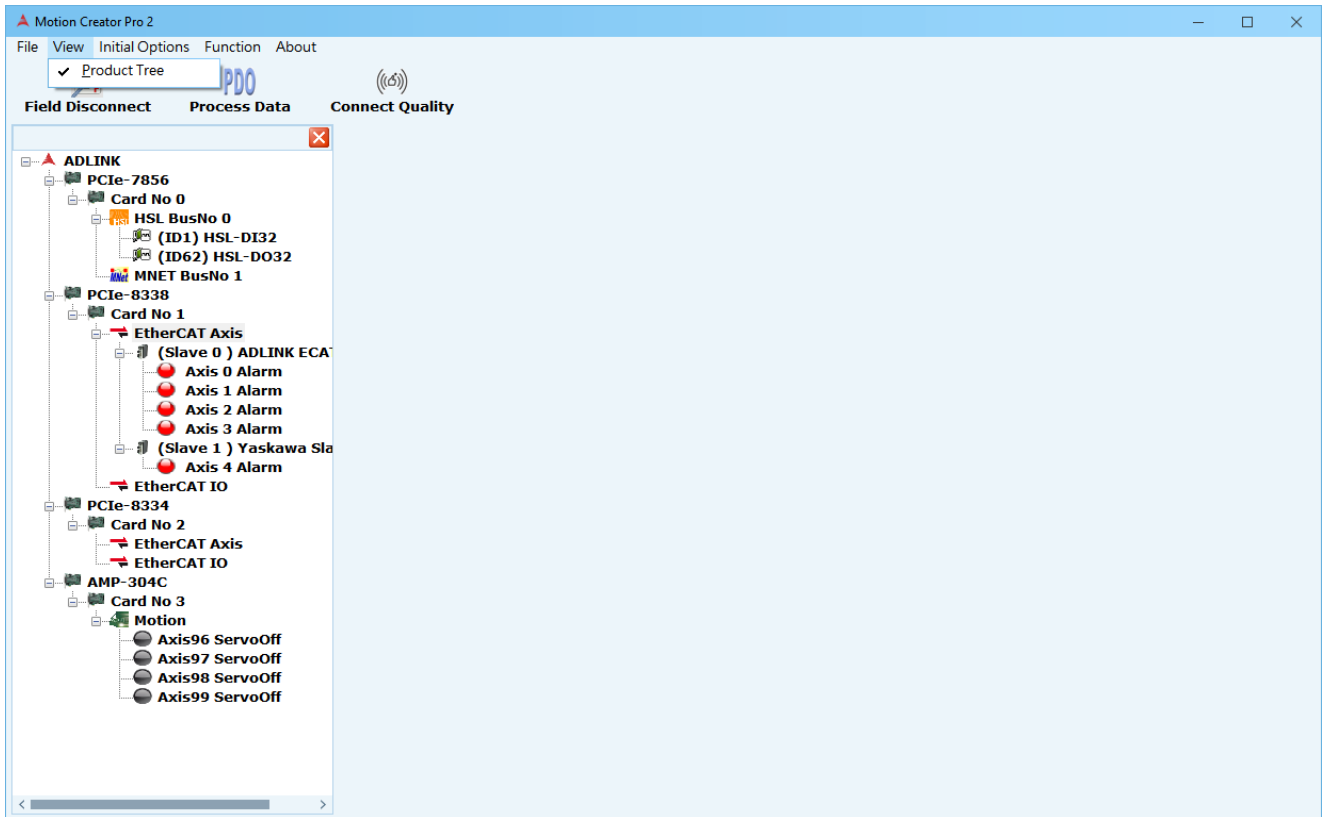
### 1.2.1 File->Exit

可關閉 MCP2



## 1.2.2 View->Project Tree

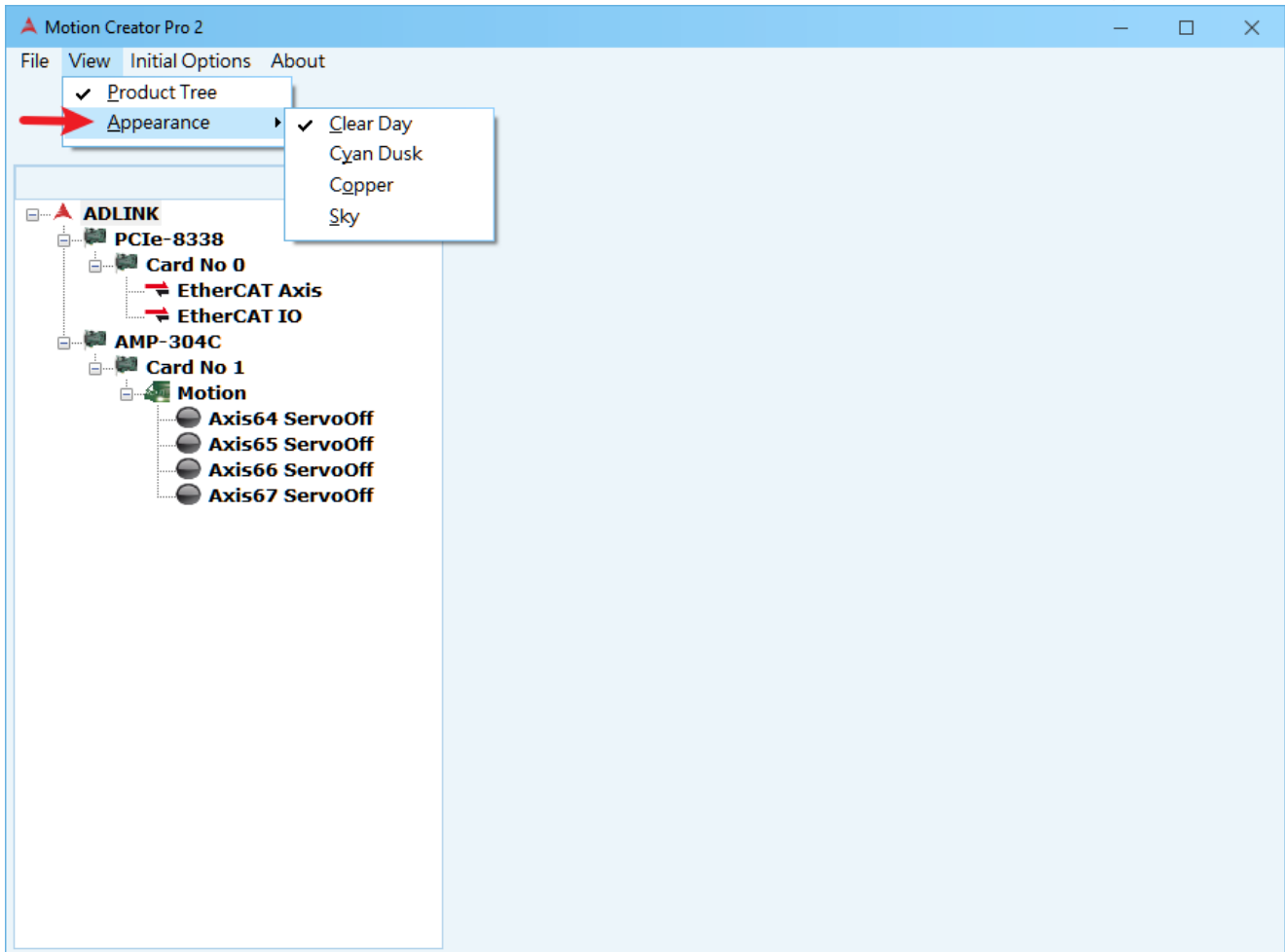
用來打開/關閉 裝置樹狀圖





### 1.2.3 View ->Appearance

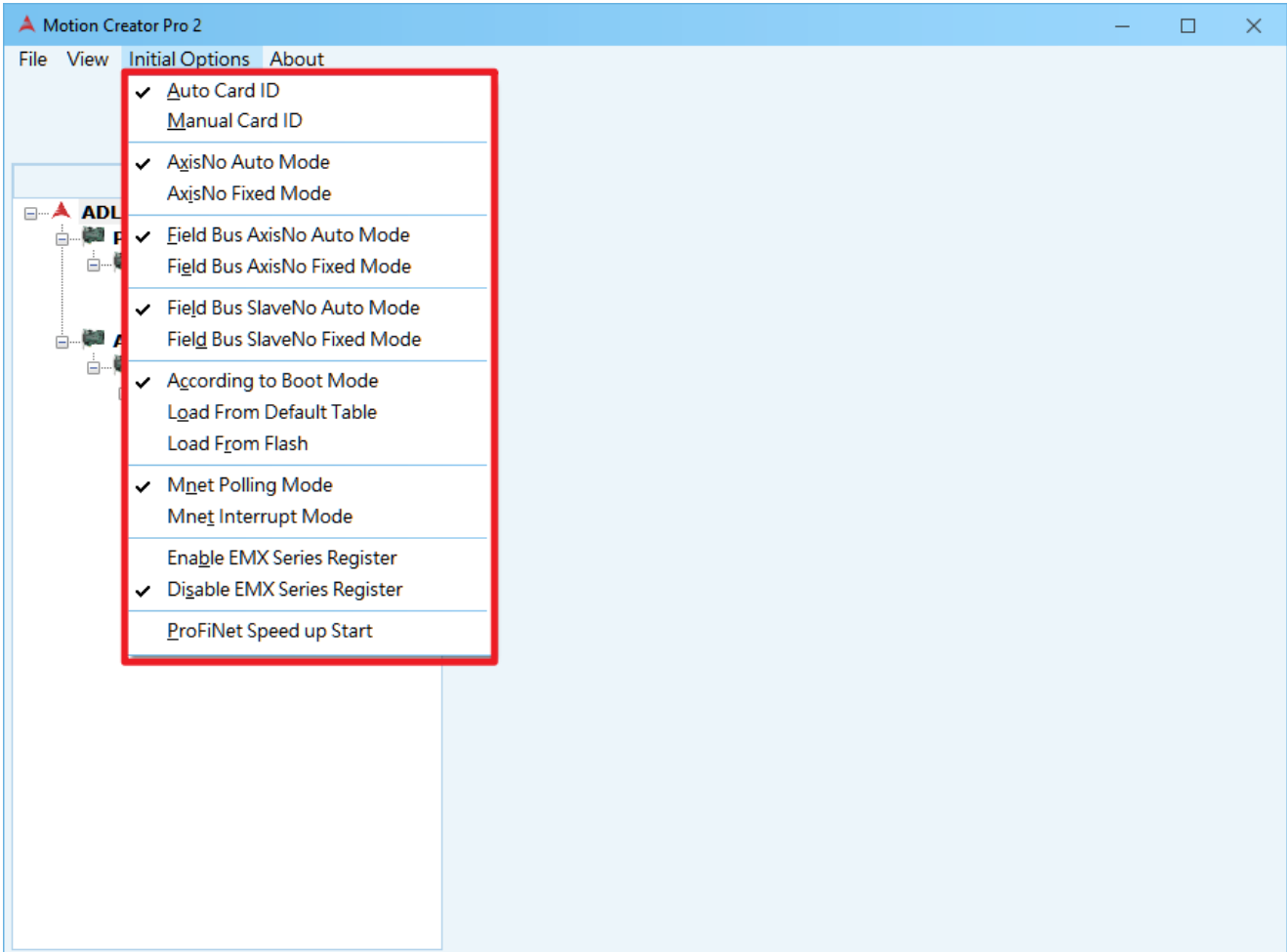
用來改變 MCP2 外觀使用，此選單中的設定一旦更動，需重新開啟 MCP2 方能完成變更。



## 1.2.4 Initial Options->xxx Mode

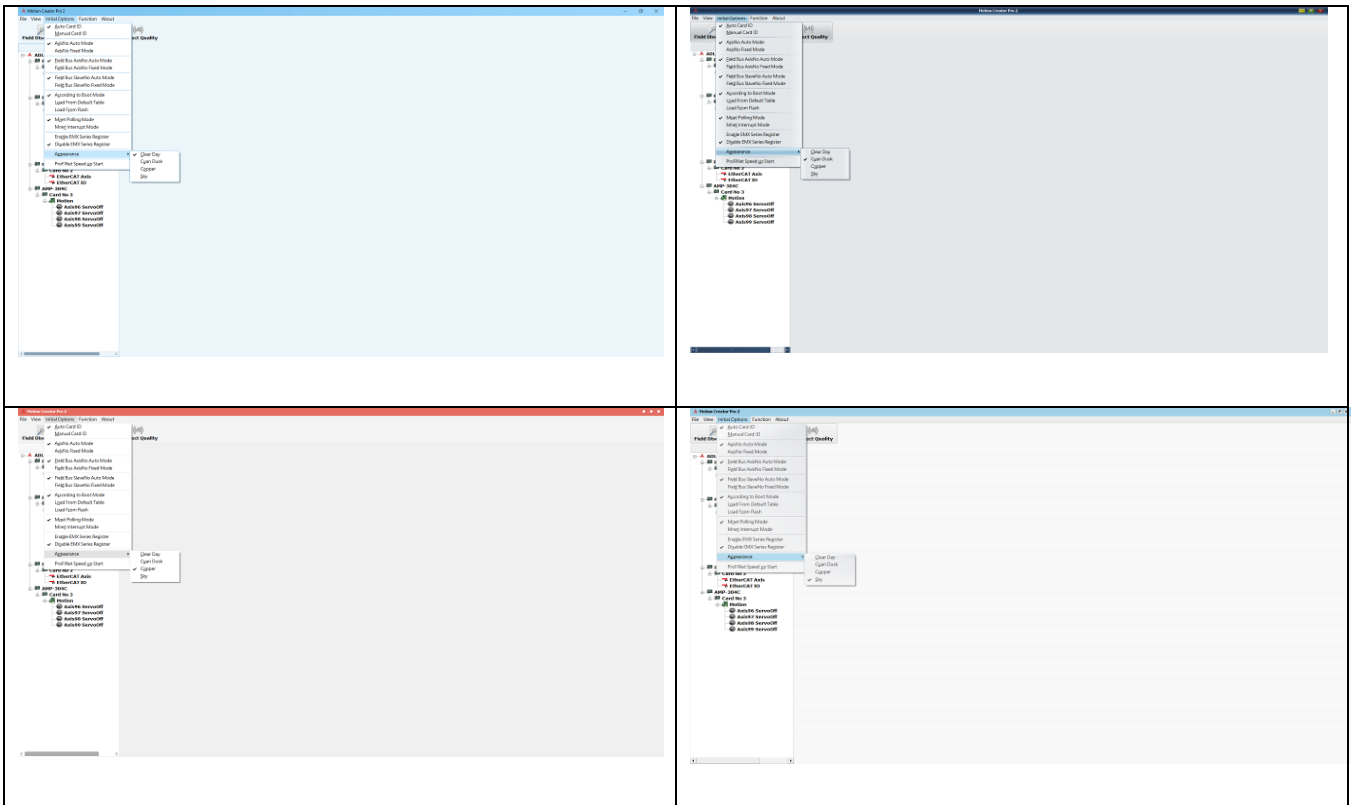
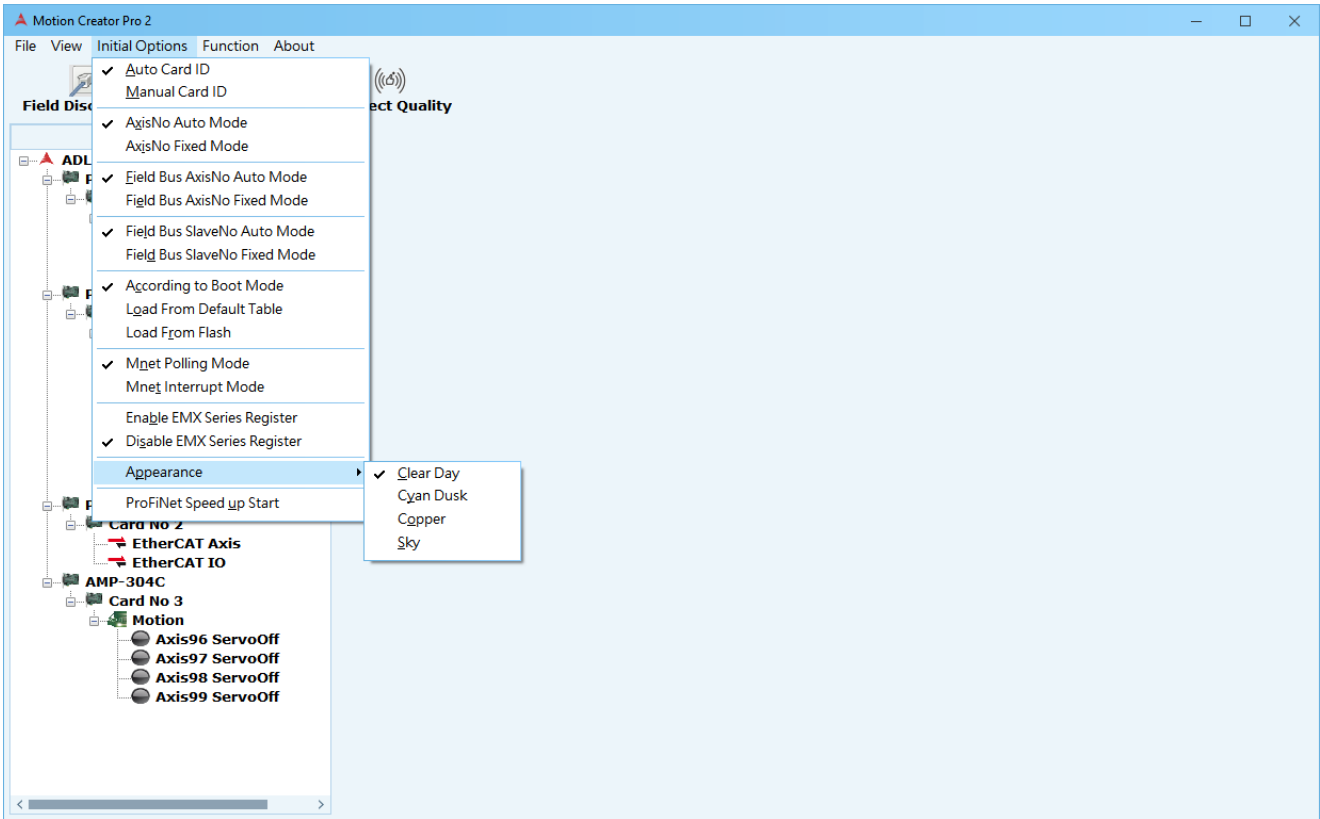
控制卡初始化選項，此選單中的設定一旦更動，需重新開啟 **MCP2** 方能完成變更。

此處部分參數對應 APS\_initial( I32 \*BoardID\_InBits , I32 Mode )，細節可參考 APS function library 手冊。



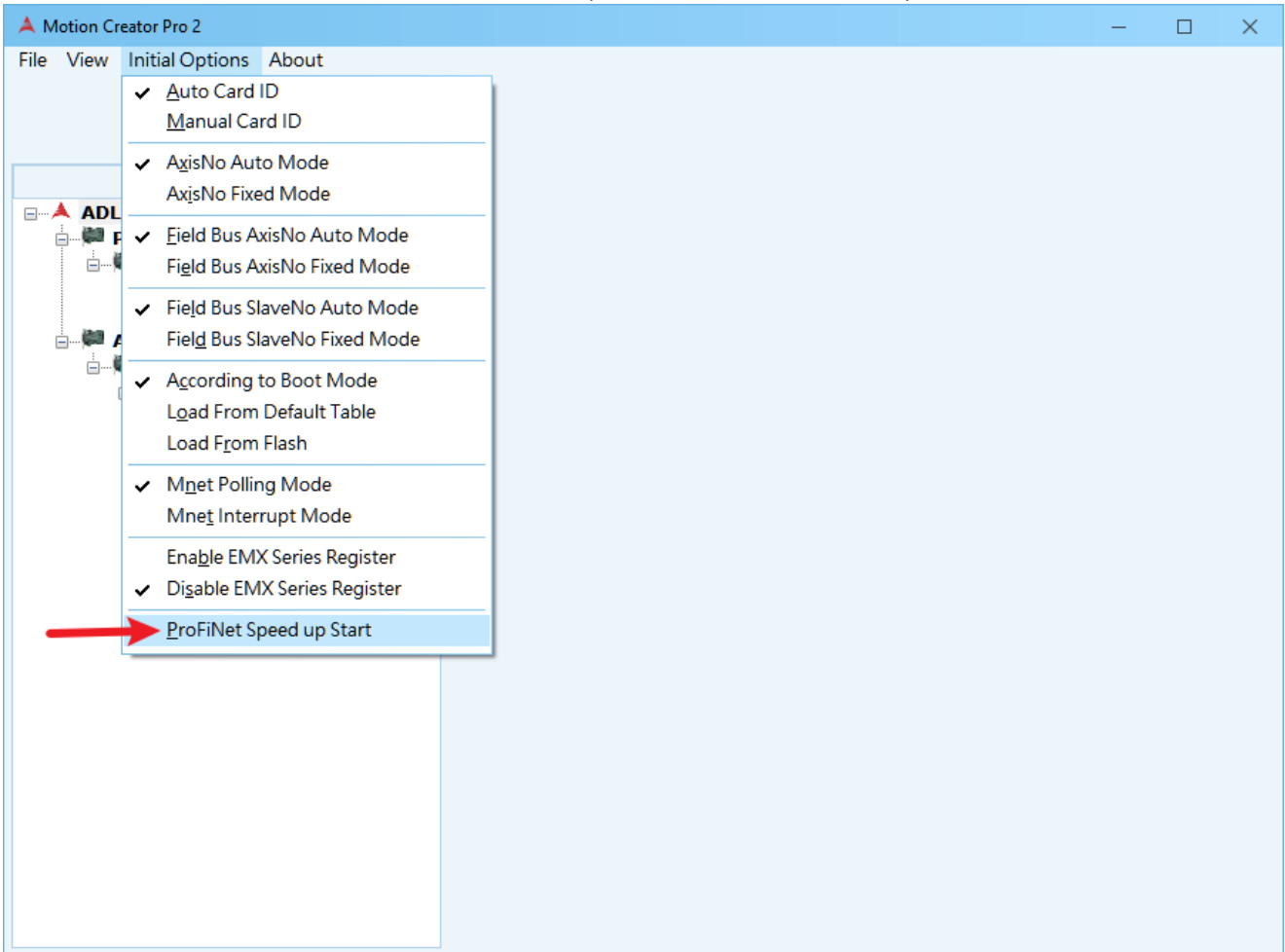
## 1.2.5 Initial Options->Appearance

用來改變 MCP2 外觀使用，此選單中的設定一旦更動，需重新開啟 MCP2 方能完成變更。



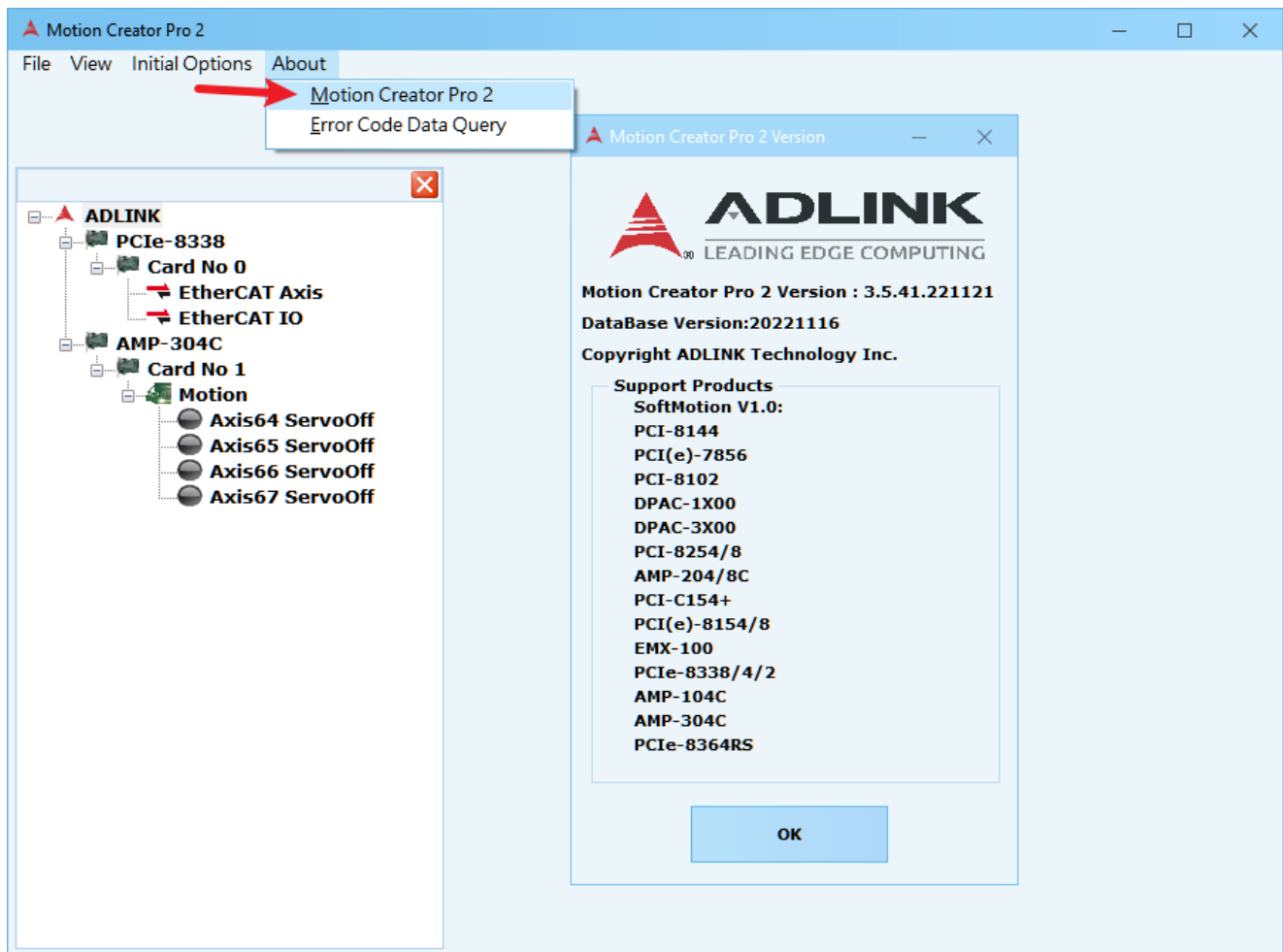
## 1.2.6 Initial Options->ProFiNetSpeed up Start

用來快速啟動 PCIe-8364RS 的 Slave 連線(用於初始連線後的啟動)



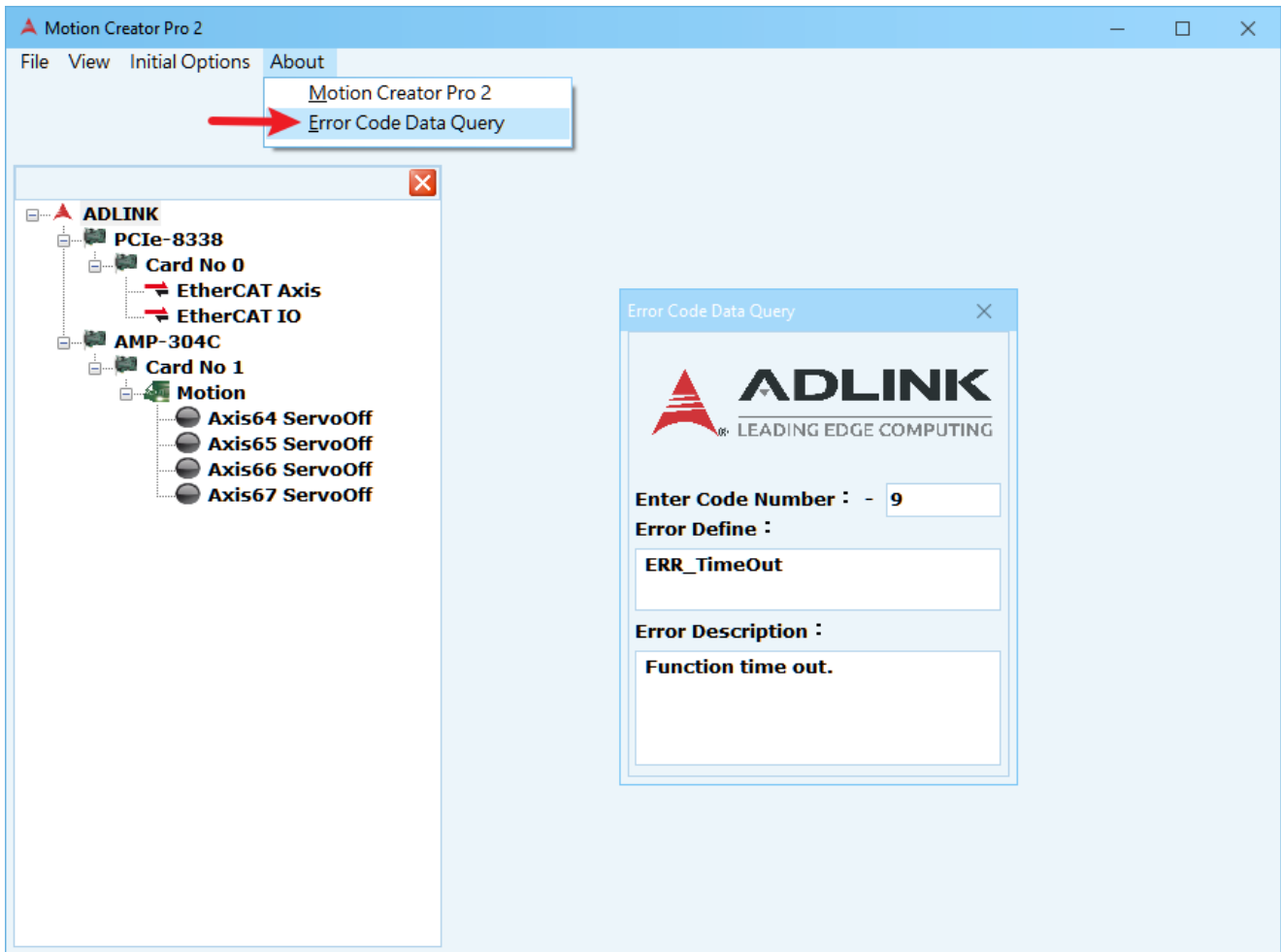
### 1.2.7 About->Motion Creator Pro 2

可打開版本資訊頁面，亦提供支援的硬體型號。



## 1.2.8 About->Error Code Data Query

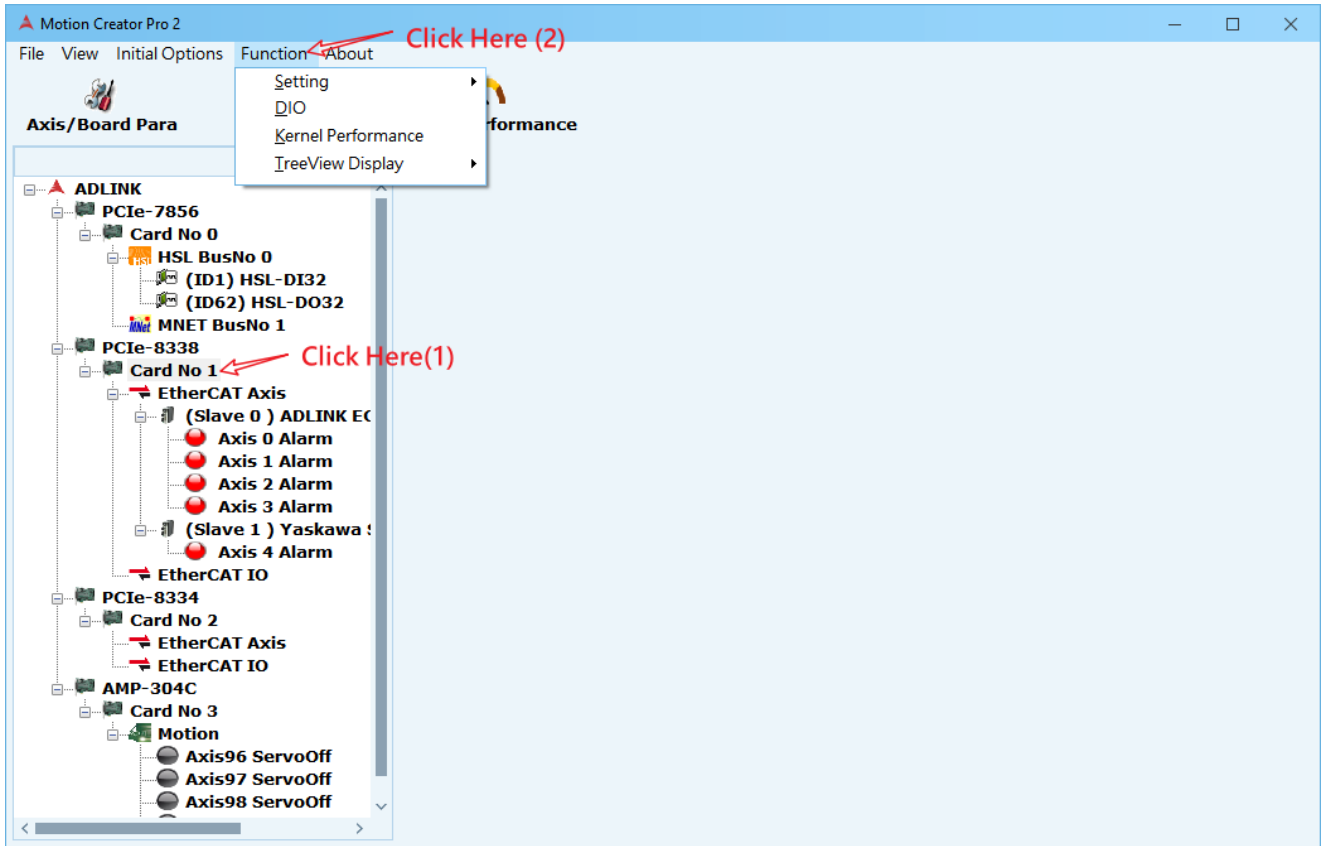
查詢 error code 的定義。



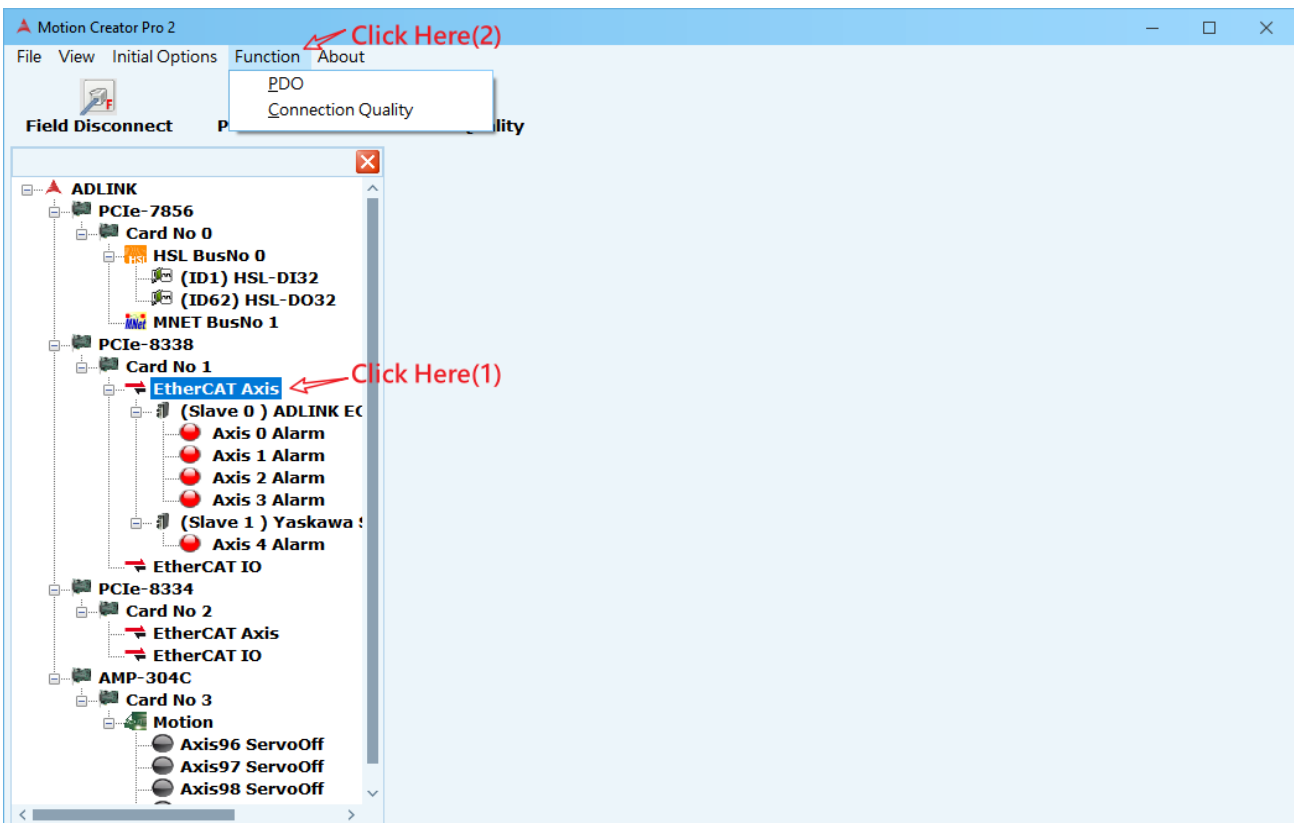
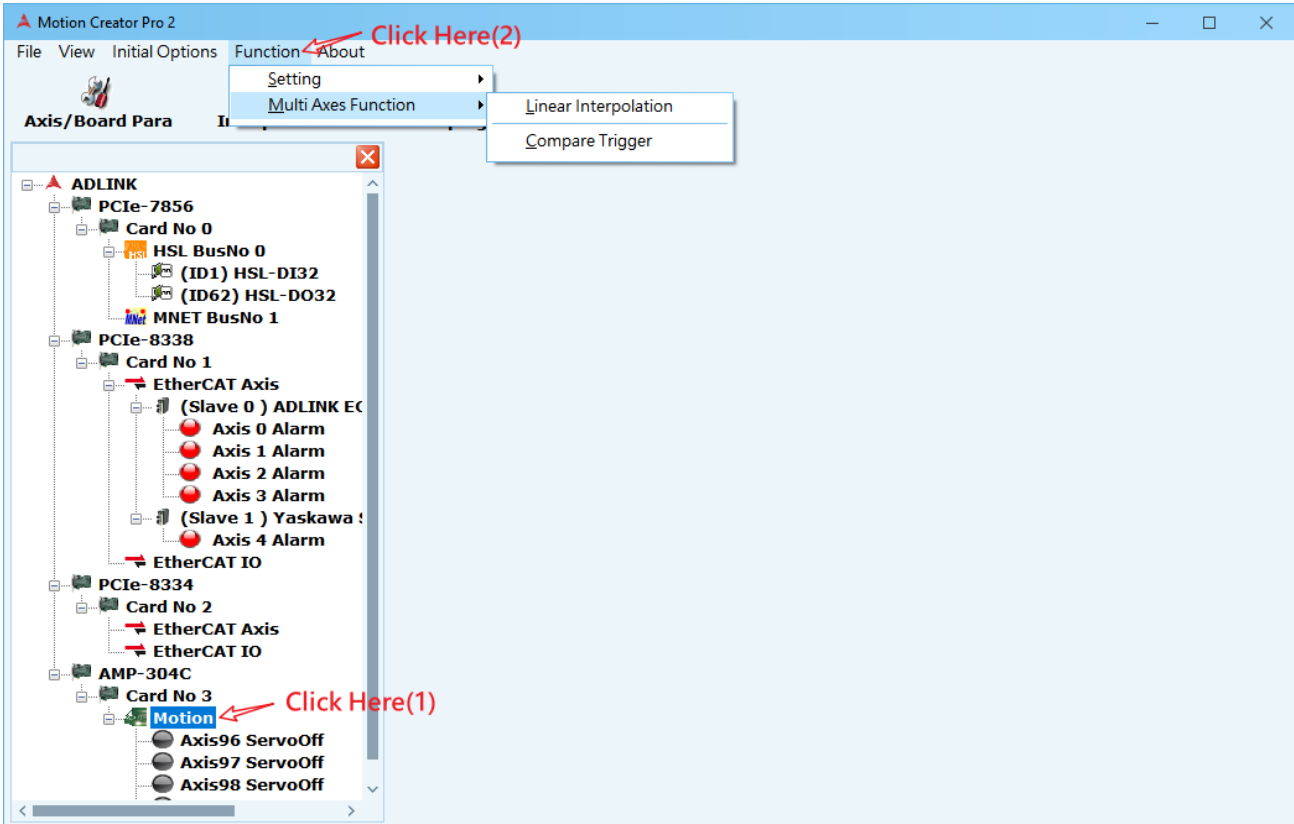
## 1.3 功能(Function)

此功能選單會依據您在裝置樹狀圖中點選的是哪一種功能分類來做顯示，以下則列出相關功能。下列三張圖分別說明在 Device tree 上點選 Card\_No， Slave， 和 Axis 時，Function menu 所顯示可使用的功能選項。

1. 點選 Card No ->Function
2. 顯示選單如下圖，為各類與硬體或系統相關的功能。

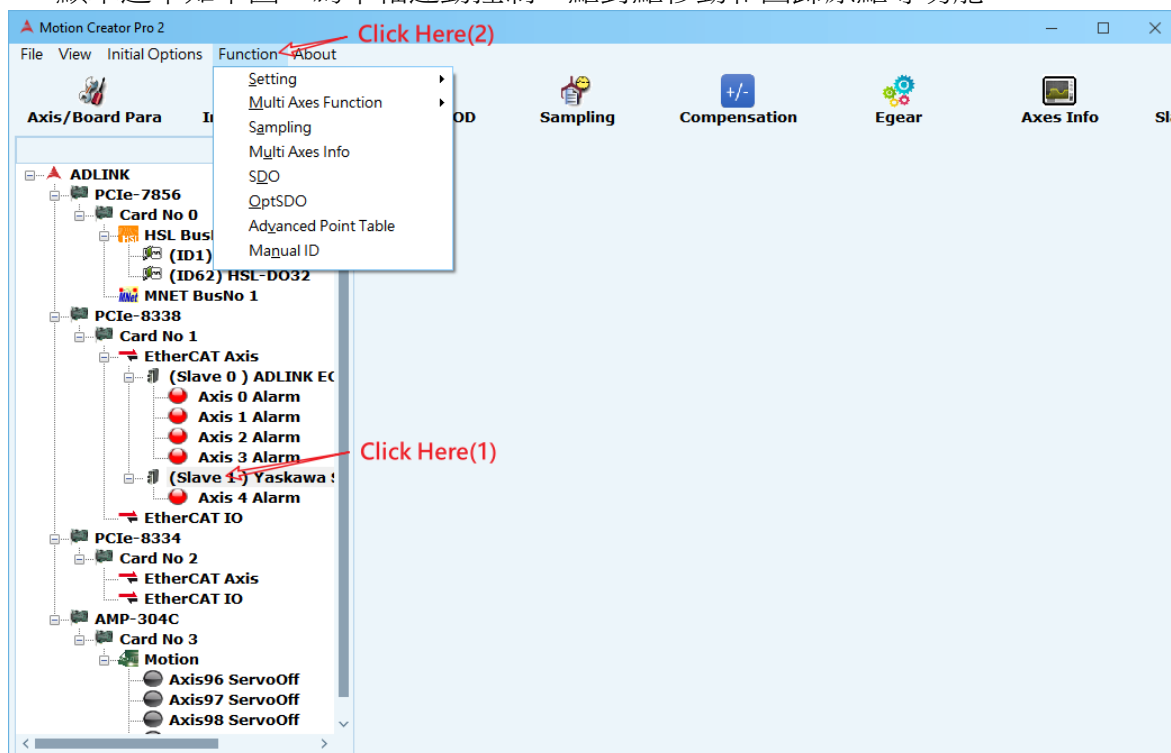


1. 在樹狀圖的 Card No x 的子項目，例如 Motion、EtherCAT AXIS、EtherCAT IO...等。
2. 點選 Motion\EtherCAT Axis\EtherCAT IO\HSL BusNo X\MNET BusNo X->Function
3. 顯示選單如下圖，為多軸運動控制、取樣和設定參數等功能。





1. 點選 Slave No ->Function
2. 顯示選單如下圖，為單軸運動控制、點對點移動和回歸原點等功能。



## 1.4 快速功能按鈕(Speed Button)

快速功能按鈕區塊，經常使用的功能放入此區塊方便快速點選。如同 Function Menu 會依據使用者在裝置樹狀圖選擇的是 Card No、Motion、Axis、Slave 來顯示不同的功能圖示。下面三張圖示說明點選不同的項目所出現的圖示。

如下裝置樹狀圖點選 Card No 0 出現 DIO，DSP Performance 等快速鈕。

## 2. 安裝指南

# 3. MCP2 Function list

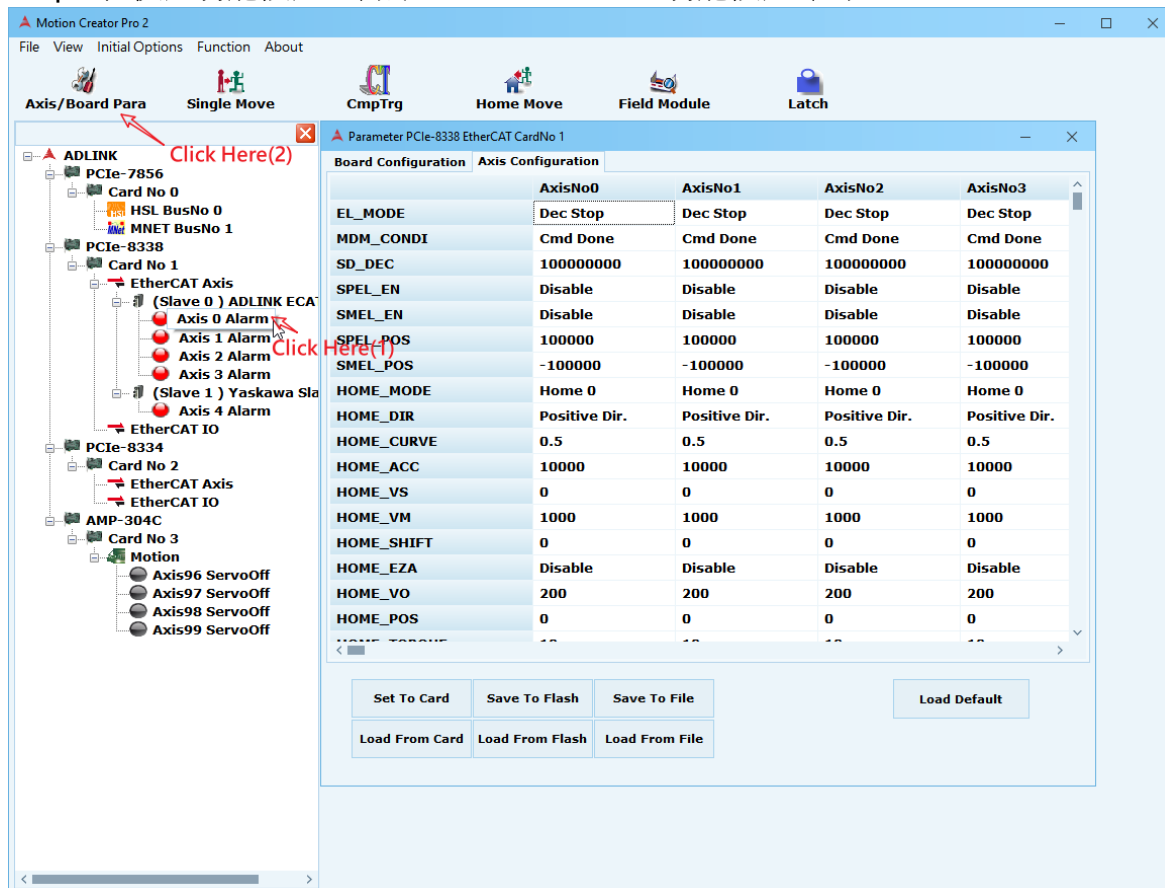
## 3.1 Parameter Manager

本控制卡上所有的軸參數和系統參數設定可統一由此頁面所管理。這些參數包括運行模式、加速速率、減速速率，加加速度，運動 I/O 邏輯等。有關定義和詳細描述，請參見 **APS Function Library** 參數表。

打開參數設定頁面如下圖 Step1 和 Step2 所示:

Step1. 先在裝置樹狀圖中點選的 Card or Slave or Axis

Step2. 在快速功能按鈕上再點 Board/Axis Para 功能按鈕即可。



The screenshot shows the Motion Creator Pro 2 software interface. The left pane displays a device tree with the following structure:

- ADLINK
  - PCIe-7856
    - Card No 0
      - HSL BusNo 0
      - MNET BusNo 1
    - PCIe-8338
      - Card No 1
        - EtherCAT Axis (Slave 0) ADLINK ECA
          - Axis 0 Alarm (Click Here(1))
          - Axis 1 Alarm
          - Axis 2 Alarm
          - Axis 3 Alarm
        - (Slave 1) Yaskawa Sla
        - EtherCAT IO
      - PCIe-8334
        - Card No 2
          - EtherCAT Axis
          - EtherCAT IO
        - AMP-304C
          - Card No 3
            - Motion
              - Axis96 ServoOff
              - Axis97 ServoOff
              - Axis98 ServoOff
              - Axis99 ServoOff

The main window displays the 'Parameter PCIe-8338 EtherCAT CardNo 1' dialog. The 'Axis Configuration' tab is active, showing a table of parameters for AxisNo0 through AxisNo3. The 'Dec Stop' parameter for AxisNo0 is highlighted. Red arrows point to 'Click Here(2)' on the 'Axis/Board Para' button and 'Click Here(1)' on the 'Axis 0 Alarm' node in the device tree.

