Motion Creator Pro 2

User's Manual

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Part No.: 50M-00100-1000

LEADING EDGE COMPUTING

Preface

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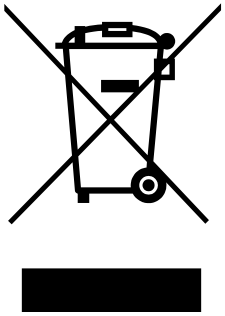

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Revision History

Revision	Release Date	Description of Change(s)
0.1	2022-12-30	Preliminary release

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1 Overview

Motion Creator Pro 2 (MCP2) software is a user interface specifically developed for ADLINK motion control products. In a standard Windows environment, MCP2 provides simple configuration, testing, and verification functions without end users' writing code, reducing testing time and accelerating device development.

MCP2 software supports all ADLINK motion control products, including pulse control cards and EtherCAT control card, and provides basic motion control functions such as single-axis motion, tween motion, and homing. Functions such as axis status and IO status on the user interface can also be monitored in real time.

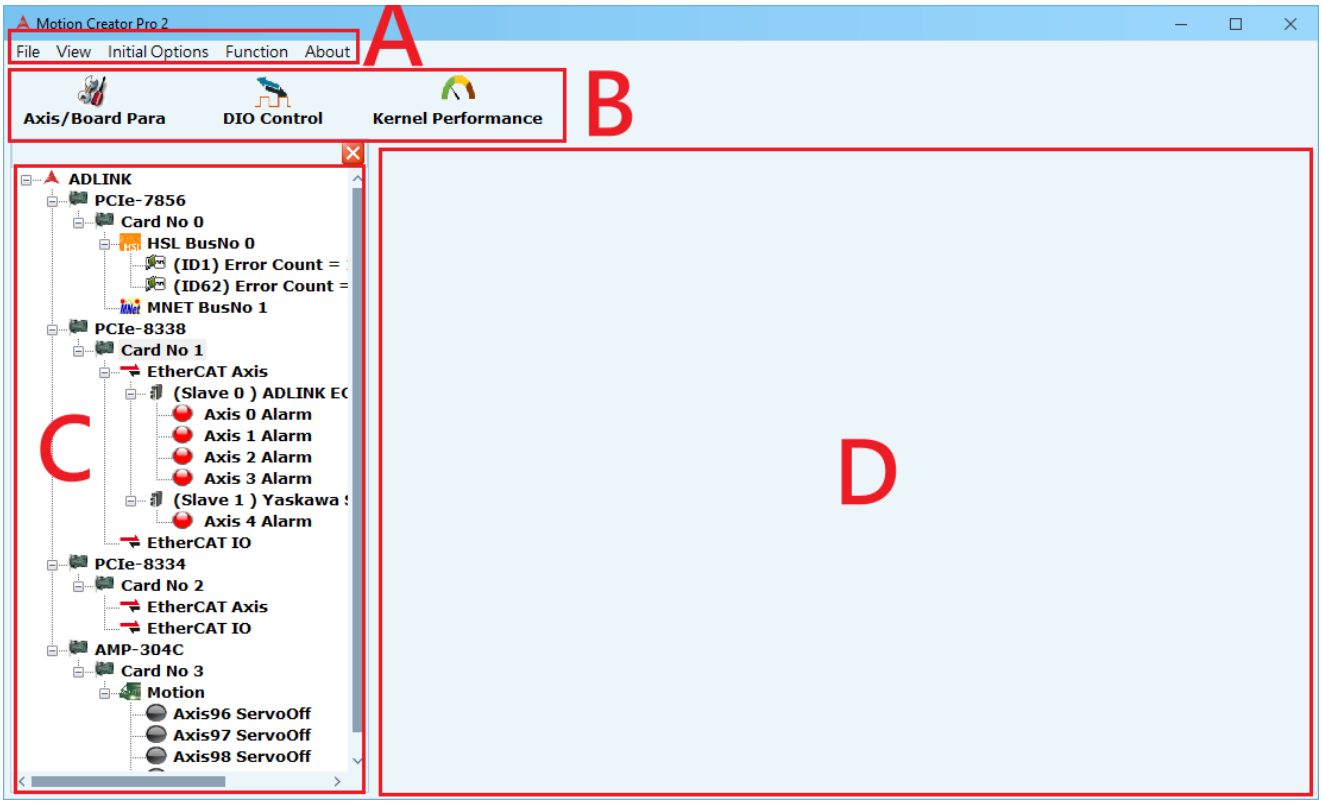
Notes:

- The MCP2 software execution path is: **Start>Assembly>ADLINK>PCIe-8338>Motion Creator Pro 2**.
- MCP2 software is best viewed with a minimum screen resolution of 1920X1080.

1.1 User Interface

This section describes the elements of the MCP2 user interface. There are four main elements to the MCP2 user interface.

- A: Menus
- B: icon bar
- C: Device tree
- D: Function pages



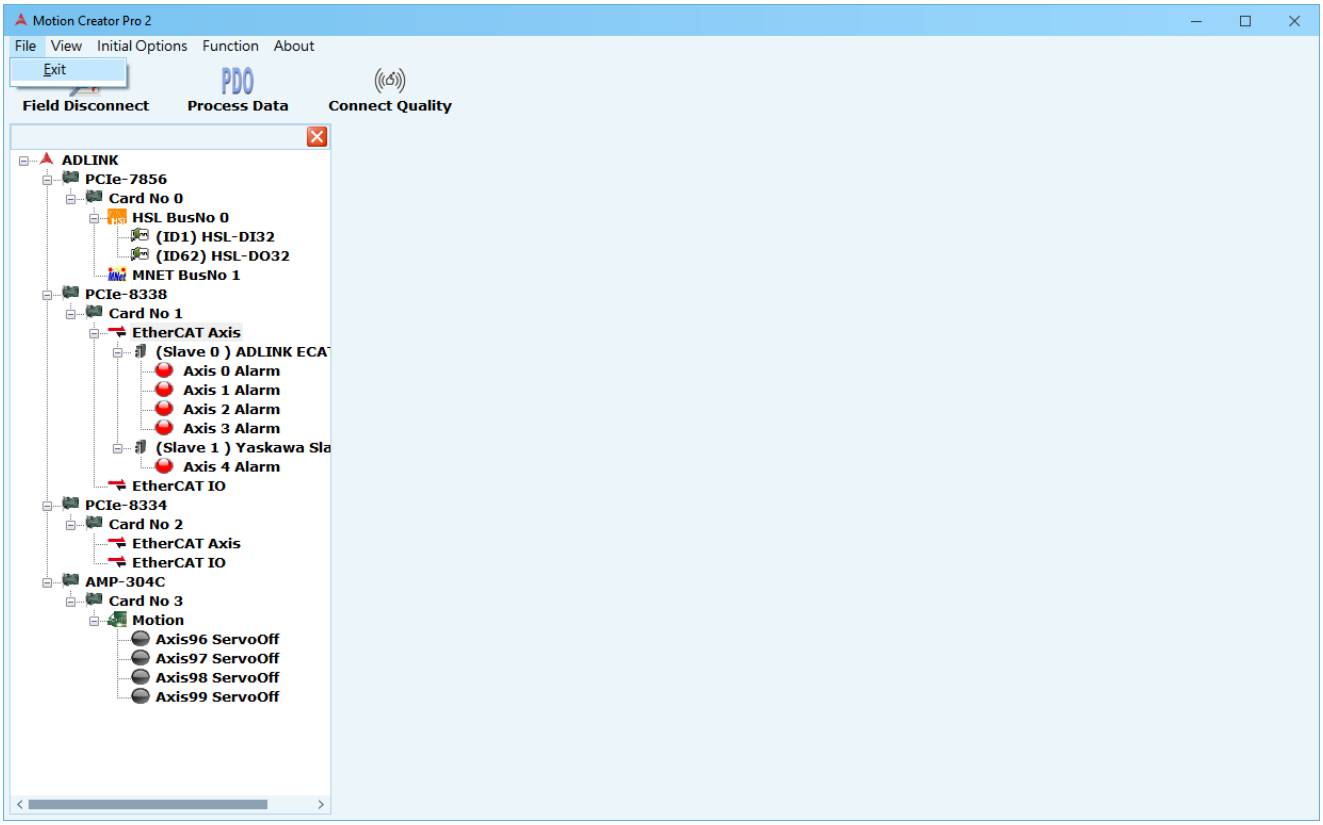
1.2 Menus

This area includes the following menus: **File**, **View**, **Initial Options**, **Function**, and **About**.

Note: The **Function** menu can is displayed only after clicking a Card No. on the device tree view.

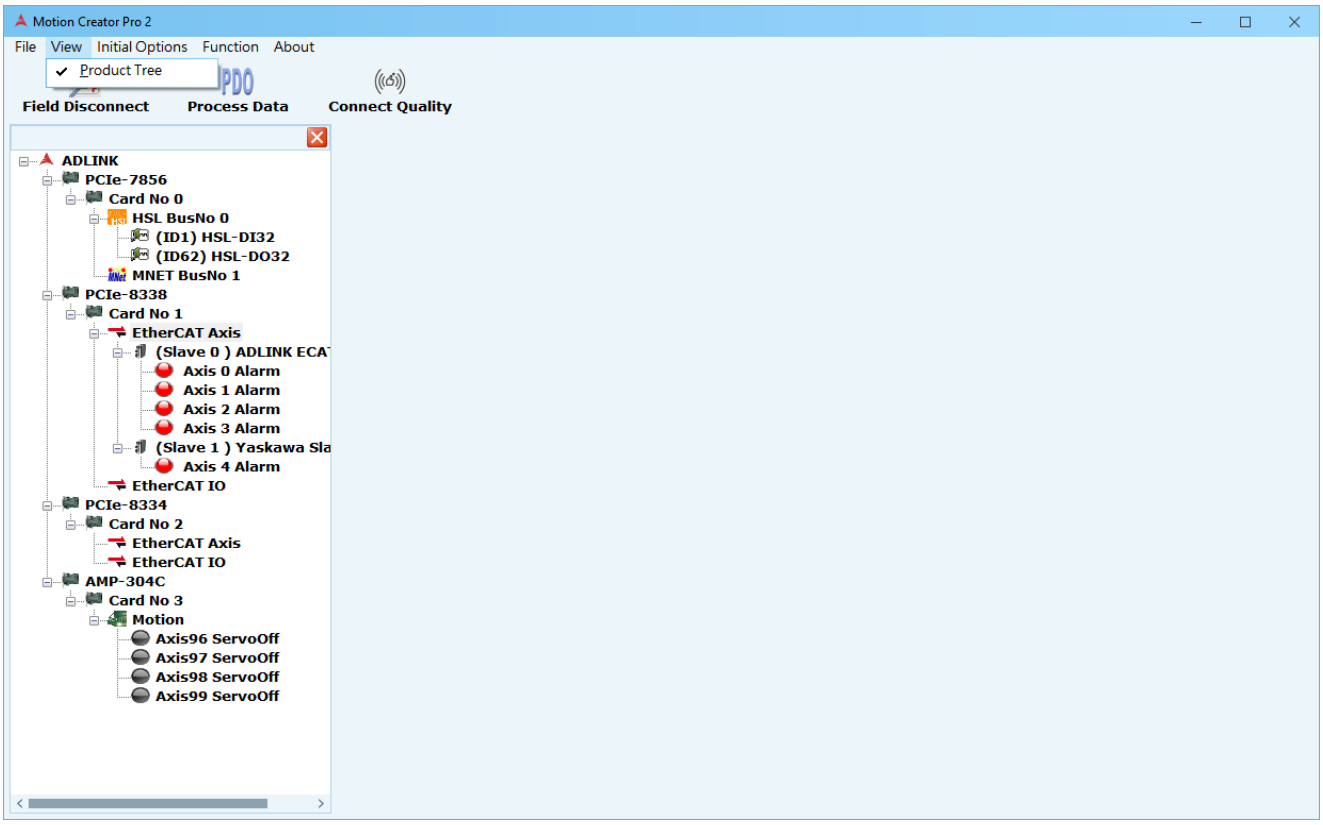
1.2.1 File->Exit

Click to exit MCP2.



1.2.2 View->Project Tree

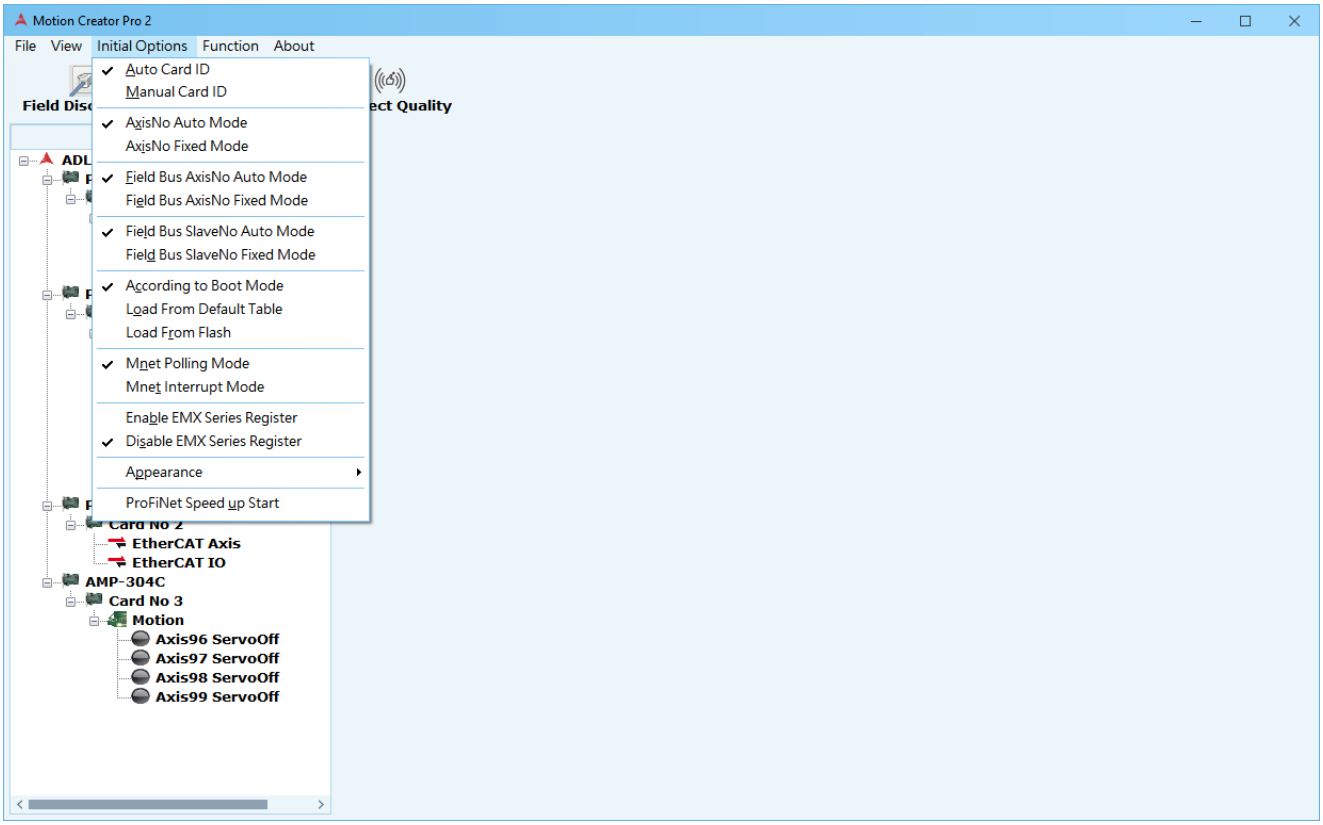
Used to open/close the device tree panel.



1.2.3 Initial Options->xxx Mode

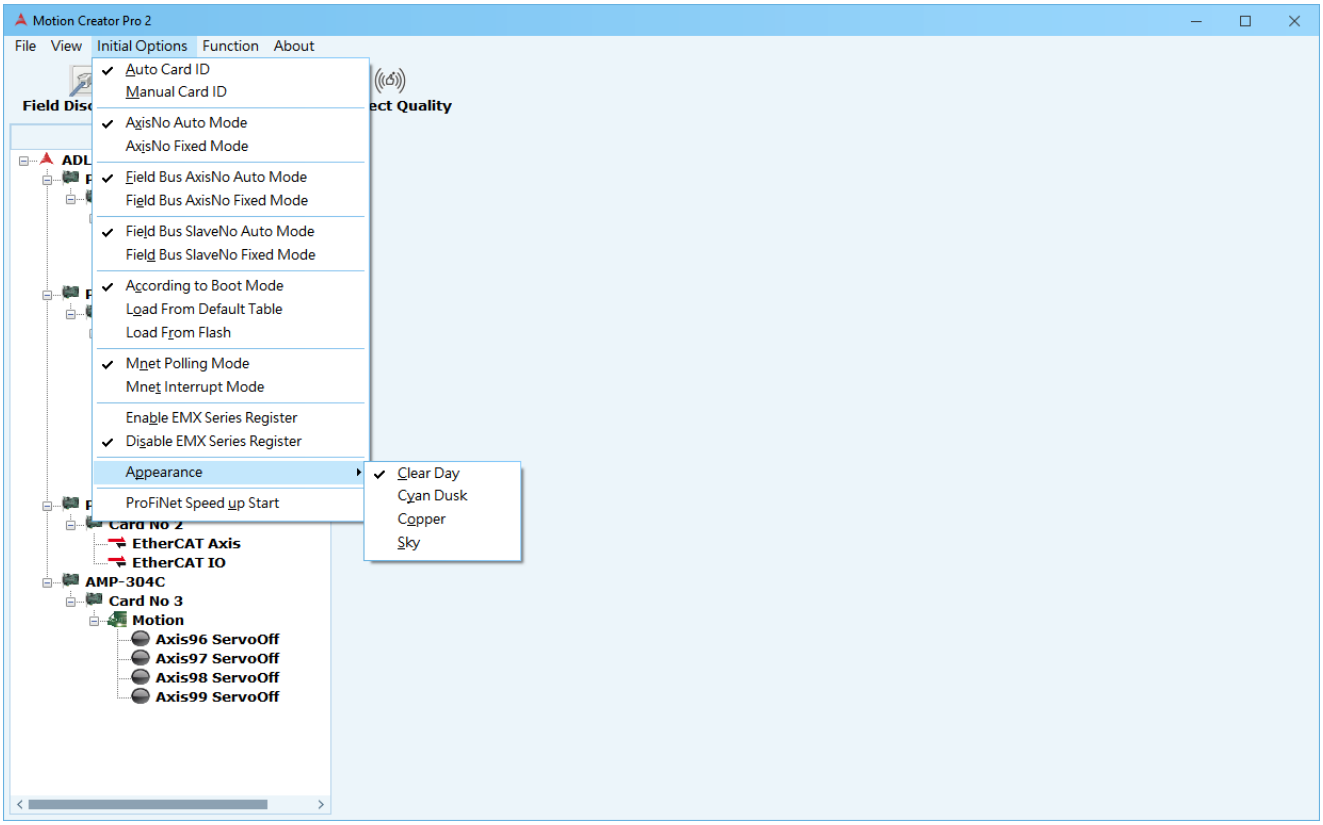
This menu lists the control card initialization options. Once the settings in this menu are changed, restart MCP2 to complete the changes.

Some parameters correspond to APS_initial(I32 *BoardID_InBits, I32 Mode). For details, see the APS function library.



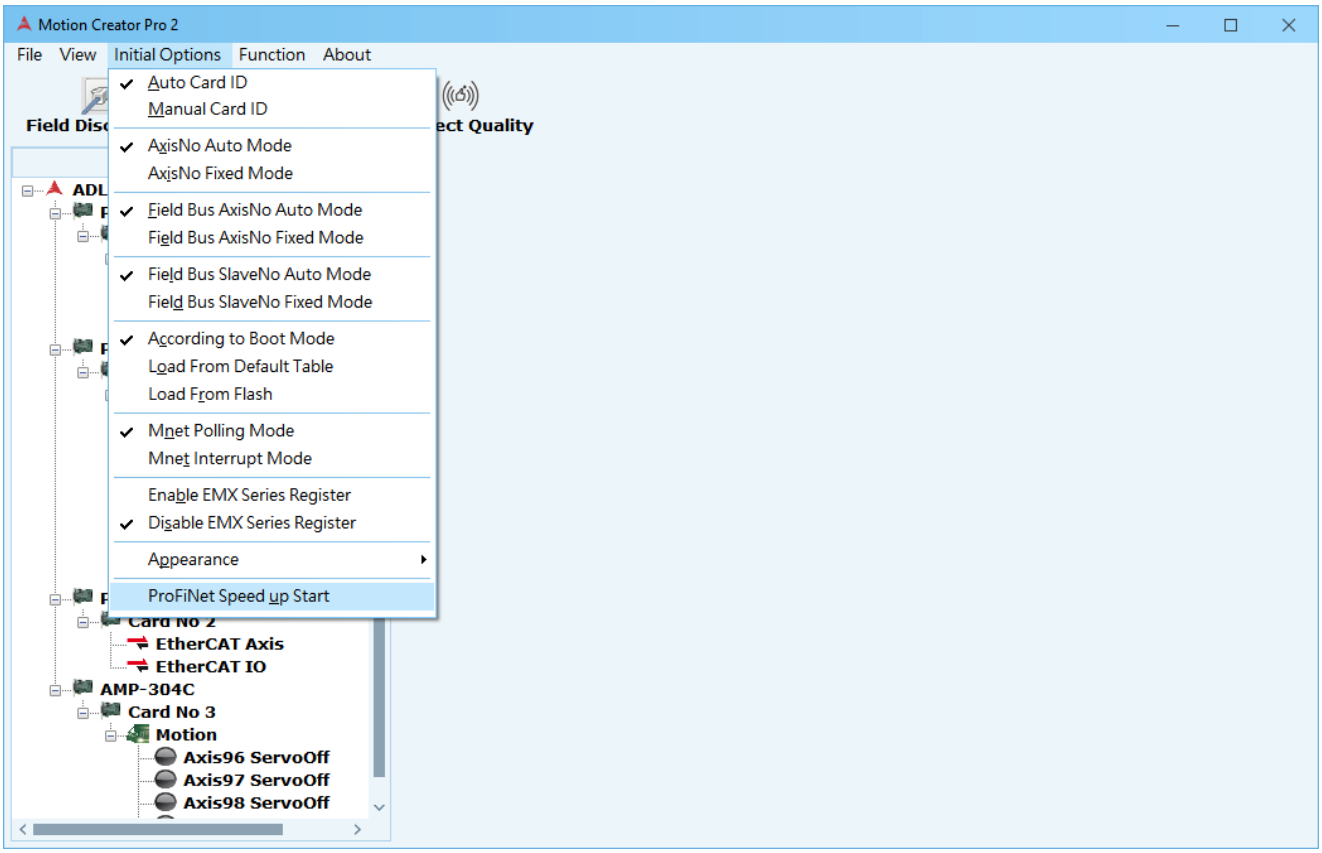
1.2.4 Initial Options->Appearance

Use these options to change the appearance of MCP2. Once the settings in this menu are changed, restart MCP2 to complete the changes.



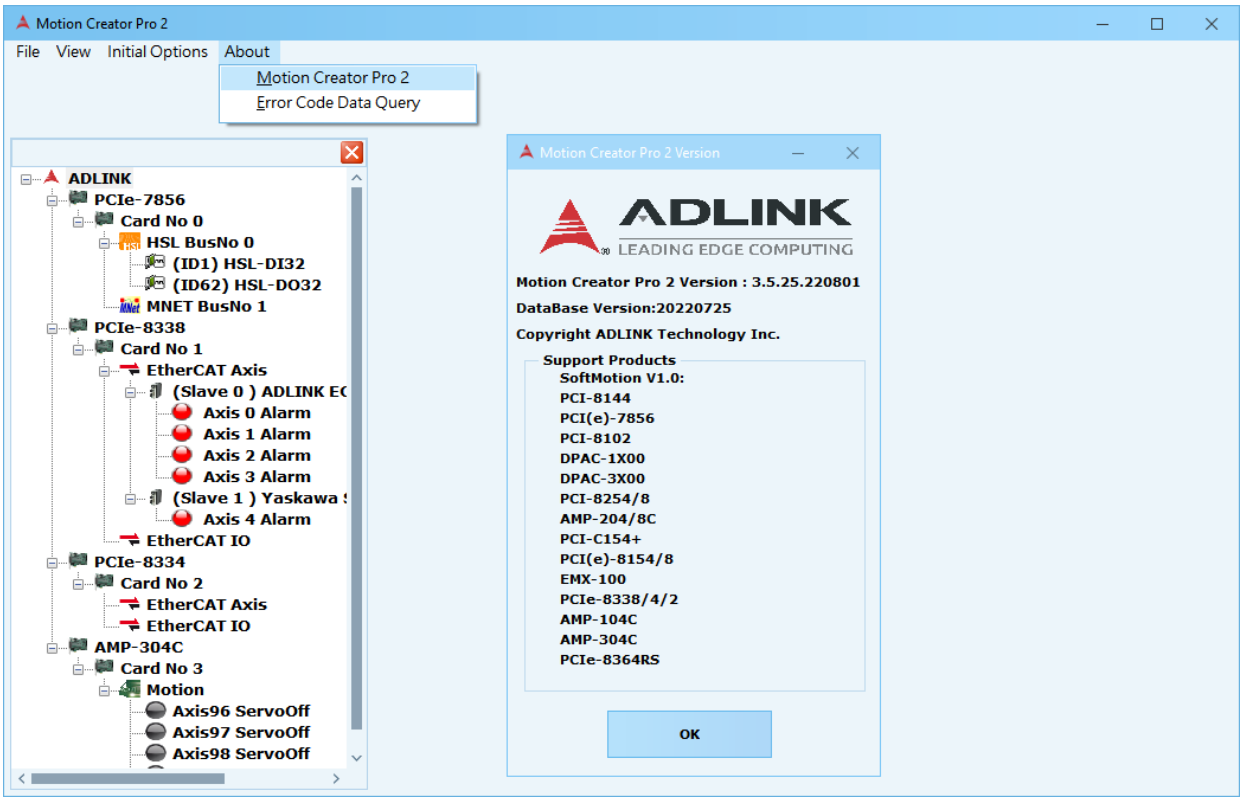
1.2.5 Initial Options->ProFiNetSpeed up Start

Slave connection for fast startup of card after initial connection.



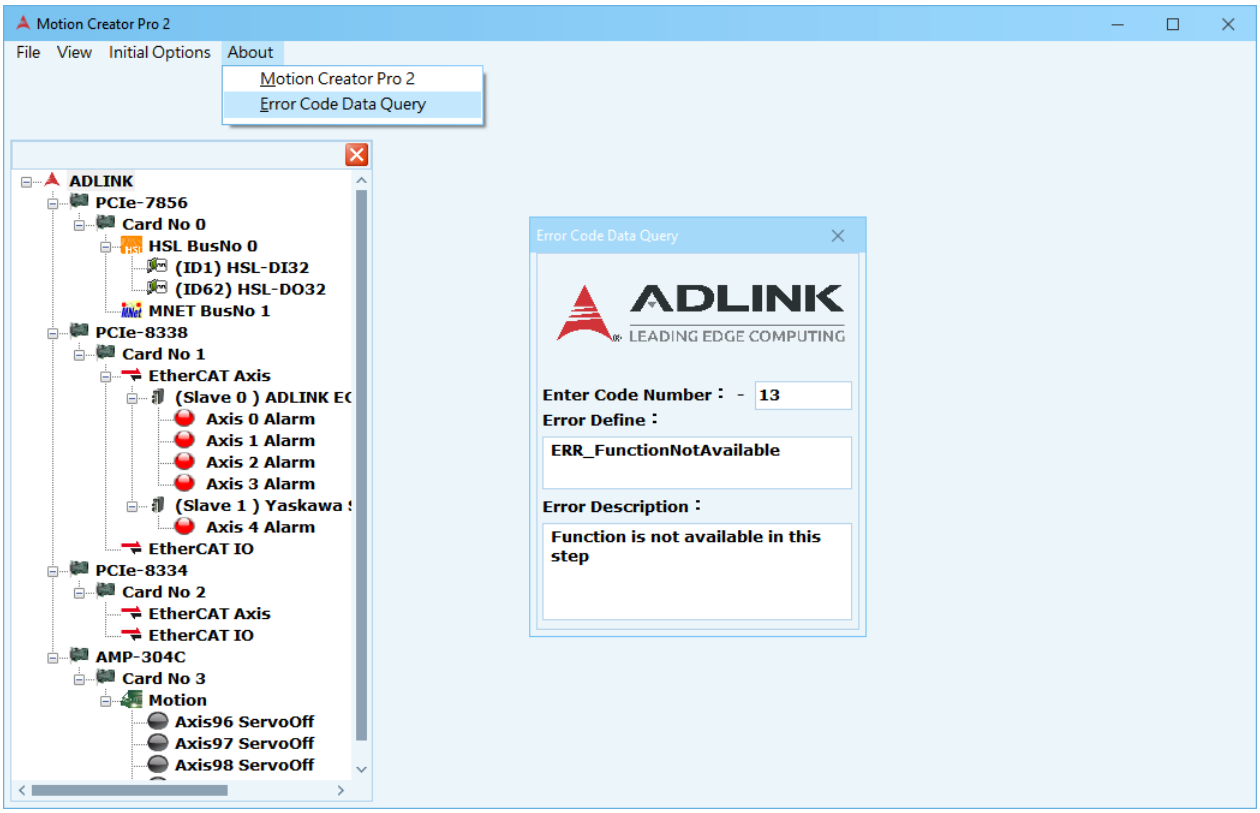
1.2.6 About->Motion Creator Pro 2

This menu item lists the MCP2 version information and supported hardware.



1.2.7 About->Error Code Data Query

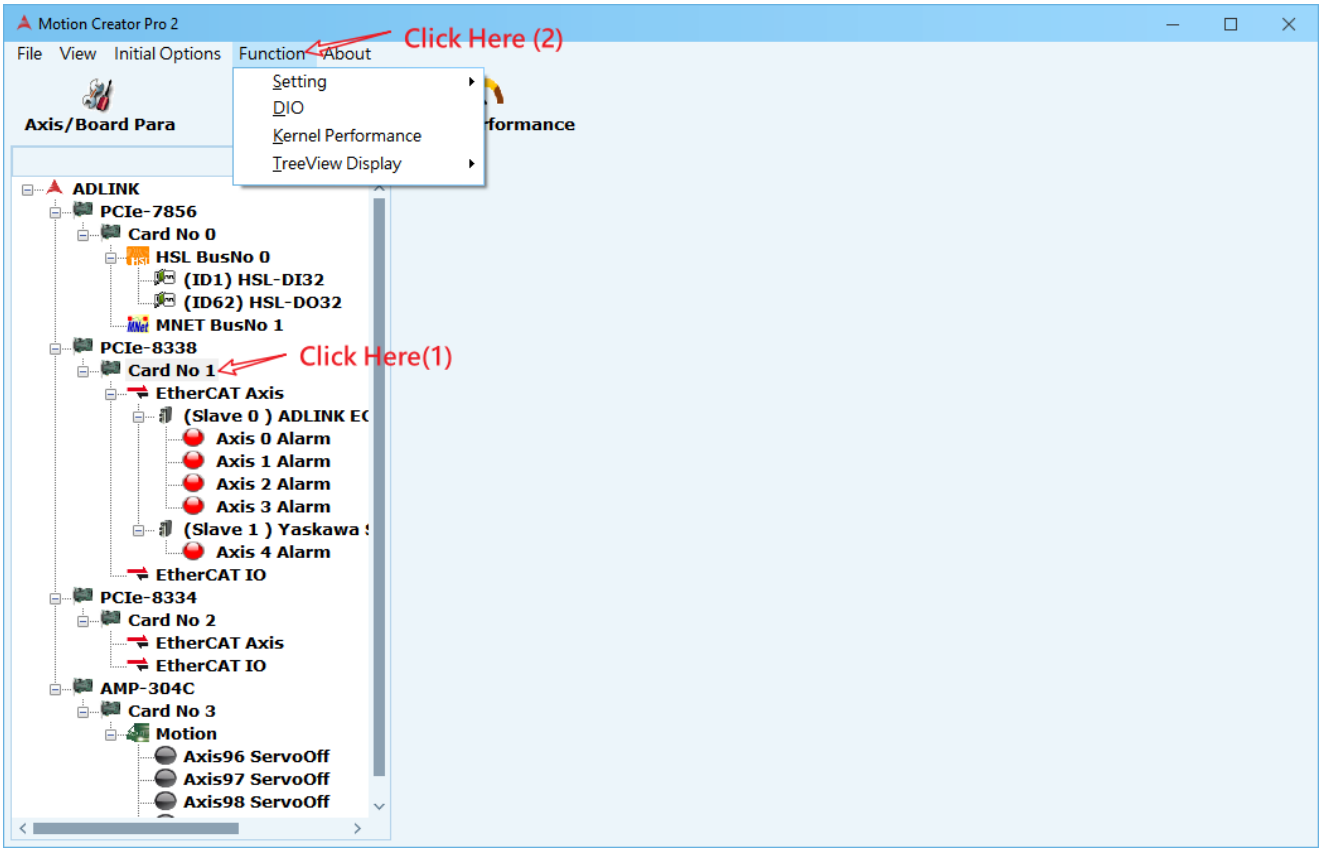
Enter an error code to show its definition and description.



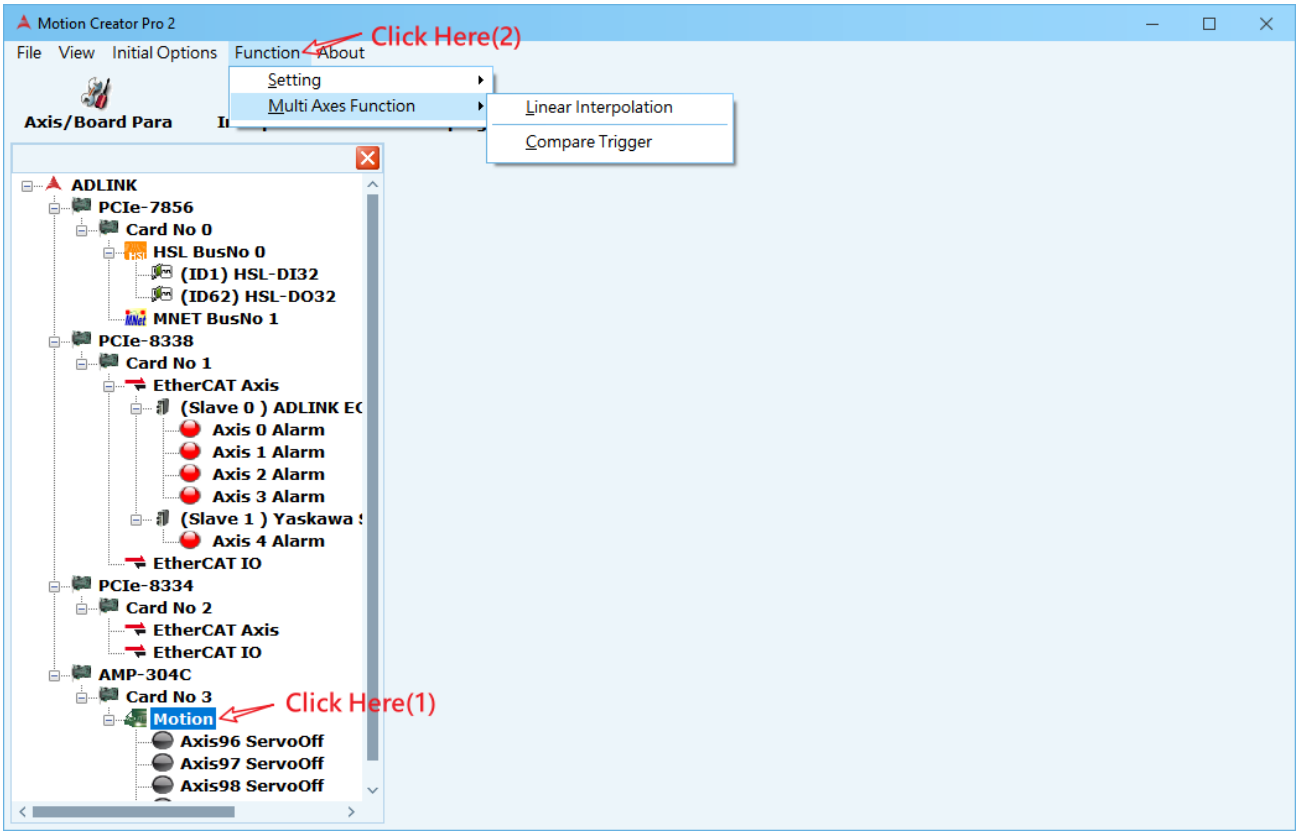
1.3 Function

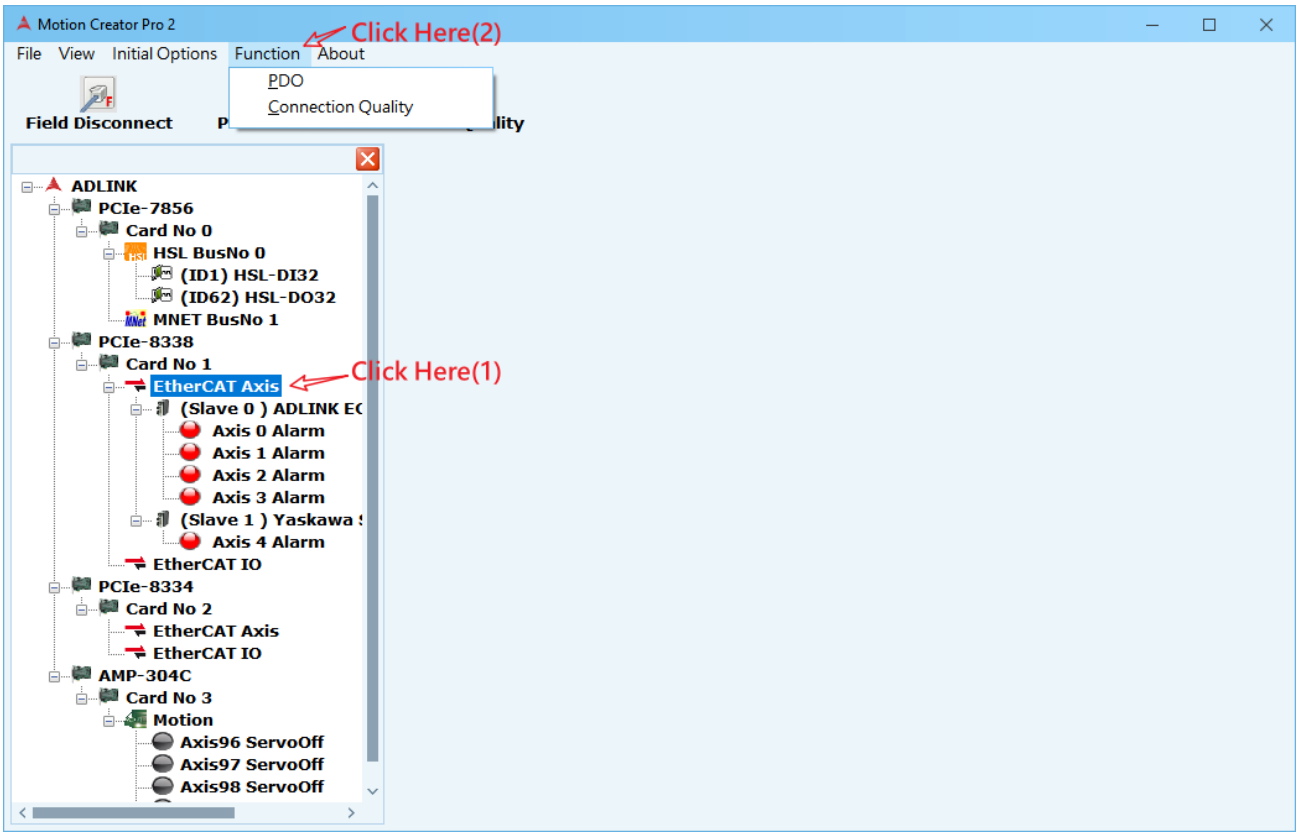
This menu corresponds to the feature category selected in the device tree view. The relevant features are listed below. The following figures illustrate the respective available options in the Function menu when Card_No, Slave, and Axis are selected in the device tree.

1. Click **Card No->Function**
2. The following figure shows the various hardware or system related functions.

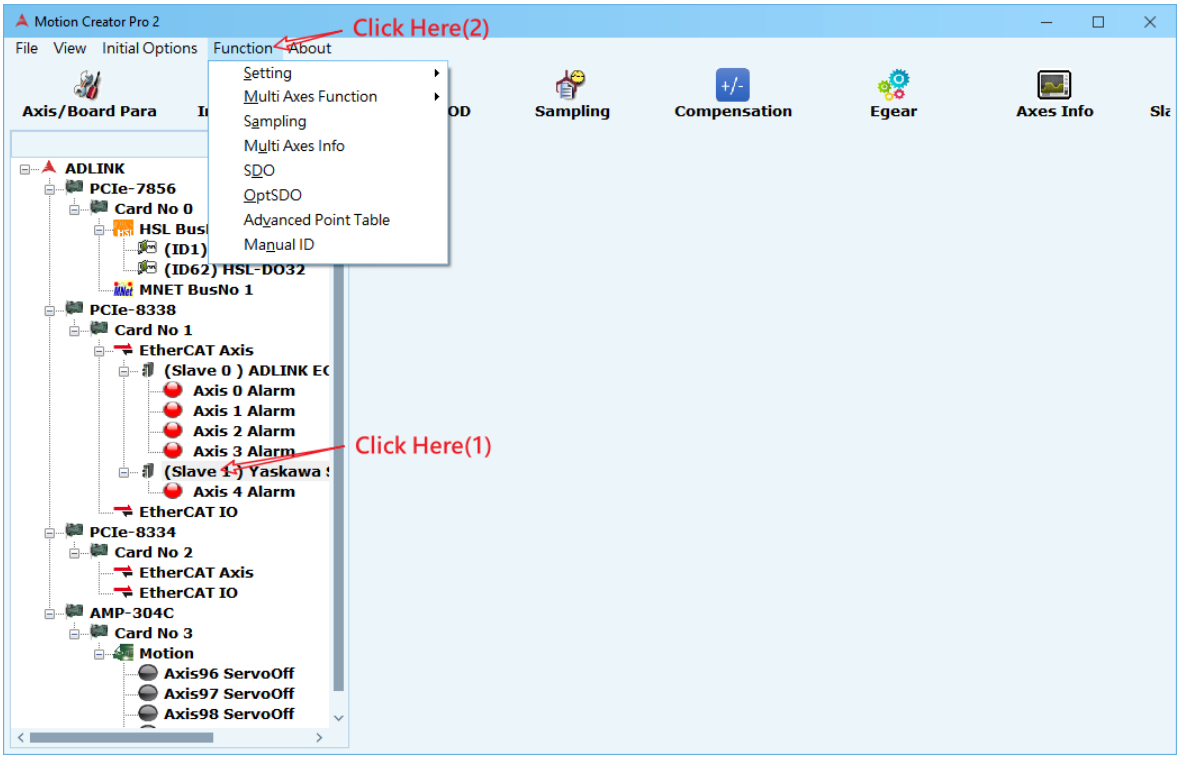


1. Click **Motion\EtherCAT\ProfiNet\HSL\MNET->Function**
2. The menu displays as shown below, including functions such as multi-axis motion control, sampling and parameter setting.





1. Click **Slave No. ->Function**
2. The menu displays as shown below, including functions for single-axis motion control, point-to-point movement and return to origin.



1.4 Icon Bar

The icon bar is where frequently used functions can be put for quick selection. For example, the Function Menu will display different function icons according to whether the user selects Card No, Motion, Axis and Slave in the device tree view.

The following three diagrams illustrate the diagrams that appear when different items are clicked. Click Card No 0 in the following device tree view to display DIO, DSP Performance and other icons.

STEIN - ADD MISSING PICTURES

2 Installation

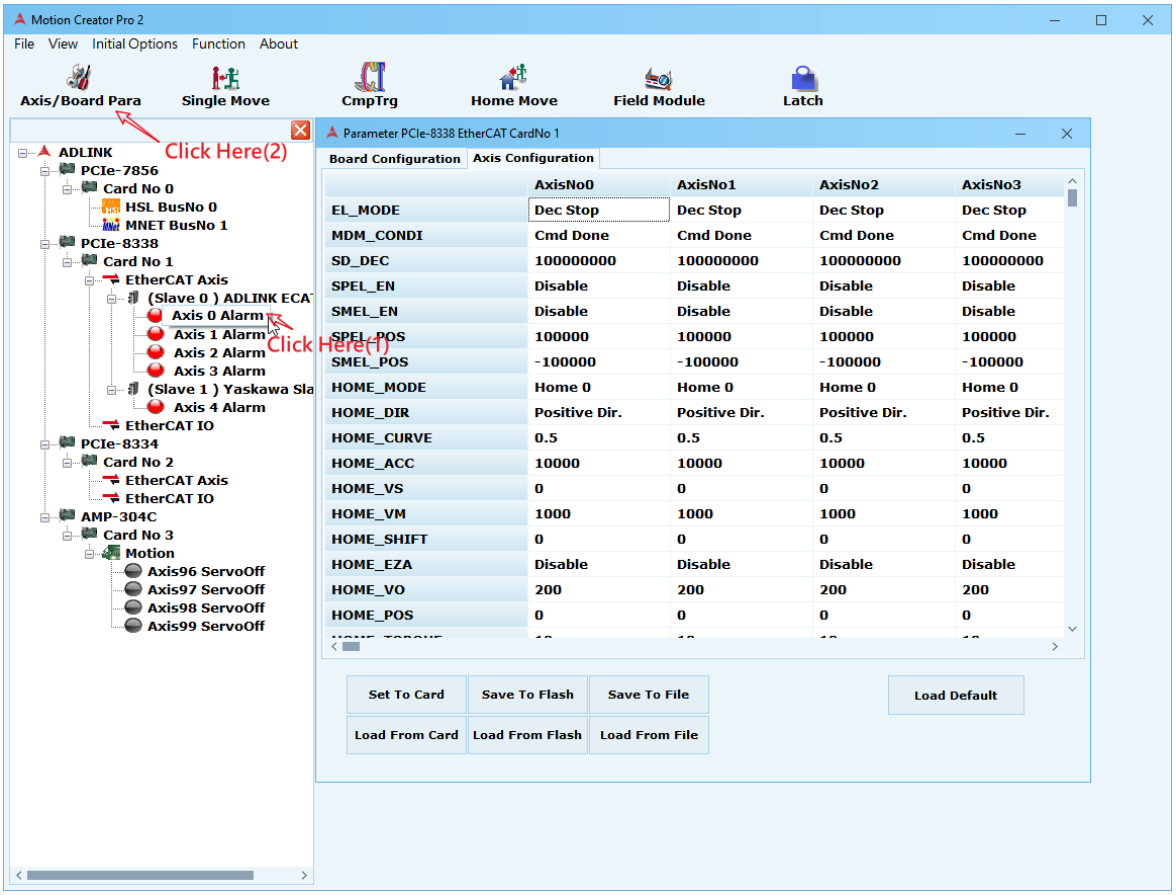
STEIN - ADD MISSING INFORMATION

3 MCP2 Function list

3.1 Parameter Manager

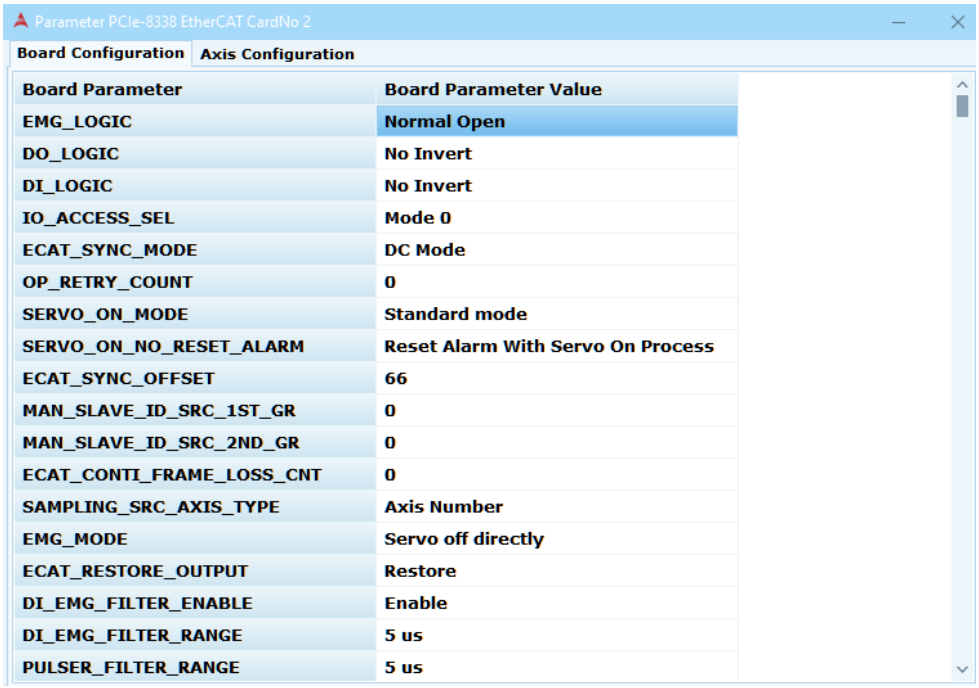
The control card axis parameters and system parameters can be unified by the parameter management, including operation mode, acceleration rate, deceleration rate, acceleration, motion I/O logic, etc. See the APS Function Library parameter table for definitions and detailed descriptions.

To open the parameter manager page, follow these steps:
Step 1. Click “Card” or “Slave” or “Axis” in the device tree.
Step 2. Click **Axis/Board Para** on the icon bar.



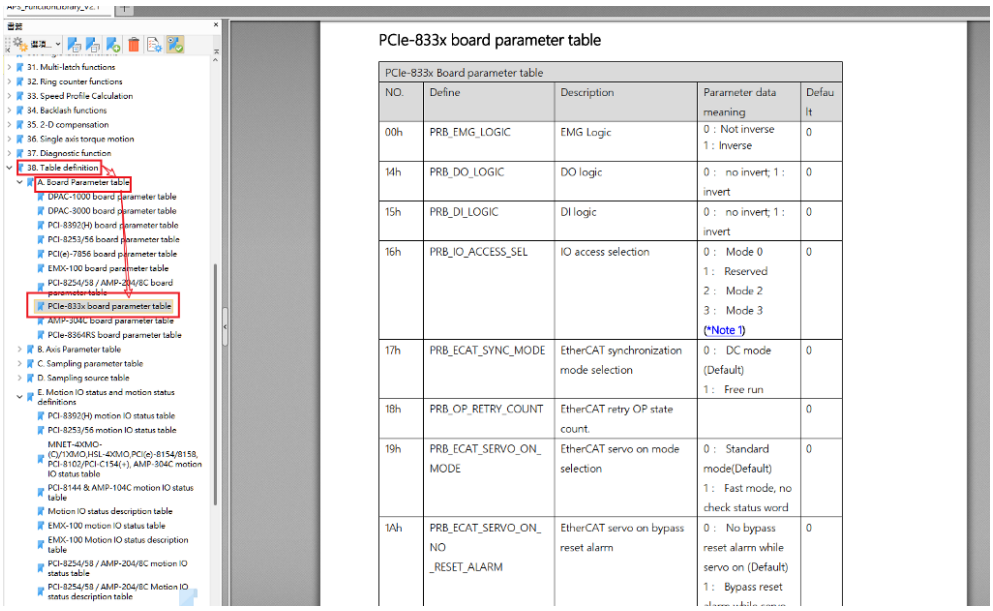
3.1.1 Parameter Configuration

For board configuration, refer to the APS Function Library manual **Table definition-> Board Parameter table**. The following example shows a PCI-8338 board.



