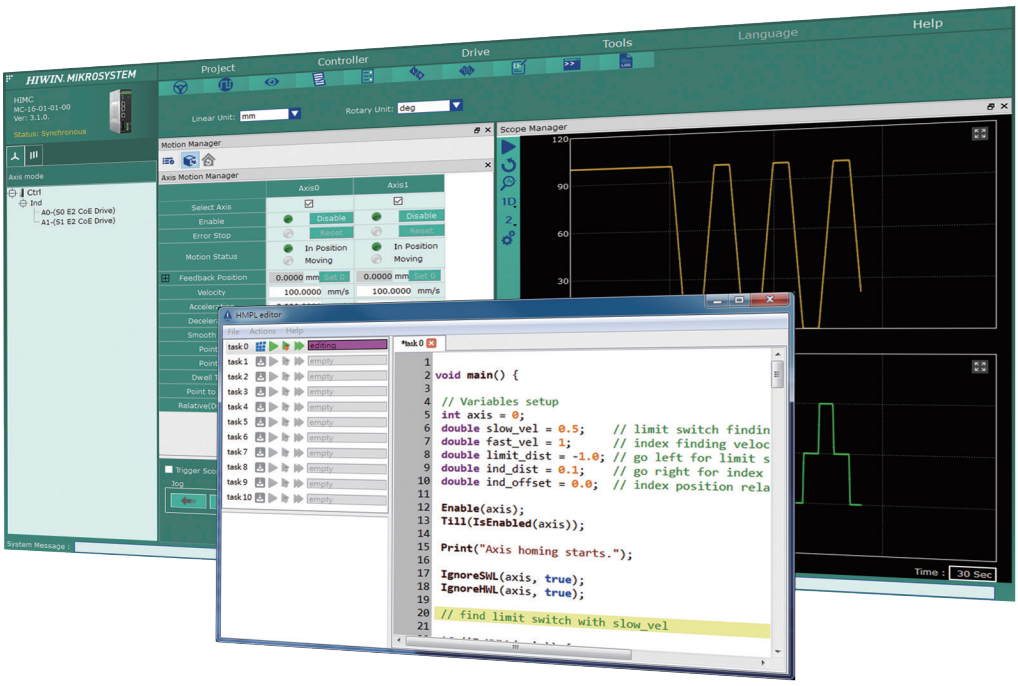
HIWIN® MIKROSYSTEM



HIMC

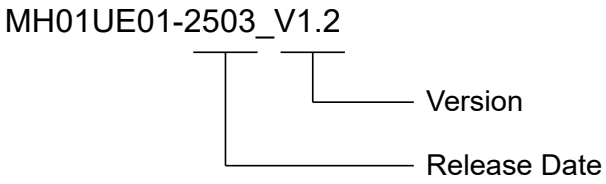
iA Studio User Guide

www.hiwinmikro.tw

MH01UE01-2503_V1.2

Revision History

The version of the guide is also indicated on the bottom of the front cover.



Release Date	Version	Applicable Software Version	Revision Contents
Mar. 31st, 2025	1.2	iA Studio 3.2	1. Update controller icon in iA Studio. 2. Revise section 1.2 “**Version description**”. 3. Revise section 2.6 “**Firmware manager**”. 4. Revise section 4.14.1 “**Open IP Setting**”.
Feb. 28th, 2025	1.1	iA Studio 3.1	1. Update main screen icon in iA Studio. 2. Revise section 2.1.4 “**Access privilege**”. 3. Delete section 2.1.5 “**Connection version consistency**”. 4. Revise section 3.2.3 “**ESI Manager and setting**”. 5. Revise section 3.3.1 “**Set up HIMC**”. 6. Revise section 4.1 “**Motion Manager**”. 7. Revise section 4.2 “**Parameter Configuration**”. 8. Revise section 4.3 “**Status Manger**”. 9. Revise section 4.5 “**Analog IO**”. 10. Revise section 4.8 “**Controller Log**”. 11. Separate section 4.10 from section 4.9.5 “**Plot View**”. 12. Revise section 4.10.8 “**Computation window**”. 13. Revise section 4.12 “**Modbus Manager**”. 14. Add section 4.15 “**EtherCAT**”. 15. Add section 4.16 “**Watch Window**”. 16. Revise section 5.1 “**iA Studio error codes**”, including adding section 5.1.3 “**Master communication error codes**”.
Mar. 15th, 2023	1.0	iA Studio 3.0	1. Update HIWIN logo. 2. Revise chapter 3 “**Controller configuration**”. 3. Revise section 4.4 “**Digital IO**”. 4. Revise section 4.5 “**Analog IO**”. 5. Revise section 4.8 “**Controller log**”. 6. Remove section 4.14 “**PDO Mapping Manager**”. 7. Add section 4.14 “**CoE Object Dictionary**”.
Jun. 30th, 2022	0.6	iA Studio 2.0	1. Revise table 1.4.1.1. 2. Add section 2.9 “**Performance mode**”. 3. Revise section 3.3.1, Step 7, Note 2. 4. Revise table 4.2.4.1. 5. Add section 4.5 “**Analog IO**”. 6. Revise table 4.11.2.1. 7. Revise figure 4.13.1.2. 8. Revise section 4.14.1, Step 5. 9. Revise table 5.1.1.1, 5.1.3.2, 5.1.3.3 and