	AxisNo0	AxisNo1	AxisNo2	AxisNo3
EL_MODE	Dec Stop	Dec Stop	Dec Stop	Dec Stop
MDM_CONDI	Cmd Done	Cmd Done	Cmd Done	Cmd Done
SD_DEC	100000000	100000000	100000000	100000000
SPEL_EN	Disable	Disable	Disable	Disable
SMEL_EN	Disable	Disable	Disable	Disable
SPEL_POS	100000	100000	100000	100000
SMEL_POS	-100000	-100000	-100000	-100000
HOME_MODE	Home 0	Home 0	Home 0	Home 0
HOME_DIR	Positive Dir.	Positive Dir.	Positive Dir.	Positive Dir.
HOME_CURVE	0.5	0.5	0.5	0.5
HOME_ACC	10000	10000	10000	10000
HOME_VS	0	0	0	0
HOME_VM	1000	1000	1000	1000
HOME_SHIFT	0	0	0	0
HOME_EZA	Disable	Disable	Disable	Disable
HOME_VO	200	200	200	200
HOME_POS	0	0	0	0

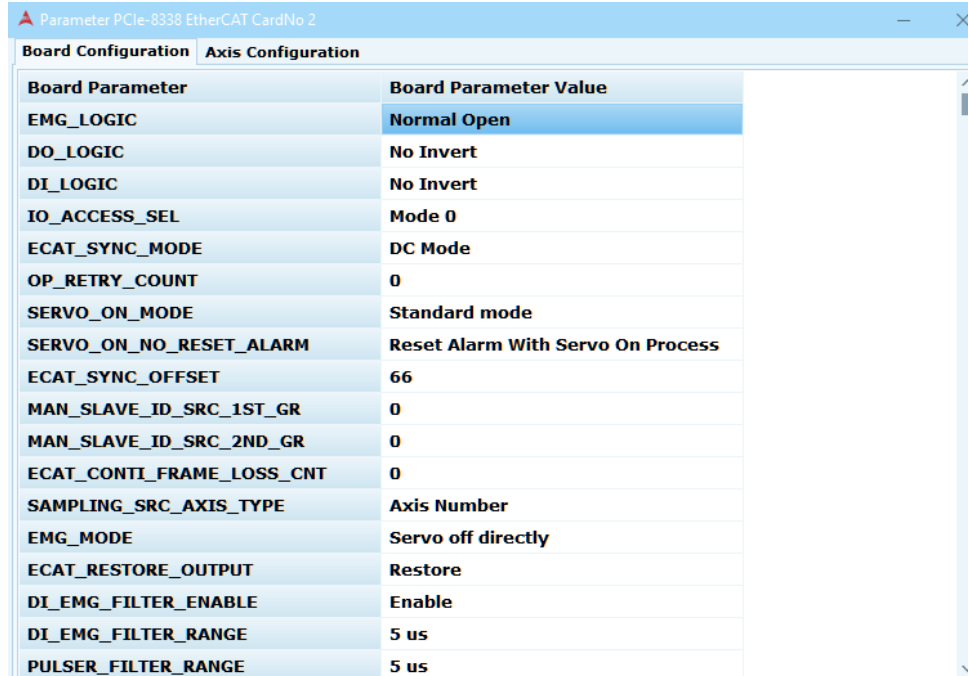
Buttons at the bottom of the dialog:

  - Set To Card
  - Save To Flash
  - Save To File
  - Load Default
  - Load From Card
  - Load From Flash
  - Load From File

### 3.1.1 參數配置(Parameter Configuration)

Board Configuration 內容請參閱 APS Function Library 手冊 Table definition-> Board Parameter table

如下圖為例 PCIe-8338 的板卡

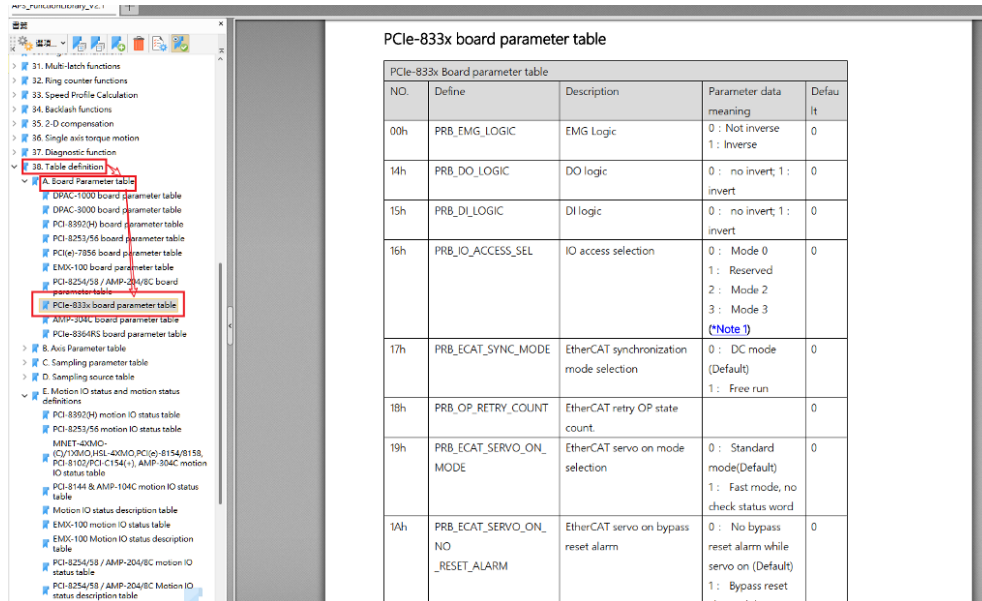


Board Parameter	Board Parameter Value
EMG_LOGIC	Normal Open
DO_LOGIC	No Invert
DI_LOGIC	No Invert
IO_ACCESS_SEL	Mode 0
ECAT_SYNC_MODE	DC Mode
OP_RETRY_COUNT	0
SERVO_ON_MODE	Standard mode
SERVO_ON_NO_RESET_ALARM	Reset Alarm With Servo On Process
ECAT_SYNC_OFFSET	66
MAN_SLAVE_ID_SRC_1ST_GR	0
MAN_SLAVE_ID_SRC_2ND_GR	0
ECAT_CONTI_FRAME_LOSS_CNT	0
SAMPLING_SRC_AXIS_TYPE	Axis Number
EMG_MODE	Servo off directly
ECAT_RESTORE_OUTPUT	Restore
DI_EMG_FILTER_ENABLE	Enable
DI_EMG_FILTER_RANGE	5 us
PULSER_FILTER_RANGE	5 us

Board Configuration 頁面可參考內容

38. Table definition->A. Board Parameter table->PCIe-833x board parameter table

如下圖



NO.	Define	Description	Parameter data meaning	Default
00h	PRB_EMG_LOGIC	EMG Logic	0: Not inverse 1: Inverse	0
14h	PRB_DO_LOGIC	DO logic	0: no invert; 1: invert	0
15h	PRB_DI_LOGIC	DI logic	0: no invert; 1: invert	0
16h	PRB_IO_ACCESS_SEL	IO access selection	0: Mode 0 1: Reserved 2: Mode 2 3: Mode 3 (*Note 1)	0
17h	PRB_ECAT_SYNC_MODE	EtherCAT synchronization mode selection	0: DC mode (Default) 1: Free run	0
18h	PRB_OP_RETRY_COUNT	EtherCAT retry OP state count.		0
19h	PRB_ECAT_SERVO_ON_MODE	EtherCAT servo on mode selection	0: Standard mode(Default) 1: Fast mode, no check status word	0
1Ah	PRB_ECAT_SERVO_ON_NO_RESET_ALARM	EtherCAT servo on bypass reset alarm	0: No bypass reset alarm while servo on (Default) 1: Bypass reset	0

Axis Configuration 內容請參閱 APS Function Library 手冊 Table definition-> Axis Parameter table

如下圖為例 PCIe-8338 的板卡

Board Configuration		Axis Configuration			
	AxisNo12	AxisNo13	AxisNo14	AxisNo15	
EL_MODE	Dec Stop	Dec Stop	Dec Stop	Dec Stop	
MDM_CONDI	Cmd Done	Cmd Done	Cmd Done	Cmd Done	
SD_DEC	100000000	100000000	100000000	100000000	
SPEL_EN	Disable	Disable	Disable	Disable	
SMEL_EN	Disable	Disable	Disable	Disable	
SPEL_POS	100000	100000	100000	100000	
SMEL_POS	-100000	-100000	-100000	-100000	
HOME_MODE	Home 0	Home 0	Home 0	Home 0	
HOME_DIR	Positive Dir.	Positive Dir.	Positive Dir.	Positive Dir.	
HOME_CURVE	0.5	0.5	0.5	0.5	
HOME_ACC	10000	10000	10000	10000	
HOME_VS	0	0	0	0	
HOME_VM	1000	1000	1000	1000	
HOME_SHIFT	0	0	0	0	
HOME_EZA	Disable	Disable	Disable	Disable	
HOME_VO	200	200	200	200	
HOME_POS	0	0	0	0	

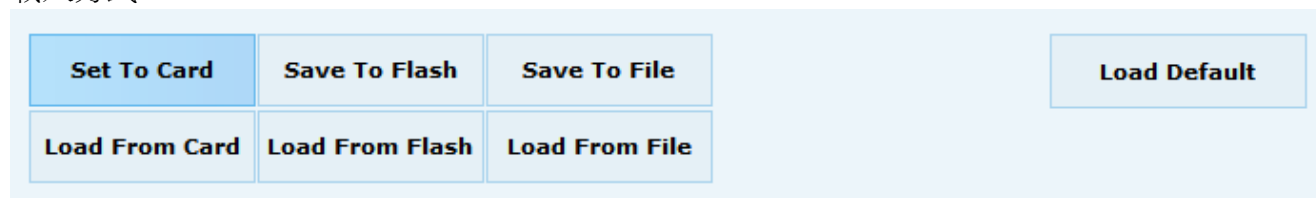
Axis Configuration 頁面可參考內容

38. Table definition->A. Board Parameter table->PCIe-833x Axis parameter table 如下圖

NO.	Define	Description	Value	Default	Type
02h (2)	PRA_EL_MODE	Stop mode when EL turns on. Note : Deceleration profile is given according to PRA_SD_DEC.	0 : Deceleration stop 1 : Stop immediately	0	I32
03h (3)	PRA_MDM_CONDI	Motion done condition (Affective with motion status NSTP bit)	0 : Command done; 1 : Command done with INP	0	I32
07h (7)	PRA_SD_DEC	Stop deceleration including EL stop, stop function and multi-stop().	Unit : pulse/sec2	10000000 0.0	F64
08h (8)	PRA_SPEL_EN	Soft PEL enable	0 : Disable 1 : Reserved 2 : Soft-Limit (SPEL)	0	I32
09h (9)	PRA_SMEL_EN	Soft MEL enable	0 : Disable 1 : Reserved 2 : Soft-Limit (SMEL)	0	I32
0Ah (10)	PRA_SPEL_POS	Soft-end-limit for positive end [ F64 ]	Unit : pulse	100000.0	F64
0Bh (11)	PRA_SMEL_POS	Soft-end-limit for negative end [ F64 ]	Unit : pulse	-100000.0	F64
		Home mode setting *If user uses EtherCAT home	0 : home mode 0 (ORG) 1 : home mode 1 (EL)	0	I32

### 3.1.2 儲存卡和軸參數(Save Board and Axis Parameter)

在頁面的下方有數個參數操作的按鈕，依照系統設定將參數設定完畢後可選擇下列幾種儲存/載入方式：



Set To Card：將參數設定值直接寫入至控制卡中使用。

Load From Card：從控制卡中讀取參數至頁面顯示。

Save To Flash：將參數寫入至控制卡中的非揮發性記憶體。

Load From Flash：從控制卡中非揮發性記憶體讀取參數至頁面顯示。

Save To File：將參數寫入至指定的檔案中(\*.xml)。

Load From File：從指定檔案讀取參數至頁面顯示(\*.xml)。

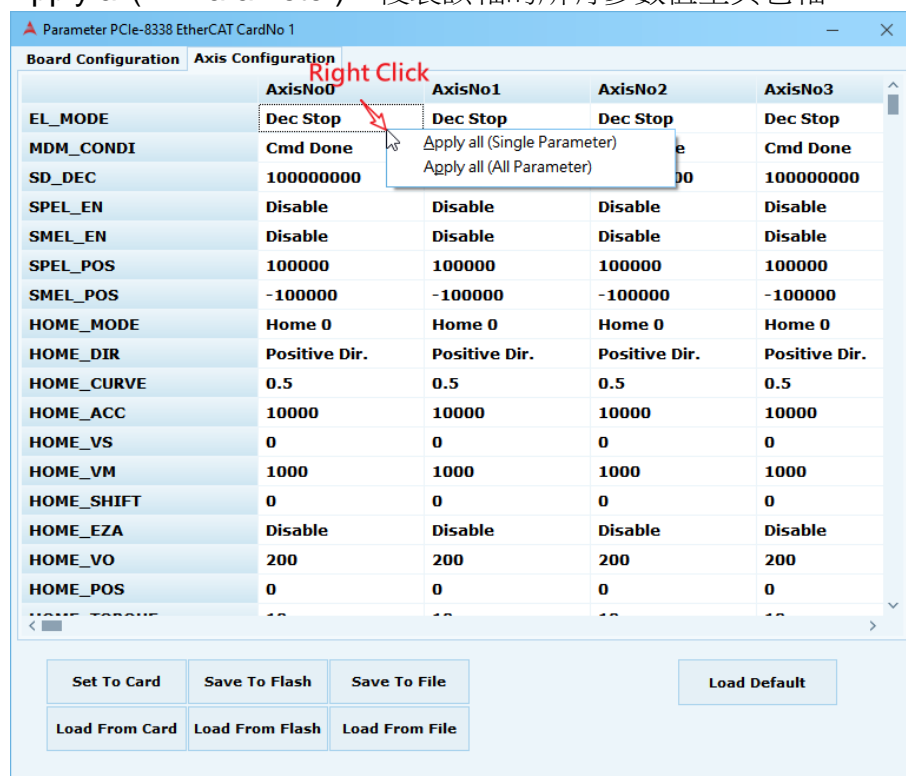
Load Default：載入出廠預設值至頁面顯示。

### 3.1.3 統一設定軸參數(Apply All)

在一運動控制系統中，可能有多軸的參數是類似或完全相同的情況，MCP2 提供一個複製參數設定值到多軸的功能，不需再每軸一一做參數設定。使用方法為在設定軸參數設定頁面上按滑鼠右鍵，即可跳出欲設定的選項。

Apply all(Single Parameter)：只複製該欄的設定值至其它軸。

Apply all(All Parameter)：複製該軸的所有參數值至其它軸。



## 3.2 Homing

該Homing頁面用於軸的原點(ORG)位置模式及參數設定。透過軸參數設置程序，選擇幾種模式，用戶無需編寫歸零序列即可完成返回原點的運動。設置完成後，將根據原點的物理位置來更新軸的位置。此功能為“發後即忘”的方式。這就意味著在軸運動期間不會掛起用戶的程序或過程。用戶必須使用運動狀態檢查功能或中斷事件等待功能來等待它完成。

打開回歸原點頁面步驟如下圖(1)~(2)所示，首先在裝置樹列上點選”Axis X”，再至快速功能按鈕點選 Home Move 功能按鈕。

The screenshot displays the Motion Creator Pro 2 software interface. On the left is a device tree showing the hierarchy: ADLINK > PCIe-8158 > Card No 0 > Motion > Axis 12 ServoOn. A red arrow labeled "Click Here(1)" points to "Axis 12 ServoOn".

The main window is titled "Homing Movement PCIe-8338 EtherCAT CardID2 AxisNo 12". It contains several configuration fields:

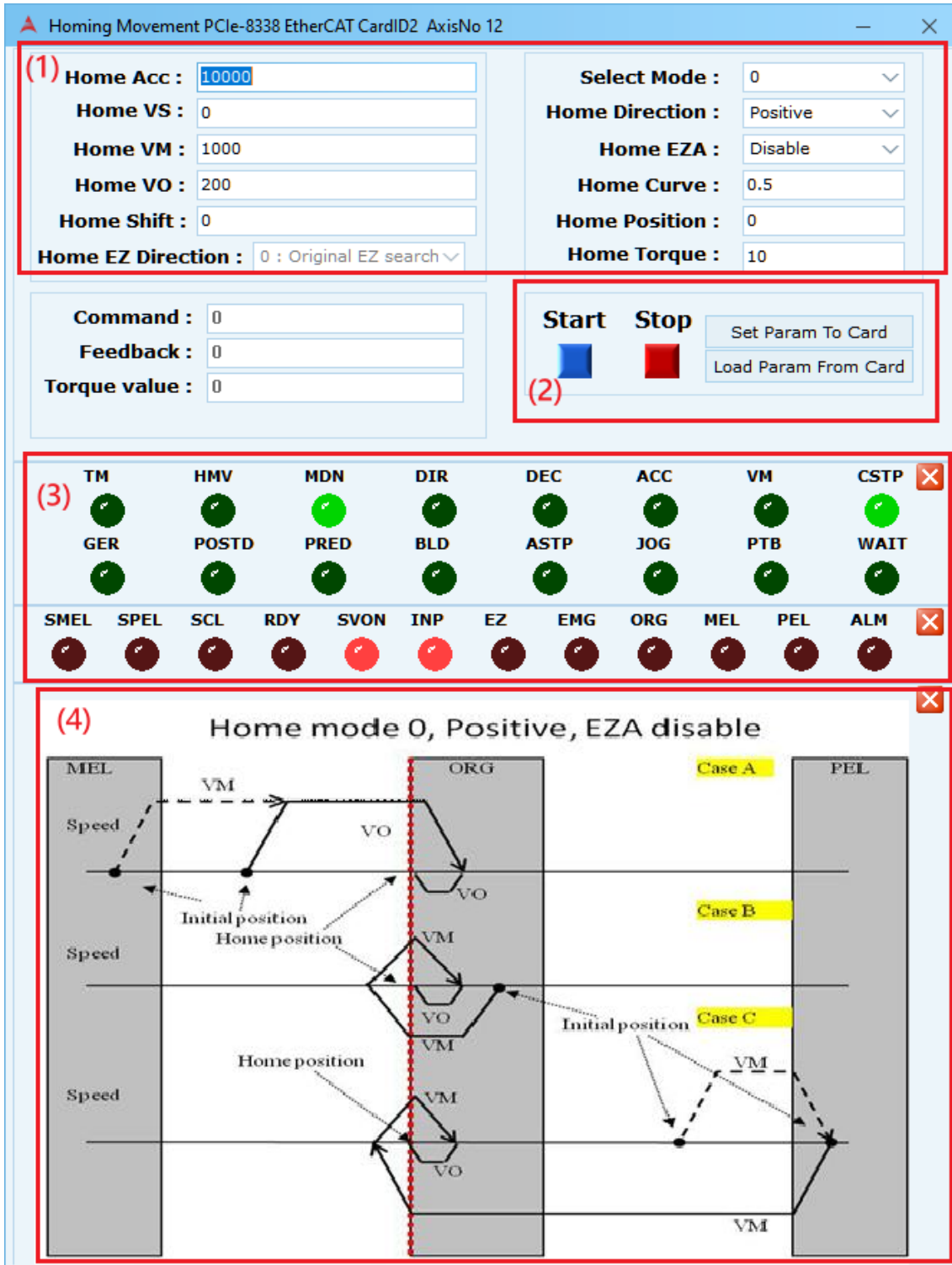
- Home Acc: 10000
- Home VS: 0
- Home VM: 1000
- Home VO: 200
- Home Shift: 0
- Home EZ Direction: 0 : Original EZ search
- Select Mode: 0
- Home Direction: Positive
- Home EZA: Disable
- Home Curve: 0.5
- Home Position: 0
- Home Torque: 10

Below the fields are "Command", "Feedback", and "Torque value" fields, all set to 0. There are "Start" and "Stop" buttons, along with "Set Param To Card" and "Load Param From Card" options.

A status indicator row shows various indicators: TM, HMV, MDN, DIR, DEC, ACC, VM, CSTP, GER, POSTD, PRED, BLD, ASTP, JOG, PTB, WAIT, SMEL, SPEL, SCL, RDY, SVON, INP, EZ, EMG, ORG, MEL, PEL, ALM. The "ORG" indicator is highlighted with a red circle and a red arrow labeled "Click Here(2)".

At the bottom, a diagram titled "Home mode 0, Positive, EZA disable" shows three speed profiles (Case A, Case B, Case C) over time. The profiles show the axis starting from an initial position, moving towards the home position (ORG), and then stopping. Case A shows a linear deceleration to a stop at the home position. Case B shows a linear deceleration to a stop at the home position, followed by a linear acceleration back to the initial position. Case C shows a linear deceleration to a stop at the home position, followed by a linear acceleration back to the initial position, and then a linear deceleration to a stop at the initial position.

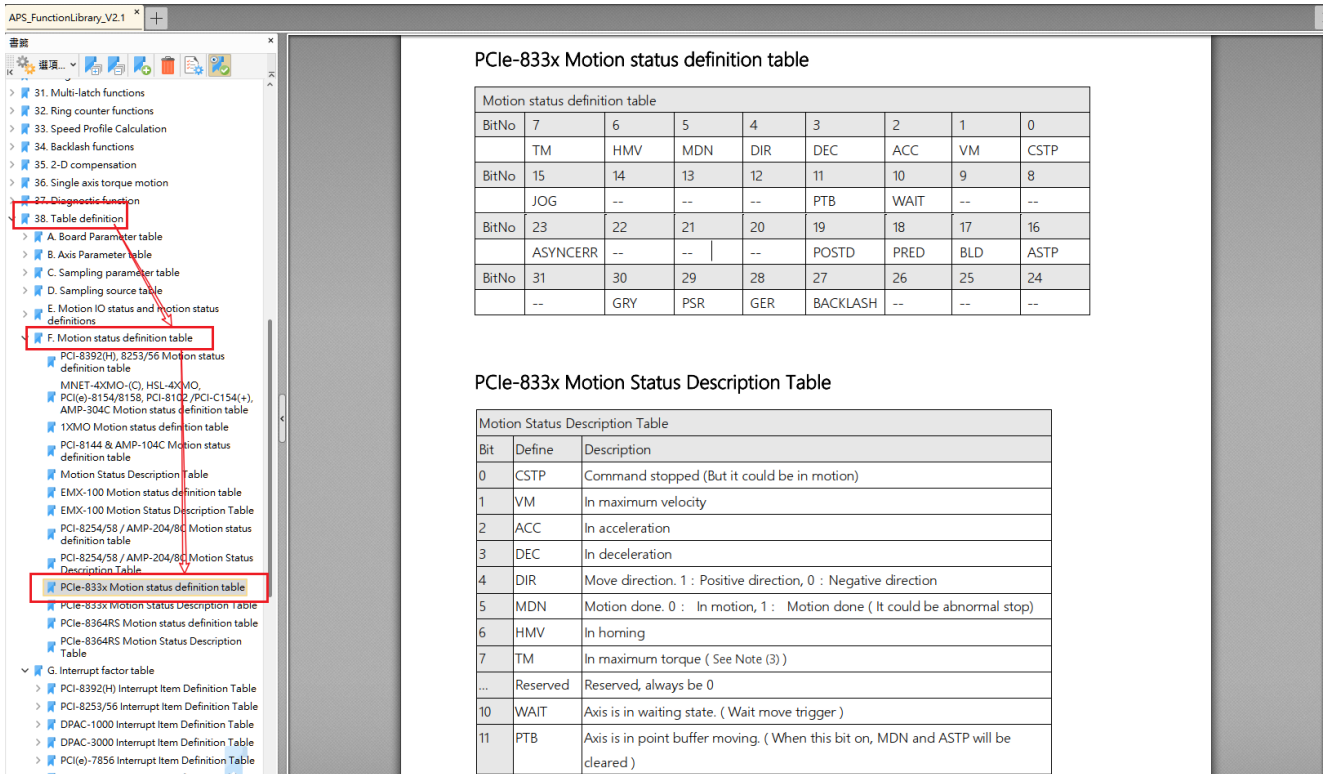
回歸原點頁面可分為四大區塊：



- (1) 回原點各類參數設定。
- (2) 開始/停止鈕和設定/載入參數。
- (3) 狀態顯示區。
- Motion Status 其對應內容請參閱 APS Function Library 手冊 Table definition-> Motion status definition tables  
 例如上圖為 PCIe-8338 Motion Status 參考內容路徑為  
 38. Table definition-> F. Motion status definition table -> PCIe-833x Motion status definition table

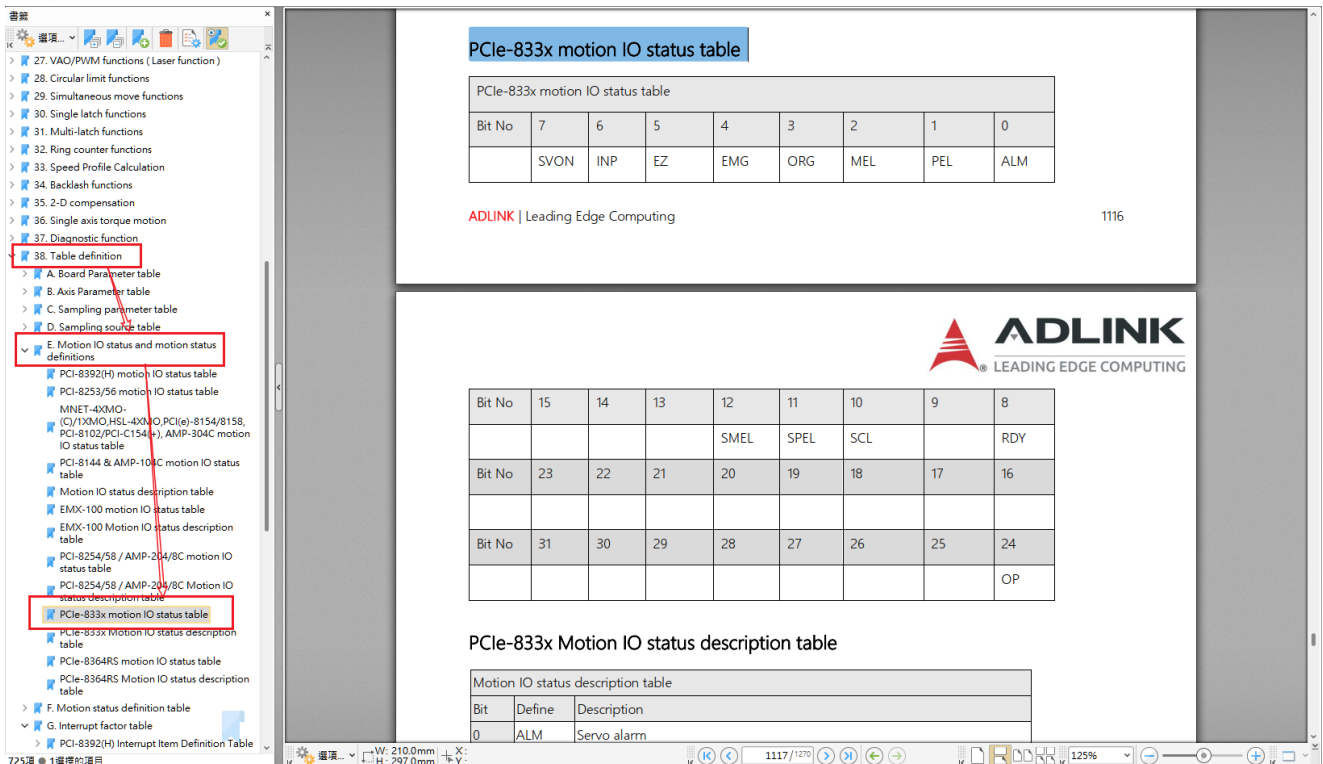
如下圖





- Motion IO Status 其對應內容請參閱 APS Function Library 手冊 Table definition->Motion IO status and motion status definitions  
 例如上圖為 PCIe-8338 Motion IO Status 參考內容路徑為  
 38. Table definition-> E. Motion IO status and motion status definitions -> PCIe-833x motion IO status table

如下圖



(4) 圖示目前回原點的方式。

## 3.3 Single Move

單軸操作功能可控制某單一軸做絕對運動、相對運動、速度運動和吋動等功能，並可即時監控命令、位移、速度和各類運動狀態資訊。

打開單軸操作頁面步驟如下圖(1)~(2)所示:首先在裝置樹列上點選”Axis X”，再至快速功能按鈕點選 Single Move 功能按鈕。

The figure consists of two screenshots of the Motion Creator Pro 2 software interface, illustrating the steps to access the 'Single Move' function for a specific axis.

**Top Screenshot (Figure 1):** Shows the 'Single Movement' window for 'AxisNo 12'. The left sidebar displays a device tree with 'Axis 12 ServoOn' selected. A red arrow labeled 'Click Here(1)' points to this selection. The main panel shows various motion parameters and status indicators. A red arrow labeled 'Click Here(2)' points to the 'Single Move' button in the top navigation bar.

**Bottom Screenshot (Figure 2):** Shows the 'Single Movement' window for 'AxisNo 1'. The left sidebar displays a device tree with 'Axis 1 ServoOff' selected. A red arrow labeled 'Click Here(1)' points to this selection. The main panel shows motion parameters and status indicators. A red arrow labeled 'Click Here(2)' points to the 'Single Move' button in the top navigation bar.

### 3.3.1 位移/命令狀態(Position/Command Status)

此區塊顯示的各類資訊如下：

**Command**：目前的命令位置

**Position**：目前的回授位置

**Cmd Vel**：目前的命令速度

**FBK Vel**：目前的回授速度

**Err Pos**：位移誤差值

**TargetPos**：目標位置

**Set Pos**：同時設定目命令位置和回授位置

**MaxVel**：設定點對點運動時的最大速度

<b>Command :</b>	<input type="text" value="0"/>
<b>Position :</b>	<input type="text" value="0"/>
<b>Cmd Vel :</b>	<input type="text" value="0"/>
<b>FBK Vel :</b>	<input type="text" value="0"/>
<b>Err Pos :</b>	<input type="text" value="0"/>
<b>TargetPos :</b>	<input type="text" value="0"/>
<b>Set Pos</b>	<input type="text" value="0"/>
<b>MaxVel :</b>	<input type="text" value="100000"/>

### 3.3.2 運動操作(Move Operation)

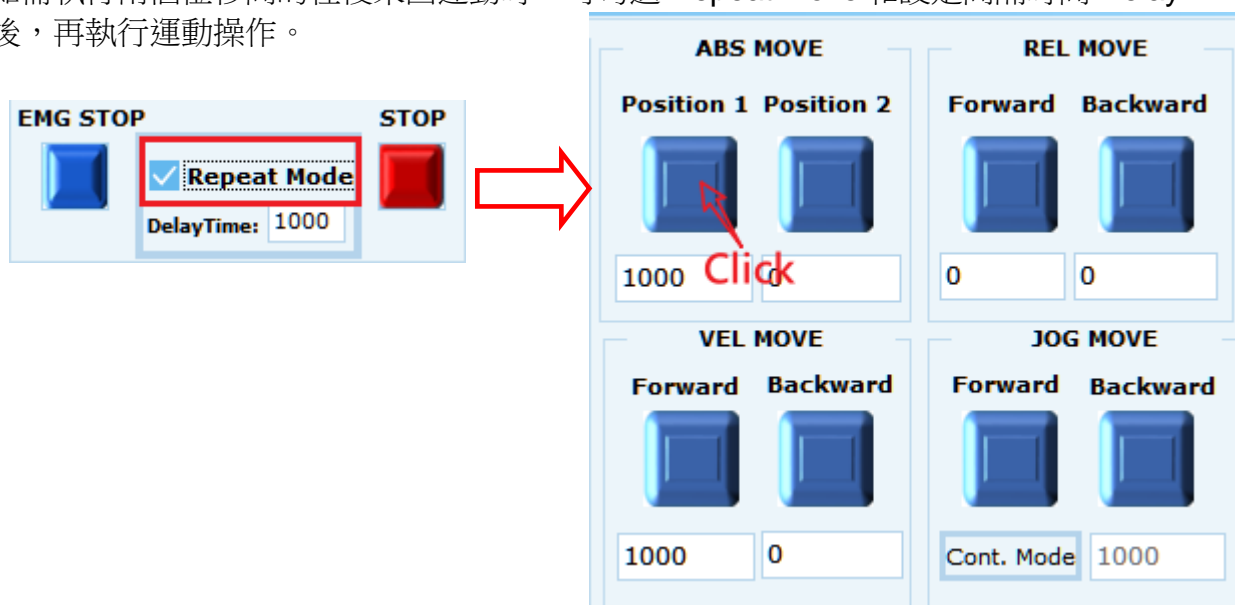
運動操作可分四種操作模式，輸入的位移量皆是以 Pulse 為單位。

- (1) ABS MOVE：絕對位置移動，可輸入絕對位置
- (2) REL MOVE：相對位置移動，可輸入相對位置
- (3) VEL MOVE：速度移動，可輸入速度
- (4) JOG MOVE：吋動，點選 Free 或 Step mode. (Step mode 須設定位移量)



※加減速率可在 3.1 參數管理中設定。

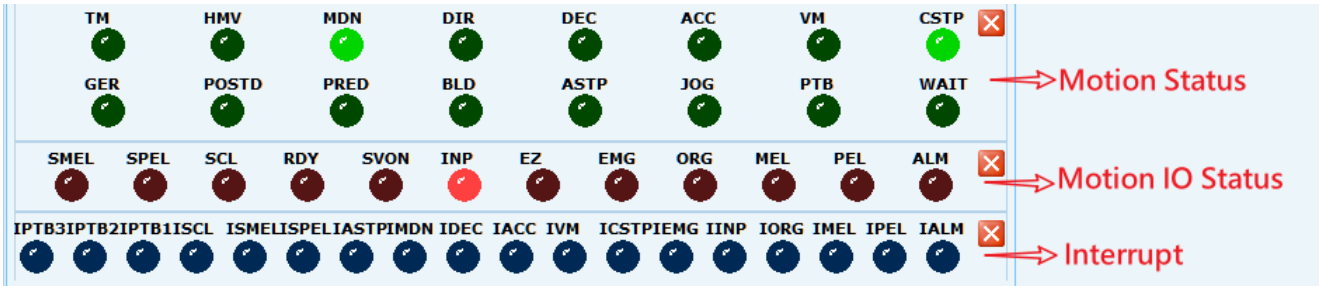
如需執行兩個位移間的往復來回運動時，可勾選 Repeat Move 和設定間隔時間 Delay Time 後，再執行運動操作。



### 3.3.3 狀態顯示區(Status View)

狀態顯示區即時回饋控制器上的資訊，包含Motion Status、Motion IO Status、Interrupt、Error Interrupt四區塊。

● Motion Status



對應內容請參閱 APS Function Library 手冊 Table definition-> Motion status definition tables

例如上圖為 PCIe-8338 Motion Status 參考內容路徑為

38. Table definition-> F. Motion status definition table -> PCIe-833x Motion status definition table

如下圖

PCle-833x Motion status definition table

Motion status definition table								
BitNo	7	6	5	4	3	2	1	0
	TM	HMV	MDN	DIR	DEC	ACC	VM	CSTP
BitNo	15	14	13	12	11	10	9	8
	JOG	--	--	--	PTB	WAIT	--	--
BitNo	23	22	21	20	19	18	17	16
	ASYNCERR	--	--	--	POSTD	PRED	BLD	ASTP
BitNo	31	30	29	28	27	26	25	24
	--	GRY	PSR	GER	BACKLASH	--	--	--

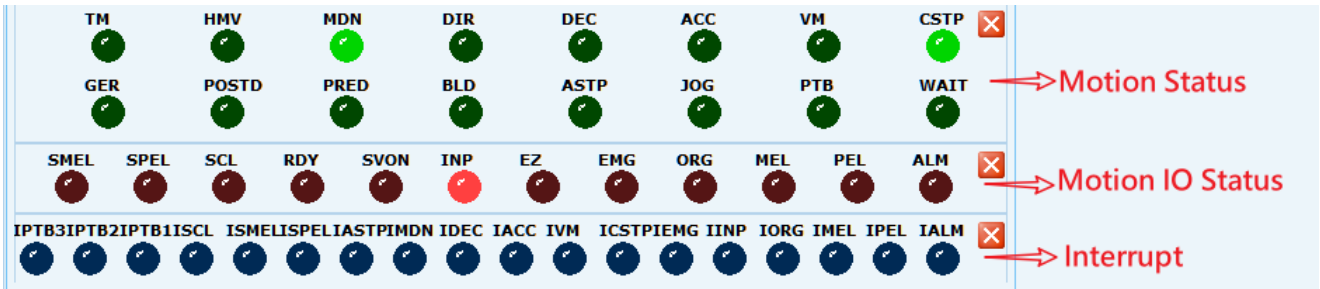
PCle-833x Motion Status Description Table

Bit	Define	Description
0	CSTP	Command stopped (But it could be in motion)
1	VM	In maximum velocity
2	ACC	In acceleration
3	DEC	In deceleration
4	DIR	Move direction. 1 : Positive direction, 0 : Negative direction
5	MDN	Motion done. 0 : In motion, 1 : Motion done ( It could be abnormal stop)
6	HMV	In homing
7	TM	In maximum torque ( See Note (3) )
...	Reserved	Reserved, always be 0
10	WAIT	Axis is in waiting state. ( Wait move trigger )
11	PTB	Axis is in point buffer moving. ( When this bit on, MDN and ASTP will be cleared )

如有伺服異常停止的情況，Soft motion 系列軸卡可點選”ASTP”查得停止的原因。



● Motion IO Status



對應內容請參閱 APS Function Library 手冊 Table definition->Motion IO status and motion status definitions

例如上圖為 PCIe-8338 Motion IO Status 參考內容路徑為

38. Table definition-> E. Motion IO status and motion status definitions -> PCIe-833x motion IO status table

如下圖

**PCIe-833x motion IO status table**

Bit No	7	6	5	4	3	2	1	0
	SVON	INP	EZ	EMG	ORG	MEL	PEL	ALM

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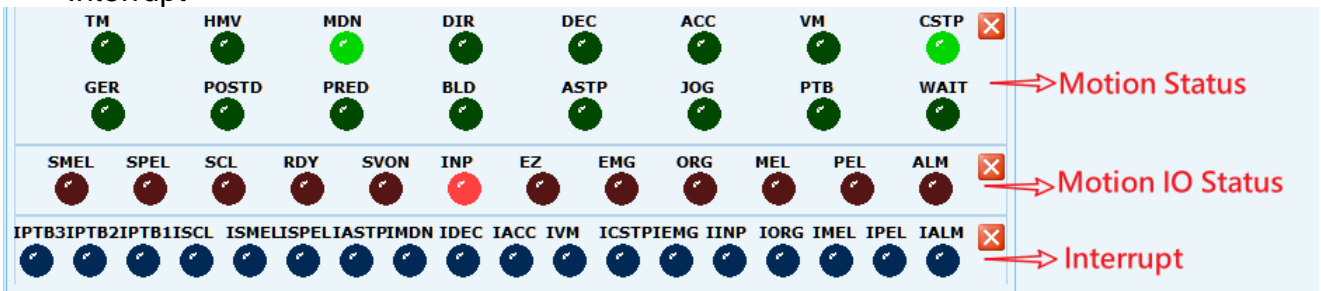
**PCIe-833x Motion IO status description table**

Bit No	15	14	13	12	11	10	9	8
				SMEL	SPEL	SCL		RDY
Bit No	23	22	21	20	19	18	17	16
Bit No	31	30	29	28	27	26	25	24
								OP

**Motion IO status description table**

Bit	Define	Description
0	ALM	Servo alarm

● Interrupt



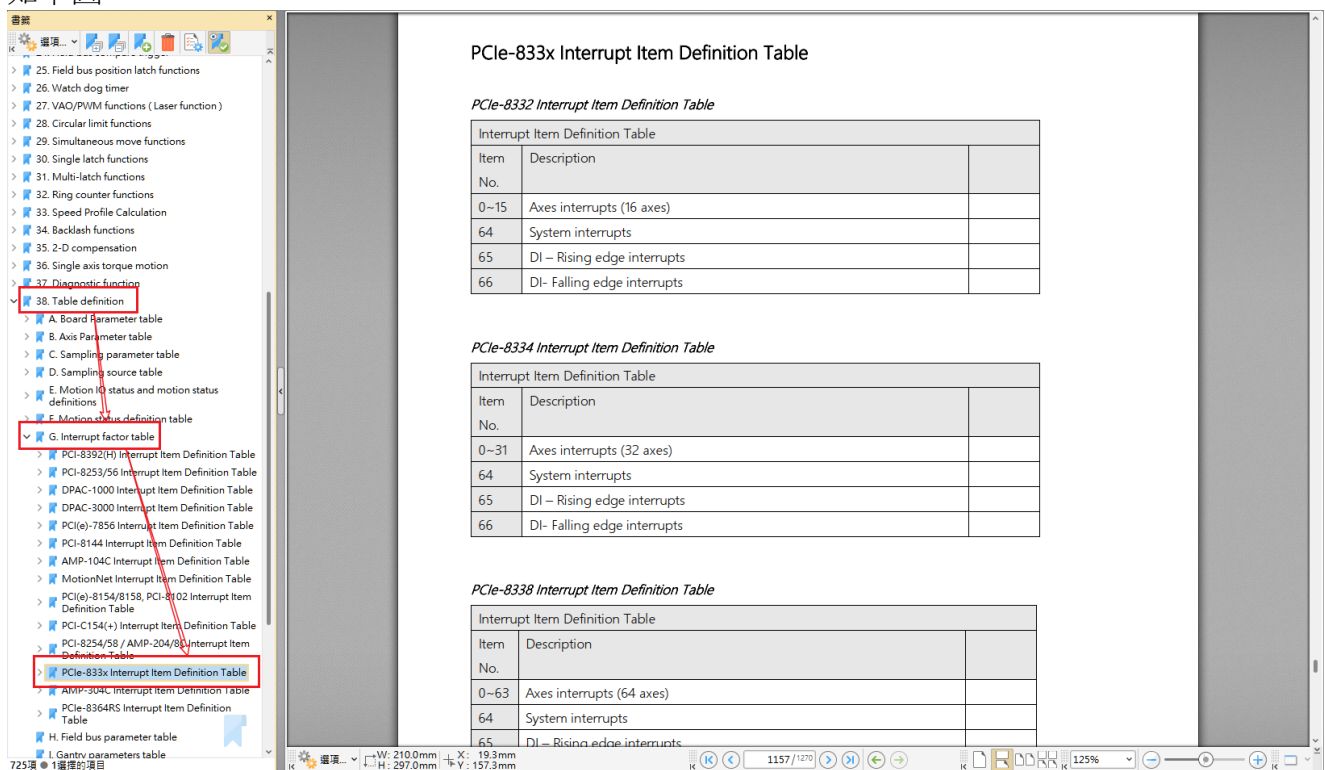
對應內容請參閱 APS Function Library 手冊 Table definition-> Interrupt factor table

例如上圖為 PCIe-8338 Interrupt 參考內容路徑為

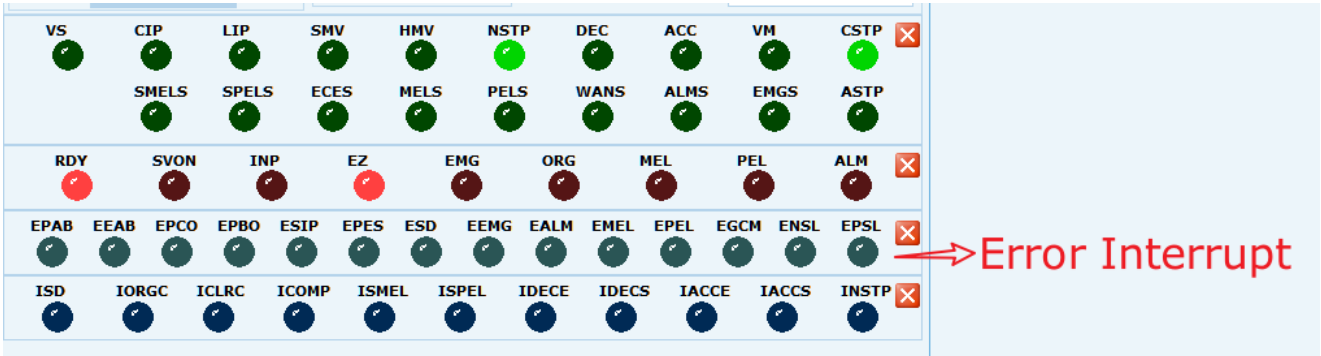
38. Table definition-> G. Interrupt factor table -> PCIe-833x Interrupt Item Definition

Table

如下圖



● Error Interrupt(僅 Pulse type 軸卡)



對應內容請參閱 APS Function Library 手冊 Table definition-> Interrupt factor table-> Interrupt Item Definition Table-> Axes error interrupt definition of Items

例如上圖為 PCIe-8158 Error Interrupt 參考內容路徑為

38. Table definition-> G. Interrupt factor table -> PCI(e)-8154/8158 , PCI-8102 Axes error interrupt definition of Items

如下圖

11	ICOMP4	General comparator is ON	
12	ICOMP5	Trigger comparator or comparator 5 is ON	
13	ICLRC	Counter is reset by CLR input	
14	Reserved	Reserved	
15	IORGC	Counter is latched by ORG input	
16	ISD	SD input turns on	
17	Reserved	Reserved	
18	Reserved	Reserved	
19	ICSTA	CSTA input or APS_start_simultaneous_move turn on	
20~	Reserved	Reserved(Always set to 0)	

**PCI(e)-8154/8158, PCI-8102 Axes error interrupt definition of Items : (Return Code)**

The error interrupt sources are non-maskable but the error number of situation could be get from APS\_wait\_error\_int()'s return code if it is not timeout.

Return Code	Interrupt condition description	Note
0	+Soft Limit is on and axis is stopped	
1	-Soft Limit is on and axis is stopped	
2	Error Comparator or comparator 3 is ON and axis is stopped	
3	General Comparator is on and axis is stopped	
4	Trigger Comparator or comparator 5 is ON and axis is stopped	
5	+End Limit is on and axis is stopped	
6	-End Limit is on and axis is stopped	

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## 3.4 Interpolation

補間功能適合使用於一軸以上對於位移量有交互關係的運動控制系統中，其型式有2軸線性、2軸圓弧、3軸線性...等而補間功能分為Pulse type 軸卡與Soft motion 軸卡兩種頁面設定，其相對應的設定參數亦略有不同。

打開補間頁面的方式如下圖(1)~(2)步驟，依照不同軸卡點選裝置樹列中的”Slave”或者”Motion”，再點選快速功能按鈕上的”Interpolation 鈕”。

The screenshot displays the Motion Creator Pro 2 interface. The top window is titled "Interpolation PCIe-8158 CardNo 0". On the left, a tree view shows the device hierarchy: ADLINK > PCIe-8158 > Card No 0 > Motion. A red arrow labeled "Click Here(1)" points to the "Motion" node. Another red arrow labeled "Click Here(2)" points to the "Interpolation" button in the top toolbar. The main configuration area for this window includes:
 

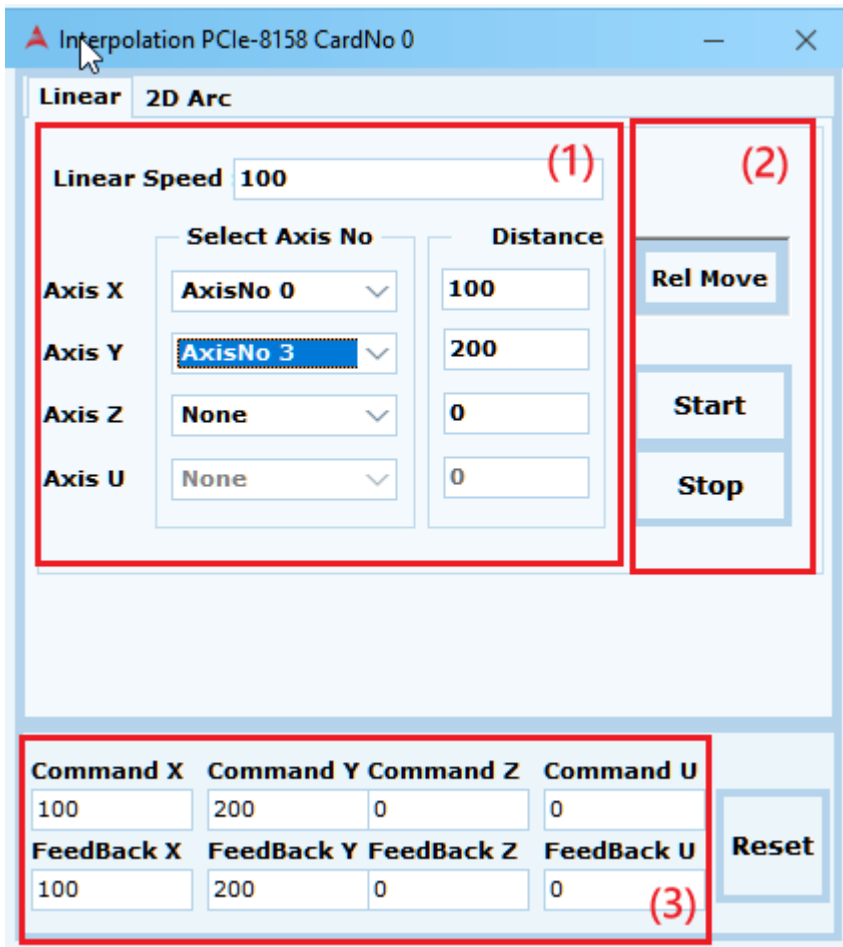
- Linear Speed: 0
- Axis X, Y, Z, U: Each has a "None" dropdown and a "0" position field.
- Buttons: "Abs Move", "Start", "Stop".
- Command X, Y, Z, U: Each has a "0" field.
- FeedBack X, Y, Z, U: Each has a "0" field.
- Buttons: "Reset".