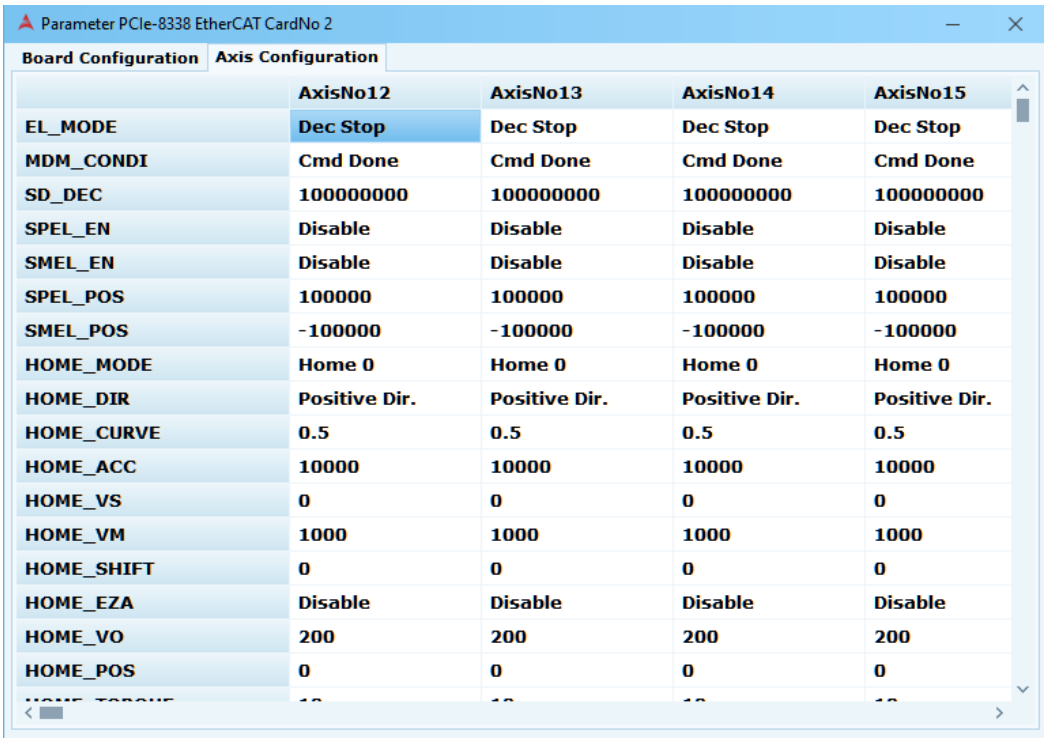
Board Parameter	Board Parameter Value
EMG_LOGIC	Normal Open
DO_LOGIC	No Invert
DI_LOGIC	No Invert
IO_ACCESS_SEL	Mode 0
ECAT_SYNC_MODE	DC Mode
OP_RETRY_COUNT	0
SERVO_ON_MODE	Standard mode
SERVO_ON_NO_RESET_ALARM	Reset Alarm With Servo On Process
ECAT_SYNC_OFFSET	66
MAN_SLAVE_ID_SRC_1ST_GR	0
MAN_SLAVE_ID_SRC_2ND_GR	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

The board configuration page is available under **Table definition->A. Board Parameter table->PCIe-833x board parameter table** as shown below.



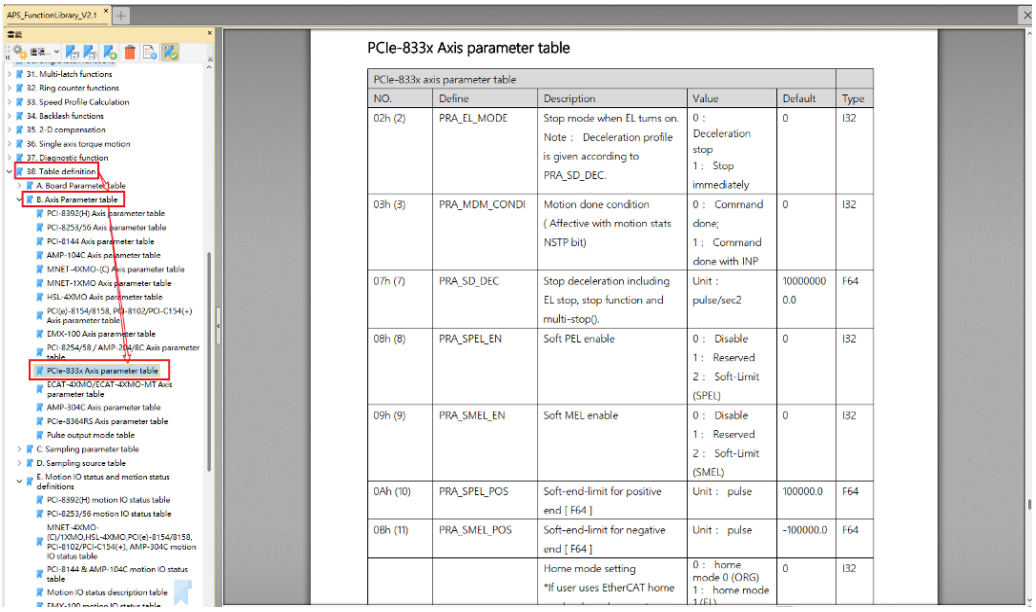
PCIe-833x Board parameter table				
NO.	Define	Description	Parameter data meaning	Default
00h	PRB_EMG_LOGIC	EMG Logic	0 : Not inverse 1 : Inverse	0
14h	PRB_DO_LOGIC	DO logic	0 : no invert; 1 : invert	0
15h	PRB_DI_LOGIC	DI logic	0 : no invert; 1 : invert	0
16h	PRB_IO_ACCESS_SEL	IO access selection	0 : 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 is described in the APS Function Library manual under **Table definition-> Axis Parameter table**. The following figure shows the PCI-8338 board information.



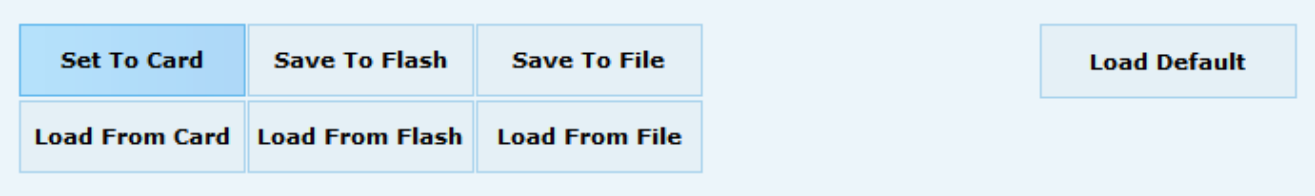
	AxisNo12	AxisNo13	AxisNo14	AxisNo15
EL_MODE	Dec Stop	Dec Stop	Dec Stop	Dec Stop
MDM_CONDI	Cmd Done	Cmd Done	Cmd Done	Cmd Done
SD_DEC	100000000	100000000	100000000	100000000
SPEL_EN	Disable	Disable	Disable	Disable
SMEL_EN	Disable	Disable	Disable	Disable
SPEL_POS	100000	100000	100000	100000
SMEL_POS	-100000	-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 is available under **Table definition->A. Board Parameter table->PCIe-833x Axis parameter table**, as shown below.



3.1.2 Save Axis Parameter

There are several buttons for parameter operations at the bottom of the page. After setting parameters according to system settings, you can select the following storage/loading methods:



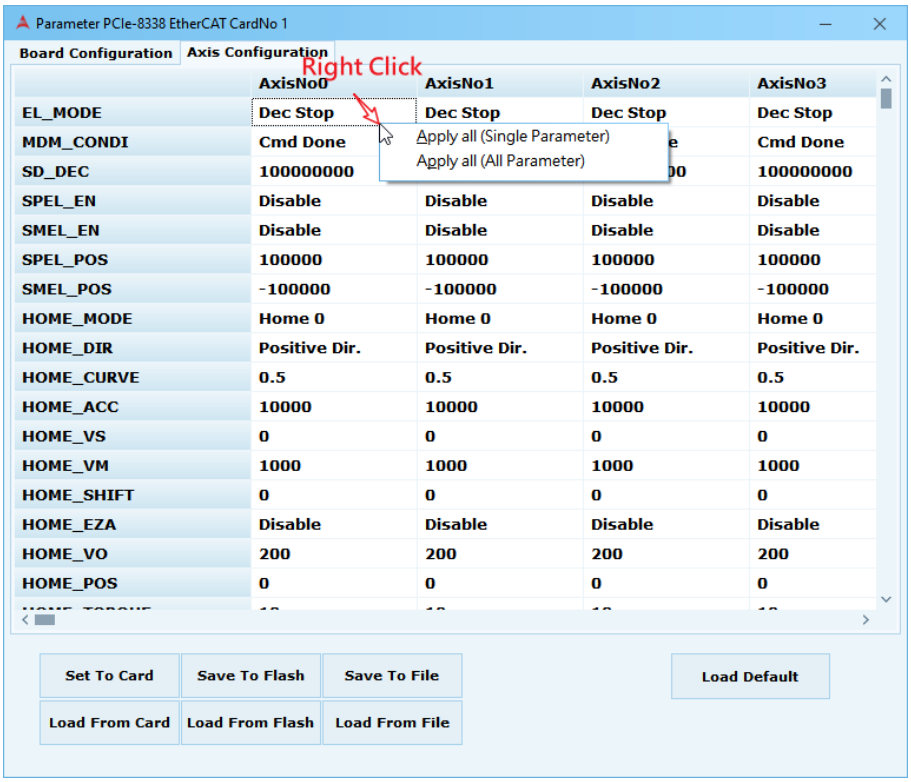
- **Set To Card**: The parameter set value is directly written to the control card for use.
- **Load From Card**: Read parameters from the control card to the page display.
- **Save To Flash**: Writes parameters to non-volatile memory in the control card.
- **Load From Flash**: Read parameters from non-volatile memory of control card to page display.
- **Save To File**: Writes the parameter to the specified file (xml).
- **Load From File**: Read parameters from the specified file to the page display (xml).
- **Load Default**: Load the factory default value to the page display.

3.1.3 Apply All

In a motion control system, there may be multiple axis parameters that are similar or exactly the same. MCP2 provides a copy of the parameter set value to the multi-axis function, saving the need to enter each axis parameter setting each time.

Click the right mouse button on the setting axis parameter setting page to select one of the following options:

- **Apply all (Single Parameter)**: Copy only the set values of this column to other axes.
- **Apply all (All Parameter)**: Copies all parameter values for this axis to other axes.

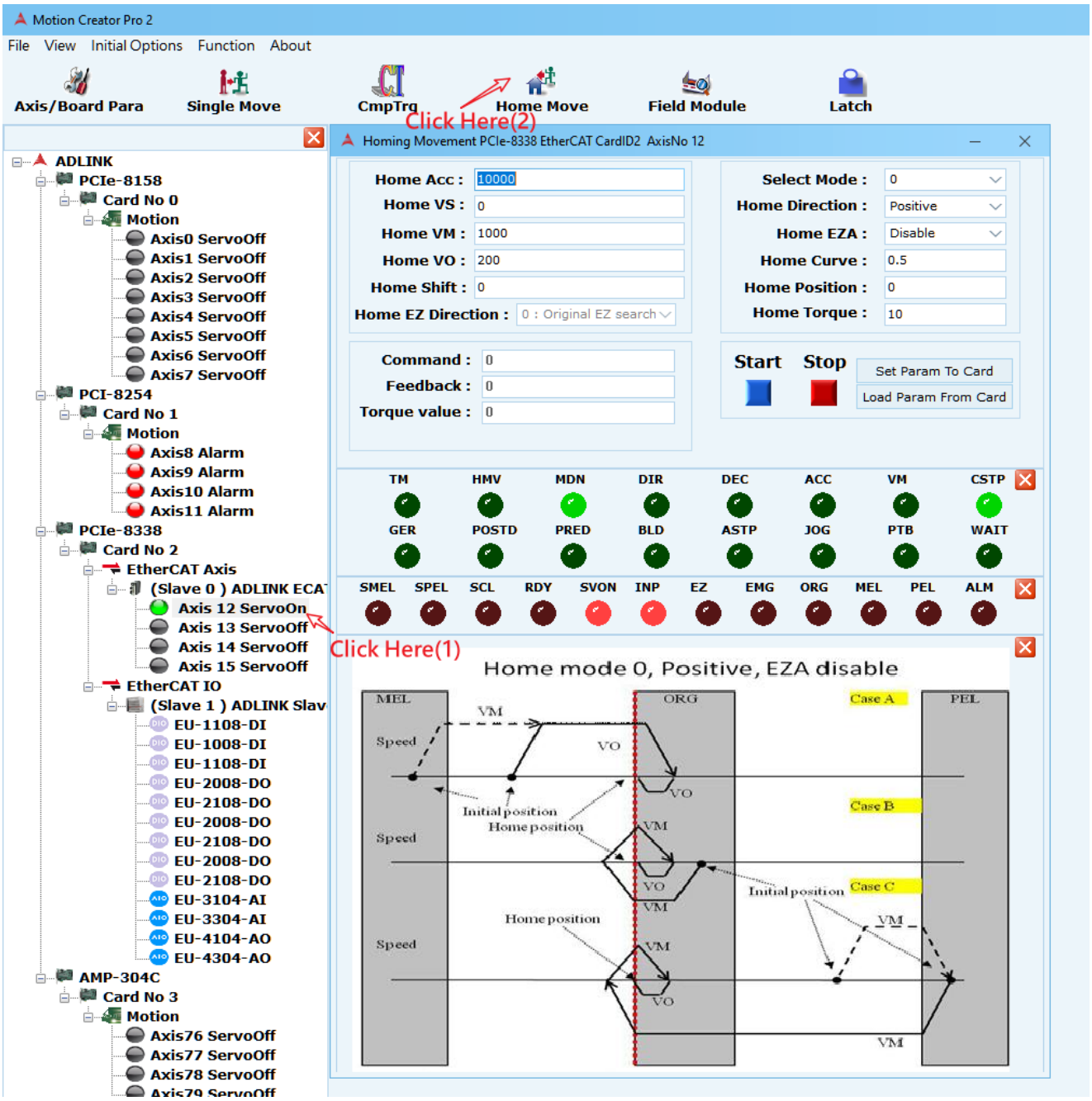


	AxisNo0	AxisNo1	AxisNo2	AxisNo3
EL_MODE	Dec Stop	Dec Stop	Dec Stop	Dec Stop
MDM_CONDI	Cmd Done			Cmd Done
SD_DEC	100000000			100000000
SPEL_EN	Disable	Disable	Disable	Disable
SMEL_EN	Disable	Disable	Disable	Disable
SPEL_POS	100000	100000	100000	100000
SMEL_POS	-100000	-100000	-100000	-100000
HOME_MODE	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

3.2 Homing

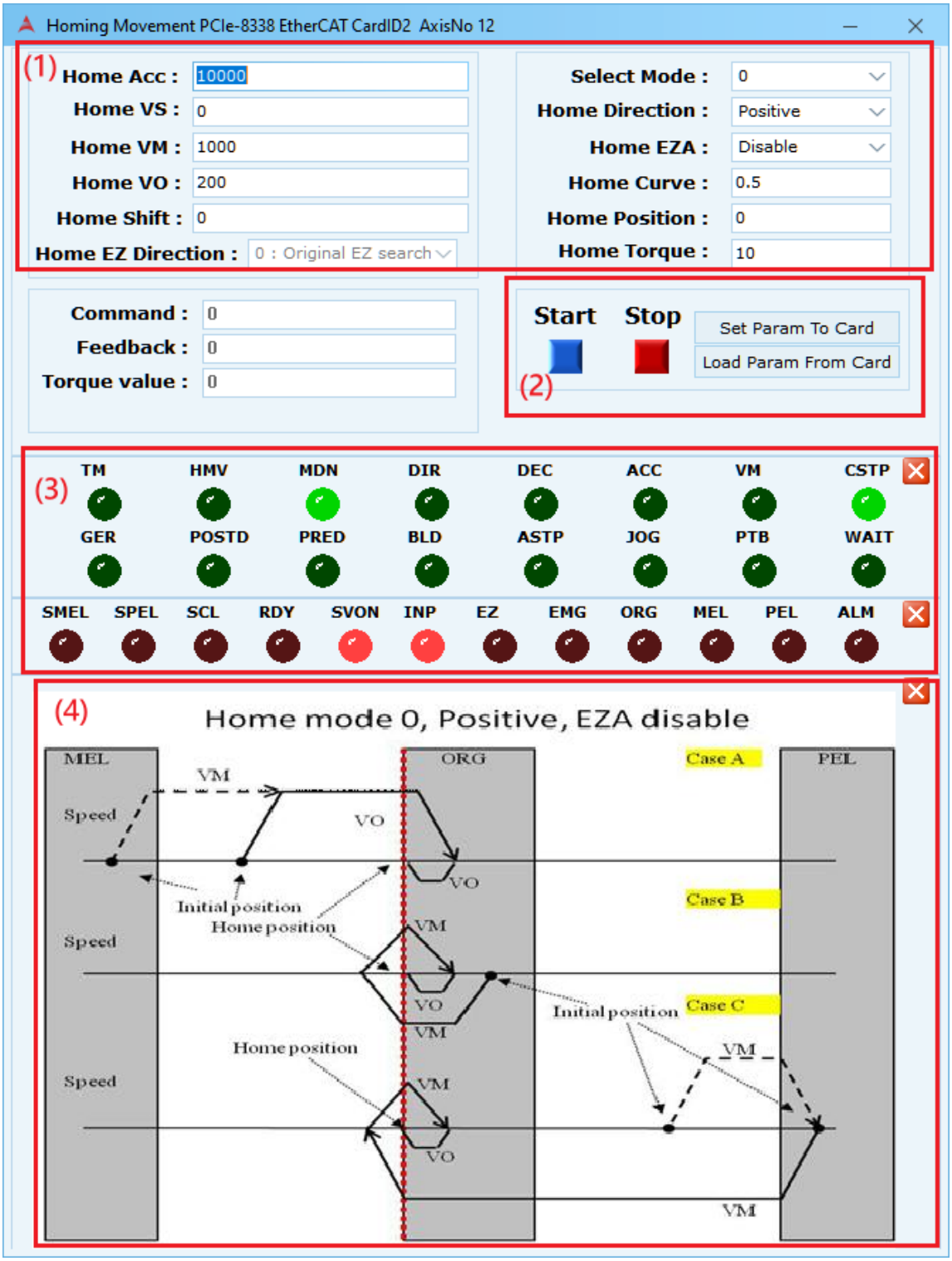
The Homing page is used for the origin of the startup axis (ORG or DOG, etc.) position. Through the axis parameter settings, you can select n modes, and real-time monitoring of command, displacement, and various motion status information.

The steps to open the return to origin page are shown below. First, click **Axis0** in the device tree, then click the **Home Move** icon.

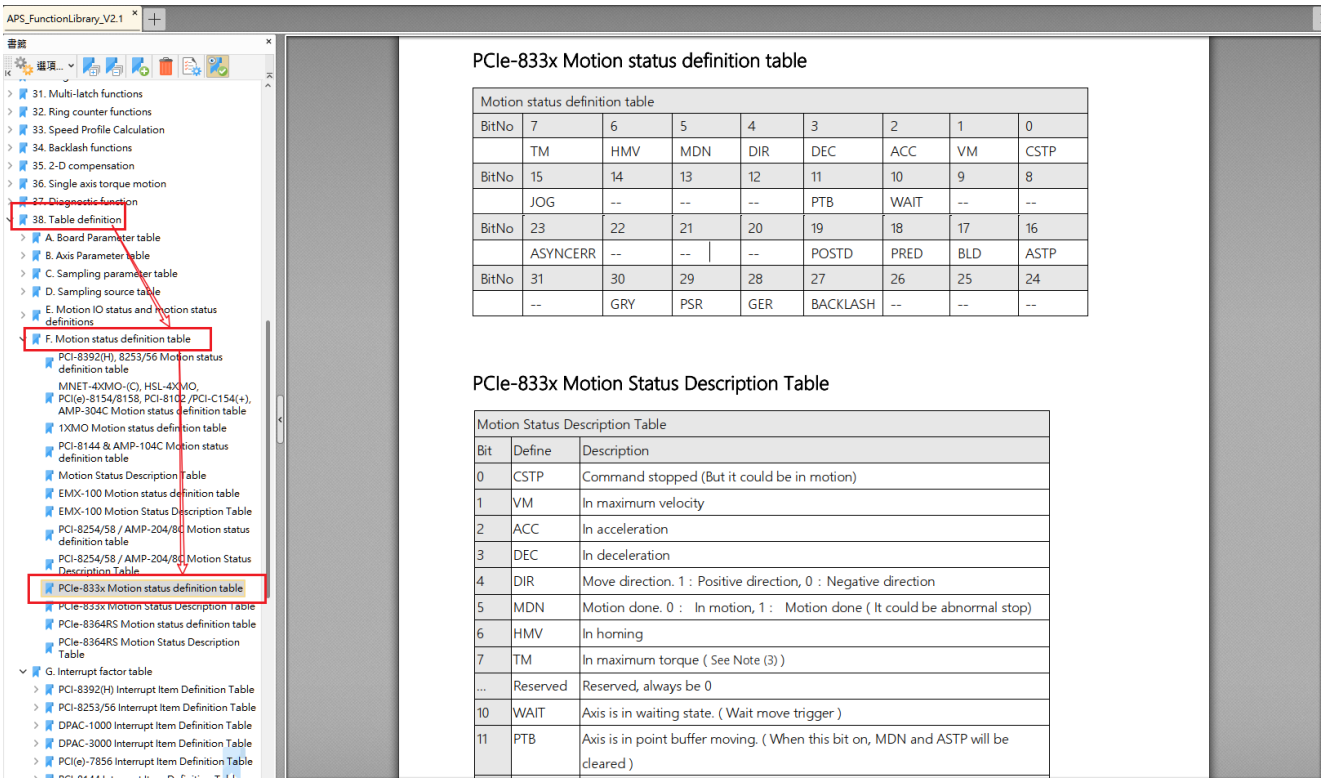


The return to origin page has four areas:

(1) Various return to origin parameter settings
(2) Start/stop button and set/load parameters
(3) Status display area
(4) Display of the current way back to the origin



For motion status, refer to **Table definition-> Motion status definition tables** in the APS Function Library. For example, the following figure shows PCI-8338 Motion Status 38. Table definition-> F. Motion status definition table -> PCIe-833x Motion status definition table, as shown below.



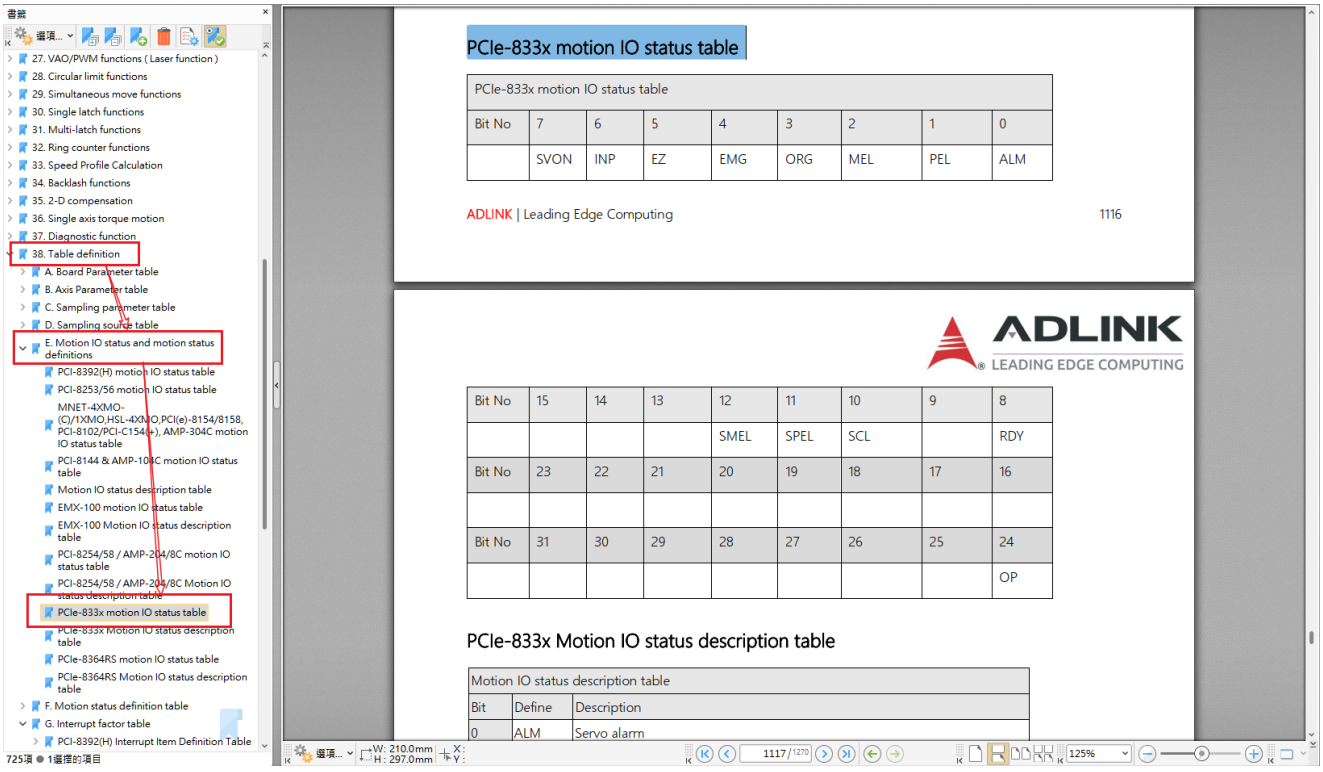
PCIe-833x Motion status definition table

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	--	--	--

PCIe-833x Motion Status Description Table

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)

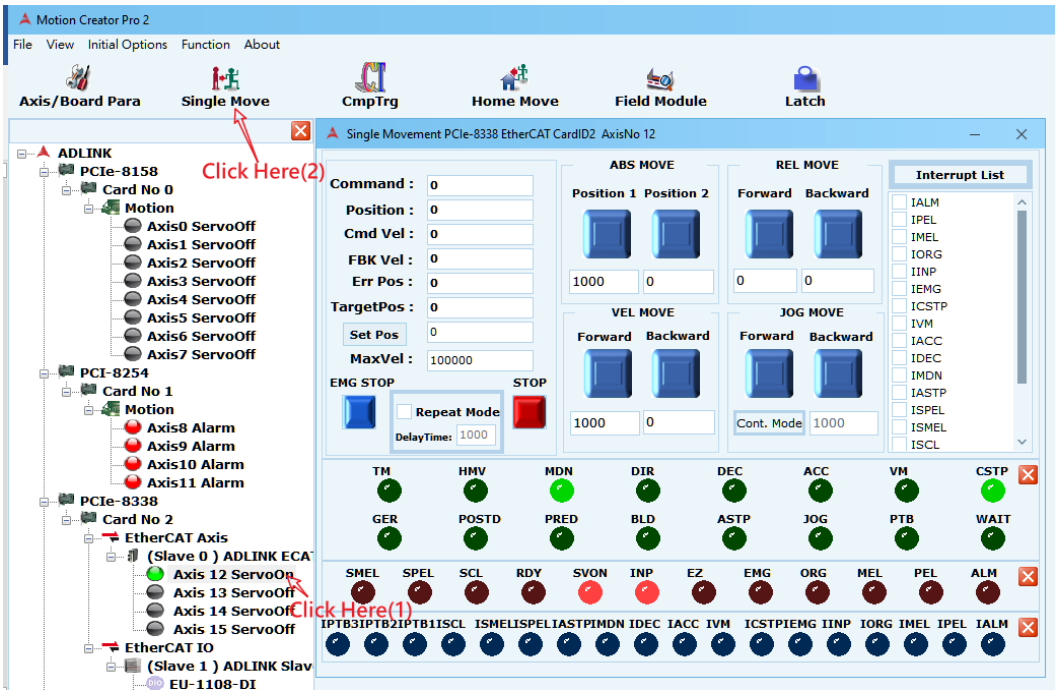
For Motion IO Status definitions, see **Table definition->Motion IO status and motion status definitions** in the APS Function Library. For the example above, the PCIe - 8338 Motion path for IO Status reference content is shown as 38. Table definition-> E. Motion IO status and motion status definitions -> PCIe-833x motion IO status table, as below.

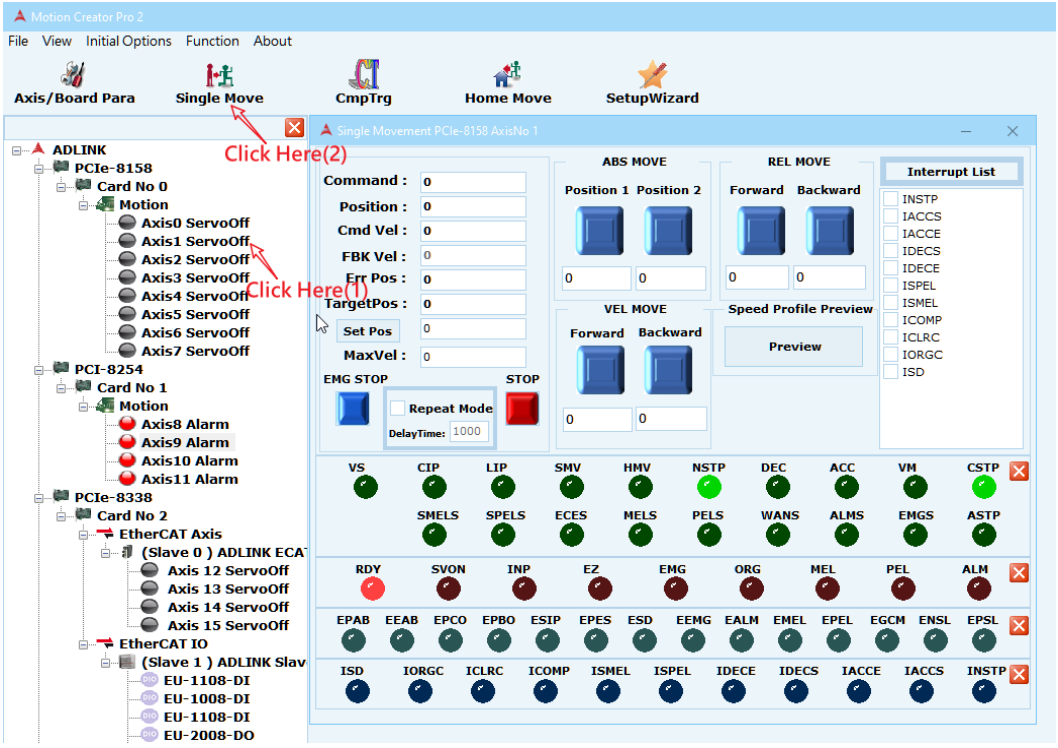


3.3 Single Move

The single-axis operation function can control a single axis to do absolute motion, relative motion, speed motion and inch motion and other functions, and can monitor the command, displacement, speed and various motion state information in real time.

The steps of opening the single-axis operation page are as shown below. First, click **Axis x** on the device tree, and then click the **Single Move** icon.





3.3.1 Position/Command Status

This area displays the following information:

- **Command**: Current command location
- **Position**: Current feedback location
- **Cmd Vel**: Current command speed
- **FBK Vel**: Current feedback speed
- **Err Pos**: Displacement error value
- **TargetPos**: Target position
- **Set Pos**: Set the command position and the feedback position at the same time
- **MaxVel**: Set point to point maximum velocity

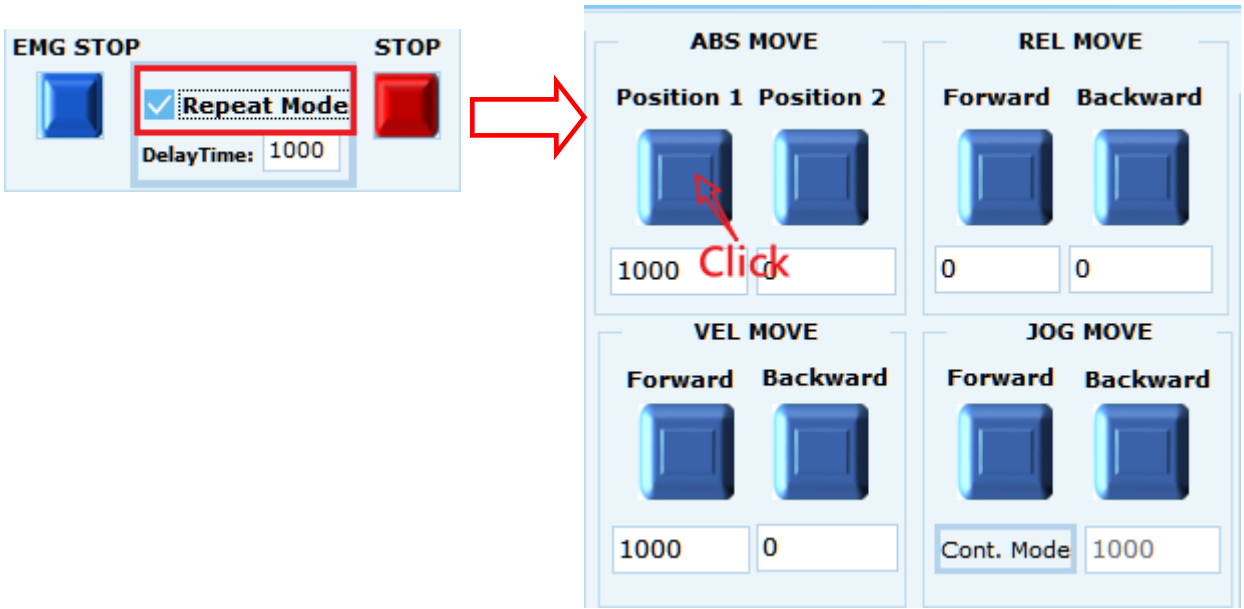
3.3.2 Move Operation

Motion operation can be divided into four operation modes, the input displacement is in Pulse units.

(1) ABS MOVE: Absolute position movement, you can enter the absolute position
(2) REL MOVE: Relative position movement, you can enter the relative position
(3) VEL MOVE: Speed movement, speed can be entered
(4) JOG MOVE: Move in inches, click Free or Step mode. (Step mode must set displacement)

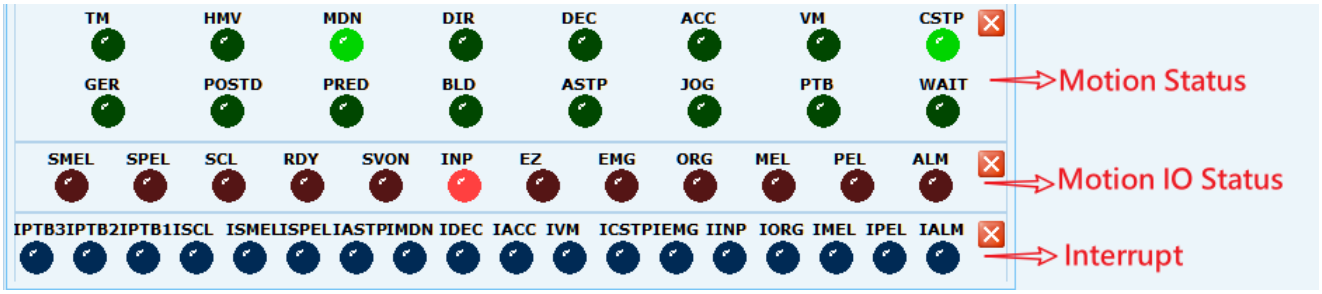
Note: The increase or decrease rate can be set in 3.1 Parameter Management.

If it is necessary to perform reciprocating movement between two displacements, check **Repeat Move** and set the **Delay Time** interval before the movement operation is performed.



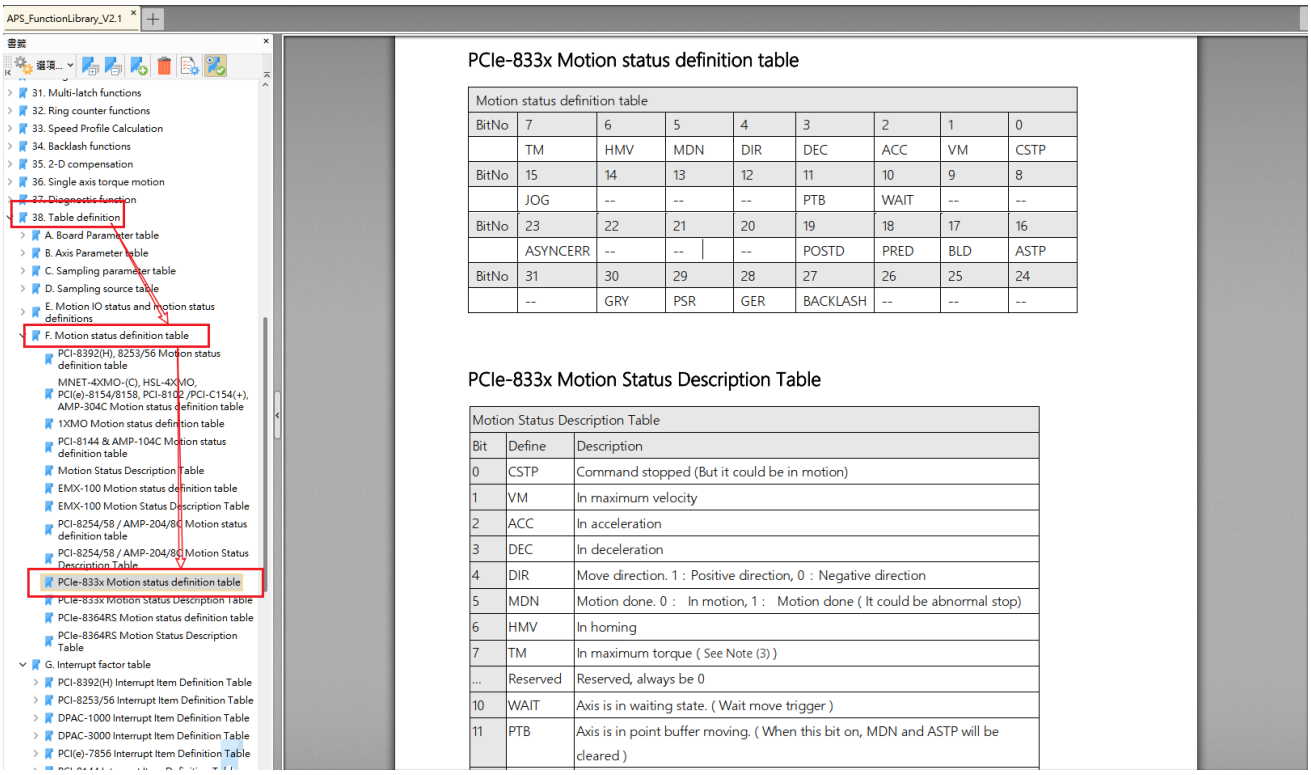
3.3.3 Status View

The Status display area provides real-time feedback to the controller, including Motion Status, Motion IO, Interrupt, and Interrupt Error blocks.



- **Motion Status**

Refer to the APS Function Library manual **Table definition-> Motion status definition tables**. For PCIe-8338 Motion Status, refer to 38. Table definition-> F. Motion status definition table -> PCIe-833x Motion status definition table, as shown below.



PCIe-833x Motion status definition table

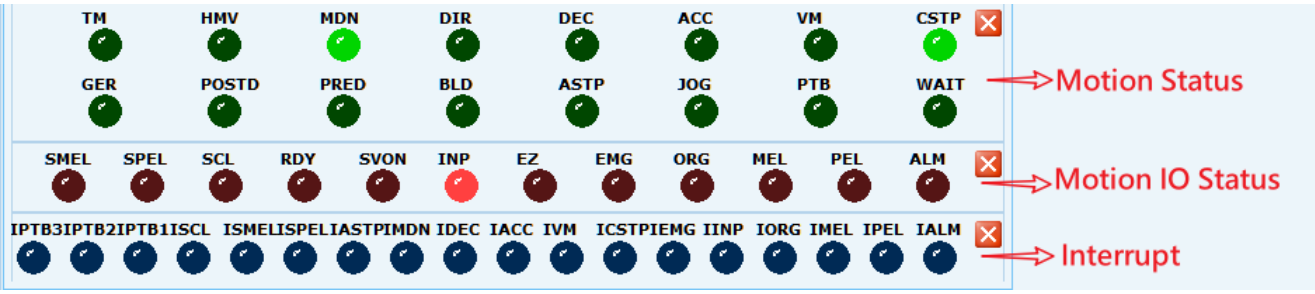
Motion status definition table								
BitNo	7	6	5	4	3	2	1	0
	TM	HMV	MDN	DIR	DEC	ACC	VM	CSTP
BitNo	15	14	13	12	11	10	9	8
	JOG	--	--	--	PTB	WAIT	--	--
BitNo	23	22	21	20	19	18	17	16
	ASYNCERR	--	--	--	POSTD	PRED	BLD	ASTP
BitNo	31	30	29	28	27	26	25	24
	--	GRY	PSR	GER	BACKLASH	--	--	--

PCIe-833x Motion Status Description Table

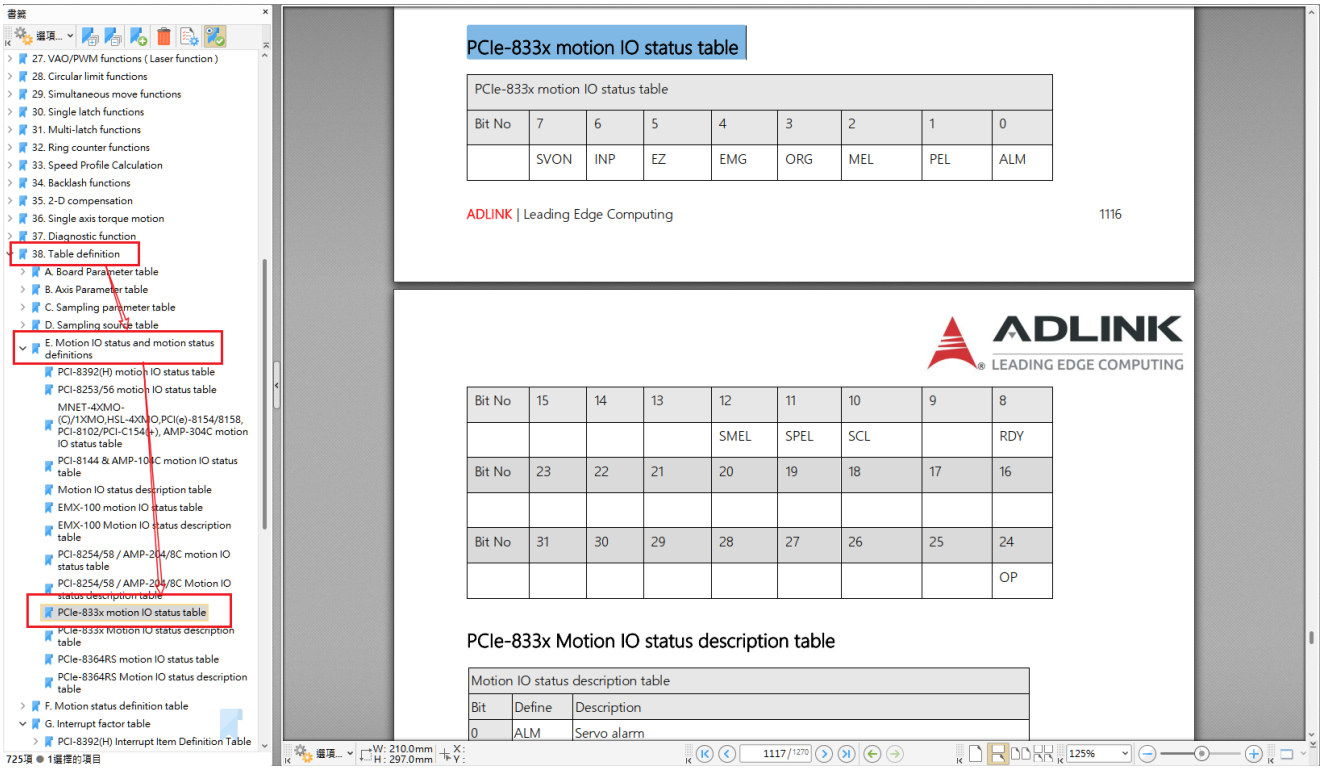
Motion Status Description Table		
Bit	Define	Description
0	CSTP	Command stopped (But it could be in motion)
1	VM	In maximum velocity
2	ACC	In acceleration
3	DEC	In deceleration
4	DIR	Move direction. 1 : Positive direction, 0 : Negative direction
5	MDN	Motion done. 0 : In motion, 1 : Motion done (It could 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。

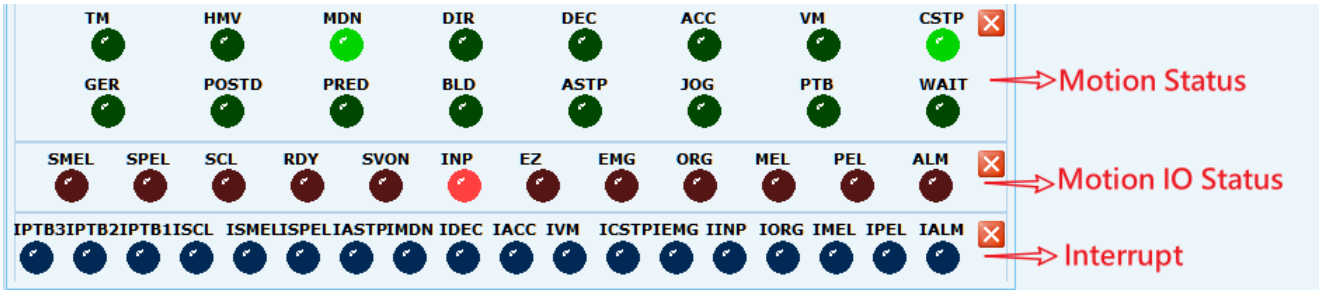
- **Motion IO Status**



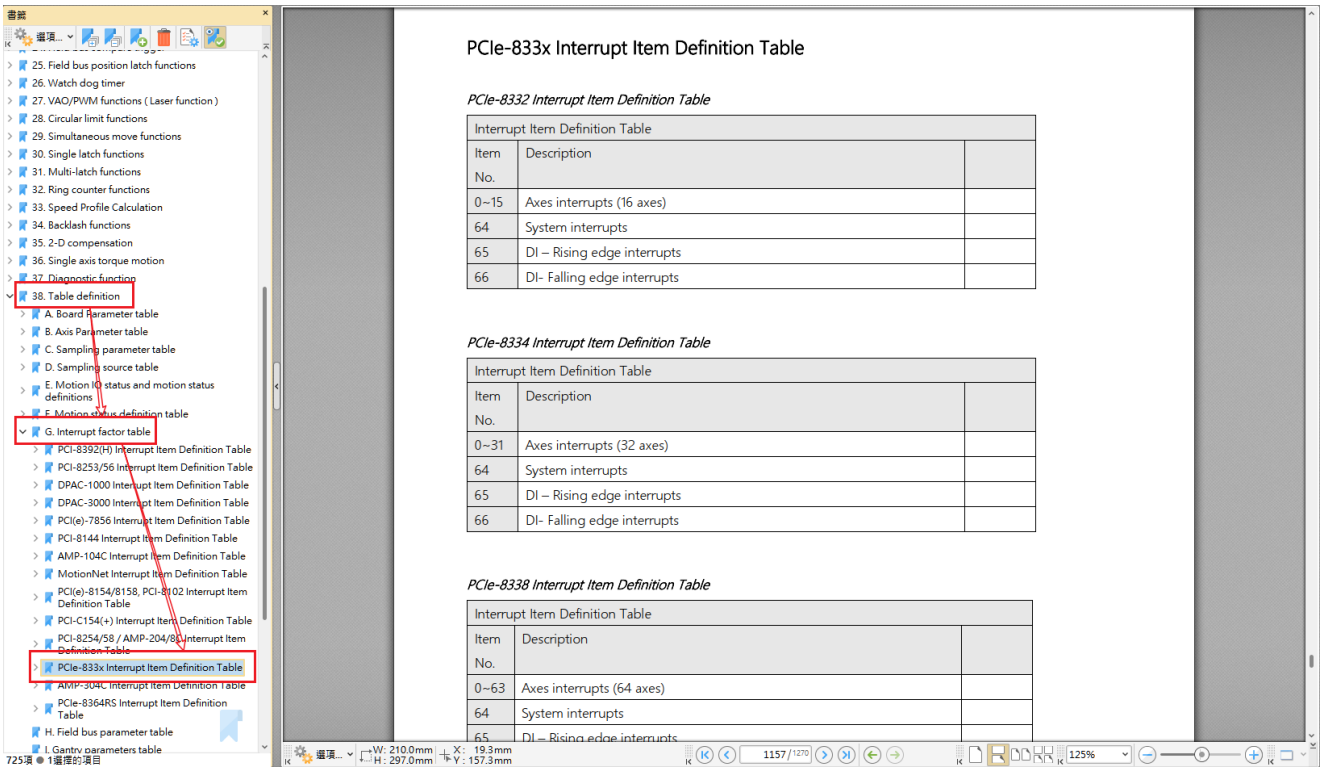
Refer to APS Function Library manual **Table definition->Motion IO status and motion status definitions**. For PCIe-8338 Motion path IO Status, refer to 38. Table definition-> E. Motion IO status and motion status definitions -> PCIe-833x motion IO status table, as shown below.