Release Date	Version	Applicable Software Version	Revision Contents
			5.1.3.4.
Sep. 15th, 2021	0.5	iA Studio 1.4	1. Revise figure 2.1.5.1. 2. Revise table 5.1.1.1, 5.1.3.2 and 5.1.3.3.
Jul. 27th, 2020	0.4	iA Studio 1.3	1. Add section 2.1.4 “**Access privilege**”. 2. Add section 2.1.5 “**Connection version consistency**”. 3. Revise figure 3.3.1.6. 4. Revise section 3.3.1, Step 7, Note 1. 5. Add section 3.3.1, Step 7, Note 2. 6. Revise figure 4.2.1.2. 7. Add section 4.2.4 “**Parameter descriptions**”. 8. Revise figure 4.8.2.1. 9. Revise figure 4.8.2.1.1. 10. Revise figure 4.8.3.1. 11. Revise figure 4.8.3.1.1. 12. Add section 4.11.5 “**Search for user-defined parameters**”. 13. Add section 4.13 “**PDO mapping manage**r”. 14. Revise table 5.1.1.1, 5.1.3.2 and 5.1.3.3.
Nov. 29th, 2019	0.3	iA Studio 1.2.4032.0	**Section 1.2 System requirements:** iA Studio also supports Windows 10 (32-bit or 64-bit) operating system.
Apr. 2nd, 2019	0.2	iA Studio 1.1.3772.0	1. Update **Configuration Wizard** interface. Divide it into three steps, “Scan Network”, “Configuration Setup”, and “Save to HIMC”. 2. Optimize **Save / Load project file** operation interface. 3. Optimize table operation interface of **Motion Manager**, **Controller Parameter**, and **Status Manager**. 4. Add Group Status interface in **Status Manager**. 5. Add 3D Scope function in **Scope Manager**. 6. Amplify Time / Value Cursor function in **Plot View**. Add computation function and loading different parameter data file function. 7. Add password protection function in **HMPL Editor**. 8. Add **IP Setting** window.
Apr. 25th, 2018	0.1	iA Studio 1.0.2461.0	First edition.

Related Documents

Through related documents, users can quickly understand the positioning of this manual and the correlation between manuals and products. Go to HIWIN MIKROSYSTEM's official website → Download → Manual Overview for details (https://www.hiwinmikro.tw/Downloads/ManualOverview_EN.htm).

Table of Contents

1. iA Studio overview

1.1 iA Studio introduction

industrial Automation Studio (iA Studio) is a Windows-based software package which supports multiple motion control products from HIWIN. With graphical user interface and powerful functions, iA Studio enables users to easily configure, operate and monitor controller.

1.2 Version description

HIMC controller with CoE communication (product model: MC-XX-XX-01-XX) must be applied with software version iA Studio 3.0 and above, while HIMC controller with MoE communication (product model: MC-XX-01-00-XX) must be applied with software version iA Studio 2.X and below. Follow the table below to use the corresponding software version.

Table 1.2.1 Software versions corresponding to controller products

Software Version	Controller		Communication Format	Product Model
iA Studio 3.2 and above		HIMC3	EtherCAT	MC-XX-**03-01**-XX
iA Studio 3.1 iA Studio 3.0		HIMC	EtherCAT	MC-XX-**01-01**-XX
iA Studio 2.X and below			mega-ulink	MC-XX-**01-00**-XX

The unit of motion variables adopted by iA Studio 1.3 and above:
linear motion (mm), rotary motion (deg), time (ms)
The unit of motion variables adopted by iA Studio 1.2 and below:
linear motion (m), rotary motion (rad), time (s)

1.3 System requirements

System requirements for running iA Studio on a Windows-based PC are as follows.

Table 1.3.1 System requirements

Operating System	Windows 7 (32-bit, 64-bit) Windows 10 (32-bit, 64-bit)
CPU	Intel Core i3 3.5 GHz or higher
RAM	4 GB or more
Hard Disk Space	400 MB or more
Display	1366 x 768
Communication Type	Ethernet

1.4 iA Studio modules

iA Studio provides the following modules for users to configure, operate and monitor controller.

- Motion Manager
- Parameter Configuration
- Status Manager
- Digital IO
- Analog IO
- Message Window
- Error Message
- Controller Log
- Scope Manager
- Plot View
- Watch Window
- HMPL Editor
- Table Viewer
- Modbus Manager
- IP Setting
- EtherCAT

1.5 Main screen

After iA Studio connects to the controller, the main screen will display. For connecting to the controller, please refer to section 2.1.1 **Connection setting**. iA Studio main screen is divided into six sections, menu bar, workspace, emergency stop, status bar, network configuration view and controller information box. The following will describe the function of each section.