 The bottom window is titled "Interpolation PCIe-8338 EtherCAT CardNo 2". The tree view shows: ADLINK > PCIe-8338 > Card No 2 > EtherCAT Axis (Slave 0) > ADLINK ECA. A red arrow labeled "Click Here(1)" points to the "Motion" node under "EtherCAT Axis". Another red arrow labeled "Click Here(2)" points to the "Interpolation" button. The configuration area includes:
 

- Interpolation Type: 2DLinear
- Move Setting: Absolute, Relative, Info... tabs. Position X: 1000, Position Y: 2000.
- Parameter Source: User input.
- Speed Parameter: Start Velocity, Max Velocity, End Velocity, Acceleration, Deceleration, S-Factor, all set to 0.
- Buttons: "Repeat Mode", "DelayTime: 1000", "EMG Stop", "Slow Stop".
- Graph: A velocity (V) vs. time (T) graph showing a trapezoidal profile with "Stop and blend" and "Abort" points.

- Pulse type 軸卡頁面

設定功能分為 2 頁面  
Linear 頁面

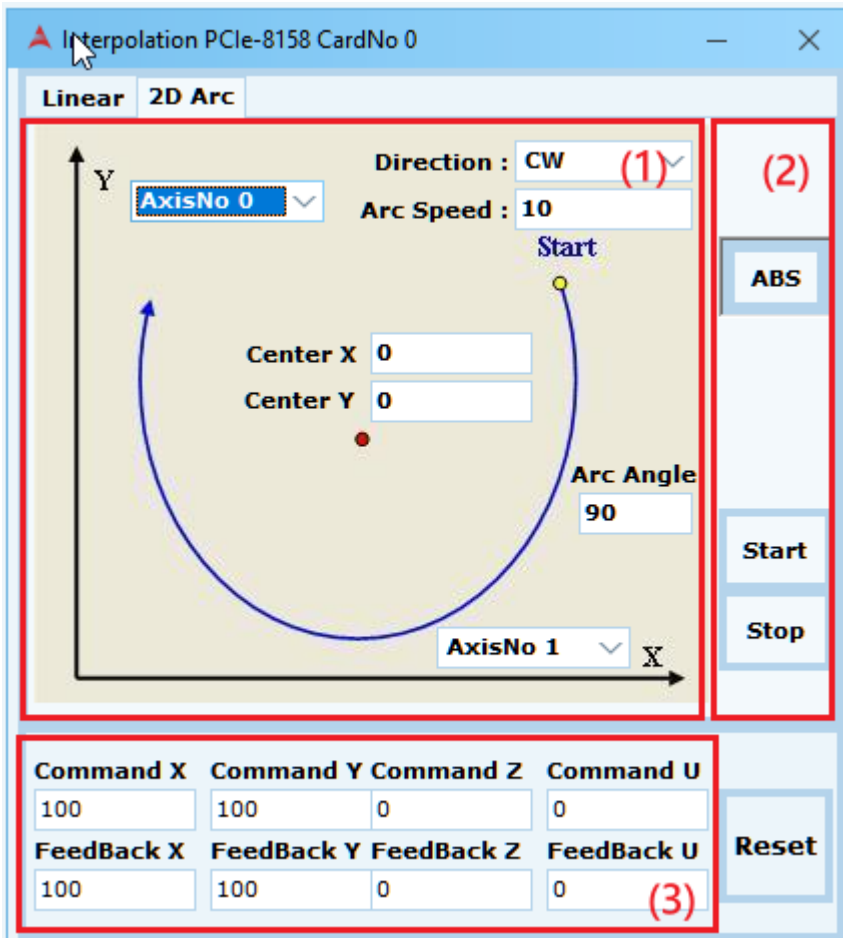


The screenshot shows the 'Linear' configuration page in the 'Interpolation PCIe-8158 CardNo 0' software. The interface is divided into three main sections:

- Section (1):** Configuration for the linear movement. It includes a 'Linear Speed' field set to 100. Below it, there are four rows for 'Axis X', 'Axis Y', 'Axis Z', and 'Axis U'. Each row has a 'Select Axis No' dropdown menu and a 'Distance' input field. For Axis X, the dropdown is 'AxisNo 0' and the distance is 100. For Axis Y, the dropdown is 'AxisNo 3' and the distance is 200. For Axis Z and Axis U, the dropdown is 'None' and the distance is 0.
- Section (2):** Control buttons. It includes a 'Rel Move' button, a 'Start' button, and a 'Stop' button.
- Section (3):** Monitoring table. It has four columns: 'Command X', 'Command Y', 'Command Z', and 'Command U'. Below these are rows for 'FeedBack X', 'FeedBack Y', 'FeedBack Z', and 'FeedBack U'. The values in the 'Command' and 'FeedBack' rows are 100, 200, 0, and 0 respectively. A 'Reset' button is located to the right of the table.

- (1) 選擇欲做補間運動的軸號及位移量。
- (2) Abs Mode/Rel Mode：設定絕對或相對運動以及位移量。  
Start/Stop：啟動命令及停止命令
- (3) 監測各軸命令及回授

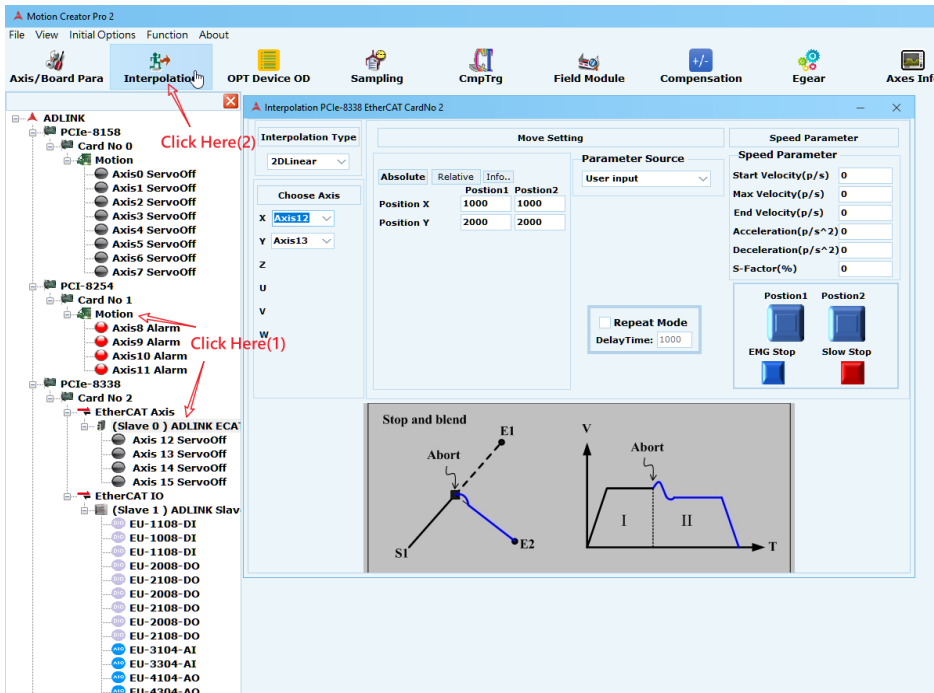
## 2D Arc 頁面



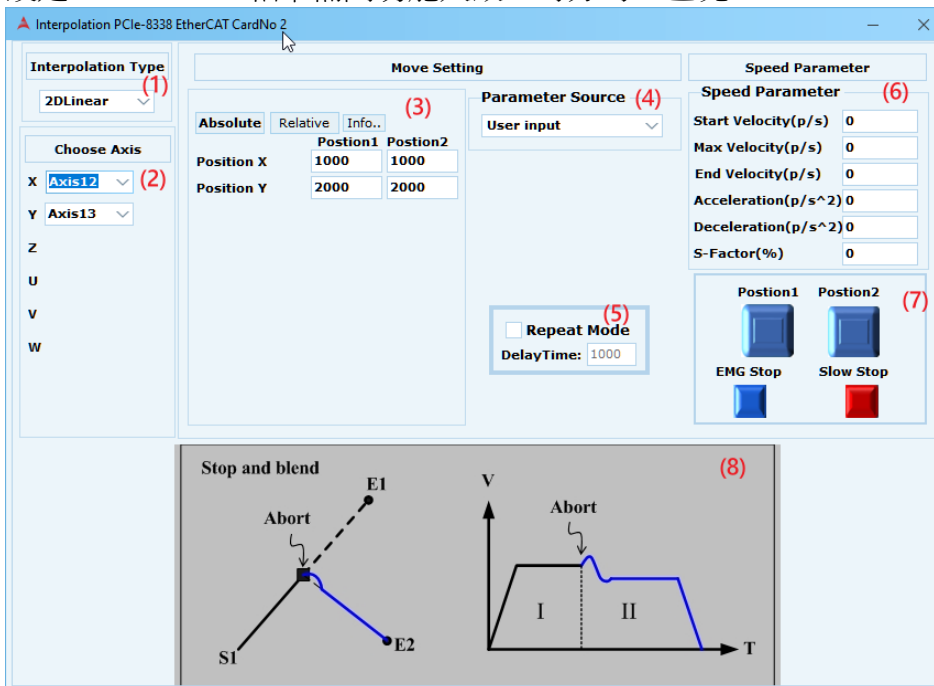
Command X	Command Y	Command Z	Command U
100	100	0	0
FeedBack X	FeedBack Y	FeedBack Z	FeedBack U
100	100	0	0 (3)

- (1) 選擇欲做 2D Arc 運動的軸號及旋轉量、中心點、速度、轉向。
- (2) Abs /Rel：設定絕對或相對運動。  
Start/Stop：啟動命令及停止命令
- (3) 監測各軸命令及回授

### ● Soft motion 軸卡頁面



設定 Soft motion 軸卡補間功能大致上可分為 8 區塊



(1) Interpolation Type : 在 11 種補間型式中選擇運動類型對應 API 如下。

Interpolation Type	API
2DLinear	APS_line_all
3DLinear	APS_line_all
4DLinear	APS_line_all
5DLinear	APS_line_all
6DLinear	APS_line_all
2DARC_A	APS_arc2_ca_all
2DARC_E	APS_arc2_ce_all
3DARC_A	APS_arc3_ca_all

3DARC_E	APS_arc3_ce_all
3DSPH_A	APS_spiral_ca_all
3DSPH_E	APS_spiral_ce_all

- (2) Choose Axis：選擇欲做補間運動的軸號。
- (3) Absolute/Relative：設定絕對或相對運動以及位移量。
- (4) Parameter Source：選擇速度參數的來源。

Parameter Source	Description
User input	使用區塊(3)中的速度參數
Axis parameter	使用目前軸參數的設定(軸參數頁面請參考 3.1 及 APS 手冊設定)
Only Vmax	使用區塊(3)中的速度參數，但最大速使用參考 3.1 及 APS 手冊設定

- (5) 如需執行兩個位移間的往復來回運動時，可勾選 Repeat Move 和設定間隔時間 Delay Time 後，再執行運動操作。
- (6) Speed Parameter：輸入各個速度設定值，若在區塊(1)中選擇的參數來源為 user input 時，區塊(4)的操作將可使用此處的設定。
- (7) 開始與停止運動操作控制。
- (8) 選擇的模式示意。

## 3.5 Sampling

取樣頁面功能可在運動控制過程中，將各種命令、位置、速度等資料做採集再一併顯示在圖表上顯示，以利調機或做後續分析工作。

打開取樣頁面步驟如下圖(1)~(2)所示:首先在裝置樹列上點選”Slave”或”Motion”，再至快速功能按鈕點選 Sampling 功能按鈕。

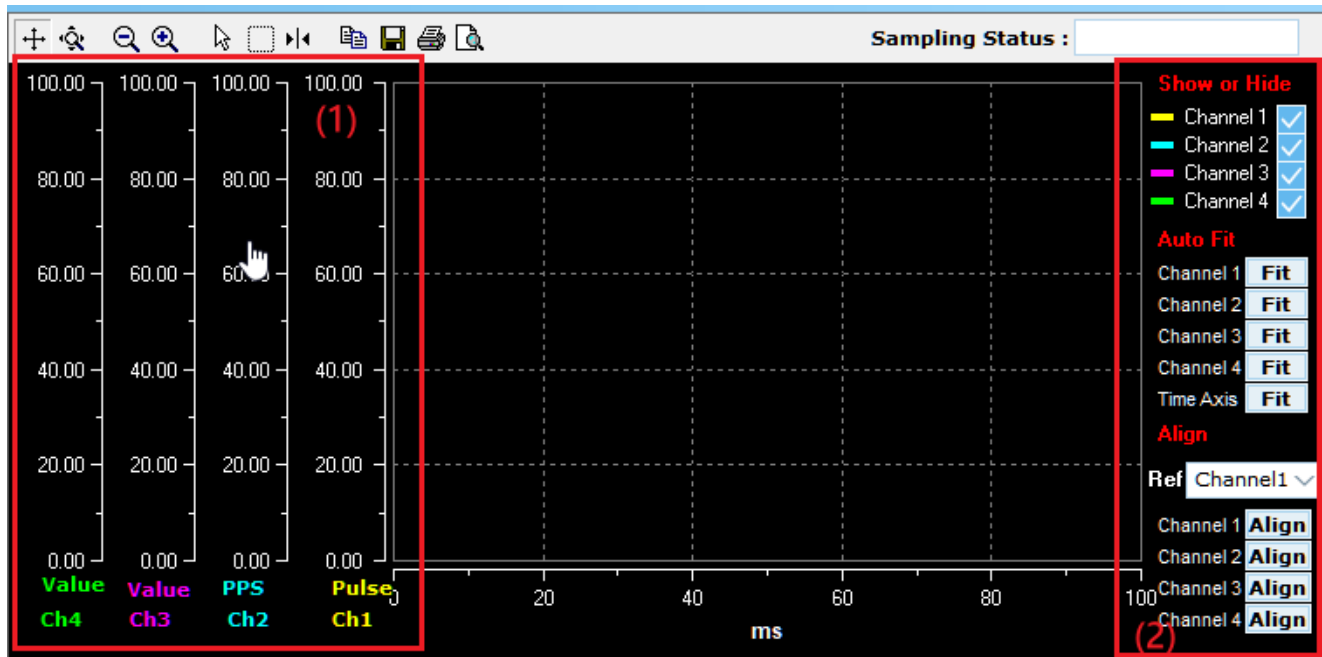
The screenshot displays the Motion Creator Pro 2 interface. The left sidebar shows a hierarchical device tree. Under the 'PCI-8254 Card No 1' section, the 'Motion' option is selected, indicated by a red arrow and the label 'Click Here(1)'. The top toolbar contains various function buttons, with the 'Sampling' button highlighted by a red arrow and the label 'Click Here(2)'. The main window shows a 'Sampling Status' graph with four channels (Ch1, Ch2, Ch3, Ch4) plotted against time (ms). Below the graph is the 'Sampling Setting' panel, which includes dropdown menus for Channel1-4 (set to SAMP\_COM\_POS and Axis 8), Sampling Rate (1 ms), Total Points (100), Trigger Channel (CH 1), and Trigger Edge (Rising). The 'Select Sampling Mode' is set to SINGLE, and there are buttons for Start Sampling, Stop Sampling, Sampling Clear, Data Export, Data Import, and 2D Plot.

### 3.5.1 繪圖區(Drawing Area)

取樣功能一次可同時採集四種不同的資料，而不同的資料型別其單位和數值刻度可能不盡相同，因此繪圖區中左半邊的 Y 座標軸 channel1~channel4 為各 channel 獨立的刻度如下圖 (1)，而橫向 X 座標軸則固定為時間軸其最小單位為 millisecond。

在下圖(2)區塊，可對資料顯示方式做設定，其功能如下：

1. 選擇該 channel 是否顯示
2. 自動調整資料至填滿繪圖區
3. 將各通道的資料 Y 座標軸對齊於某一指定通道顯示。



### 3.5.2 取樣設定(Sampling Setting)

取樣設定主要可分為三個步驟，分別為：

- (1) 決定對哪一運動軸做取樣，和其取樣的資料型別，如位置、速度等。
- (2) 設定取樣速度、點數和決定觸發取樣通道等。
- (3) 設定完後可顯則單次(Single)或連續(Repeat)觸發模式。

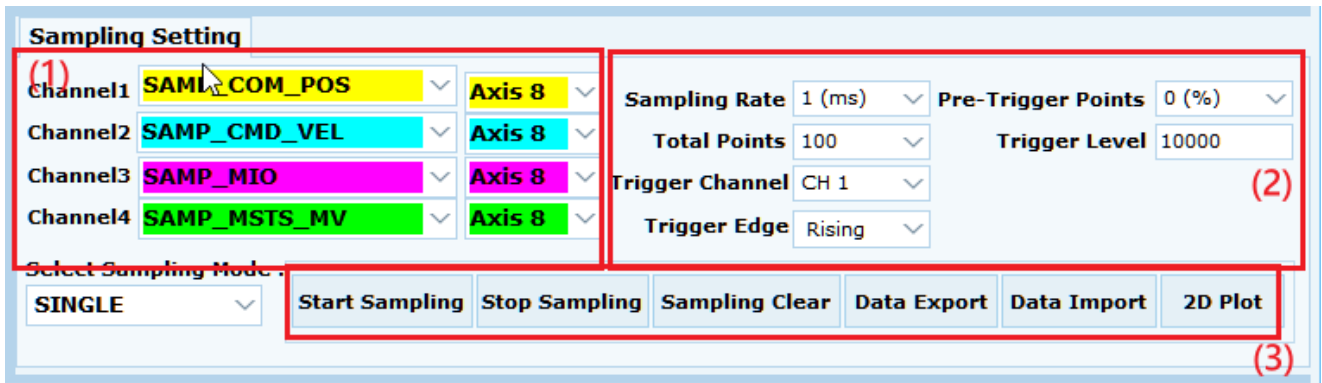
Start Sampling：開始做取樣

Stop Sampling：按鈕可停止動作

Sampling Clear：可清除繪圖區資料

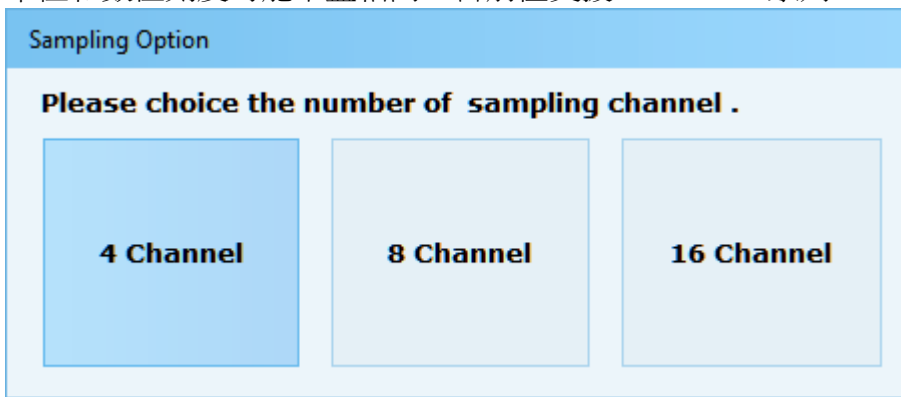
Data Export：將取樣資料輸出至檔案(\*.csv 格式)

Data Import：將取樣資料檔案輸入(\*.csv 格式)

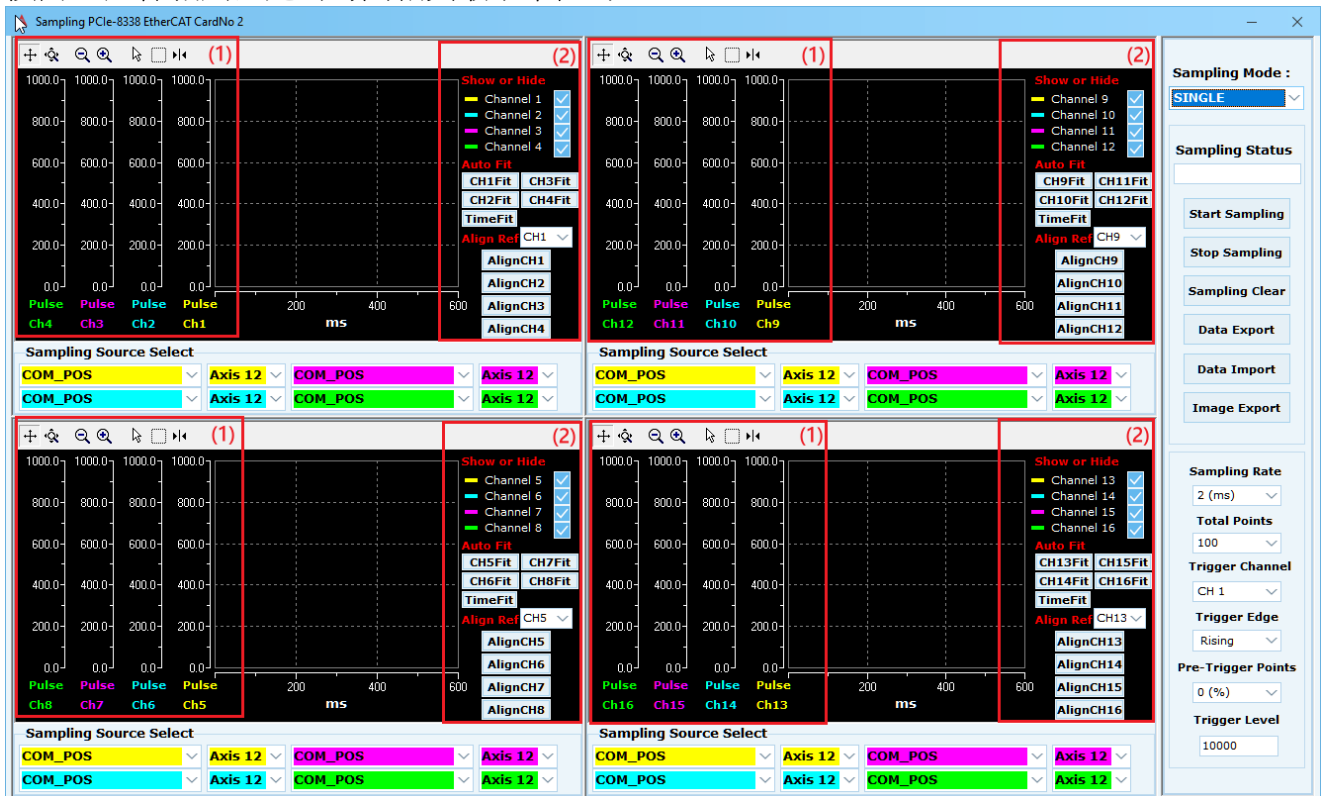


### 3.5.3 16CH Sampling

16CH 取樣功能一次可同時採集 4、8、16 種不同的資料的選擇如下圖，而不同的資料型別其單位和數值刻度可能不盡相同。目前僅支援 EtherCAT 系列。



因此繪圖區中左半邊的 Y 座標軸 channel1~channel16 為各 channel 獨立的刻度如下圖(1)，而橫向 X 座標軸則固定為時間軸其最小單位為 millisecond。





取樣設定主要可分為三個步驟，分別為：

- (1) 決定對哪一運動軸做取樣，和其取樣的資料型別，如位置、速度等。
- (2) 設定取樣速度、點數和決定觸發取樣通道等。
- (3) 設定完後可顯示單次(Single)或連續(Repeat)觸發模式。

Start Sampling：開始做取樣

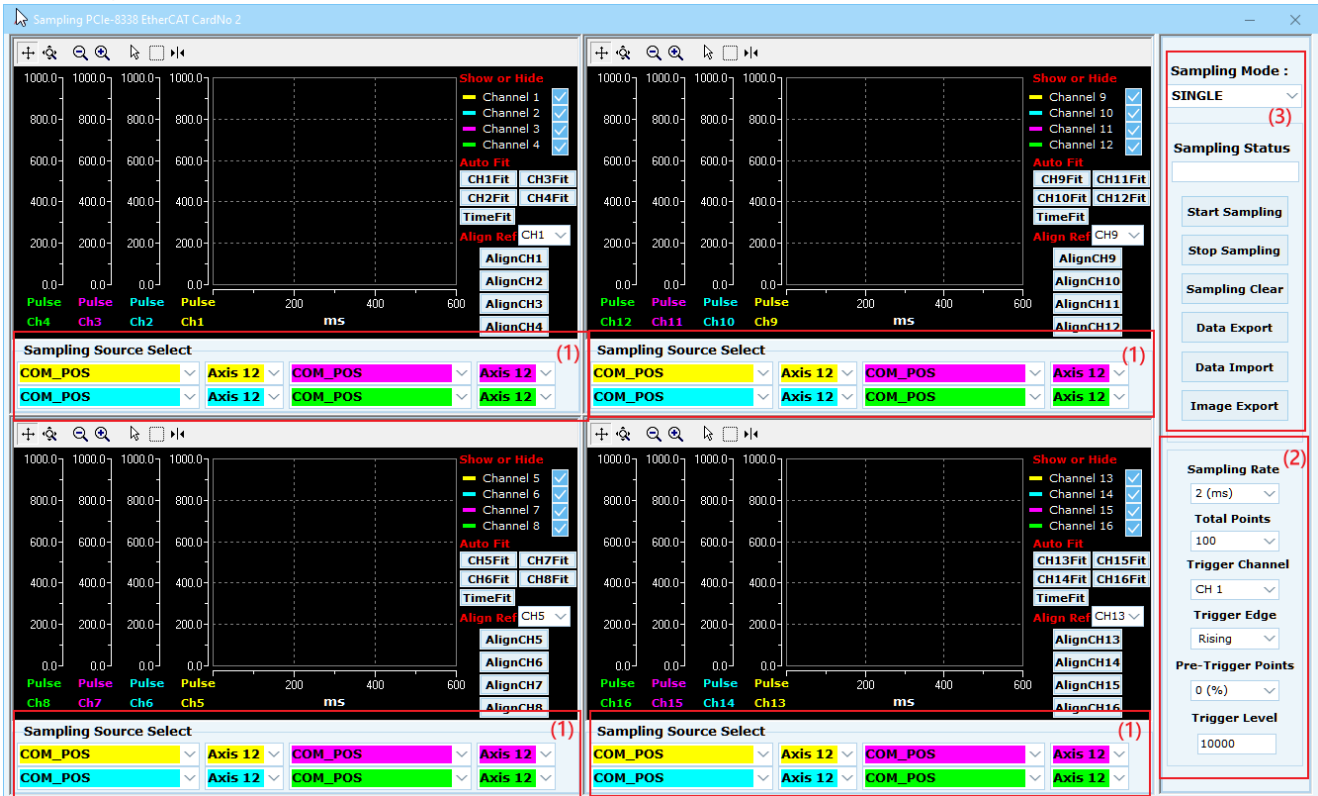
Stop Sampling：按鈕可停止動作

Sampling Clear：可清除繪圖區資料

Data Export：將取樣資料輸出至檔案(\*.csv 格式)

Data Import：將取樣資料檔案輸入(\*.csv 格式)

Image Export：擷取圖片



## 3.6 Setup Wizard

**Setup Wizard**為一個讓您快速設定個軸的參數配置的工具，藉由著一步一步地引導頁面，協助您方便、有效地將系統設置完成。我們建議在進行任何運動控制操作前(剛開始使用本控制卡時)，第一個步驟可以先執行此功能。**Setup Wizard**可達成下列幾項目的：

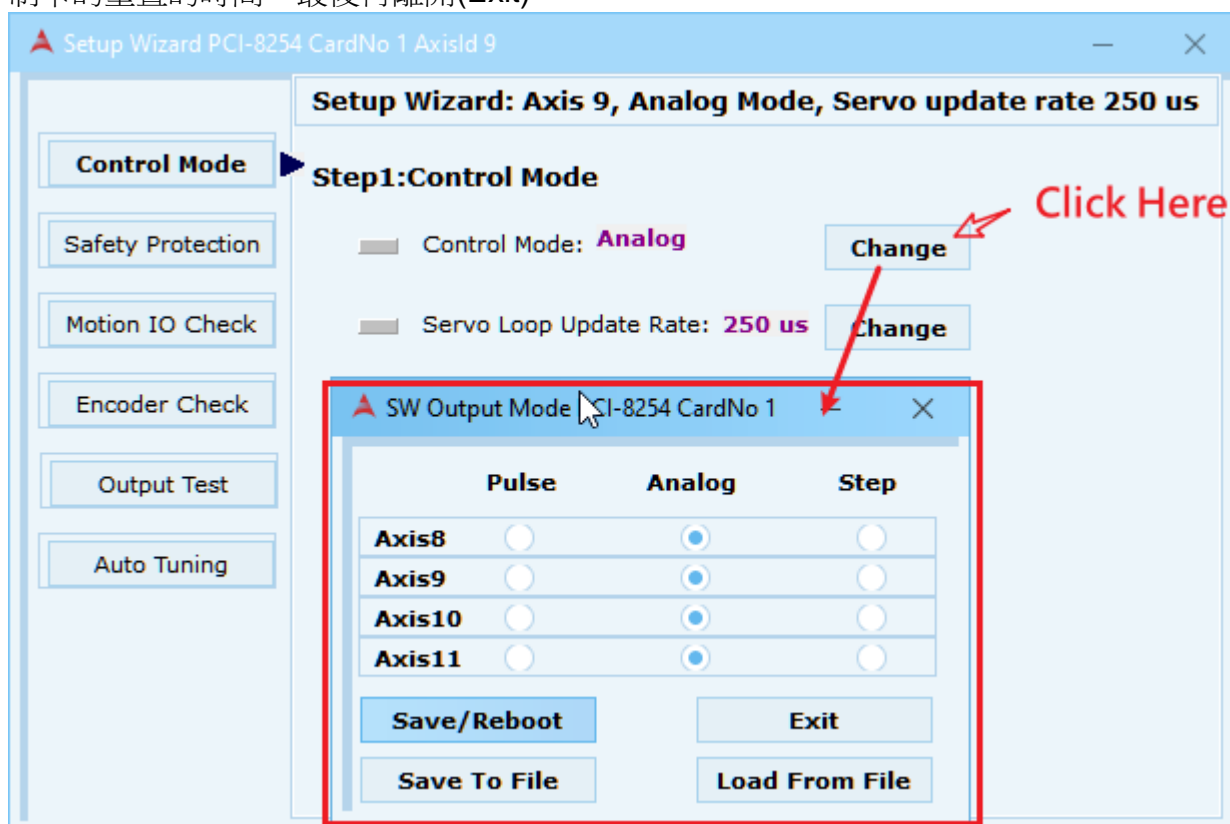
1. 控制卡基本參數設定: 包括控制模式，伺服週期，安全設定等
2. 配線檢查: I/O, Encoder 等

3. 伺服調機 (類比，閉迴路控制模式)：提供**Auto tuning**功能，協助使用者找出一組穩定且具有一定性能的伺服參數。

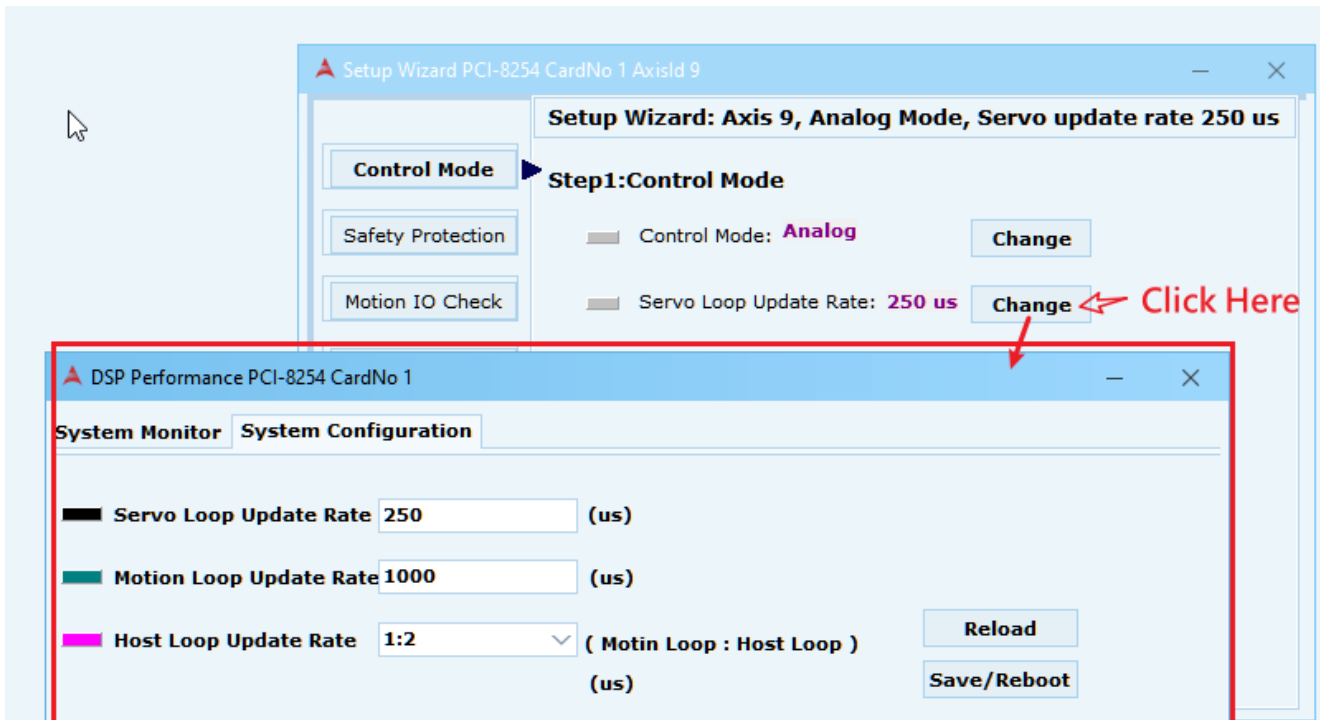
打開 Setup Wizard 頁面步驟如下圖(1)~(2)所示:首先在裝置樹列上點選"Axis X"，再至快速功能按鈕點選 Setup Wizard 功能按鈕。

### 3.6.1 控制模式(Control Mode)

設定各軸控制模式為 Analog Type 或 Pulse Type，點選 Change 按鈕後會出現一個新頁面供您設定各軸的輸出訊號型式。設定完畢後請按 Save/Reboot 按鈕，此時需等待一段存檔和控制卡的重置的時間，最後再離開(Exit)。

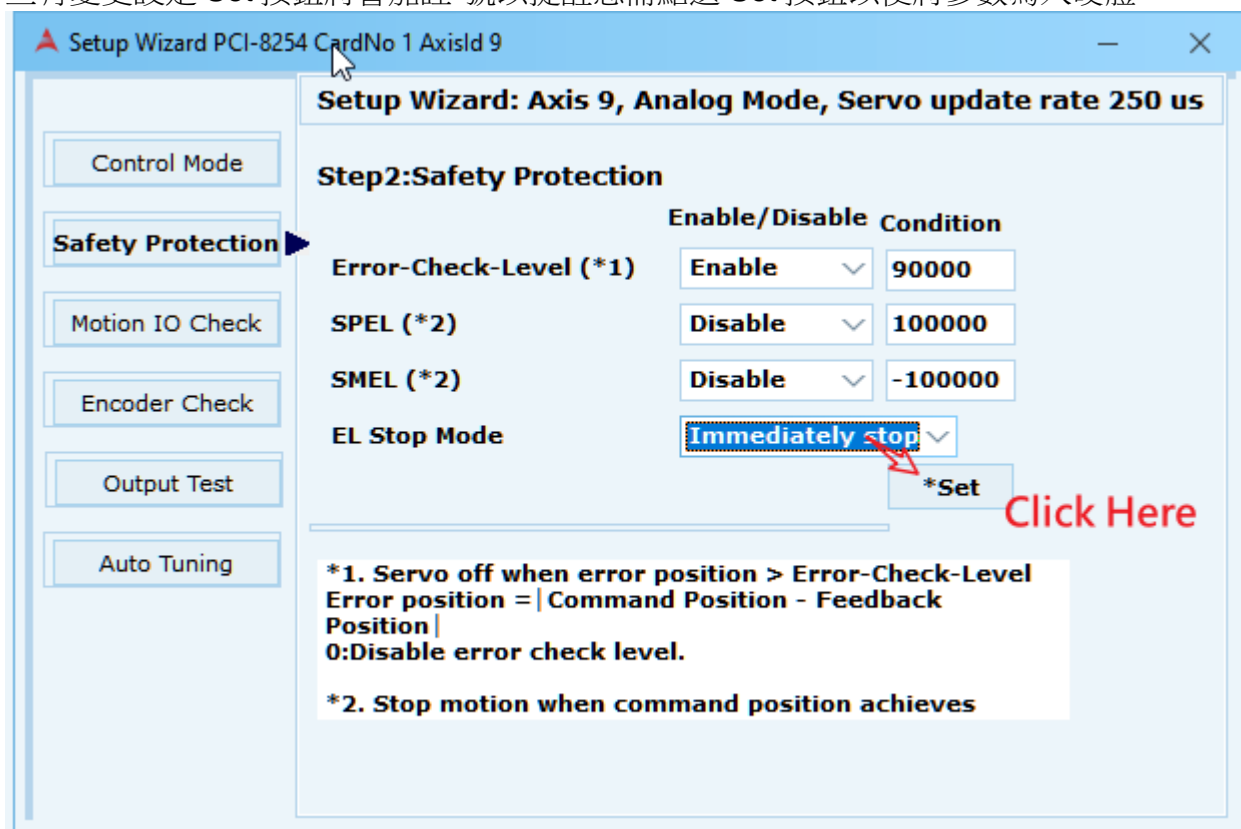


如下圖所示打開伺服控制率更新速度設定畫面，填入適當的 Servo Loop Update Rate 後按 Save/Reboot 按鈕等待控制卡重置(Reset)。



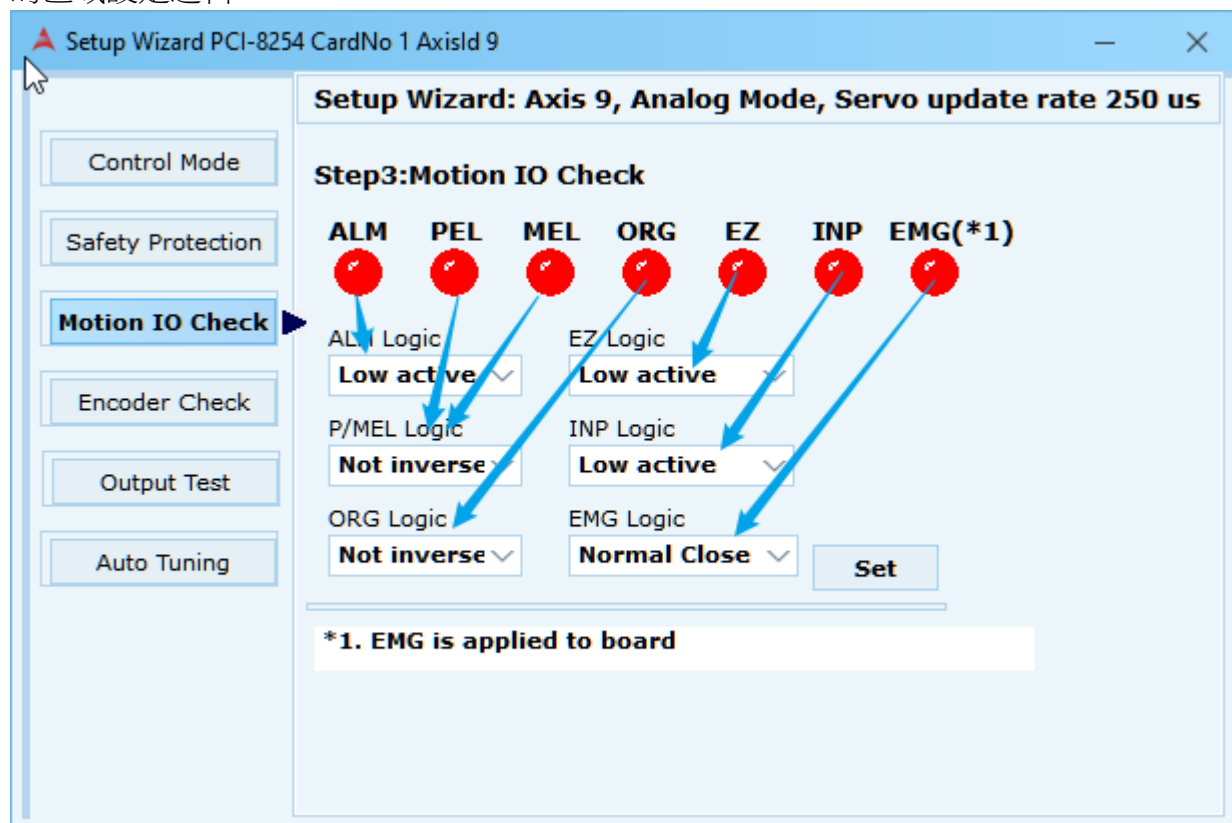
### 3.6.2 安全保護(Safety Protection)

此步驟包含 Error-Check-Level 和 soft-limit 的保護設定，請設定是否啟動功能和條件參數。一旦有變更設定 Set 按鈕將會加註\*號以提醒您需點選 Set 按鈕以便將參數寫入硬體。

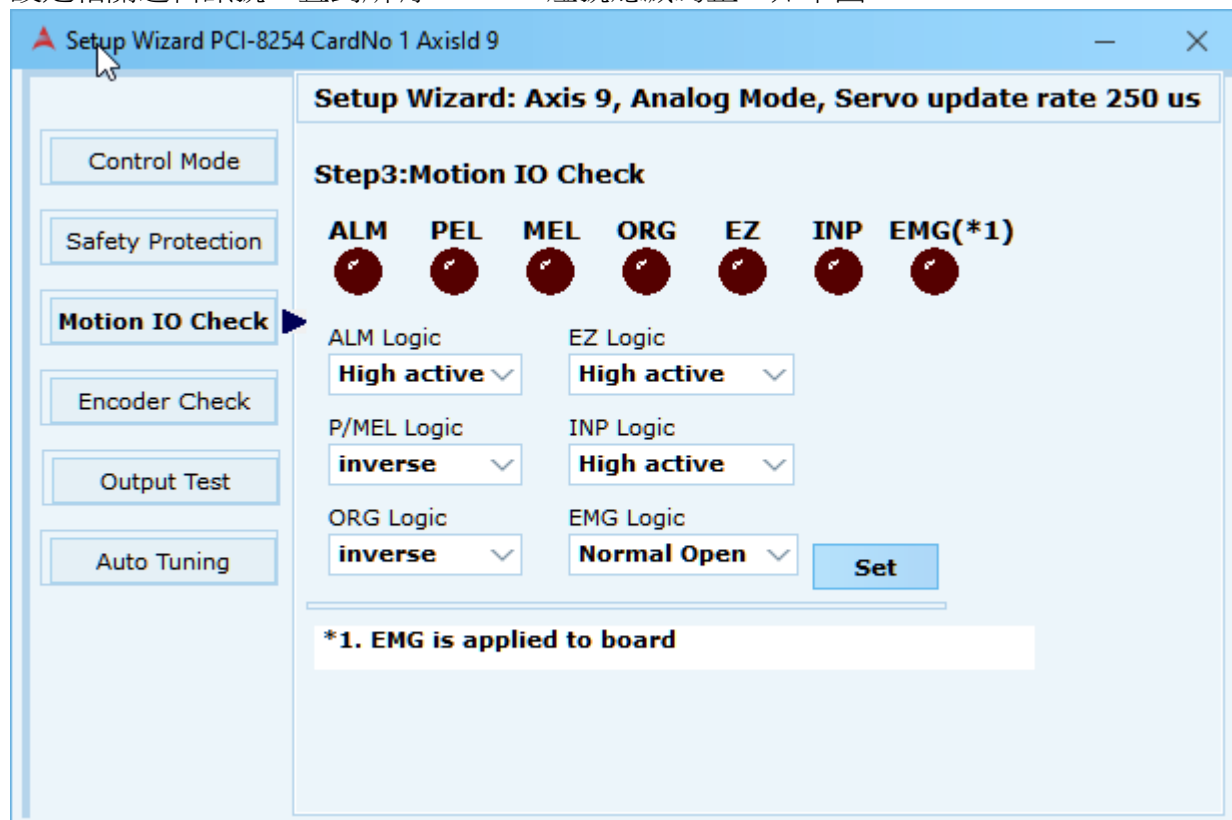


### 3.6.3 確認控制邏輯(Motion IO Check)

設定 Motion IO 的正反向訊號，各 IO 即時狀況如 LED 燈號所顯示，並分別由下圖箭頭中指向的區域設定邏輯。

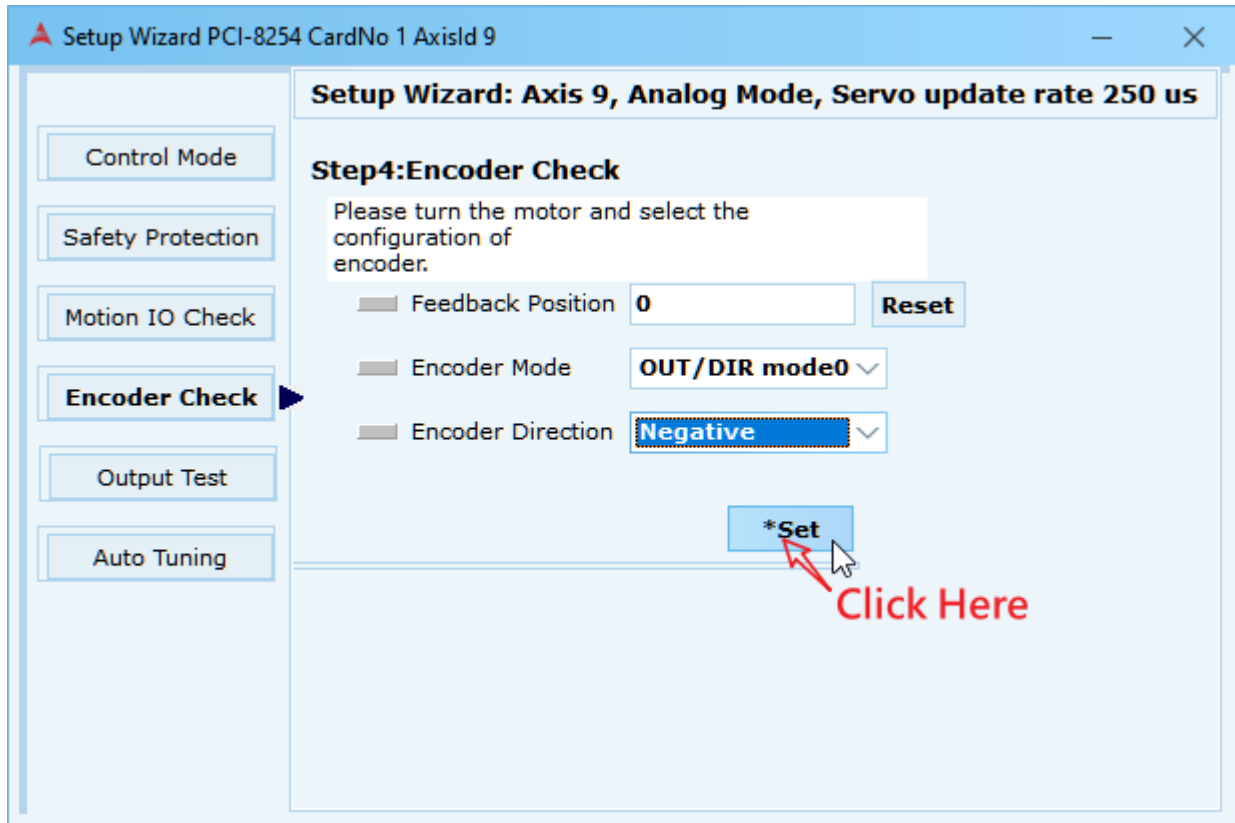


設定相關邏輯訊號，直到所有 IO LED 燈號熄滅為止，如下圖。



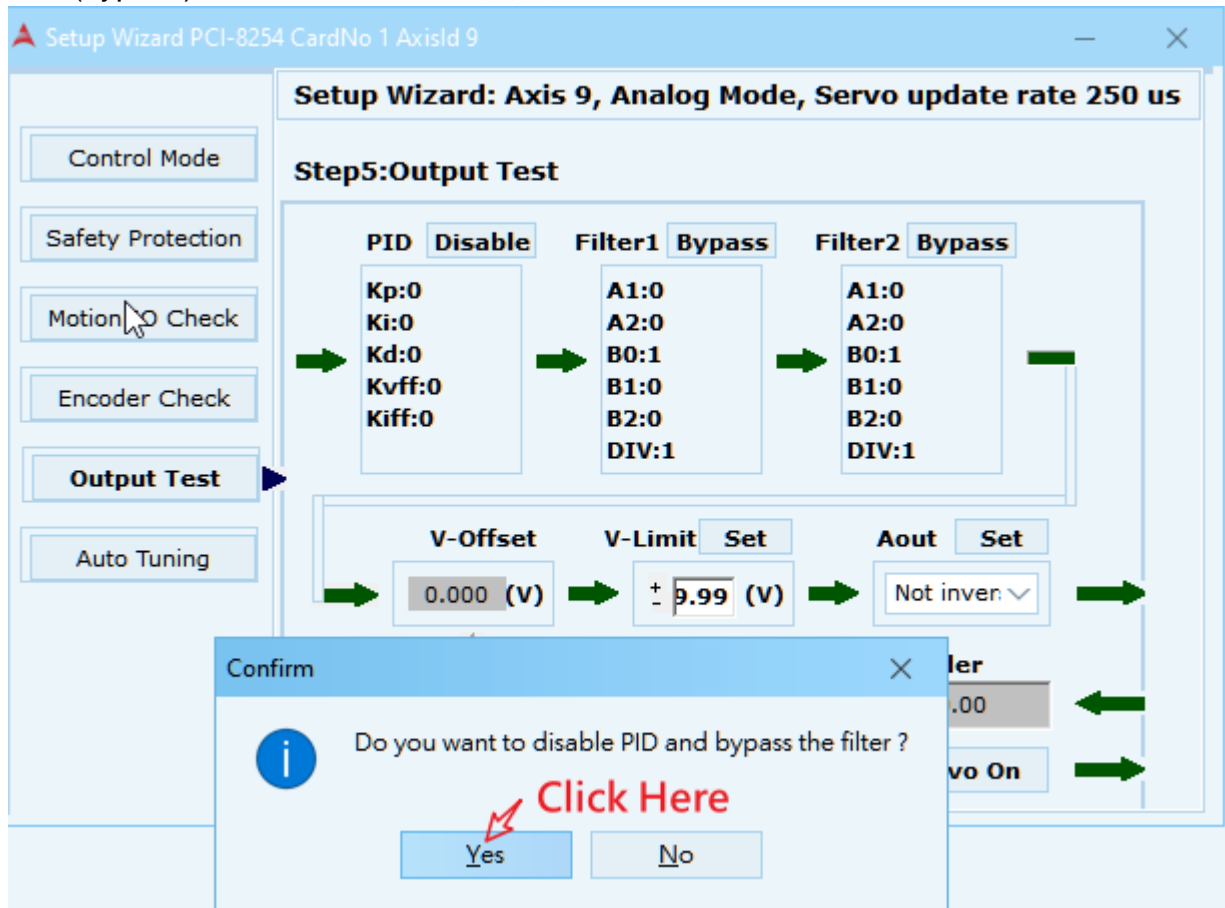
### 3.6.4 確認編碼器(Encoder Check)