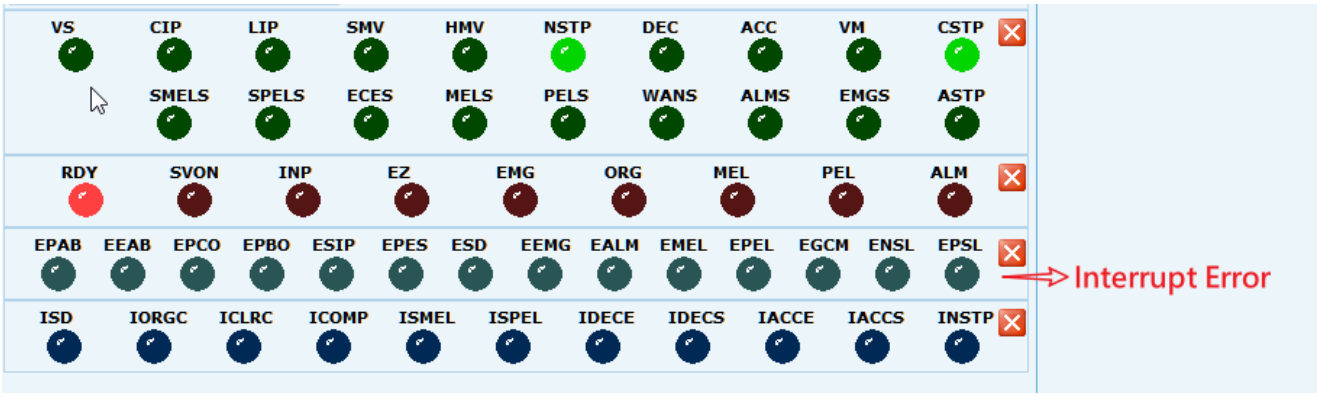
- **Interrupt**



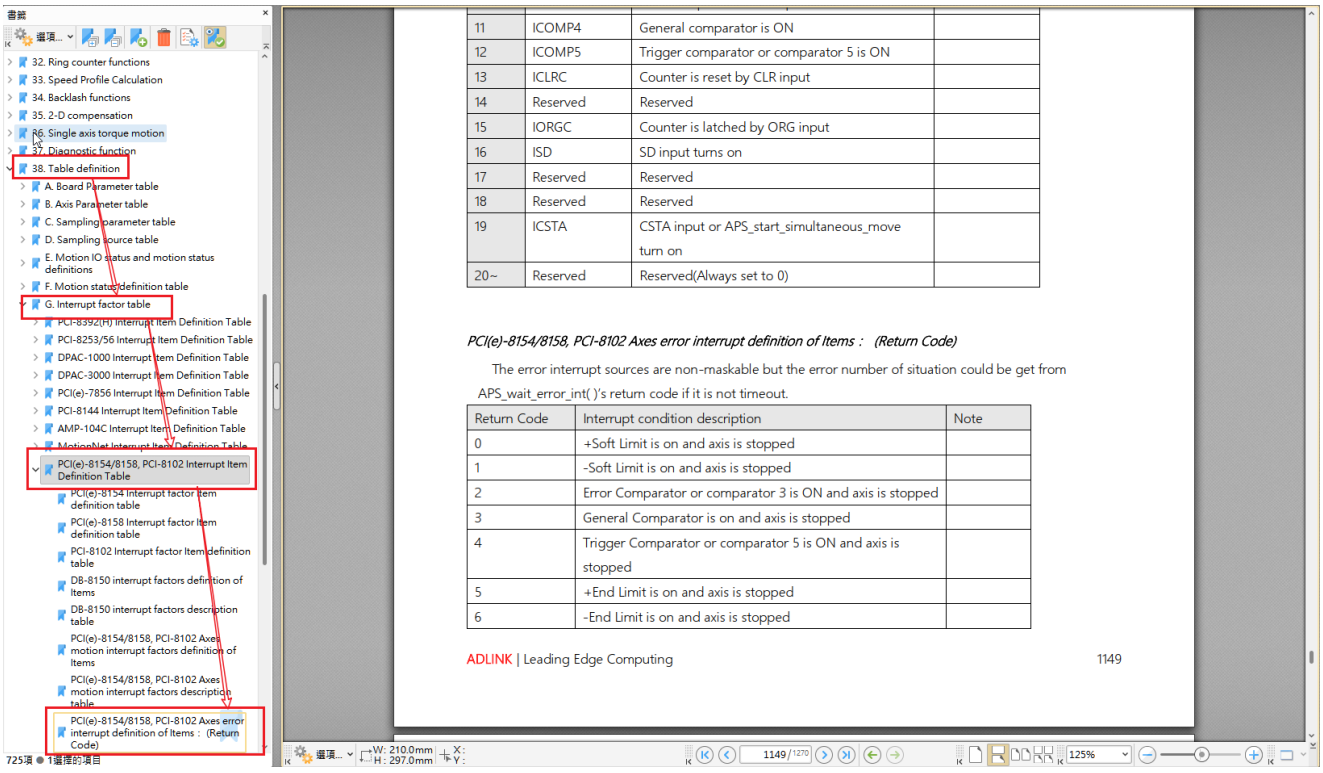
Refer to the APS Function Library manual **Table definition-> Interrupt factor table**. For the Interrupt reference content path for the PCIe-8338, refer to 38. Table definition-> G. Interrupt factor table -> PCIe-833x Interrupt Item Definition Table, as shown below.



- **Interrupt Error (Pulse type Axis card only)**



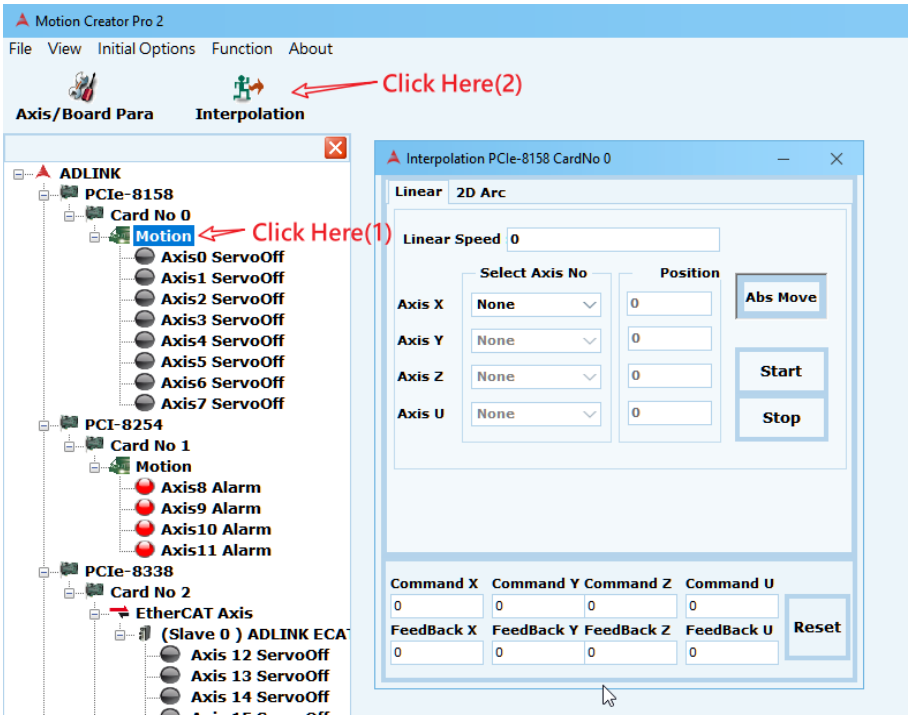
Refer to the APS Function Library manual **Table definition-> Interrupt factor table-> Interrupt Item Definition Table-> Axes error** for the corresponding interrupt definitions. For the PCIe-8158 error interrupt reference path, refer to 38. Table definition-> G. Interrupt factor table -> PCI(e)-8154/8158, PCI-8102 Axes error interrupt definition of Items, as shown below.

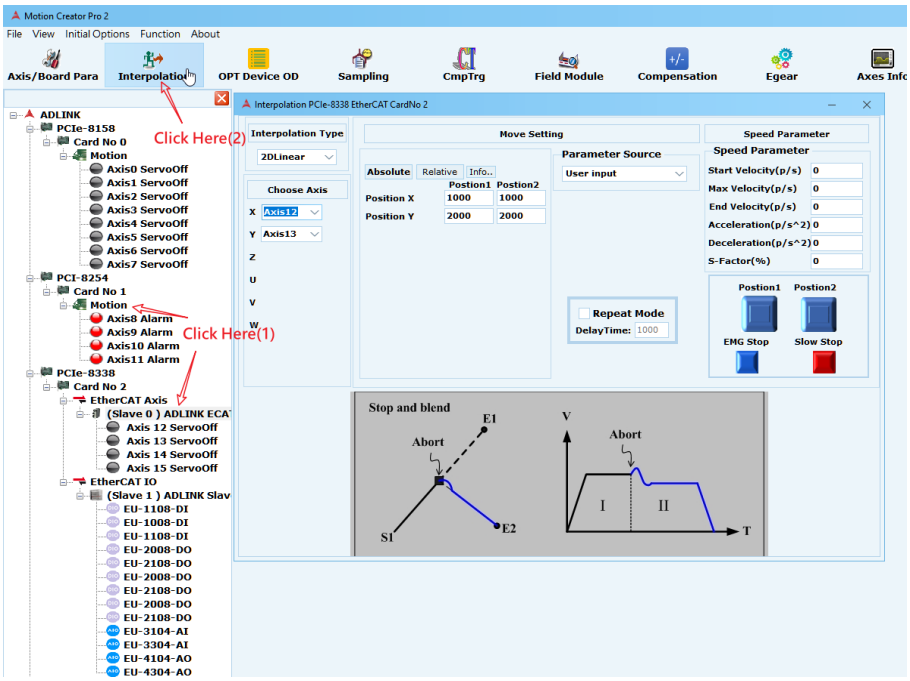


3.4 Interpolation

Interpolation is suitable for use in motion control systems where there is an interaction between the displacement of more than one axis, for example, 2 axis, 2 axis arc, 3 axis, etc. The tween function is divided into two settings for pulse type axis cards and soft motion axis cards, and their corresponding setting parameters are also slightly different.

Click **Slave** or **Motion** in the device tree according to the card type, and then click the **Interpolation** icon, as shown below.

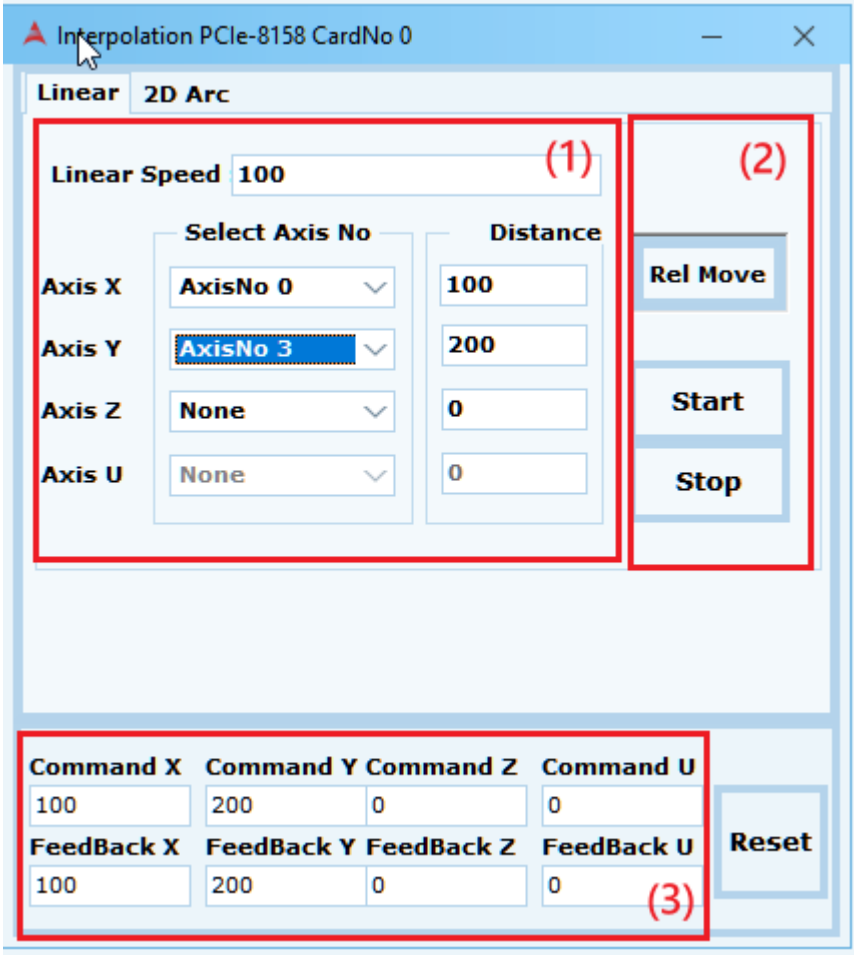




- **Pulse type Axis card page**

The setting functions are divided into two pages.

Linear page

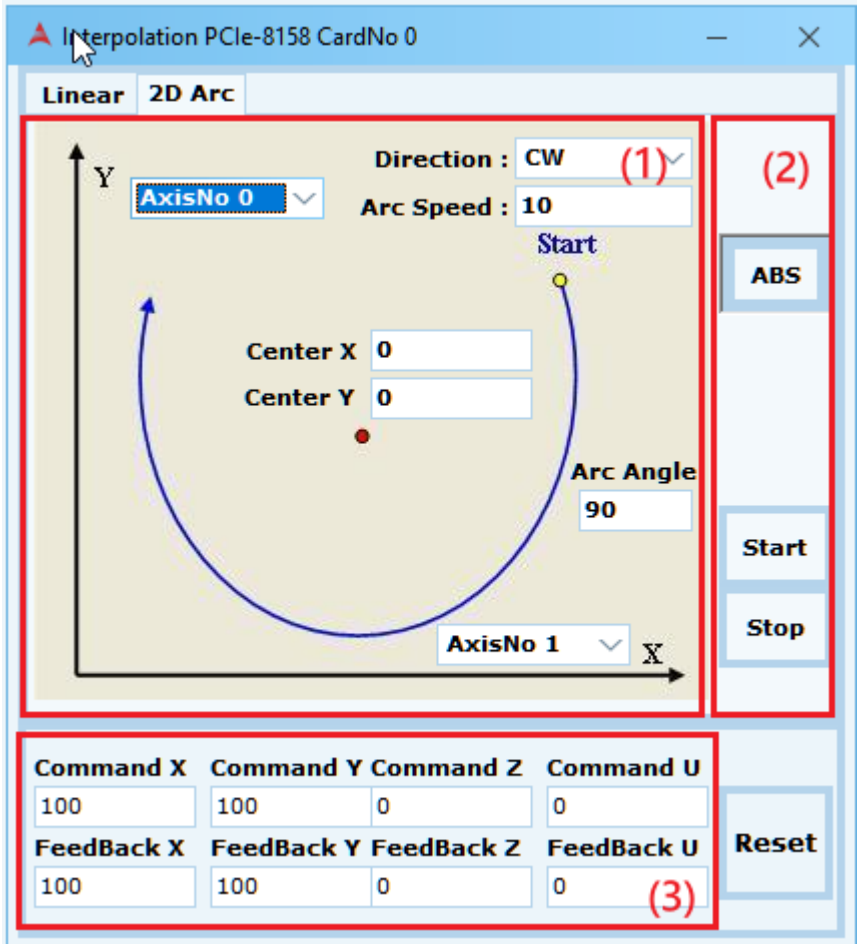


(1) Select the axis number and displacement quantity to perform the tween movement.

(2) **Abs Mode/Rel Mode**: Set absolute or relative motion and the amount of displacement.
Start/Stop: Start command and stop command

(3) Monitor the command and reply of each axis.

2D Arc page

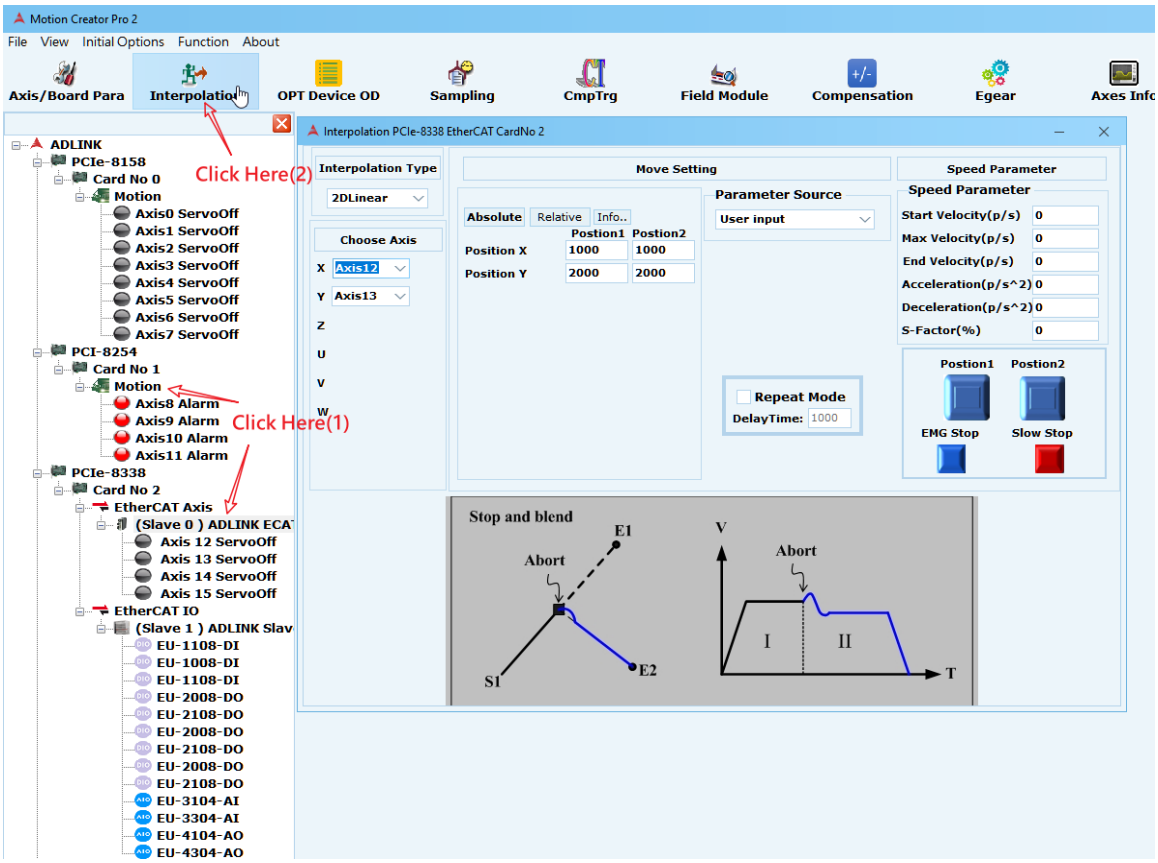


(1) Select the axis number, rotation amount, center point, speed and steering for 2D Arc movement.

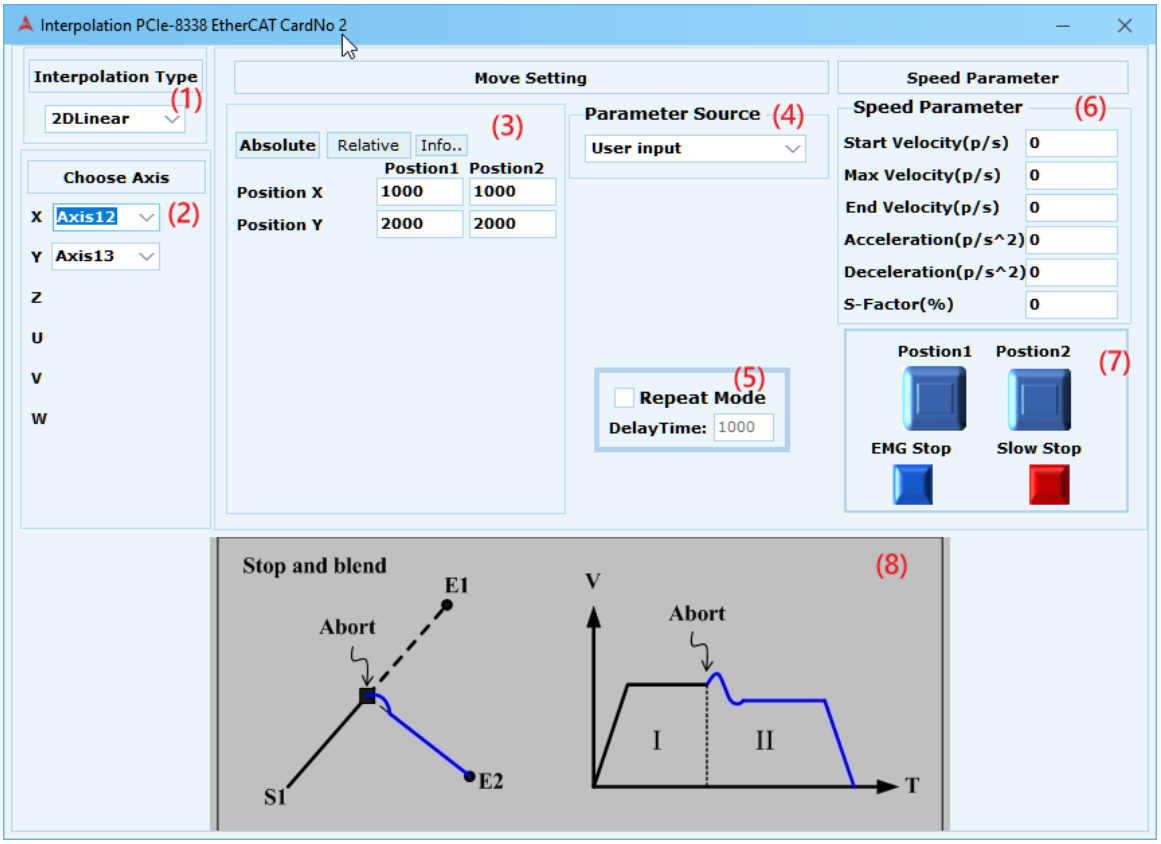
(2) **Abs /Rel**: Set absolute or relative motion.
Start/Stop: Start command and stop command.

(3) Monitor the commands and feedback of each axis.

- **Soft motion axis card page**



The tween function of a soft motion axis card can be roughly divided into eight areas.



(1) **Interpolation Type**: The API for selecting the exercise type among the eleven tween types is as follows.

Interpolation Type	
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**: Select the axis number for the tween motion.
(3) **Absolute/Relative**: Set absolute or relative motion and the amount of displacement.
(4) **Parameter Source**: Select the source of the speed parameter.

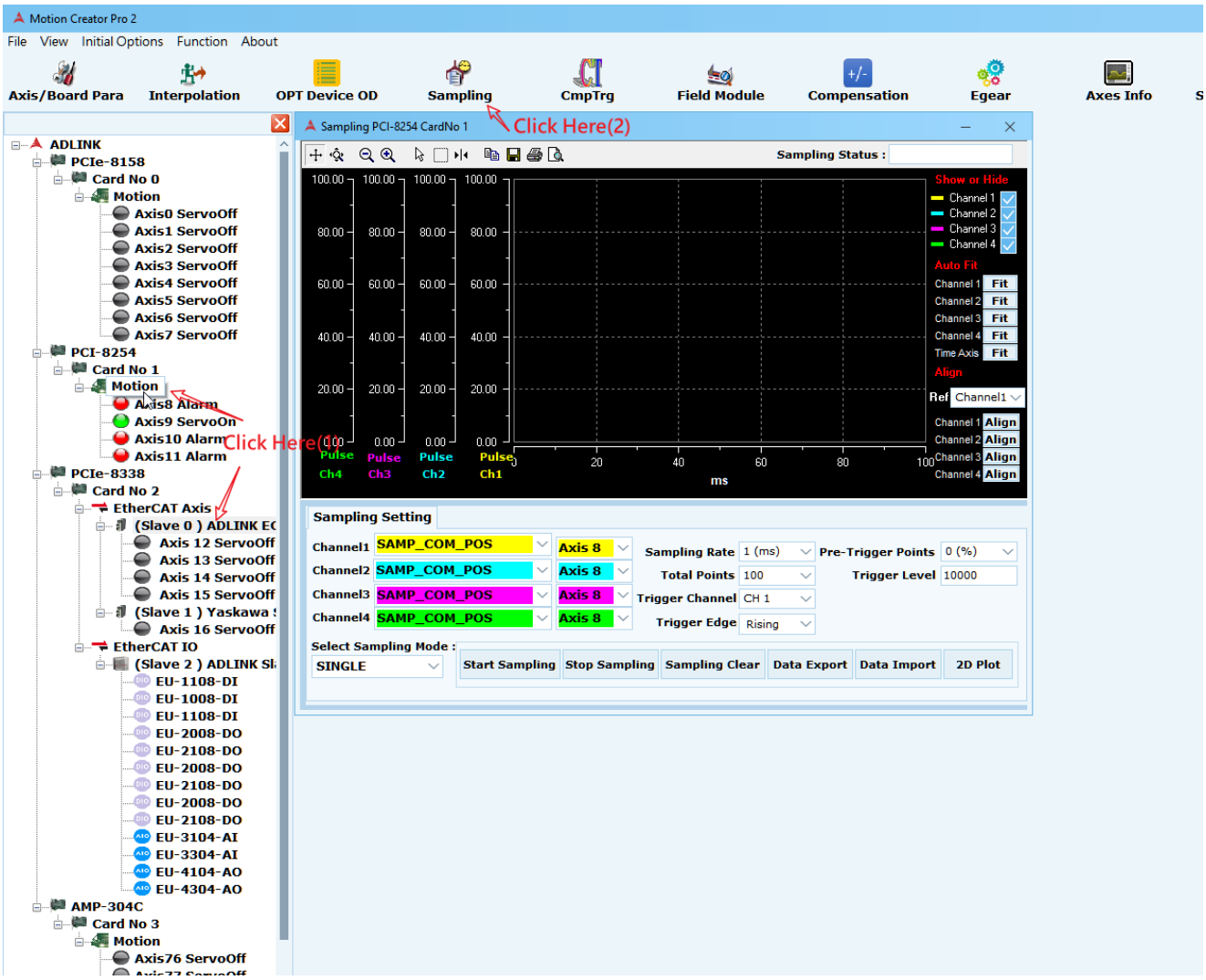
Parameter Source	Description
User input	Use the velocity parameter in block (6)
Axis parameter	Use current axis parameter Settings (for axis parameter pages, please refer to 3.1 and APS manual Settings)
Only Vmax	Use the speed parameters in Block (6), but the maximum speed should be set according to 3.1 and APS manual

(5) If it is necessary to perform reciprocating and back movement between two displacements, you can select **Repeat Move** and set the **Delay Time** before performing the movement operation.
(6) **Speed Parameter**: Enter each speed set. If the parameter selected in block (4) is from user input, the operation in block (7) will use the setting here.
(7) Start and stop movement operation control.
(8) Schematic diagram of the selected mode.

3.5 Sampling

The sampling page function can collect command, position, speed and other data and display them on the motion control process chart, help with machine adjustment or analysis.

Follow the steps in the image below. Click **Slave** or **Motion** in the device tree, and then click the **Sampling** icon.

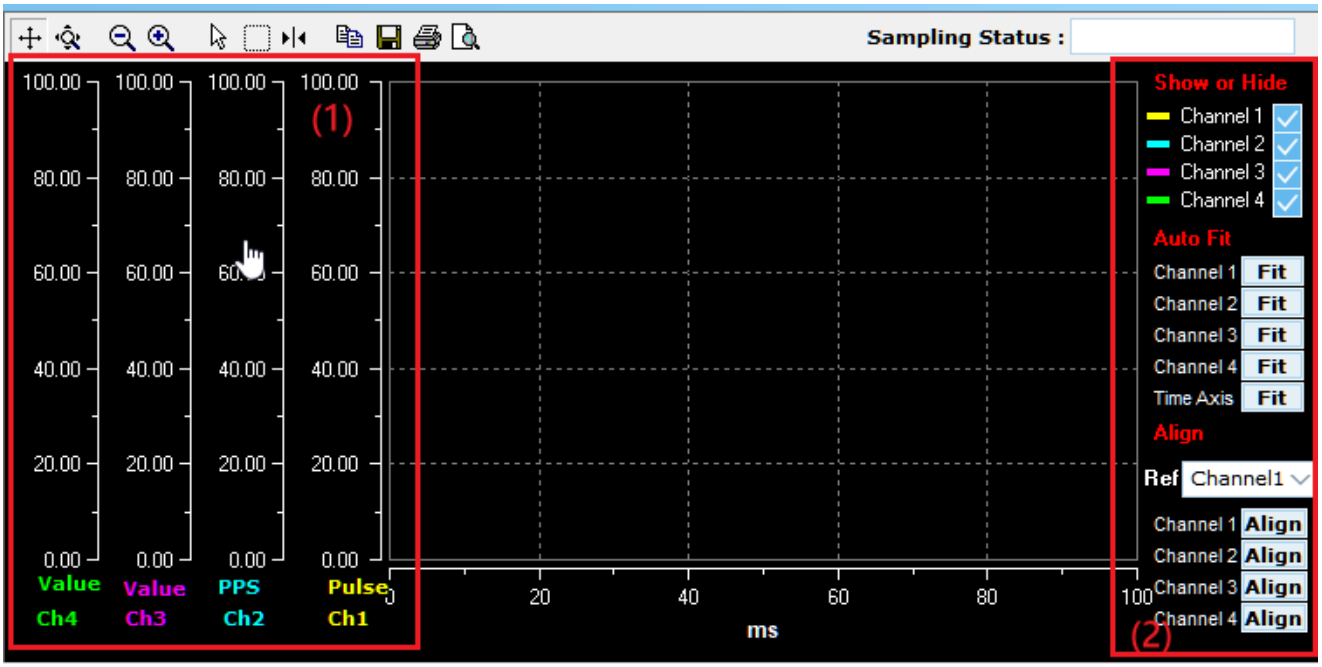


3.5.1 Drawing Area

The sampling function collects multiple varying data points. For example, the channel values in the left part of the drawing area (1) are scaled independently while the time in the graph section displays as milliseconds.

Items highlighted in (2) control the data display mode settings as follows.

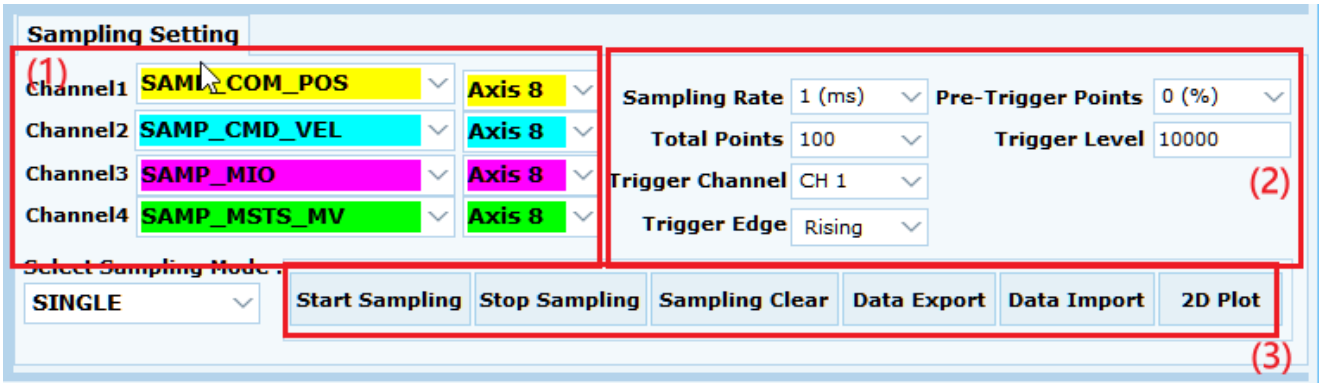
- **Show or Hide**: Select whether to display the channel
- **Auto Fit**: Automatically adjust the data to fill the drawing area
- **Align**: Align the Y-coordinate axis of the data of each channel to a specified channel for display.



3.5.2 Sampling Settings

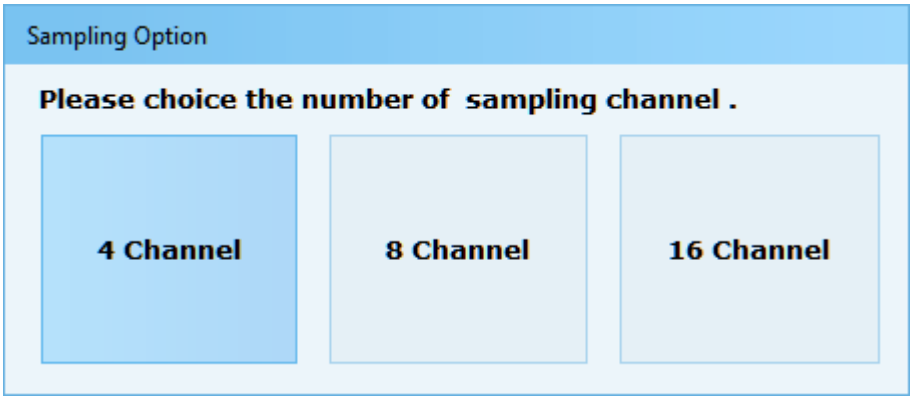
Sampling settings can be organized into three sections:

(1) Decide which axis of motion to sample and the type of data to sample, such as position and velocity, etc.
(2) Set the sampling speed, points and options to trigger the sampling channel.
(3) **Single** or **Repeat** trigger modes can be displayed after setting.
Start Sampling: Start taking samples
Stop Sampling: Click to stop sampling
Sampling Clear: Clear drawing area data
Data Export: Output sampling data to file (*.csv format)
Data Import: Input sample data file (*.csv format)

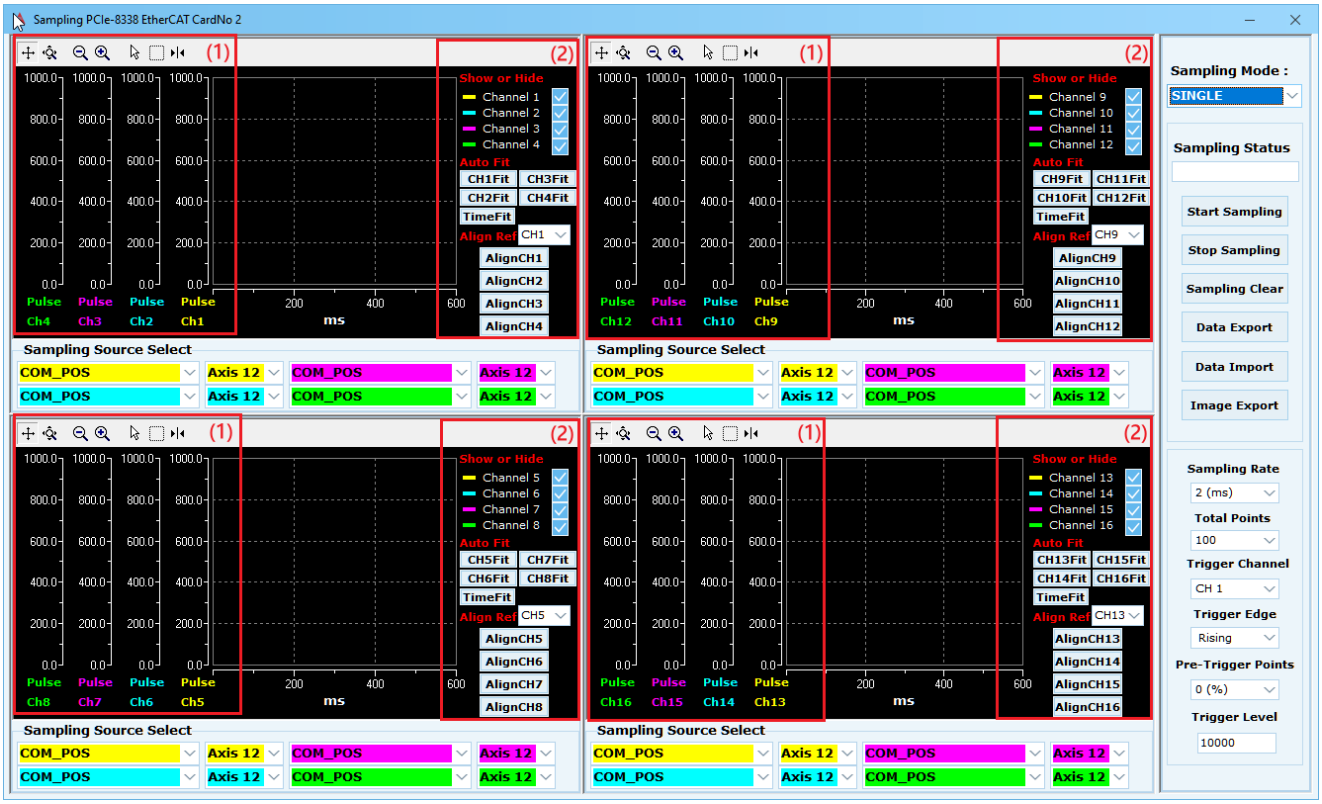


3.5.3 16CH Sampling

The 16CH sampling function can simultaneously collect 4, 8, or 16 different kinds of data as shown in the figure below. The unit and numerical scale may be different for different data types. Currently, only the Ether Cat series is supported.



In the following figure, the Y-axis in the left part of the drawing areas are scaled independently, while the transverse X-axis is fixed as the time axis, with a minimum unit of millisecond.



Sampling setting can be divided into three steps:

(1) Decide which axis of motion to sample and the type of data to sample, such as position and velocity, etc.
(2) Set the sampling speed, points and options to trigger the sampling channel.
(3) **Single** or **Repeat** trigger mode can be displayed after setting.
Start Sampling: Start taking samples
Stop Sampling: Click to stop sampling
Sampling Clear: Clear drawing area data
Data Export: Output sampling data to file (*.csv format)
Data Import: Input the sample data file (*.csv format)
Image Export: Capture images

3.6 Setup Wizard

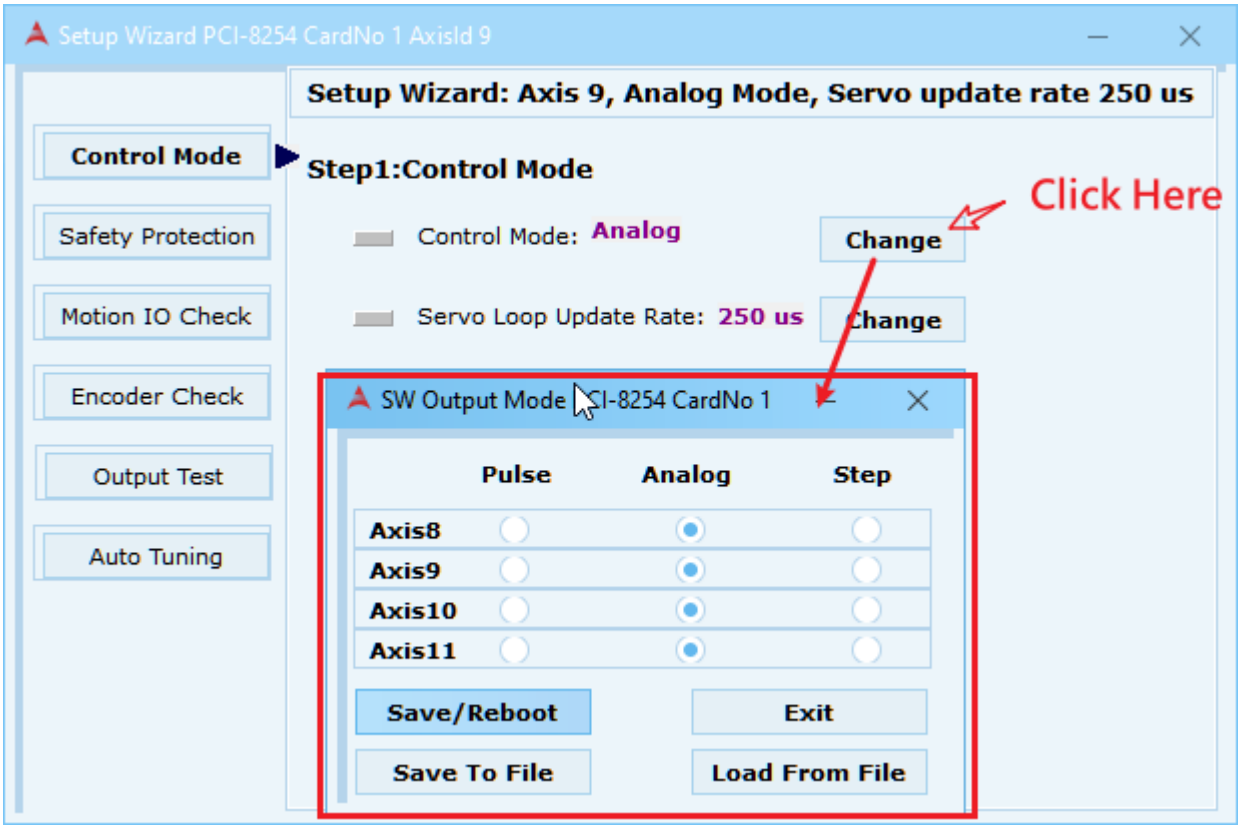
Setup Wizard is a tool that lets you quickly set parameters for an axis, helping you to easily and efficiently complete system setup by walking through the page step by step. We recommend that you perform this function as a first step before performing any motion control operations (at the beginning of using this control card). Setup Wizard can achieve the following:

- Control card basic parameter setting including control mode, servo cycle, safety setting, etc.
- Wiring check for I/O, Encoder, etc.
- Servo tuning machine (analogical, closed-loop control mode) provides Auto tuning function to help users find out a set of stable servo parameters with certain performance.

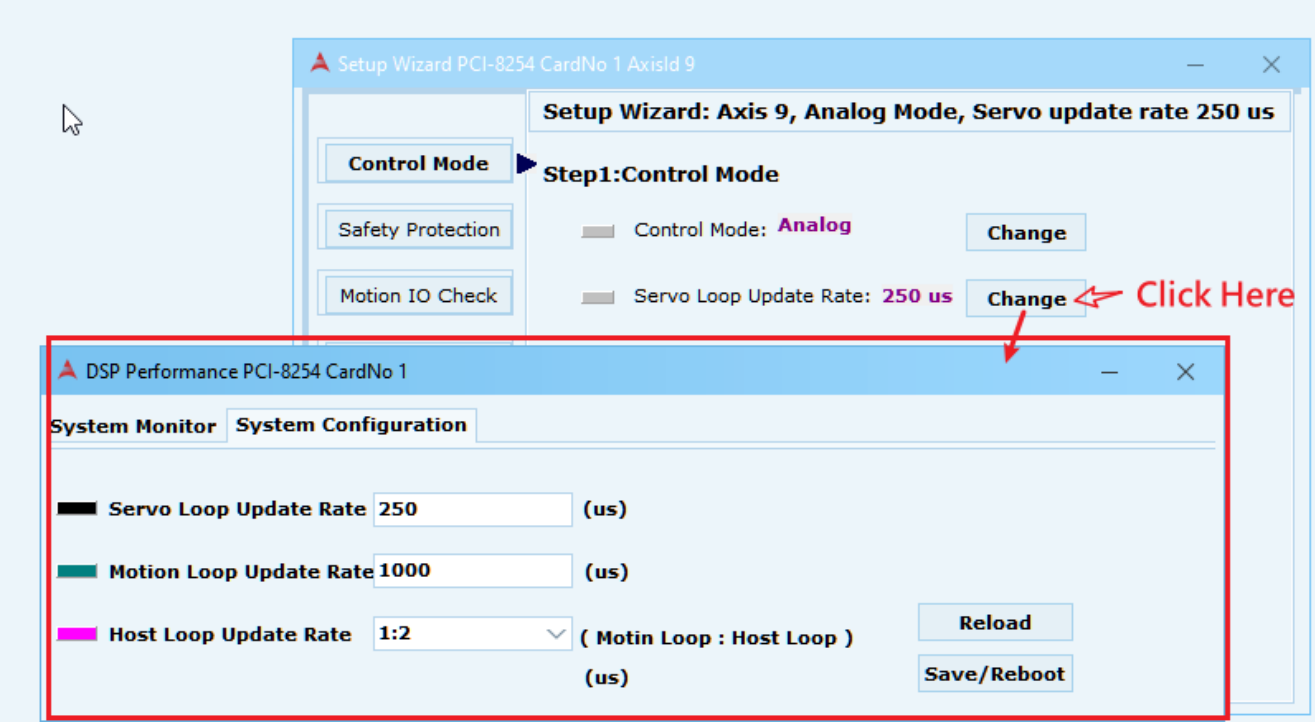
To open the **Setup Wizard** page, click **Axis x** in the setup tree, and then click the **Setup Wizard** icon.

3.6.1 Control Mode

Set the control mode of each axis to **Analog Type** or **Pulse Type**, and then click **Change**. A new page will appear for you to set the output signal type of each axis. After changing the settings, click **Save/Reboot**. It might take some time to save and reset the control card. When the action is complete, click **Exit**.

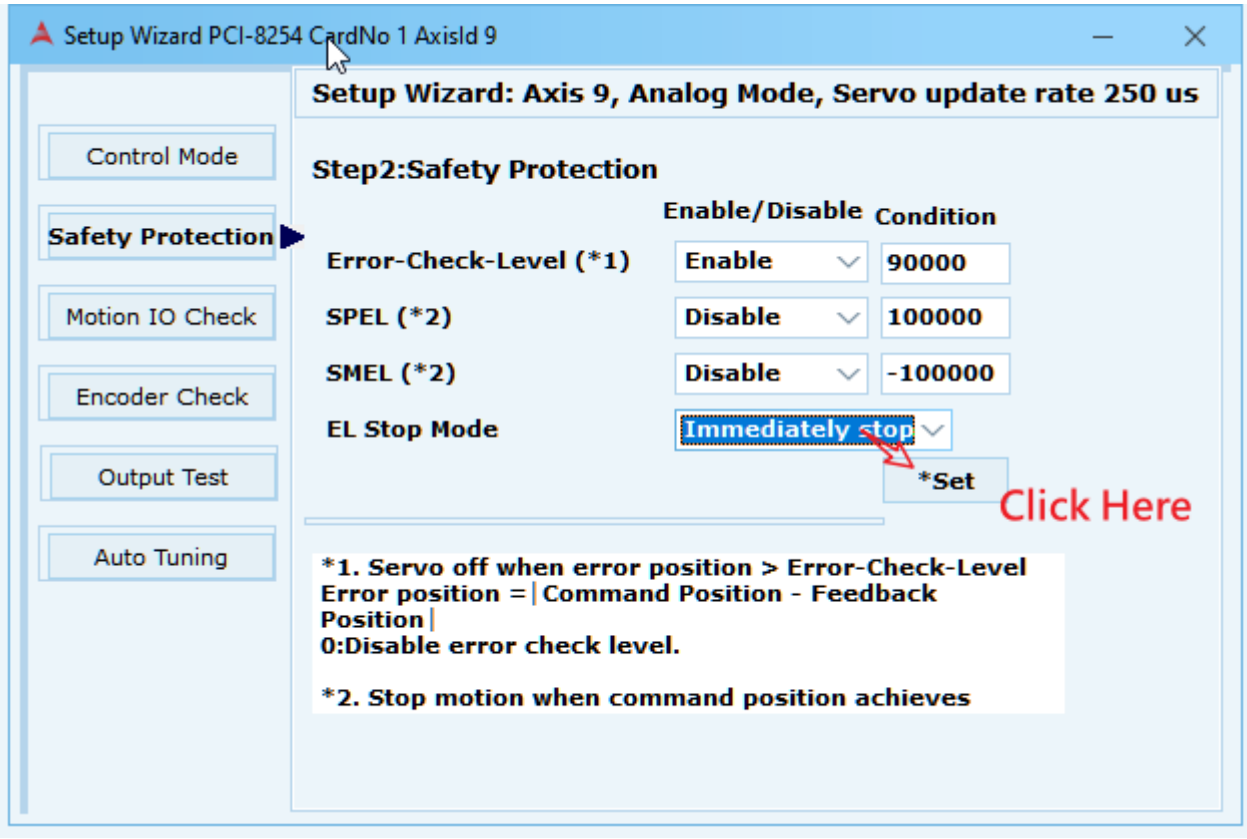


Open the Servo settings window to control the update rate speed as shown in the figure below. Fill in the appropriate **Servo Loop Update Rate** setting, click **Save/Reboot**, and then wait for the control card to reset.



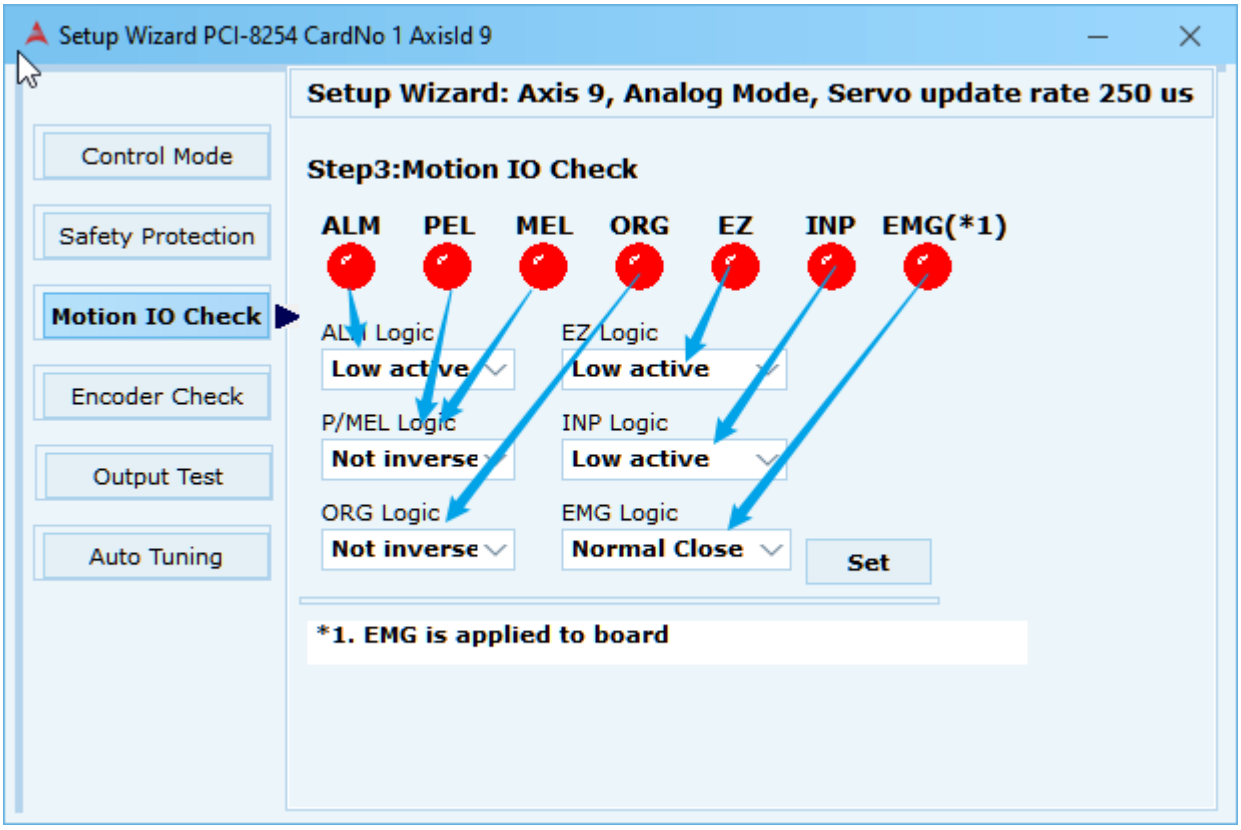
3.6.2 Safety Protection

Safety Protection includes protection settings for Error-Check-Level and soft-limits. Set whether to enable the function and parameters. The **Set** button is marked with an asterisk (*) to remind you that you need to click it in order to write the set parameters to the hardware.