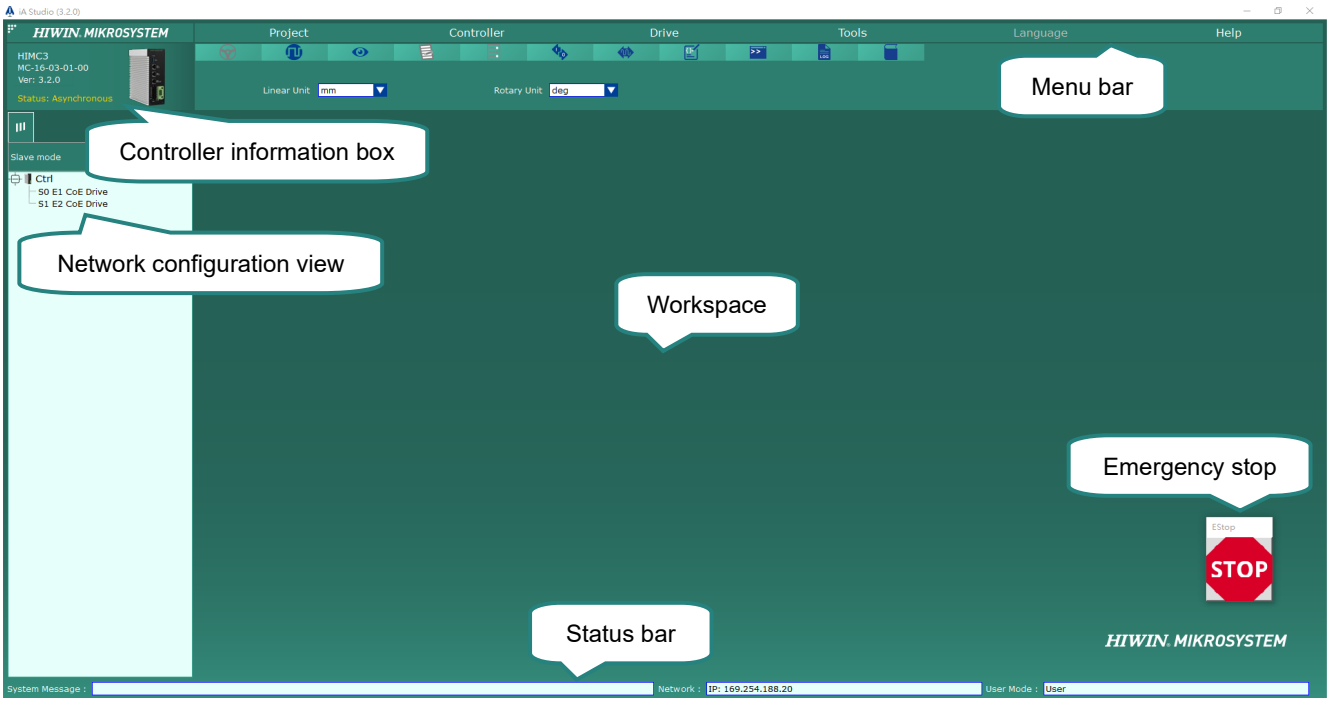


Figure 1.5.1 iA Studio main screen

1.5.1 Menu bar

Table 1.5.1.1 Menu bar

Menu Bar	Submenu	Function
Project	Configuration Wizard	Create / Modify project file.
	Load	Load project file from local disk.
	Save	Save project file to local disk.
Controller	Connection Setting	Connect to the controller or simulator.
	Firmware Manager	Manage controller firmware.
	Rescan Slaves	Rescan slaves. If configuration already exists, controller will try to switch to synchronous status.
	Store Configuration	Save current configuration to the controller.
	Reboot Controller	Reboot controller.
	Set to Factory Default	Set controller to factory default.
	Get Access Privilege	Get Access Privilege.
Tools	User Account	Change user mode.
	Turn Off/On Econ Mode	Modify performance mode.
	Parameter Configuration	View and set axis parameters.
	Motion Manager	Control single-axis motion and set motion parameters.
	Scope Manager	Monitor and collect parameter data.
	Plot View	View the recorded parameter data from scope.
	Watch Window	Monitoring window for variables.
	Parameter Configuration	View and set variables of each axis.
	Status Manager	Monitor axis motion and fault status.
	Digital IO	Monitor digital inputs and outputs.
	Analog IO	Monitor analog inputs and outputs.
	HMPL Editor	Create and run HMPL task.
	Controller Log	View controller log.
	Message Window	Open command line window.
	Table Viewer	Set User Table. User Table can be used in HMPL, API library and Modbus communication.
	Modbus Manager	Set controller parameters and HMPL global variables that can be accessed via Modbus TCP.
	IP Setting	Modify controller's CN3 IP Address, Native ASCII Port and User ASCII Port.
	EtherCAT	Object Dictionary: Access CoE object of the slave.
Language	N/A	Change to other languages.
Help	iA Studio User Guide	Open iA Studio user guide.
	Application Center	Open Application Center.
	About	Information on software and firmware version.

1.5.2 Controller information box

Controller information box shows controller model, firmware version, and controller status.

Figure 1.5.2.1 Controller information box

For controller status, please see below.

Table 1.5.2.1 Controller status

Controller Status	Description
Initializing	Controller is initializing.
Busy	Controller is busy.
Synchronous	Controller is ready to control axis motion.
Asynchronous	Controller is not ready to control axis motion.
Error	An error occurs in the controller.
Reboot	Controller is rebooting.
Broken	Connection to the controller is broken.

1.5.3 Network configuration view

In network configuration view, users can inspect the relation among master (controller) and slaves (e.g., drives) in two different modes: slave mode and axis mode.

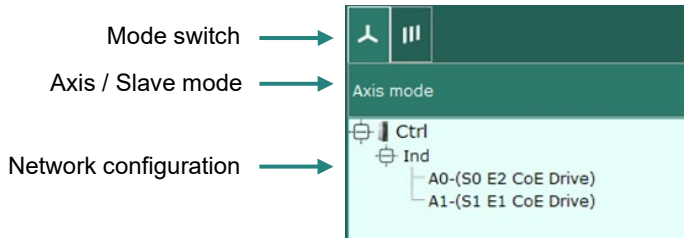


Figure 1.5.3.1 Network configuration view

(1) Slave mode

After iA Studio connects to the controller, users can see the user-defined name of all slaves. To switch to slave mode, please follow the steps below.

Step 1: Click on the icon below. Then the network configuration view will display in slave mode.
Step 2: The configuration tree displays as follows.

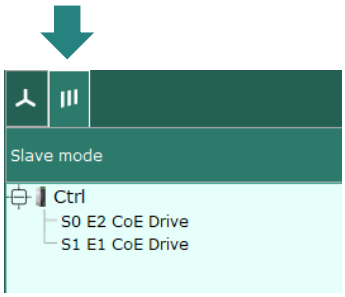


Figure 1.5.3.2 Network configuration view: slave mode

(2) Axis mode

If stages are set in Configuration Wizard, users can see stages, logical axes and physical slaves in axis mode. Axes can be listed in user-defined stage or in stage Ind. See section 3.3 **Configuration setup** for more information. To switch to axis mode, please follow the steps below.

Step 1: Click on the icon below. Then the network configuration view will display in axis mode.
Step 2: The configuration tree displays as follows.

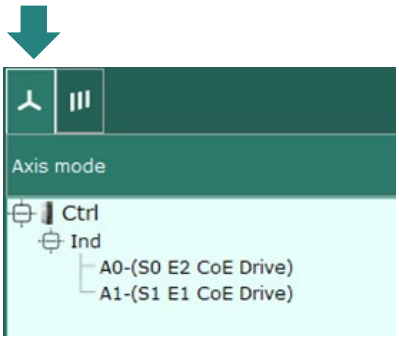


Figure 1.5.3.3 Network configuration view: axis mode

1.5.4 Workspace

Workspace is the area for displaying different modules at the same time. In workspace, users can freely drag, drop, re-size and re-arrange modules.