設定 Encoder Mode 和 Encoder Direction 後按 Set 寫入設定值。

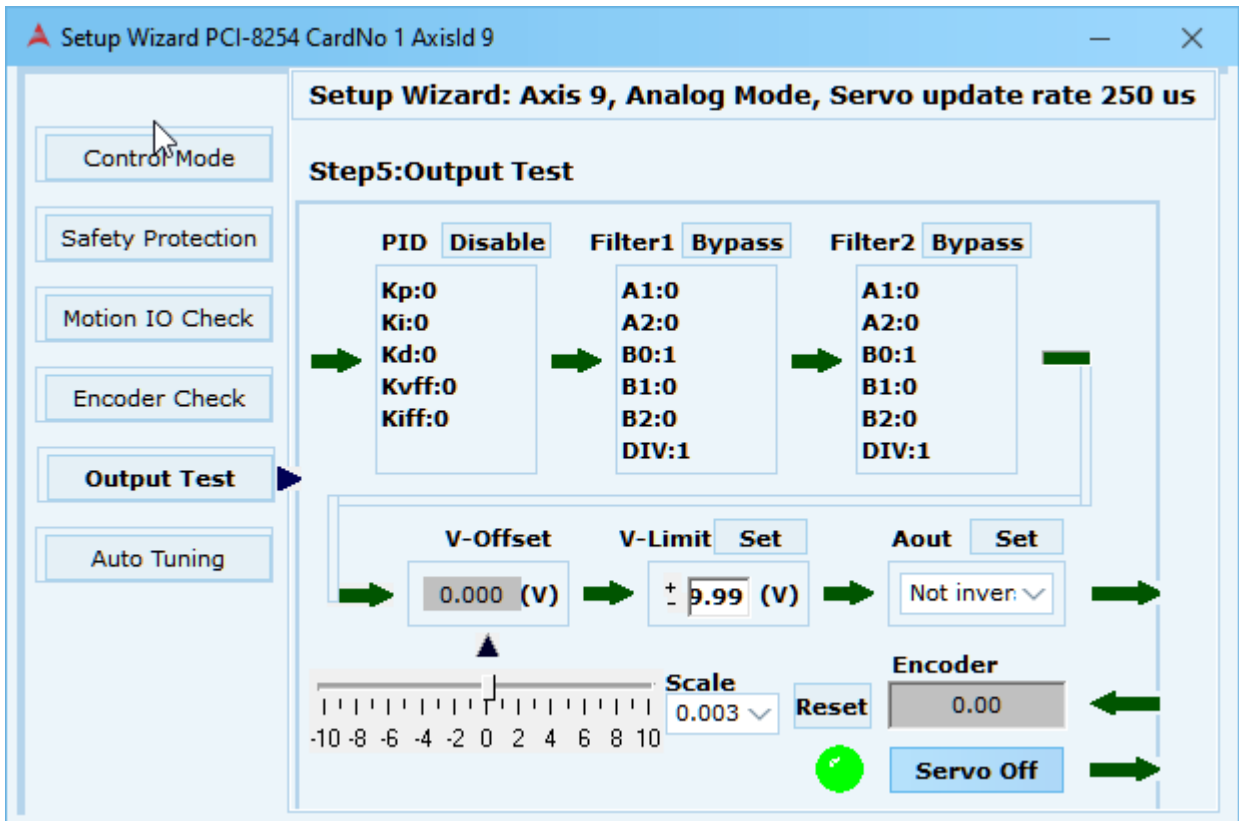


### 3.6.5 輸出測試(Output Test)

- (1) 切換到輸出測試頁面時，將自動詢問您是否要將 PID 和 Filter 等參數皆清除，請點選“**Yes**”選項清除所有設定，該軸 PID 參數設定為 0 (Disable)，Filter 參數設定為無作用 (bypass)。若選擇 No 則不做任何設定。



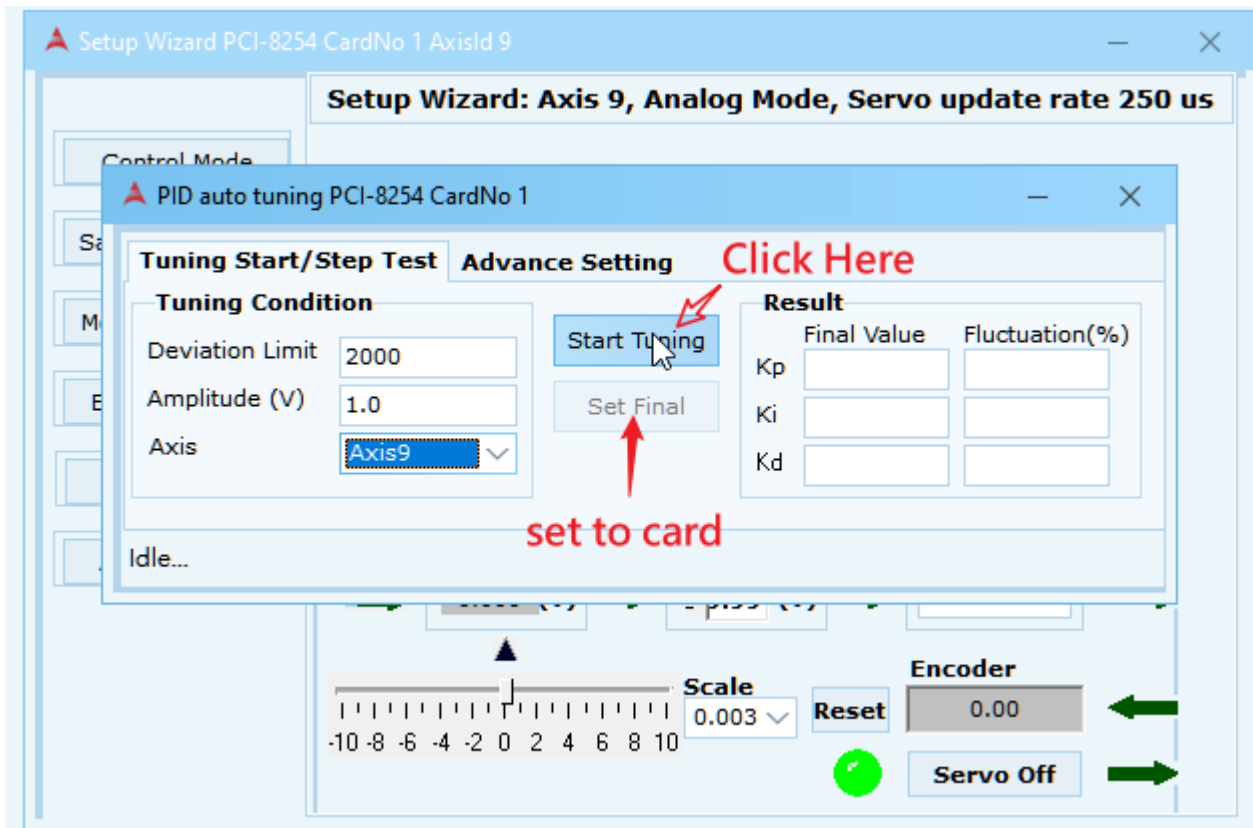
- (2) 將馬達 Servo On 後，下圖中由紅色虛線框選的部份用來設定 V-Offset 值，一開始請先從 Scale 選擇單次移動刻度的大小為 1V、0.1V 或 0.003V，再使用滑鼠滾輪或鍵盤的左右鍵來調整 V-Offset 至適當值後可進行下一步驟。



### 3.6.6 自動調適(Auto Tuning)

2.1~2.5 節的設定皆完成後，將進入到此節的自動調適功能，這會依照您的運動控制系統自動計算出一組適當的 PID 值。

- (1) 確認軸號是否正確，
- (2) 點選 **Start Tuning** 按鈕開始進行調適動作(可能需等待一段時間)。
- (3) 視該軸震動狀況調整 **Amplitude** (震動震幅)。若震幅太小 **Auto-tuning** 程序無法計算出 PID 值。
- (4) 反覆(2) ~ (3)找到一組 PID 值。顯示在右方 **Result** 中。**Fluctuation** 表示計算收斂的狀況，該值越小越好。
- (5) 當程序完成後需點 **Set Final** 按鈕將 PID 值寫入到控制卡中，此時已完 **auto-tuning** 程序。



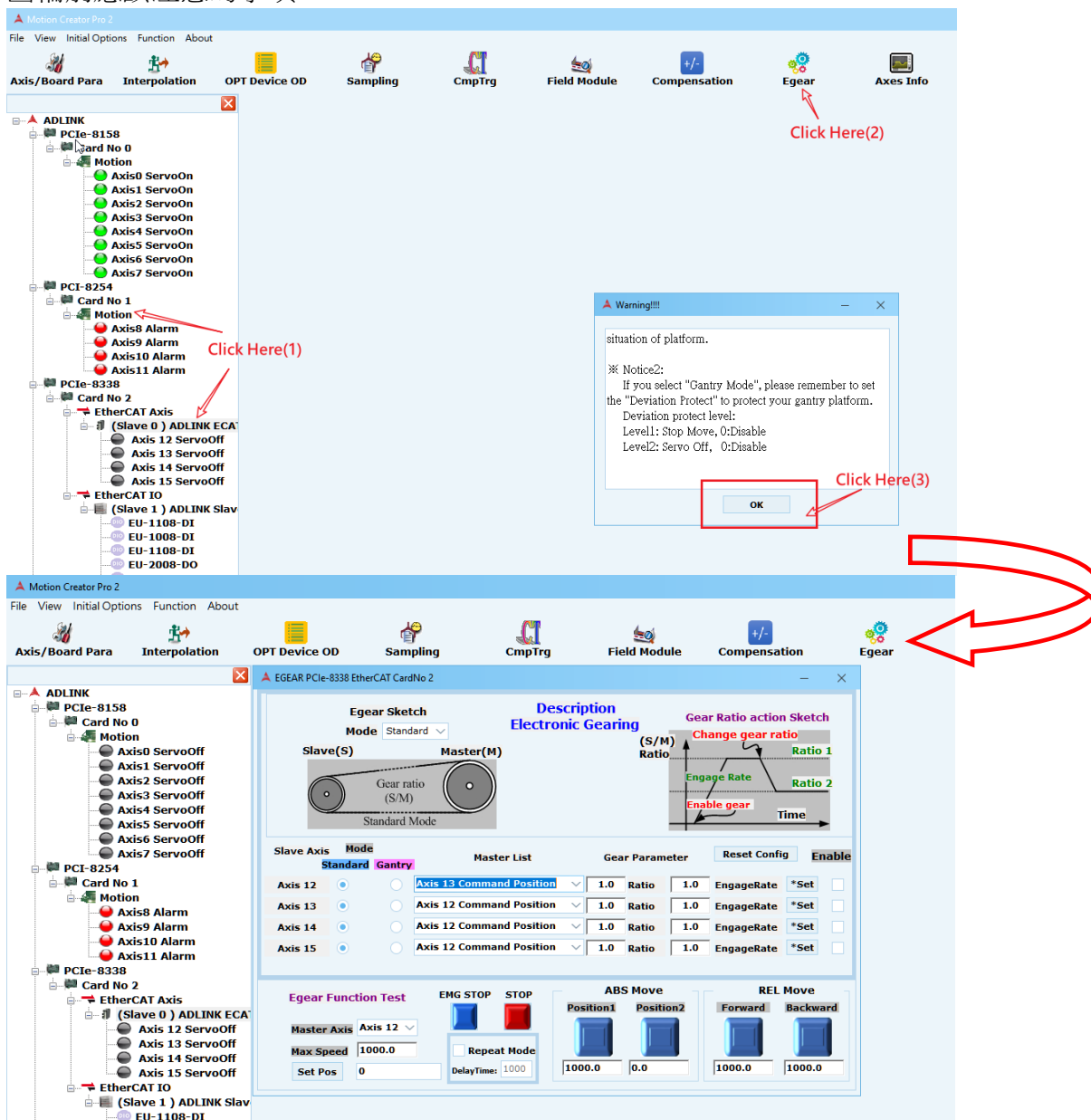
執行完 Wizard 後，代表該軸相關的基本參數已經設置完畢，可以進行單軸運動的操作或是定位運動操作(homing)。另外，可至軸參數設置頁面 3.1.1 檢視該軸參數的設置或進行儲存參數的動作。



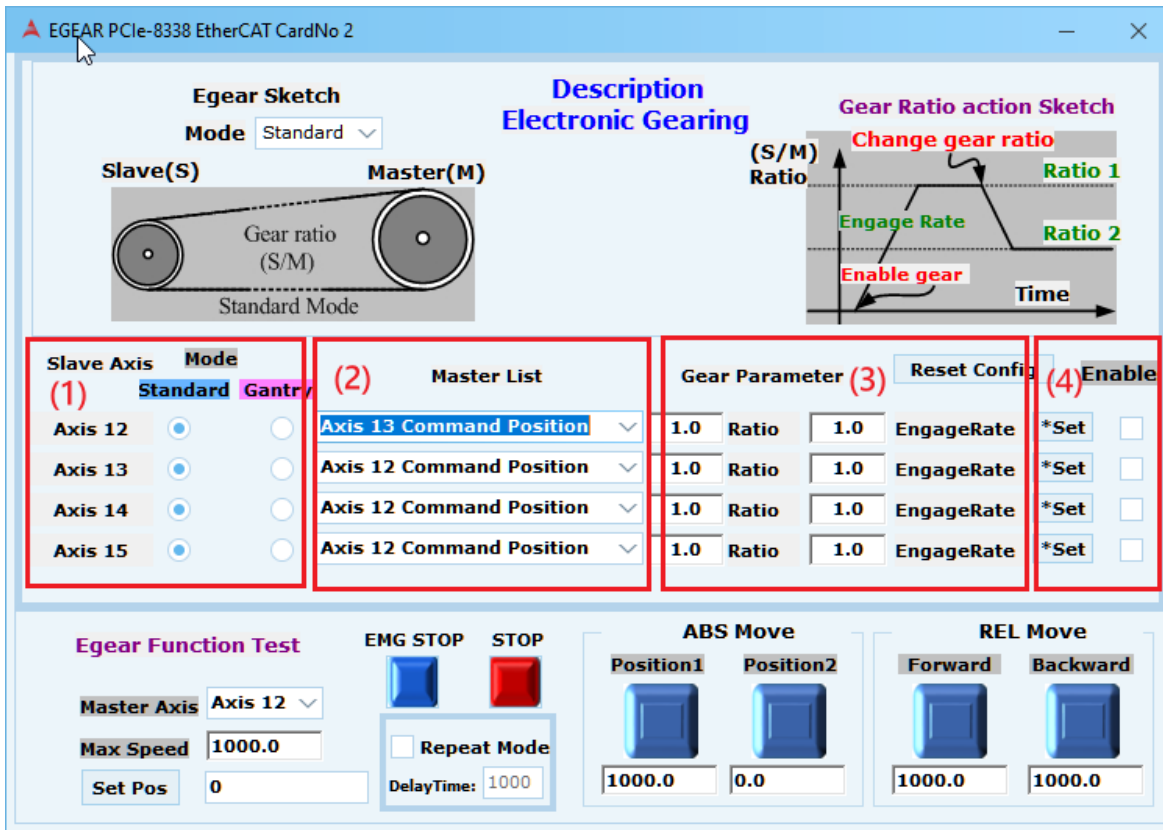
### 3.7 E-GEAR

電子齒輪功能分為**Standard**和**Gantry**兩種模式，**Standard**模式在主/從動軸可設定齒輪比，控制器將依據您所設定的齒輪比在主/從動軸輸出不同的位移量。而**Gantry**模式主/從動軸的齒輪比為固定的1:1，適用於主/從動軸需同動且位移量相同的情況，通常應用於龍門控制系統。

打開電子齒輪頁面的方式如下圖(1)~(3)步驟，依照不同軸卡點選裝置樹列中的”Slave”或者”Motion”，再點選快速功能按鈕上的”Egear 鈕”，此時會跳出一警告訊息，提醒您使用電子齒輪前應該注意的事項。



設定電子齒輪



(1) 設定該軸為 Standard 或 Gantry 模式

(2) 選擇主軸編號和訊號來源

(3) 設定齒輪比參數

Standard 模式時設定 Ratio 和 Engage Rate

1.0 Ratio 1.0 EngageRate

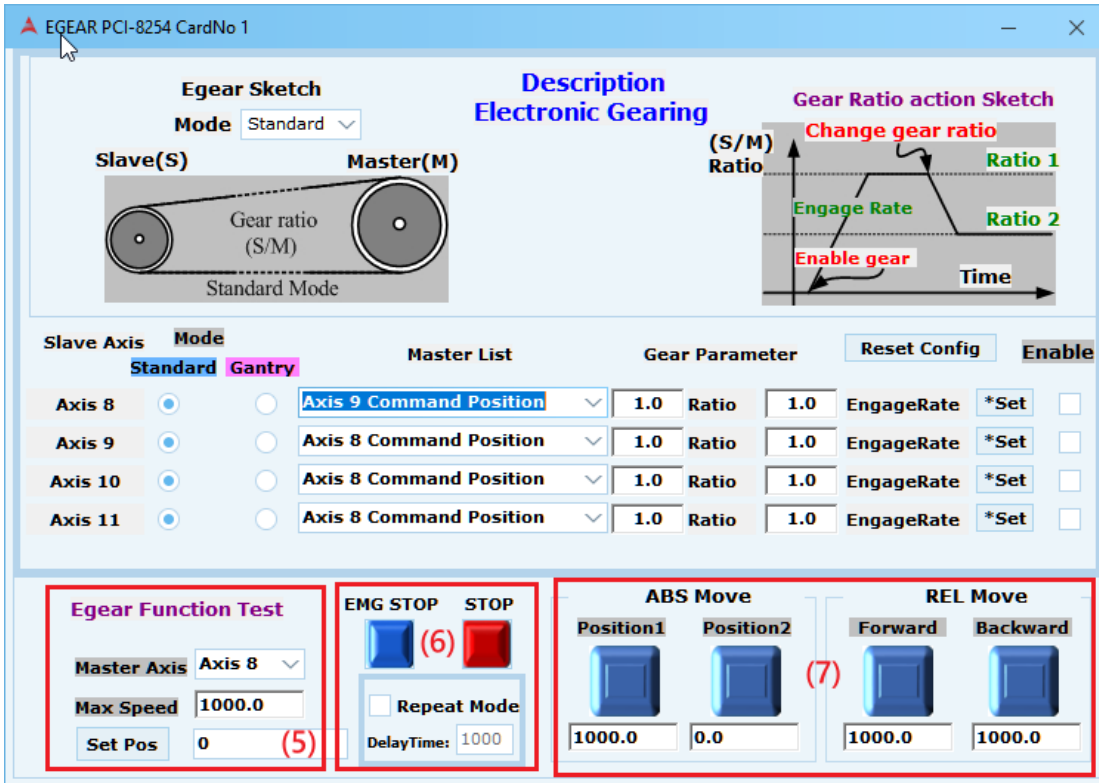
Gantry 模式時設定 Deviation 的保護量

Level1: Stop Move

Level2: Servo Off

0 Level1 0 Level2

(4) 將參數值寫入控制器，並設定是否啟動



**Egear Sketch**  
Mode: Standard

Slave(S) Master(M)  
Gear ratio (S/M)  
Standard Mode

**Description Electronic Gearing**  
Gear Ratio action Sketch  
Change gear ratio  
Engage Rate  
Ratio 1  
Ratio 2  
Enable gear  
Time

Slave Axis	Mode	Master List	Gear Parameter	Reset Config	Enable
Axis 8	Standard <input checked="" type="radio"/> Gantry <input type="radio"/>	Axis 9 Command Position	1.0 Ratio 1.0	EngageRate *Set	<input type="checkbox"/>
Axis 9	Standard <input checked="" type="radio"/> Gantry <input type="radio"/>	Axis 8 Command Position	1.0 Ratio 1.0	EngageRate *Set	<input type="checkbox"/>
Axis 10	Standard <input checked="" type="radio"/> Gantry <input type="radio"/>	Axis 8 Command Position	1.0 Ratio 1.0	EngageRate *Set	<input type="checkbox"/>
Axis 11	Standard <input checked="" type="radio"/> Gantry <input type="radio"/>	Axis 8 Command Position	1.0 Ratio 1.0	EngageRate *Set	<input type="checkbox"/>

**Egear Function Test**  
Master Axis: Axis 8  
Max Speed: 1000.0  
Set Pos: 0 (5)

**EMG STOP STOP**  
(6)  
Repeat Mode   
DelayTime: 1000

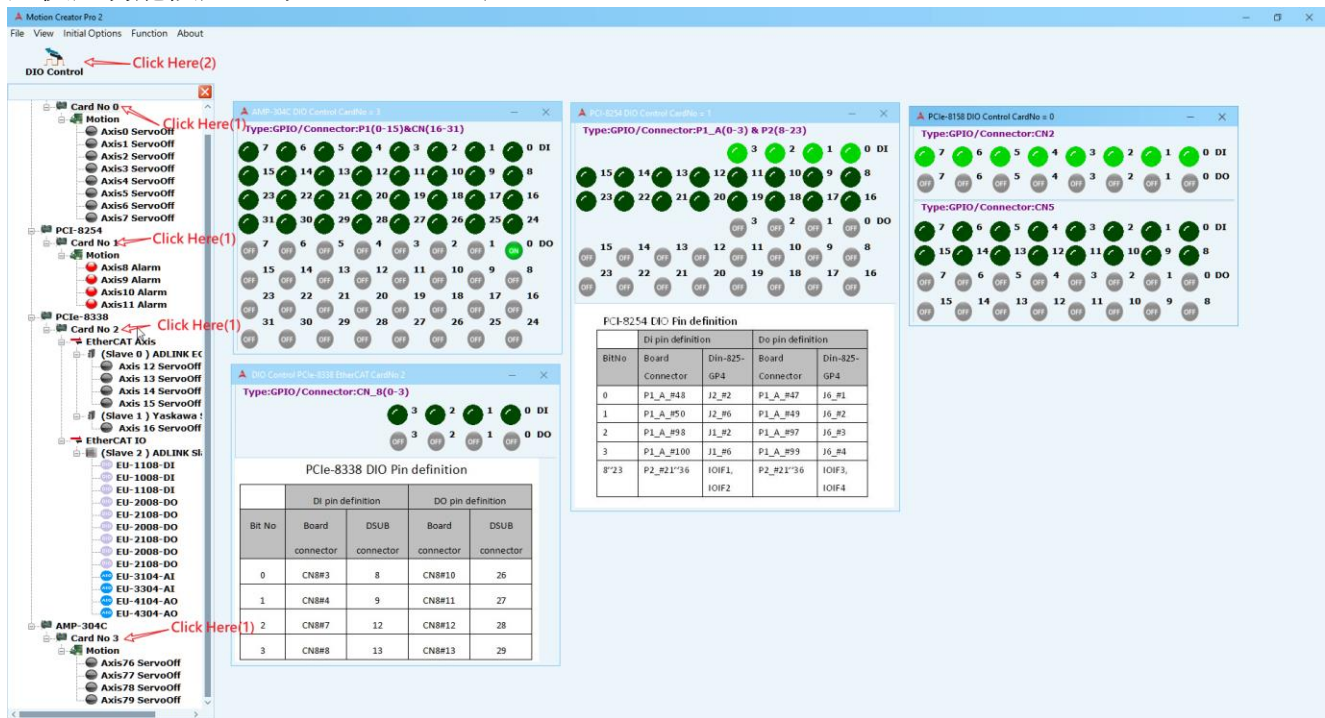
**ABS Move REL Move**  
Position1: 1000.0 Position2: 0.0 (7)  
Forward: 1000.0 Backward: 1000.0

- (5) 設定主軸最大速度及位置
- (6) 如需執行兩個位移間的往復來回運動時，可勾選 Repeat Move 和設定間隔時間 Delay Time 後，再執行運動操作
- (7) ABS MOVE：絕對位置移動，可輸入絕對位置  
REL MOVE：相對位置移動，可輸入相對位置

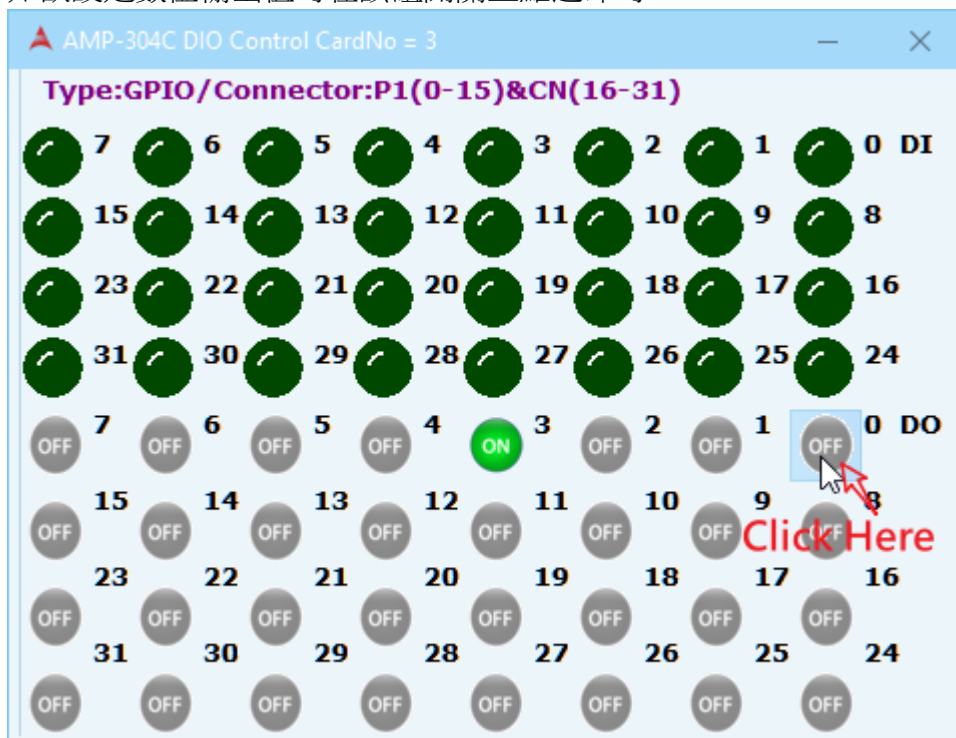
## 3.8 DIO

不同軸卡所支援的DIO組數不同。

打開 DIO 頁面的方式如下圖(1)~(2)步驟，依照不同軸卡點選裝置樹列中的“Card No X”，再點選快速功能按鈕上的“DIO Control 鈕”。



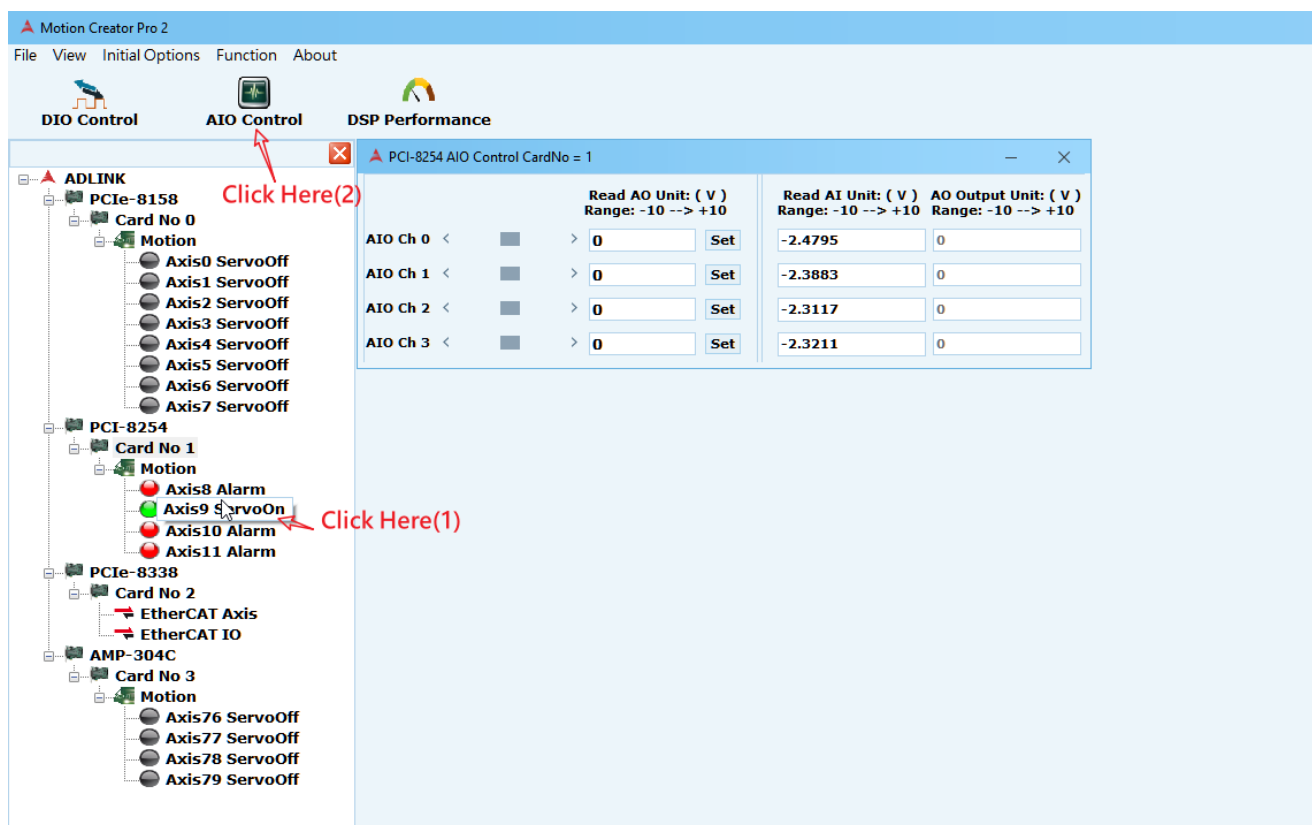
如欲設定數位輸出值可在該組開關上點選即可



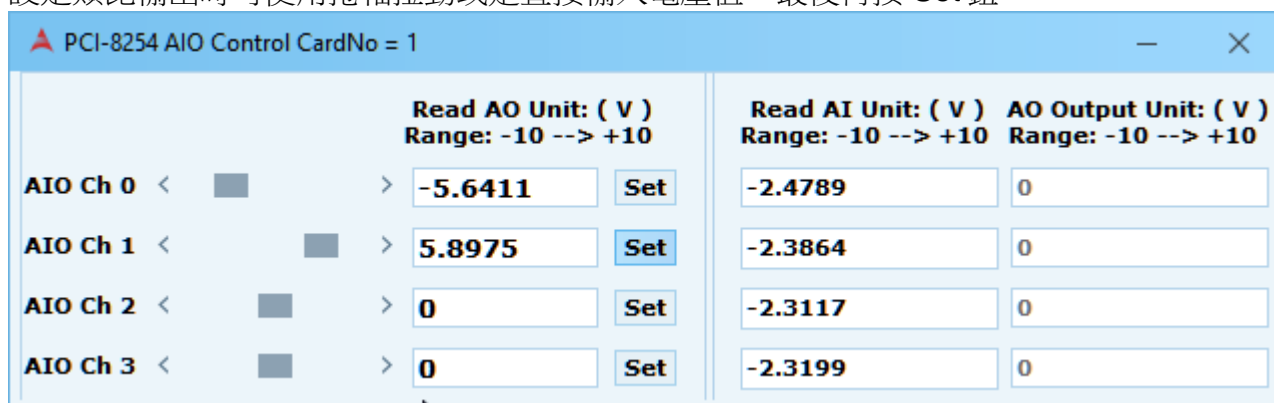
## 3.9 AIO

不同軸卡所支援的AIO組數不同，設定類比輸出時可使用捲軸拉動或是直接輸入電壓值。

打開 AIO 頁面的方式如下圖(1)~(2)步驟，依照不同軸卡點選裝置樹列中的”Card No X”，再點選快速功能按鈕上的”AIO Control 鈕”。



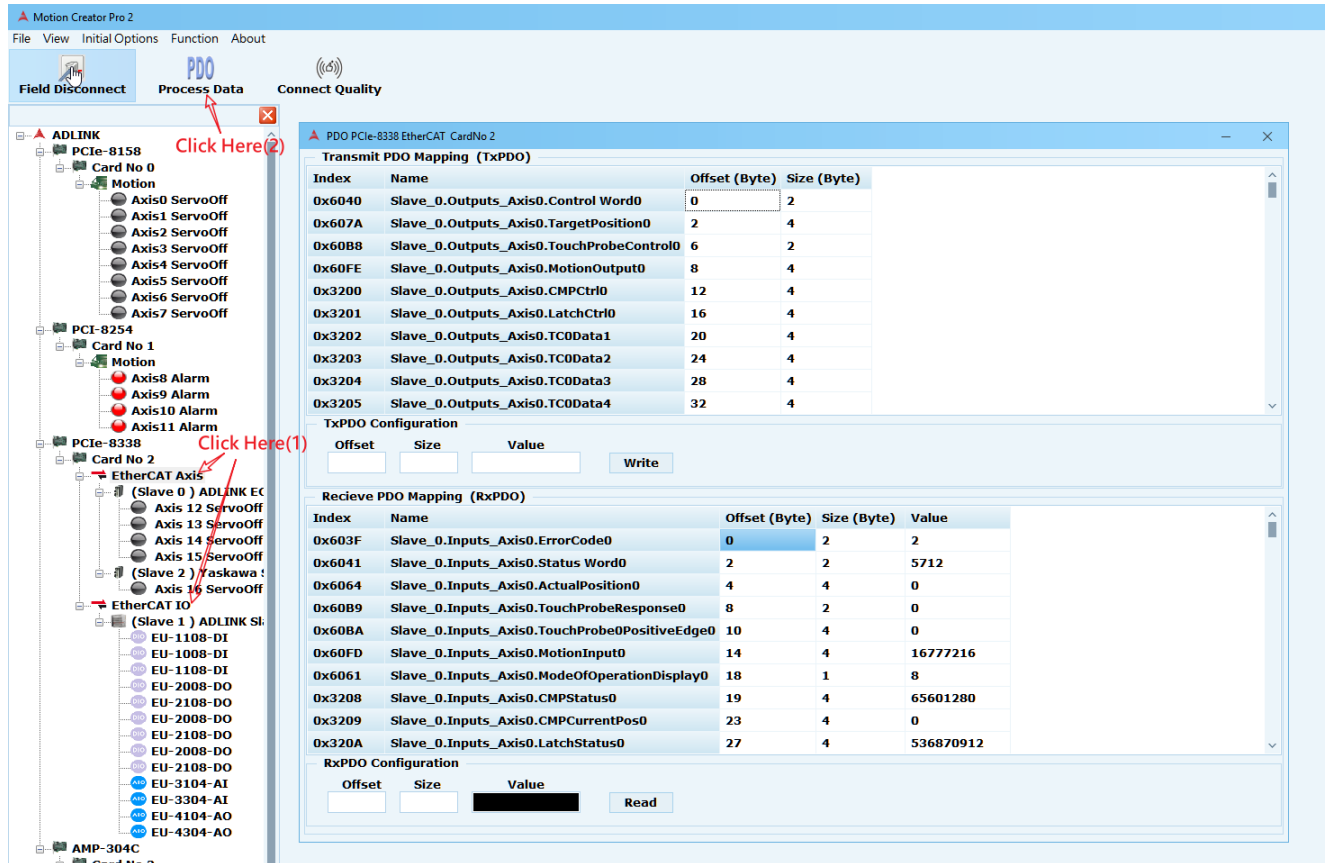
設定類比輸出時可使用捲軸拉動或是直接輸入電壓值，最後再按 Set 鈕。



## 3.10 PDO

PDO (Process Data)頁面可實現PDO (Process Data Object)週期性資料的讀寫交換。

打開 PDO 頁面的方式如下圖(1)~(2)步驟，點選裝置樹列中的點選裝置樹列中” EtherCAT Axis” 或者” EtherCAT Axis IO”，再點選快速功能按鈕上的”PDO 鈕”。



The screenshot shows the Motion Creator Pro 2 software interface. On the left is a device tree with the following structure:

- ADLINK
  - PCIe-8158 Card No 0
    - Motion
      - Axis0 ServoOff
      - Axis1 ServoOff
      - Axis2 ServoOff
      - Axis3 ServoOff
      - Axis4 ServoOff
      - Axis5 ServoOff
      - Axis6 ServoOff
      - Axis7 ServoOff
    - PCI-8254 Card No 1
      - Motion
        - Axis8 Alarm
        - Axis9 Alarm
        - Axis10 Alarm
        - Axis11 Alarm
    - PCIe-8338 Card No 2
      - EtherCAT Axis
        - (Slave 0) ADLINK EC
          - Axis 12 ServoOff
          - Axis 13 ServoOff
          - Axis 14 ServoOff
          - Axis 15 ServoOff
        - (Slave 2) Askawa
          - Axis 16 ServoOff
      - EtherCAT IO
        - (Slave 1) ADLINK SI
          - EU-1108-DI
          - EU-1008-DI
          - EU-1108-DI
          - EU-2108-DO
          - EU-2008-DO
          - EU-2108-DO
          - EU-2008-DO
          - EU-2108-DO
          - EU-3104-AI
          - EU-3304-AI
          - EU-4104-AO
          - EU-4304-AO
- AMP-304C Card No 3

The main configuration panel is titled "PDO PCIe-8338 EtherCAT CardNo 2". It contains two tables:

**Transmit PDO Mapping (TxPDO)**

Index	Name	Offset (Byte)	Size (Byte)
0x6040	Slave_0.Outputs_Axis0.Control Word0	0	2
0x607A	Slave_0.Outputs_Axis0.TargetPosition0	2	4
0x60B8	Slave_0.Outputs_Axis0.TouchProbeControl0	6	2
0x60FE	Slave_0.Outputs_Axis0.MotionOutput0	8	4
0x3200	Slave_0.Outputs_Axis0.CMPCtrl0	12	4
0x3201	Slave_0.Outputs_Axis0.LatchCtrl0	16	4
0x3202	Slave_0.Outputs_Axis0.TC0Data1	20	4
0x3203	Slave_0.Outputs_Axis0.TC0Data2	24	4
0x3204	Slave_0.Outputs_Axis0.TC0Data3	28	4
0x3205	Slave_0.Outputs_Axis0.TC0Data4	32	4

**Receive PDO Mapping (RxPDO)**

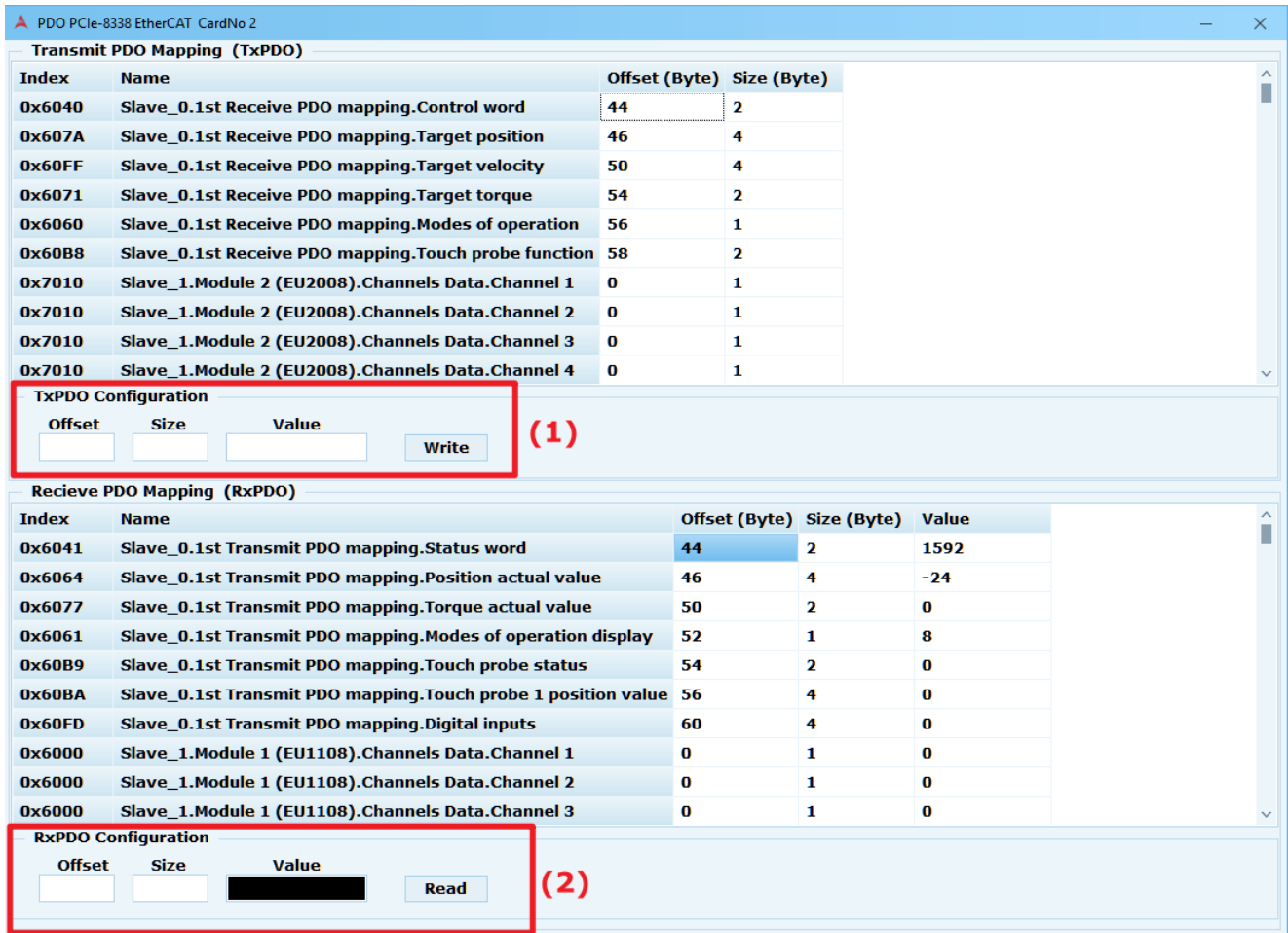
Index	Name	Offset (Byte)	Size (Byte)	Value
0x603F	Slave_0.Inputs_Axis0.ErrorCode0	0	2	2
0x6041	Slave_0.Inputs_Axis0.Status Word0	2	2	5712
0x6064	Slave_0.Inputs_Axis0.ActualPosition0	4	4	0
0x60B9	Slave_0.Inputs_Axis0.TouchProbeResponse0	8	2	0
0x60BA	Slave_0.Inputs_Axis0.TouchProbe0PositiveEdge0	10	4	0
0x60FD	Slave_0.Inputs_Axis0.MotionInput0	14	4	16777216
0x6061	Slave_0.Inputs_Axis0.ModeOfOperationDisplay0	18	1	8
0x3208	Slave_0.Inputs_Axis0.CMPStatus0	19	4	65601280
0x3209	Slave_0.Inputs_Axis0.CMPCurrentPos0	23	4	0
0x320A	Slave_0.Inputs_Axis0.LatchStatus0	27	4	536870912

Red arrows in the image point to "Click Here(1)" on the "EtherCAT Axis" node in the device tree and "Click Here(2)" on the "PDO" button in the top toolbar.

使用者可以針對 PDO 所需要的內容輸入需求

(1) TxPDO : Slave 從站送出一個程序資料物件(PDO)，使用者可將從站想傳入的 offset，Value (Size 為 Value 的位元組大小，當填入 offset 後系統會自動帶入) 填入編輯欄位內後按下 Write 按鈕進行寫入，也可以針對想知道的 Value 輸入對應的 offset 值後按下 Read 按鈕來讀取。

(2) RxPDO: Slave 從站收到的一個程序資料物件(PDO)，同樣針對想知道的 Value 輸入對應的 offset 值按下 Read 按鈕來讀取，就可以得到 value 以及相對應的 Size 大小。



The screenshot displays the 'PDO PCIe-8338 EtherCAT CardNo 2' configuration window. It is divided into two main sections: 'Transmit PDO Mapping (TxPDO)' and 'Receive PDO Mapping (RxPDO)'. Each section includes a table of mappings and a configuration panel below it.

**Transmit PDO Mapping (TxPDO) Table:**

Index	Name	Offset (Byte)	Size (Byte)
0x6040	Slave_0.1st Receive PDO mapping.Control word	44	2
0x607A	Slave_0.1st Receive PDO mapping.Target position	46	4
0x60FF	Slave_0.1st Receive PDO mapping.Target velocity	50	4
0x6071	Slave_0.1st Receive PDO mapping.Target torque	54	2
0x6060	Slave_0.1st Receive PDO mapping.Modes of operation	56	1
0x60B8	Slave_0.1st Receive PDO mapping.Touch probe function	58	2
0x7010	Slave_1.Module 2 (EU2008).Channels Data.Channel 1	0	1
0x7010	Slave_1.Module 2 (EU2008).Channels Data.Channel 2	0	1
0x7010	Slave_1.Module 2 (EU2008).Channels Data.Channel 3	0	1
0x7010	Slave_1.Module 2 (EU2008).Channels Data.Channel 4	0	1

**TxPDO Configuration Panel (1):** This panel, highlighted with a red box, contains input fields for 'Offset', 'Size', and 'Value', and a 'Write' button. A red circled number '(1)' is placed to the right of the panel.

**Receive PDO Mapping (RxPDO) Table:**

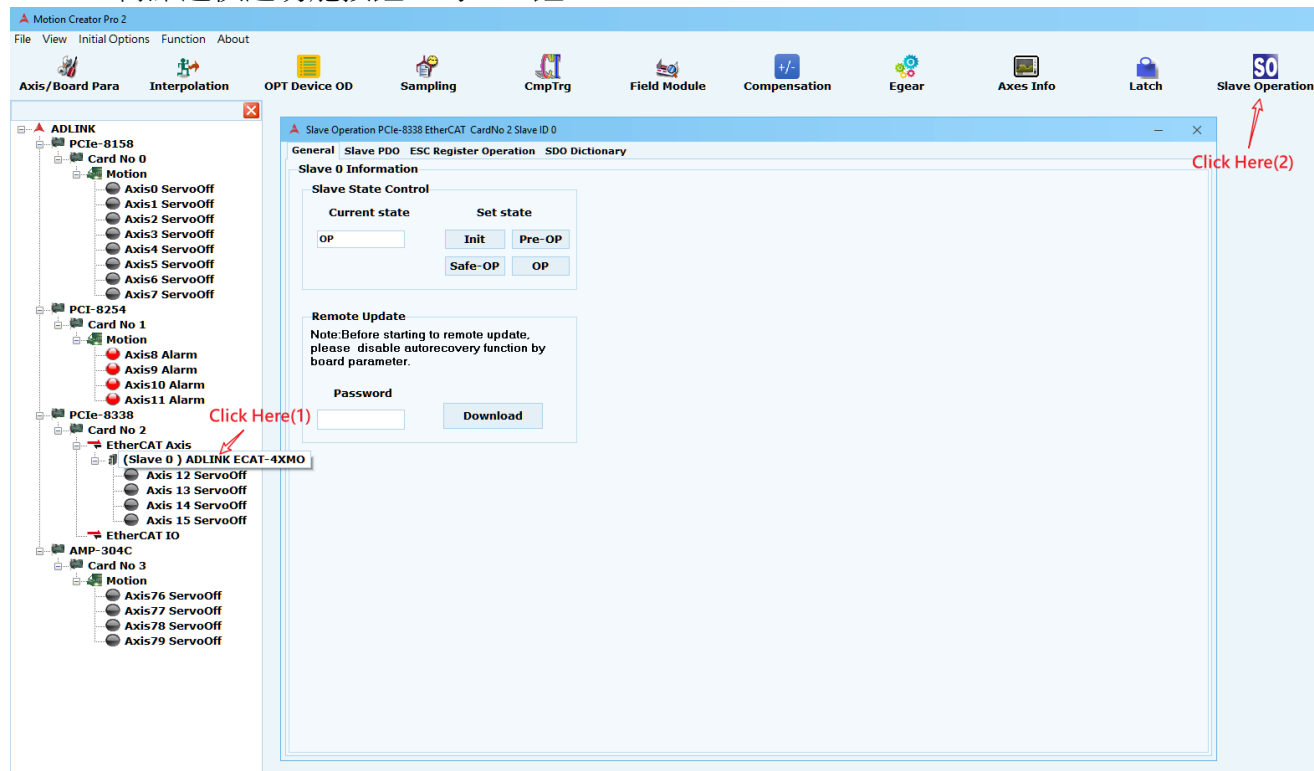
Index	Name	Offset (Byte)	Size (Byte)	Value
0x6041	Slave_0.1st Transmit PDO mapping.Status word	44	2	1592
0x6064	Slave_0.1st Transmit PDO mapping.Position actual value	46	4	-24
0x6077	Slave_0.1st Transmit PDO mapping.Torque actual value	50	2	0
0x6061	Slave_0.1st Transmit PDO mapping.Modes of operation display	52	1	8
0x60B9	Slave_0.1st Transmit PDO mapping.Touch probe status	54	2	0
0x60BA	Slave_0.1st Transmit PDO mapping.Touch probe 1 position value	56	4	0
0x60FD	Slave_0.1st Transmit PDO mapping.Digital inputs	60	4	0
0x6000	Slave_1.Module 1 (EU1108).Channels Data.Channel 1	0	1	0
0x6000	Slave_1.Module 1 (EU1108).Channels Data.Channel 2	0	1	0
0x6000	Slave_1.Module 1 (EU1108).Channels Data.Channel 3	0	1	0

**RxPDO Configuration Panel (2):** This panel, highlighted with a red box, contains input fields for 'Offset', 'Size', and 'Value', and a 'Read' button. A red circled number '(2)' is placed to the right of the panel.