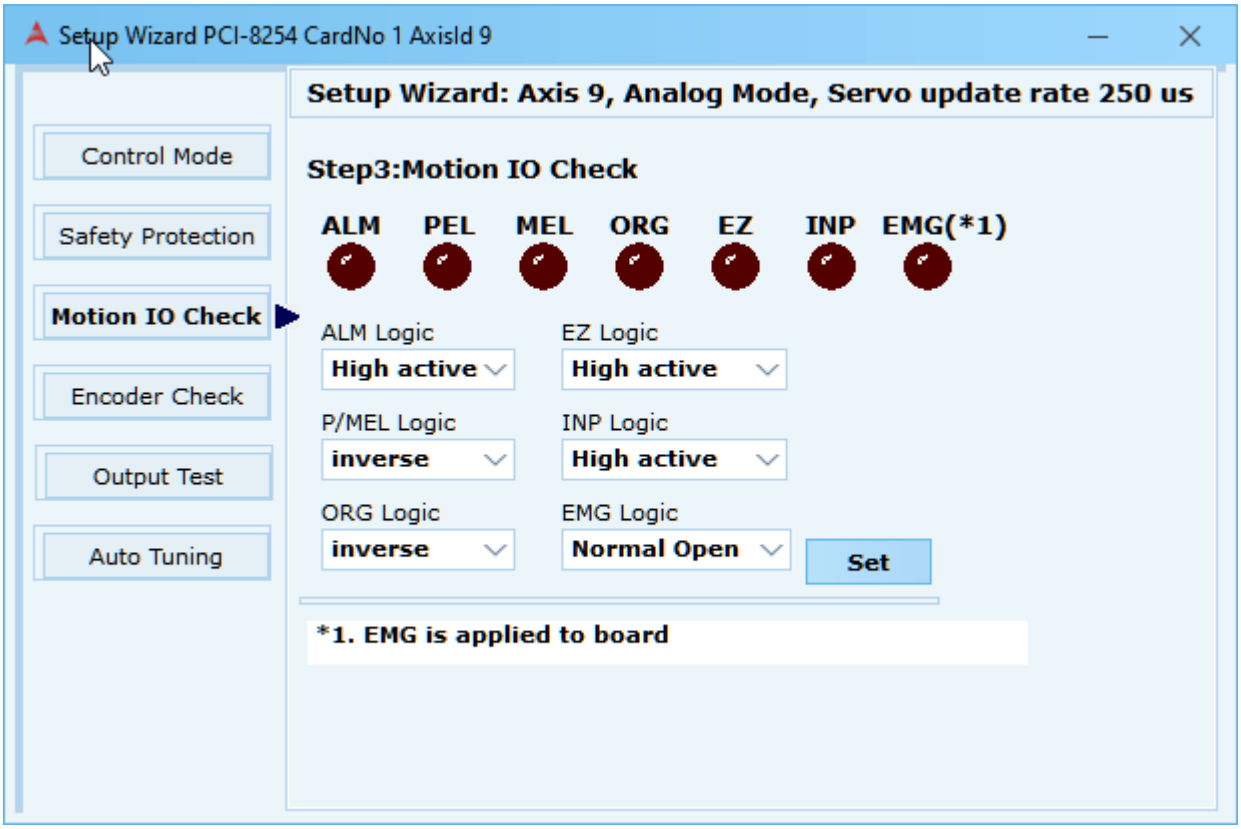


3.6.3 Motion IO Check

These settings configure the Motion IO forward and reverse signals. The real-time status of each IO is shown by the LED light and the logic is set by the corresponding fields.

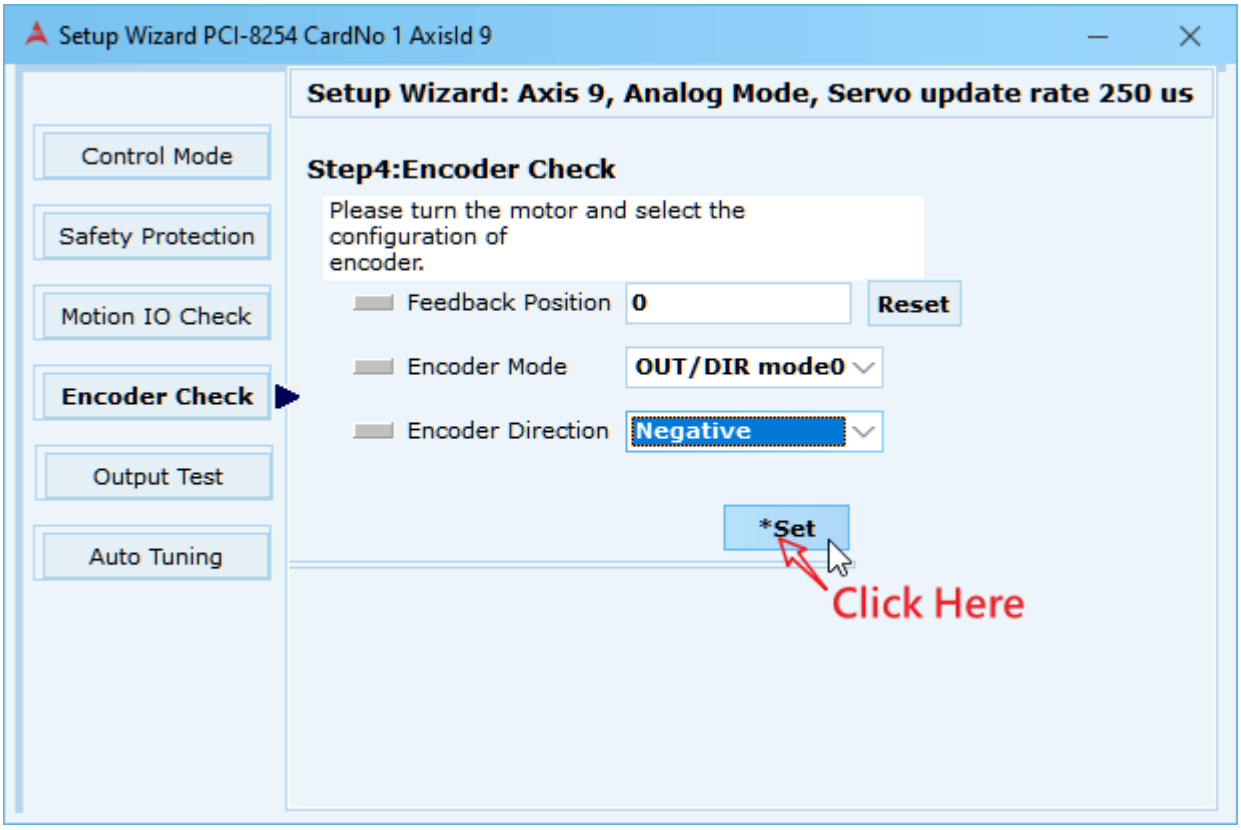


Set the relevant logic signals until all IO LED lights turn off, as shown below.



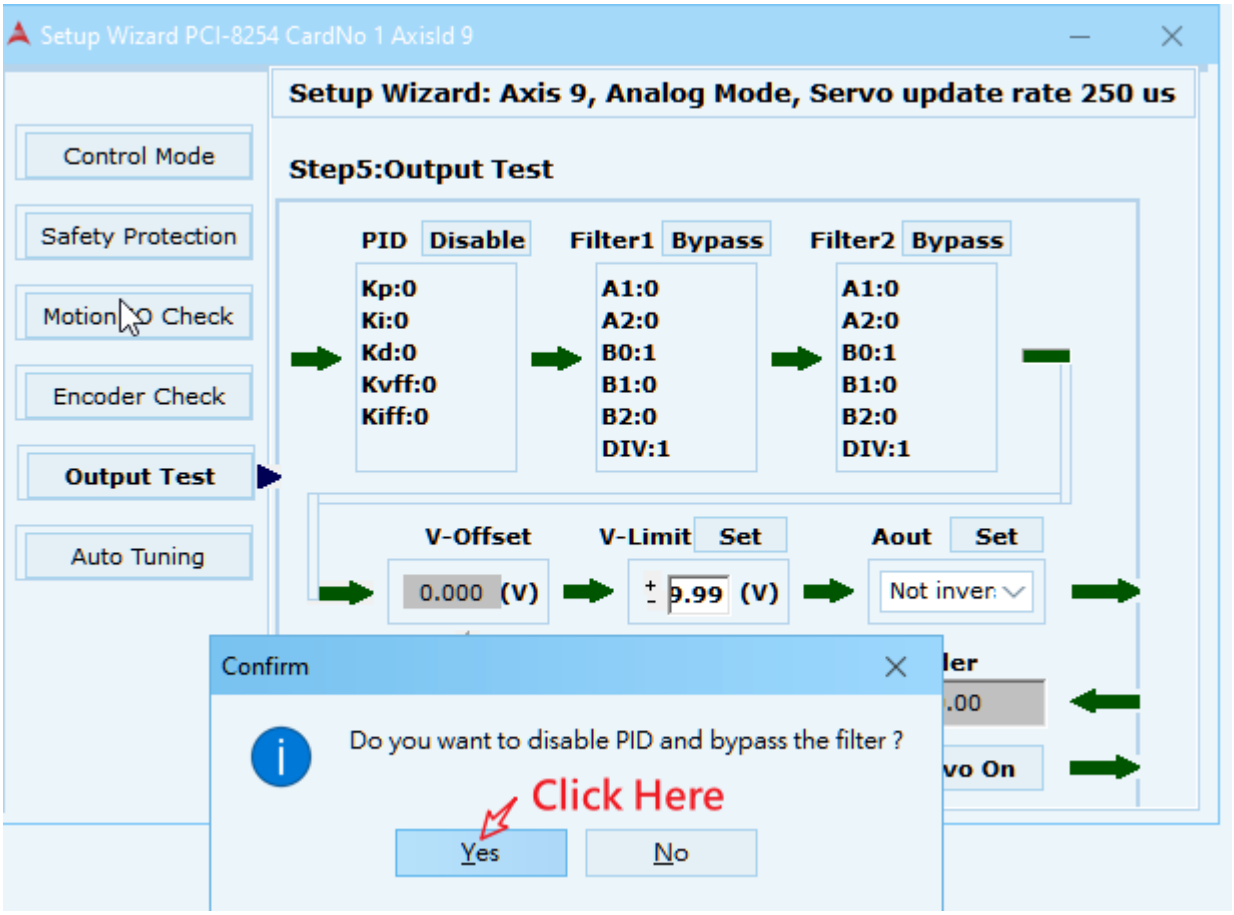
3.6.4 Encoder Check

After setting **Encoder Mode** and **Encoder Direction**, click **Set** to write the set values to the hardware.

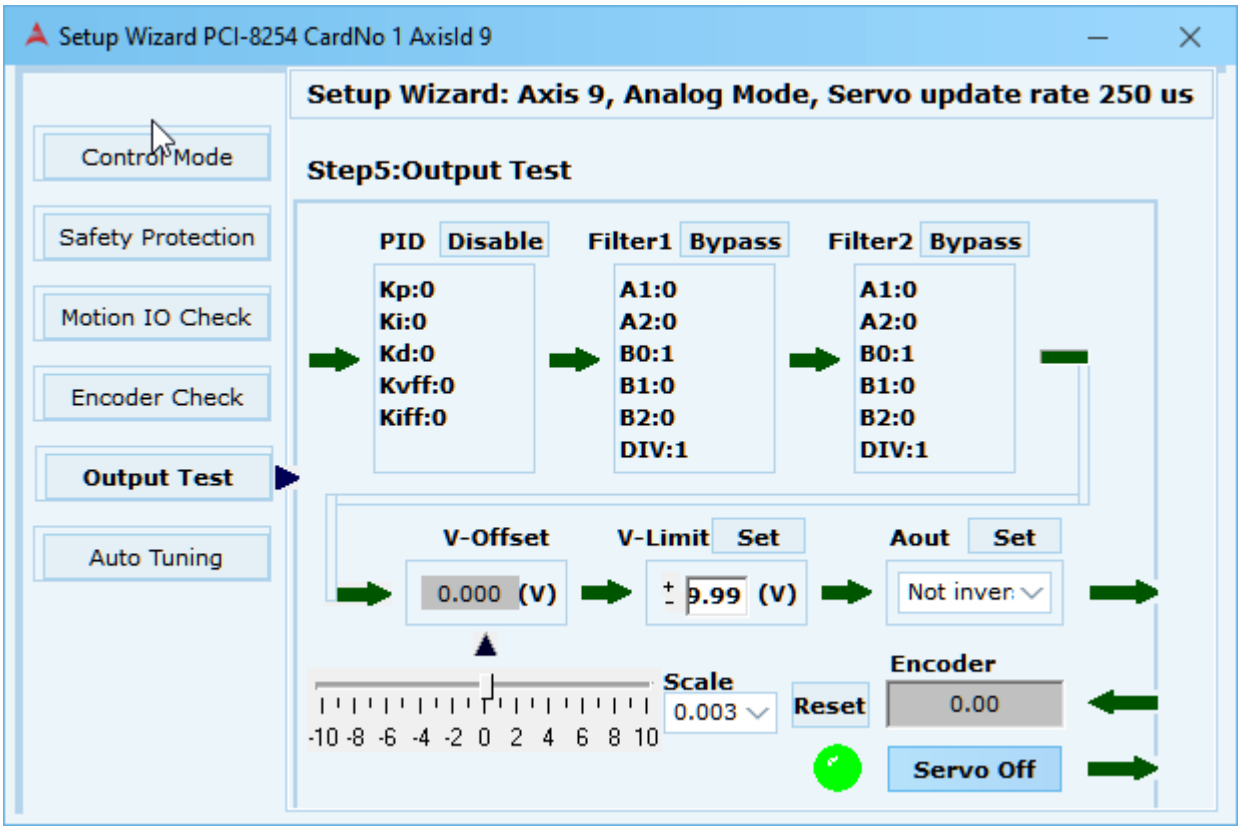


3.6.5 Output Test

When switching to the output test page, you will be automatically asked whether to clear parameters such as PID and Filter. Click **Yes** to clear all the settings. The PID parameter of the axis is set to 0 (Disable), and the filter parameter is set to no function (bypass). If you select "No", no configuration is performed.



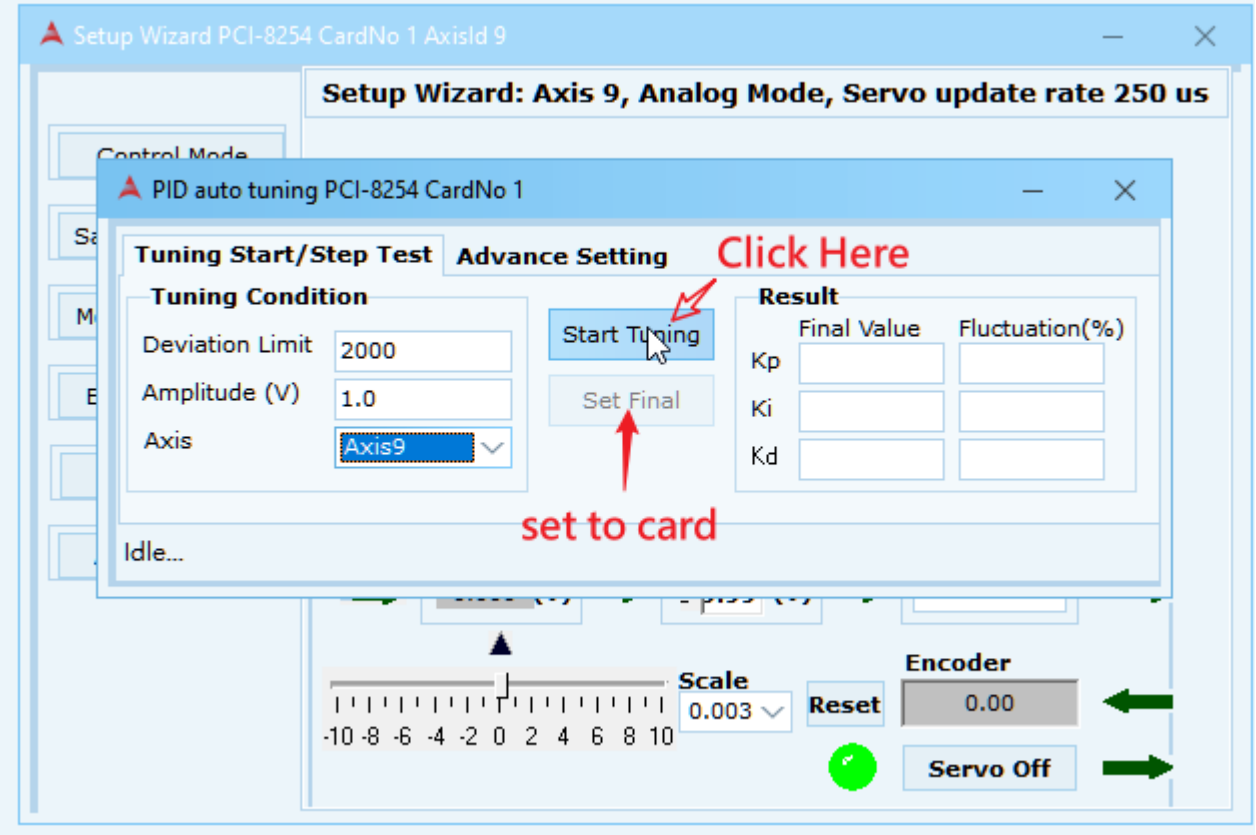
After Servo On is selected, the part selected by the dashed red box **[please add red box]** in the following figure is used to set the V-Offset value. First, select the scale size of a single shift from scale as 1V, 0.1V or 0.003V, and then use the mouse wheel or the left and right keyboard keys to adjust the V-Offset to an appropriate value.



3.6.6 Auto Tuning

After the settings in sections **2.1 to 2.5 [put in correct section numbers]** are complete, you will enter the auto-tuning function, which will automatically calculate a set of appropriate PID values according to your motion control system.

(1) Confirm whether the shaft number is correct.
(2) Select the Start Tuning button to start the tuning action (it might take some time).
(3) Adjust the vibration of the axis (Amplitude of vibration). If the vibration amplitude is too small, the Auto-tuning program cannot calculate the PID value.
(4) Repeat steps 2 and 3 to find a set of PID values. Results are displayed in the Result fields. Fluctuation indicates the calculation convergence (smaller is better).
(5) When the program is complete, you must click **Set Final** to write the PID value into the control card and complete auto-tuning.

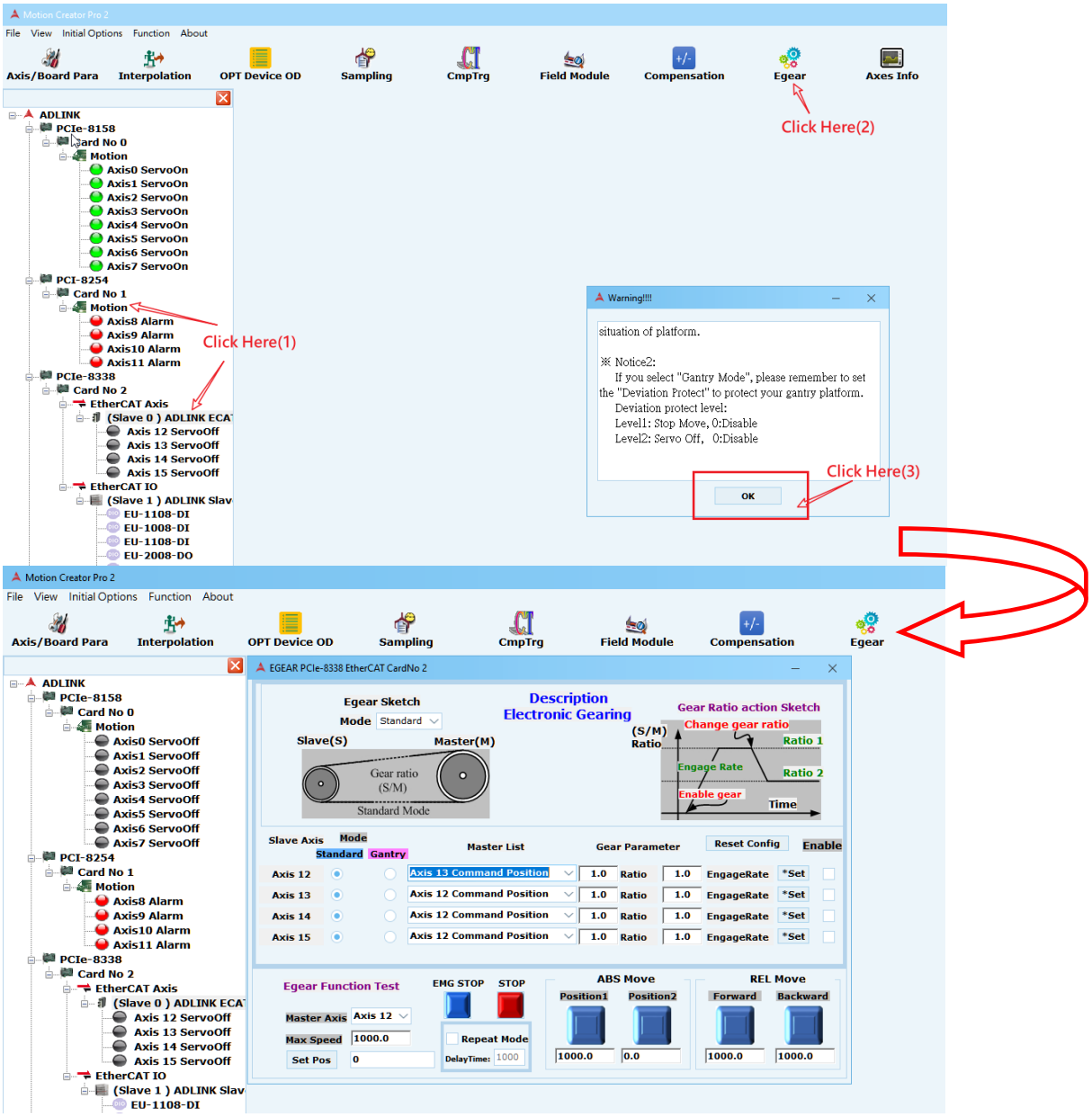


After completing the Setup Wizard, you can carry out a single-axis movement operation or positioning movement operation (homing). You can also go to 3.1.1 Parameter Configuration to view the axis parameter settings or save the parameters.

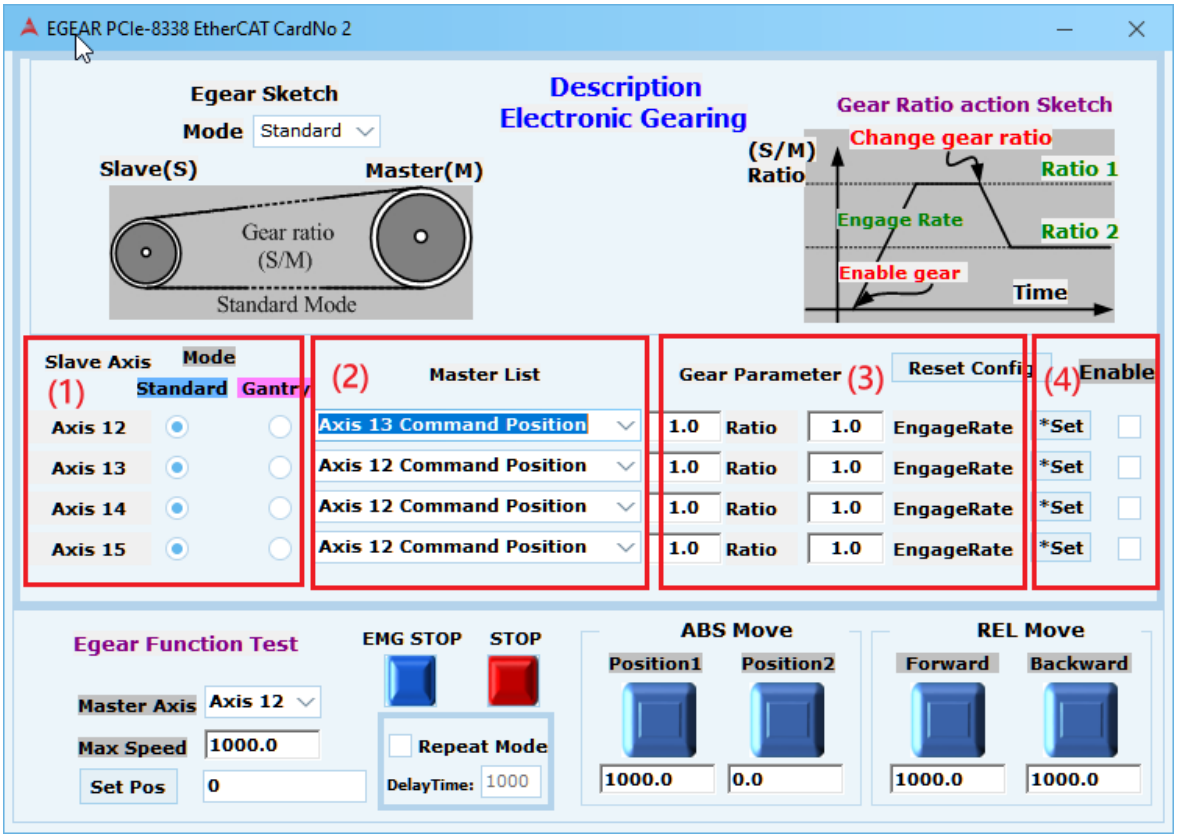
3.7 E-GEAR

Electronic gear functions are divided into two modes: Standard and Gantry. In Standard mode, gear ratios can be set in the master/driven shaft. The controller will output different displacements in the master/driven shaft according to the gear ratio set. The gear ratio of the master/driven shaft in Gantry mode is fixed at 1:1, which is suitable for situations where the master/driven shaft needs to move at the same time and the displacement is the same, like a gantry control system.

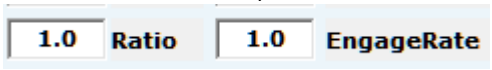
Click **Slave** or **Motion** in the device tree according to the coaxial card used, and then click the **Egear** icon. A warning message will pop up to remind you of the things you should pay attention to before using the electronic gear.



Set the electronic gear.

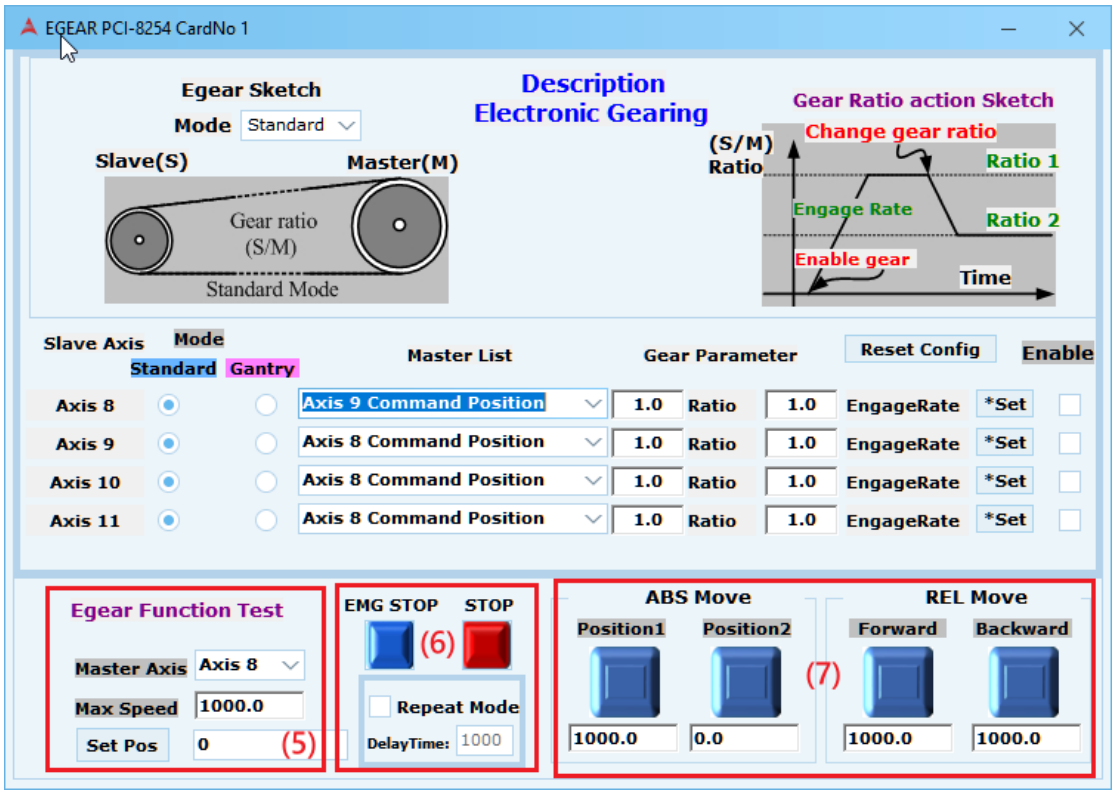


(1) Set the axis to Standard or Gantry mode
(2) Select the spindle number and signal source
(3) Set gear ratio parameters:
In Standard mode, set Ratio and Engage Rate



Set the protection amount of Deviation in Gantry mode
Level1: Stop Move
Level2: Servo Off

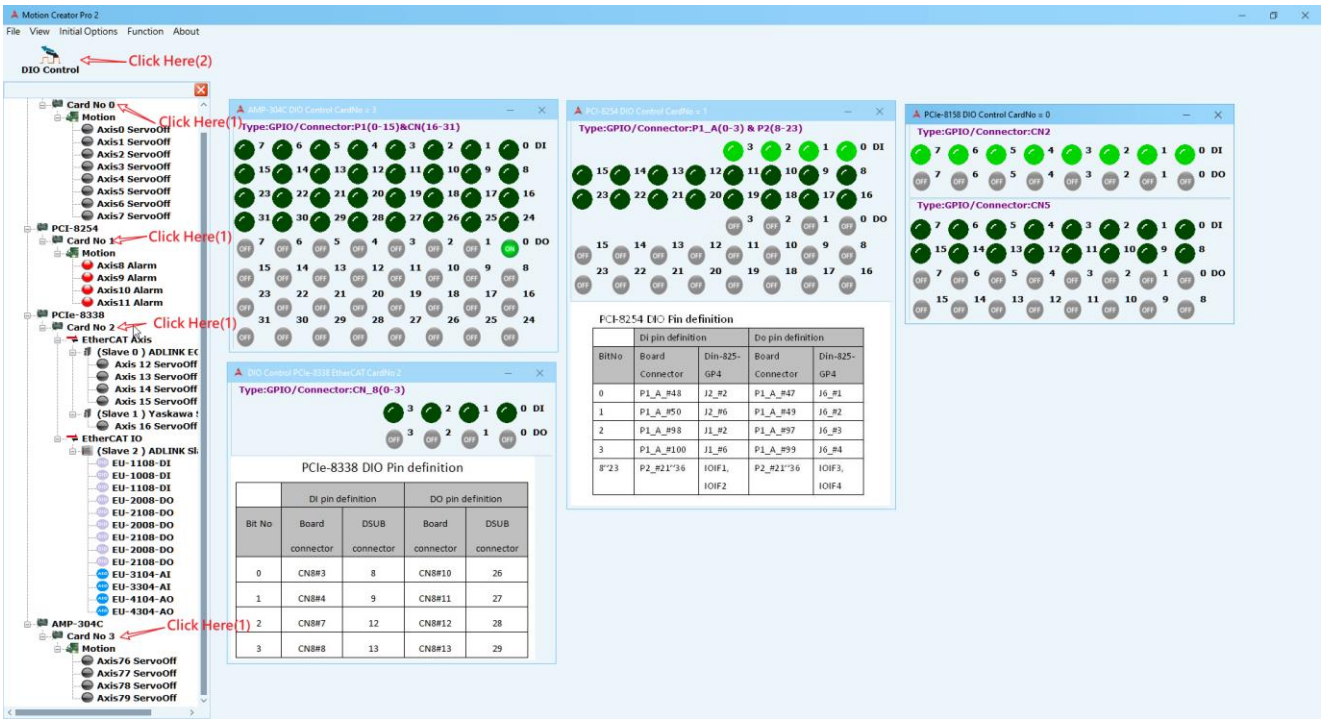
(4) Write parameter values into the controller and set whether to start



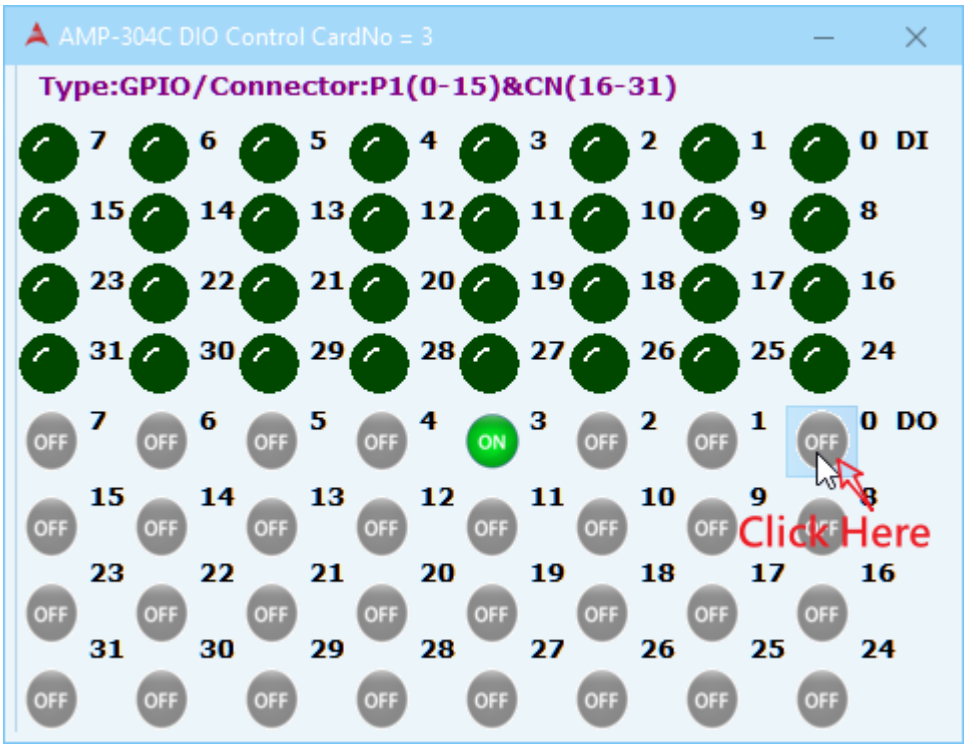
(5) Set the maximum speed and position of the spindle
(6) If it is necessary to perform reciprocating movement between two displacements, you can select Repeat Move and set the interval Delay Time before performing the movement operation
(7) ABS MOVE: Enter absolute position movement values
REL MOVE: Enter relative position movement values

3.8 DIO

The number of DIO groups supported varies depending on the axis card used. Click **Card No x** in the device tree, and then click the **DIO Control** icon to view DIO information.



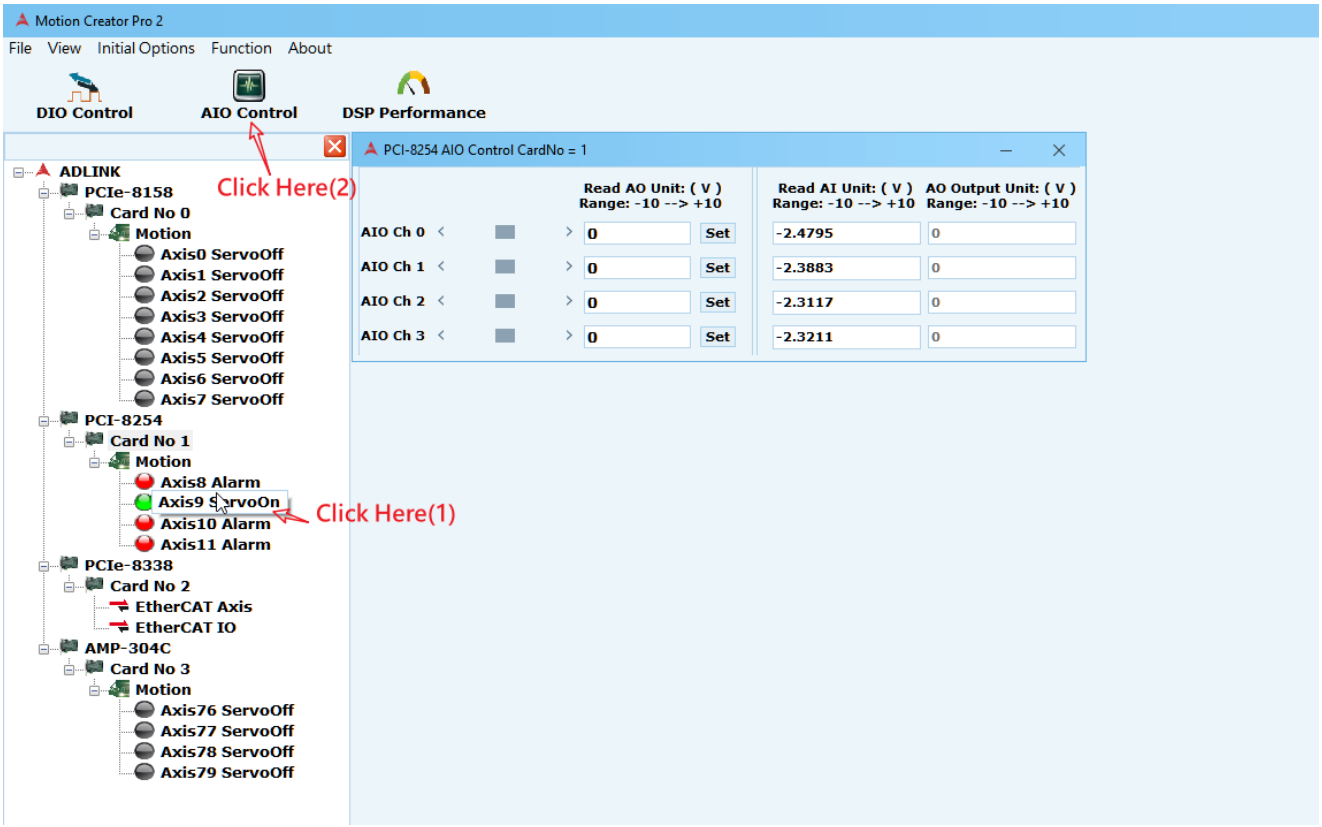
To set the digital output value, click the corresponding switch.



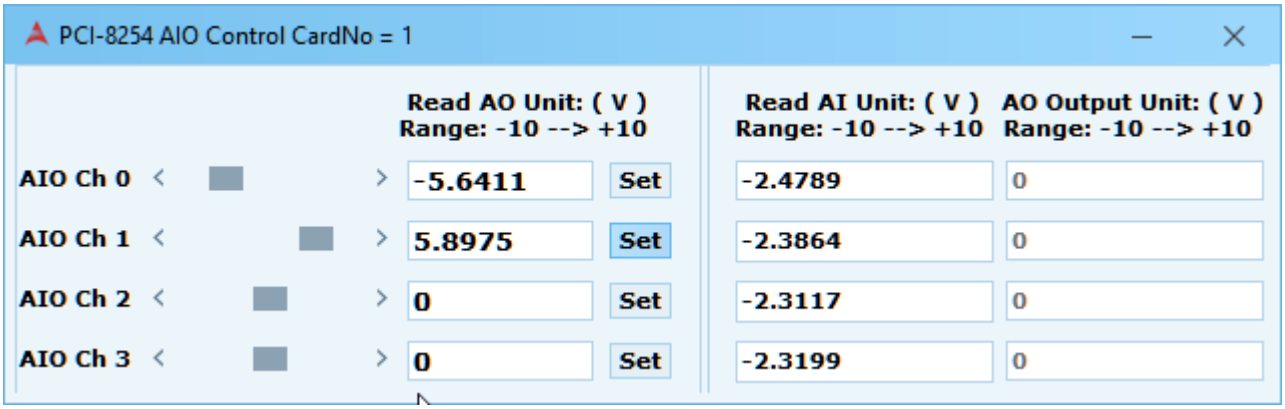
3.9 AIO

Different cards support different numbers of AIO groups. The analog output can be set using reel pull or direct input voltage value.

Click **Card No x** in the device tree, and then click the **AIO Control** icon to view AIO information.



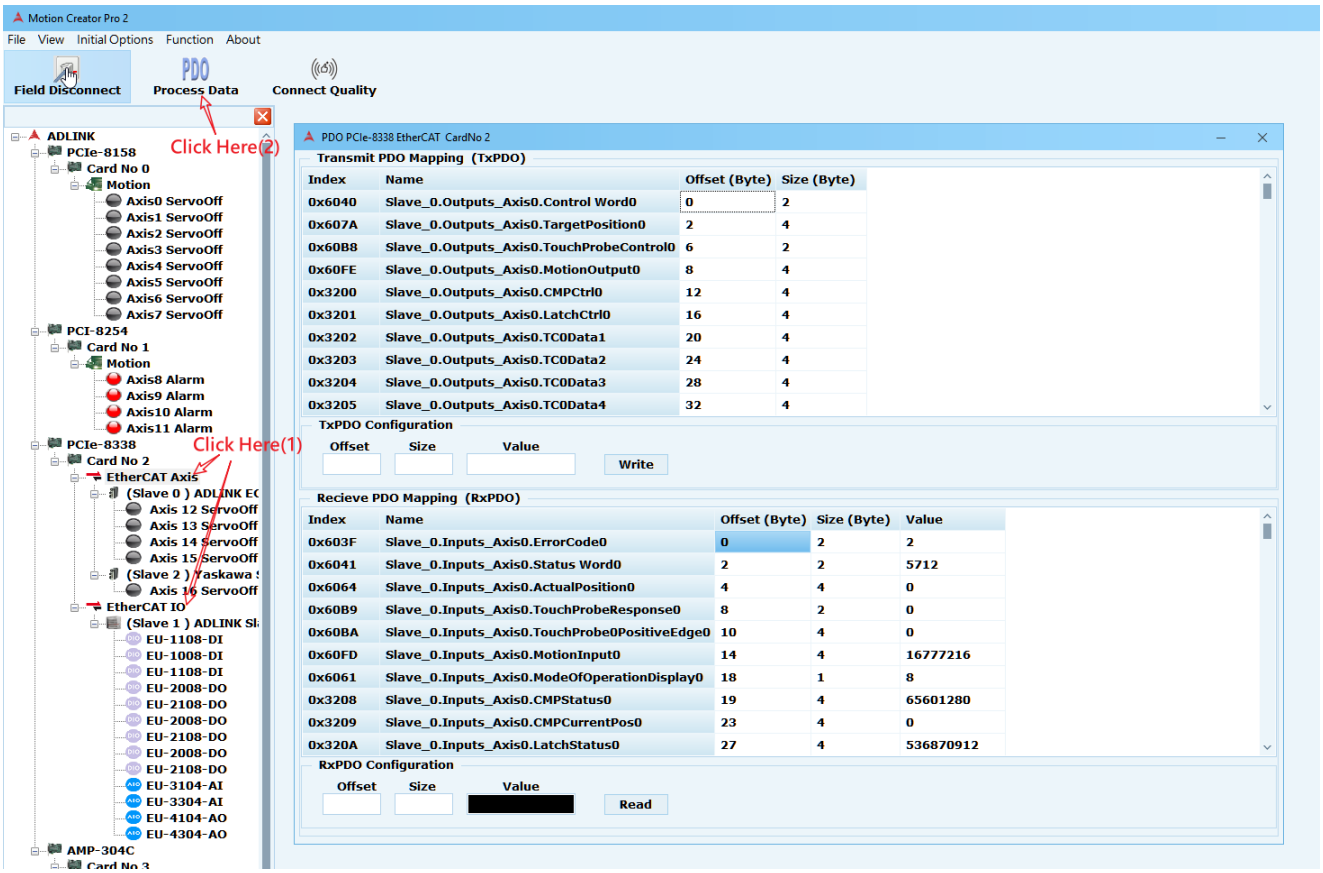
Setting analog output values by scrolling in the field with a mouse, or by direct entering a value, and then clicking **Set**.



3.10 PDO

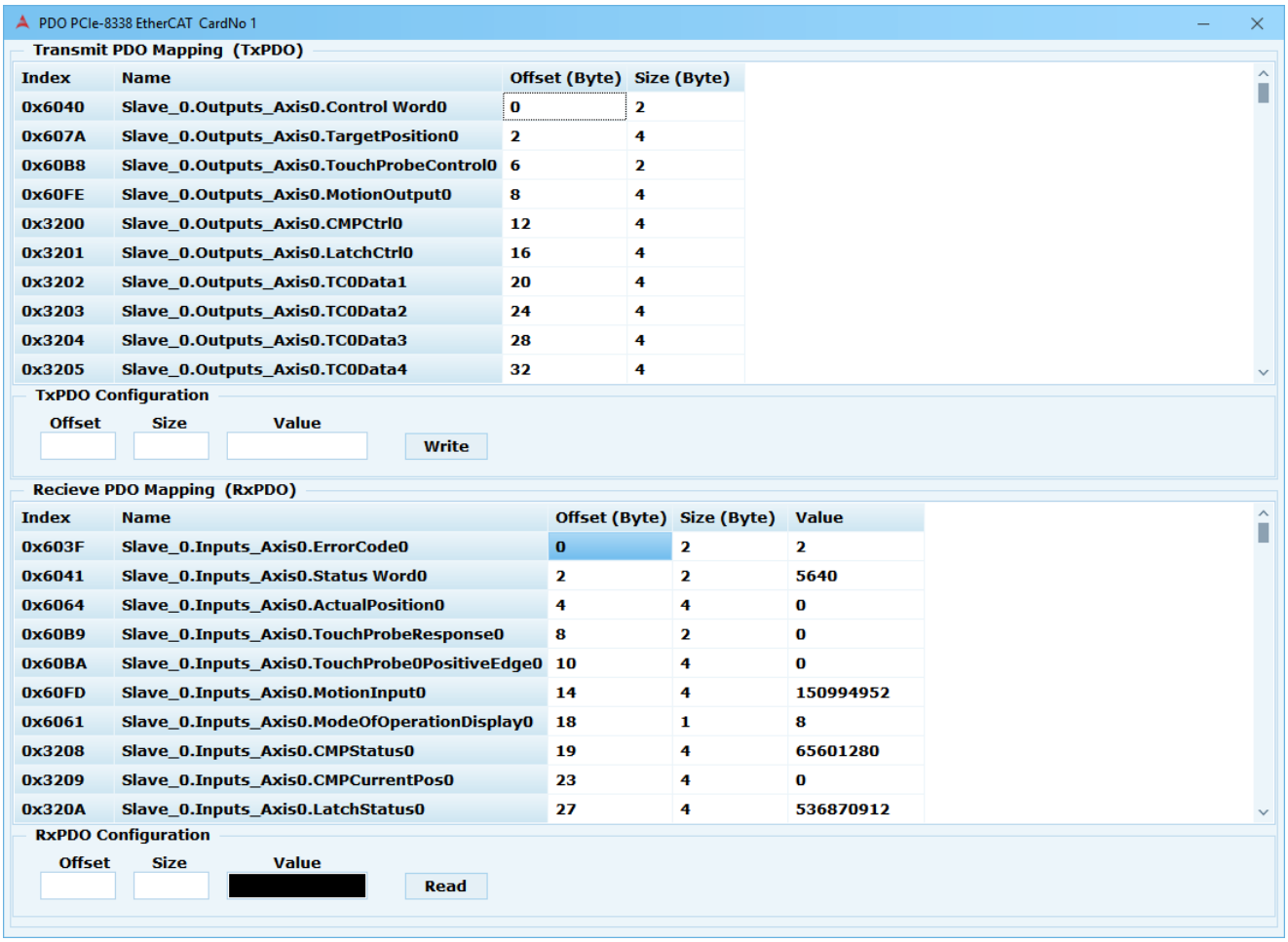
The Process Data (PDO) page can display the read and write exchange of a process data object (PDO).

Click **Ether Cat Axis** or **Ether Cat Axis IO** in the device tree, and then click the **PDO** icon to view process data information.



Users can enter requirements for what the PDO needs.

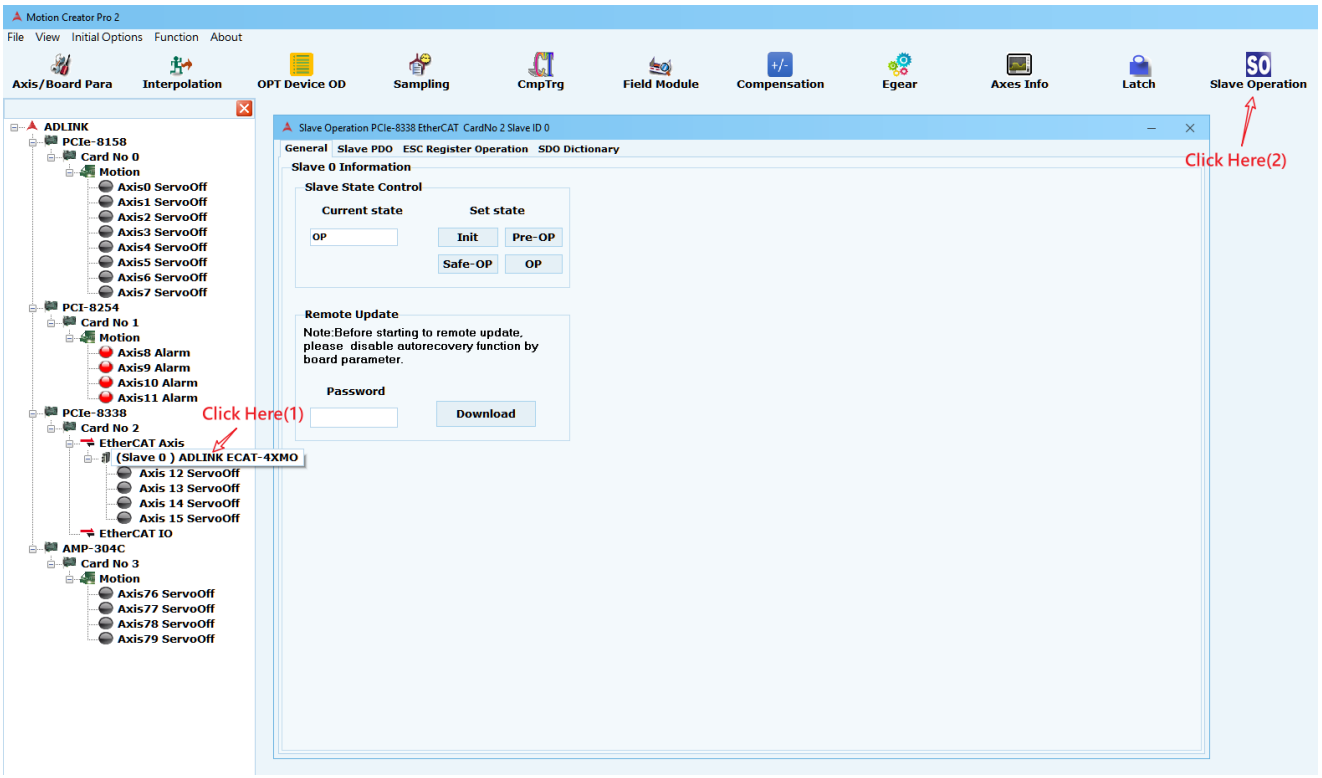
- **TxPDO**: Salve A program data object (PDO) sent from the station. The user can fill the offset, Value (Size is the size of the byte of Value, which will be automatically entered into the system after filling in the offset) into the edit field and press the Write button to write. You can also enter the offset Value for the desired value and press the Read button to read it.
- **RxPDO**: Slave A program data object (PDO) received from the slave. Press the Read button to read the offset Value of the input value to obtain the value and the corresponding Size.