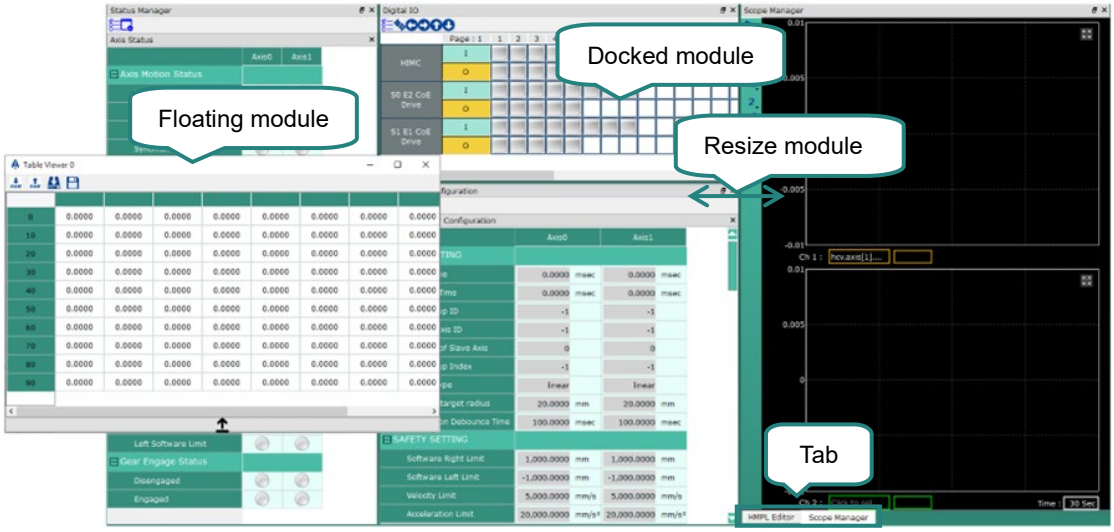


Figure 1.5.4.1 Workspace

Users can click on  button in the upper-left corner of the main screen to maximize workspace.

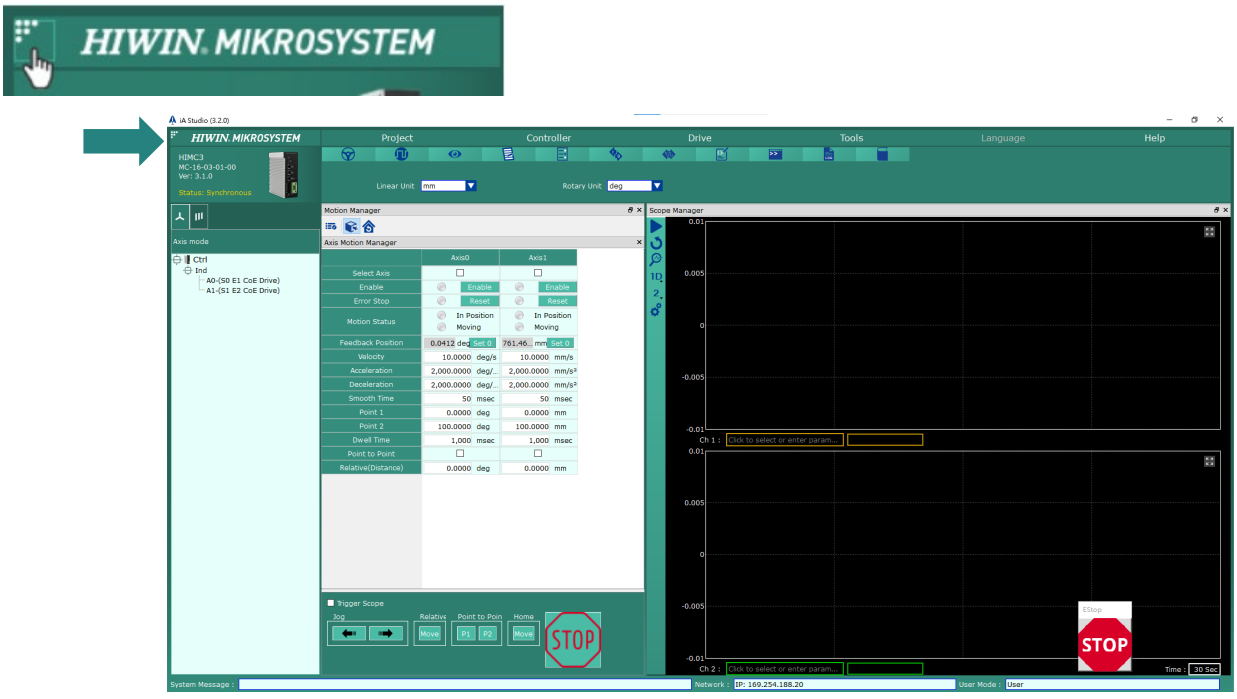


Figure 1.5.4.2 Maximize workspace

Click again on  button in the upper-left corner of the main screen to revert to the default display.