## 3.11 SDO

SO (Slave Operation)頁面可以透過SDO的通信OD(Object Dictionary)數據讀寫，獲取Slave的特定數據。進一步達到參數配置和狀態監視。

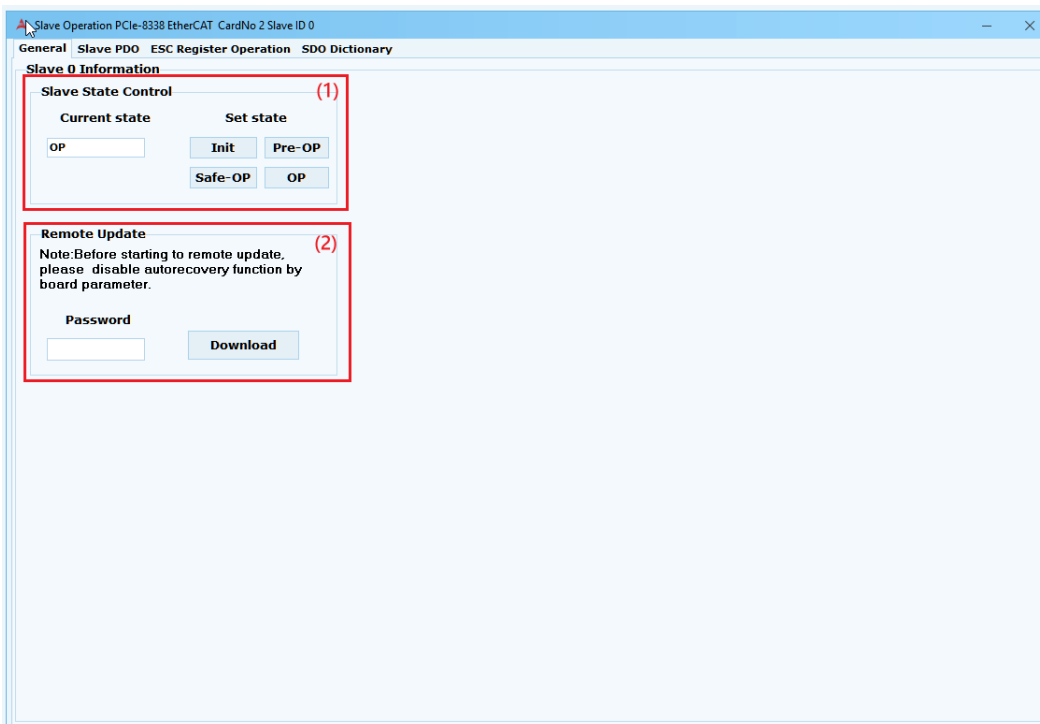
打開 SDO 頁面的方式如下圖(1)~(2)步驟，依照不同”Slave”點選裝置樹列中的(Slave X)xxxxx xxxx”，再點選快速功能按鈕上的”SO 鈕”。





SO 控制按鈕則會出現下列頁面，此時使用者可以看到四個子頁面

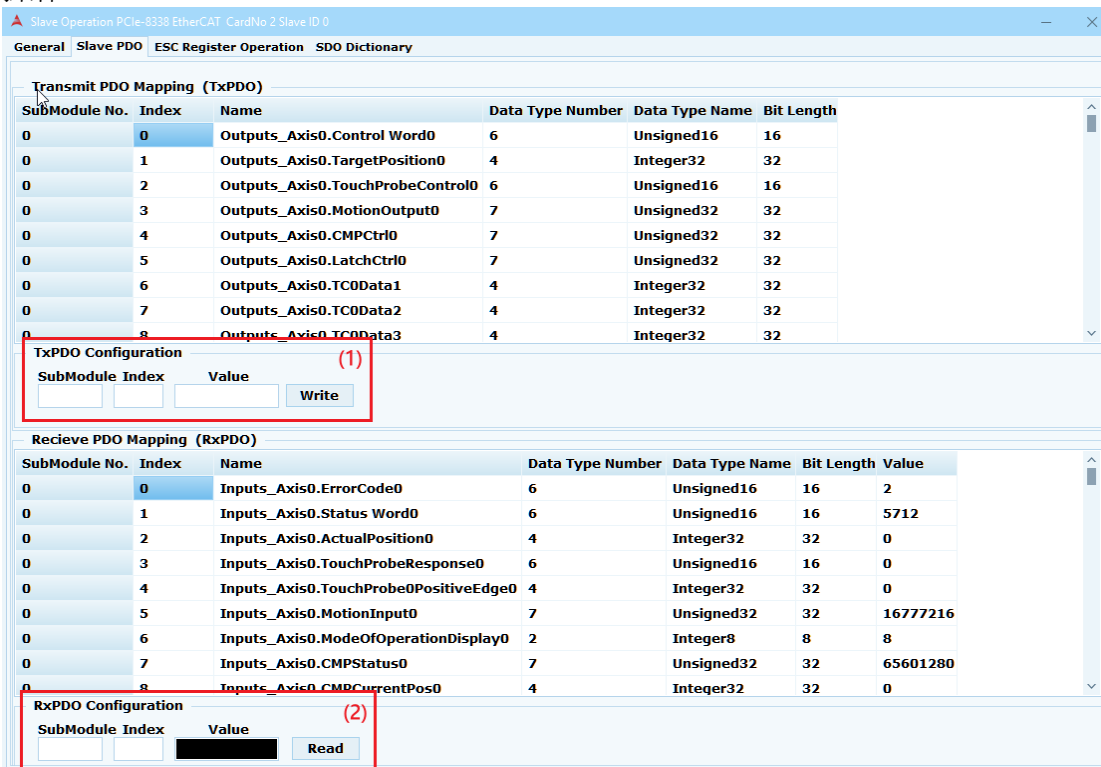
### 1. General



(1) 針對 EtherCAT Slave 狀態設定。

(2) Remote Update：更新 File over EtherCAT 功能，詳情請洽 ADLINK 服務窗口。

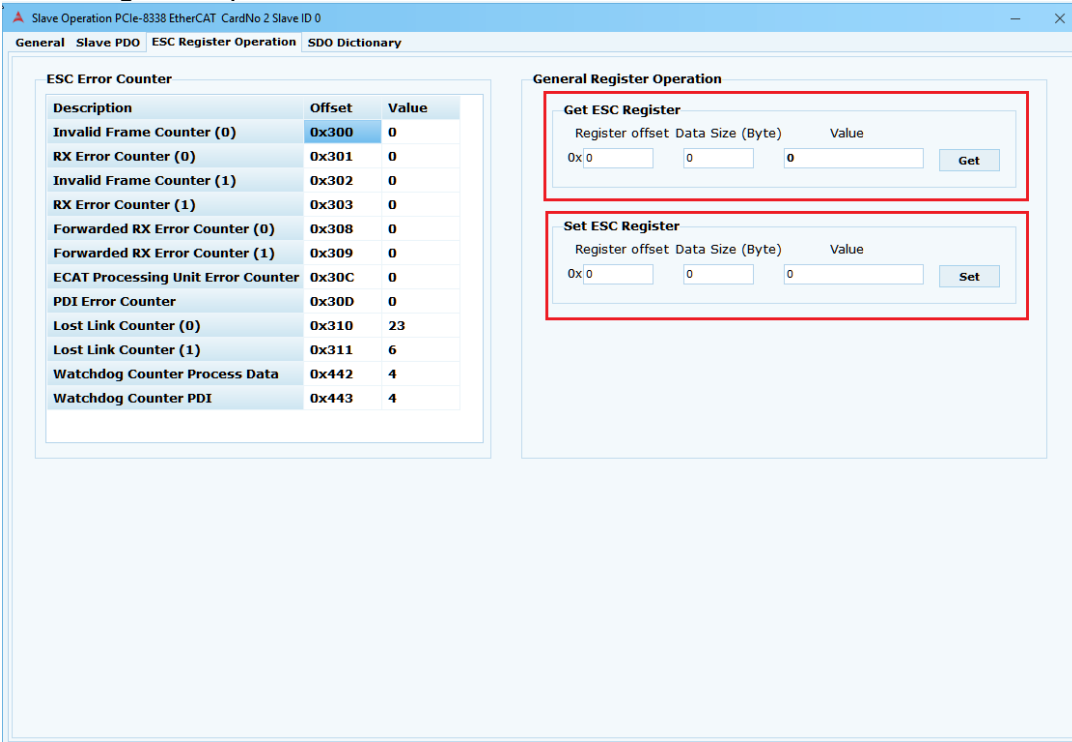
### 2. Slave PDO 會列出此從站可透過 PDO 操作的 object dictionary，透過 Read/Write 按鈕來操作



(1) Write:輸入在 TxPDO 表內欲操作名稱 OD 的 SubModule, Index，並參考 Data Type Name 以及 Bit Length 輸入對應的 Value 按下 Write 按鈕。

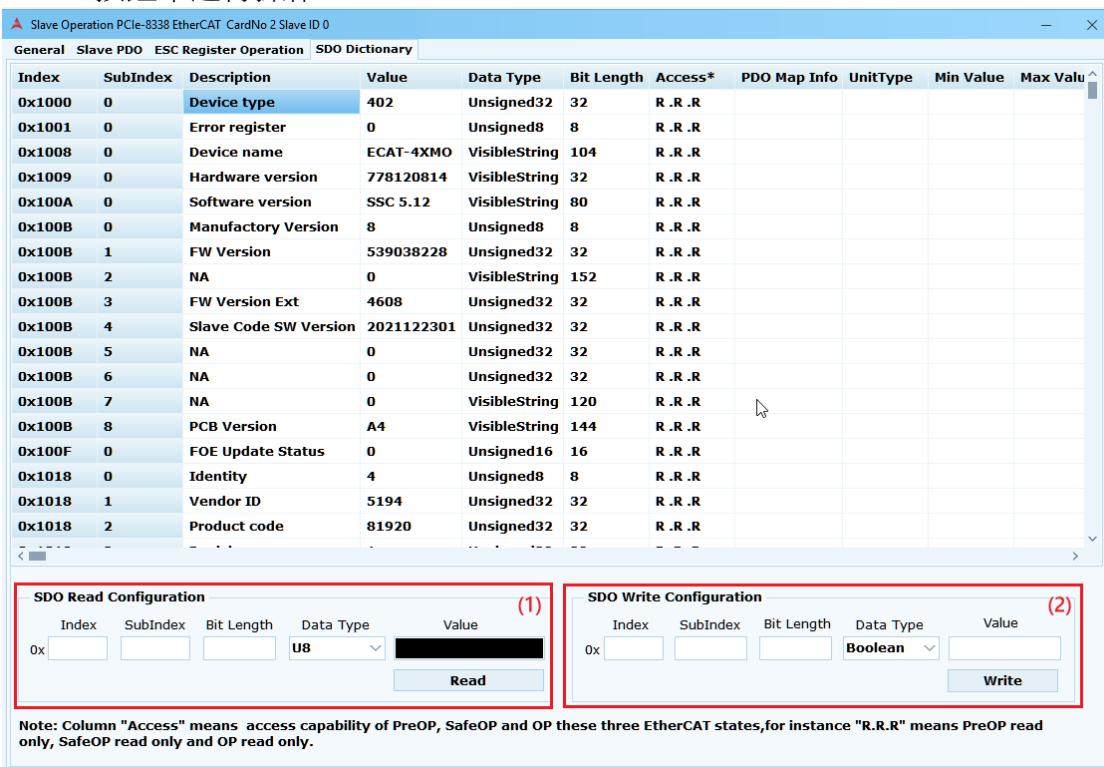
(2) Read:輸入在 RxDPO 表內欲操作名稱 OD 的 SubModule, Index 按下 Read 按鈕可得其值。

### 3. ESC Register Operation



(1) 針對 EtherCAT Slave Controller 讀取資訊以及寫入資訊頁面

### 4. SDO Dictionary 的頁面會列出所有的服務資料物件，使用者可以透過畫面中的 Read /Write 按鈕來進行操作



(1) Read：輸入 Index、SubIndex、Bit Length、Data Type 後，按下 Read 後隨即在 Value 欄位內顯示所需的值。

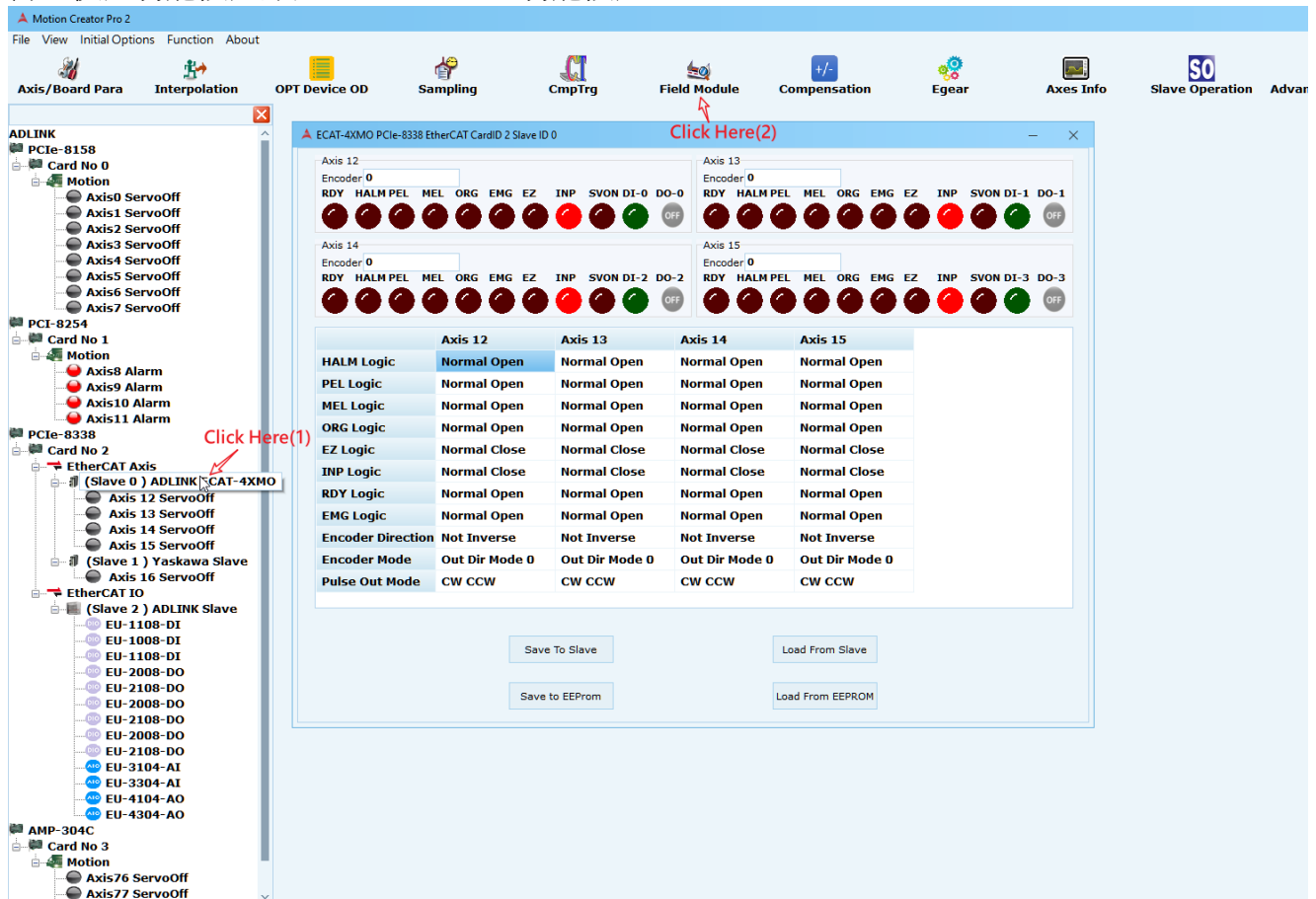
(2) Write：輸入 Index、SubIndex、Bit Length、Data Type 按下 Write 按鈕即可設定所需的值。

# 3.12 Field module

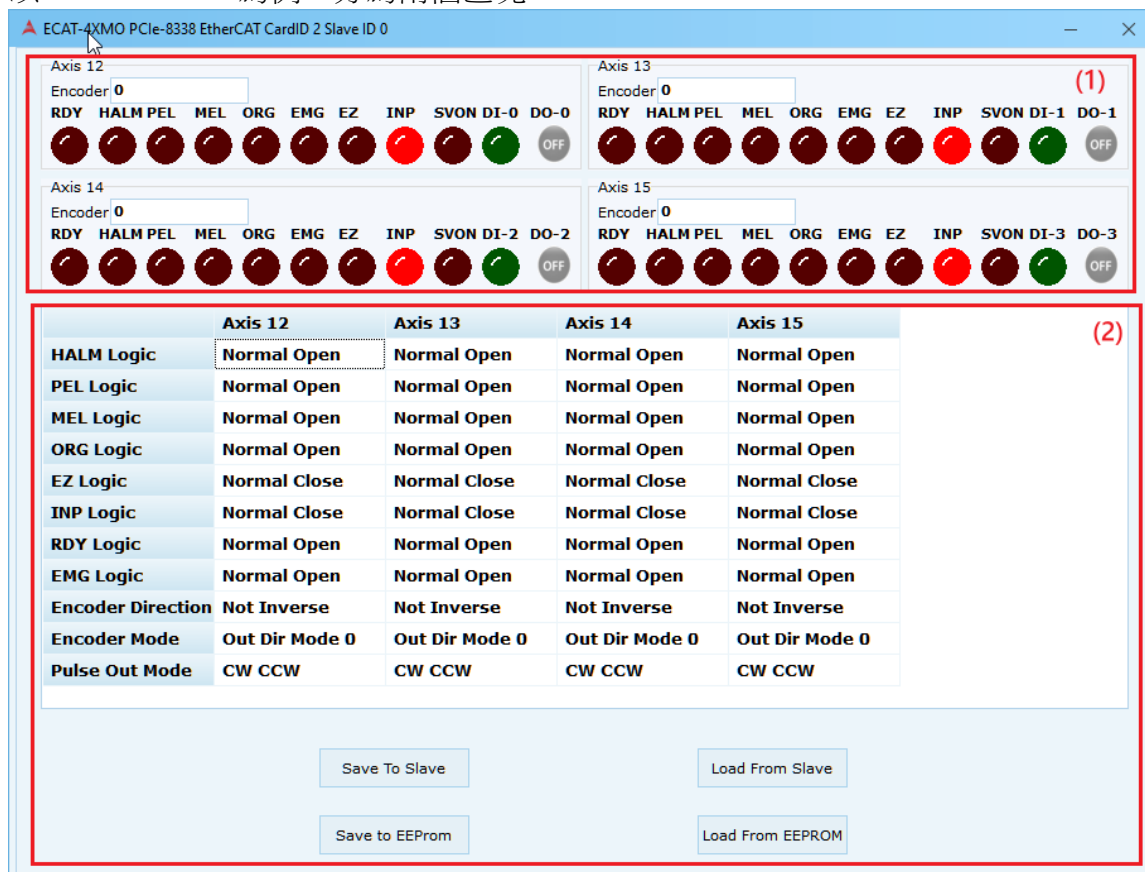
ADLINK slave專有的頁面，依照Slave Axis 或Slave IO，有不同呈現功能。

## 3.12.1 ADLINK Slave Axis

打開 Field module 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Slave X”，再至快速功能按鈕點選 Field module 功能按鈕。



以 ECAT-4XMO 為例，分為兩個區塊



The screenshot shows the ECAT-4XMO software interface. The top section, labeled (1), displays the status of four axes: Axis 12, Axis 13, Axis 14, and Axis 15. Each axis has a set of indicator lights for RDY, HALM, PEL, MEL, ORG, EMG, EZ, INP, SVON, DI, and DO. The INP light for Axis 13 is illuminated red, and the DO-1 light for Axis 13 is illuminated green. The bottom section, labeled (2), is a table of SDO settings for the same four axes.

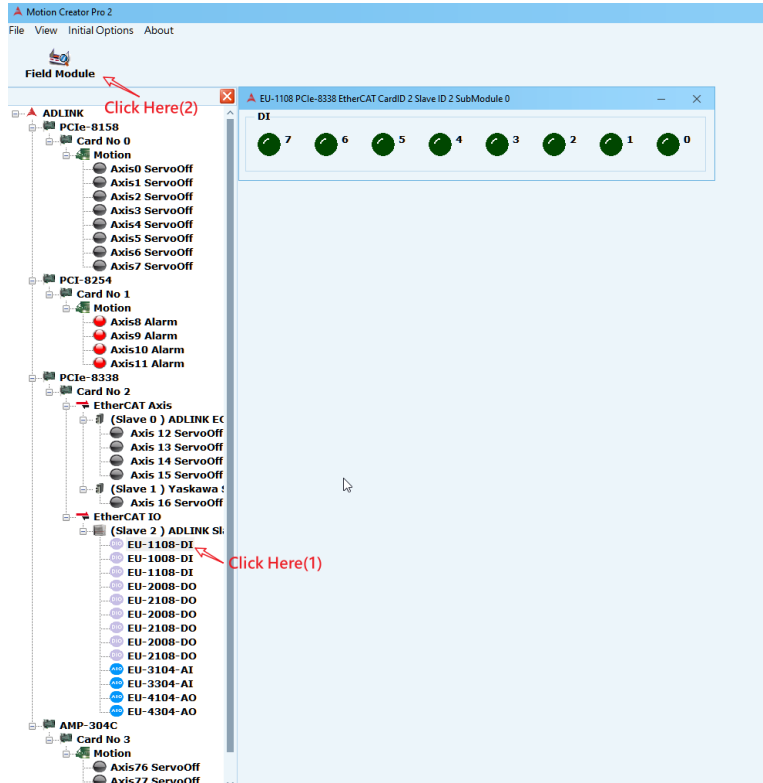
	Axis 12	Axis 13	Axis 14	Axis 15
HALM Logic	Normal Open	Normal Open	Normal Open	Normal Open
PEL Logic	Normal Open	Normal Open	Normal Open	Normal Open
MEL Logic	Normal Open	Normal Open	Normal Open	Normal Open
ORG Logic	Normal Open	Normal Open	Normal Open	Normal Open
EZ Logic	Normal Close	Normal Close	Normal Close	Normal Close
INP Logic	Normal Close	Normal Close	Normal Close	Normal Close
RDY Logic	Normal Open	Normal Open	Normal Open	Normal Open
EMG Logic	Normal Open	Normal Open	Normal Open	Normal Open
Encoder Direction	Not Inverse	Not Inverse	Not Inverse	Not Inverse
Encoder Mode	Out Dir Mode 0	Out Dir Mode 0	Out Dir Mode 0	Out Dir Mode 0
Pulse Out Mode	CW CCW	CW CCW	CW CCW	CW CCW

At the bottom of the interface, there are four buttons: "Save To Slave", "Load From Slave", "Save to EEPROM", and "Load From EEPROM".

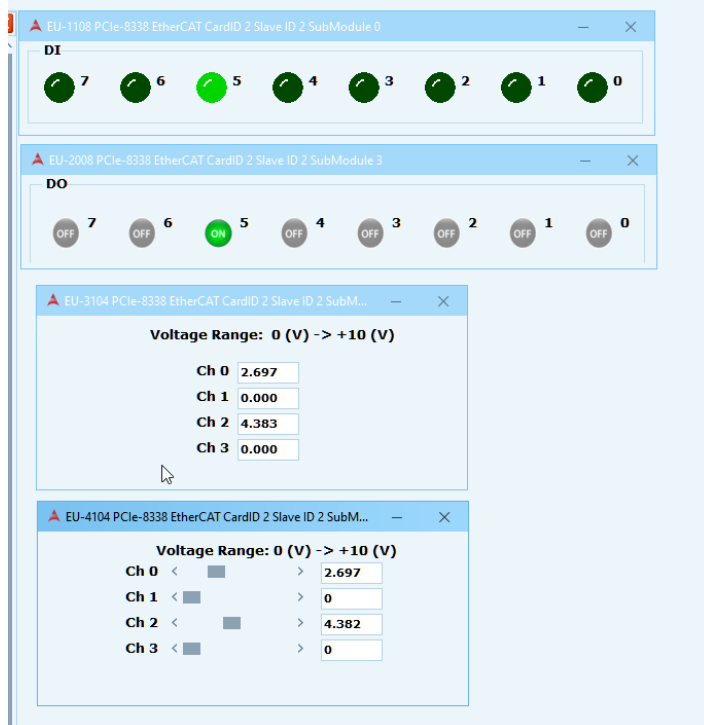
- (1) 每一個軸的狀態顯示。
- (2) 針對 ADLINK slave 常用的 SDO 組態支援設定。

### 3.12.2 ADLINK Slave IO

打開 Field module 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選 DIO 或 AIO，再至快速功能按鈕點選 Field module 功能按鈕。



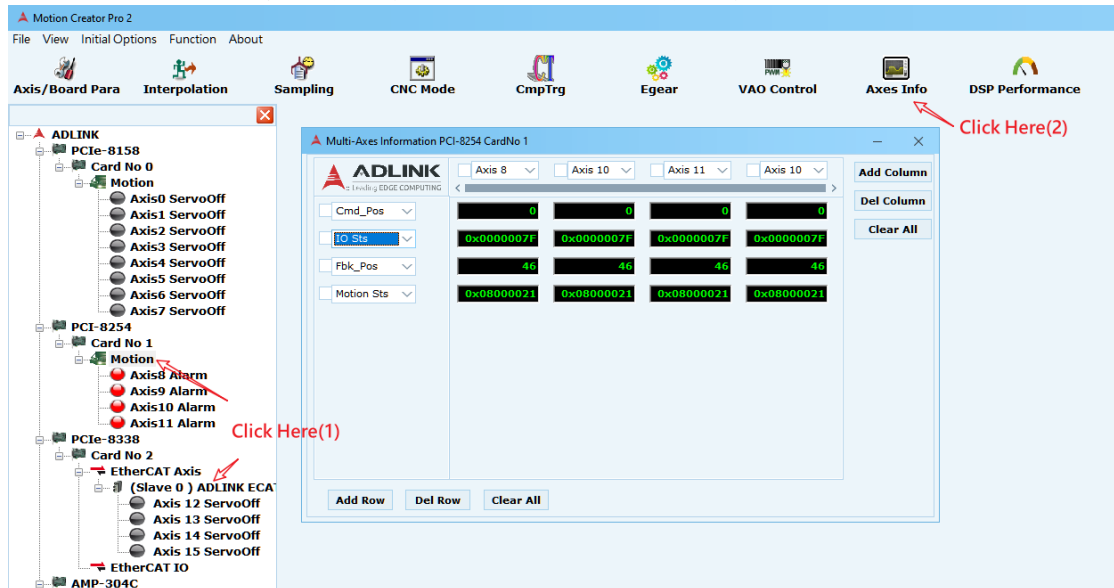
以 EU-6000 等相關商品為例，分為四種不同的 DIO 及 AIO 設定



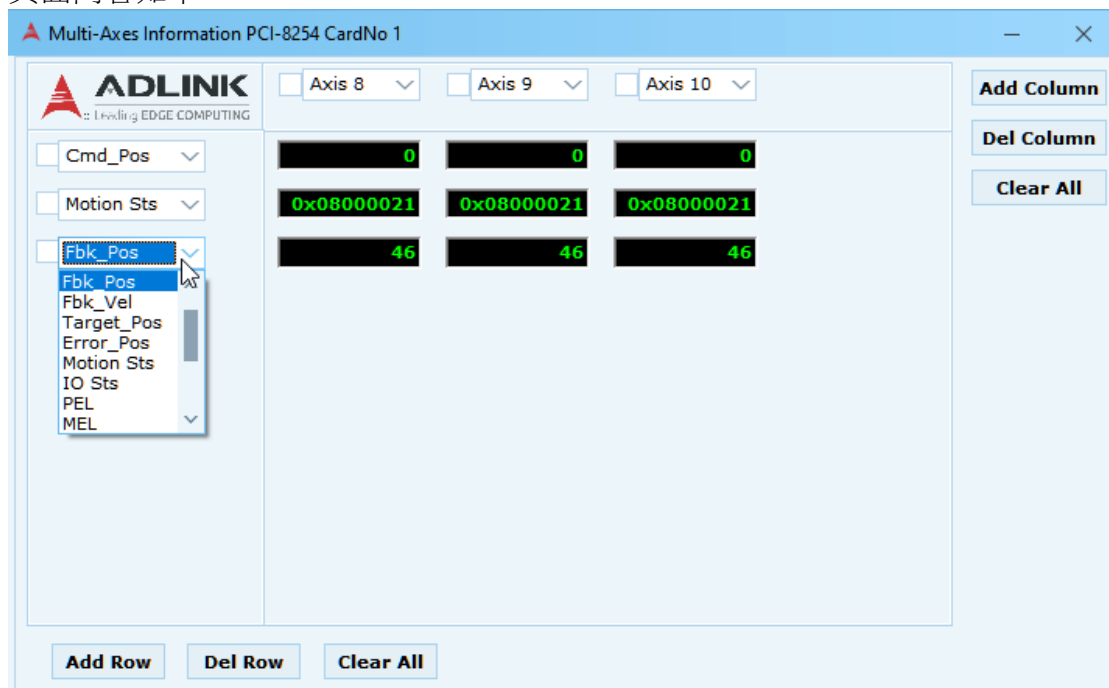
## 3.13 Axis info

**Axis info** 頁面可監控新增或移除自訂義多軸的運動狀態、命令、回授、速度、加速度..等數據監測。

打開多軸資訊頁面步驟如下圖方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Slave X”或”Motion”，再至快速功能按鈕點選 **Axis Info** 功能按鈕。



頁面內容如下



**Add Row**：增加多個監控來源的列，可透過下拉式選單選擇如 **Cmd\_Pos**、**Cmd\_Vel**、**Fbk\_Pos**、**Fbk\_Vel** .. 等監控來源。

**Del Row**：刪除勾選的監控來源列。

**Clear All**：刪除所有監控來源列。

**Add Column** : 增加多個監控軸的行，可透過下拉式選單選擇欲監控的軸號。

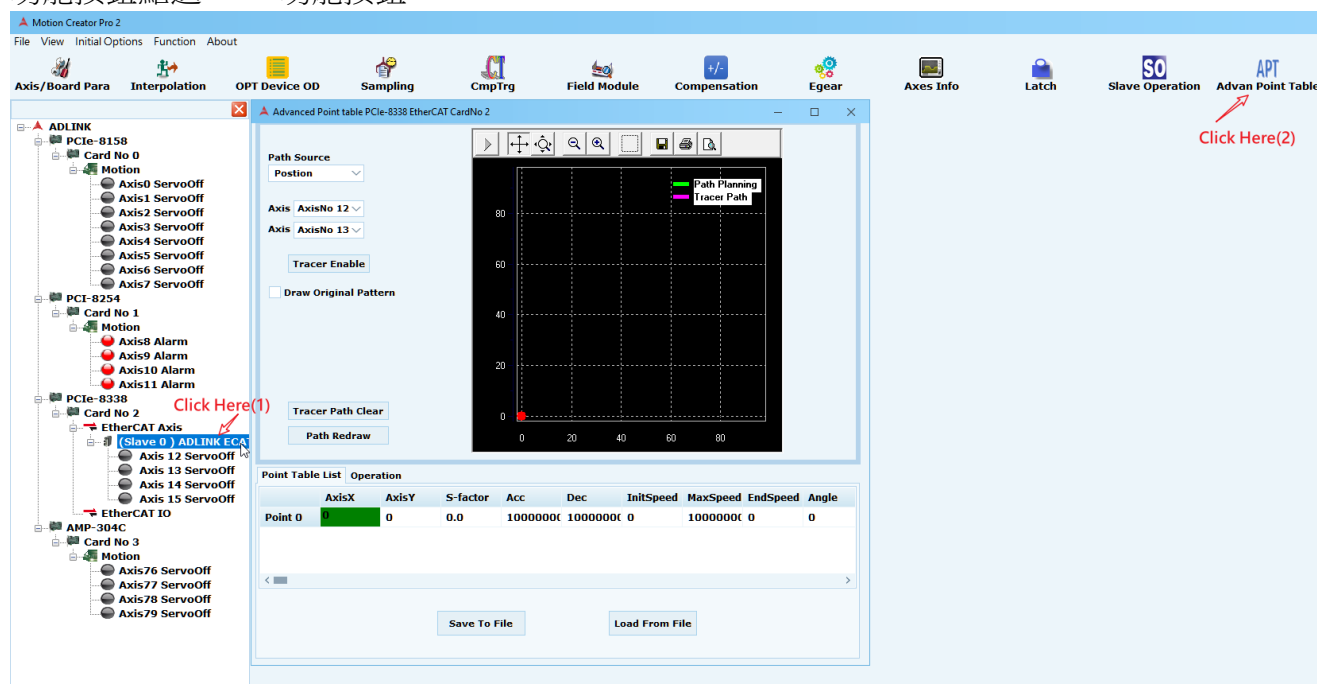
**Del Column**: 刪除勾選的監控軸。

**Clear All** : 刪除所有監控軸。

## 3.14 Advanced Point Table

進階點表提供了使用者自行規劃出的二維多點執行連續運動的功能並將運動軌跡顯示在圖表上，其運動內容包含絕對直線運動、圓弧運動或相對直線、圓弧運動..等，使用者可自行設定每個點運動的基本參數並儲存成檔案供後續使用。

打開 APT 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Slave X”，再至快速功能按鈕點選 APT 功能按鈕。

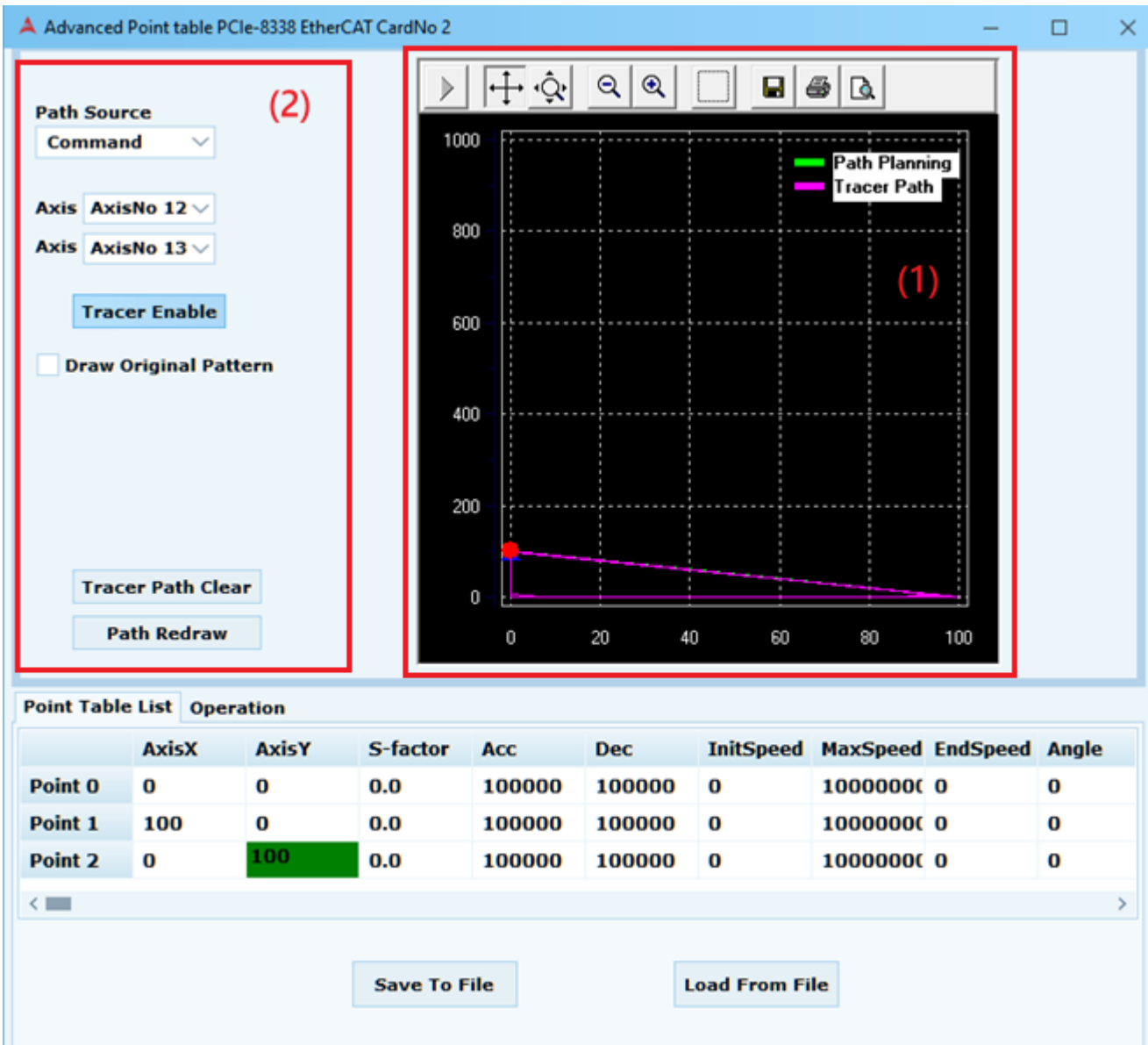


The screenshot shows the Motion Creator Pro 2 software interface. The main window is titled "Advanced Point table PCIe-8338 EtherCAT CardNo 2". The left sidebar shows a device tree with "Slave 0 ADLINK ECA" selected under "EtherCAT Axis". A red arrow points to this selection with the text "Click Here(1)". The top toolbar has the "APT" button highlighted, with a red arrow pointing to it and the text "Click Here(2)". The main workspace contains a graph with a grid and a legend for "Path Planning" and "Tracer Path". Below the graph is a "Point Table List" table.

Point	AxisX	AxisY	S-factor	Acc	Dec	InitSpeed	MaxSpeed	EndSpeed	Angle
Point 0	0	0	0.0	1000000	1000000	0	1000000	0	0



### 3.14.1 繪圖區(Drawing Area)



The screenshot displays the 'Advanced Point table PCIe-8338 EtherCAT CardNo 2' window. On the left, a control panel (labeled (2)) includes a 'Path Source' dropdown set to 'Command', two 'Axis' dropdowns set to 'AxisNo 12' and 'AxisNo 13', a 'Tracer Enable' button, a 'Draw Original Pattern' checkbox, a 'Tracer Path Clear' button, and a 'Path Redraw' button. The main drawing area (labeled (1)) shows a 2D coordinate system with axes from 0 to 1000. A green line represents 'Path Planning' and a pink line represents 'Tracer Path'. Below the drawing area is a 'Point Table List' table with columns for AxisX, AxisY, S-factor, Acc, Dec, InitSpeed, MaxSpeed, EndSpeed, and Angle. The 'Point 2' row is highlighted in green, showing AxisX: 0 and AxisY: 100. At the bottom are 'Save To File' and 'Load From File' buttons.

	AxisX	AxisY	S-factor	Acc	Dec	InitSpeed	MaxSpeed	EndSpeed	Angle
Point 0	0	0	0.0	100000	100000	0	1000000	0	0
Point 1	100	0	0.0	100000	100000	0	1000000	0	0
Point 2	0	100	0.0	100000	100000	0	1000000	0	0

可將使用者所設定好的 2 維點運動軌跡顯示在此區(1)，綠色線(Path Planning)為控制命令的軌跡，而粉紅色線(Tracer Path)為實際運動的軌跡，繪圖功能(2)設定如下：

Path Source：可選擇是實際運動位置或命令位置

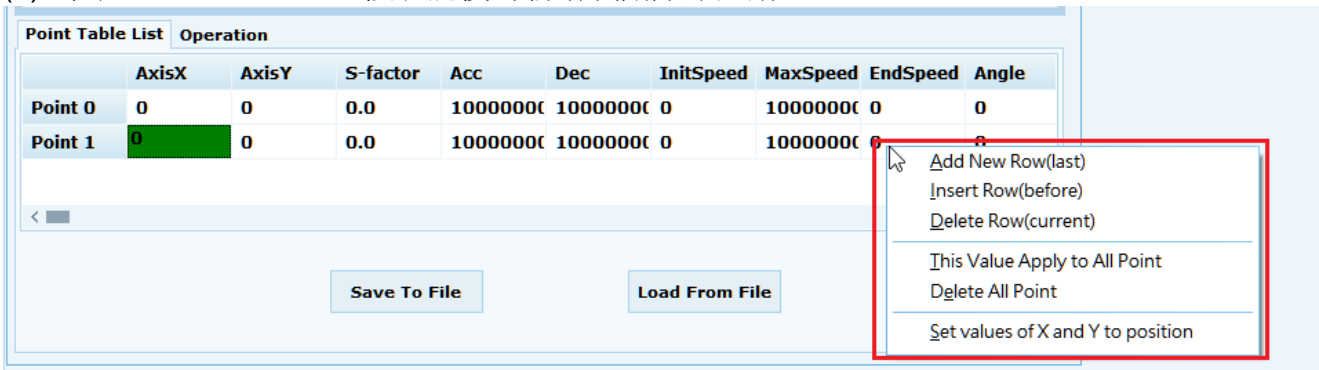
Axis X,Y：選擇 2 維運動的軸 ID

Tracer Path Clear：將實際運動軌跡從繪圖區清除

Path Redraw：重新繪製控制命令軌跡

### 3.14.2 命令配置區(Configuration Area)

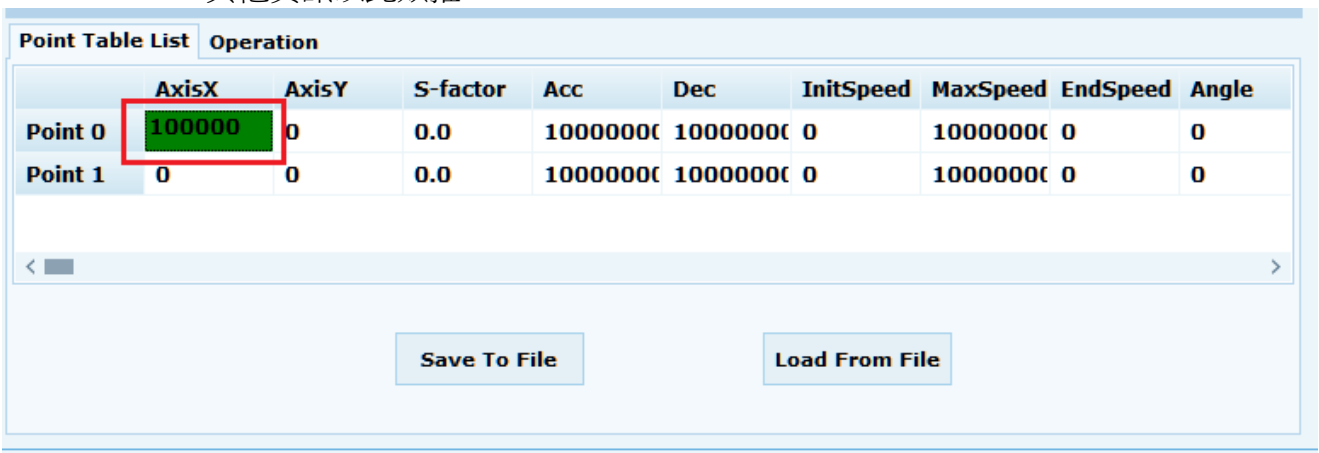
(1) 在此 Point Table List 按右鍵後可新增或刪除點運動



Point	AxisX	AxisY	S-factor	Acc	Dec	InitSpeed	MaxSpeed	EndSpeed	Angle
Point 0	0	0	0.0	1000000	1000000	0	1000000	0	0
Point 1	0	0	0.0	1000000	1000000	0	1000000	0	0

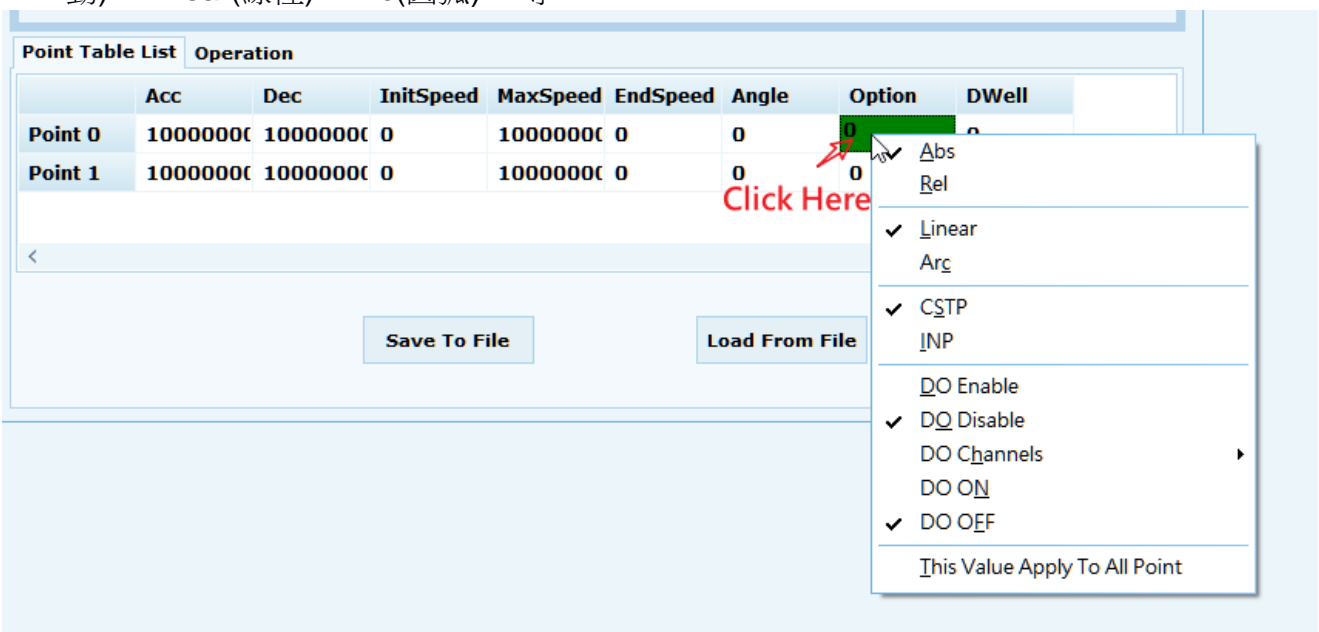
- Add New Row(last)
- Insert Row(before)
- Delete Row(current)
- This Value Apply to All Point
- Delete All Point
- Set values of X and Y to position

(2) 在格子內滑鼠左鍵點兩下即可編輯此運動命令的資訊，如 Point 0, Axis X 的位置為 100000，其他資訊以此類推



Point	AxisX	AxisY	S-factor	Acc	Dec	InitSpeed	MaxSpeed	EndSpeed	Angle
Point 0	100000	0	0.0	1000000	1000000	0	1000000	0	0
Point 1	0	0	0.0	1000000	1000000	0	1000000	0	0

(3) 在 Option 格子內按右鍵可勾選此運動的進階配置，例如 Abs(絕對運動)、Rel(相對運動)、Linear(線性)、Arc(圓弧)....等



Point	Acc	Dec	InitSpeed	MaxSpeed	EndSpeed	Angle	Option	DWell
Point 0	1000000	1000000	0	1000000	0	0	0	0
Point 1	1000000	1000000	0	1000000	0	0	0	0

- Abs
- Rel
- Linear
- Arc
- CSTP
- INP
- DO Enable
- DO Disable
- DO Channels
- DO ON
- DO OEF
- This Value Apply To All Point

### 3.14.3 操作區(Operation Area)

點選 Operation Tab 後可看到如下三個區塊:

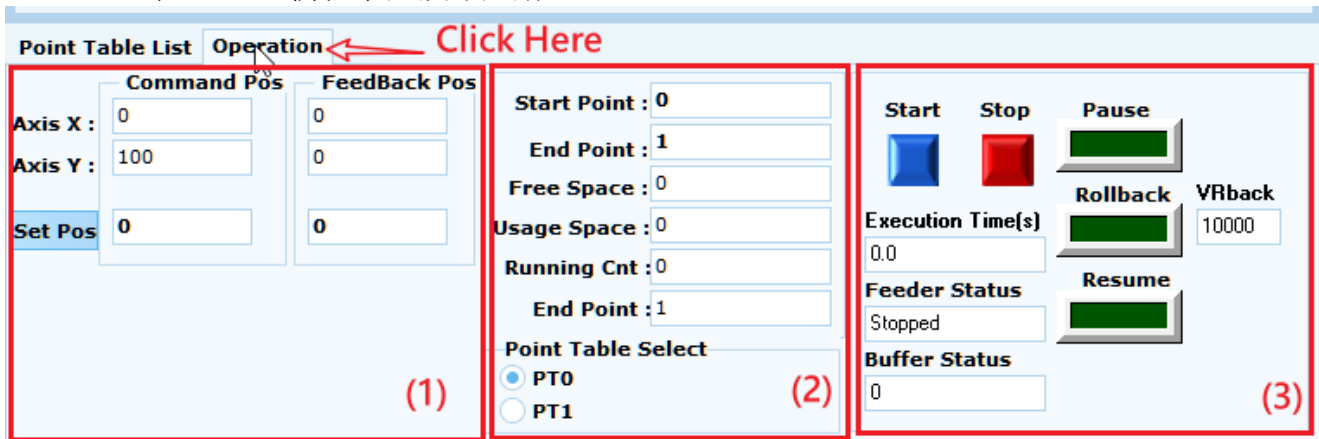
- (1) 監控兩軸的命令以及回授位置。
- (2) 監控目前命令點位已經執行到第幾點，點表的 Buffer 狀態以及選擇哪個 Point Table。
- (3) 監控填點器執行時間、狀態以及 Buffer 狀態。
- (4) Star : 開始點表運動。