3.11 SDO

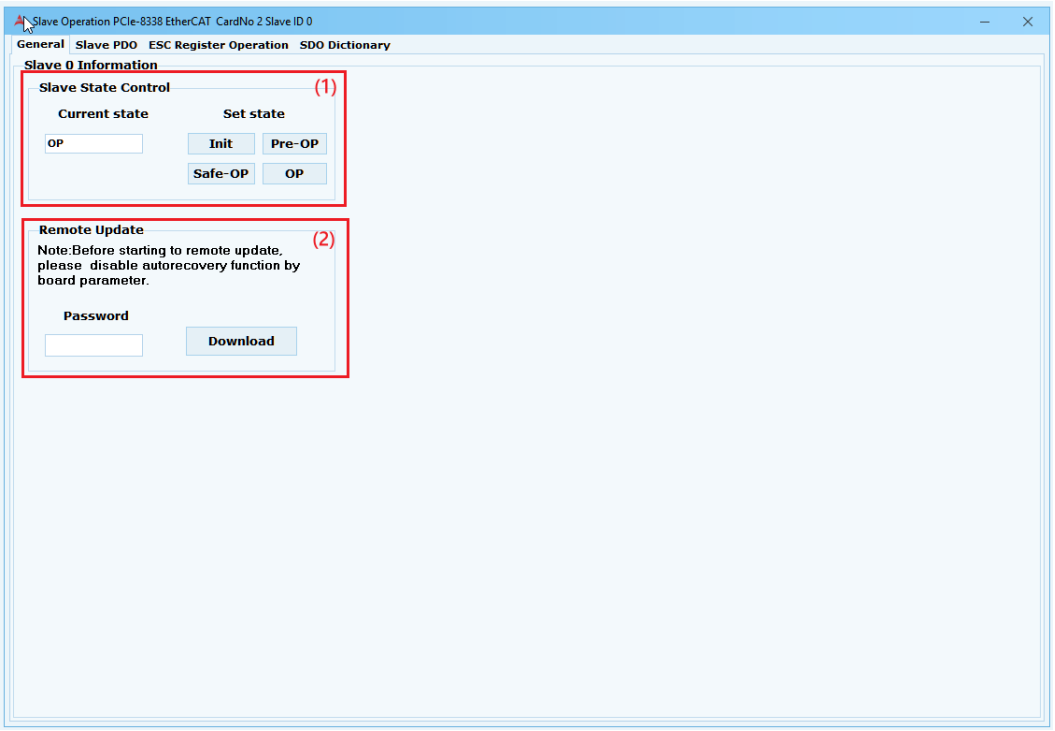
The SDO (Process Data) page can read and write OD (Object Dictionary) data through SDO communication to obtain the slave-specific data. SDO additionally supports parameter configuration and status monitoring.

Click **(Slave x) xxxxx xxxx** in the device tree and then click the **SO** icon.



The SDO Mapping Editor page has four sub-pages.

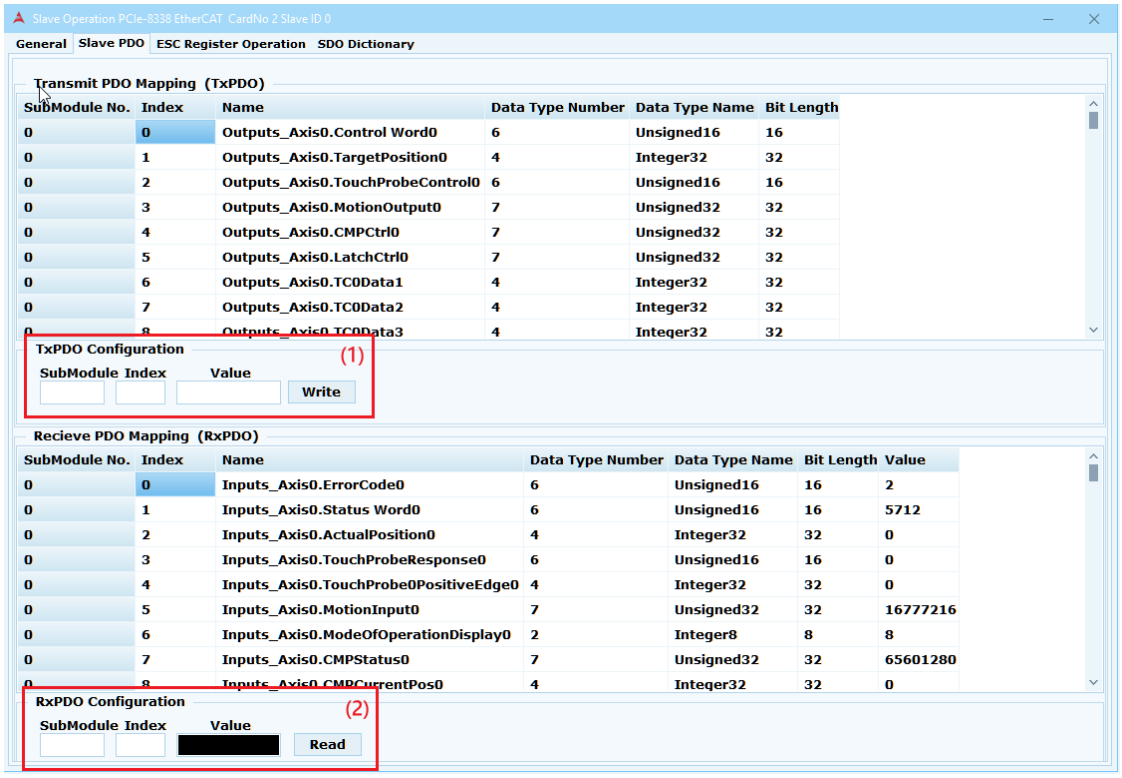
General



(1) **Slave State Control**: Set EtherCAT slave state.
(2) **Remote Update**: Update file over EtherCAT. (Contact ADLINK for details.)

Slave PDO

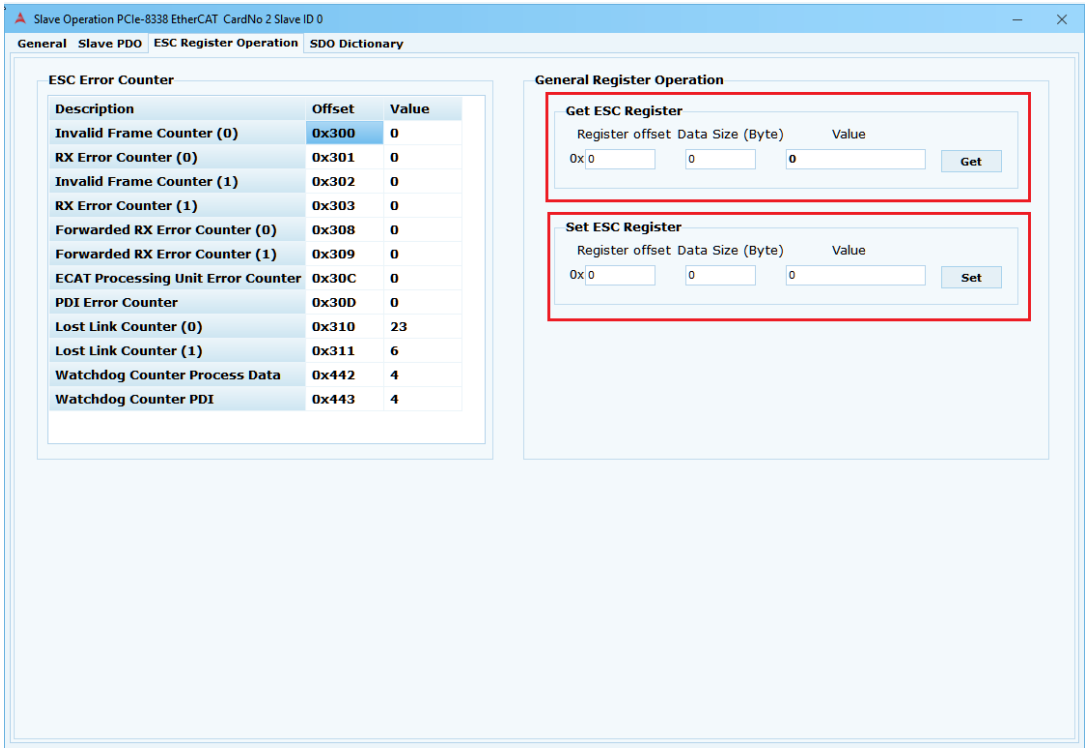
Slave PDO lists the object dictionaries that the slave can operate through the PDO, using the Read and Write buttons.



(1) **Write**: Input the SubModule and Index of the operation Name OD in TxPDO table, and enter the corresponding Value by referring to Data Type Name and Bit Length, and then click **Write**.

(2) **Read**: Input the SubModule of the operation name OD in the RxPDO table, Index and then click **Read** to get its value.

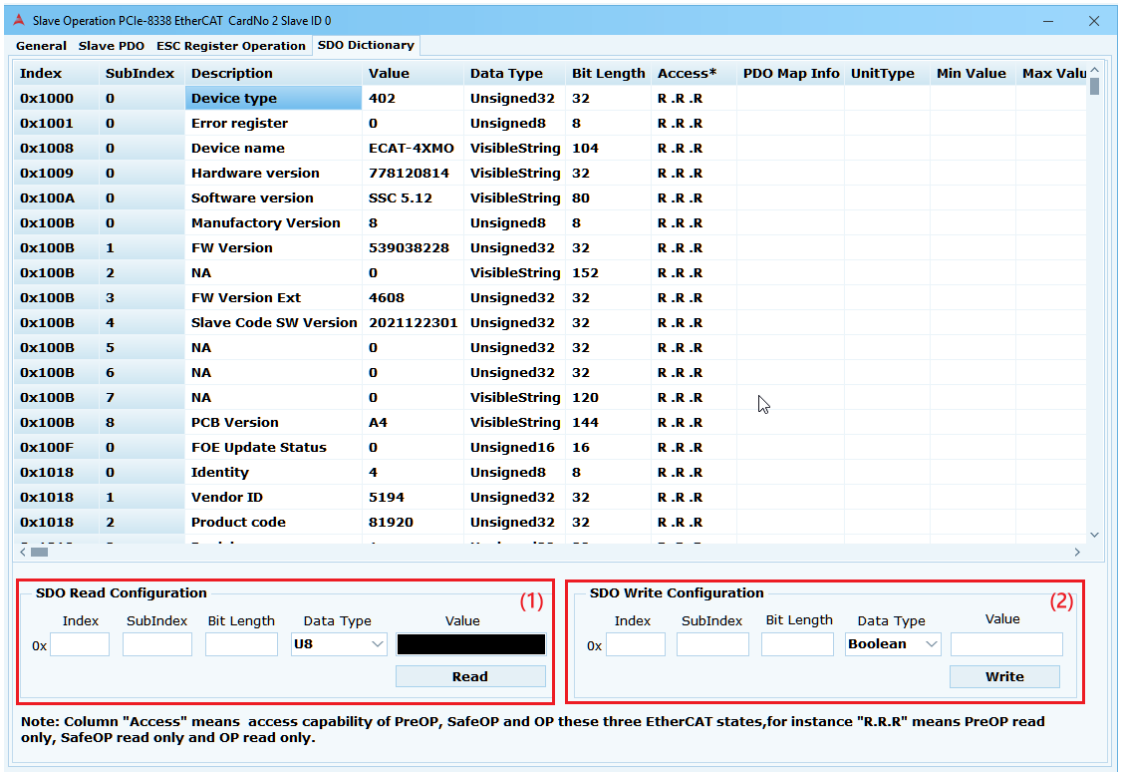
ESC Register Operation



Read and write information pages for EtherCAT Slave Controller.

SDO Dictionary

The SDO Dictionary page lists all the service data objects the user can manipulate.



(1) **Read**: Enter Index and SubIndex, and click **Read** to display the desired Value in the value field.

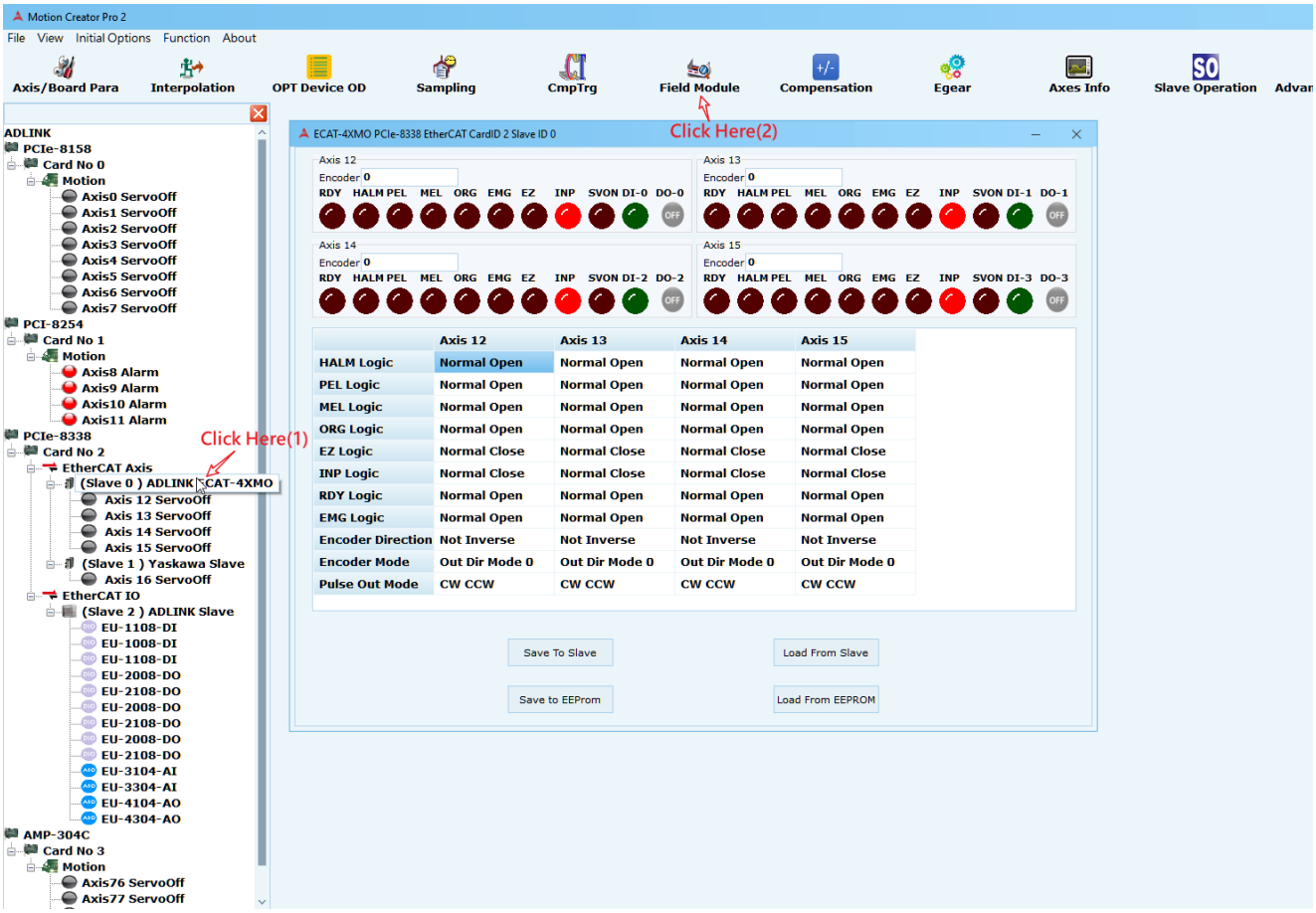
(2) **Write**: Enter Index, SubIndex,Value and click **Write** to set the desired values.

3.12 Field module

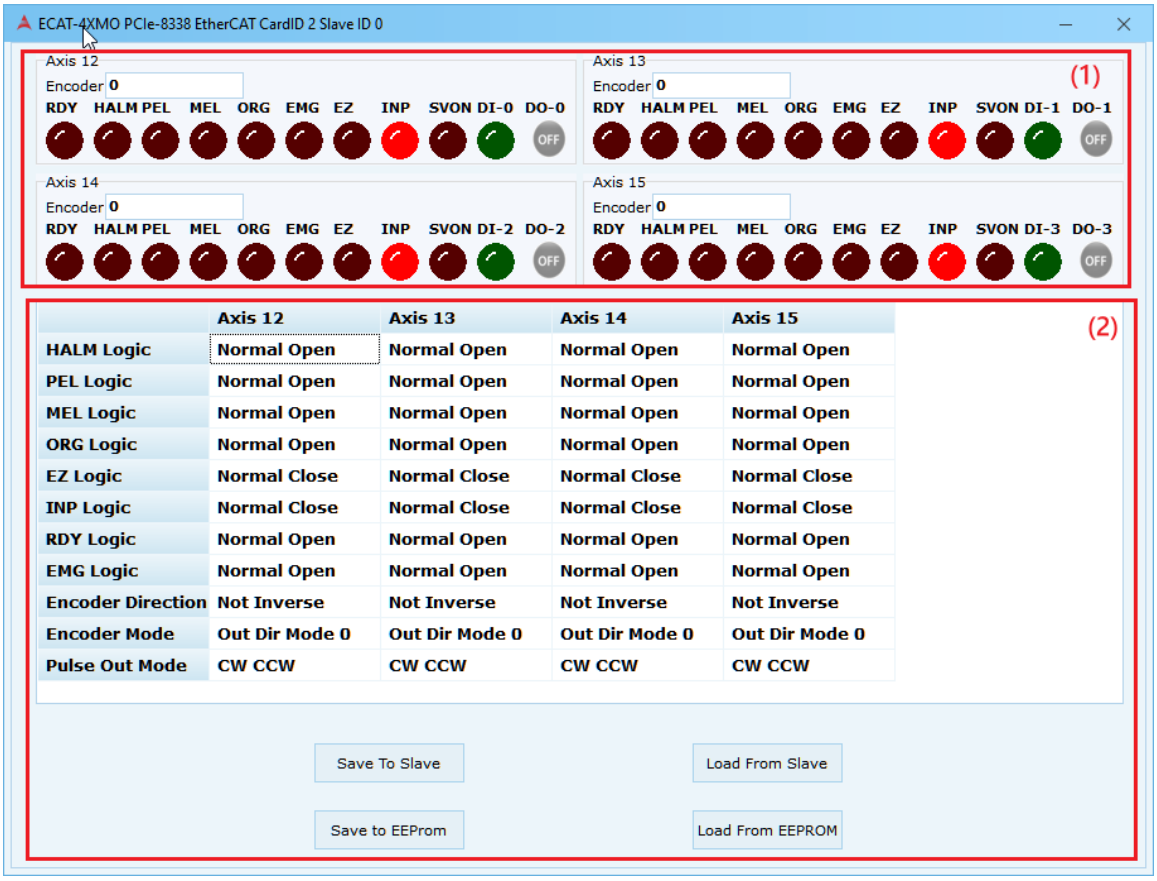
ADLINK Slave-specific pages, depending on Slave Axis or Slave IO, have different rendering functions.

3.12.1 ADLINK Slave Axis

To open the Field module page, click **Slave x** on the device tree, and then click the **Field module** icon.



Using an ECAT-4XMO, for example, the information is divided into two areas.

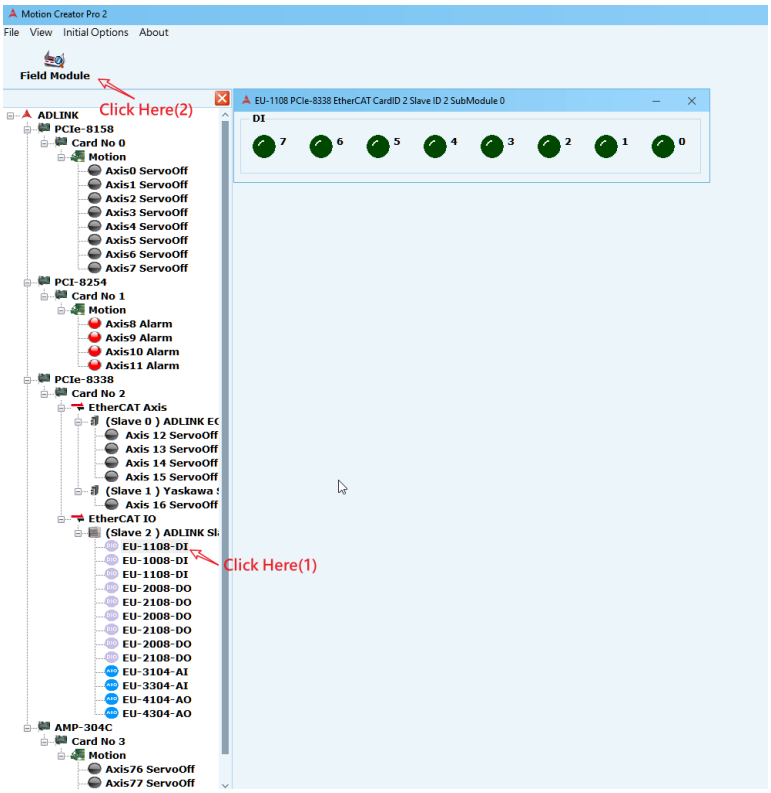


	Axis 12	Axis 13	Axis 14	Axis 15
HALM Logic	Normal Open	Normal Open	Normal Open	Normal Open
PEL Logic	Normal Open	Normal Open	Normal Open	Normal Open
MEL Logic	Normal Open	Normal Open	Normal Open	Normal Open
ORG Logic	Normal Open	Normal Open	Normal Open	Normal Open
EZ Logic	Normal Close	Normal Close	Normal 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

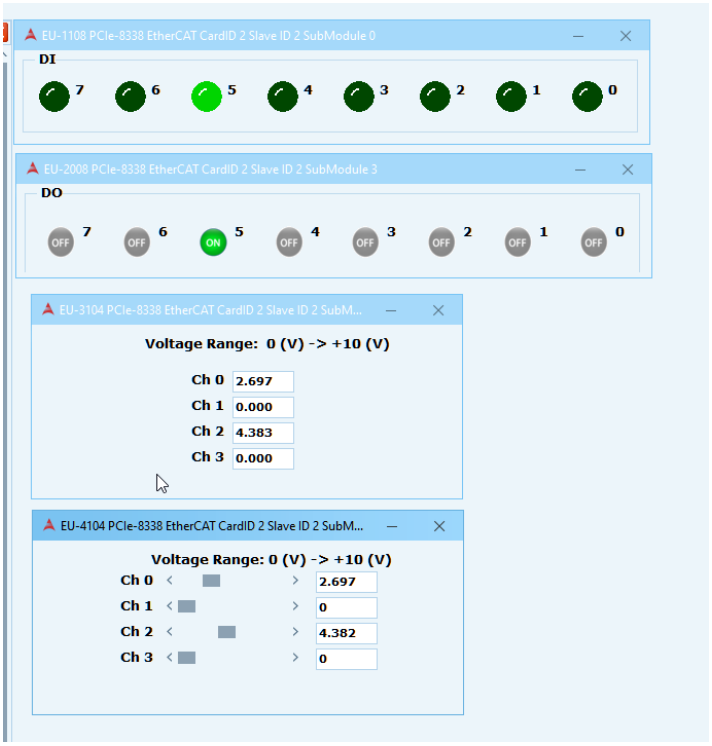
(1) Displays the status of each axis.
(2) Common SDO configuration support settings for an ADLINK slave.

3.12.2 ADLINK Slave IO

Click **DIO** or **AIO** in the device tree, and then click the **Field Module** icon.



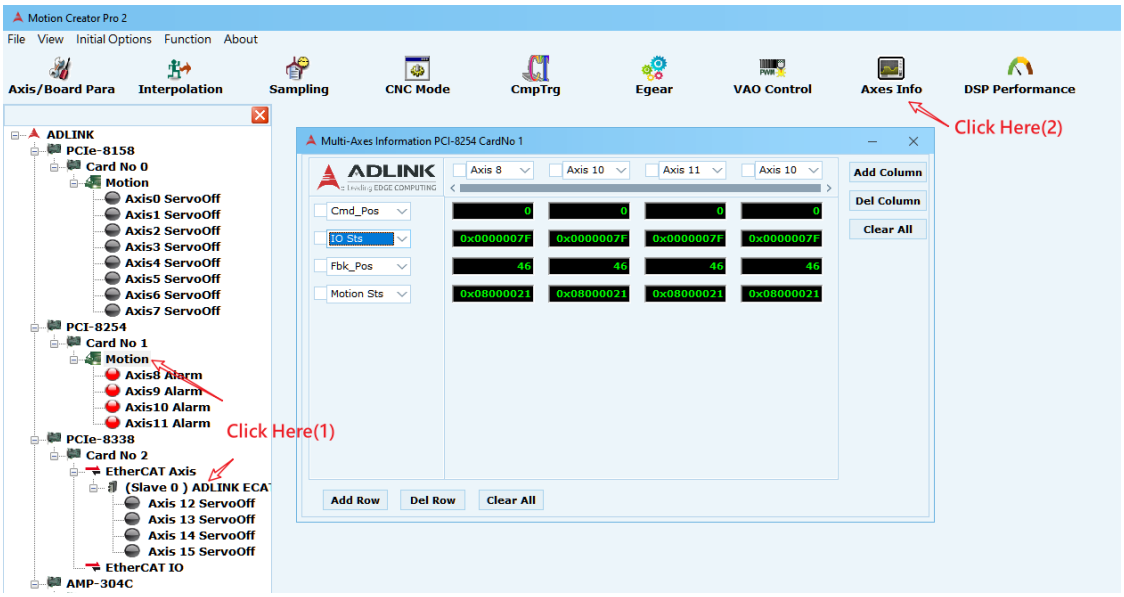
Using an EU-6000, for example, the information is divided into four different DIO and AIO settings.



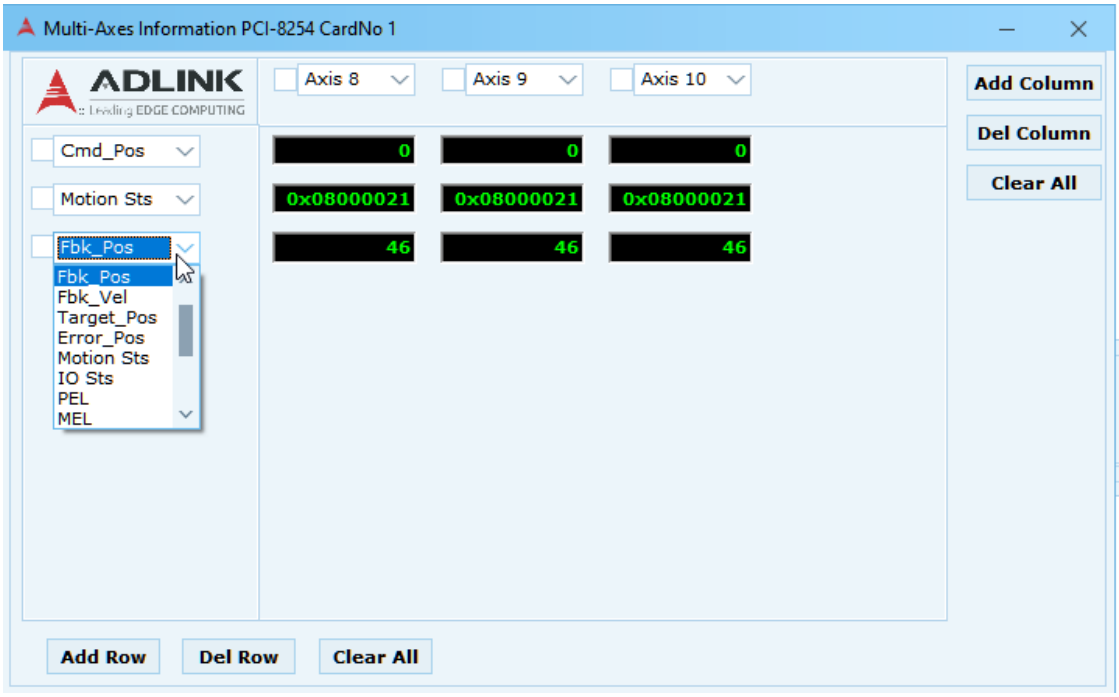
3.13 Axis Info

The Axis info page monitors new or removed custom multi-axis motion states, commands, feedback, speed, acceleration, etc. for data monitoring.

To open the multi-axis information page, click **Slave x** or **Motion** on the device tree, and then click the **Axes Info** icon.



The multi-axis information page content is as follows.

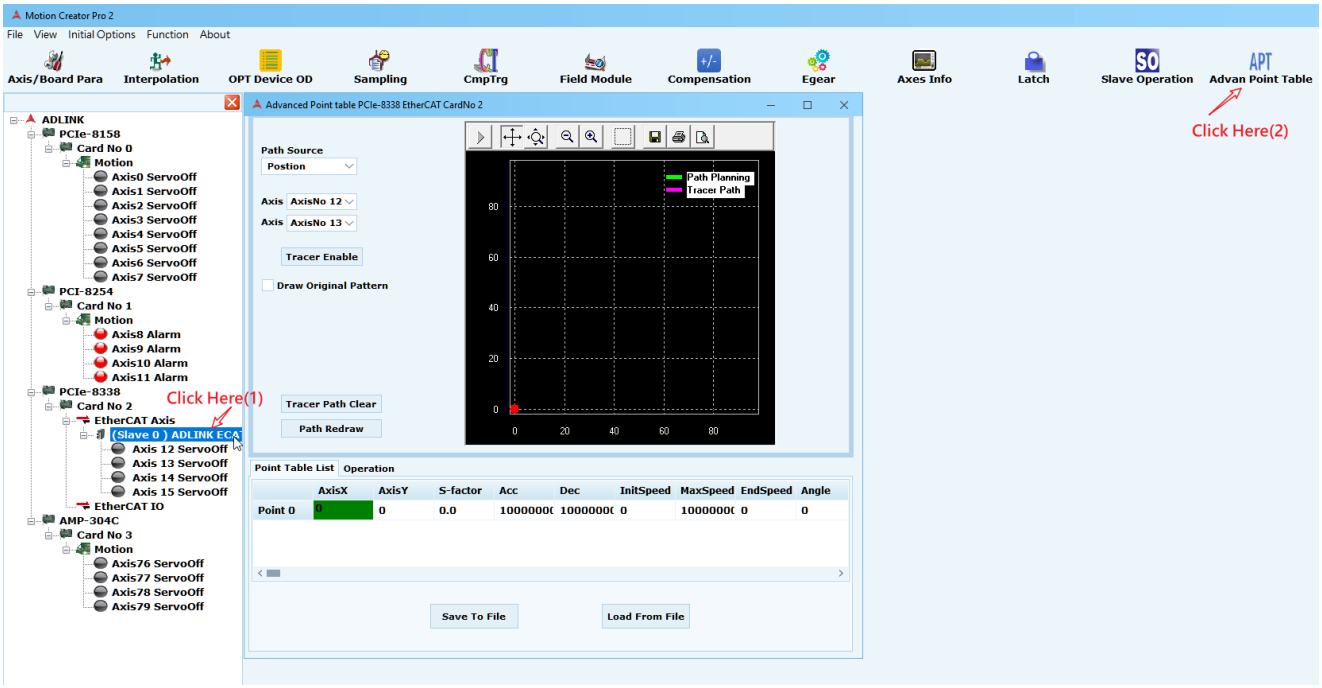


- **Add Row**: Add columns from multiple monitoring sources, such as Cmd_Pos, Cmd_Vel, Fbk_Pos, Fbk_Vel and other monitoring sources.
- **Del Row**: Deletes the selected monitoring source column.
- **Clear All**: Deletes all monitoring source columns.
- **Add Column**: Adds a row with multiple monitoring axes. You can select the axis number to be monitored from the drop-down list.
- **Del Column**: Deletes the selected monitoring axis.
- **Clear All**: Deletes all monitoring axes.

3.14 Advanced Point Table

The advanced point table provides the function of two-dimensional multi-point continuous motion planned by the user and displays the motion trajectory on the chart. The motion content includes absolute linear motion, circular motion or relative linear motion, and circular motion. Users can set the basic parameters of each point motion and save the file for later use.

To open APT page, click **Slave x** on the device tree, and then click the **APT** icon.

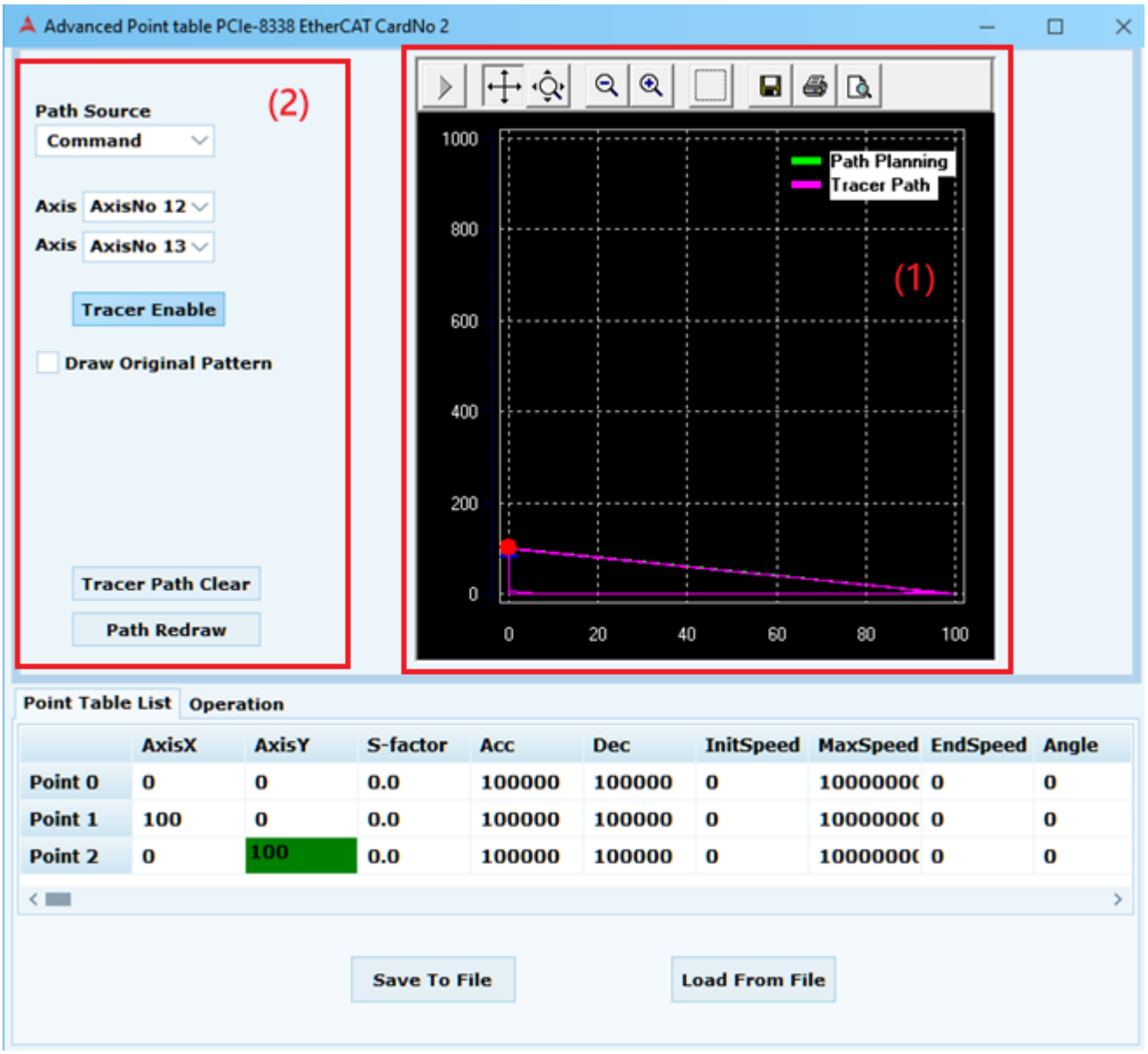


3.14.1 Drawing Area

The two-dimensional point movement track set by the user can be displayed in area (1). The green line (Path Planning) is the trajectory of the control command, and the pink line (Tracer Path) is the trajectory of the actual movement.

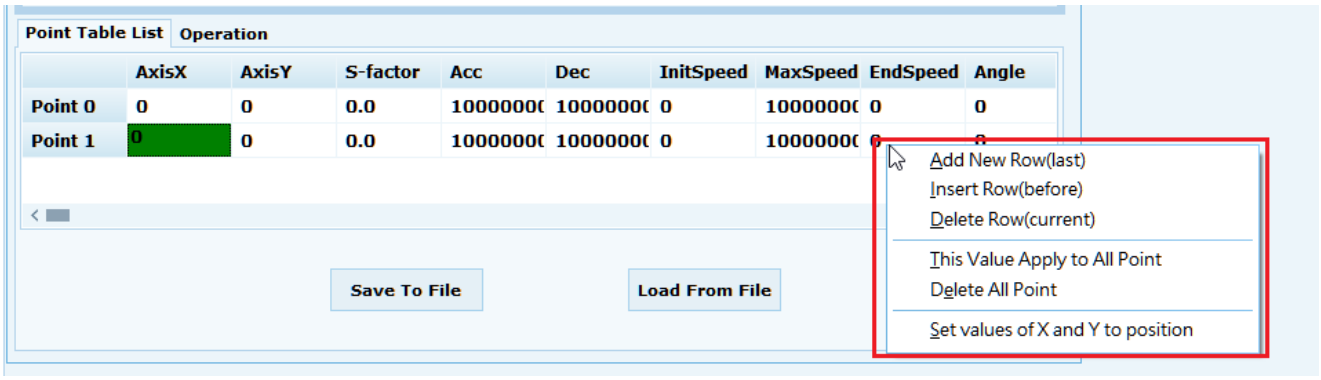
The drawing function (2) is set as follows:

- **Path Source**: Actual motion position or command position
- **Axis X,Y**: Selects the axis ID of the 2D motion
- **Tracer Path Clear**: Clears the actual path from the drawing area
- **Path Redraw**: Redraws the control command trajectory

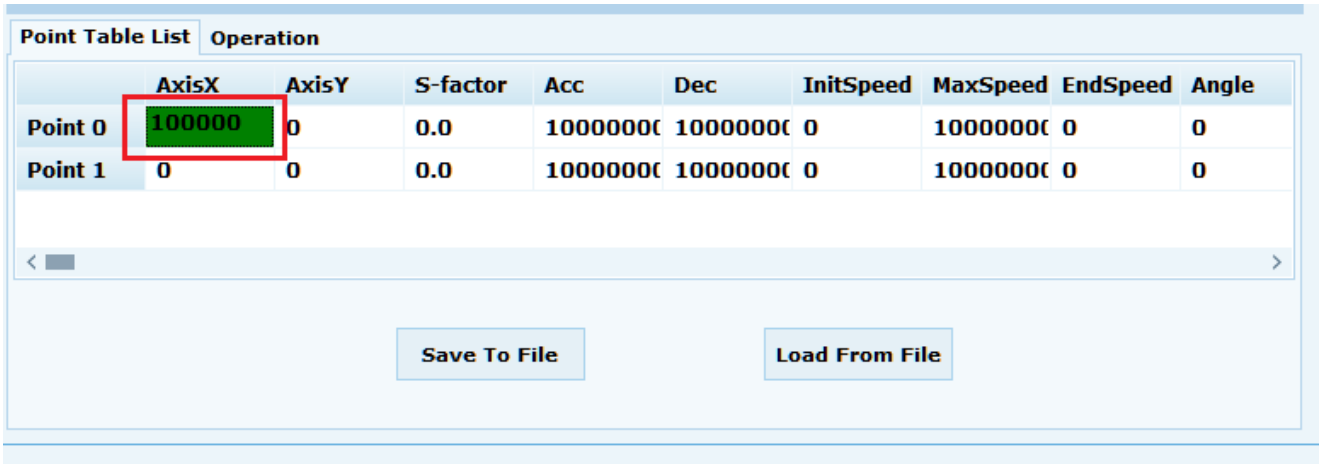


3.14.2 Configuration Area

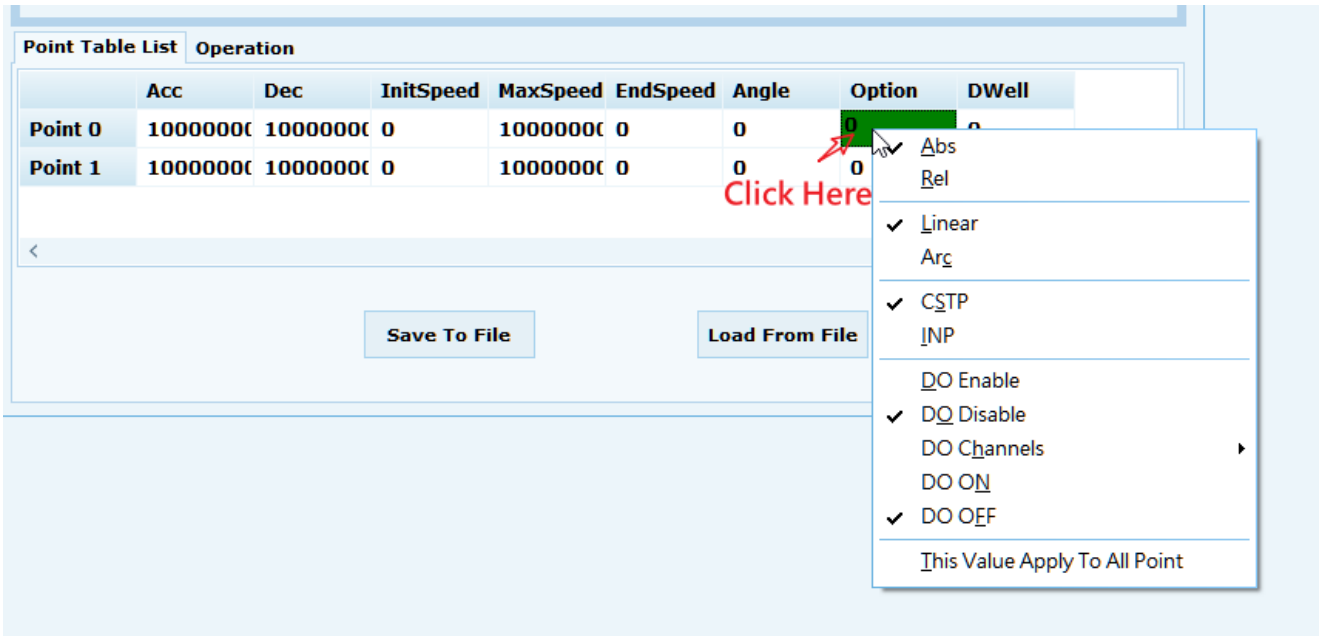
Right-click on the Point Table List to add or delete point movements.



Click in the grid to edit the information of the motion command. For example, the position of Point 0, Axis X, is 100000.



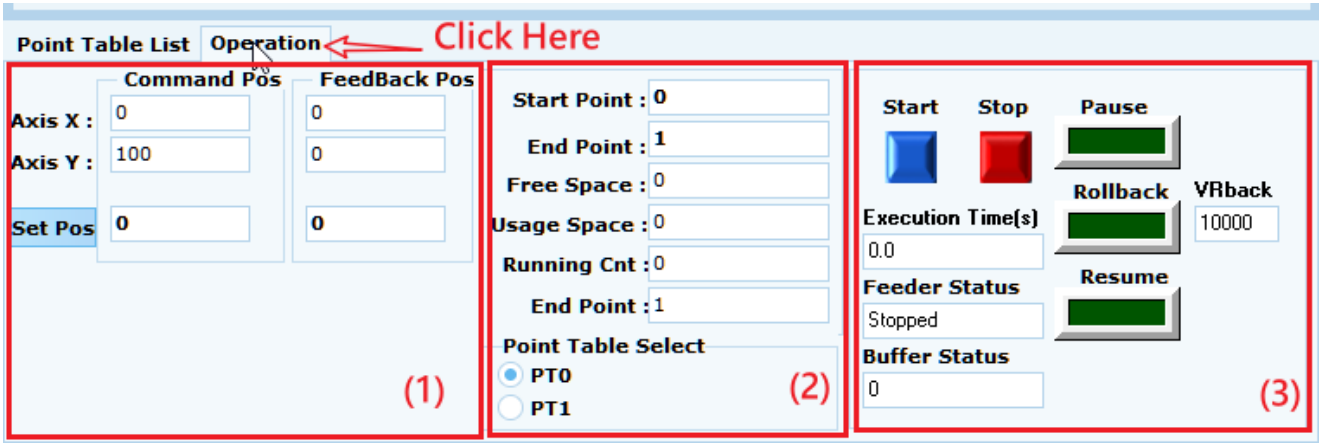
Right-click in an Option cell to access advanced configuration options, such as Abs (absolute motion), Rel (relative motion), Linear (linear), Arc (Arc), etc.



3.14.3 Operation Area

Click the Operation tab to see the following options.
(1) Use these values to monitor the command and feedback position of the two axes.
(2) Use these values to monitor the current point to which the command has been executed, the buffer status of the point table, and which point table to select.
(3) Use these values to monitor the execution time, feeder status and buffer status of the dot filler. Additional functions include:

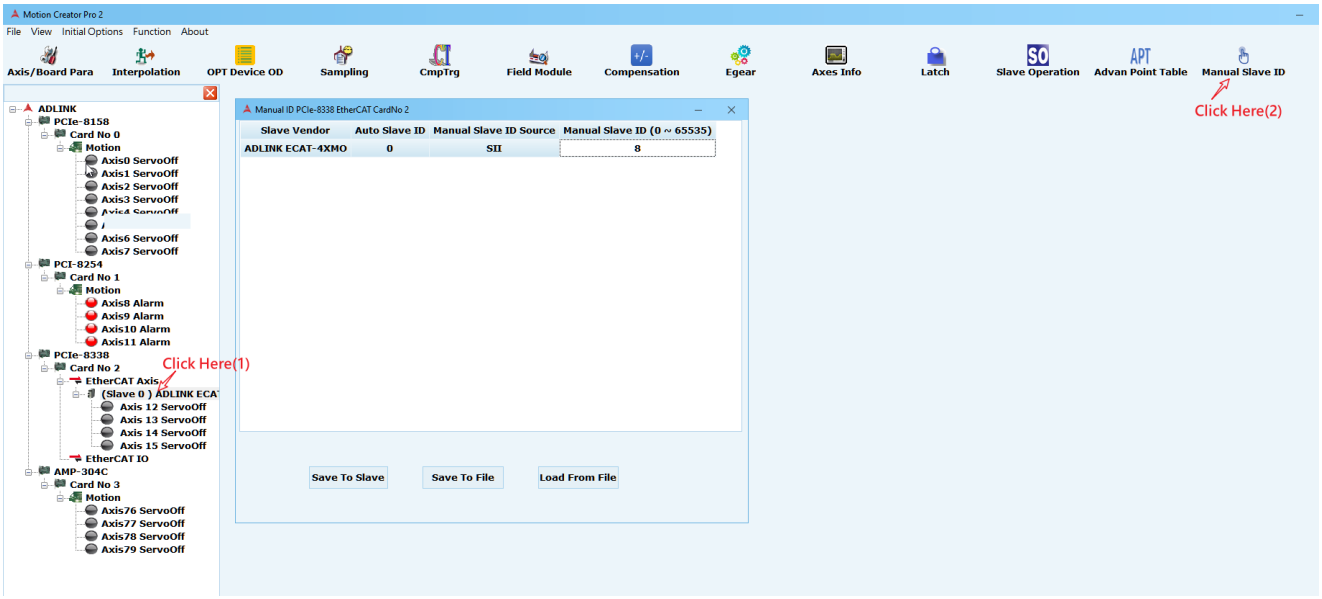
- **Start**: Start point table motion.
- **Stop**: Stop point table motion.
- **Pause**: Pause point table motion.
- **Rollback**: In Pause state, use the speed set by VRback to return to the previous motion position.
- **Resume**: Resume from pause.



3.15 Manual Settings Slave ID (Manual ID)

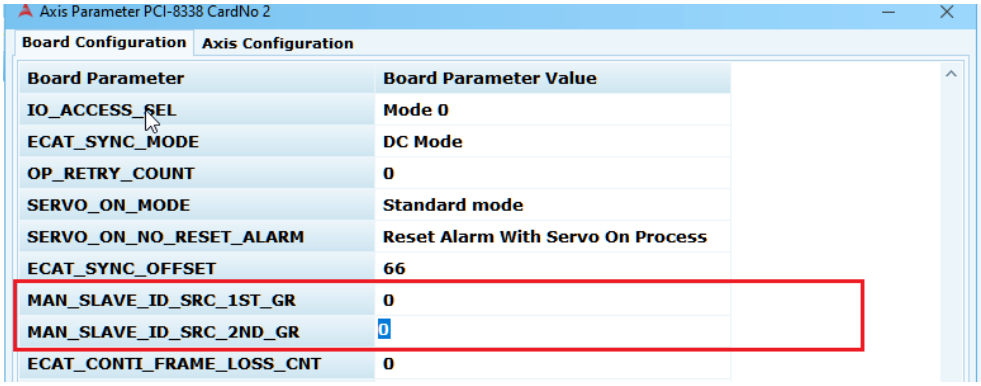
Manual ID allows the user to set the ID of each Slave.