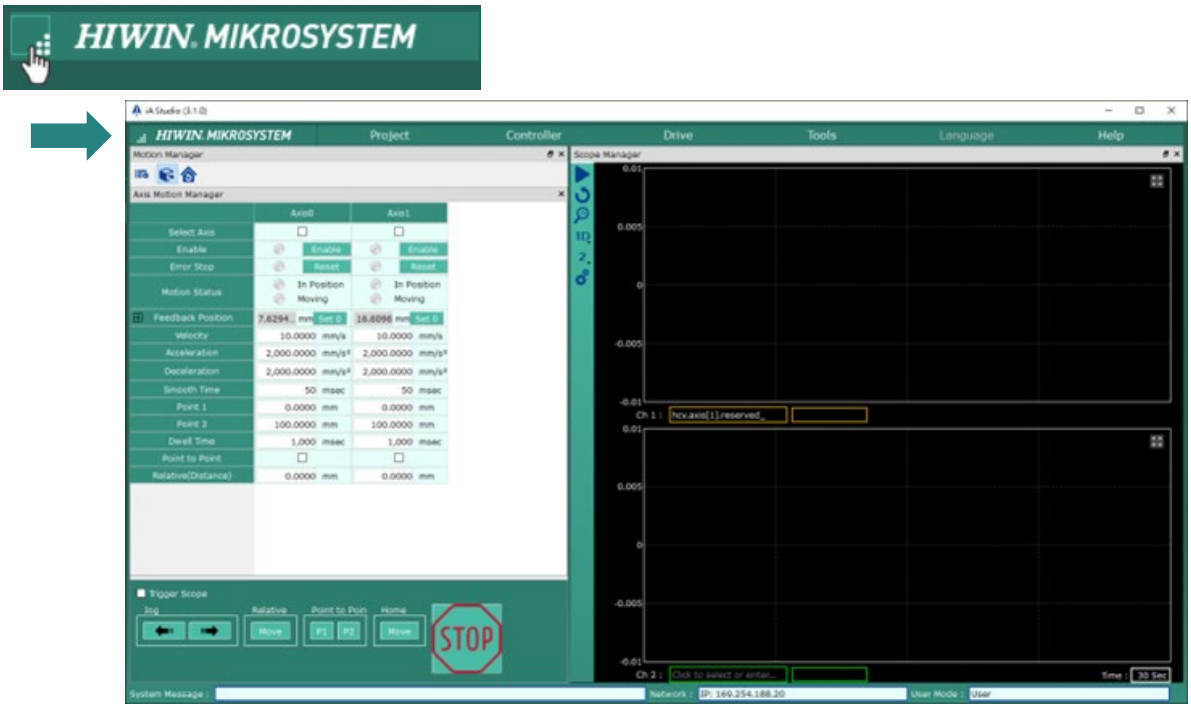


Figure 1.5.4.2 Revert to the default workspace

1.5.5 Status bar

Status bar shows system message, network type, and user mode.

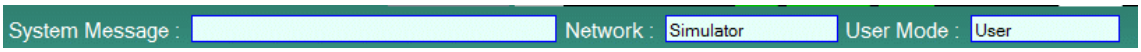


Figure 1.5.5.1 Status bar

1.5.6 Emergency stop

Click on **Emergency Stop** button to disable all axes. All HMPL tasks will be stopped at the same time. The button is always shown on the top of main screen when iA Studio and controller are connected. The button will disappear when iA Studio and controller are disconnected or iA Studio is closed.

Figure 1.5.6.1 Emergency Stop button

Note: Emergency stop can also be activated by keyboard function key **F12**.

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2. iA Studio basics

2.1 Connecting to the controller

In Connection Setting, users can connect iA Studio to the controller via specified communication type.

2.1.1 Connection setting

Follow the steps below to open Connection Setting window.

Step 1: Click on **Controller** on the menu bar.

Step 2: Click on **Connection Setting**. Then the Connection Setting window will appear as figure 2.1.1.2.

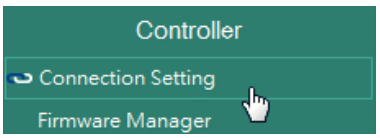

Figure 2.1.1.1 Connection Setting

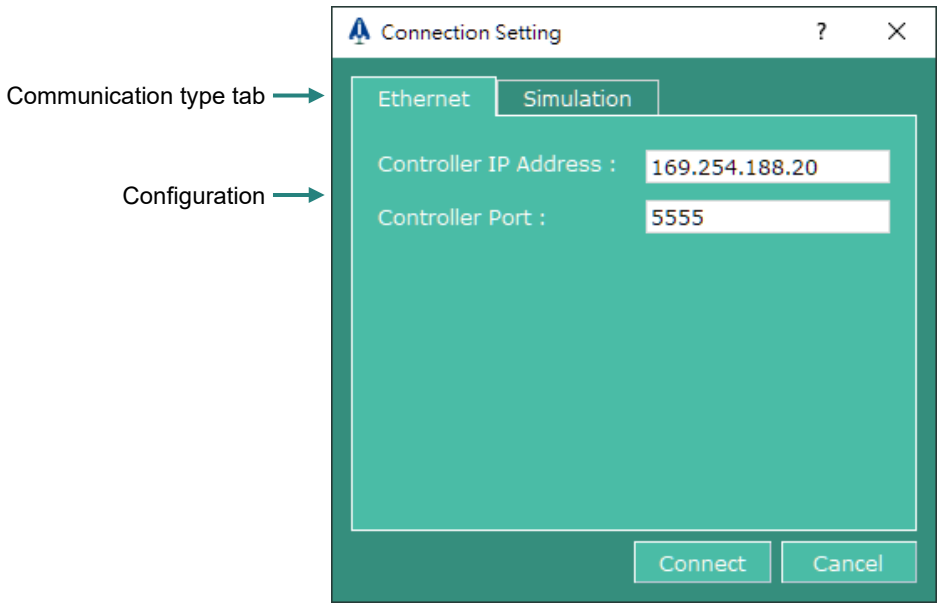

Figure 2.1.1.2 Connection Setting window: Ethernet

Table 2.1.1.1 Connection Setting window

Connection Type Tab	Description
Ethernet	Connect to controller via TCP / IP.
Simulation	Connect to virtual simulator.

2.1.2 Connecting to the controller via Ethernet

Controller can be connected via Ethernet. You may follow the steps below to establish connection.

Step 1: Select **Ethernet** tab in Connection Setting window.

Step 2: Enter controller IP address and IP port.

Step 3: Click on **Connect** button to initialize the connection. A pop-up window will appear to indicate the connecting progress.

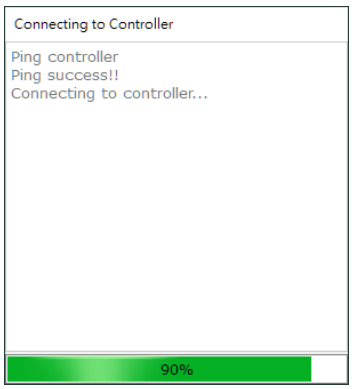

Figure 2.1.2.1 Connecting progress pop-up window

Connection Setting window and pop-up window will close automatically after connection is successfully established. If connection cannot be established, an error dialog will appear. When the error log appears, please check if the communication cable is properly connected to the controller.