Stop: 停止點表運動。

Pause: 暫停表運動。

Rollback : 在 Pause 狀態使用 VRback 設定的速度回到上一點的運動位置。

Resume : 在 Pause 情況下繼續點運動。



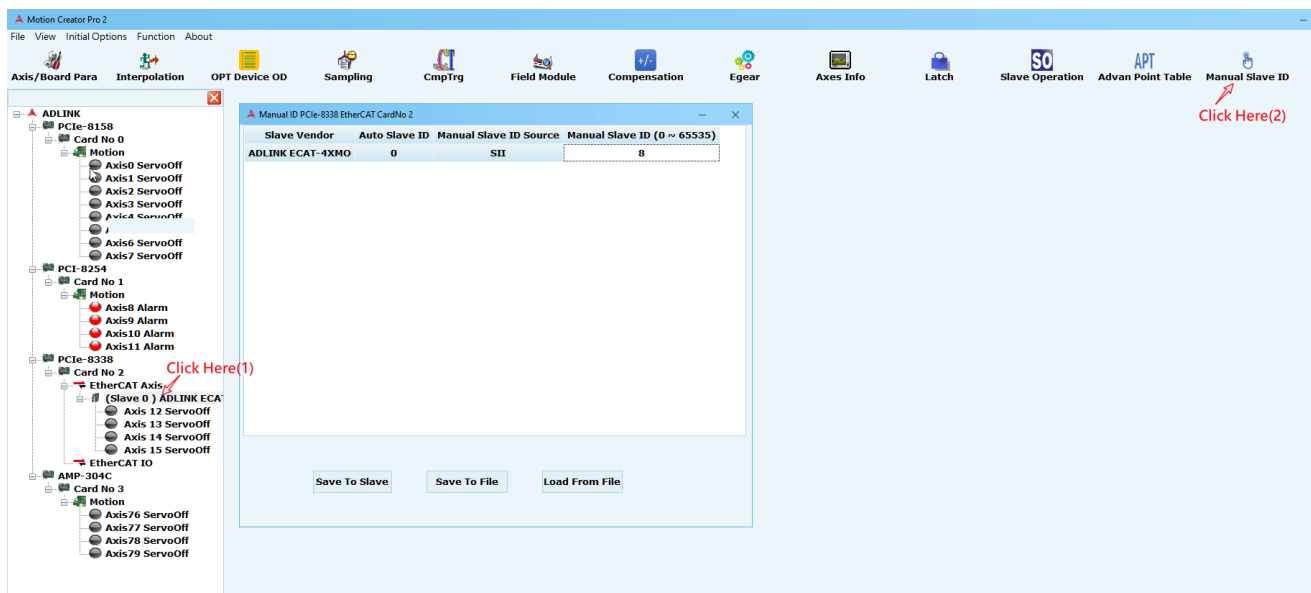
The screenshot shows the 'Operation' tab selected. A red arrow points to the 'Operation' tab with the text 'Click Here'. The interface is divided into three main sections:

- (1) Command and Feedback Positions:**
  - Axis X: Command Pos (0), Feedback Pos (0)
  - Axis Y: Command Pos (100), Feedback Pos (0)
  - Set Pos: Command Pos (0), Feedback Pos (0)
- (2) Point Table Parameters and Selection:**
  - Start Point: 0
  - End Point: 1
  - Free Space: 0
  - Usage Space: 0
  - Running Cnt: 0
  - End Point: 1
  - Point Table Select:
    - PT0
    - PT1
- (3) Execution Controls and Status:**
  - Start: Blue button
  - Stop: Red button
  - Pause: Green button
  - Rollback: Green button
  - VRback: 10000
  - Execution Time(s): 0.0
  - Feeder Status: Stopped
  - Resume: Green button
  - Buffer Status: 0

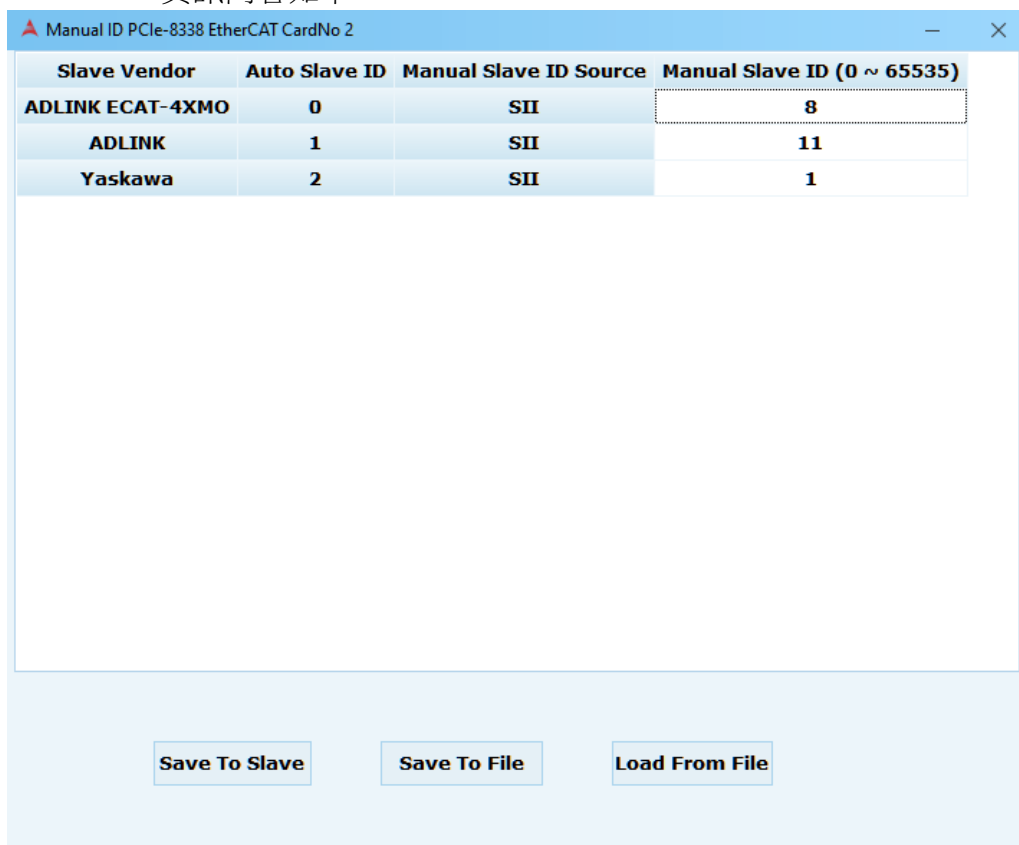
## 3.15 手動設置 Slave ID (Manual ID)

手動ID提供了使用者自行設定每個Slave ID號，詳細的手動ID流程會在後續說明。

打開手動 ID 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Slave X”，再至快速功能按鈕點選 Manual ID 功能按鈕。



Manual ID 資訊內容如下

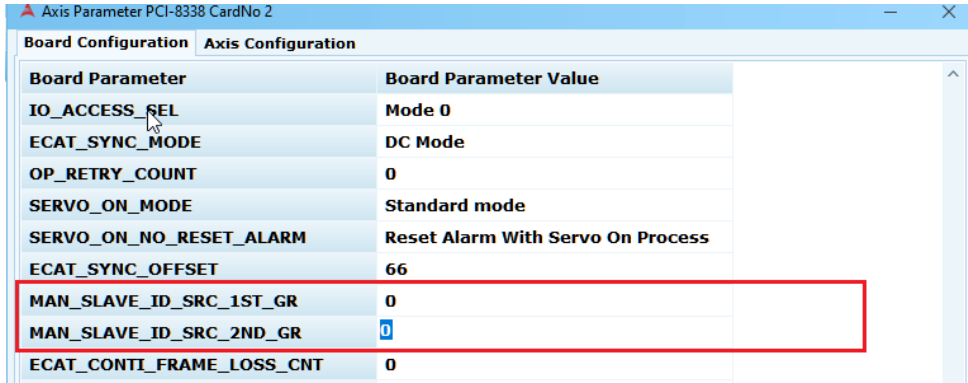


Auto Slave ID : 表內列出系統自動排列從 0 到 65535 的 Slave ID 號。

Manual Slave ID Source :

目前 PCIe-833x 都是讀取方式則是讀取 ESC 上的 Configured Station Alias Register 的資料而來定義為 SII，另一種模式透過讀取 AL Status Code 來得到 ID-Selector 的資訊定義為 AL Control

該資訊需搭配 board parameter 選擇不同的讀取方式來進行讀取 ID 資訊，設定請參閱 APS Function Library 手冊



Board Parameter	Board Parameter Value
IO_ACCESS_SEL	Mode 0
ECAT_SYNC_MODE	DC Mode
OP_RETRY_COUNT	0
SERVO_ON_MODE	Standard mode
SERVO_ON_NO_RESET_ALARM	Reset Alarm With Servo On Process
ECAT_SYNC_OFFSET	66
MAN_SLAVE_ID_SRC_1ST_GR	0
MAN_SLAVE_ID_SRC_2ND_GR	0
ECAT_CONTI_FRAME_LOSS_CNT	0

Manual Slave ID : 左鍵點兩下後可自行編輯欲設定的 Slave ID。

Save to Slave : 將設定好的 Slave ID 寫入 Slave 的 EEPROM。

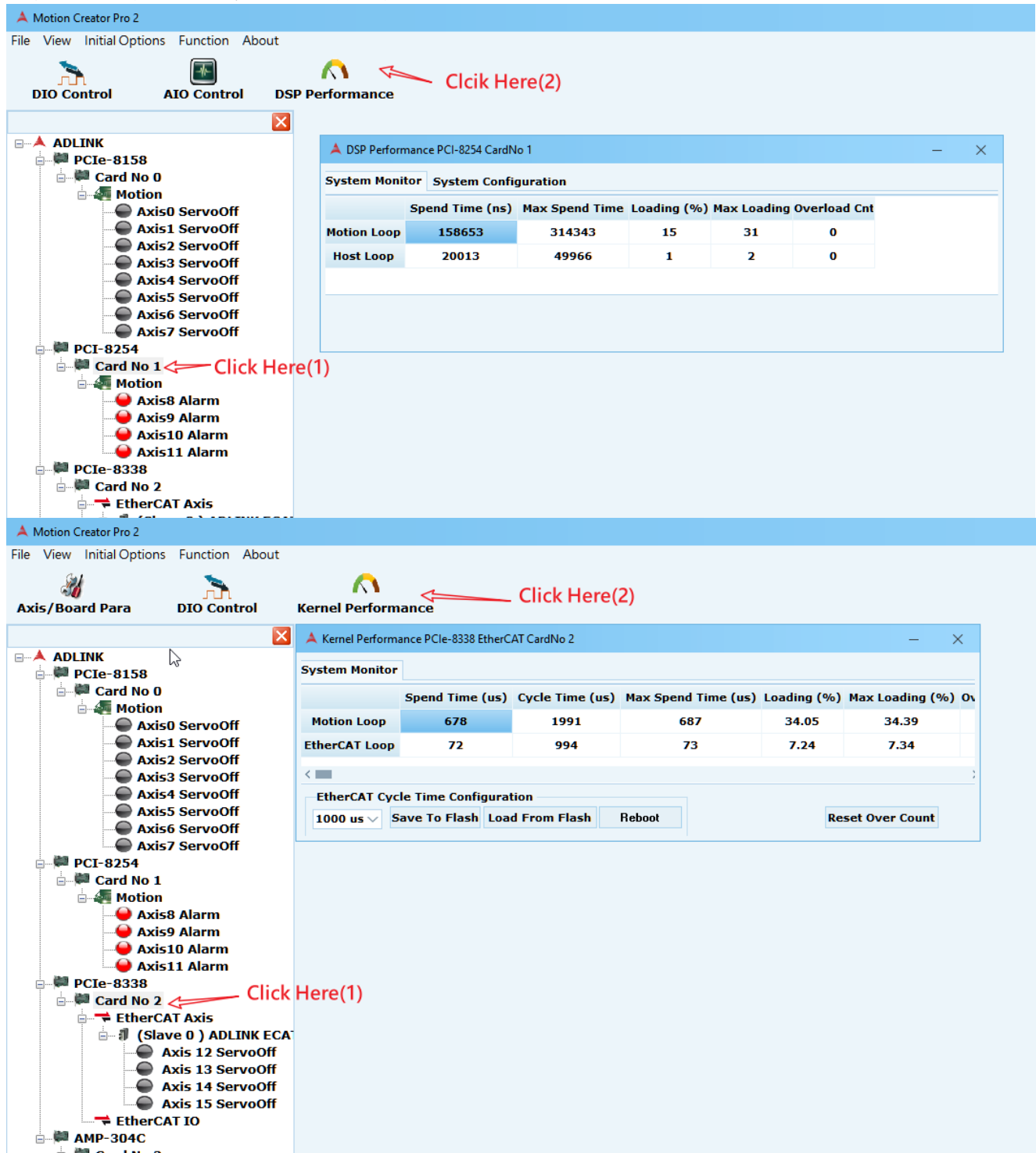
Save to File : 將此配置存成一個 xml 檔案。

Load From File : 載入一個 xml 檔案並顯示在表內。

## 3.16 (DSP/Kernel Performance)

核心效能提供使用者目前**EtherCAT cycle time** 和 **Motion cycle time**、消耗時間、以及負載情況，此外也提供了使用者更改目前**cycle time**的設定。

打開核心效能頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選” Card No X ”，再至快速功能按鈕點選核心效能功能按鈕。



The image shows two screenshots of the Motion Creator Pro 2 software interface. The top screenshot shows the 'DSP Performance' window for a PCI-8254 card. The bottom screenshot shows the 'Kernel Performance' window for a PCI-8338 EtherCAT card.

**Top Screenshot: DSP Performance**

The 'DSP Performance' window displays a table with the following data:

	Spend Time (ns)	Max Spend Time	Loading (%)	Max Loading	Overload Cnt
Motion Loop	158653	314343	15	31	0
Host Loop	20013	49966	1	2	0

**Bottom Screenshot: Kernel Performance**

The 'Kernel Performance' window displays a table with the following data:

	Spend Time (us)	Cycle Time (us)	Max Spend Time (us)	Loading (%)	Max Loading (%)	Overload Cnt
Motion Loop	678	1991	687	34.05	34.39	
EtherCAT Loop	72	994	73	7.24	7.34	

Below the table, the 'EtherCAT Cycle Time Configuration' section shows a dropdown menu set to '1000 us' and buttons for 'Save To Flash', 'Load From Flash', 'Reboot', and 'Reset Over Count'.

### 3.16.1 DSP Performance

DSP Performance PCI-8254 CardNo 1					
System Monitor		System Configuration			
	Spend Time (ns)	Max Spend Time	Loading (%)	Max Loading	Overload Cnt
Motion Loop	167030	314633	16	31	0
Host Loop	20600	53606	1	2	0

- Spend time: 目前運算所每周期所耗費時間 (單位 Nano-second)
- Max spend time: 到目前為止所耗費的最大時間 (單位 Nano-second)
- Loading: 目前週期中所佔的比例(工作比重) (100%)
- Max loading: 記錄到最大的 DSP 工作比重(100%)
- Overload Cnt:過附載累計次數

### 3.16.2 Kernel Performance

Kernel Performance PCIe-8338 EtherCAT CardNo 2						
System Monitor						
	Spend Time (us)	Cycle Time (us)	Max Spend Time (us)	Loading (%)	Max Loading (%)	Overload Cnt
Motion Loop	679	1992	689	34.09	34.50	
EtherCAT Loop	73	995	75	7.34	7.54	

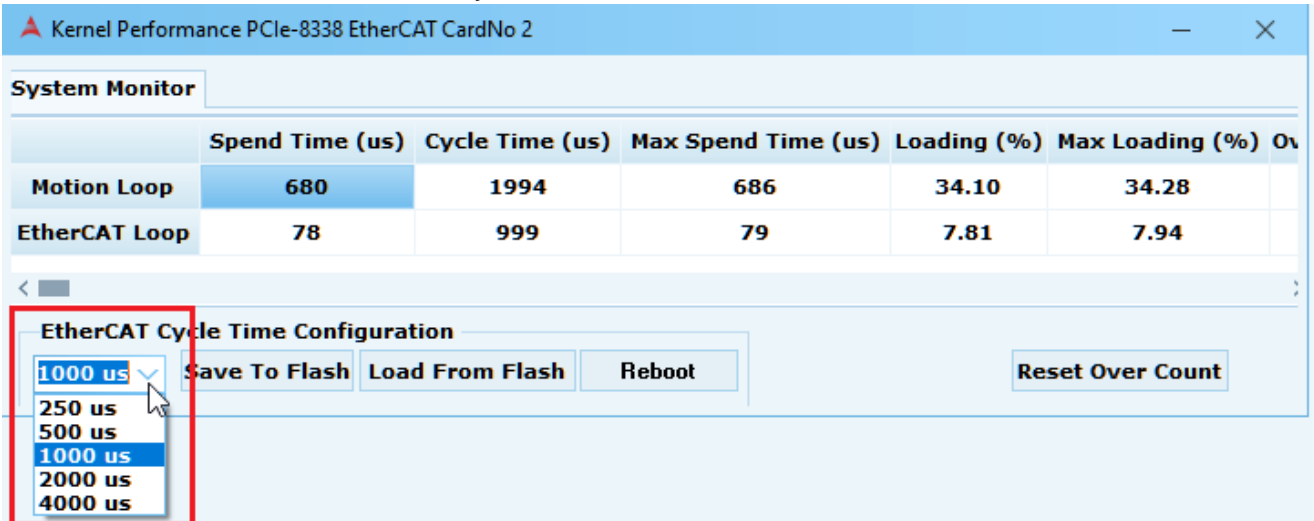
EtherCAT Cycle Time Configuration

1000 us

- Spend Time : 實際系統消耗時間，單位為 Micro-second。
- Cycle Time : 實際系統的 cycle time，單位為 Micro-second。
- Max Spend Time : MCP2 估算的系統最大消耗時間，單位為 Micro-second。
- Loading : MCP2 估算系統目前運算負載百分比(%)。
- Max Loading : MCP2 估算系統目前最大負載百分比(%)
- Overload Cnt:過附載累計次數

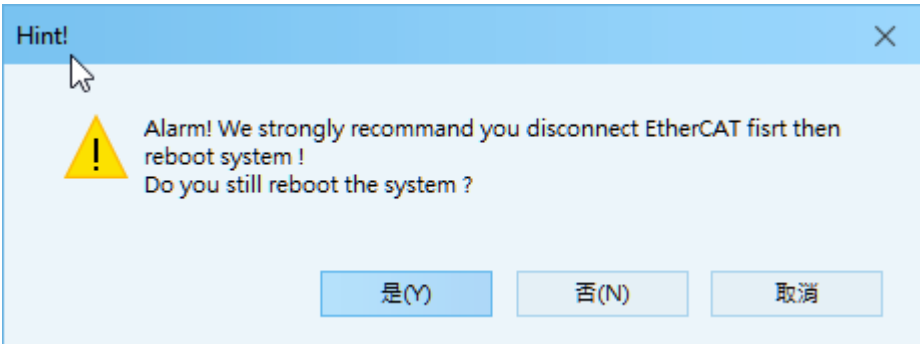
### 3.16.3 如何設定 EtherCAT Cycle time

1. 在下拉式選單選擇要設定的 cycle time



	Spend Time (us)	Cycle Time (us)	Max Spend Time (us)	Loading (%)	Max Loading (%)	Over
Motion Loop	680	1994	686	34.10	34.28	
EtherCAT Loop	78	999	79	7.81	7.94	

2. 點選 Save To Flash 按鈕。
3. 點選 Reboot 按鈕後會跳出提示視窗(請先確認 Field Bus 已斷線後再執行)

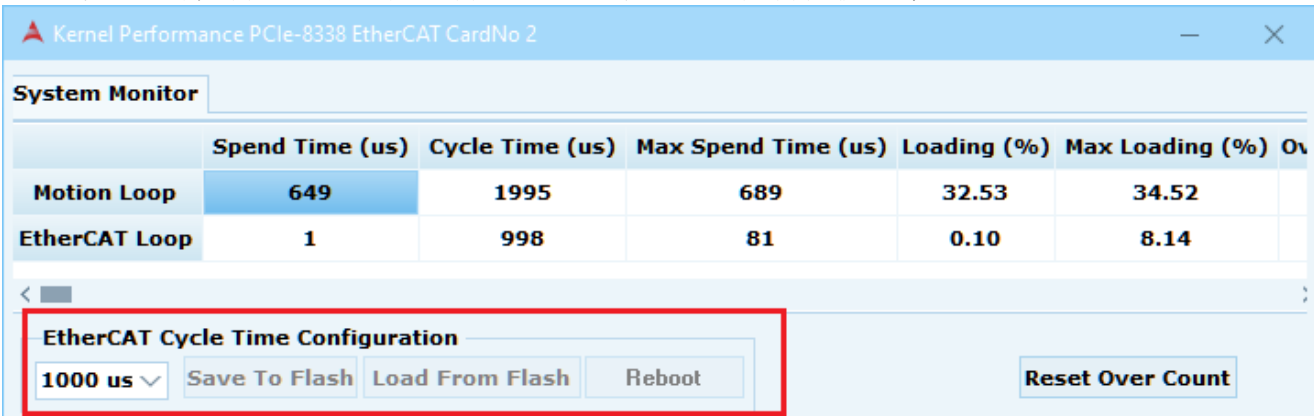


Hint!

Alarm! We strongly recommend you disconnect EtherCAT first then reboot system!  
Do you still reboot the system?

是(Y)    否(N)    取消

4. 等待的時候會出現功能按鈕會反白直到系統重置後會恢復正常。



	Spend Time (us)	Cycle Time (us)	Max Spend Time (us)	Loading (%)	Max Loading (%)	Over
Motion Loop	649	1995	689	32.53	34.52	
EtherCAT Loop	1	998	81	0.10	8.14	

5. 點選 Card No X，點選 Axis/Board Para 快速功能按鈕開啟頁面，點選 Save to Flash 按鈕。



Parameter PCIe-8338 EtherCAT CardNo 2

Board Configuration

Board Parameter	Board Parameter Value
EMG_LOGIC	Normal Open
DO_LOGIC	No Invert
DI_LOGIC	No Invert
IO_ACCESS_SEL	Mode 0
ECAT_SYNC_MODE	DC Mode
OP_RETRY_COUNT	0
SERVO_ON_MODE	Standard mode
SERVO_ON_NO_RESET_ALARM	Reset Alarm With Servo On Process
ECAT_SYNC_OFFSET	66
MAN_SLAVE_ID_SRC_1ST_GR	0
MAN_SLAVE_ID_SRC_2ND_GR	0
ECAT_CONTI_FRAME_LOSS_CNT	0
SAMPLING_SRC_AXIS_TYPE	Axis Number
EMG_MODE	Servo off directly
ECAT_RESTORE_OUTPUT	Restore
DI_EMG_FILTER_ENABLE	Enable
DI_EMG_FILTER_RANGE	5 us
PULSER_FILTER_RANGE	5 us

Buttons: Set To Card, **Save To Flash**, Save To File, Load Default, Load From Card, Load From Flash, Load From File

### 3.17 Compare Trigger

比較觸發功能分為線性比較法(Linear Compare)和表格比較法(Table Compare)，當比較到使用者設定的條件時再相對應的動作。

打開觸發功能頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹依據不同的軸卡列上點選”Slave X ”或”Motion”，再至快速功能按鈕點選觸發功能功能按鈕。

The screenshot shows the Motion Creator Pro 2 software interface. On the left is a device tree with the following structure:

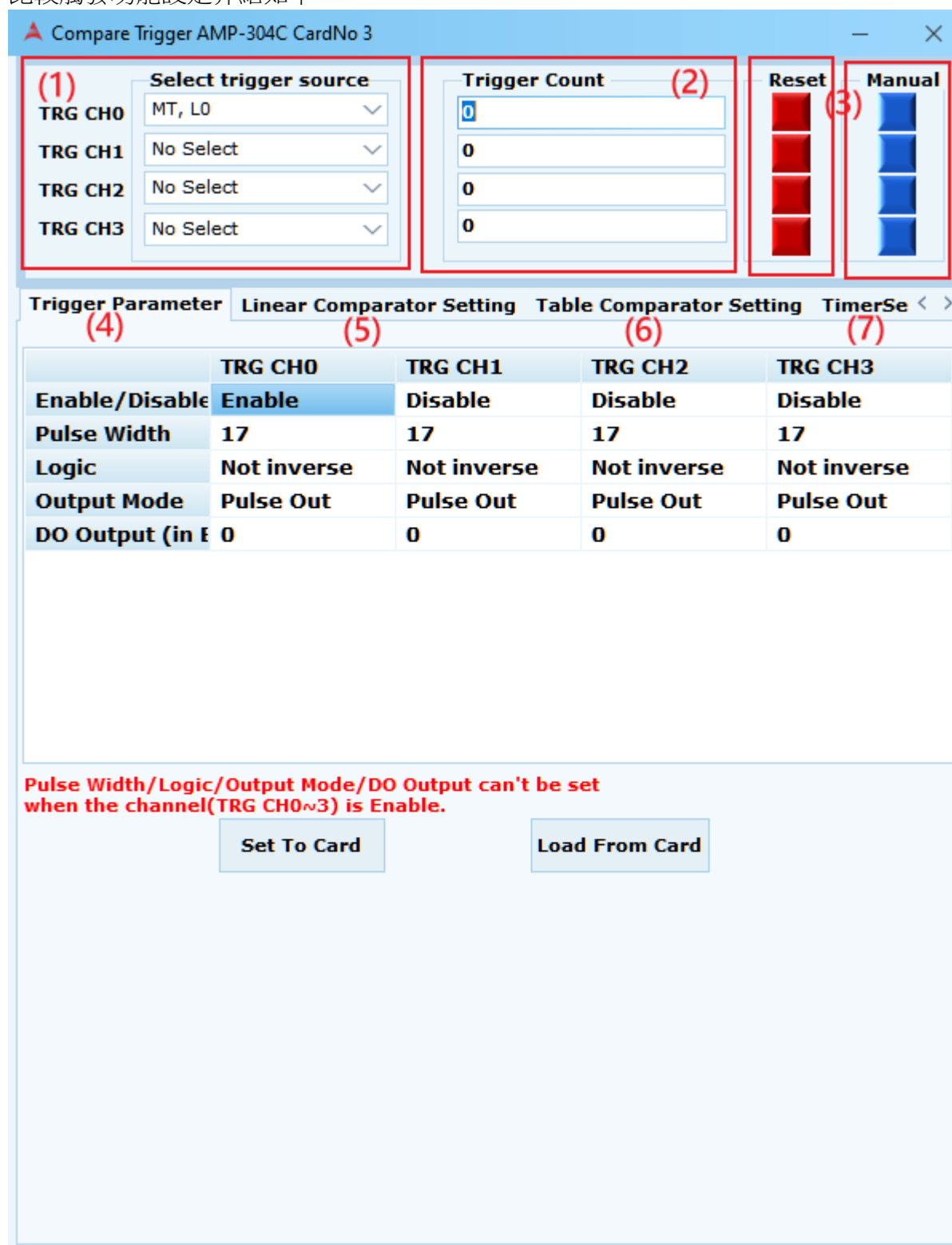
- ADLINK
  - PCIe-8158
    - Card No 0
      - Motion
        - Axis0 ServoOff
        - Axis1 ServoOff
        - Axis2 ServoOff
        - Axis3 ServoOff
        - Axis4 ServoOff
        - Axis5 ServoOff
        - Axis6 ServoOff
        - Axis7 ServoOff
    - PCI-8254
      - Card No 1
        - Motion
          - Axis8 Alarm
          - Axis9 Alarm
          - Axis10 Alarm
          - Axis11 Alarm
      - PCIe-8338
        - Card No 2
          - EtherCAT Axis
            - (Slave 0 ) ADLINK ECA
              - Axis 12 ServoOff
              - Axis 13 ServoOff
              - Axis 14 ServoOff
              - Axis 15 ServoOff
            - (Slave 1 ) Yaskawa Sla
              - Axis 16 ServoOff
        - EtherCAT IO
      - AMP-304C
        - Card No 3
          - Motion
            - Axis76 ServoOff
            - Axis77 ServoOff
            - Axis78 ServoOff
            - Axis79 ServoOff

The right side of the interface shows the 'Compare Trigger AMP-304C CardNo 3' configuration window. At the top, there are controls for 'Select trigger source' (TRG CH0-3), 'Trigger Count' (0-0), and 'Reset'/'Manual' buttons. Below this is a 'Trigger Parameter' section with tabs for 'Linear Comparator Setting', 'Table Comparator Setting', and 'TimerSe'. The 'Linear Comparator Setting' tab is active, showing a table:

	TRG CH0	TRG CH1	TRG CH2	TRG CH3
Enable/Disable	Enable	Disable	Disable	Disable
Pulse Width	17	17	17	17
Logic	Not inverse	Not inverse	Not inverse	Not inverse
Output Mode	Pulse Out	Pulse Out	Pulse Out	Pulse Out
DO Output (in E	0	0	0	0

Below the table, there is a red warning message: "Pulse Width/Logic/Output Mode/DO Output can't be set when the channel(TRG CH0~3) is Enable." At the bottom of the window are 'Set To Card' and 'Load From Card' buttons. Red arrows in the image point to 'Click Here(1)' on the 'Motion' folder of the AMP-304C Card No 3 in the device tree, and 'Click Here(2)' on the 'CmpTrg' button in the top toolbar.

比較觸發功能設定介紹如下



**Trigger Parameter**

	TRG CH0	TRG CH1	TRG CH2	TRG CH3
Enable/Disable	Enable	Disable	Disable	Disable
Pulse Width	17	17	17	17
Logic	Not inverse	Not inverse	Not inverse	Not inverse
Output Mode	Pulse Out	Pulse Out	Pulse Out	Pulse Out
DO Output (in E	0	0	0	0

**Pulse Width/Logic/Output Mode/DO Output can't be set when the channel(TRG CH0~3) is Enable.**

Set To Card      Load From Card

- (1) Select trigger source：選擇各通道的觸發來源訊號
- (2) Trigger Count：顯示各通道已觸發的數量
- (3) Reset：清除已觸發的數量      Manual：手動給予觸發訊號
- (4) Trigger Parameter：比較觸發的參數設定，不同軸卡有不同的設定，參數請內容請參閱 APS Function Library 手冊 Table definition-> Trigger parameter table  
上圖為 ADLINK 的 AMP-304C 產品，因此對应手冊內容如下圖

APS\_FunctionLibrary\_V2.1

AMP-304C Trigger parameter table

NO	Define	Description	Value	Default
0x00	TGR_LCMP0_SRC	Linear compare 0 (LCMP0) source	0 ~ 3 : Pulse counter 0~3 8 : Timer 0 counter 9 : Disable	9
0x01	TGR_LCMP1_SRC	Linear compare 1 (LCMP1) source	0 ~ 3 : Pulse counter 0~3 8 : Timer 0 counter 9 : Disable	9
0x02	TGR_TCMP0_SRC	Table compare 0 (TCMP0) source	0 ~ 3 : Pulse counter 0~3 8 : Timer 0 counter 9 : Disable	9
0x03	TGR_TCMP1_SRC	Table compare 1 (TCMP1) source	0 ~ 3 : Pulse counter 0~3 8 : Timer 0 counter 9 : Disable	9
0x04	TGR_TCMP0_DIR	Table compare 0 (TCMP0) direction	0 : Negative direction 1 : Positive direction 2 : Bi-direction(No direction)	1
0x05	TGR_TCMP1_DIR	Table compare 1 (TCMP1) direction	0 : Negative direction 1 : Positive direction 2 : Bi-direction(No direction)	1
0x06	TGR_TRG_EN	TRG 0 ~ 3 enable by bit	Bit x : ( 0 : disable, 1 : enable) Bit 0 : TRG0 enable,	0

(5) Linear Comparator Setting : 線性比較器設定

Trigger Parameter   **Linear Comparator Setting**   Table Comparator Setting   TimerSe < >

**Linear Compare 0 (LCMP0)**

StartPoint: 0   RepeatTimes: 0   Interval: 0   \*SET

CurrCmpValue: 100   Select Input Source: Encoder 0

**Linear Compare 1 (LCMP1)**

StartPoint: 0   RepeatTimes: 0   Interval: 0   \*SET

CurrCmpValue: 0   Select Input Source: Disable

**Linear Compare 2 (LCMP2)**

StartPoint: 0   RepeatTimes: 0   Interval: 0   \*SET

CurrCmpValue: 0   Select Input Source: Disable

**Linear Compare 3 (LCMP3)**

StartPoint: 0   RepeatTimes: 0   Interval: 0   \*SET

CurrCmpValue: 0   Select Input Source: Disable

## (6) Table Comparator Setting : 表格比較器設定

Trigger Parameter   Linear Comparator Setting   **Table Comparator Setting**   TimerSe < >

**TCMP0 Input Table Points**

1000	1500	2000	2500	3000
3500	4000	4500	5000	5500

 Global  
 Point   **\*SET**

CmpValue : 0   Neg ▾   Select Source   Disable ▾   Don't Rei ▾

**TCMP1 Input Table Points**

1000	2000	3000	4000	5000
6000	7000	8000	9000	10000

 Global  
 Point   **\*SET**

CmpValue : 0   Neg ▾   Select Source   Disable ▾   Don't Rei ▾

**TCMP2 Input Table Points**

1000	2500	4000	5500	7000
8500	10000	11500	13000	14500

 Global  
 Point   **\*SET**

CmpValue : 0   Neg ▾   Select Source   Disable ▾   Don't Rei ▾

**TCMP3 Input Table Points**

1000	3000	5000	7000	9000
11000	13000	15000	17000	19000

 Global  
 Point   **\*SET**

CmpValue : 0   Neg ▾   Select Source   Disable ▾   Don't Rei ▾

## (7) Timer Setting : 計時器設定

Linear Comparator Setting   Table Comparator Setting   **TimerSetting**   < >

Compare Value   TRG\_CHx

0   Second

Timer   Timer Counter   1   Set

-20224

Counter Driection: Positive Count ▾

N: 1

Timer Interval = (N+2) \* 8ns    Enable Ring Counter

N: Range 0 ~ 268435455(0xfffff)

## 3.18 Latch

位置門鎖功能讓使用者門鎖瞬間位置，再針對位置做相對應的訊號輸出或運動反應。

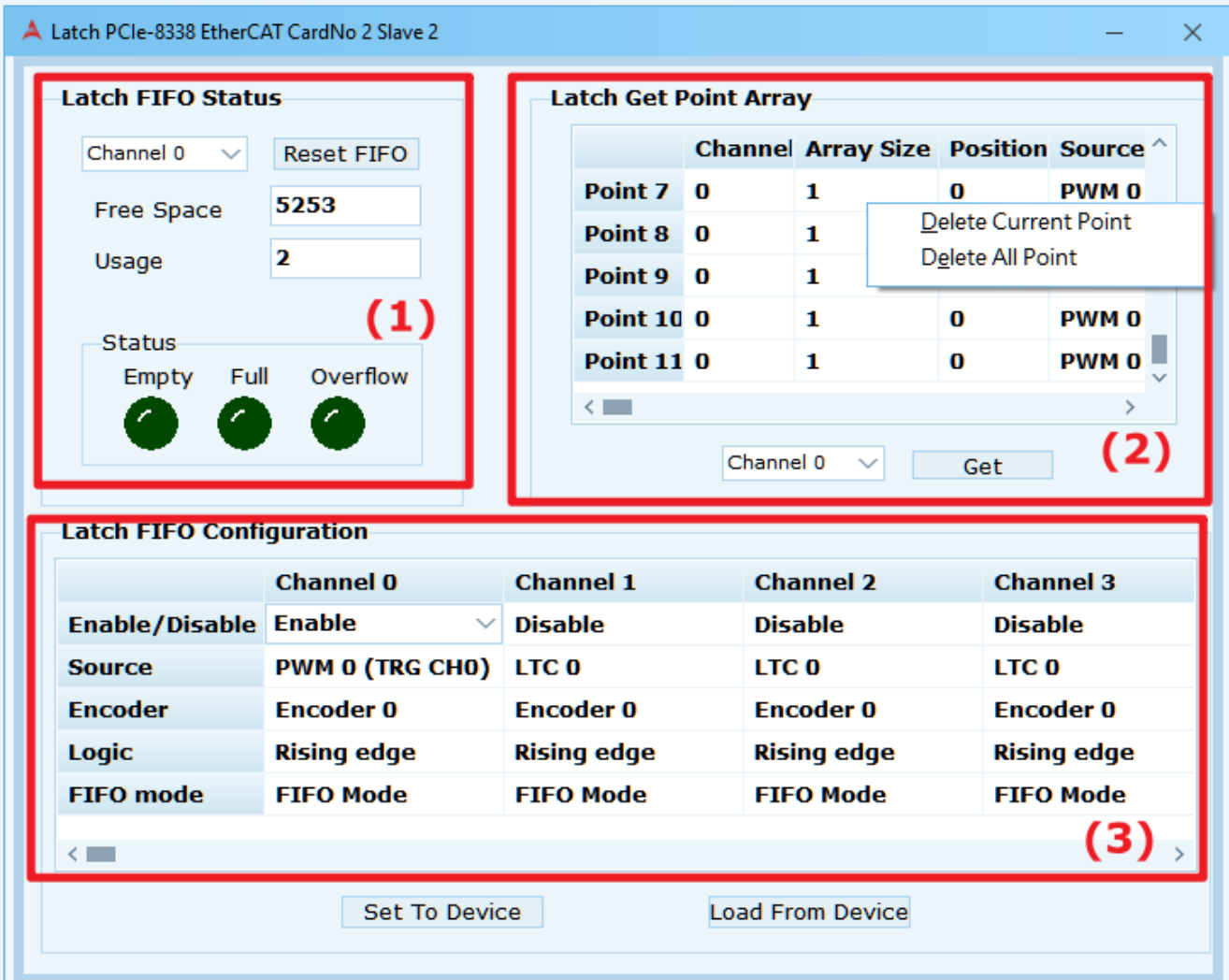
以下圖示顯示了” Latch” 操作方式

打開 Latch 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Axis X”，再至快速功能按鈕點選 Latch 功能按鈕。

The screenshot shows the Motion Creator Pro 2 software interface. On the left is a device tree with the following structure:

- ADLINK
  - PCIe-8158
    - Card No 0
      - Motion
        - Axis0 ServoOff
        - Axis1 ServoOff
        - Axis2 ServoOff
        - Axis3 ServoOff
        - Axis4 ServoOff
        - Axis5 ServoOff
        - Axis6 ServoOff
        - Axis7 ServoOff
    - PCI-8254
      - Card No 1
        - Motion
          - Axis8 Alarm
          - Axis9 Alarm
          - Axis10 Alarm
          - Axis11 Alarm
    - PCIe-8338
      - Card No 2
        - EtherCAT Axis
          - (Slave 0 ) ADLINK ECA
            - Axis 12 Alarm
            - Axis 13 ServoOff
            - Axis 14 ServoOff
            - Axis 15 ServoOff
          - (Slave 1 ) Yaskawa Sla
            - Axis 16 ServoOff
      - EtherCAT IO
    - AMP-304C
      - Card No 3
        - Motion
          - Axis76 ServoOff
          - Axis77 ServoOff
          - Axis78 ServoOff
          - Axis79 ServoOff

打開 Latch 頁面操作區(Operation Area)三個區塊



The screenshot shows the 'Latch PCIe-8338 EtherCAT CardNo 2 Slave 2' interface. It is divided into three main sections, each highlighted with a red box and a red number:

- (1) Latch FIFO Status:** This section shows the status for Channel 0. It includes a 'Reset FIFO' button, 'Free Space' (5253), and 'Usage' (2). Below this are three status indicators: 'Empty', 'Full', and 'Overflow', each with a green circular icon.
- (2) Latch Get Point Array:** This section displays a table of point data. A context menu is open over the table, showing 'Delete Current Point' and 'Delete All Point' options. The table has columns for Channel, Array Size, Position, and Source. Below the table is a 'Get' button.
- (3) Latch FIFO Configuration:** This section is a table for configuring parameters for four channels (Channel 0 to Channel 3). It includes settings for Enable/Disable, Source, Encoder, Logic, and FIFO mode. At the bottom of this section are 'Set To Device' and 'Load From Device' buttons.

- (1) Latch FIFO 狀態，定期的更新使用者所選擇的通道 FIFO 狀態，以及重置與使用狀態。
- (2) 取得使用者選取的通道 FIFO 點資訊，包含閘鎖位置及來源，並且列印到表單上供使用者參考，當不用的時候可按右鍵點選單一資訊或全部移除。
- (3) Latch 的相關參數設定，如 latch 通道號、來源、閘鎖的編碼器號以及閘鎖的邏輯條件等，當這些配置好之後再 enable。設定參數請內容請參閱 APS Function Library 手冊 Table definition-> Latch parameter table  
上圖為 ADLINK 的 ECAT-4XMO 產品，因此對應手冊內容如下圖

APS\_FunctionLibrary\_V2.1

ECAT-4XMO/ECAT-4XMO-MT, ECAT-TRG4/ECAT-TRG4-MT Latch parameter table

NO	Define	Description	Value	Default :
0x10	LTC_IPT	Latch source	Source to trigger the position latch : bit 0~3 : Axis 0~3 digital input "LTC"; bit 8~11 : PWM pulse out 0~3, refer to TGR_TRG_EN setting	0
0x11	LTC_ENC	Latch encoder	Determine which encoder is latched when latch source is triggered; The range of encoder no. is 0~3	0
0x12	LTC_LOGIC	Latch logic	Support three kinds of logic modes to trigger the latch process : 0 : Rising edge. 1 : Falling edge. 2 : Both rising and falling edge.	0
0x13	LTC_EN	Latch flow enable	Enable position latch process, refer to <a href="#">Field bus position latch functions</a> . 0 : Disable, 1 : Enable *This parameter would not store at device.	0
0x14	LTC_FIFO_MOD	Latch single point	Bit 0~3 : latch channel mode 0 : Latch point using FIFO mode.	0

725页 ● 1 選擇的項目

W: 210.0mm L: X: 220.6mm  
H: 297.0mm Y: 206.0mm

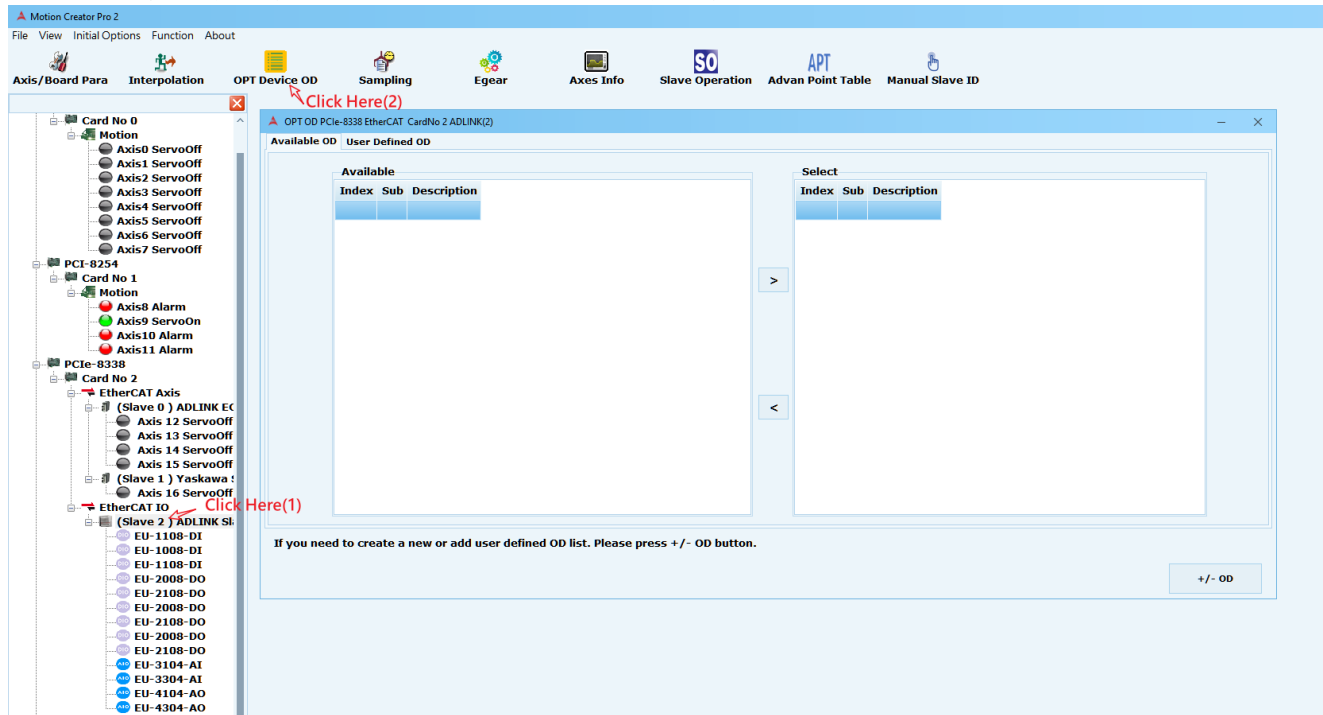
1224 / 1270 125%



## 3.19 OPT Device OD

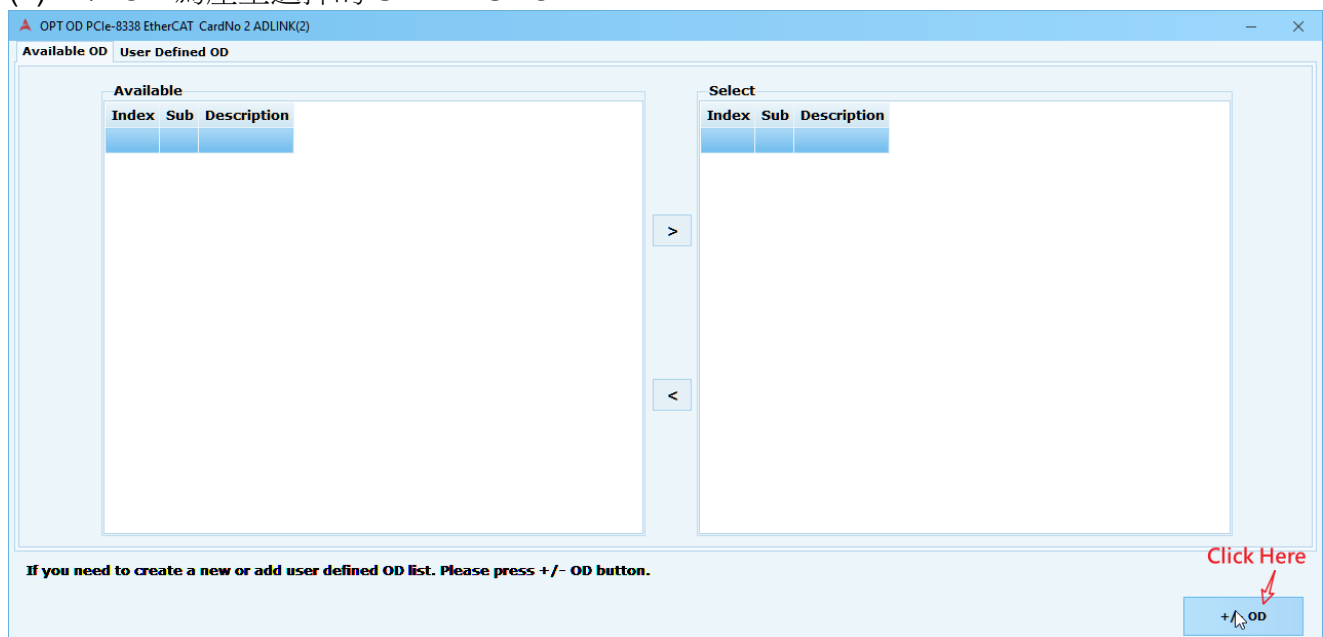
OPT Device OD 頁面是 SDO 頁面的延伸，使用者可以選擇想要的 SDO 的通信 OD (Object Dictionary) 數據讀寫，獲取 Slave 的特定數據及監視。

打開 OPT Device OD 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Slave X”，再至快速功能按鈕點選 OPT Device OD 功能按鈕。

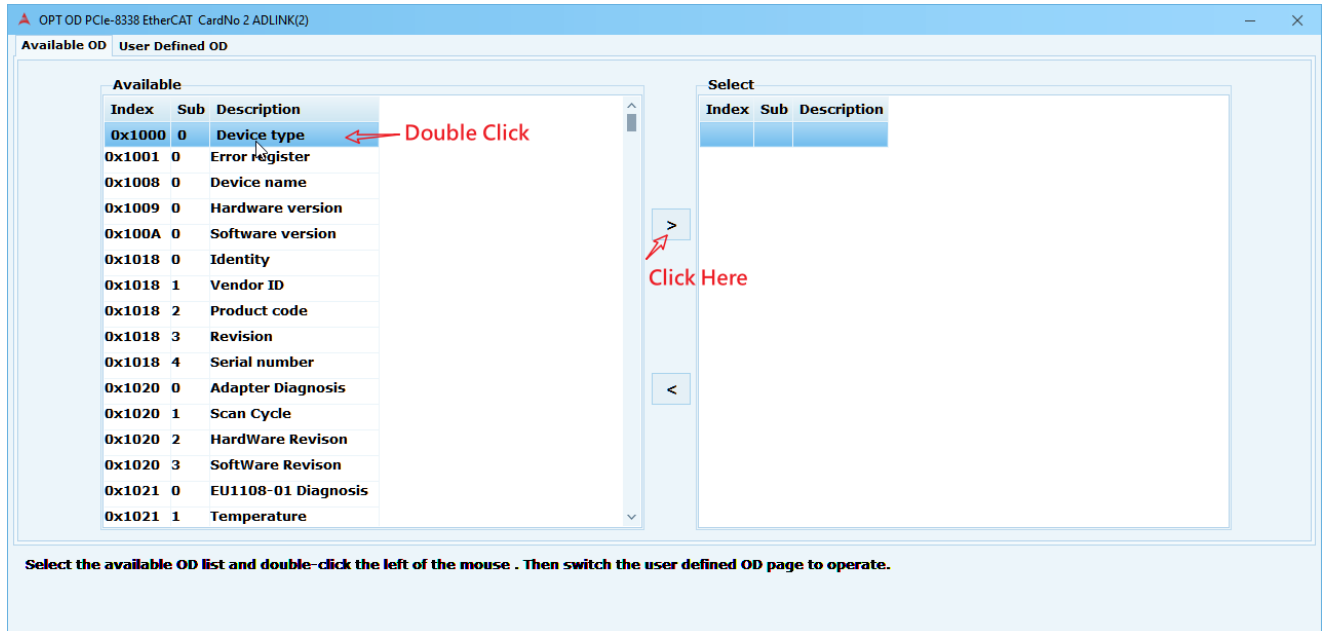


OPT Device OD 功能設定介紹如下

(1) +/- OD 為產生選擇的 SLAVE SDO



- (2) 產生後的 OD Data 會顯示在 Available，在項目上連續點擊滑鼠兩下或者使用中間的向右按鈕(如下圖)，即選擇想要的 OD Data



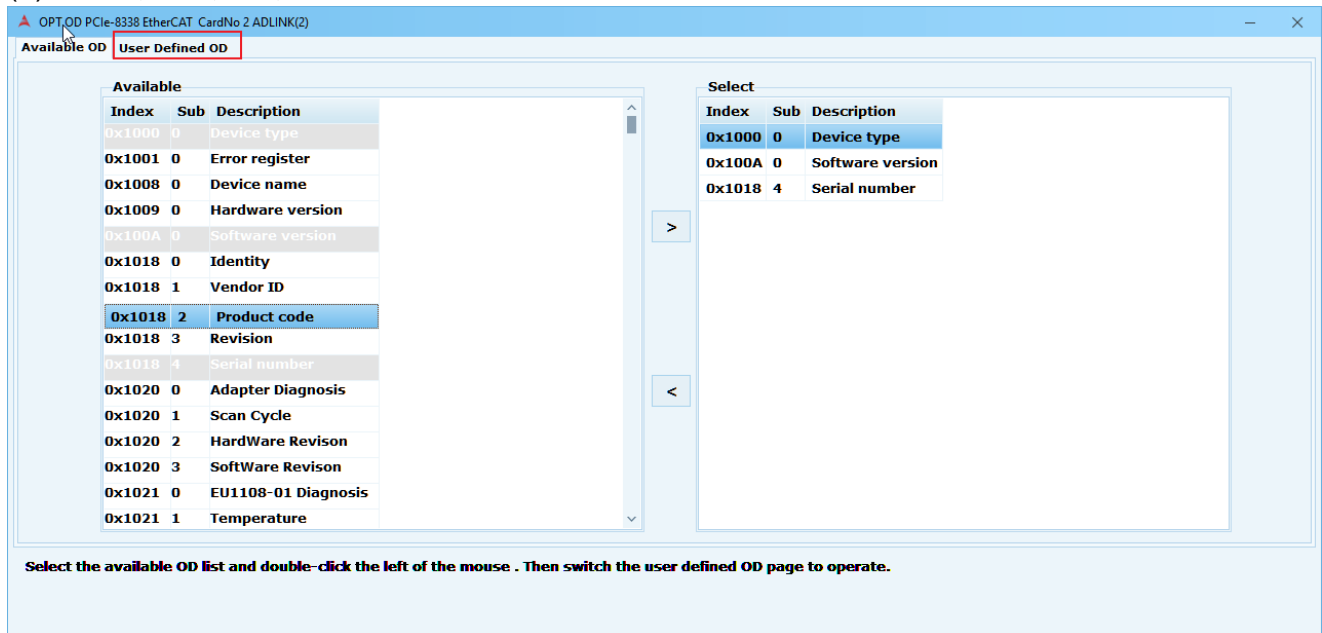
Available OD    User Defined OD

Index	Sub	Description
0x1000	0	Device type
0x1001	0	Error register
0x1008	0	Device name
0x1009	0	Hardware version
0x100A	0	Software version
0x1018	0	Identity
0x1018	1	Vendor ID
0x1018	2	Product code
0x1018	3	Revision
0x1018	4	Serial number
0x1020	0	Adapter Diagnosis
0x1020	1	Scan Cycle
0x1020	2	HardWare Revison
0x1020	3	SoftWare Revison
0x1021	0	EU1108-01 Diagnosis
0x1021	1	Temperature

Index	Sub	Description

Select the available OD list and double-click the left of the mouse . Then switch the user defined OD page to operate.