To open the Manual ID page, click **Slave x** in the device tree, and then click the **Manual ID** icon.

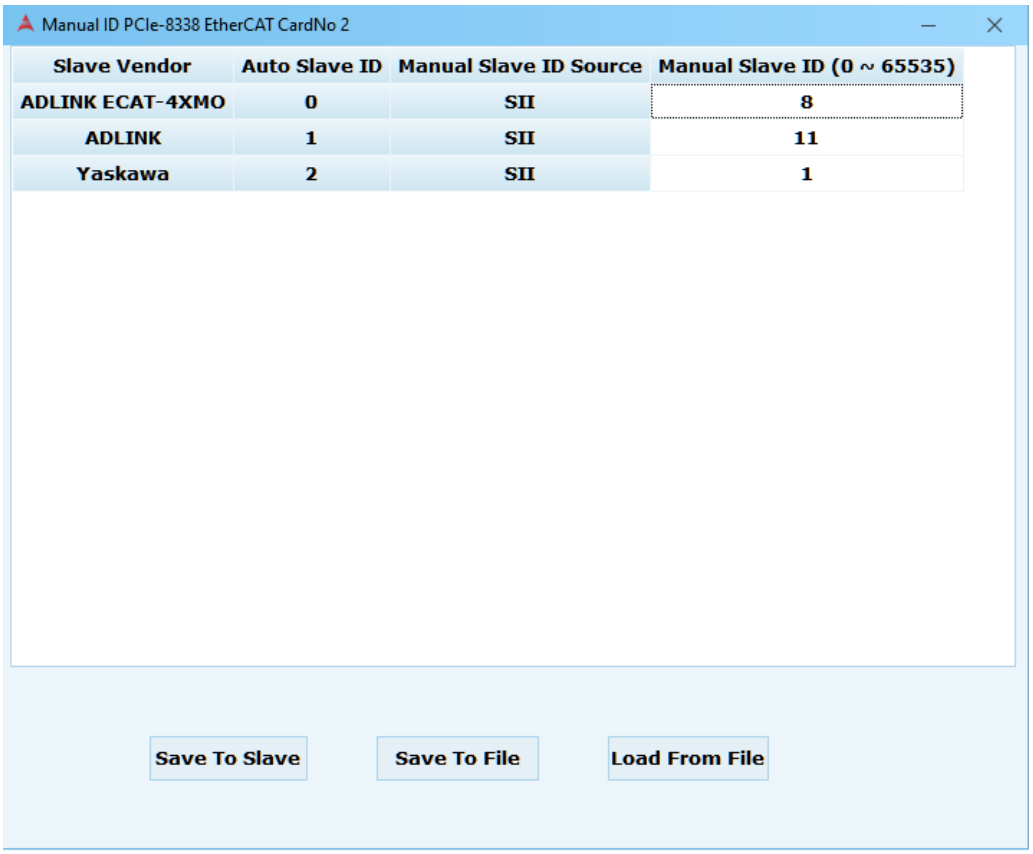


Information about the Manual ID includes:

- **Auto Slave ID**: Slave IDs that are automatically sorted from 0 to 63335 are listed in this table.
- **Manual Slave ID Source**: Currently, PCI-833X is configured to read from the ESC Configured Station Alias Register and is defined as SII. The other mode gets the information for the ID-Selector by reading the AL Status Code defined as AL Control. This information needs to be combined with board parameter to select different reading modes to read ID information. For these settings, refer to the APS Function Library manual.



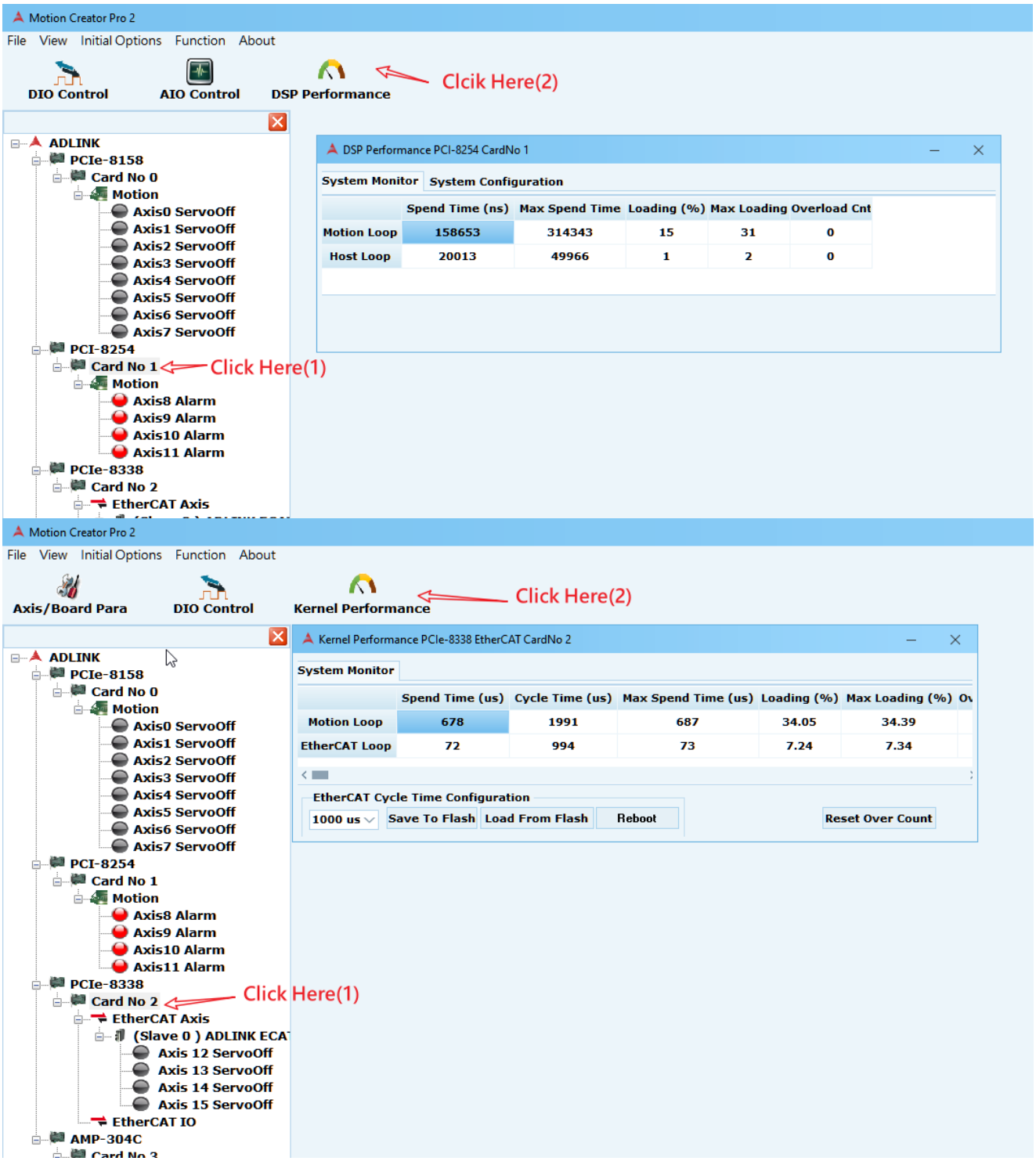
- **Manual Slave ID**: Editable Slave ID.
- **Save to Slave**: Writes the configured Slave ID to the EEPROM of the Slave.
- **Save to File**: Saves configuration as an xml file.
- **Load From File**: Loads an xml file and displays it in the table.



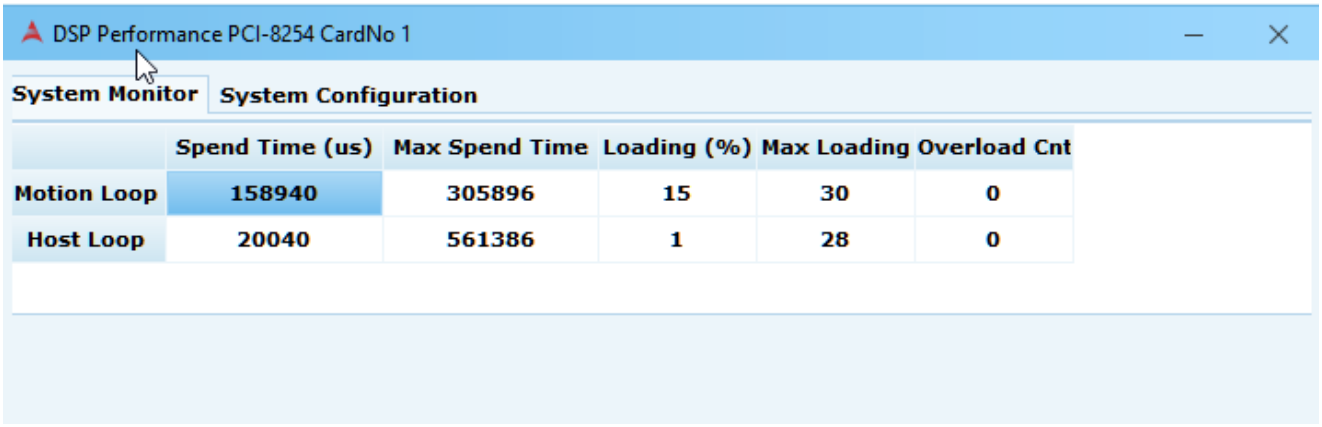
3.16 DSP/Kernel Performance

DSP/Kernel Performance provides the user's current EtherCAT cycle time and motion cycle time, consumption time, and load, as well as the user's settings for changing the current cycle time.

To open the DSP/Kernel Performance, click **Card No x** on the device tree, and then click the **DSP Performance** or **Kernel Performance** icon as necessary.

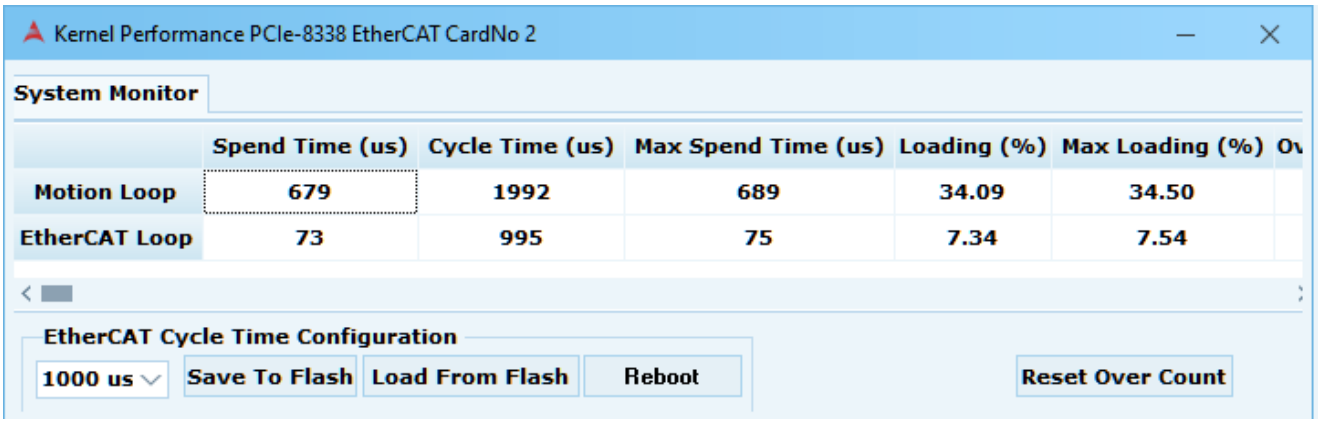


3.16.1 DSP Performance



- **Spend Time**: Time consumed per cycle of the current operation in nanoseconds
- **Max Spend Time**: Maximum time taken so far in nanoseconds
- **Loading**: Proportion in current cycle (work proportion) (100%)
- **Max Loading**: Recorded maximum DSP workload (100%)
- **Overload Cnt**: Cumulative number of overloading

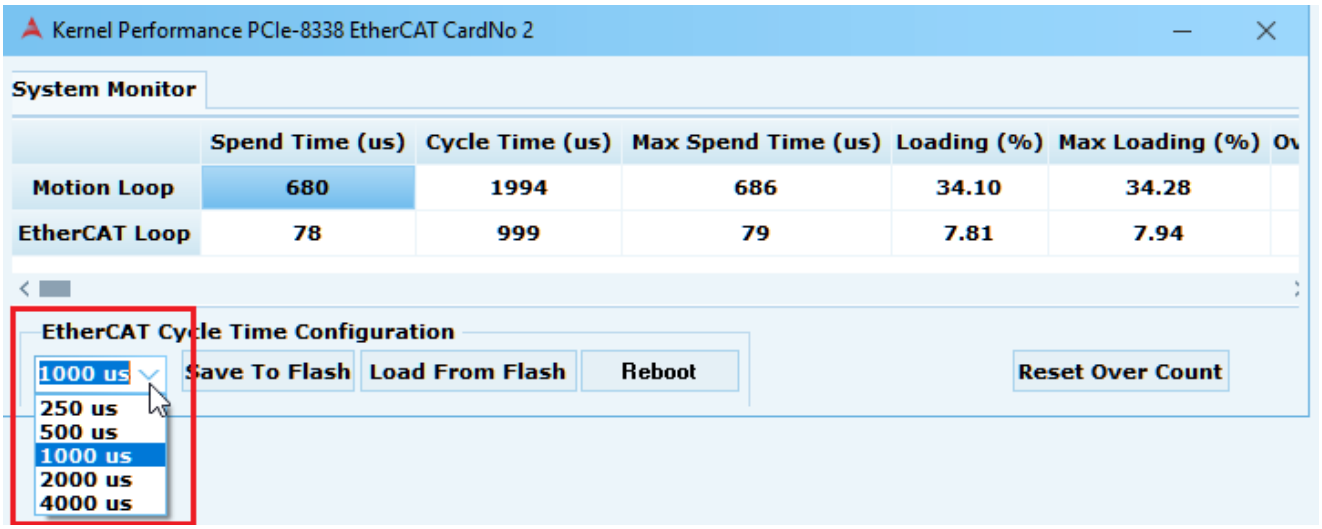
3.16.2 Kernel Performance



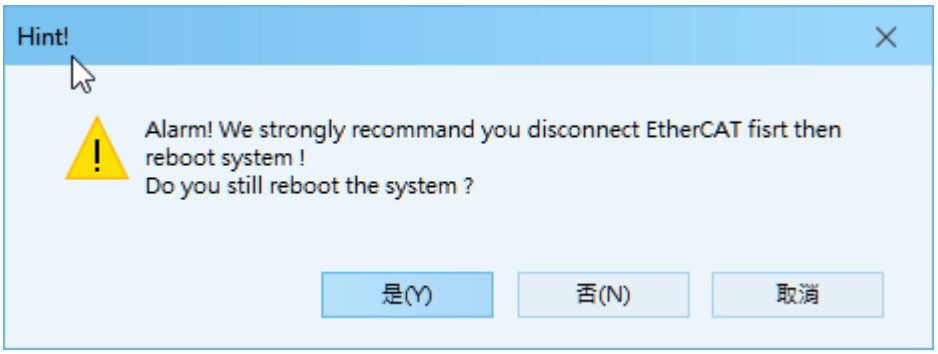
- **Spend Time**: Actual system consume time in microseconds
- **Cycle Time**: Actual system cycle time in microseconds
- **Max Spend Time**: MCP2 estimates the system's biggest consumption time in microseconds
- **Loading**: MCP2 estimates the percentage of the system's current computational load (%).
- **Max Loading**: MCP2 estimated system current maximum load percentage (%)
- **Overload Cnt**: Cumulative number of overloading

3.16.3 How to set EtherCAT Cycle time

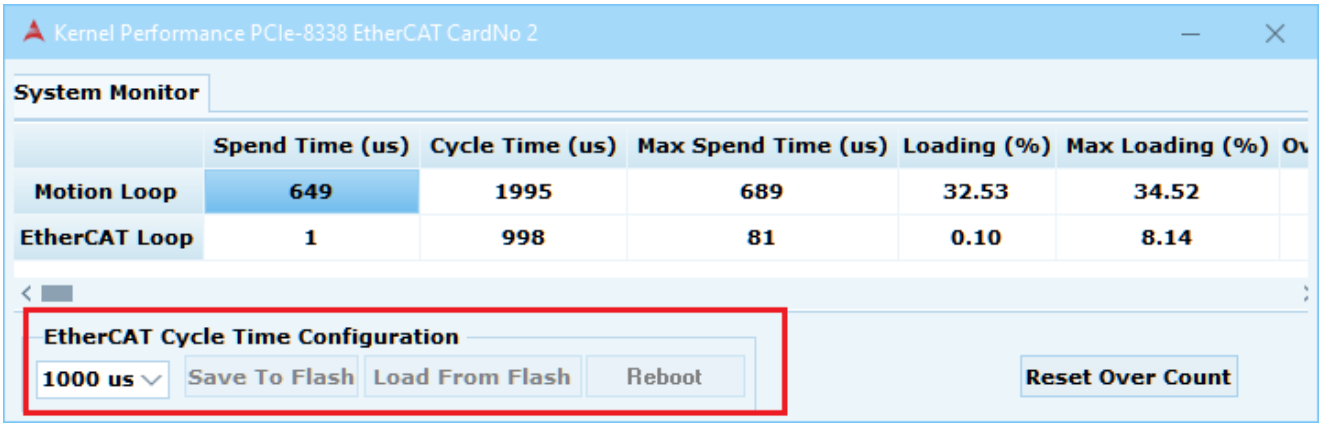
1. Select cycle time from the drop-down list.



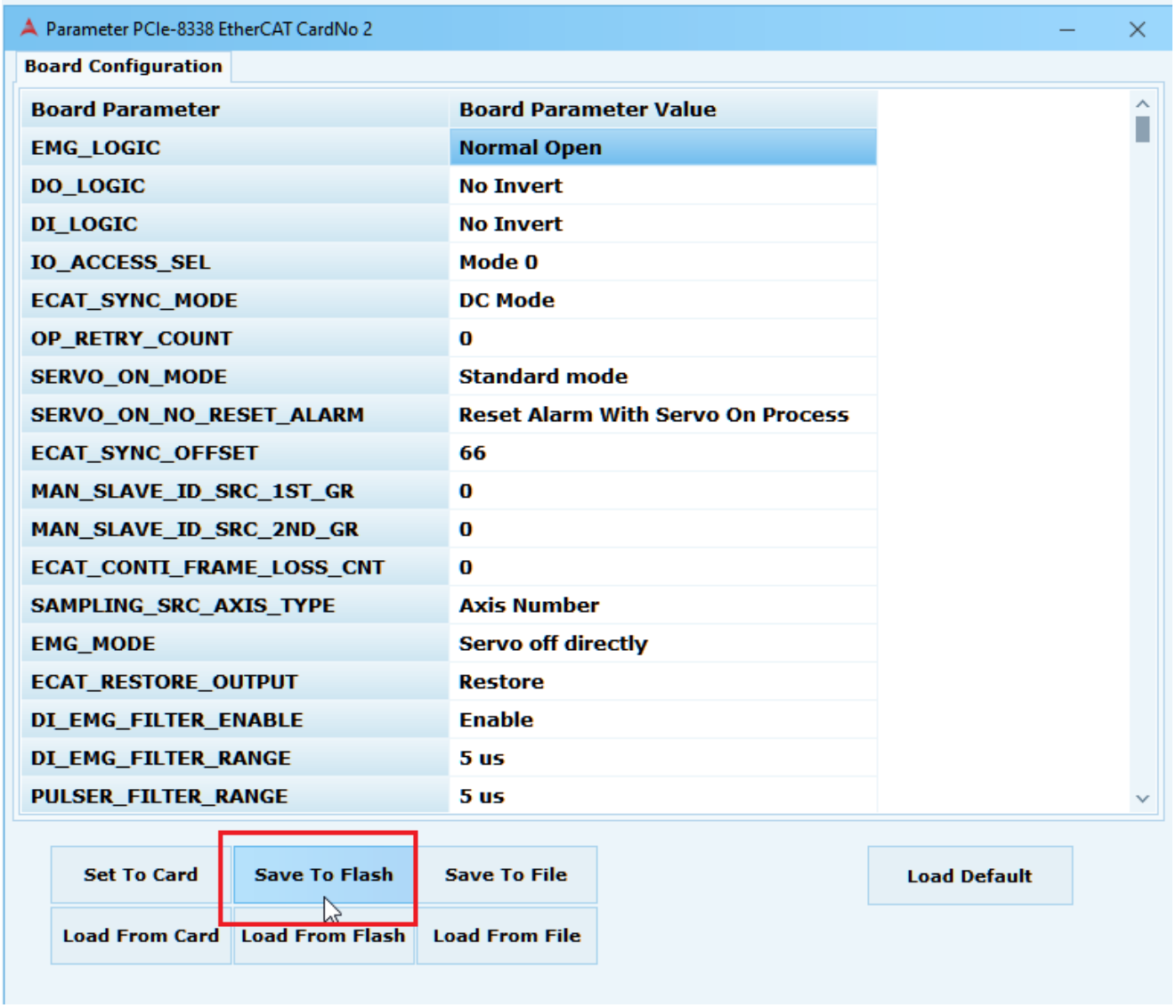
2. Click **Save To Flash**.
3. Click **Reboot.** A pop-up window will appear.
   Note: Ensure that Field Bus is disconnected before performing this operation.



4. While waiting, the function button will turn white until the system is reset.



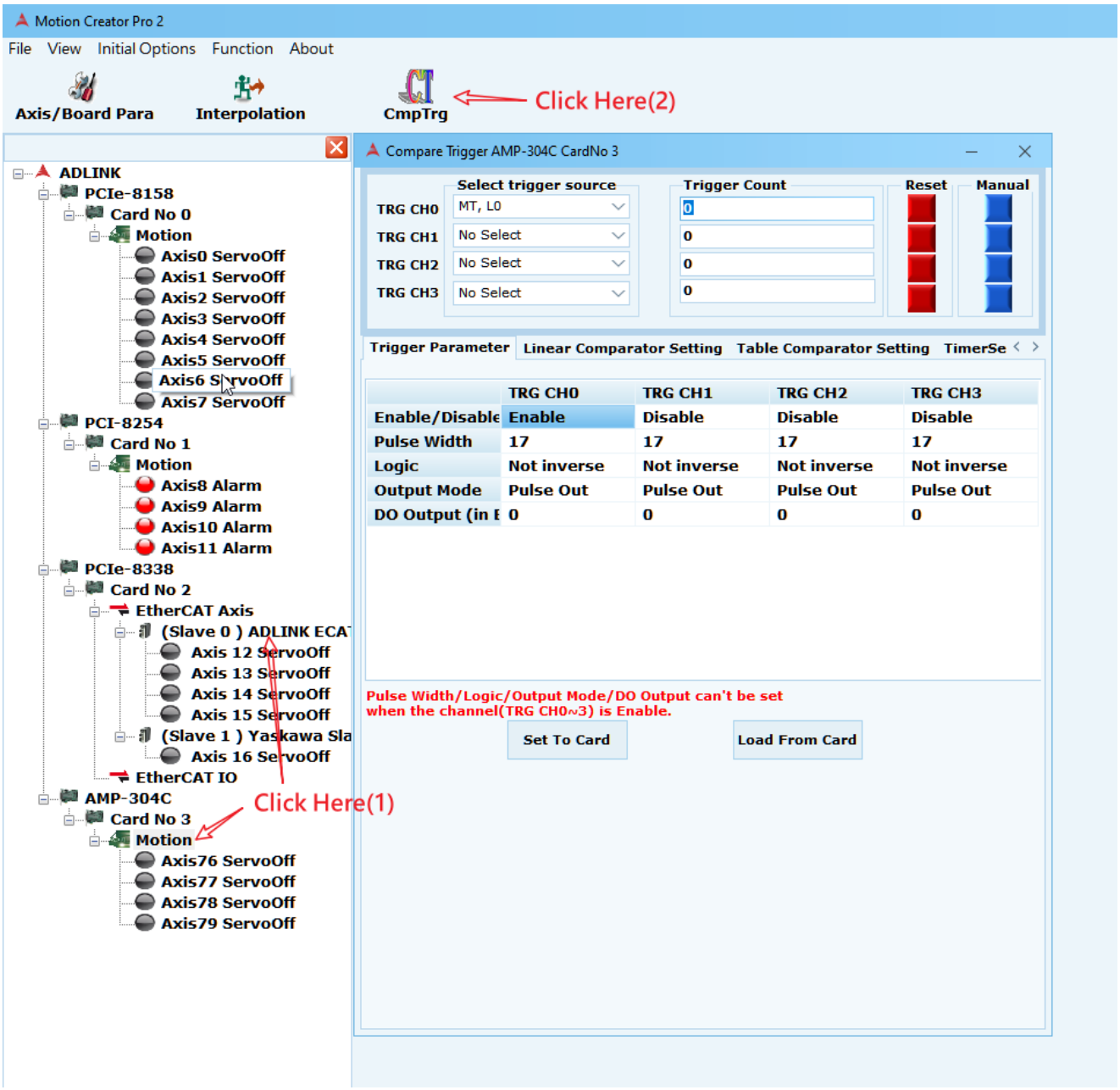
5. Click **Card No x**, and then click **Axis/Board Para fast** to open the page. Click **Save to Flash**.



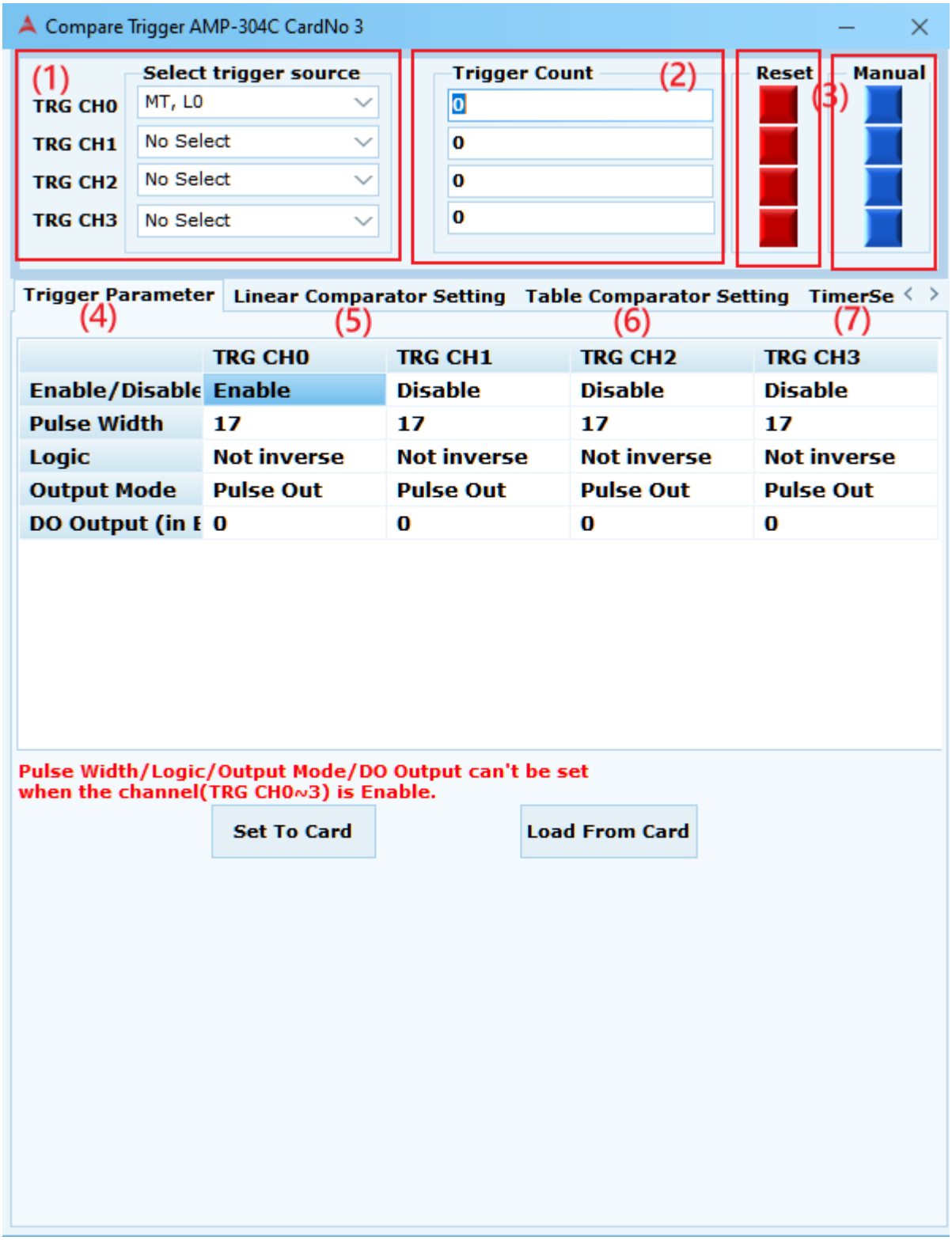
3.17 Compare Trigger

The comparison trigger functions are divided into Linear Compare and Table Compare, which take corresponding actions when the conditions set by the user are compared.

To open the compare trigger function page, click **Slave x** or **Motion** on different axis cards in the device tree, and then click the **CmpTrg** icon.

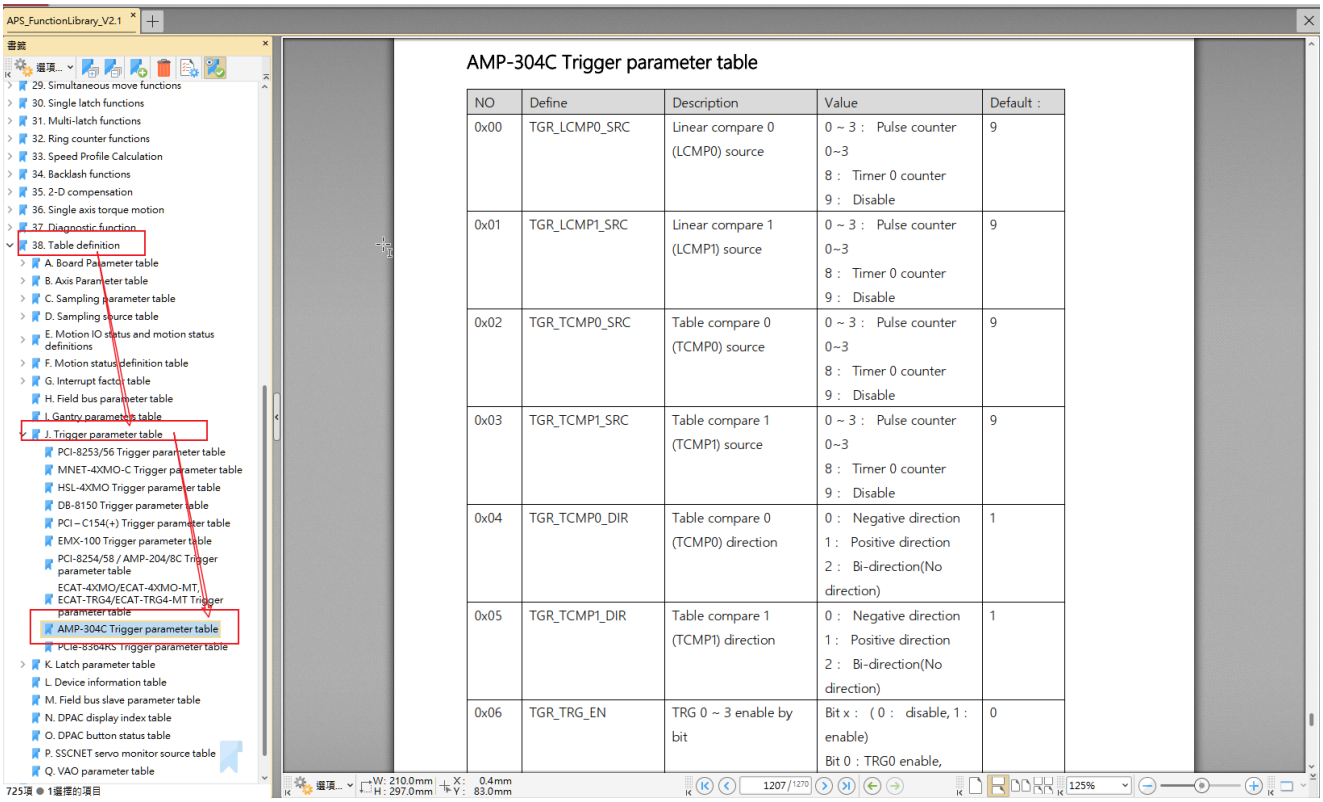


The comparison trigger functions are described below.

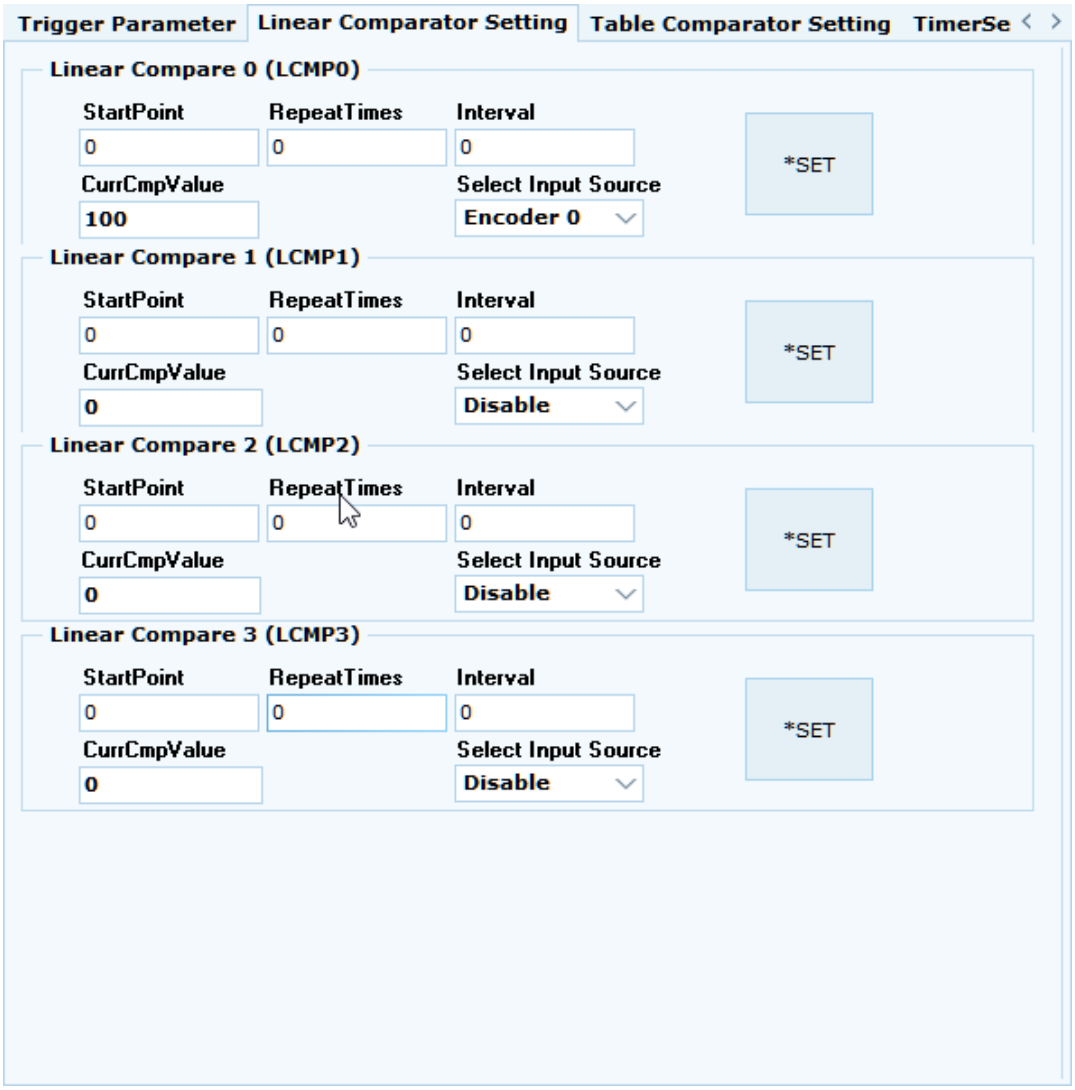


(1) **Select trigger source**: Selects the trigger source signal of each channel
(2) **Trigger Count**: Displays the number of triggered channels
(3) **Reset**: Clears the trigger count
Manual: Triggers the signal manually

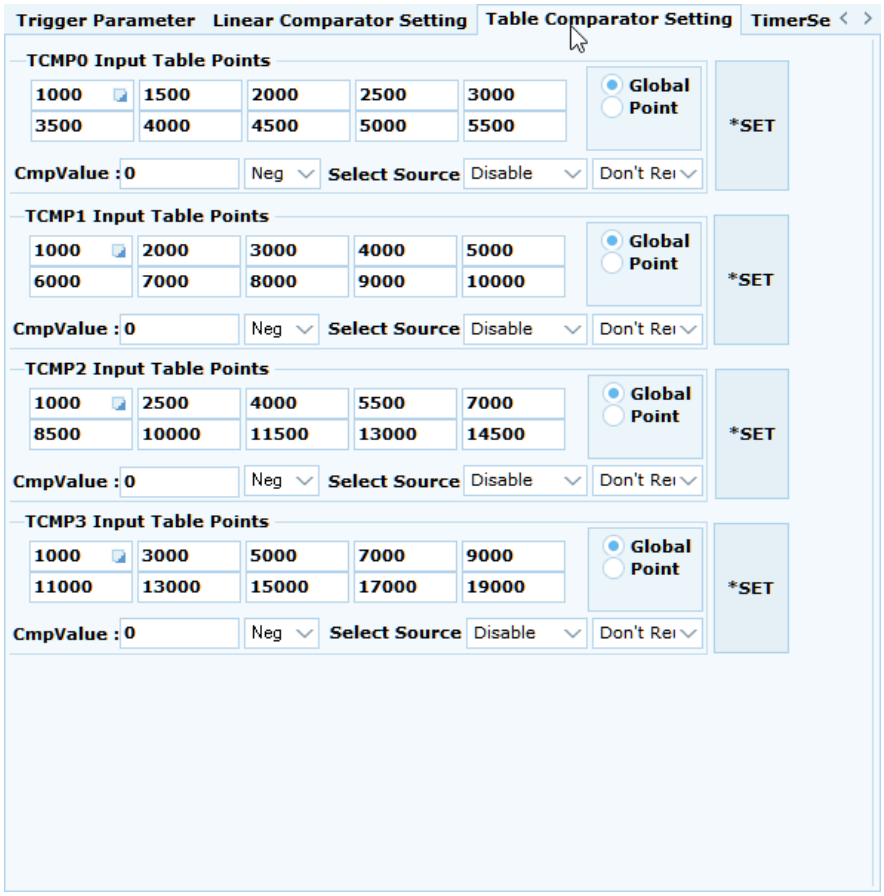
(4) **Trigger Parameter**: Compares the trigger setting parameters. Different axis cards have different settings. Refer to the APS Function Library manual Table definition-> Trigger parameter table for more information. This example is for ADLINK's AMP-304C, so the corresponding manual content is shown below.



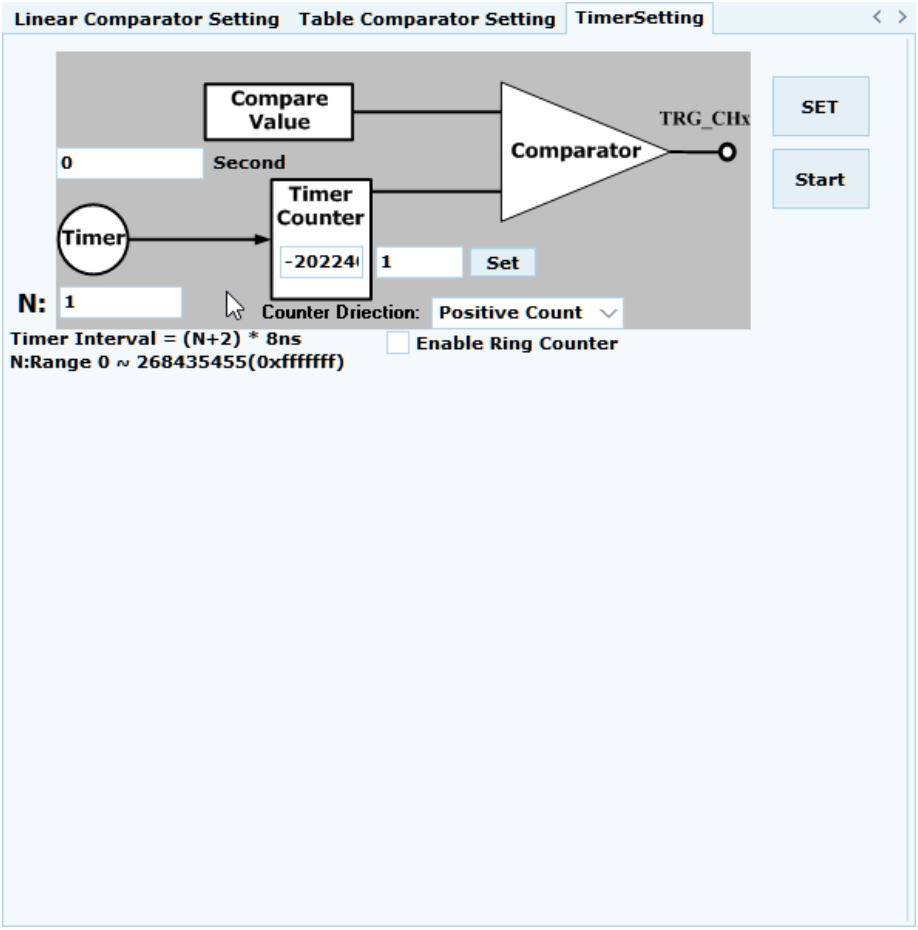
(5) Linear Comparator Setting: [ADD CONTENT]



(6) **Table Comparator Setting**: Sets the table comparator values.



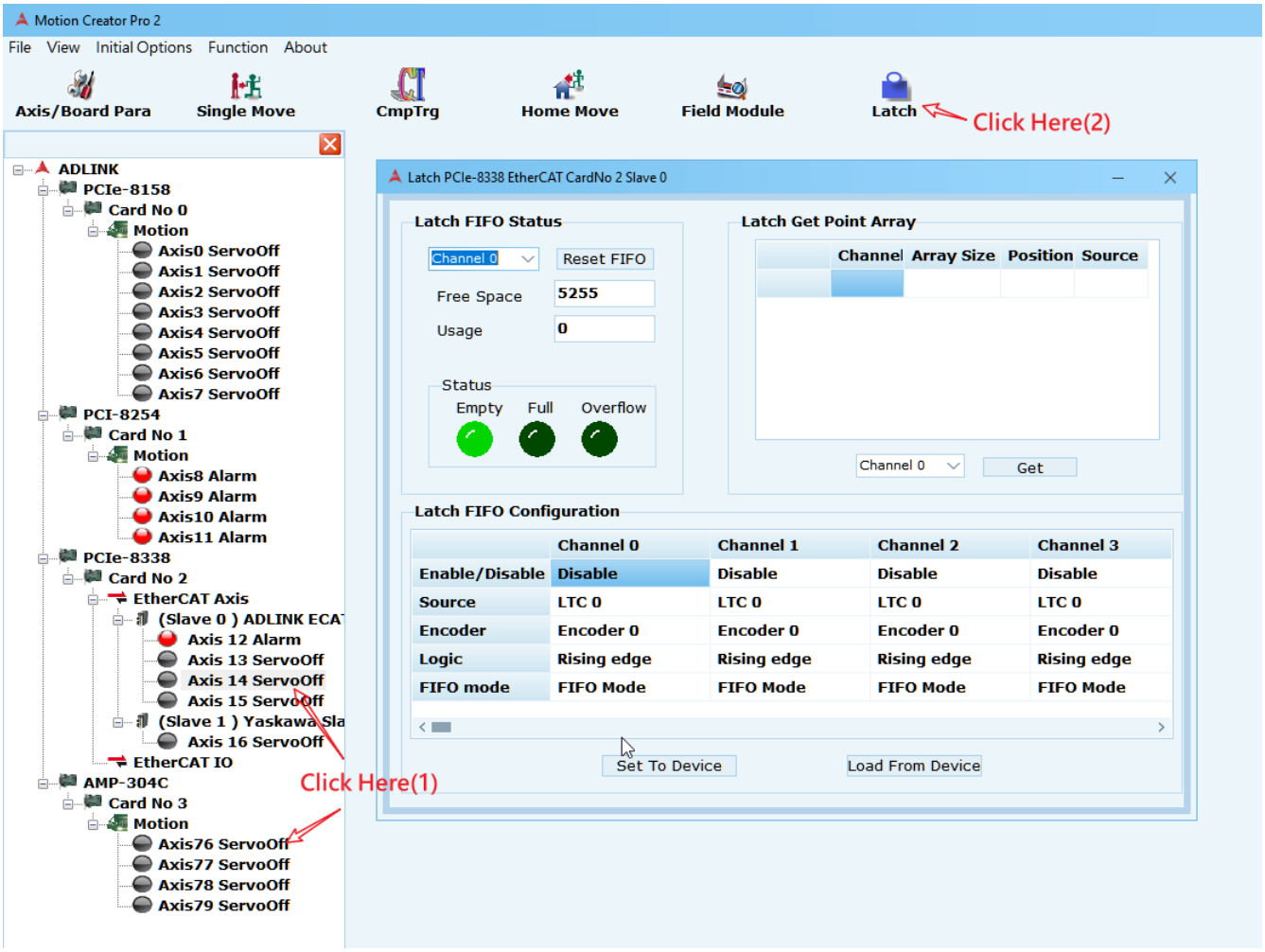
(7) **Timer Setting**: 計時器設定



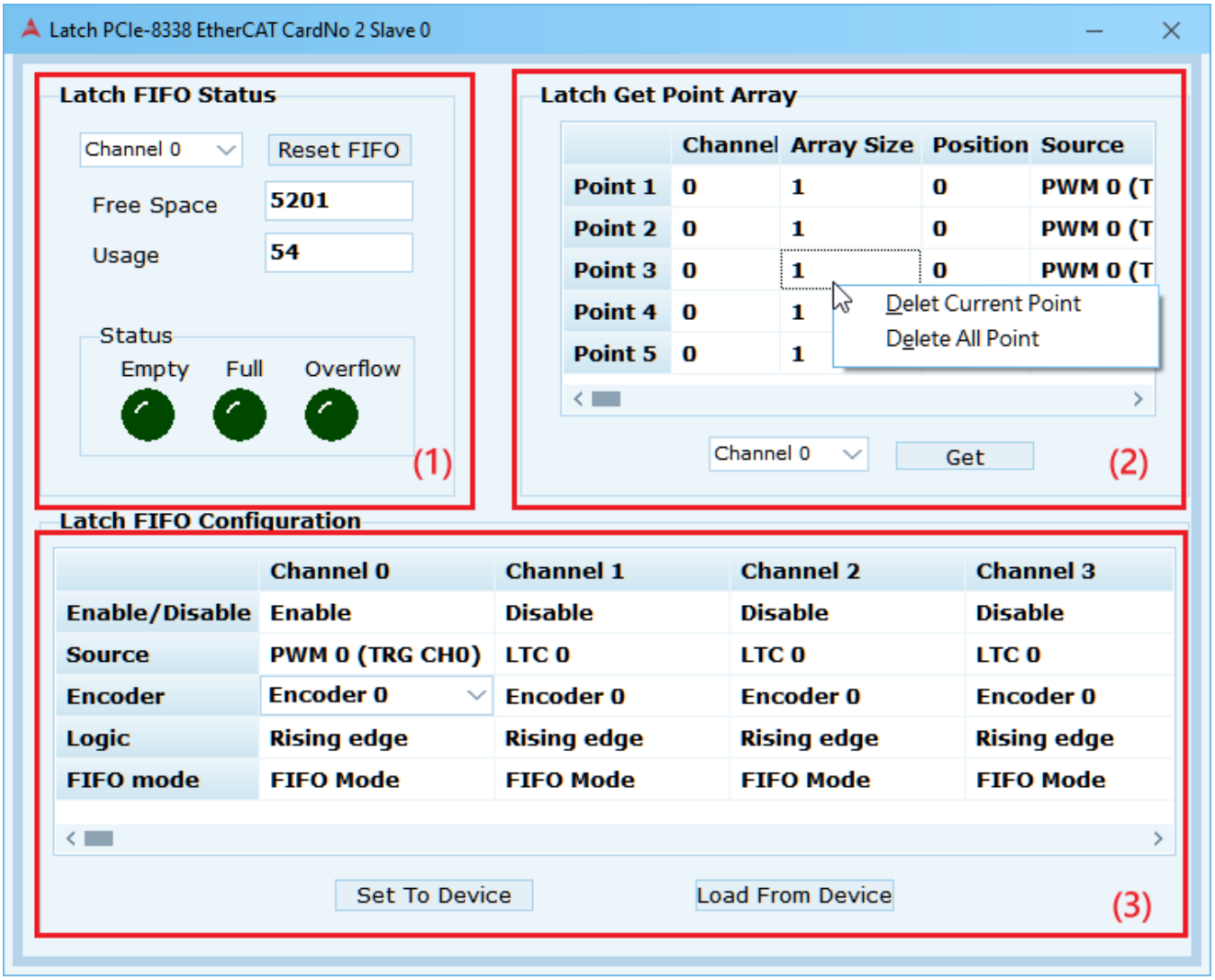
3.18 Latch

The position latch function allows the user to latch an instant position and then make a corresponding signal output or motion response to the position.

To open the Latch page, click **Axis x** on the device tree column, then click the **Latch** icon.