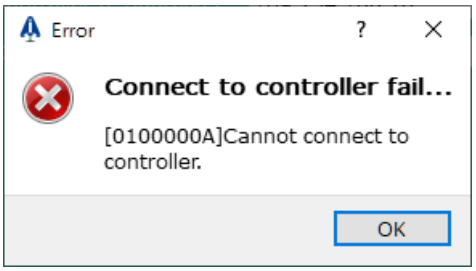

Figure 2.1.2.2 Fail to connect to the controller

2.1.3 Connecting to the simulator

To connect to the simulator, you may follow the steps below to establish connection.

Step 1: Select **Simulation** tab in Connection Setting window.

Step 2: Click on **Configure** button to open Slave Configuration Setting window.

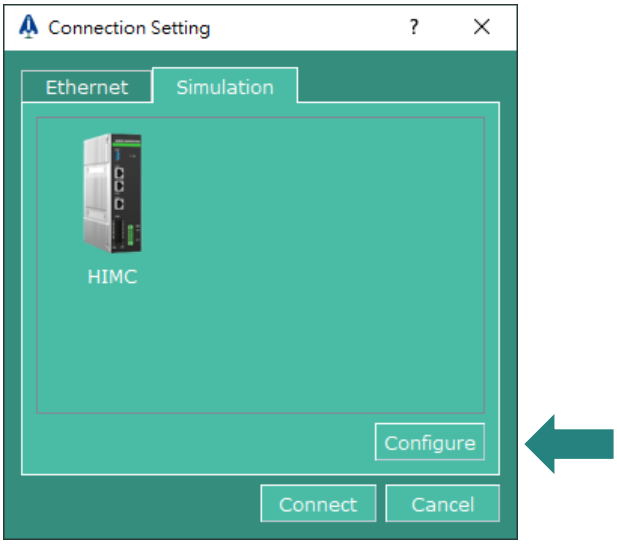

Figure 2.1.3.1 Connection Setting window: Simulation

Step 3: Set up slave configuration and click on **OK** button.

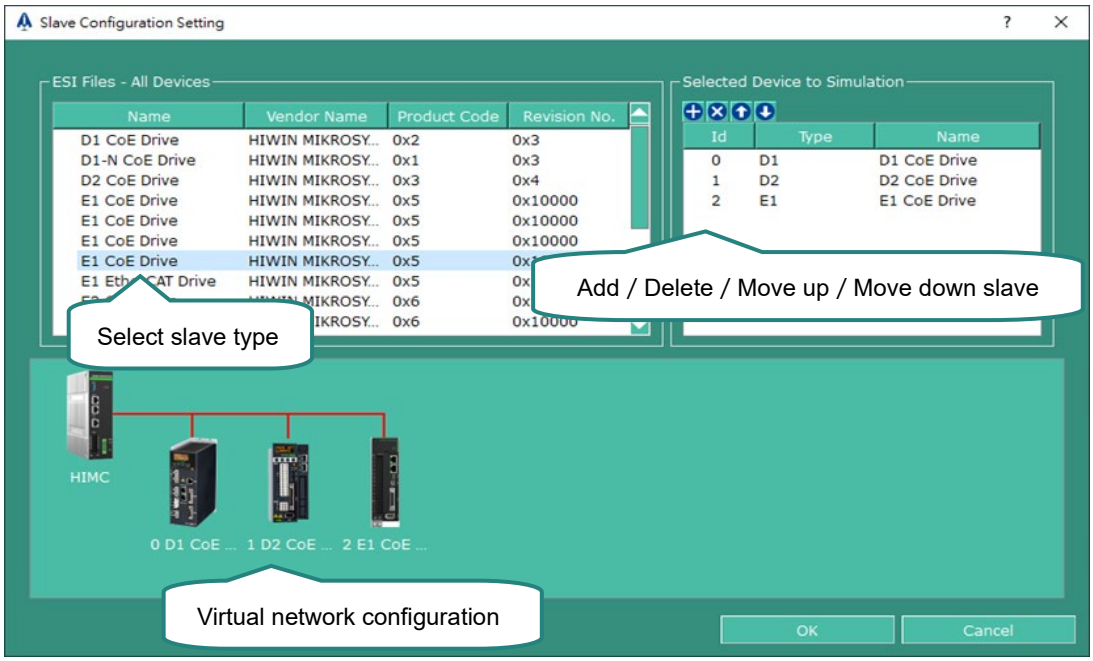

Figure 2.1.3.2 Slave Configuration Setting window

Step 4: Click on **Connect** button to initialize connection. A pop-up window will appear to indicate the connecting progress.

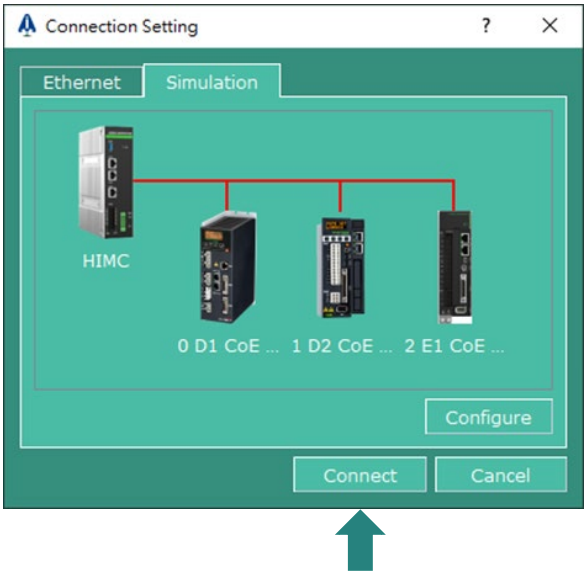

Figure 2.1.3.3 Connecting to the simulator

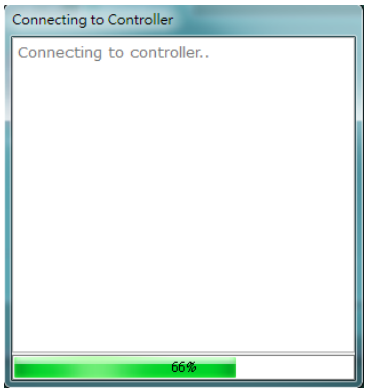

Figure 2.1.3.4 Connecting progress pop-up window

Connection Setting window and pop-up window will close automatically after connection is successfully established.