- (3) 選擇後結果如下，並切換 User Defined OD 分頁



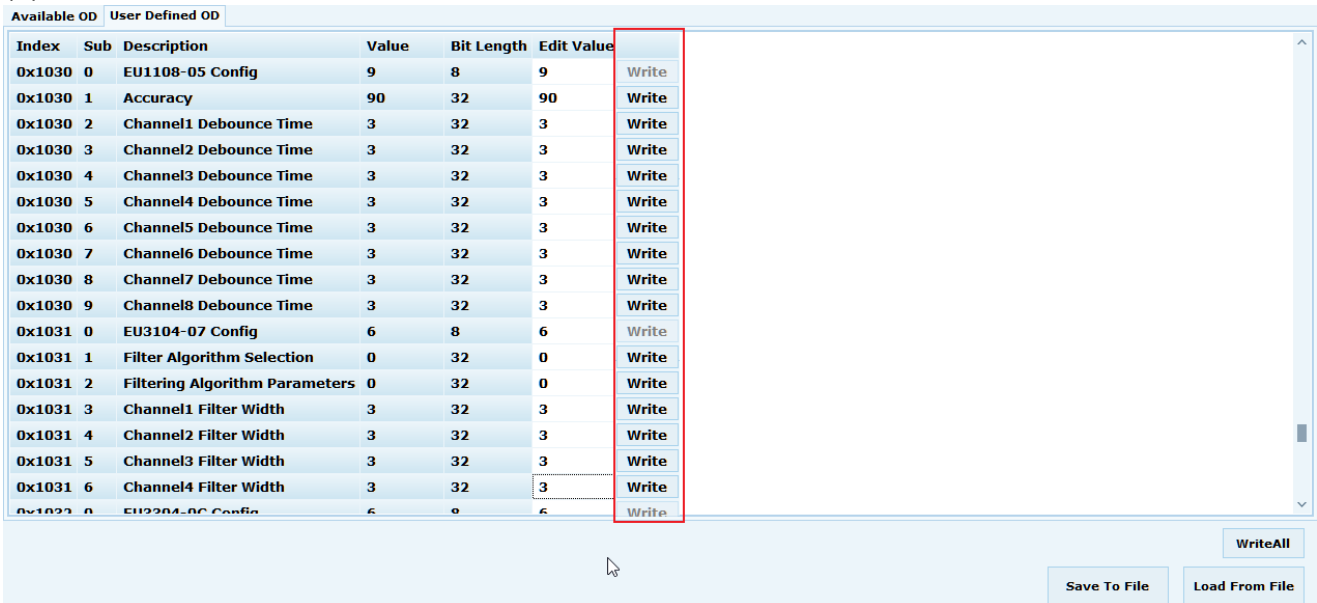
Available OD    **User Defined OD**

Index	Sub	Description
0x1000	0	Device type
0x1001	0	Error register
0x1008	0	Device name
0x1009	0	Hardware version
0x100A	0	Software version
0x1018	0	Identity
0x1018	1	Vendor ID
0x1018	2	Product code
0x1018	3	Revision
0x1018	4	Serial number
0x1020	0	Adapter Diagnosis
0x1020	1	Scan Cycle
0x1020	2	HardWare Revison
0x1020	3	SoftWare Revison
0x1021	0	EU1108-01 Diagnosis
0x1021	1	Temperature

Index	Sub	Description
0x1000	0	Device type
0x100A	0	Software version
0x1018	4	Serial number

Select the available OD list and double-click the left of the mouse . Then switch the user defined OD page to operate.

(4) 分頁會呈現必要的 OD 資訊，如項目最右側無反白 Write 為可寫入的 OD Data

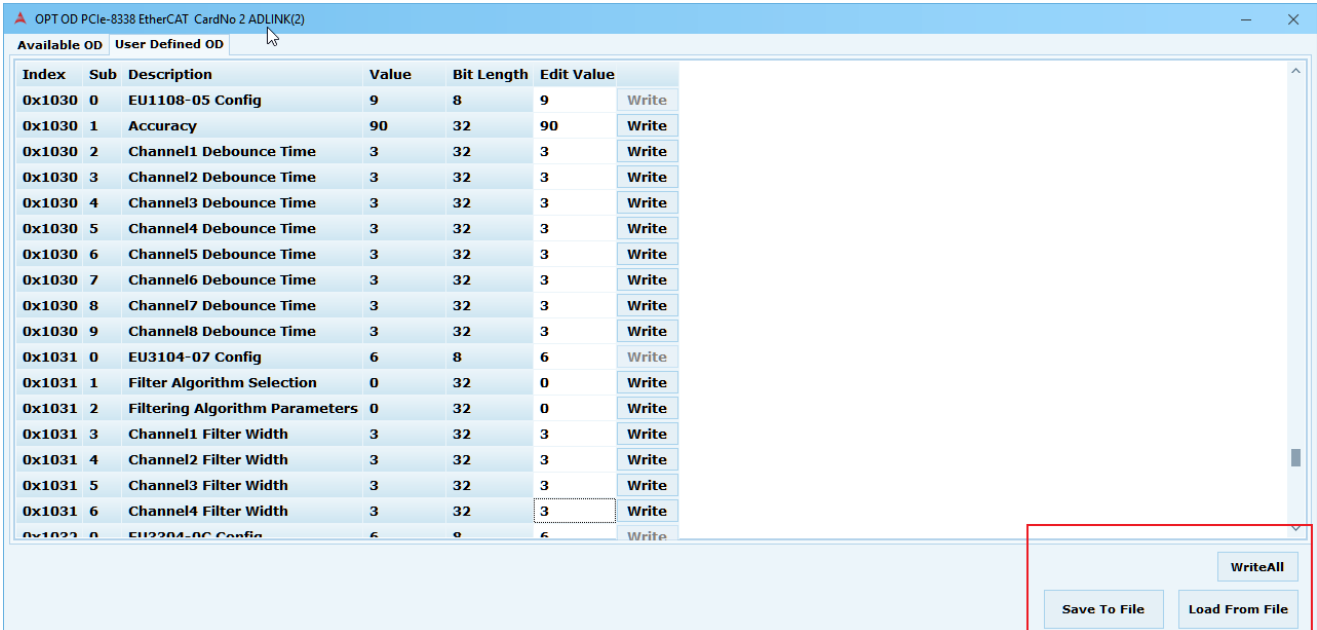


Index	Sub	Description	Value	Bit Length	Edit Value	
0x1030	0	EU1108-05 Config	9	8	9	Write
0x1030	1	Accuracy	90	32	90	Write
0x1030	2	Channel1 Debounce Time	3	32	3	Write
0x1030	3	Channel2 Debounce Time	3	32	3	Write
0x1030	4	Channel3 Debounce Time	3	32	3	Write
0x1030	5	Channel4 Debounce Time	3	32	3	Write
0x1030	6	Channel5 Debounce Time	3	32	3	Write
0x1030	7	Channel6 Debounce Time	3	32	3	Write
0x1030	8	Channel7 Debounce Time	3	32	3	Write
0x1030	9	Channel8 Debounce Time	3	32	3	Write
0x1031	0	EU3104-07 Config	6	8	6	Write
0x1031	1	Filter Algorithm Selection	0	32	0	Write
0x1031	2	Filtering Algorithm Parameters	0	32	0	Write
0x1031	3	Channel1 Filter Width	3	32	3	Write
0x1031	4	Channel2 Filter Width	3	32	3	Write
0x1031	5	Channel3 Filter Width	3	32	3	Write
0x1031	6	Channel4 Filter Width	3	32	3	Write
0x1031	7	Channel5 Filter Width	3	32	3	Write
0x1031	8	Channel6 Filter Width	3	32	3	Write
0x1031	9	Channel7 Filter Width	3	32	3	Write
0x1031	10	Channel8 Filter Width	3	32	3	Write

Buttons: WriteAll, Save To File, Load From File

(5) 分頁右下角分別為

- WriteALL：一次寫入 OD Data
- Save to file：儲存使用者自定義的 OD Data(\*.csv 格式)
- Load from file：匯入使用者自定義的 OD Data(\*.csv 格式)



Buttons: WriteAll, Save To File, Load From File

## 3.20 IO 映射(IO Mapping)

### 3.20.1 EtherCAT

IO 映射**不建議**手動修改配置文件的內容。請使用 MCP2 IO 映射頁面進行映射和檢查。  
對於每種類型的 IO，軟體端口最大支援數量為”32”。

- IO 映射配置文件可以通過 MCP2 IO 映射形式保存到”CSV”文件。
- IO 映射配置文件設置只能透過 MCP2 設定。用戶要寫入配置文件，請是用 APS 的 API 將配置結果寫入。
- 無需重新映射 ADLINK 已整合過的模組。

以下是使用 MCP2 設置 IO 映射配置的操作步驟說明

#### 步驟 1：

更新 kernel 版本：C:\Program Files (x86)\ADLINK\PCIe-833x\Kernel Update

功能版本需求要 **2022050503\_833x\_kernel** 以上版本

#### 步驟 2：

打開 IO 映射頁面步驟方式如下圖(1)~(2)步驟所示，EtherCAT 連線後，首先在裝置樹列上點選”EtherCAT IO”，再至快速功能按鈕點選 IO 映射功能按鈕。

The screenshot shows the Motion Creator Pro 2 software interface. On the left is a device tree with the following structure:

- ADLINK
  - PCIe-8158
    - Card No 0
      - Motion
        - Axis0 ServoOff
        - Axis1 ServoOff
        - Axis2 ServoOff
        - Axis3 ServoOff
        - Axis4 ServoOff
        - Axis5 ServoOff
        - Axis6 ServoOff
        - Axis7 ServoOff
    - PCI-8254
      - Card No 1
        - Motion
          - Axis8 Alarm
          - Axis9 Alarm
          - Axis10 Alarm
          - Axis11 Alarm
    - PCIe-8338
      - Card No 2
        - EtherCAT Axis
          - (Slave 0) ADLINK EC
            - Axis 12 Alarm
            - Axis 13 Alarm
            - Axis 14 Alarm
            - Axis 15 Alarm
            - Axis 16 Alarm
          - EtherCAT IO ← Click Here(1)
          - (Slave 2) ADLINK SI
            - EU-1108-DI
            - EU-1008-DI
            - EU-1108-DI
            - EU-2008-DO
            - EU-2108-DO
            - EU-2008-DO
            - EU-2108-DO
            - EU-2008-DO
            - EU-2108-DO
            - EU-3104-AI
            - EU-3304-AI
            - EU-4104-AO
            - EU-4304-AO
    - AMP-304C
      - Card No 3
        - Motion
          - Axis76 ServoOff

The main configuration window is titled "EtherCAT IO Mapping PCIe-8338 EtherCAT CardNo 2". It contains two tables:

**Configurable PDO Mapping ( Output )**

SlaveID	SubMod No.	Index	Bit Length	Offset	Name	Map No.
2	2	0	1	0	Module 2 (EU2008).Channels Data.Channel 1	
2	2	1	1	1	Module 2 (EU2008).Channels Data.Channel 2	
2	2	2	1	2	Module 2 (EU2008).Channels Data.Channel 3	
2	2	3	1	3	Module 2 (EU2008).Channels Data.Channel 4	
2	2	4	1	4	Module 2 (EU2008).Channels Data.Channel 5	
2	2	5	1	5	Module 2 (EU2008).Channels Data.Channel 6	
2	2	6	1	6	Module 2 (EU2008).Channels Data.Channel 7	
2	2	7	1	7	Module 2 (EU2008).Channels Data.Channel 8	
2	4	0	1	0	Module 4 (EU2108).Channels Data.Channel 1	
2	4	1	1	1	Module 4 (EU2108).Channels Data.Channel 2	
2	4	2	1	2	Module 4 (EU2108).Channels Data.Channel 3	
2	4	3	1	3	Module 4 (EU2108).Channels Data.Channel 4	

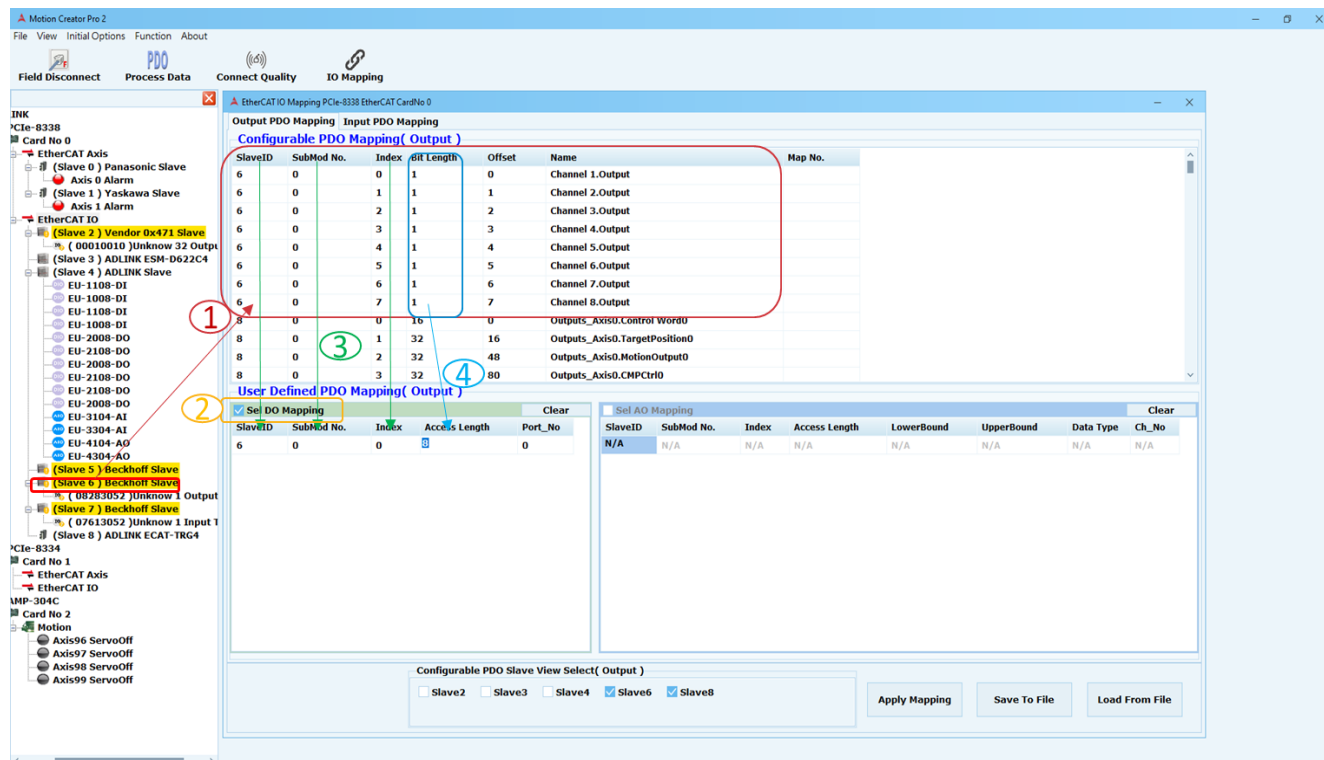
**User Defined PDO Mapping ( Output )**

SlaveID	SubMod No.	Index	Access Length	Port_No
N/A	N/A	N/A	N/A	N/A

At the bottom of the window, there are buttons for "Apply Mapping", "Save To File", and "Load From File". A checkbox labeled "Slave2" is checked.

## 步驟 2-1 ( 選擇 DIO 映射 ) :

選擇需要 Slave IO 來映射。參考可配置 PDO 視窗進行對應的設定。



① 選擇需要 Slave IO 映射，參考可配置 PDO 視窗。

② 勾選需要設置的 IO 類型。

③ SlaveID 填寫需要映射 Slave ID。

SubMod No. 填寫對應的 SubMod No，請參考可配置 PDO 視窗中的 SubMod No。

Index 填寫起始 Index。請參考可配置 PDO 視圖內容中的 Index 訪問起始位置。

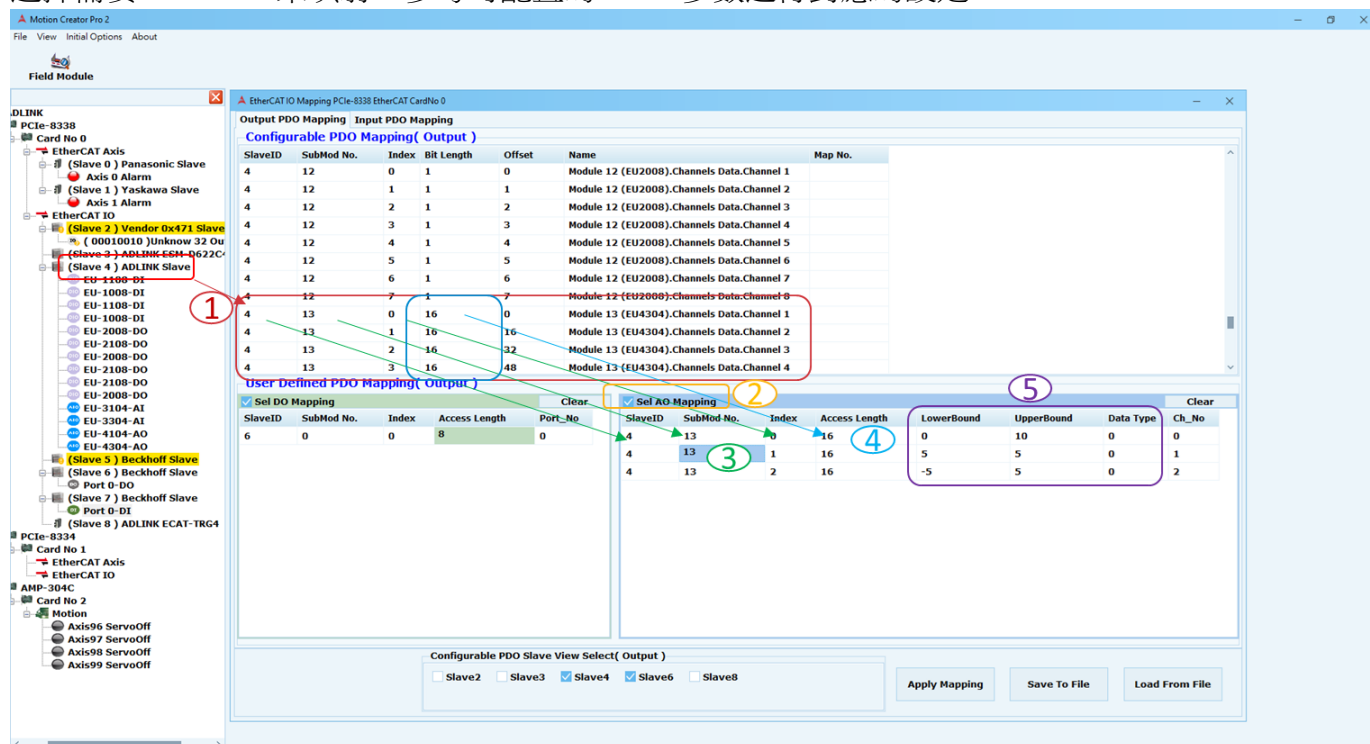
④ Access Length 填寫定義端口需要的 IO Bit。

### DIO 映射參數：

- SlaveID：需要映射 Slave ID。
- SubMod No.：可配置的 PDO 視圖
- Index：根據可配置的 PDO 視圖內容中的 Index 訪問起始位置。
- Access Length：根據可配置 PDO 視圖內容中的 Bit Length 訪問端口長度。  
 最大值：32 位  
 最小值：1 位
- Port\_No：自動生成。

## 步驟 2-2 ( 選擇 AIO 映射 ) :

選擇需要 Slave IO 來映射。參考可配置的 PDO 參數進行對應的設定。



① 選擇需要 Slave IO 映射，參考可配置 PDO 視窗。

② 勾選需要設置的 IO 類型。

③ SlaveID 填寫需要映射 Slave ID。

SubMod No. 填寫對應的 SubMod No，請參考可配置 PDO 視窗中的 SubMod No。  
Index 填寫起始 Index。請參考可配置 PDO 視圖內容中的 Index 訪問起始位置。

④ Access Length 填寫定義端口需要的 IO Bit。

⑤ LowerBound 填寫物理量下限。

UpperBound 填寫物理量上限。

Data type 填寫物理量類型

(0：無符號整數、1：有符號整數、2：以 MSB 為符號的絕對值、3：原始數據)

### AIO 映射參數：

- SlaveID：需要映射 Slave ID。
- SubMod No.：可配置的 PDO 視圖
- Index：根據可配置的 PDO 視圖內容中的 Index 訪問起始位置。
- Access Length：根據可配置 PDO 視圖內容中的 Bit Length 訪問端口長度。(注意：長度必需正確)
- LowerBound：物理量下限。
- UpperBound：物理量上限。
- Data type：物理量類型。
  - 類型 0(無符號整數)

- 例如 16 bits = 0 to +65535
- 類型 1(有符號整數)
  - 例如 for 16 bits = -32768 to +32767
- 類型 2(以 MSB 為符號的絕對值)
  - 例如 for 16 bits = -32767 to +32767
- 類型 3(原始數據)
- Ch\_No : 自動生成。

### 步驟 2-3 : (用戶定義 PDO 映射)

添加和刪除行有兩種方法：

- 右鍵單擊表格

SlaveID	SubMod No.	Index	Access Length	Port_No
6	0	0	8	0

Add New Row(last)  
 Delete Row(current)

- 使用鍵盤添加(Ctrl+enter)、刪除(Ctrl+delete)

SlaveID	SubMod No.	Index	Access Length	Port_No
6	0	0	8	0
6	0	0	8	1
6	0	0	8	2

提示：

- 將鼠標移到表格上會出現提示。

✓ Sel DO Mapping Clear

SlaveID	SubMod No.	Index	Access Length	Port_No
N/A	N/A	N/A	N/A	N/A

Please refer to the SubMod No. column in the PDO view table.

✓ Sel DI Mapping Clear

SlaveID	SubMod No.	Index	Access Length	Port_No
N/A	N/A	N/A	N/A	N/A

Please refer to the SubMod No. column in the PDO view table.

用戶定義的 DIO 映射提示

✓ Sel AO Mapping Clear

SlaveID	SubMod No.	Index	Access Length	LowerBound	UpperBound	Data Type	Ch_No
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Please set a physical lower limit.

Sel AI Mapping							Clear
SlaveID	SubMod No.	Index	Access Length	LowerBound	UpperBound	Data Type	Ch_No
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

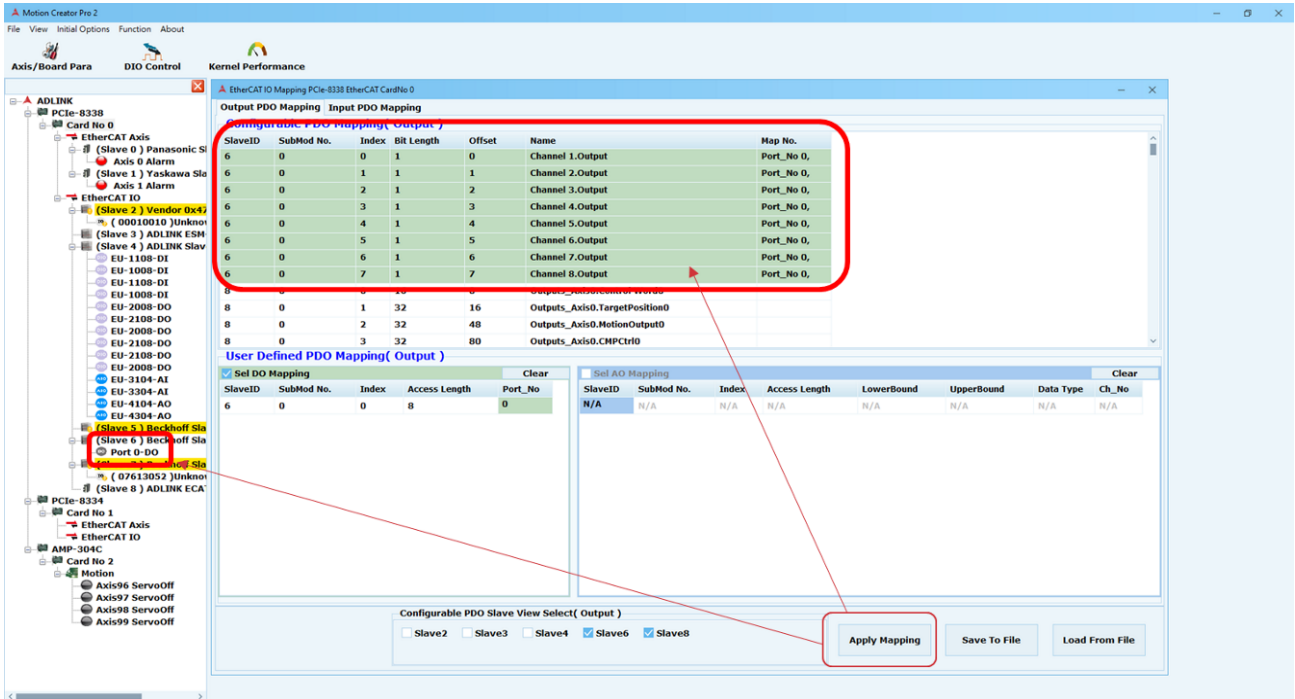
0: Unsigned integer with N-bit resolution without sign, therefore polarity detection is no longer possible.  
 Example : Range for 16 bits = 0 to +65535  
 1: Signed integer(2's complement(negated + 1)).  
 Example :Range for 16 bits = -32768 to +32767 dec.  
 2: Absolute value with MSB=1 (highest bit) as sign of negative values.  
 Example : Range for 16 bits = -32767 to +32767 dec.  
 3: Raw data has no transformation between physical value and raw data.

用戶定義的 AIO 映射提示

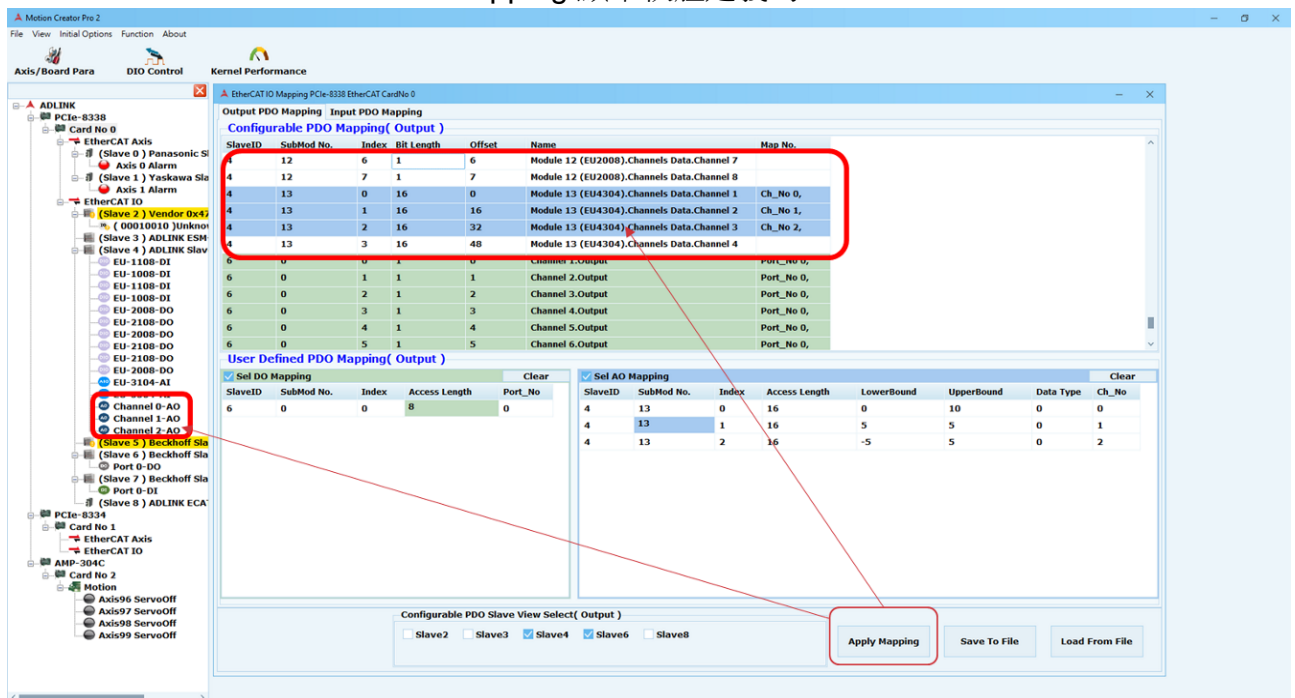


步驟 3：

單擊 Apply Mapping 按鈕。可配置的 PDO 視圖將映射結果顯示。樹狀圖也會顯示軟體定義的 Port No 或 Channel No。



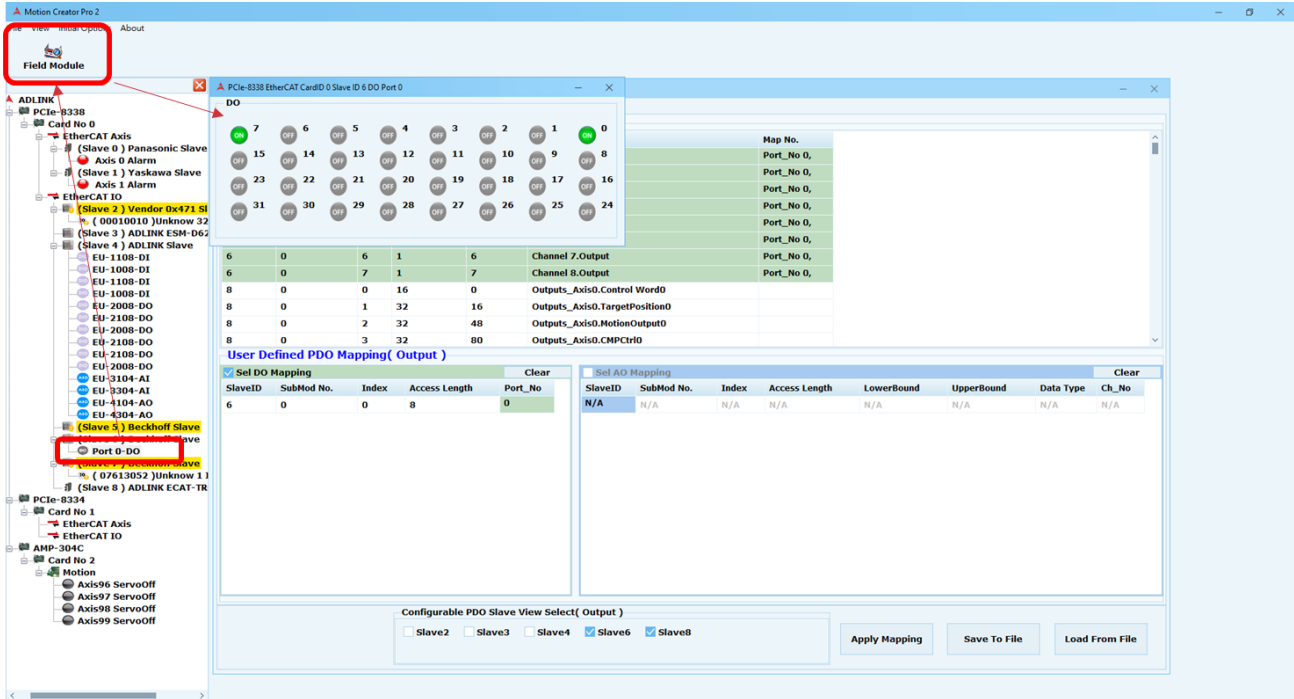
DIO mapping 顯示軟體定義的 Port No



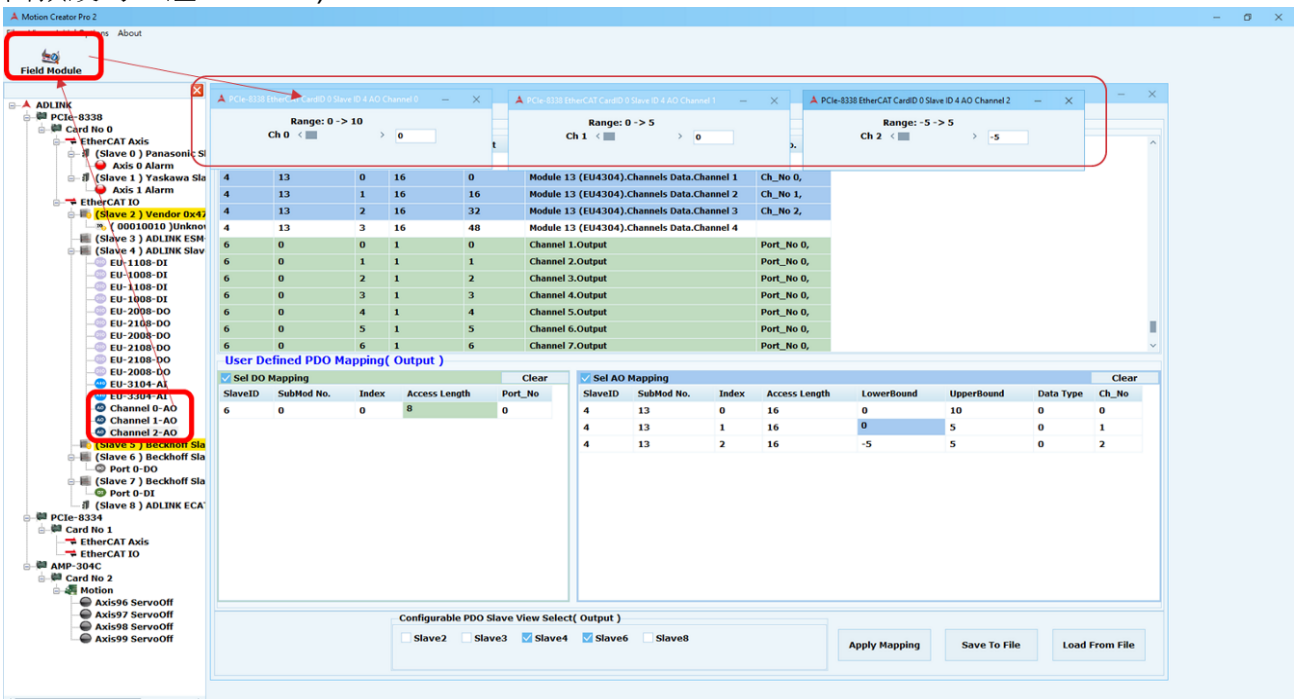
AIO mapping 顯示軟體定義的 Channel No

### 步驟 4：

如果選擇樹狀圖定義 Port No 會顯示連線模組按鈕功能。開啟後即可開始控制 DO\DI(視窗預設為 32 組 DO 或 DI Port)。該 DO\DI 控制位是來自於用戶設置的長度。如果控制超出用戶設置的 DIO 長度，將返回錯誤代碼。



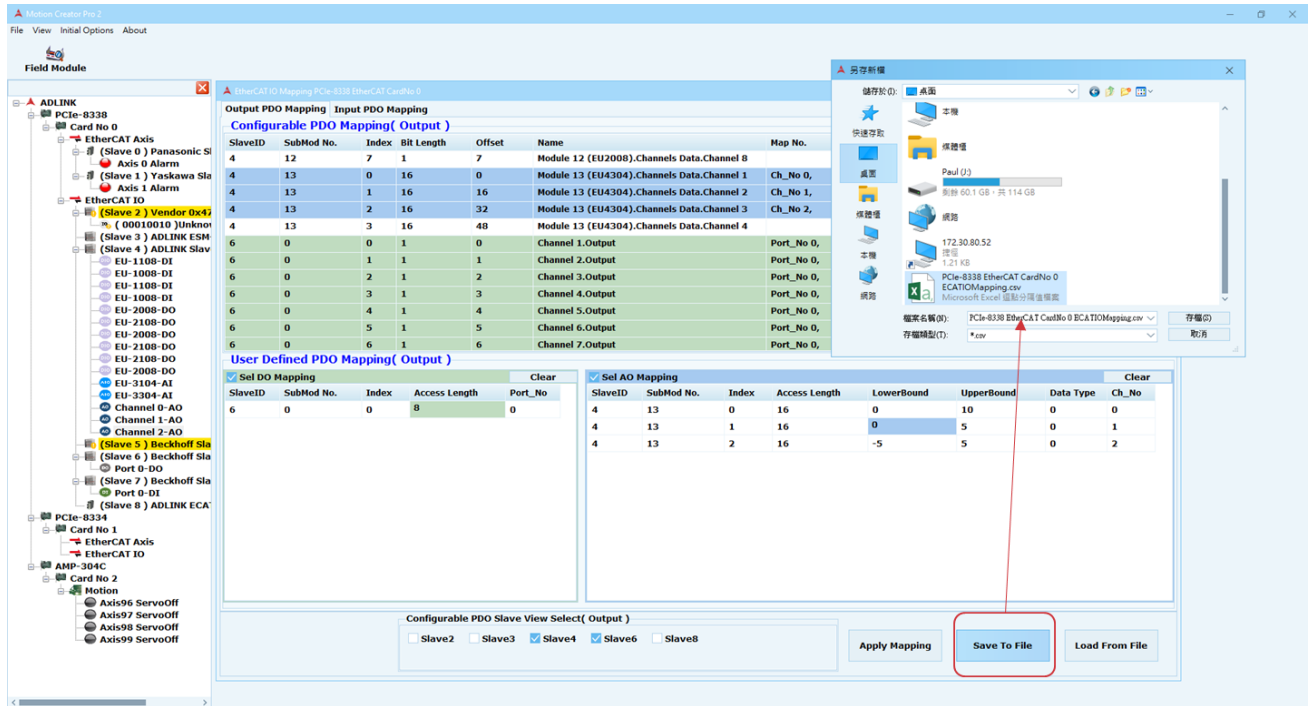
如果選擇樹狀圖定義 Channel No 會顯示連線模組按鈕功能。開啟後即可開始控制 AO/AI (視窗預設為 1 組 channel)。



以下是使用 MCP2 保存/加載文件並應用映射指令操作步驟說明

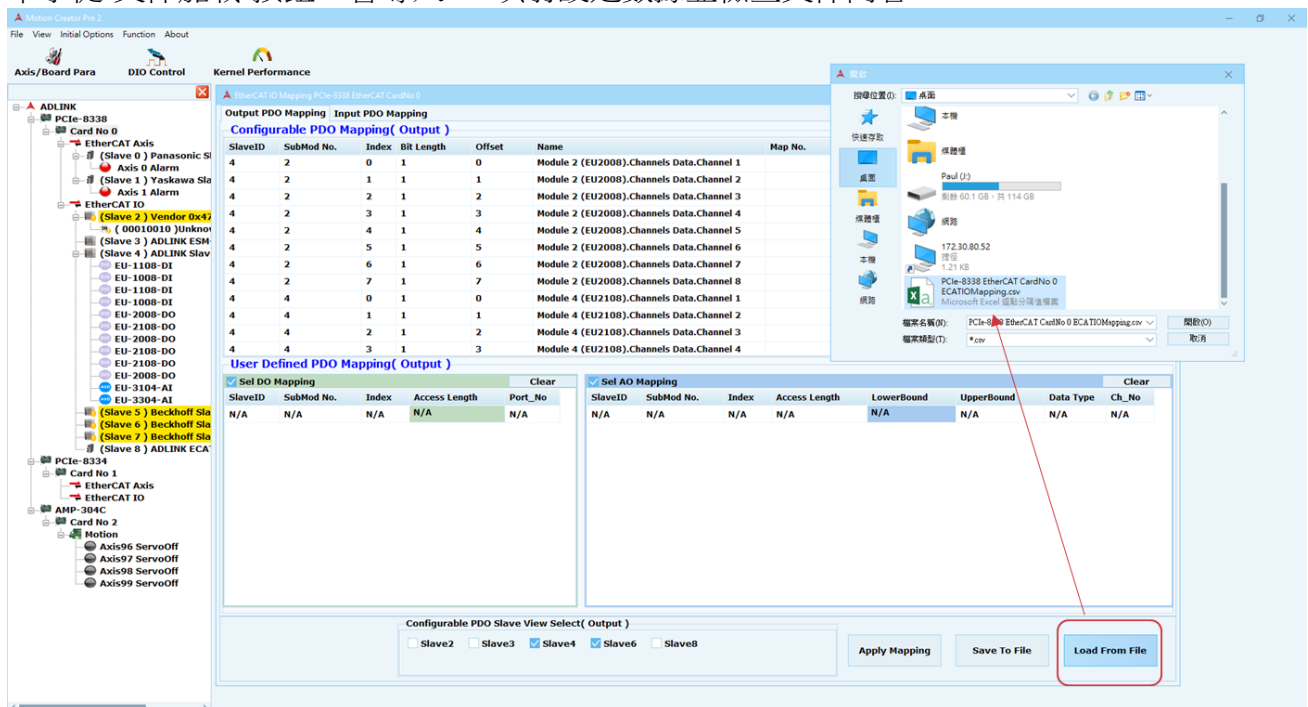
### 步驟 1：

單擊“保存到文件”按鈕將 IO 映射設定數據導出到文件。



### 步驟 2：

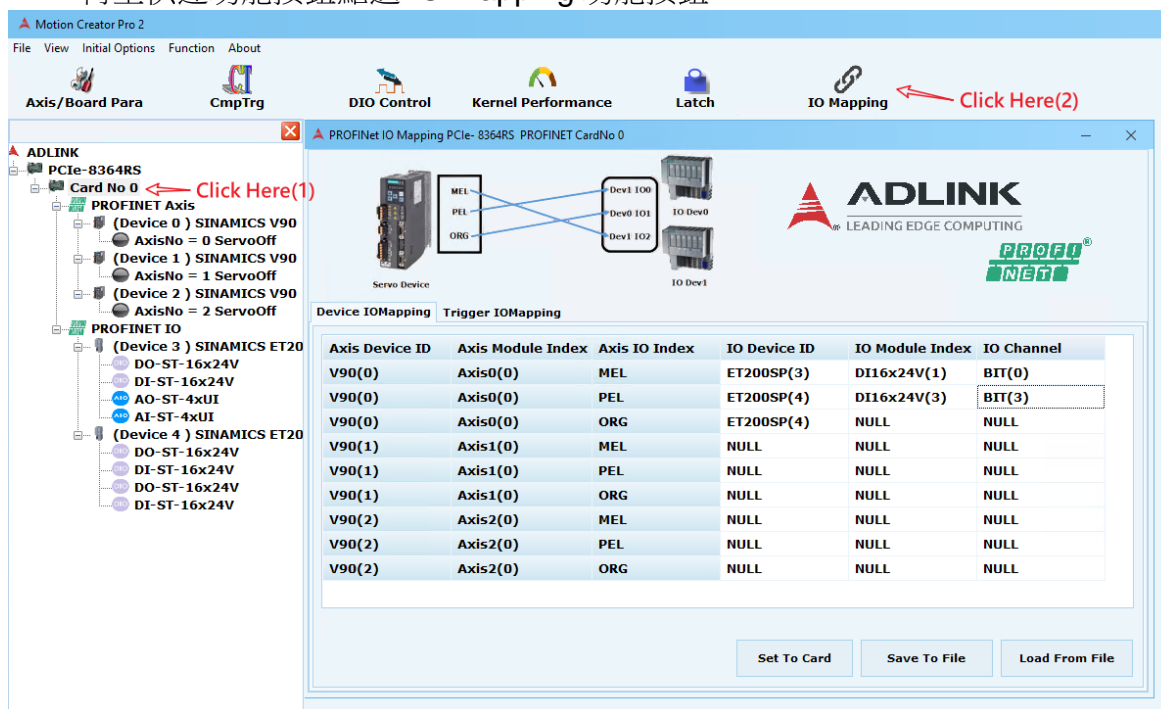
單擊從“文件加載”按鈕，會導入 IO 映射設定數據並檢查文件內容。



### 3.20.2 ProFiNet

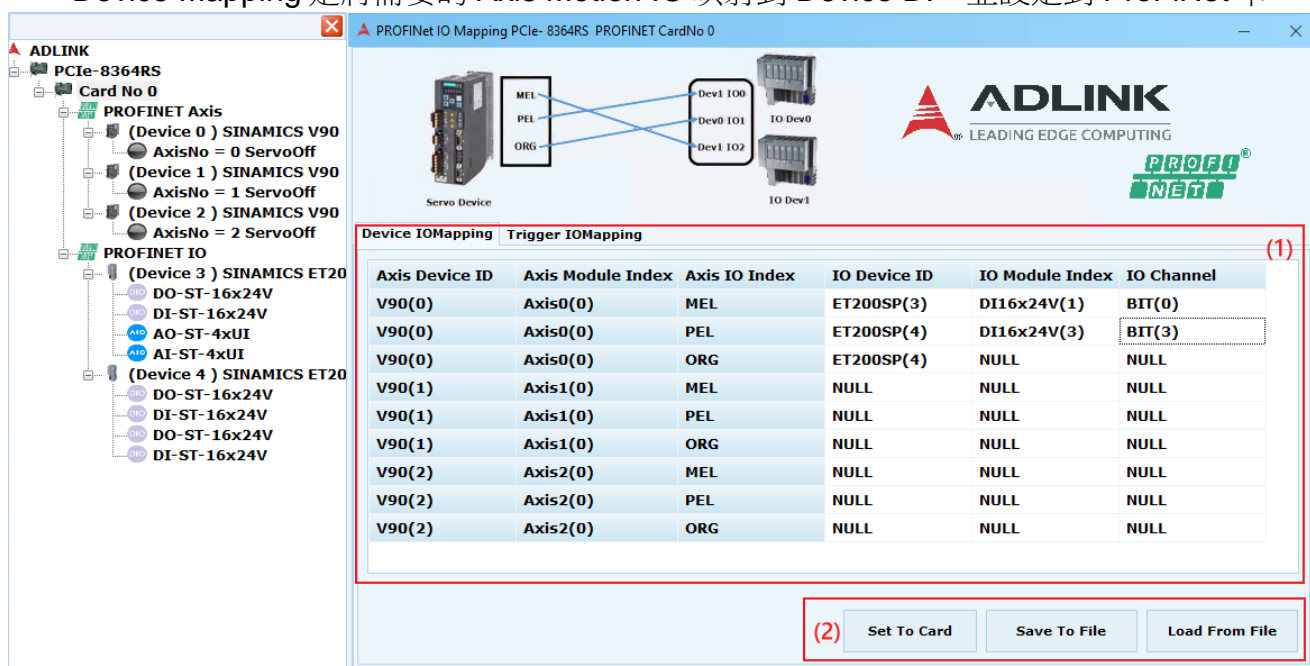
ProFiNet 的 Slave Device 上的 Motion IO 需使用 Slave IO 做為映射使用，因此需要 IO Mapping，對應其 Motion IO。