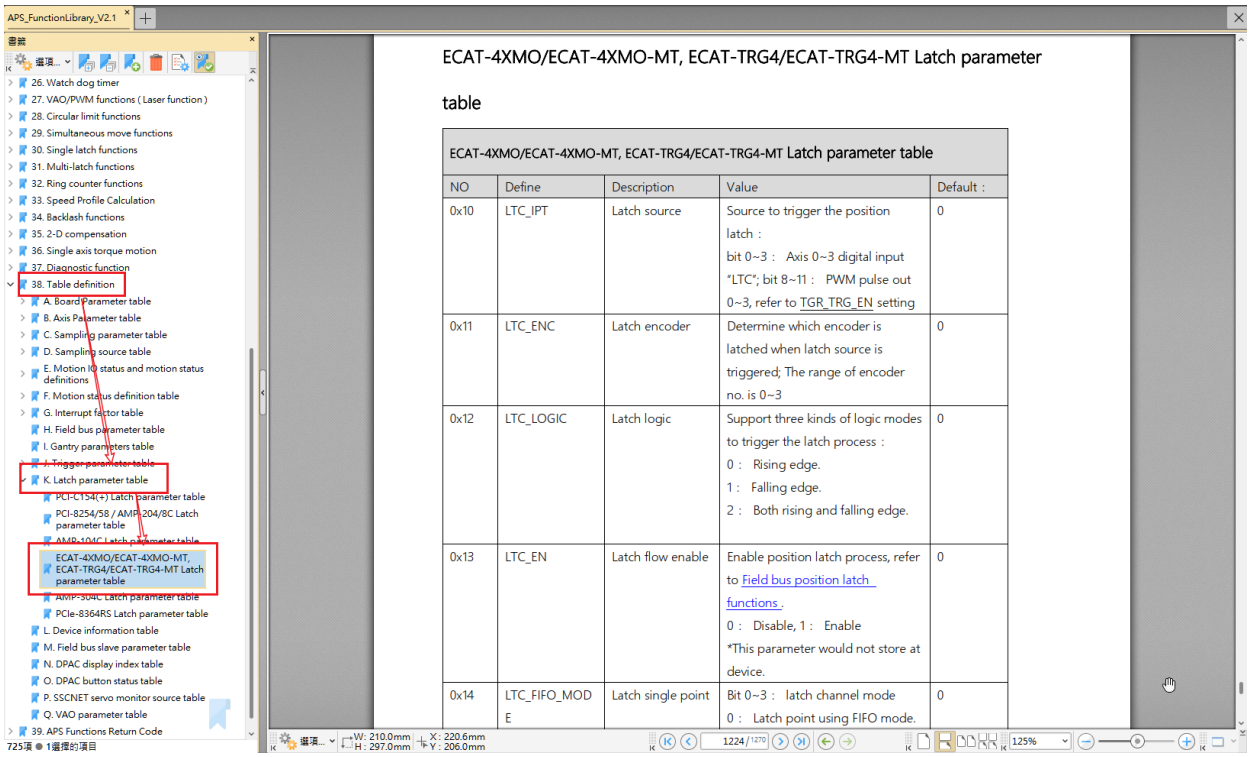
Latch configuration options are shown below.



(1) **Latch FIFO status**: Regularly updates the FIFO status of channels selected by users, and resets and usage the status.

(2) **Latch Get Point Array**: Obtains the FIFO point information of the channel selected by the user, including the location and source of the latch. When not in use, right-click to select a single point or delete all the information.

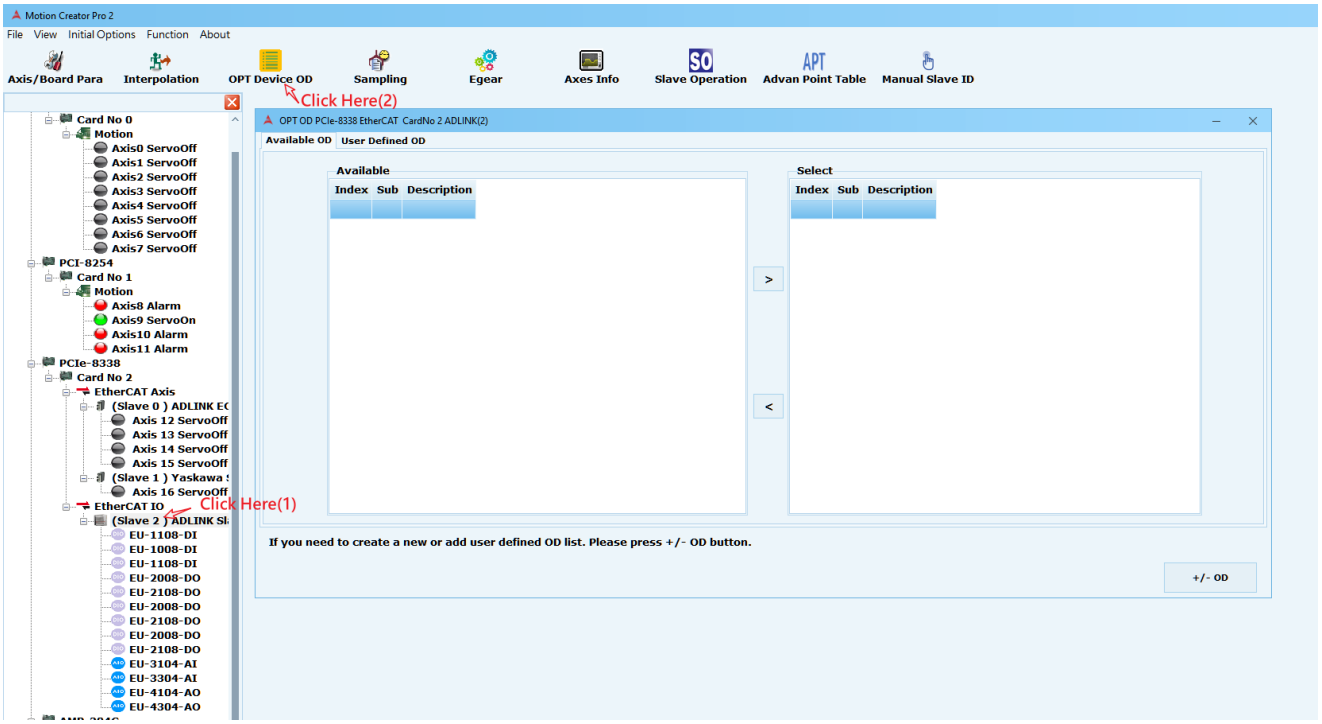
(3) **Latch FIFO Configuration:** Sets parameters related to Latch, such as latch channel number, source, latch encoder number and latch logical conditions, etc., and can be enabled after configuration is complete. For setting parameters, refer to the APS Function Library manual Table definition-> Latch parameter table. This example is for ADLINK's 4XMO, so the corresponding manual content is shown below.



3.19 OPT Device OD

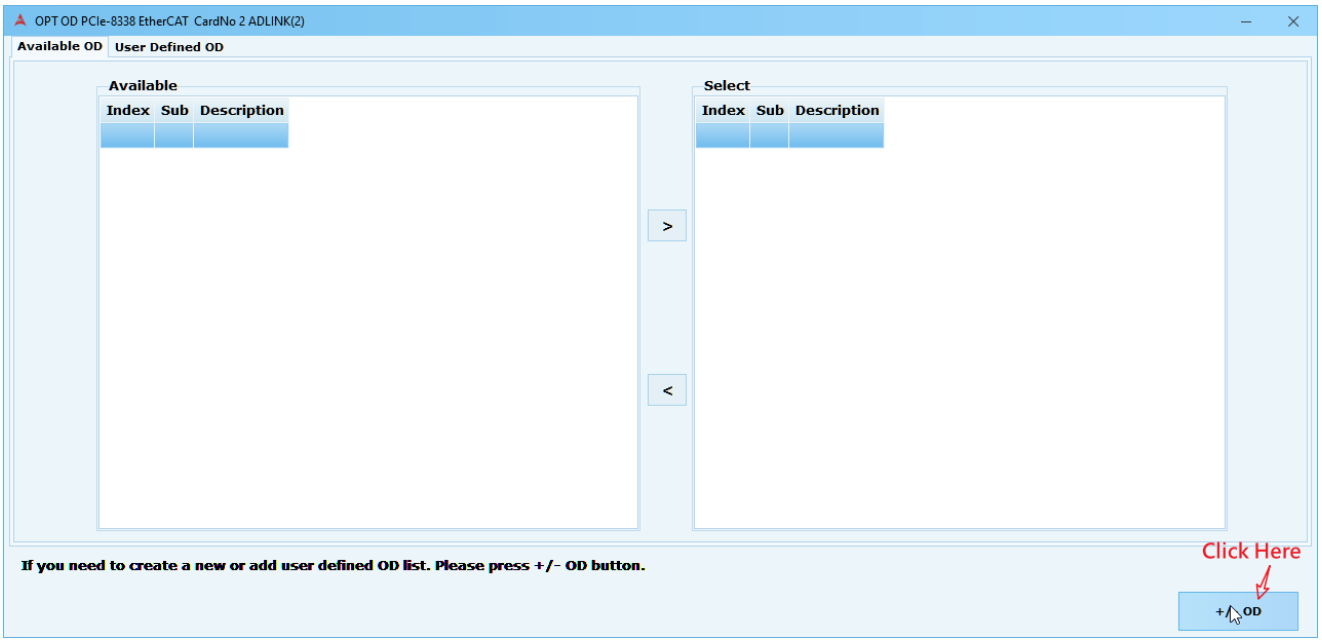
The OPT Device OD page is an extension of the SDO page. Users can choose to read and write the Object Dictionary (OD) data of the SDO to obtain the specific data of the Slave and monitor it.

To open the OPT Device OD, click **Slave x** in the device tree column, and then click the **OPT Device OD** icon.

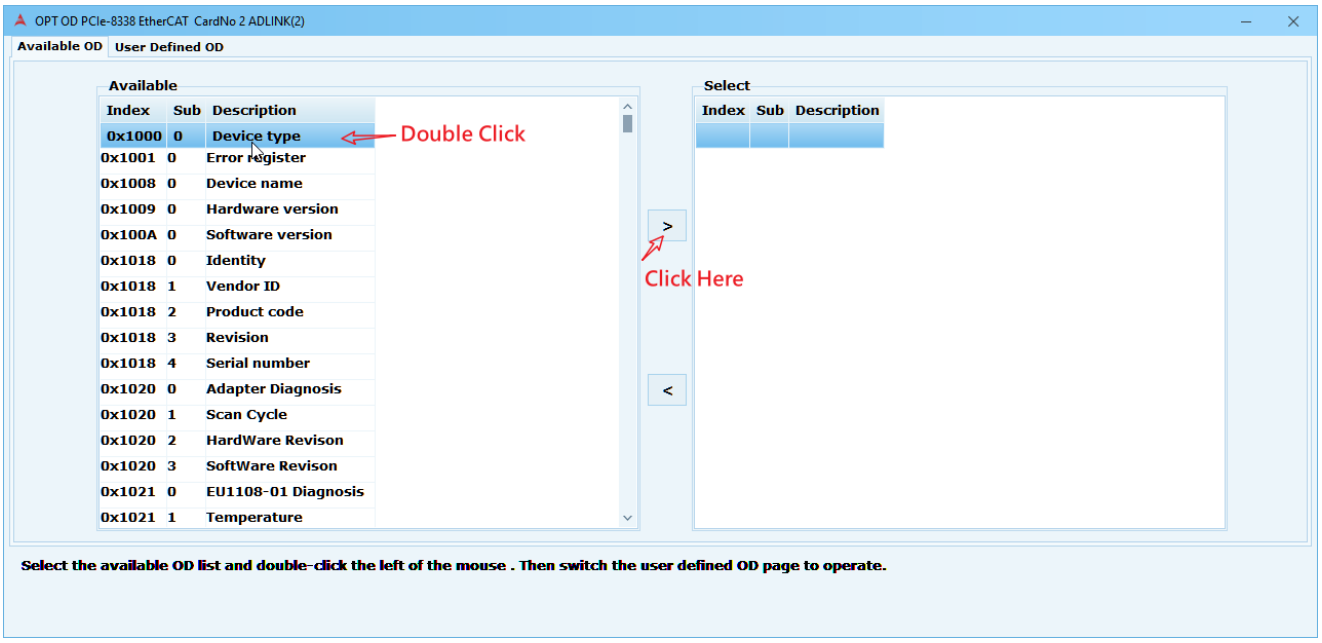


OPT Device OD function settings are shown below.

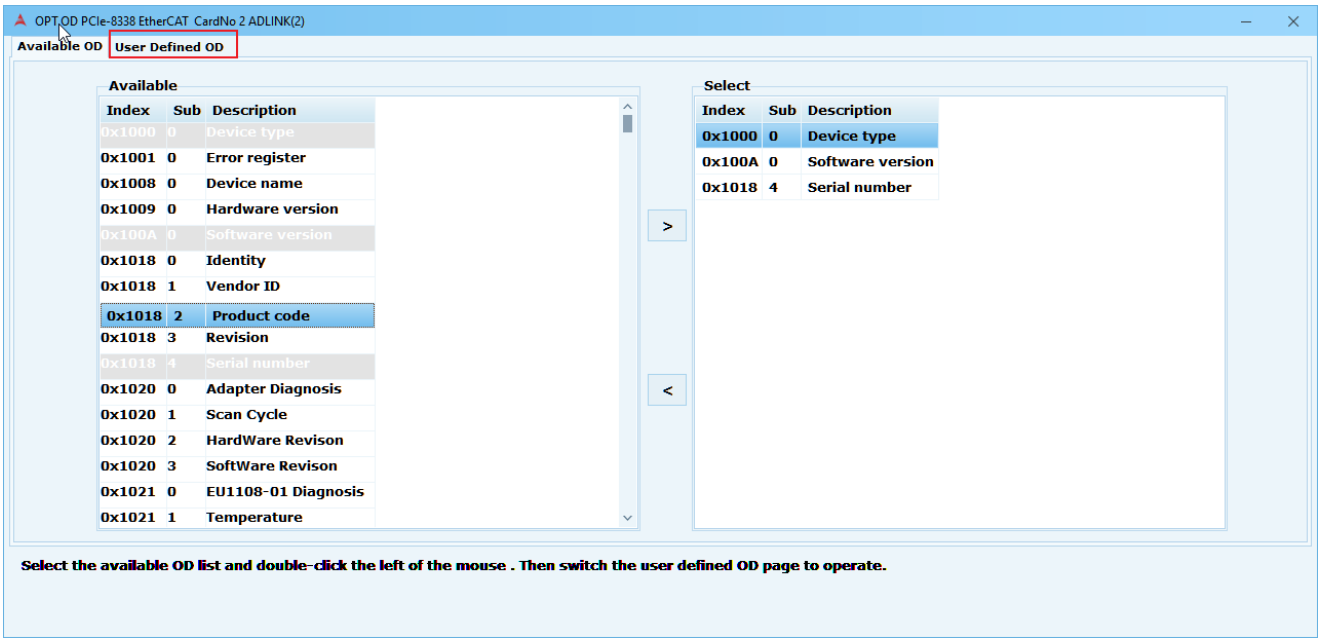
(1) +/ -OD is the SLAVE SDO that generates the selection.



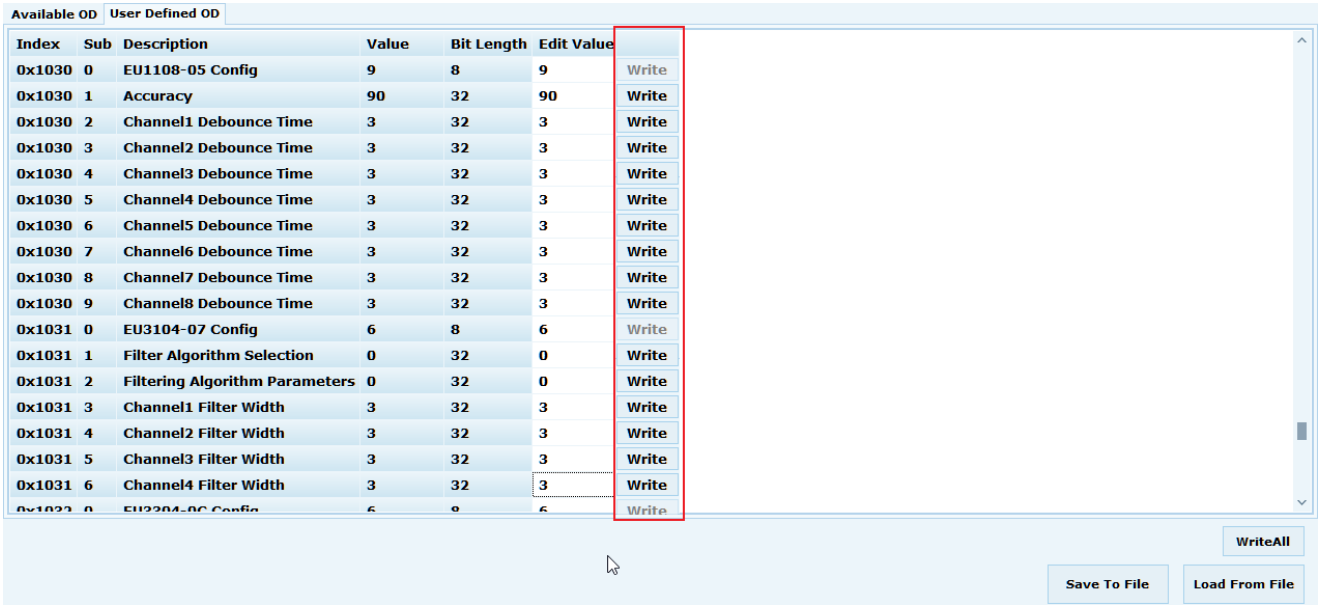
(2) The generated OD Data will be displayed under Available. Double-click a project or use the right arrow button in the middle of the window to select the desired OD Data.



(3) The selection results display in the User Defined OD tab.

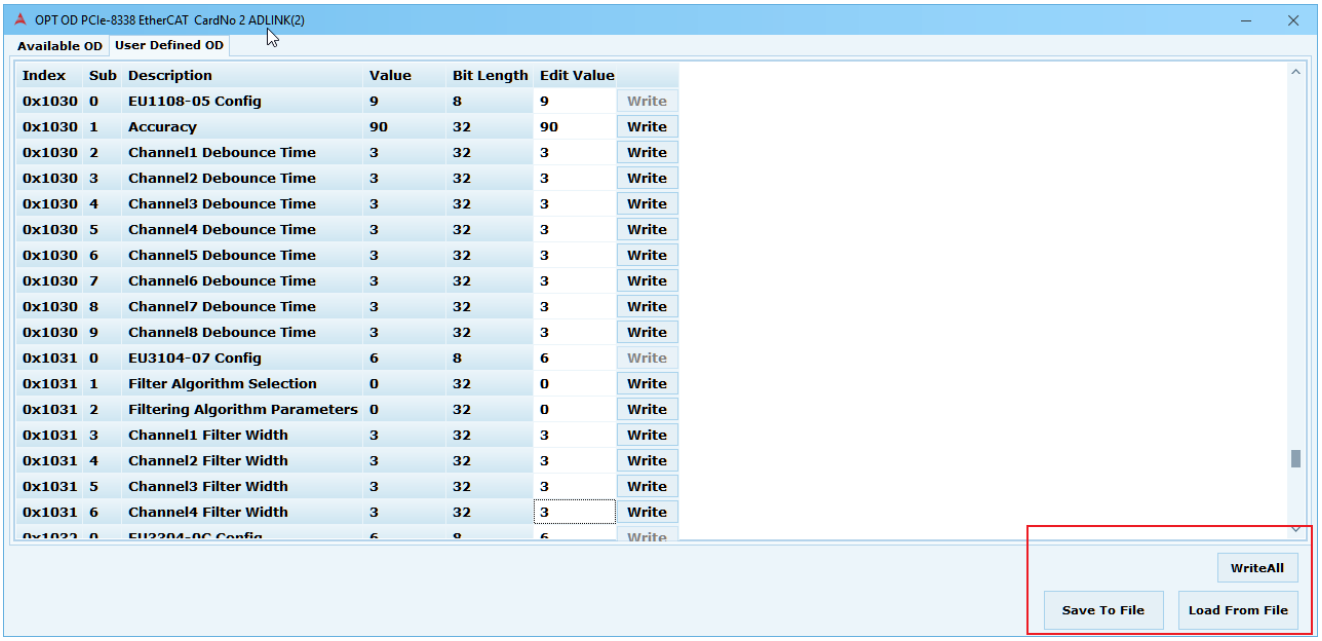


(4) The page displays the OD information. If there is no information in the right panel, click **Write** to write the OD Data.



(5) Additional functions include:

- **WriteALL**: Writes all OD Data at once
- **Save To File**: Saves user defined OD Data (*.csv format)
- **Load From File**: Imports custom OD Data (*.csv format)



3.20 IO Mapping

3.20.1 Ether CAT

Use the MCP2 IO-mapping form to perform mapping and checking operations. The maximum number of software port in slave is 32 for each IO type.

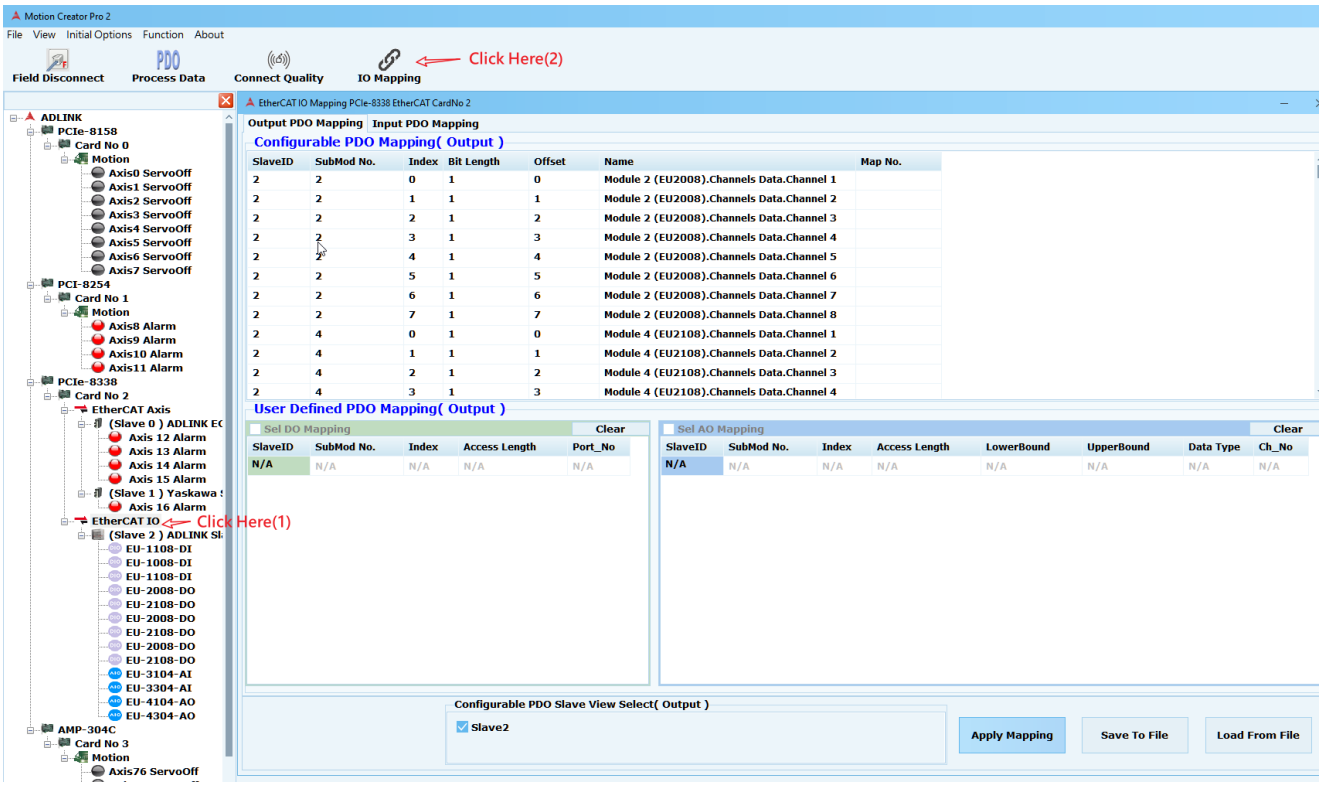
Notes:

1. Manually changing the contents of the IO mapping configuration file is not recommended.
2. The IO mapping GUI is only available via MCP2. Users should download the configuration file API from ADLINK. **[PROVIDE DOWNLOAD LINK]**
3. Configuration file can be save to "CSV" file by MCP2 IO-mapping form.
4. No need to map module that ADLINK had integrated.

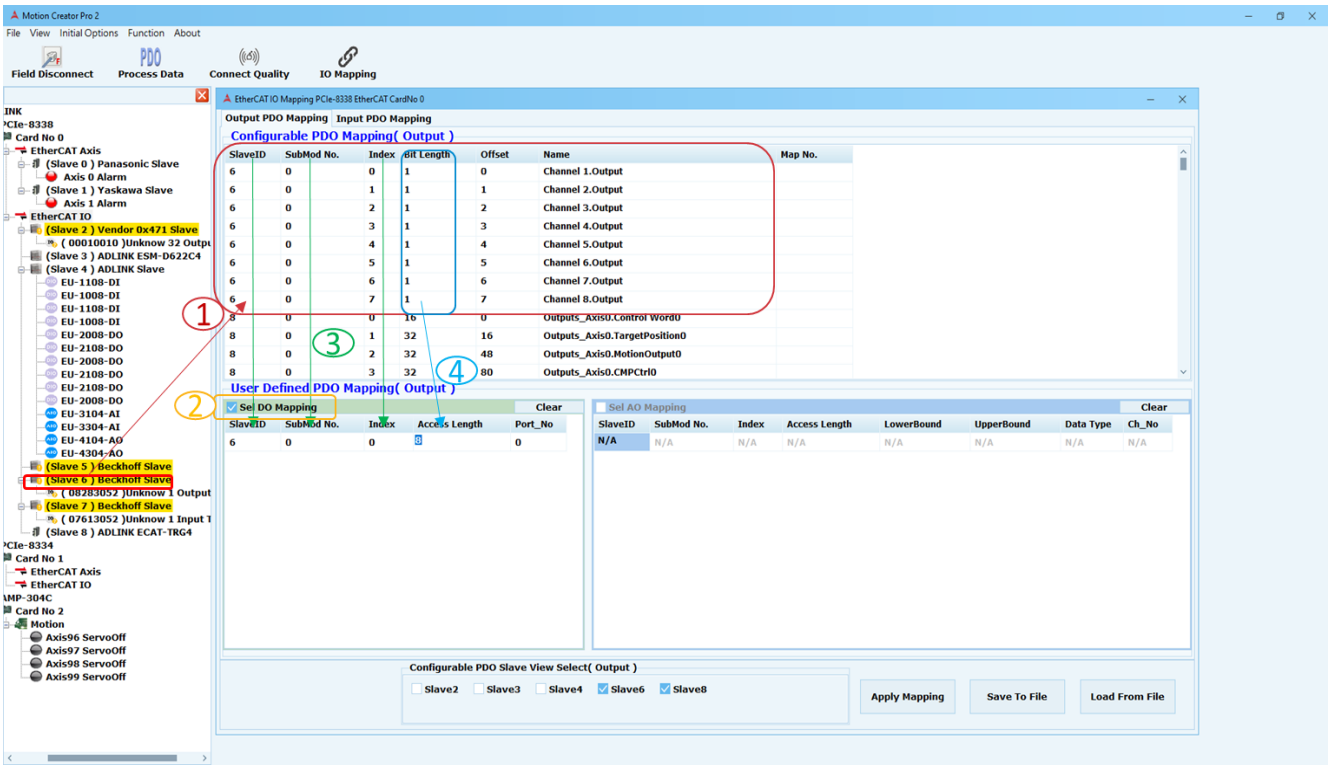
Step-by-step instructions to set up IO mapping using MCP2.

Step 1: Update kernel version in C: \Program Files (x86)\ADLINK\PCIe-833x\Kernel Update. The kernel version must be 2022050503_833x_kernel or later.

Step 2: After connecting the field bus and selecting EtherCAT IO in the tree view (1), click the **IO Mapping** icon (2) to start setting up IO mapping.



Step 2-1 (Select DIO mapping): Select the slave IO for mapping. Refer to Configurable PDO view and input the corresponding parameters.



① Select the slave IO for mapping and refer Configurable PDO view.

② Select the IO type that needs to be set.

③ Enter SlaveID data for mapping slave IO. Fill in the corresponding SubMod No.

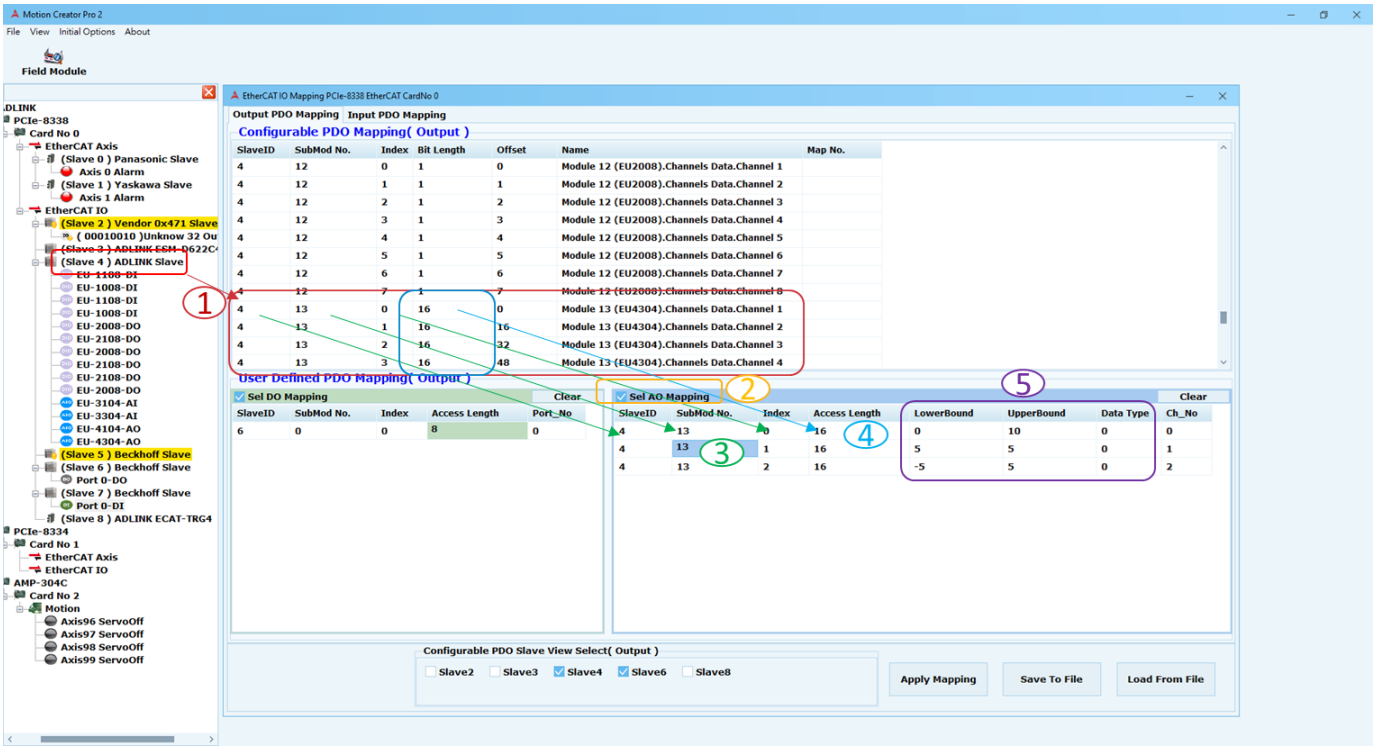
Refer to SubMod No. in Configurable PDO View. Fill in the starting index. Refer to Index in Configurable PDO View.

④ Fill in the Access Length to define the IO-bit required by the port.

DIO mapping parameters:

- **SlaveID:** Mapping of slave IO.
- **SubMod No.:** Configurable PDO view
- **Index:** Access start index according to index in Configurable PDO view.
- **Access Length:** Access port length according to Bit Length in configurable PDO view content.
  - Maximum: 32 bits
  - Minimum: 1 bit
- **Port_No:** Automatically generated.

Step 2-2 (Select AIO mapping): Select the slave IO for mapping. Refer to Configurable PDO view and input corresponding parameters.



① Select slave IO for mapping. Refer to Configurable PDO view.

② Select the IO type that needs to be set.

③ Fill in SlaveID fill for mapping slave IO. Fill in the corresponding SubMod No. Refer to SubMod No in Configurable PDO View. Index fills in the starting index. Refer to Index in Configurable PDO View.

④ Fill in Access Length to define the IO-bit required by the port.

⑤ Fill in LowerBound physical lower limit. Fill in UpperBound physical upper limit. Fill in Data type Representation type:

0: Unsigned integer
1: Signed integer
2: Absolute value with MSB as sign
3: Raw data)

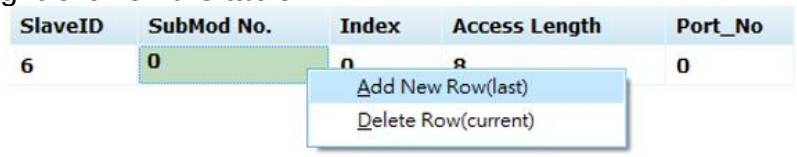
AIO mapping parameters:

- **SlaveID:** Mapping of slave IO.
- **SubMod No.:** Configurable PDO view
- **Index:** Access start index according to index in configurable PDO view content.
- **Access Length:** Access channel length according to Bit Length in configurable PDO view. **Note**: need correct length.
- **LowerBound:** Physical lower limit.
- **UpperBound:** Physical upper limit.

- **Data type:** Representation type
  - Type 0 (Unsigned integer)
    - E.g., for 16 bits = 0 to +65535
  - Type 1 (Signed integer)
    - E.g., for 16 bits = -32768 to +32767
  - Type 2 (Absolute value with MSB as sign)
    - E.g., for 16 bits = -32767 to +32767
  - Type 3 (Raw data)
- **Ch_No:** Automatically generated.

Step 2-3 (User Defined PDO Mapping): Adding and deleting rows can be done with two methods:

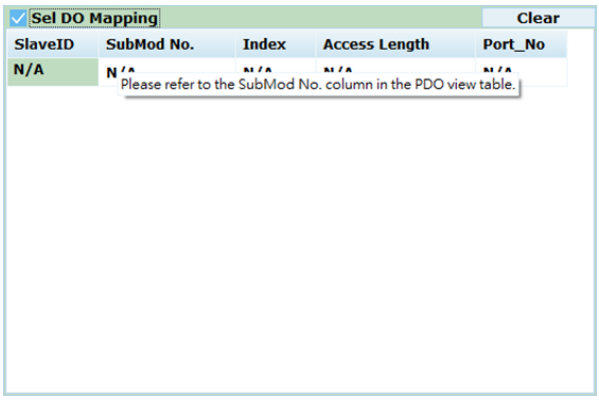
1. Right-click on the table.

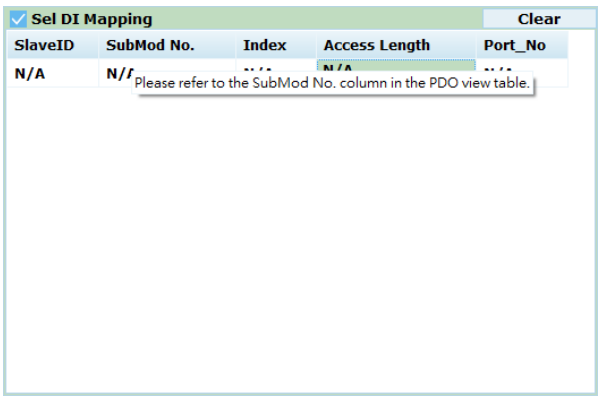


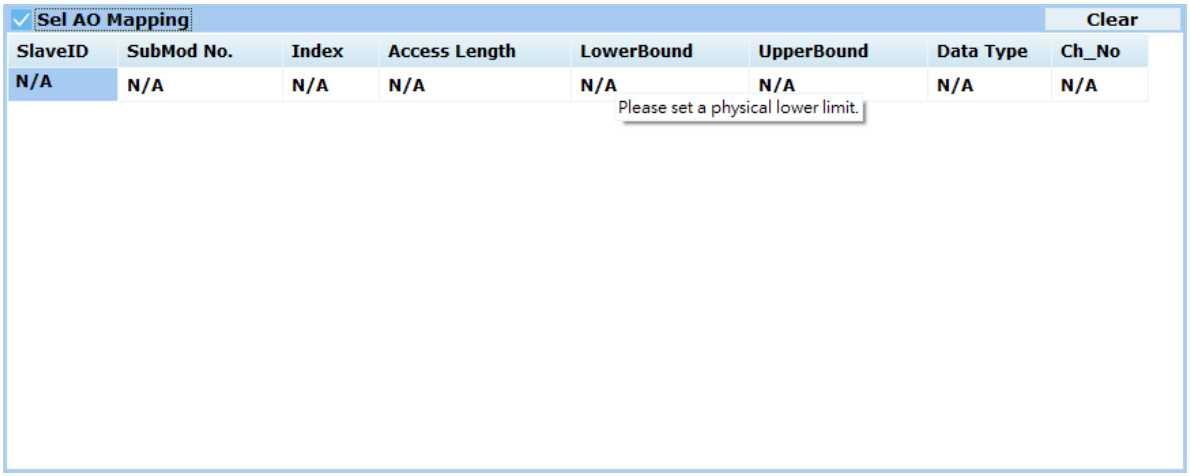
2. Use the keyboard to Add (Ctrl+Enter), or Delete (Ctrl+Delete).

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

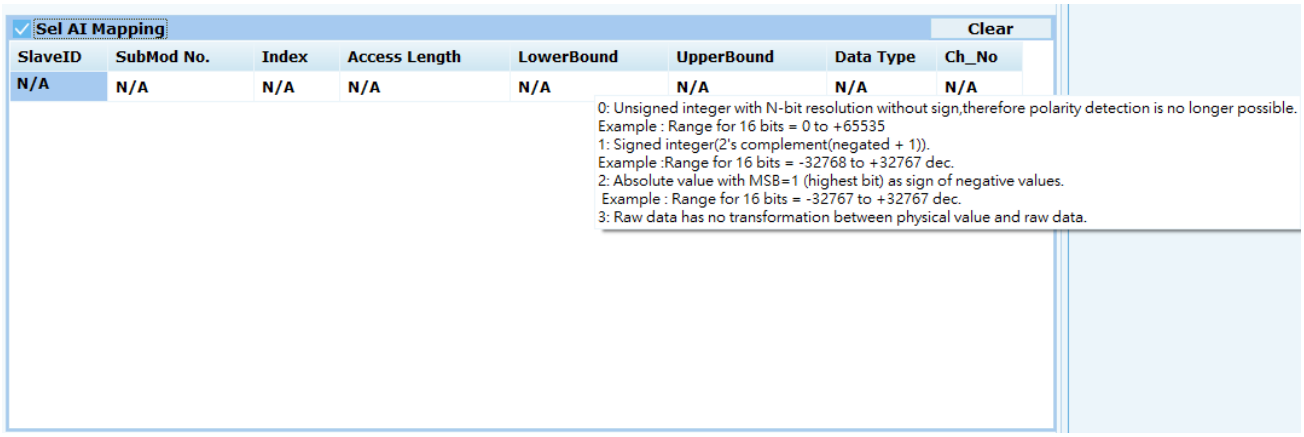
Hint: Move the mouse over the table and a hint will appear.





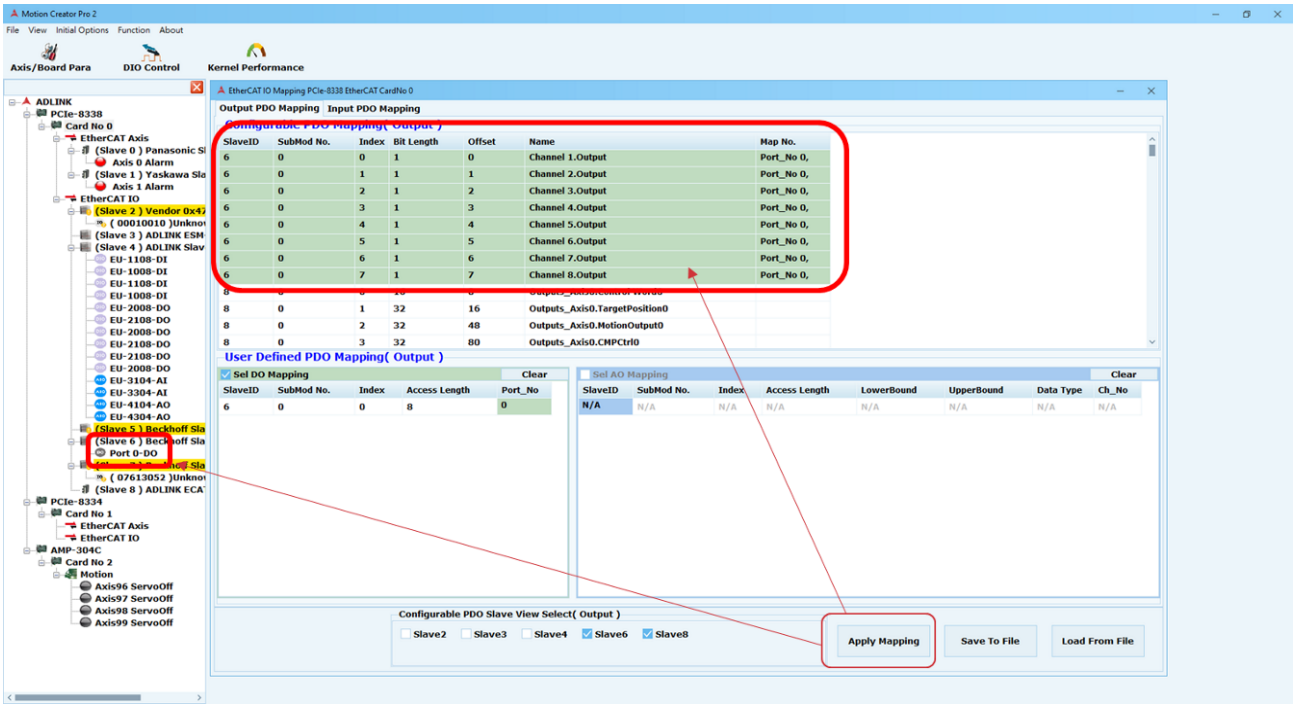


User Defiend DIO mapping hint

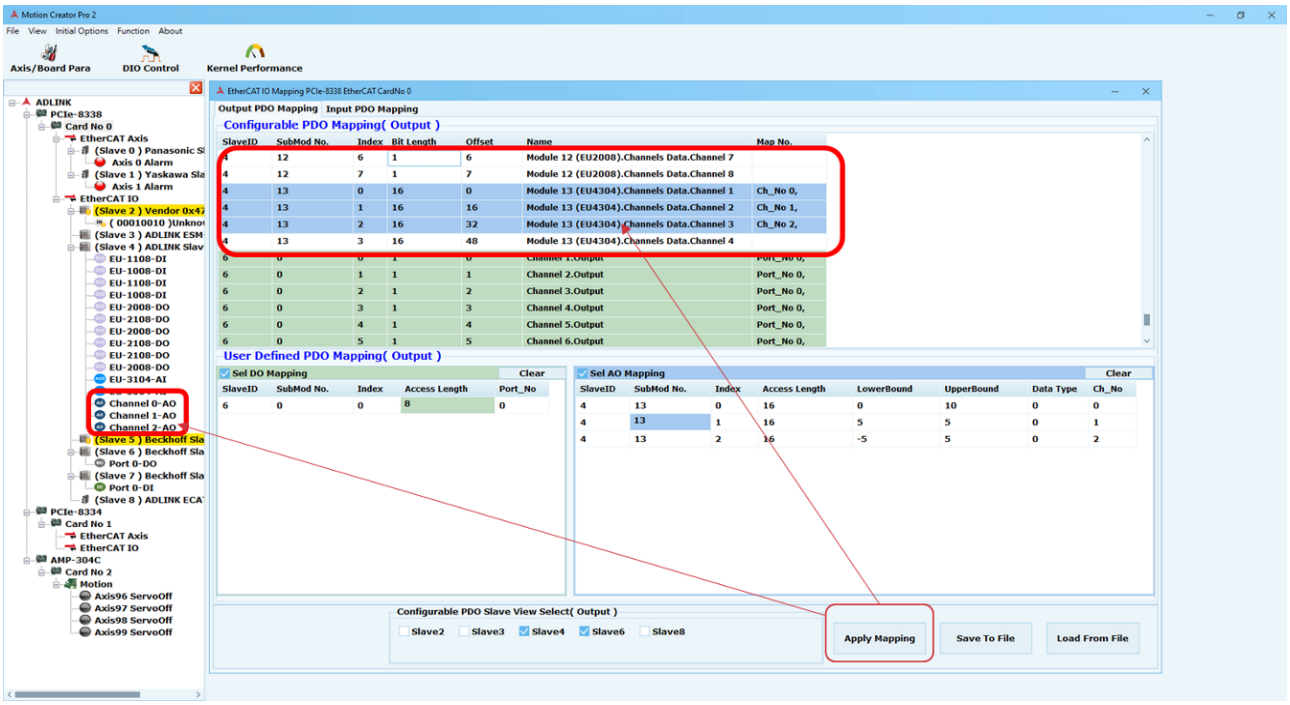


User Defiend AIO mapping hint

Step 3: Click **Apply Mapping**. The Configurable PDO view will show the mapping results. The tree view will show the software defined Port No. or Channel No.

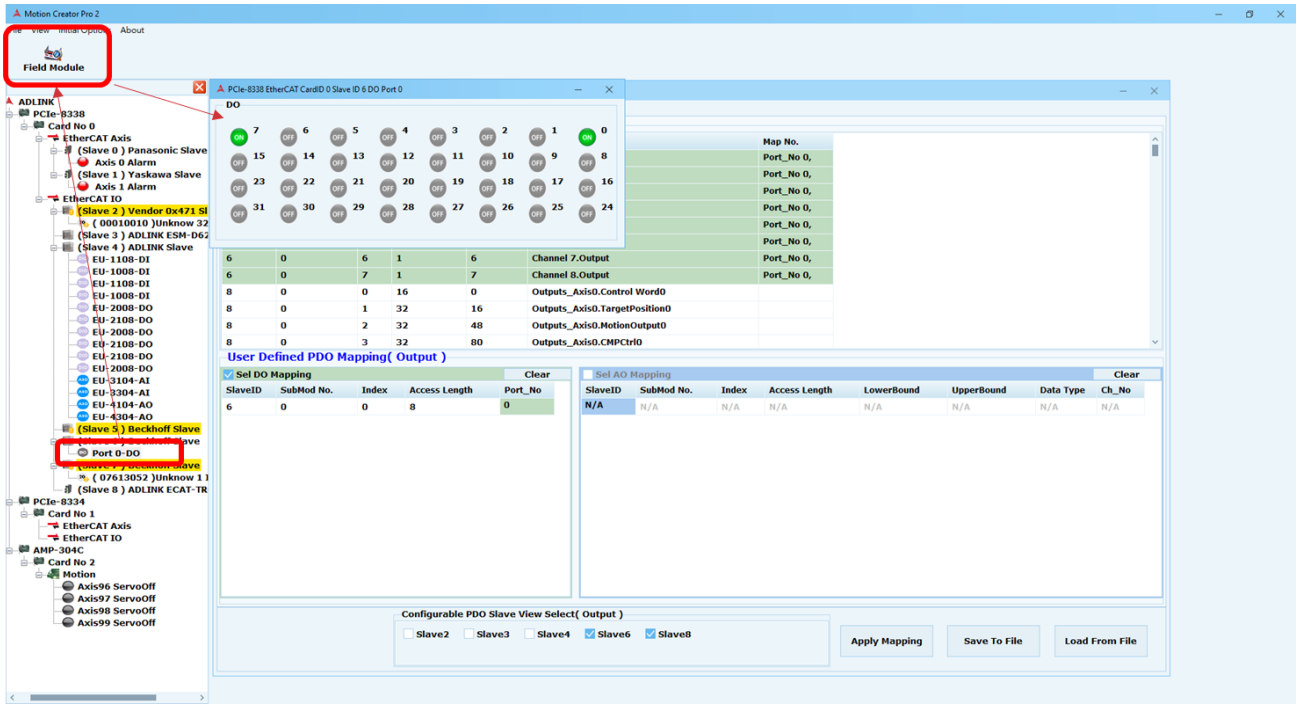


DIO mapping showing software defined Port No.

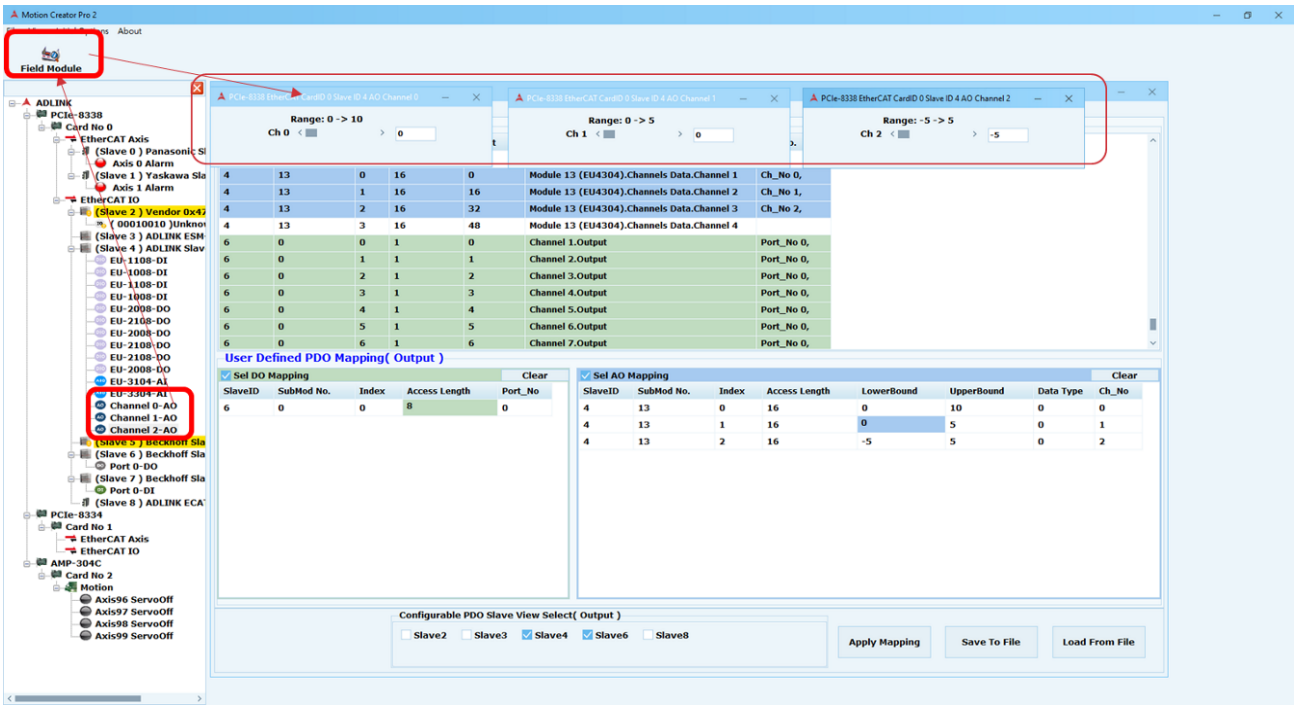


AIO mapping showing software defined Channel No.

Step 4: Selecting a software defined Port No. in tree view will enable the Field Module icon. Click **Field Module** to start DO/DI port control (default 32 DO/DI view). DO/DI control bits follow the user-defined length. An error code is returned if the DIO bits controlled by the user settings are exceeded.