2.1.4 Access privilege

Although multiple iA Studios can support to connect to the controller at the same time, only the one with access privilege is permitted to write data to the controller. For the iA Studio without access privilege, the writing function is disabled. This is to avoid the safety issue caused by multi-connection and operation.

If a user connects to the controller by iA Studio without access privilege, a warning will pop up to remind the user that only value observation is allowed with this connection. In addition, the background color of the '**Network**' field will turn to yellow and '**Access Restricted**' will keep flashing.

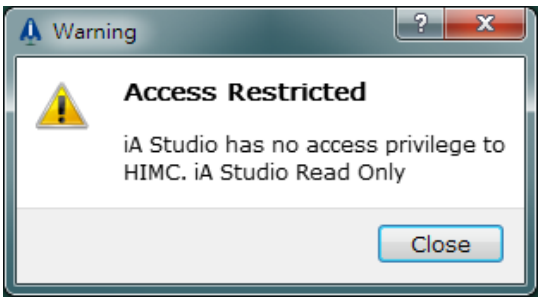

Figure 2.1.4.1 Warning to show the status of no access privilege

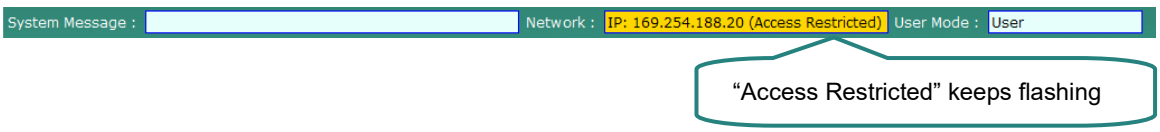

Figure 2.1.4.2 Status bar (no access privilege)

■ Get access privilege

If the current used iA Studio has no access privilege, users can obtain access privilege through this function and turn off the related functions in which other connections can write to the controller.

Please follow the steps below to obtain access privilege.
Step 1: Click **Controller** on the menu bar.
Step 2: Click **Get Access Privilege**.

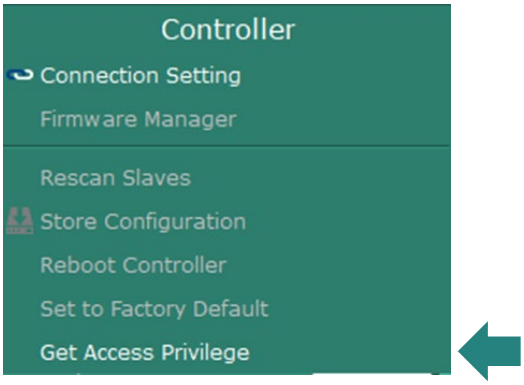

Figure 2.1.4.3 Get Access Privilege

When iA Studio has access privilege, the status bar will display as Figure 2.1.4.4.

Figure 2.1.4.4 Status bar (with access privilege)

2.2 Disconnecting from the controller

To discontinue the current connection with the controller or simulator, you may follow the steps below.

Step 1: Click on **Controller** on the menu bar. Click on **Connection Setting** to open Connection Setting window.

Step 2: Click on **Disconnect** button to discontinue current connection.

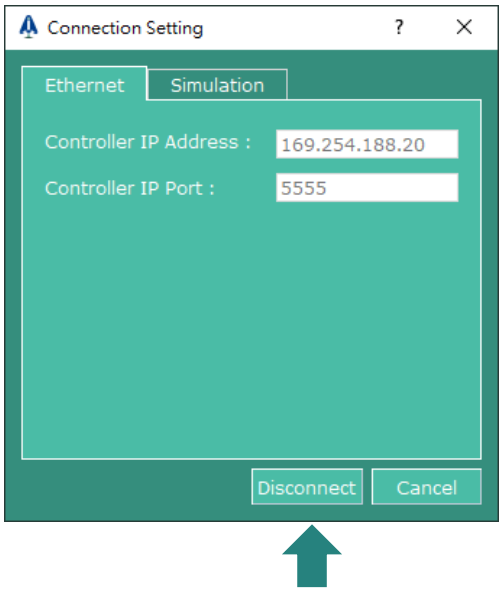

Figure 2.2.1 Connection Setting window when controller or simulator is connected

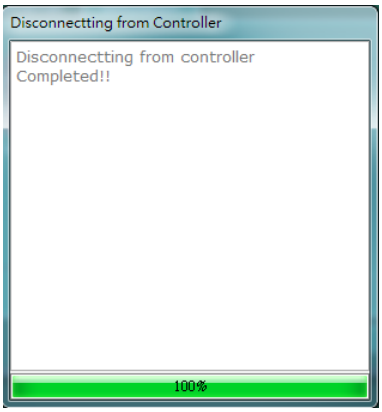

Figure 2.2.2 Disconnecting progress pop-up window

Pop-up window will automatically close after connection is successfully discontinued.

2.3 Store configuration

In iA Studio, there are two ways to save controller configuration.

(1) Use save / load project file function to save controller configuration as project file to your local disk. (Note: The file extension of iA Studio project file is *.iasprj2.) Project files can also be loaded from local disk to the controller. For further information, please refer to section 3.4 **Save / Load project file**.

(2) Use Store Configuration function to save controller configuration to the hard disk in the controller. The saved configuration will still be accessible after reboot or power-off.