打開 IO Mapping 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Card No X”，再至快速功能按鈕點選 IO Mapping 功能按鈕。



ProFiNet IO Mapping 分為兩頁面 Mapping

- Device Mapping 是將需要的 Axis Motion IO 映射到 Device DI，並設定到 ProFiNet 卡。



(1) 設定 Device DI 映射至 Axis Motion IO 表。

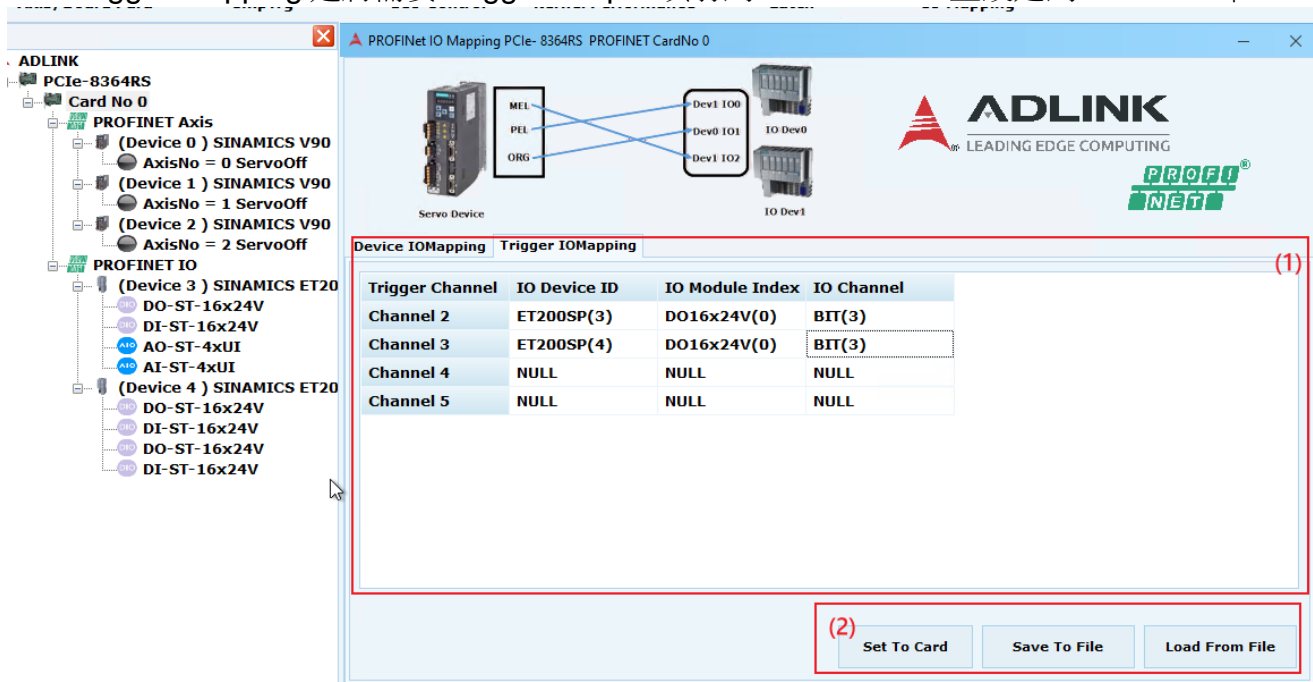
(2) 三個按鈕分為

Set to Card：設定到 ProFiNet 卡。

Save To File：將參數寫入至指定的檔案中(\*csv)。

Load From File：從指定檔案讀取參數至頁面顯示(\*csv)。

- **Trigger Mapping** 是將需要 Trigger Output 映射到 Device DO，並設定到 ProFiNet 卡。



Trigger Channel	IO Device ID	IO Module Index	IO Channel
Channel 2	ET200SP(3)	DO16x24V(0)	BIT(3)
Channel 3	ET200SP(4)	DO16x24V(0)	BIT(3)
Channel 4	NULL	NULL	NULL
Channel 5	NULL	NULL	NULL

(1) 設定 Device DO 映射至 Trigger Output 表。

(2) 三個按鈕分為

Set to Card：設定到 ProFiNet 卡。

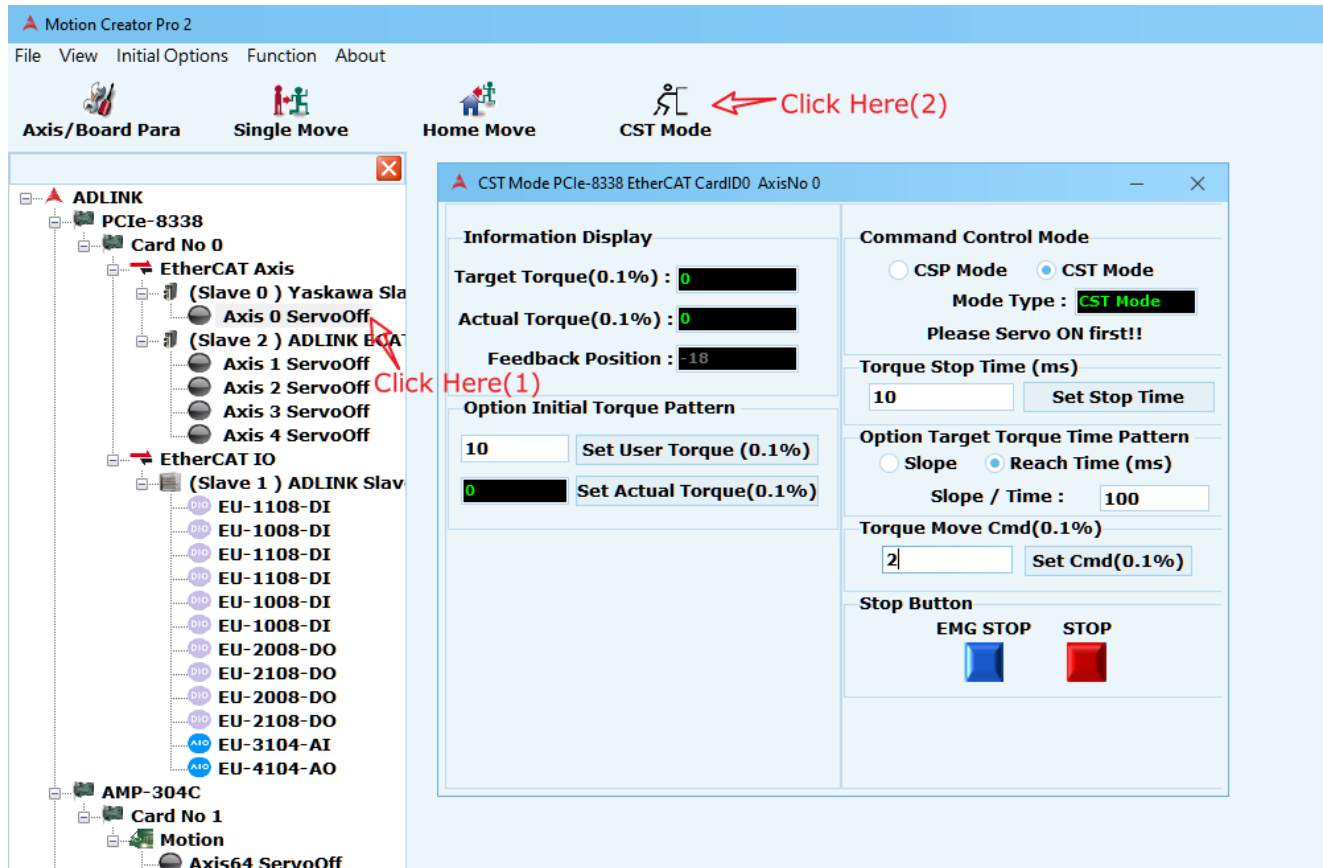
Save To File：將參數寫入至指定的檔案中(\*csv)。

Load From File：從指定檔案讀取參數至頁面顯示(\*csv)。

## 3.21 CST Mode

**CST(Cyclic Synchronous Torque)**模式下，軌跡發生器位於控制裝置中，而不是伺服驅動器中。它以循環同步的方式向驅動裝置提供目標扭矩，驅動裝置執行扭矩控制。

打開 CST Mode 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Axis X”，再至快速功能按鈕點選 CST Mode 功能按鈕。



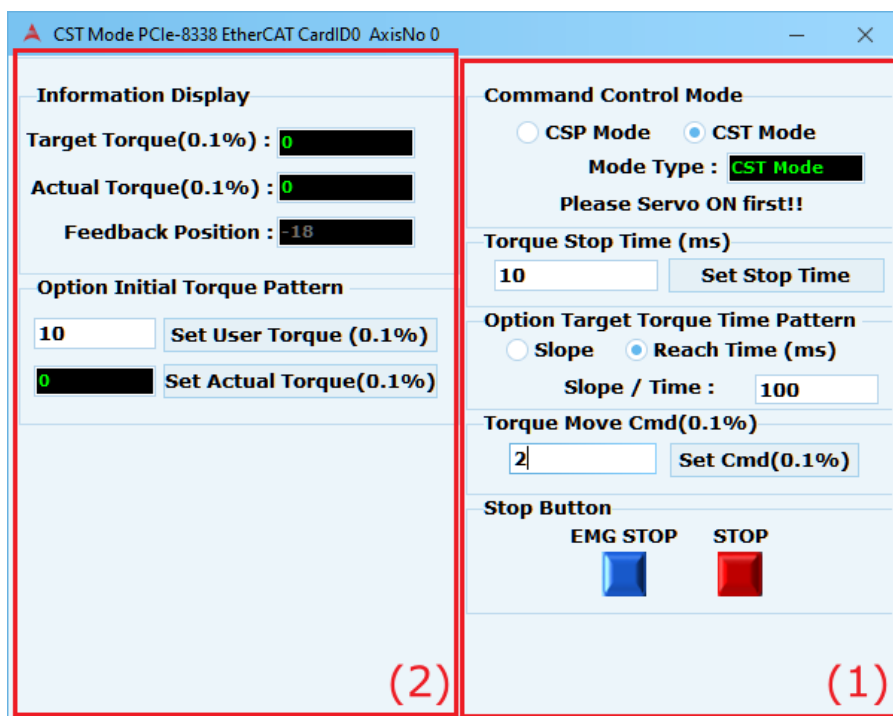
The screenshot displays the Motion Creator Pro 2 software interface. At the top, there are menu options: File, View, Initial Options, Function, and About. Below the menu is a toolbar with icons for different motion modes: Axis/Board Para, Single Move, Home Move, and CST Mode. A red arrow points to the CST Mode icon with the text "Click Here(2)".

On the left side, there is a device tree showing the hardware configuration. Under the "ADLINK" root, there is a "PCIe-8338" card with "Card No 0". Under this card, there are two "EtherCAT Axis" sections. The first section, "(Slave 0) Yaskawa Slave", contains "Axis 0 ServoOff", "(Slave 2) ADLINK Board", "Axis 1 ServoOff", "Axis 2 ServoOff", "Axis 3 ServoOff", and "Axis 4 ServoOff". A red arrow points to "Axis 0 ServoOff" with the text "Click Here(1)". The second section, "(Slave 1) ADLINK Slave", contains various digital input/output modules: EU-1108-DI, EU-1008-DI, EU-1108-DI, EU-1008-DI, EU-1008-DI, EU-2008-DO, EU-2108-DO, EU-2008-DO, EU-2108-DO, EU-3104-AI, and EU-4104-AO. Below this is the "AMP-304C" card with "Card No 1" and a "Motion" section containing "Axis64 ServoOff".

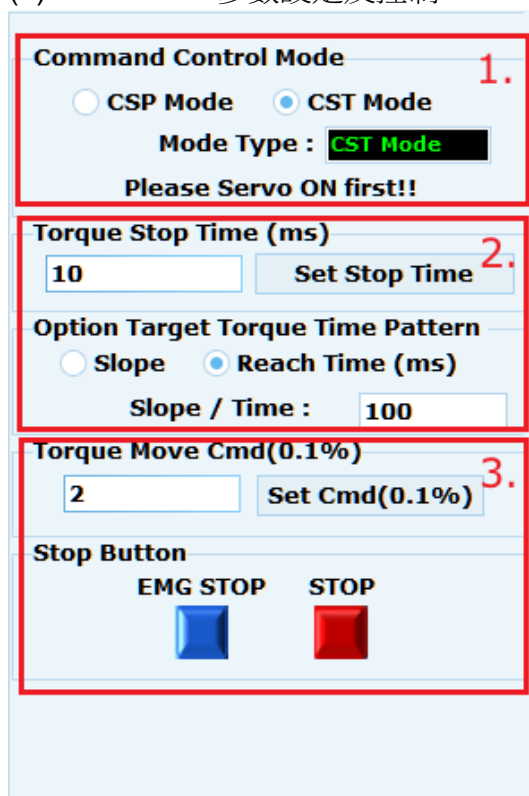
The main window on the right is titled "CST Mode PCIe-8338 EtherCAT CardID0 AxisNo 0". It contains several configuration panels:

- Information Display:** Shows "Target Torque(0.1%)" as 0, "Actual Torque(0.1%)" as 0, and "Feedback Position" as -18.
- Option Initial Torque Pattern:** Includes a field with "10" and a "Set User Torque (0.1%)" button, and a field with "0" and a "Set Actual Torque(0.1%)" button.
- Command Control Mode:** Features radio buttons for "CSP Mode" and "CST Mode" (which is selected). Below it, "Mode Type" is set to "CST Mode" and a warning "Please Servo ON first!!" is displayed.
- Torque Stop Time (ms):** A field with "10" and a "Set Stop Time" button.
- Option Target Torque Time Pattern:** Includes radio buttons for "Slope" and "Reach Time (ms)" (which is selected). Below it, "Slope / Time" is set to "100".
- Torque Move Cmd(0.1%):** A field with "2" and a "Set Cmd(0.1%)" button.
- Stop Button:** Contains two buttons: "EMG STOP" (blue) and "STOP" (red).

### 3.21.1 CST Mode 頁面兩大區塊

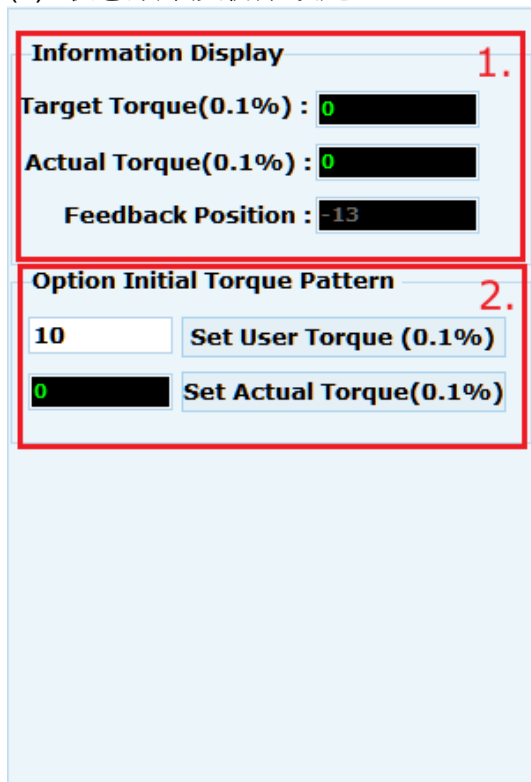


(1) CST Mode 參數設定及控制



1. 切換 CSP/CST 模式。
2. 設定轉矩停止(Stop)時間值以及選擇 Slop or reach Time 及目標轉矩方式。
3. 設定 Torque cmd(%) 及 Torque stop。

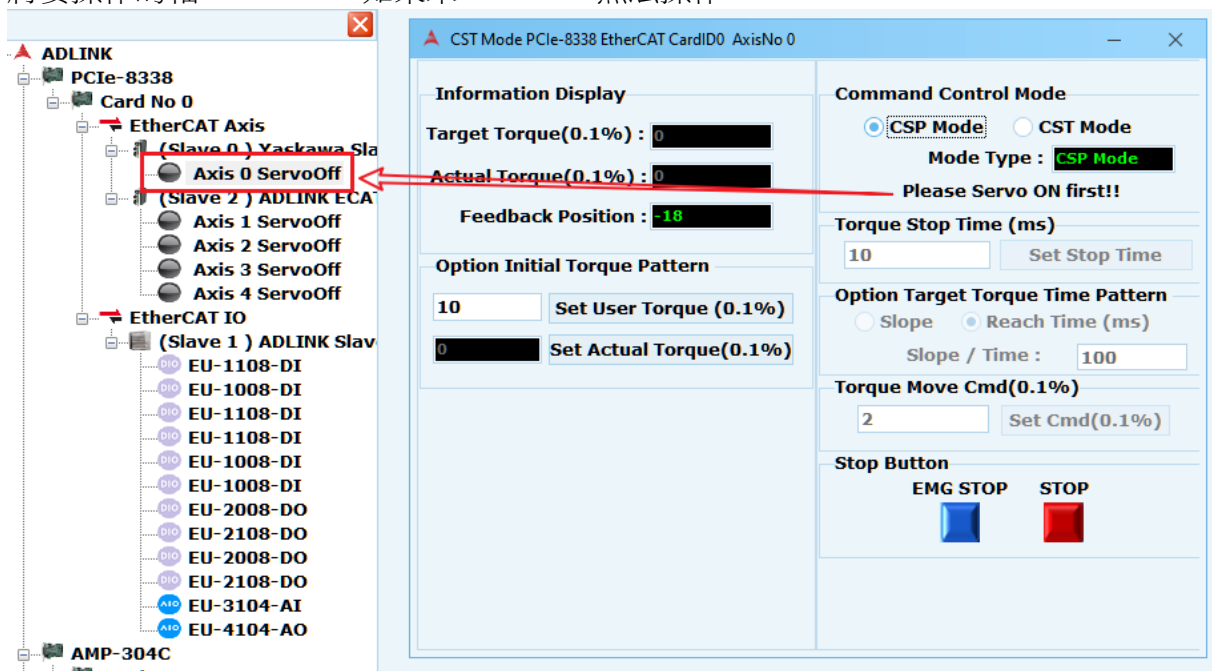
## (2) 狀態顯示及初始設定



1. 狀態顯示區：顯示目標扭矩值、實際扭矩值及回授位置。
2. 命令模式切換到 CST mode 時的初始扭矩值，可為自定義轉矩設定或當下實際轉矩值。

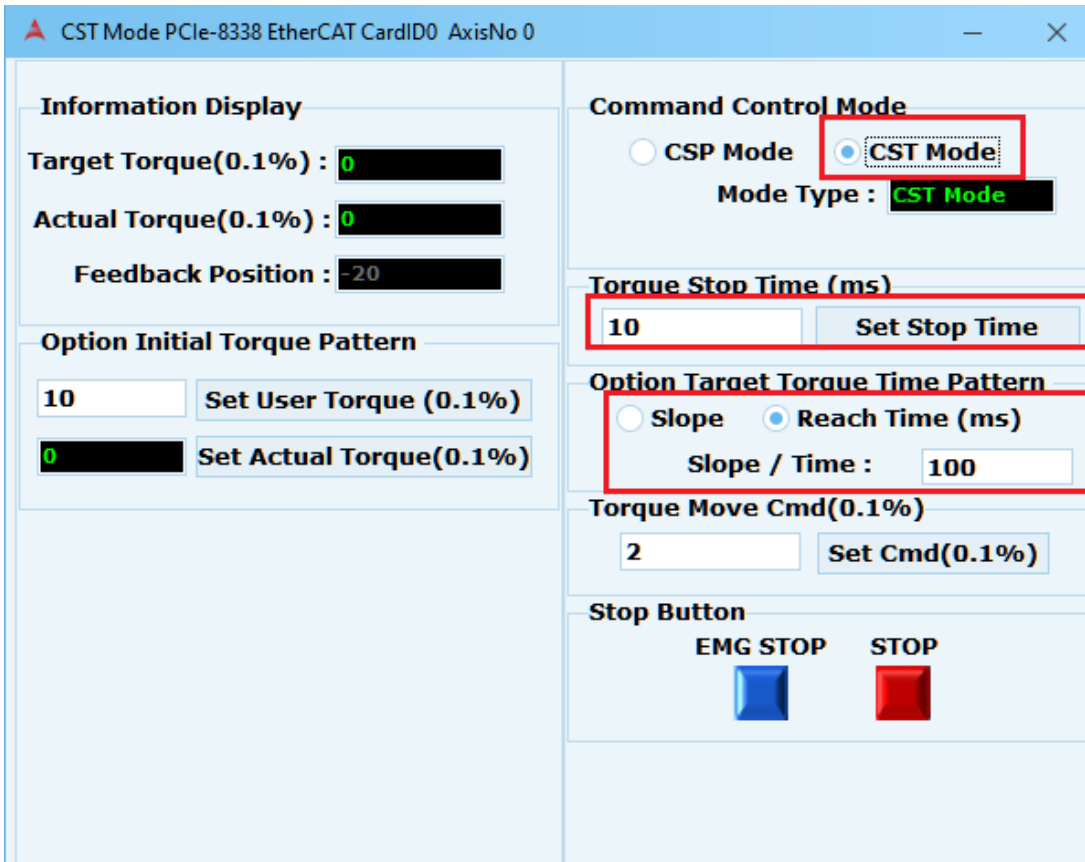
### 3.21.2 CST Mode 操作步驟

(1) 將要操作的軸 servo on，如果未 servo on 無法操作 CST mode

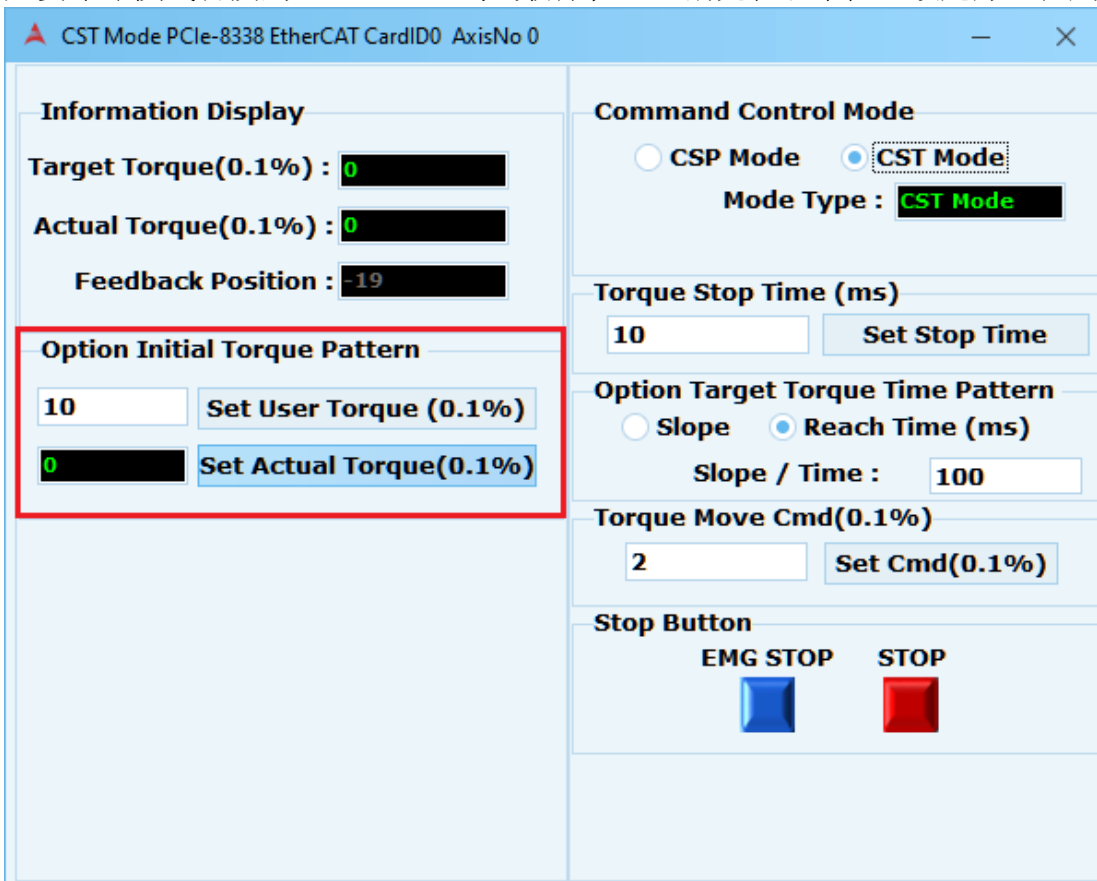




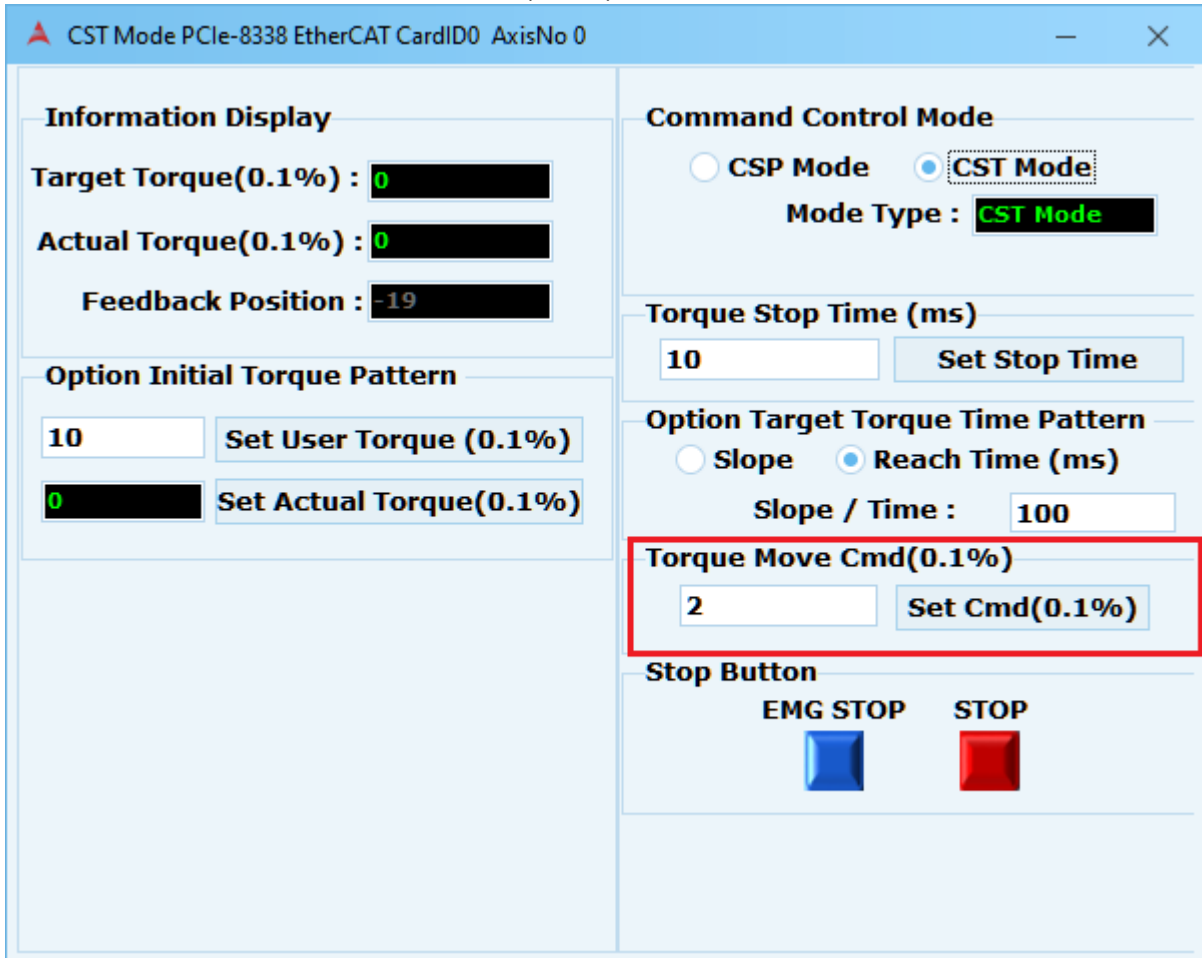
- (2) 切換為 CST mode，並設定轉矩停止(Stop)時間值及選擇 Slope or reach Time 及目標轉矩方式。



- (3) 如要命令模式切換到 CST mode 時的初始扭矩，請先在以下位置設定好，否則預設為 0



- (4) 設定要達到的轉矩值並按下 Set Cmd(0.1%)後開始動作。



The screenshot displays the 'CST Mode PCIe-8338 EtherCAT CardID0 AxisNo 0' control window. It is divided into several sections:

- Information Display:** Shows 'Target Torque(0.1%) : 0', 'Actual Torque(0.1%) : 0', and 'Feedback Position : -19'.
- Option Initial Torque Pattern:** Includes a field with '10' and a 'Set User Torque (0.1%)' button, and a field with '0' and a 'Set Actual Torque(0.1%)' button.
- Command Control Mode:** Features radio buttons for 'CSP Mode' and 'CST Mode' (which is selected), and a 'Mode Type : CST Mode' label.
- Torque Stop Time (ms):** A field with '10' and a 'Set Stop Time' button.
- Option Target Torque Time Pattern:** Includes radio buttons for 'Slope' and 'Reach Time (ms)' (which is selected), and a 'Slope / Time : 100' field.
- Torque Move Cmd(0.1%):** A field with '2' and a 'Set Cmd(0.1%)' button, which is highlighted with a red box.
- Stop Button:** Contains two buttons: 'EMG STOP' (blue) and 'STOP' (red).

## 3.22 Compensation

Compensation提供1D及2D運動的補償表設定及可匯出檔案。

打開 Compensation 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”Slave X”，再至快速功能按鈕點選 Compensation 功能按鈕。

The screenshot displays the Motion Creator Pro 2 interface. On the left, the device tree shows the following structure:

- ADLINK
  - PCIe-8158
    - Card No 0
      - Motion
        - Axis0 ServoOff
        - Axis1 ServoOff
        - Axis2 ServoOff
        - Axis3 ServoOff
        - Axis4 ServoOff
        - Axis5 ServoOff
        - Axis6 ServoOff
        - Axis7 ServoOff
    - PCI-8254
      - Card No 1
        - Motion
          - Axis8 Alarm
          - Axis9 ServoOff
          - Axis10 Alarm
          - Axis11 Alarm
      - PCIe-8338
        - Card No 2
          - EtherCAT Axis (Slave 0) ADLINK EC
            - Axis 12 ServoOff
            - Axis 13 ServoOff
            - Axis 14 ServoOff
            - Axis 15 ServoOff
          - (Slave 1) Yaskawa !
            - Axis 16 ServoOff
          - EtherCAT IO
            - (Slave 2) ADLINK SI
              - EU-1108-DI
              - EU-1008-DI
              - EU-1108-DI
              - EU-2008-DO
              - EU-2108-DO
              - EU-2008-DO
              - EU-2108-DO
              - EU-2008-DO
              - EU-2108-DO
              - EU-3104-AI
              - EU-3304-AI
              - EU-4104-AO
              - EU-4304-AO

The main window is titled "Compensation PCIe-8338 EtherCAT CardNo 2". It has tabs for "1D Compensation" and "2D Compensation". Under "Dimension X", the "Compensation Axis" is set to "Axis12" and the "Compensation Type" is "Linear". A table shows the following data:

Index	Position	Compensation
0	0	0

Additional settings include "Total Points: 1", "MinPosition: 0", and "Interval: 0". At the bottom, there are buttons for "Disable", "\*Set Table", "Data Export", and "Data Import".

### 3.22.1 1D Compensation

1D Compensation
2D Compensation

**Dimension X**

Compensation Axis Axis12 ▼

Compensation Type Linear ▼

Total Points 10

StartPosition 10

Interval 10

(1)

Index	Position	Compensation
0	10	0
1	20	0
2	30	0
3	40	0
4	50	0
5	60	0
6	70	0
7	80	0
8	90	0
9	100	0

(2)

(3)
Disable

\*Set Table

Data Export

Data Import

(1) 設定參數

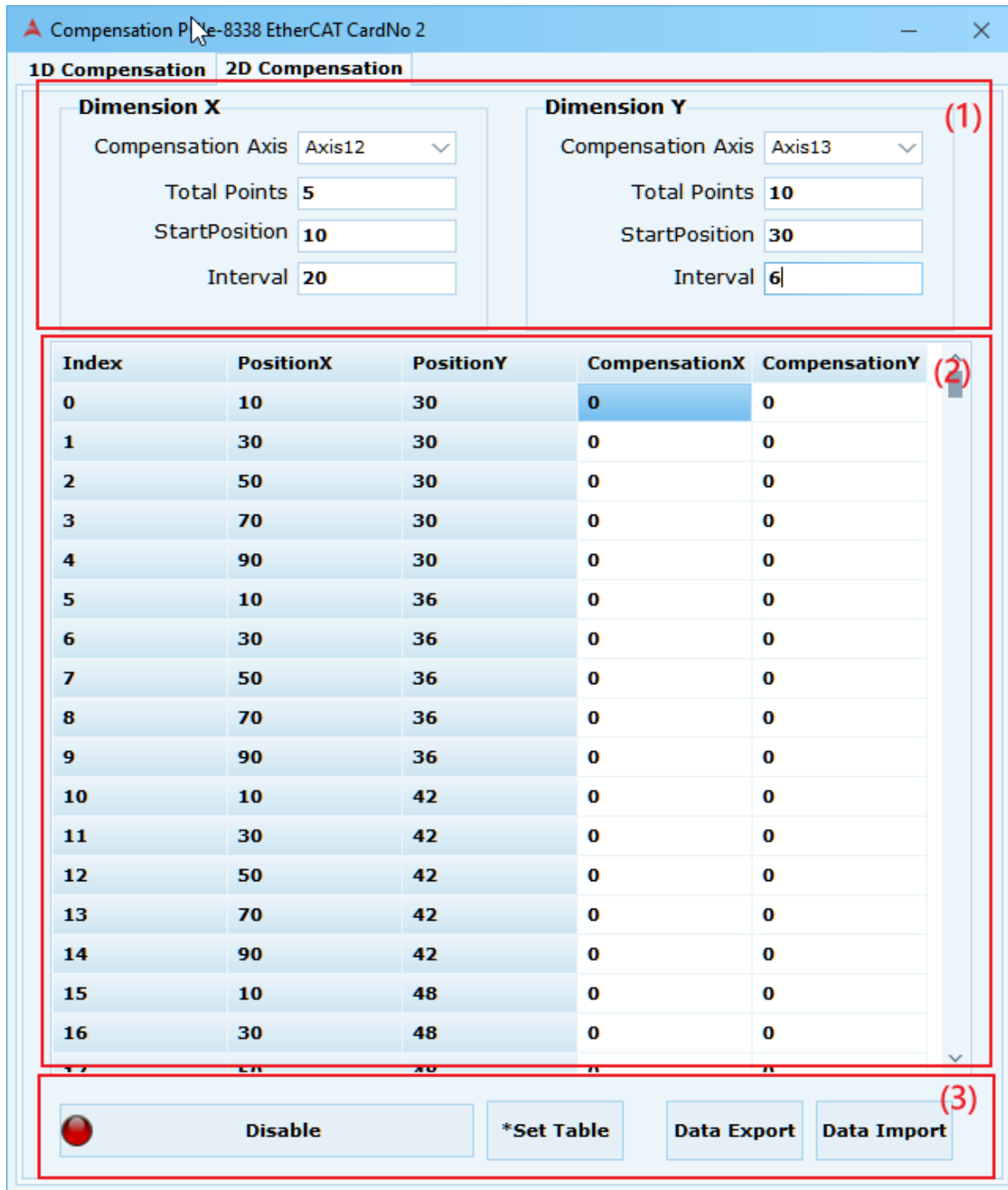
- Compensation Axis：設定補償的軸
- Compensation Type：補償型態(Linear 或 Constant)
- Total Points：補償多少點
- Start Position：補償起點
- Interval：補償點間距

(2) 輸入補償量

(3) 其他功能

- Set Table：設定補償量參數後，將參數寫入
- Disable/Enable：開啟補償
- Data Export：儲存補償數據(\*csv)
- Data Import：補償數據匯入(\*csv)

### 3.22.2 2D Compensation



Compensation Parameters - 8338 EtherCAT CardNo 2

**1D Compensation** | **2D Compensation**

**Dimension X** (1)

Compensation Axis: Axis12

Total Points: 5

StartPosition: 10

Interval: 20

**Dimension Y** (1)

Compensation Axis: Axis13

Total Points: 10

StartPosition: 30

Interval: 6

Index	PositionX	PositionY	CompensationX	CompensationY
0	10	30	0	0
1	30	30	0	0
2	50	30	0	0
3	70	30	0	0
4	90	30	0	0
5	10	36	0	0
6	30	36	0	0
7	50	36	0	0
8	70	36	0	0
9	90	36	0	0
10	10	42	0	0
11	30	42	0	0
12	50	42	0	0
13	70	42	0	0
14	90	42	0	0
15	10	48	0	0
16	30	48	0	0

(2)

(3)

Disable \*Set Table Data Export Data Import

(1) 設定參數

- Compensation Axis：設定 2 維補償的軸
- Total Points：2 維補償多少點
- Start Position：2 維補償起點
- Interval：補償點間距

(2) 輸入 2 維補償量

(3) 其他功能

- Set Table：設定 2 維補償量參數後，將參數寫入
- Disable/Enable：開啟補償
- Data Export：儲存 2 維補償數據(\*csv)
- Data Import：2 維補償數據匯入(\*csv)

## 3.23 Connect Quality

Connect Quality 頁面為監測連線品質使用，可確認Slave連線品質。

打開 Connect Quality 頁面步驟方式如下圖(1)~(2)步驟所示，首先在裝置樹列上點選”EtherCAT Axis”或”EtherCAT IO”，再至快速功能按鈕點選 Connect Quality 功能按鈕。

The screenshot displays the Motion Creator Pro 2 software interface. On the left, a device tree shows the hierarchy: ADLINK > PCIe-8158 > Card No 0 > Motion > Axis0-7 ServoOff. Below this, PCIe-8254 > Card No 1 > Motion > Axis8-11 Alarm. Further down, PCIe-8338 > Card No 2 is expanded to show EtherCAT Axis (Slave 0) ADLINK EC with Axis 12-15 Alarm, EtherCAT IO (Slave 1) Yaskawa with Axis 16 Alarm, and EtherCAT IO (Slave 2) ADLINK SI with various digital input/output modules (EU-1108-DI, EU-2008-DO, EU-2108-DO, EU-3104-AI, EU-3304-AI, EU-4104-AO, EU-4304-AO). A red arrow labeled "Click Here(1)" points to the "EtherCAT Axis" entry.

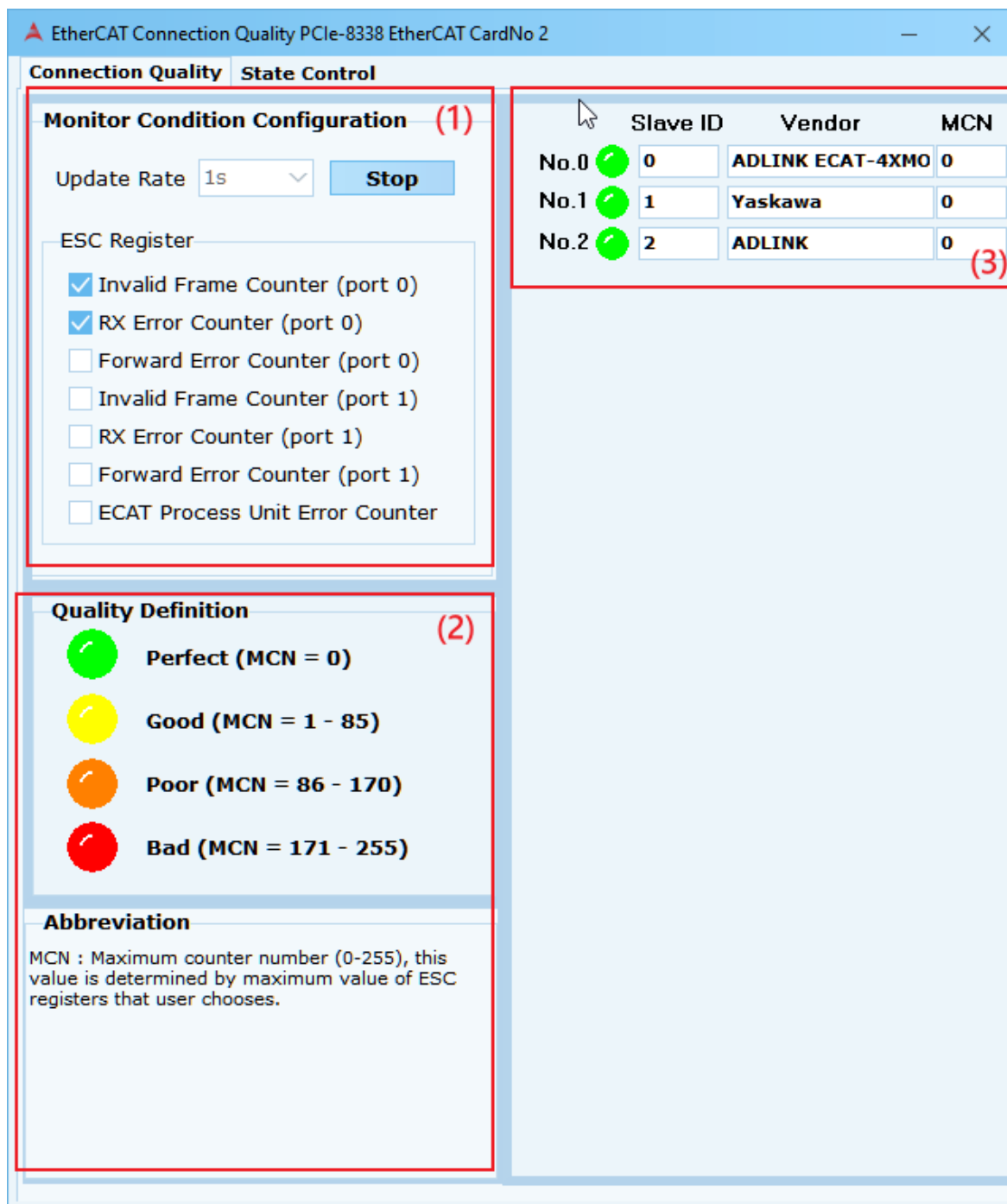
At the top of the software, a menu bar includes File, View, Initial Options, Function, and About. Below the menu, there are buttons for Field Disconnect, Process Data, and Connect Quality. A red arrow labeled "Click Here(2)" points to the "Connect Quality" button.

The "EtherCAT Connection Quality PCIe-8338 EtherCAT CardNo 2" window is open, showing the "Connection Quality" tab. It includes a "Monitor Condition Configuration" section with an "Update Rate" set to 1s and a "Monitor" button. Below this are checkboxes for various error counters (Invalid Frame Counter, RX Error Counter, Forward Error Counter, ECAT Process Unit Error Counter) for ports 0 and 1. A "Quality Definition" section shows four status levels: Perfect (MCN = 0, green), Good (MCN = 1 - 85, yellow), Poor (MCN = 86 - 170, orange), and Bad (MCN = 171 - 255, red). An "Abbreviation" section explains that MCN is the Maximum counter number (0-255).

Slave ID	Vendor	MCN
No.0	ADLINK ECAT-4XMO	N/A
No.1	Yaskawa	N/A
No.2	ADLINK	N/A

Connect Quality 有兩分頁

### 3.23.1 Connect Quality



	Slave ID	Vendor	MCN
No.0	0	ADLINK ECAT-4XMO	0
No.1	1	Yaskawa	0
No.2	2	ADLINK	0

(1) 品質監測參數勾選以及更新速率。

品質監測主要目的：當硬體信號到達相鄰的 **Slave** 時，接收到的信號卻與最初發送的不一致檢測。當發生這類情況，最有可能的原因是：1. 如果該錯誤計數零星增加，極可能是外部 **EMC** 干擾。2. 如果該錯誤計數快速且穩步增加，極可能是設備損壞。

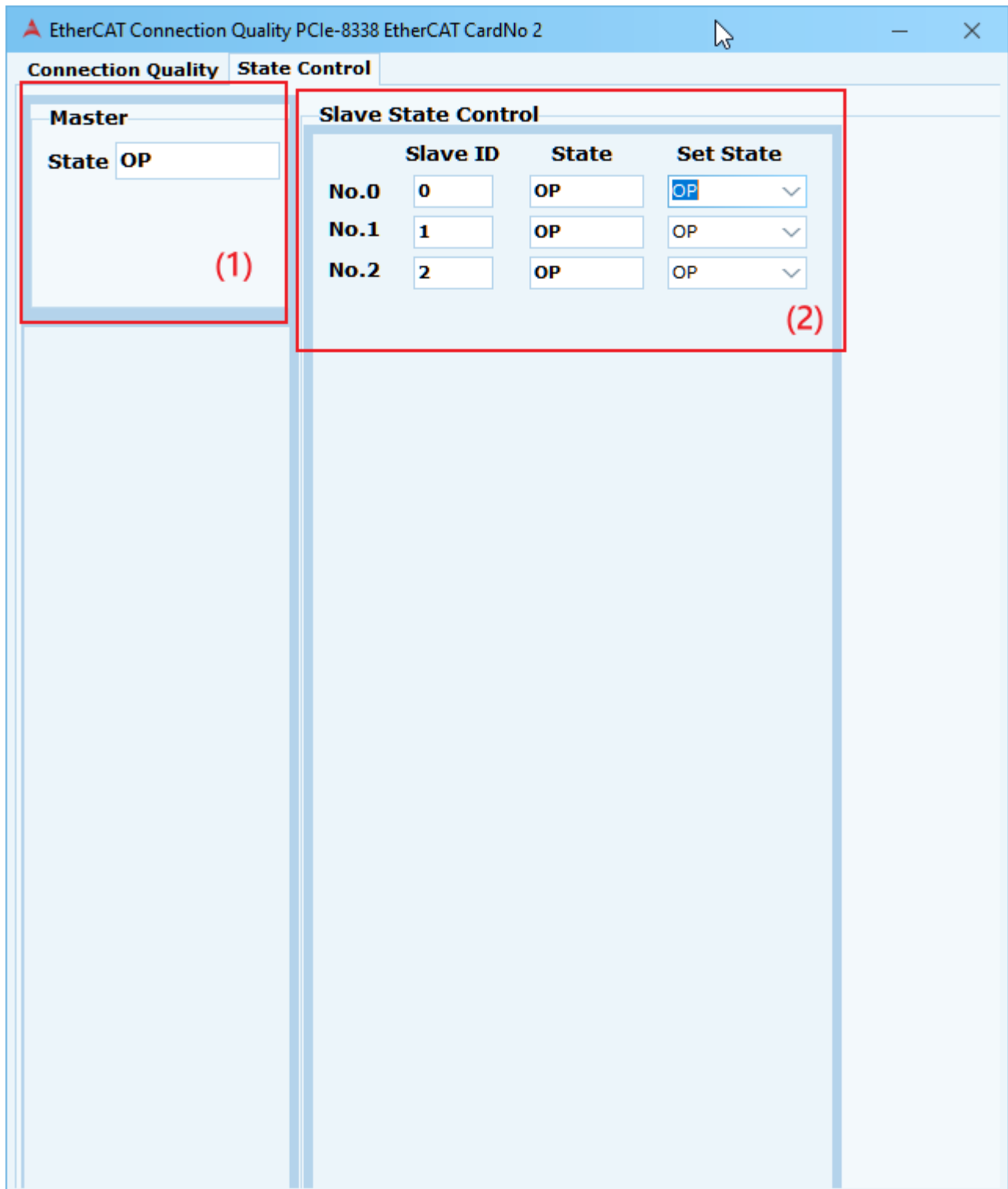
品質監測參數

- Invalid Frame Counter (port 0)  
檢測到無效的 frame(包括 RX 錯誤)
- RX Error Counter (port 0)  
檢測到物理層 RX 錯誤
- Forward Error Counter (port 0)

- 檢測到先前 ESC(EtherCAT Slave Controller) 無效的 frame。
  - Invalid Frame Counter (port 1)  
    檢測到無效的 frame(包括 RX 錯誤)
  - RX Error Counter (port 1)  
    檢測到物理層 RX 錯誤
  - Forward Error Counter (port 1)  
    檢測到先前 ESC(EtherCAT Slave Controller) 無效的 frame。
  - ECAT Process Unit Error Counter  
    檢測到 EtherCAT 流程的有無效的 frame。
- (2) 連線品質等級分類  
根據使用者選擇勾選的計數值，取最大計數值當成影響最深的因子進而使用相對應的燈號。
- (3) 品質狀態監控。



### 3.23.2 State Control



- (1) EtherCAT Master 目前狀態。
- (2) 多組針對 EtherCAT Slave 目前狀態及切換設定選項

# 4. Application

## 4.1