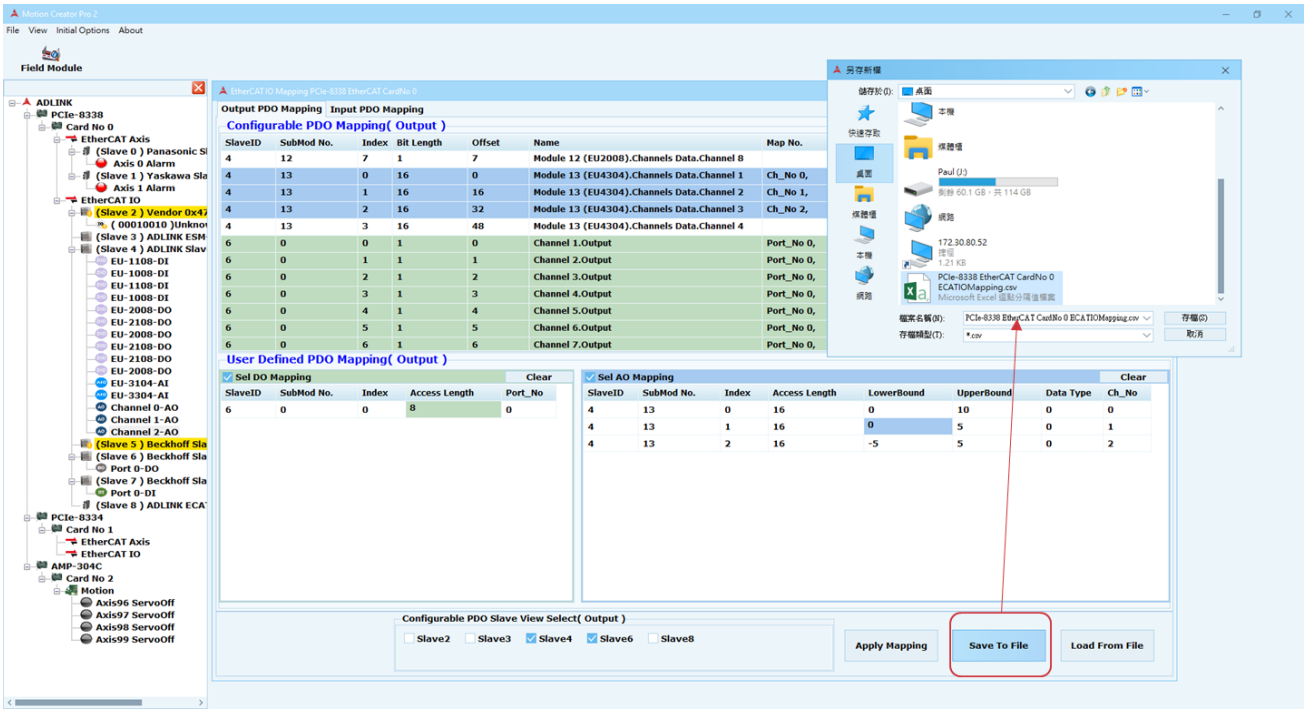


Selecting a software defined Channel No. in tree view will enable the Field Module icon. Click **Field Module** to start AO/AI channel control (default 1 channel).

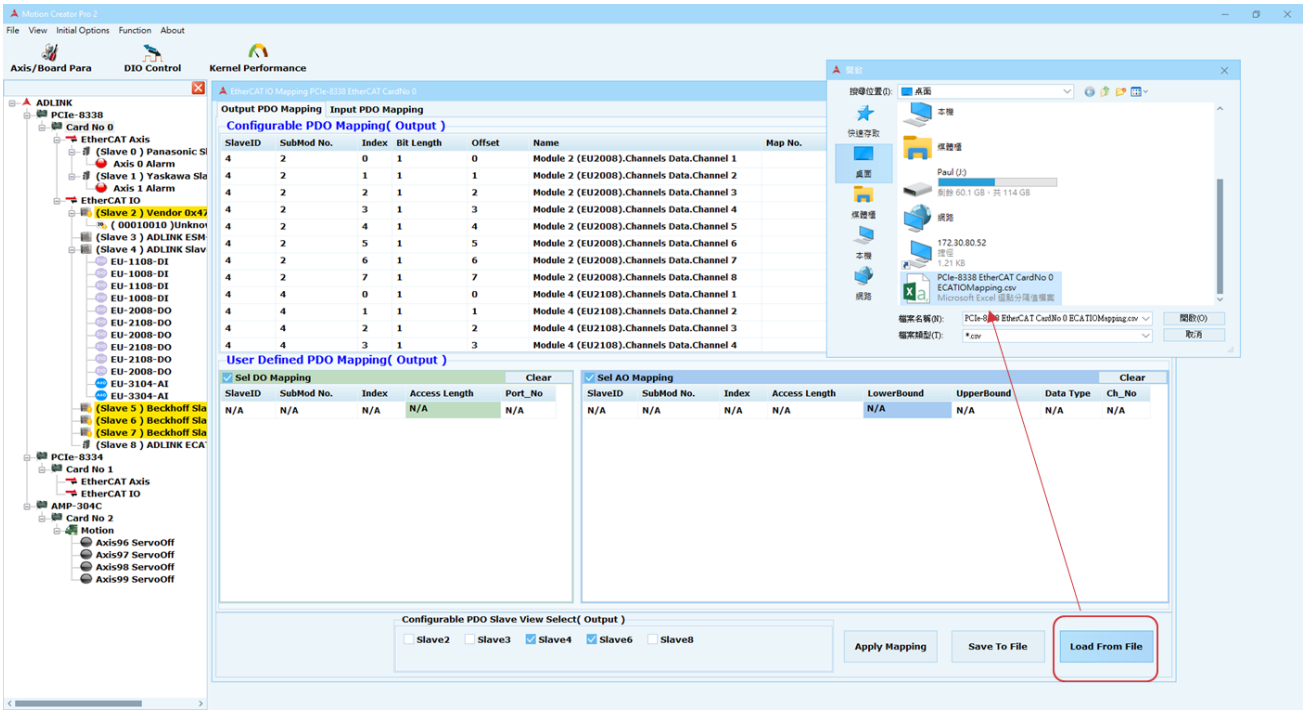


Save/Load file and apply mapping instructions

Step 1: Click **Save to File** to export the IO map data to a file.



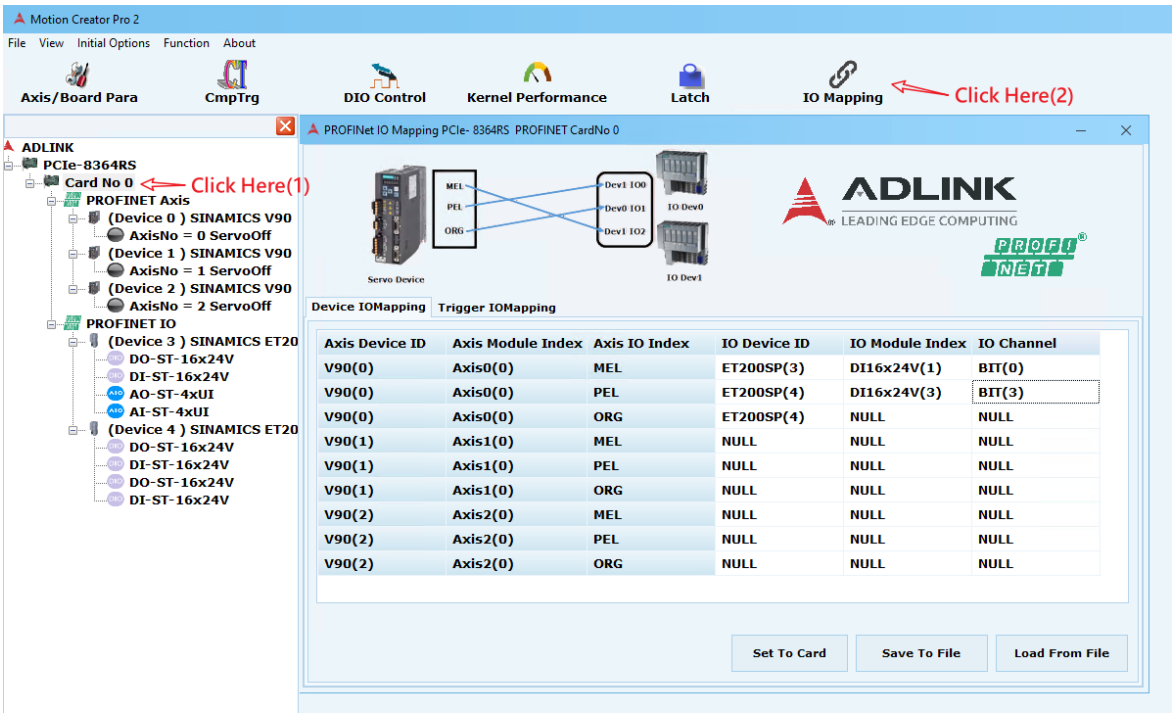
Step 2: Click **Load from file** to import and check the file contents.



3.20.2 ProFiNet

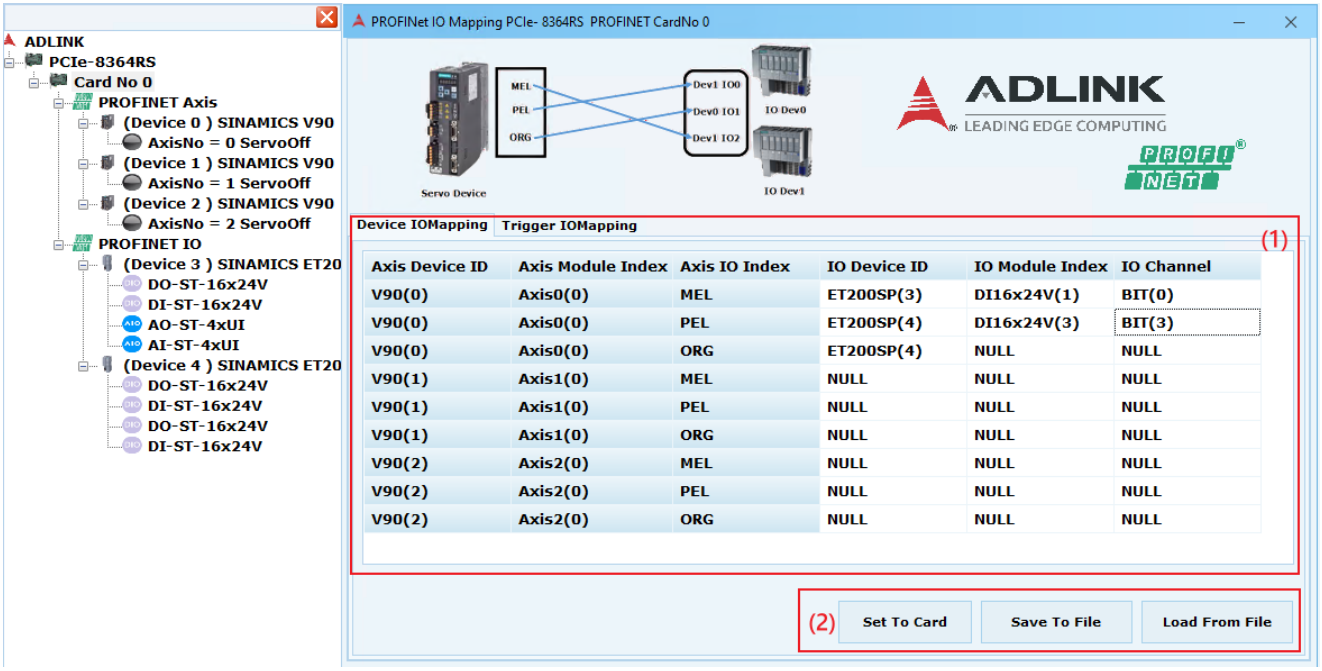
The Motion IO of the ProFiNet Slave Device uses the Slave IO as the Mapping. Therefore, I/O mapping is required for its corresponding Motion IO.

To open the IO Mapping page, click "**Card No x**" in the device tree column, and then click the **IO Mapping** icon.



ProFiNet IO Mapping is divided into two tabs.

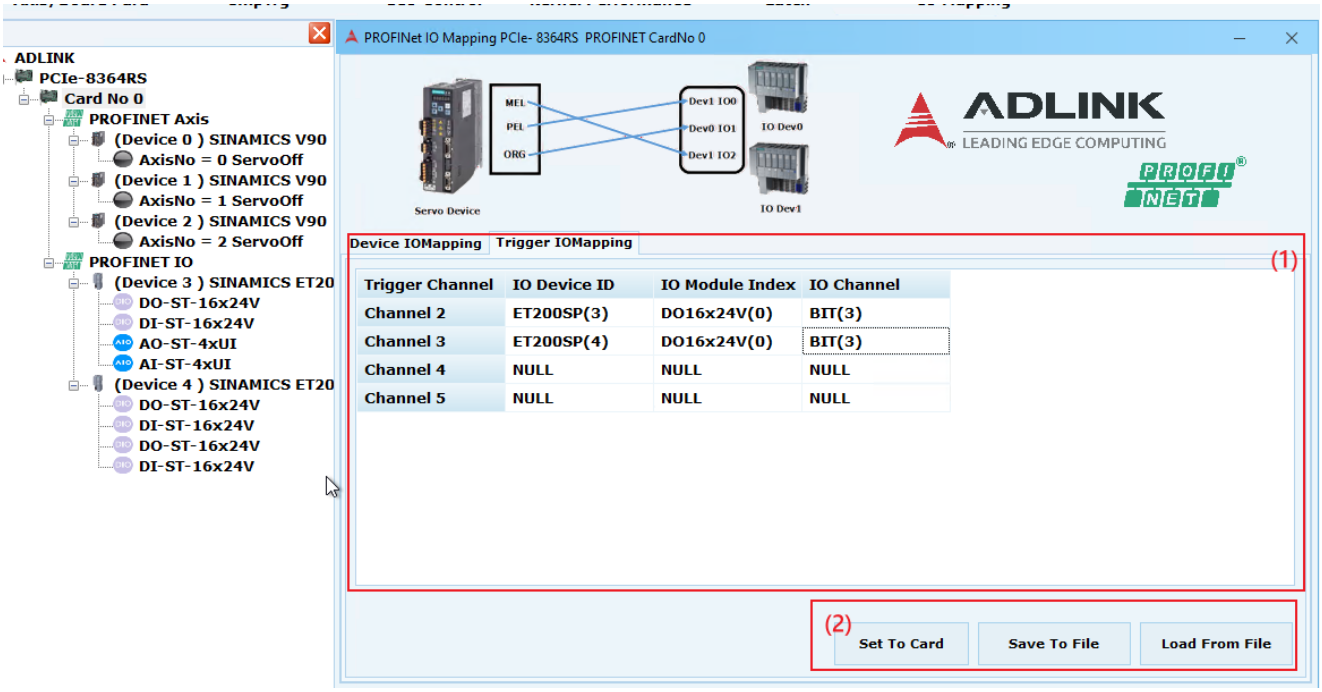
- **Device IOMapping**: maps the desired Axis Motion IO to the Device DI and sets it to the ProFiNet card.



(1) Set the Device DI mapping to Axis Motion IO table.

(2) **Set to Card**: Set values to the ProFiNet card.
Save To File: Writes parameters to a specified file (*csv).
Load From File: Reads parameters from the specified file to the page display (*csv).

- **Trigger Mapping**: maps the required Trigger Output to the Device DO and sets it to the ProFiNet card.

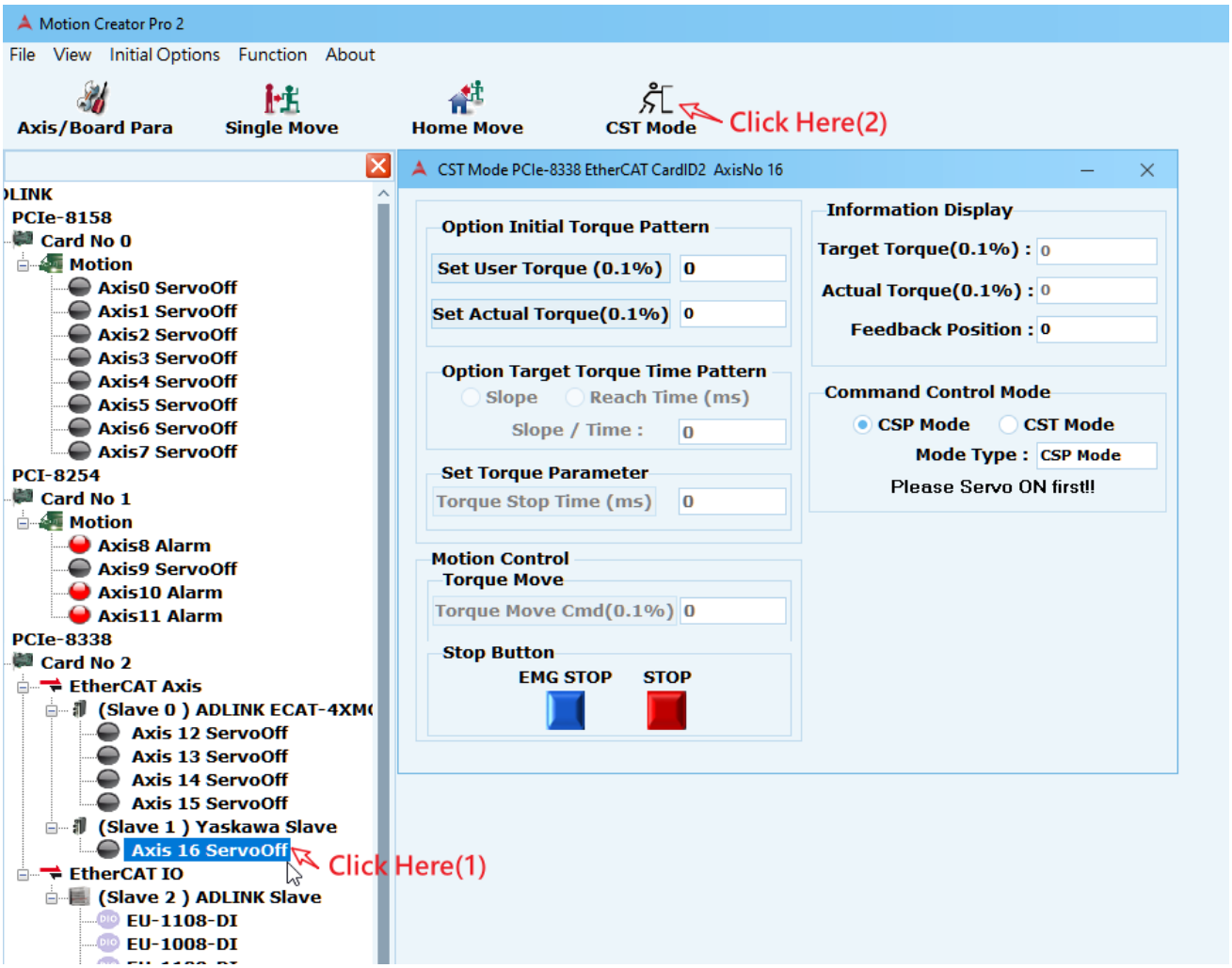


(1) Set the Device DO mapping to the Trigger Output table.
(2) **Set to Card**: Sets values to the ProFiNet card.
Save To File: Writes parameters to a specified file (*csv).
Load From File: Reads parameters from the specified file to the page display (*csv).

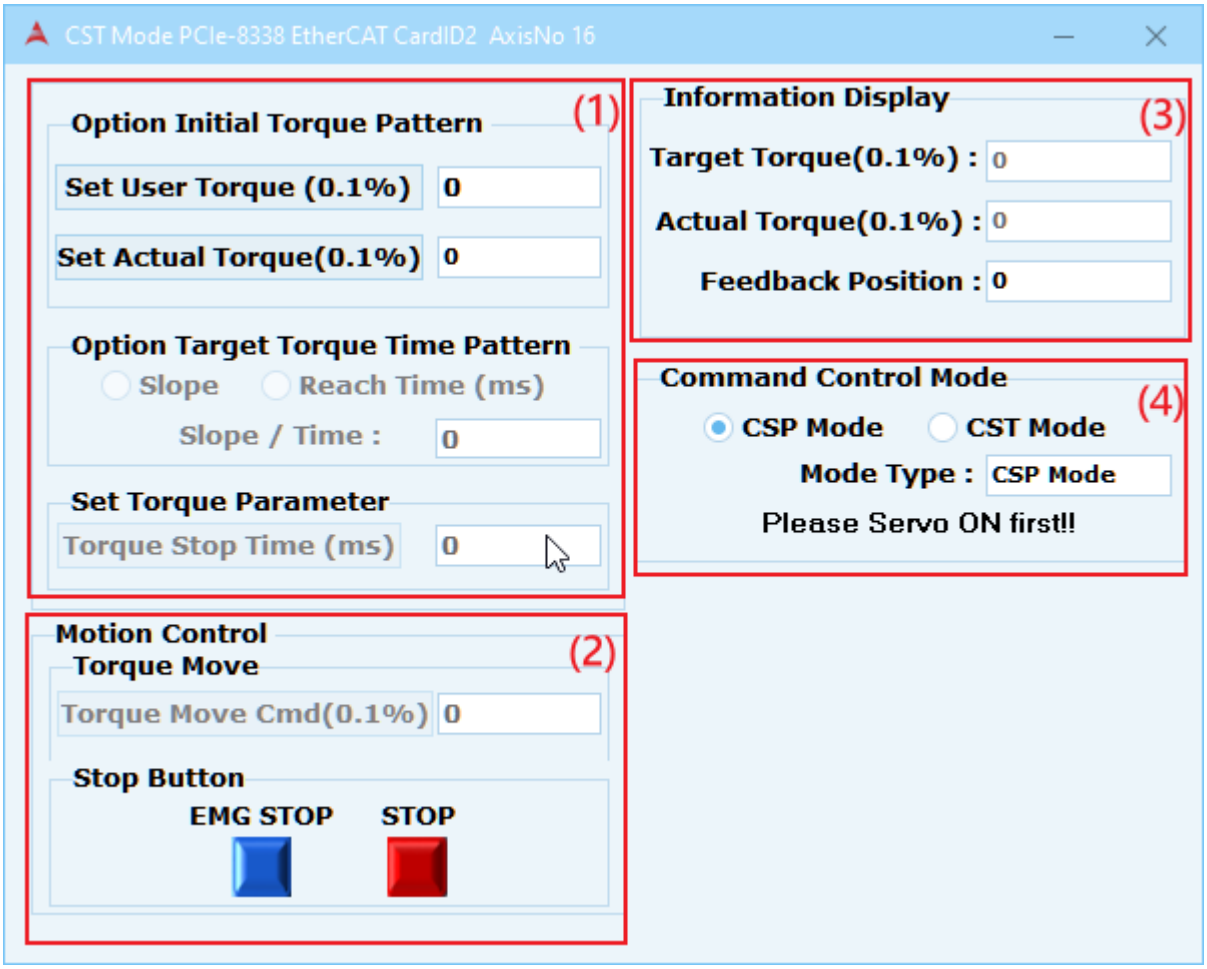
3.21 CST Mode

In Cyclic Synchronous Torque (CST) mode, the trace generator is located in the control unit instead of the servo drive. It provides the target torque to the drive device in a cyclic and synchronous manner, and the drive device performs torque control.

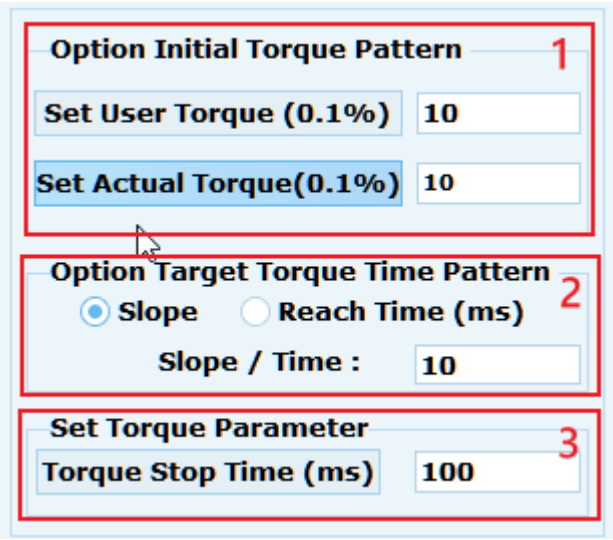
To open the CST Mode page, click **Axis x** on the device tree column, and then click the **CST Mode** icon.



CST Mode options are shown below.

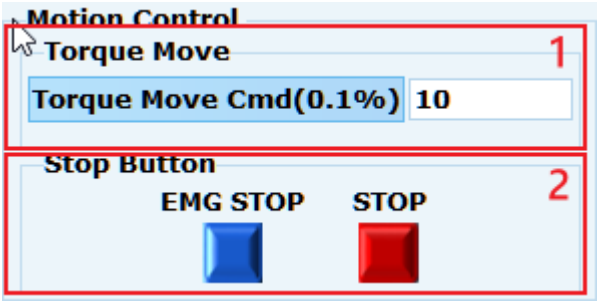


(1) CST Mode parameter setting and selection.

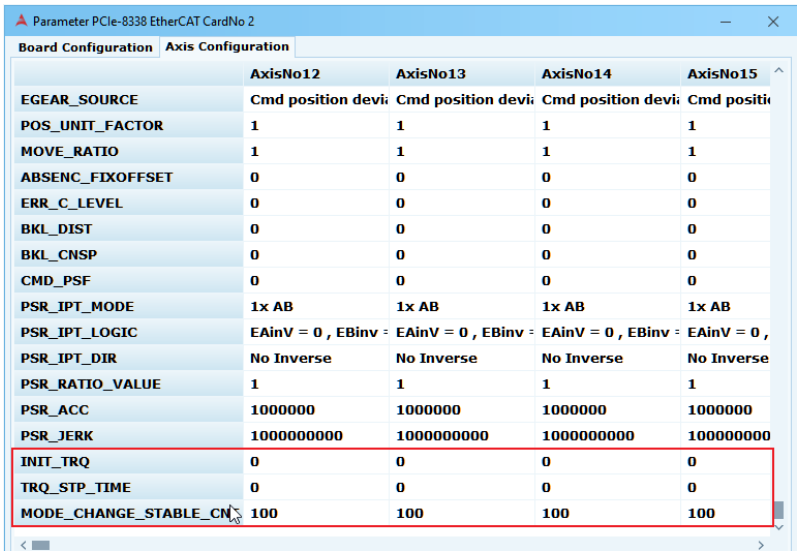


1. **Option Initial Torque Pattern**: Select (user \ actual Torque) to set the initial torque value when switching to CST mode.
2. **Option Target Torque Time Pattern**: Select Slope\reach time mode and parameters to achieve the target torque.
3. **Set Torque Parameter**: Torque Stop time value in milliseconds.

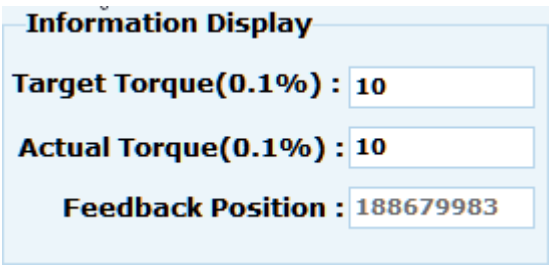
(2) Motion control



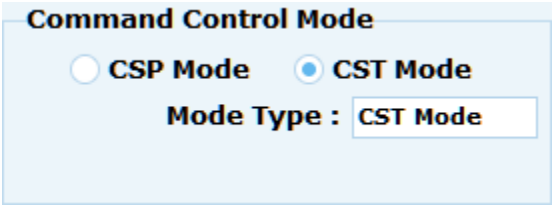
1. **Torque Move**: Torque command parameter setting.
2. **Stop Button**: **STOP** decreases the torque to 0 according to the set value of torque Stop time. The relevant settings are located in the axis parameters. **EMG STOP** indicates the immediate stop mode.



(3) **Status display area**: Displays target torque value, actual torque value and feedback position.



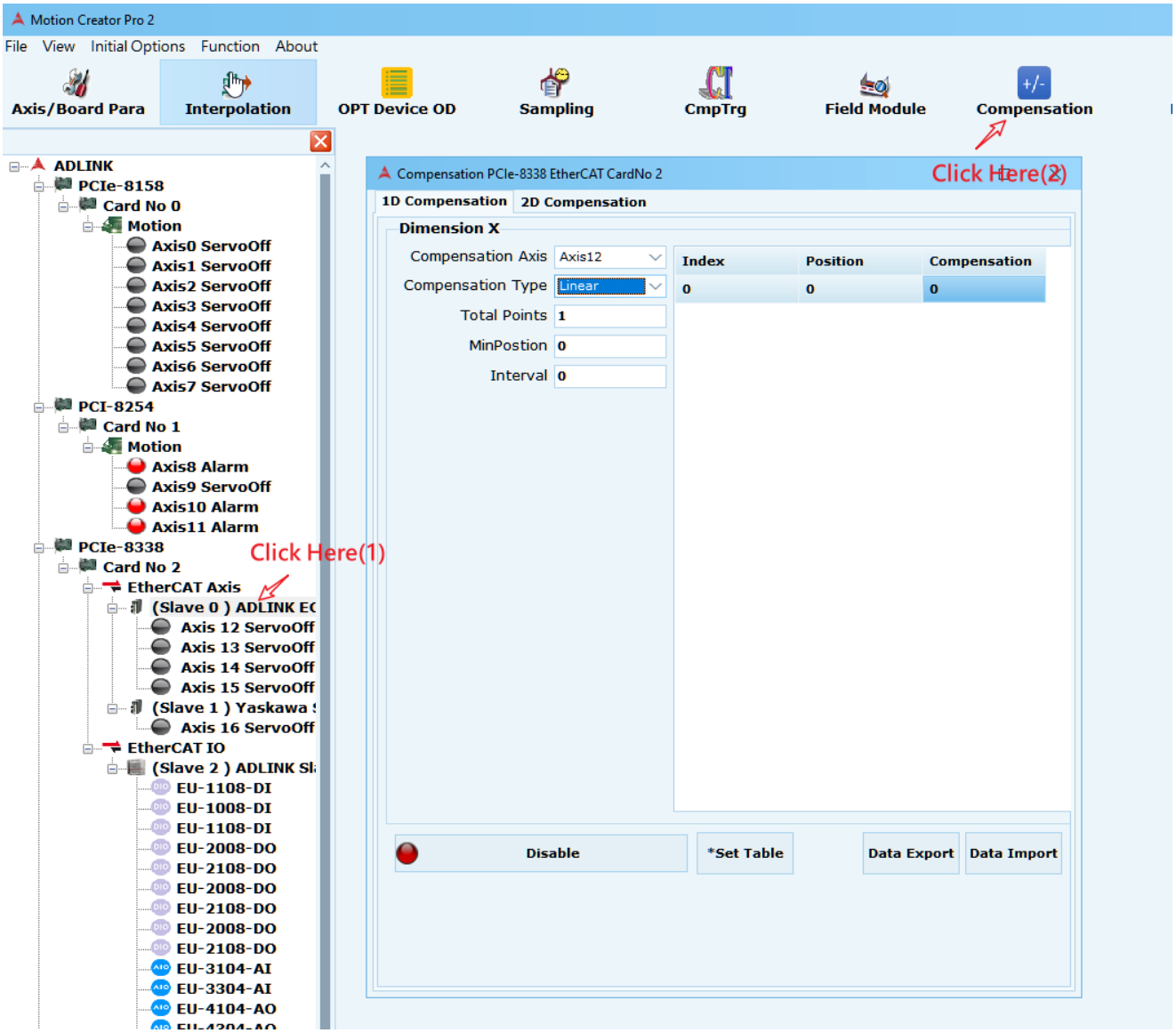
(4) **CSP/CST Mode selection and setting**: Switches mode setting.



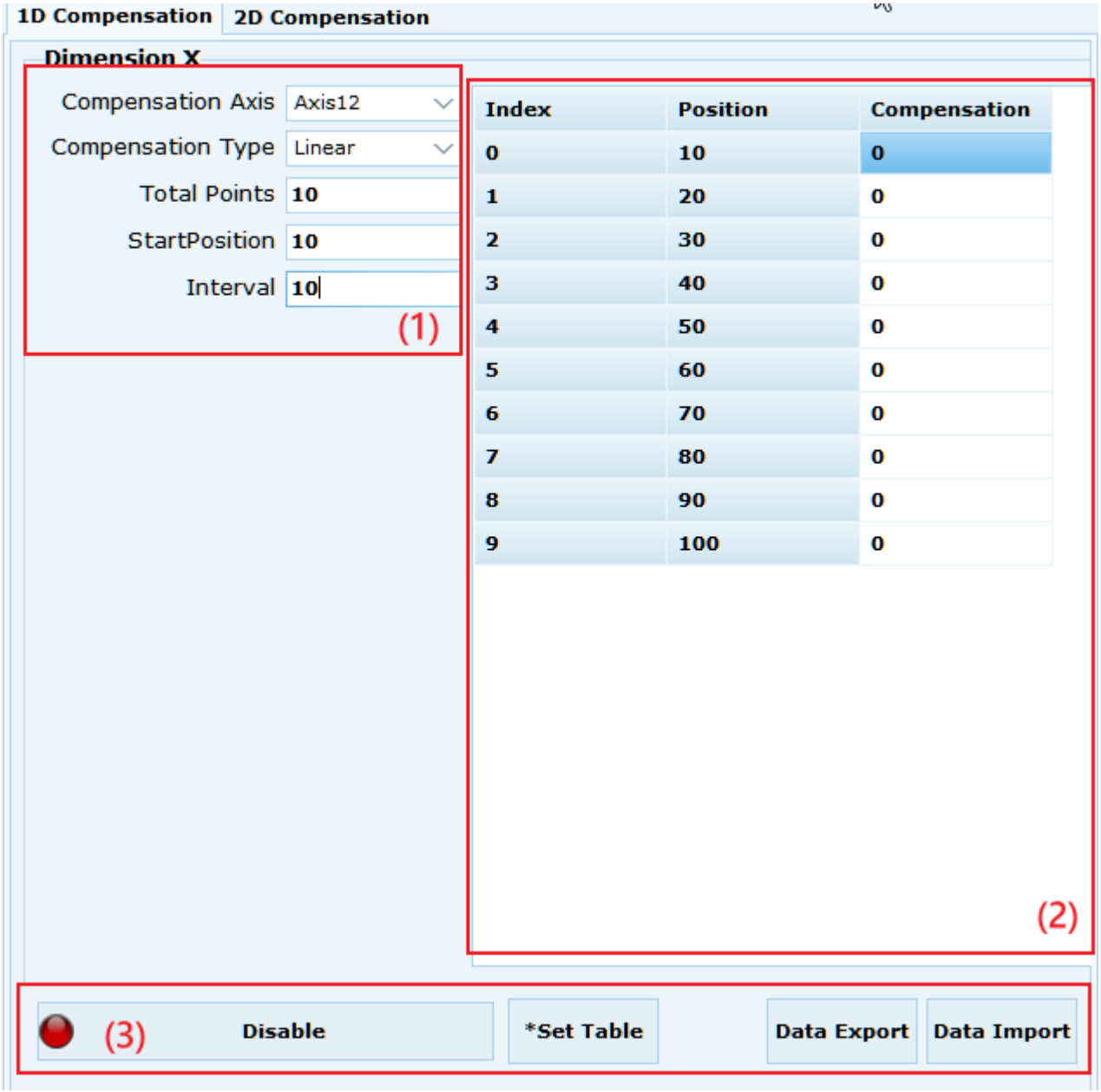
3.22 Compensation

Compensation provides 1D and 2D motion compensation table settings and can export files.

To open the Compensation page, click **Slave x** on the device tree column, and then click the **Compensation** icon.



1D Compensation

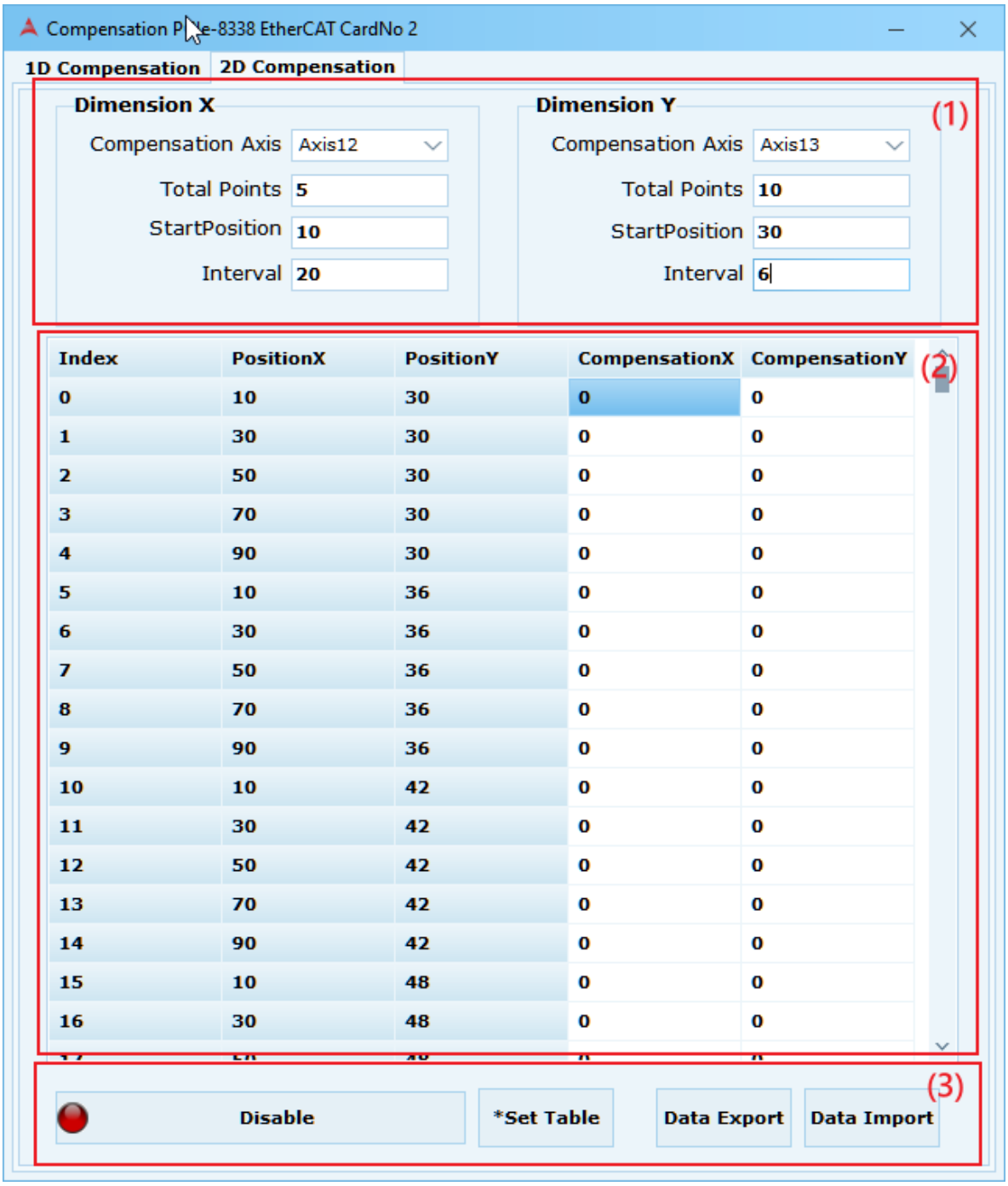


(1) Setting parameters
- **Compensation Axis**: The axis that sets compensation
- **Compensation Type**: Linear or Constant
- **Total Points**: How many points are compensated
- **Start Position**: Compensation starting point
- **Interval**: Compensation for point spacing

(2) Input compensation amount

(3) Other functions
- **Set Table**: Sets table after compensation parameters are configured
- **Disable/Enable**: Enables compensation
- **Data Export**: Stores compensated data (*csv)
- **Data Import**: Compensation data import (*csv)

2D Compensation



(1) Setting parameters
- **Compensation Axis**: An axis that sets 2D compensation
- **Total Points**: How many points are compensated in 2D
- **Start Position**: 2D compensation starting point
- **Interval**: Compensating for point spacing

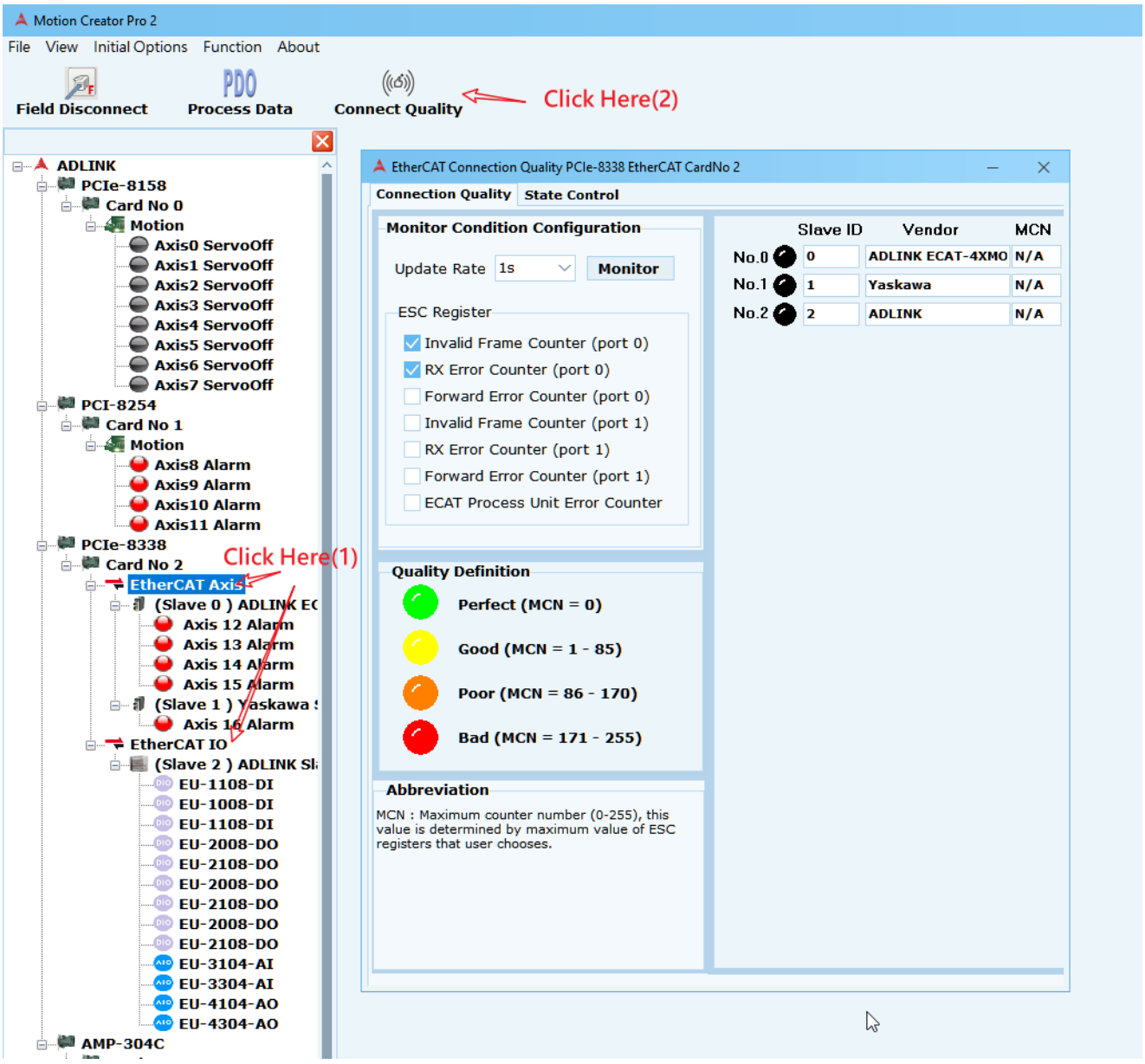
(2) Input 2D compensation

(3) Other functions
- **Set Table**: Sets table after compensation parameters are configured
- **Disable/Enable**: Enables compensation
- **Data Export**: Stores 2D compensation data (*csv)
- **Data Import**: 2D compensation data import (*csv)

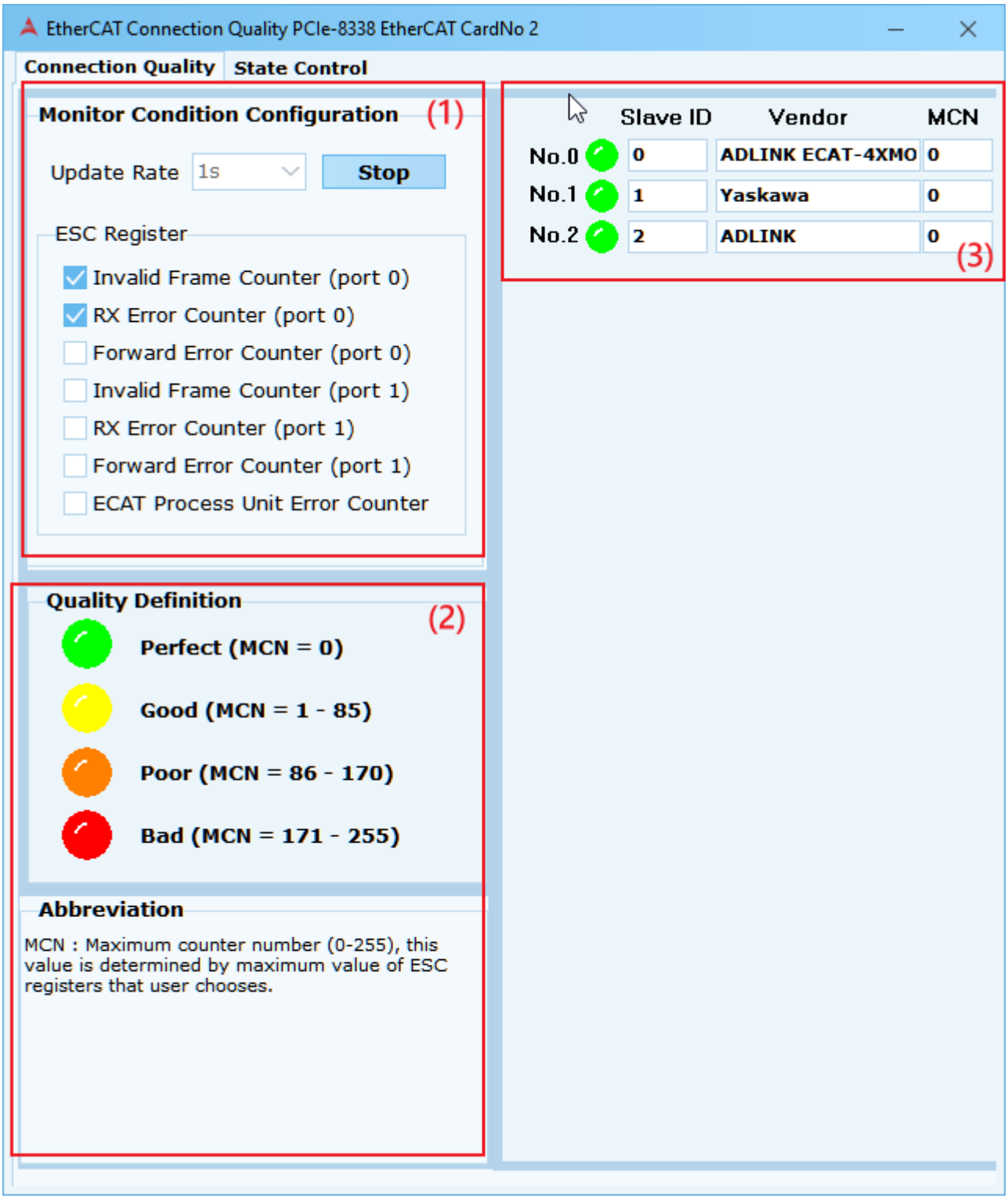
3.23 Connect Quality

The Connect Quality page is used to monitor the connection quality and confirm the Slave connection quality.

To open the Connect Quality page, click **EtherCAT Axis** or **EtherCAT IO** on the device tree, then click the **Connect Quality** icon.

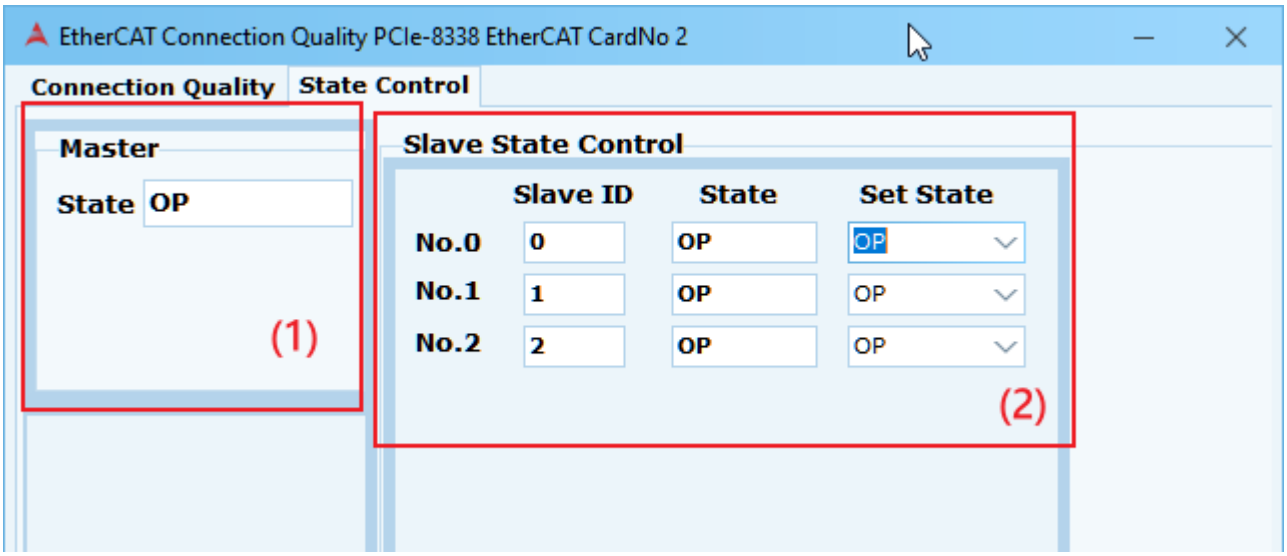


3.22.1 Connection Quality



(1) **Monitor Condition Configuration**: Checks the quality monitoring parameters and update rate.
(2) **Quality Definition**: Connection quality level classification.
(3) Quality status monitoring.

3.22.2 State Control



(1) EtherCAT Master current status.
(2) **Slave State Control**: EtherCAT Slave current status and switching setting options.