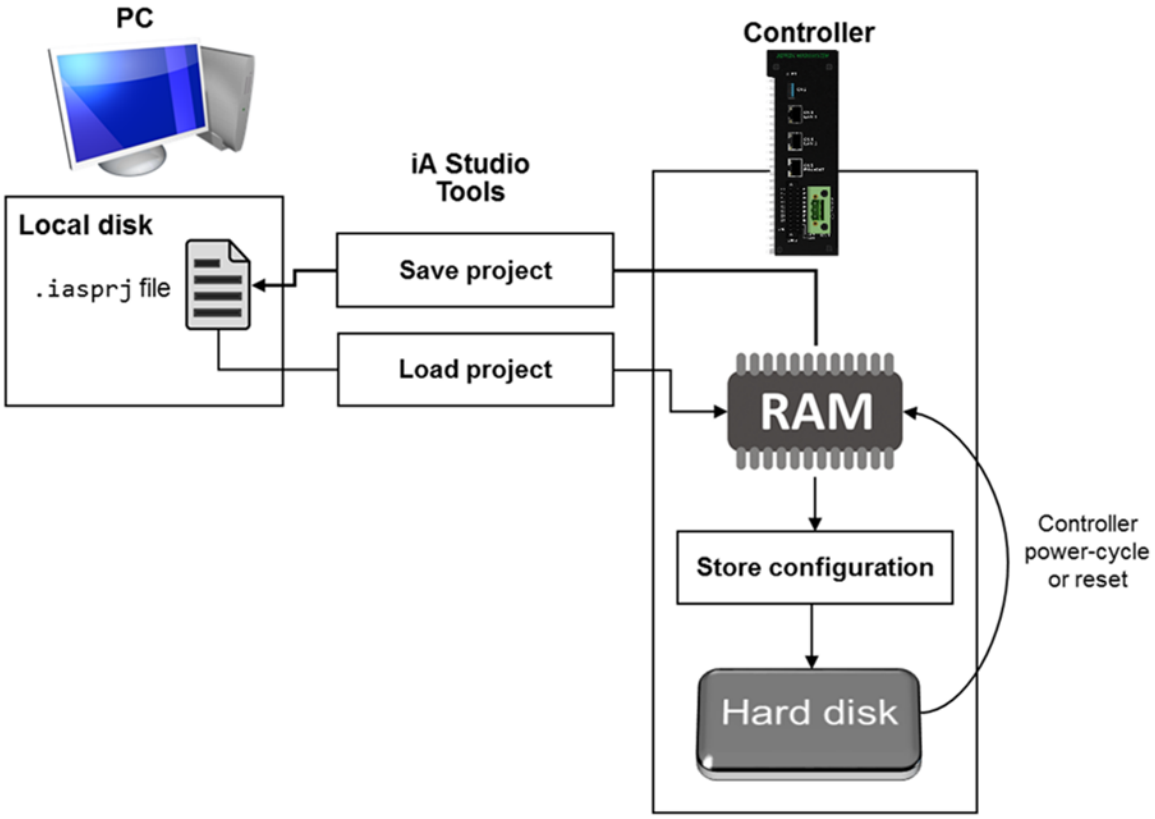

Figure 2.3.1 Save / Load project file and Store Configuration

After controller configuration is set in Configuration Wizard, users may follow the steps below to save the configuration to the controller.

Step 1: Click on **Controller** on the menu bar.
Step 2: Click on **Store Configuration**.

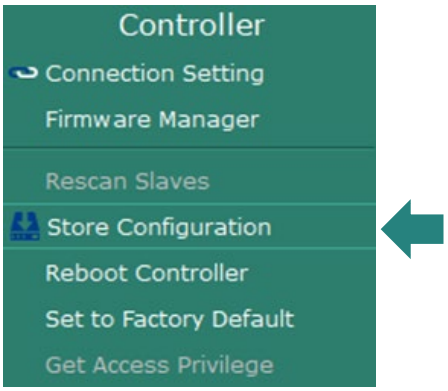

Figure 2.3.2 Store Configuration

Step 3: After **Store Configuration** is clicked on, a question dialog will appear. Click on **Yes** button to save controller configuration. A pop-up window will appear to indicate the saving progress.

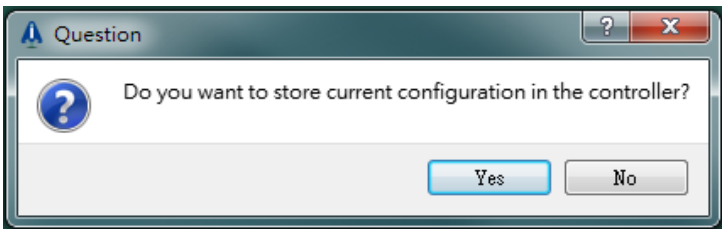

Figure 2.3.3 Save controller configuration warning dialog

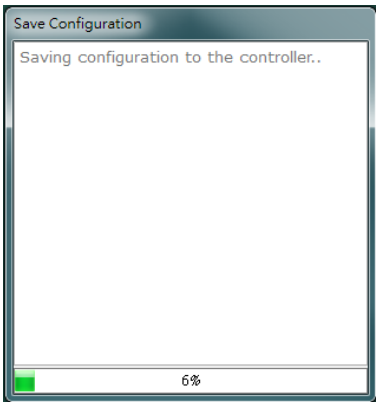

Figure 2.3.4 Pop-up window

Pop-up window will close automatically after controller configuration is successfully saved.

2.4 Reboot controller

Reboot Controller function enables users to restart and re-initialize controller. Settings which are not saved to the controller hard disk or local disk will be lost and cannot be recovered after reboot. To reboot controller, you may follow the steps below.

Step 1: Click on **Controller** on the menu bar.
Step 2: Click on **Reboot Controller**.

Figure 2.4.1 Reboot Controller

Step 3: After **Reboot Controller** is clicked on, a question dialog will appear. Click on **Yes** button to reboot controller. A pop-up window will appear to indicate the reboot progress.

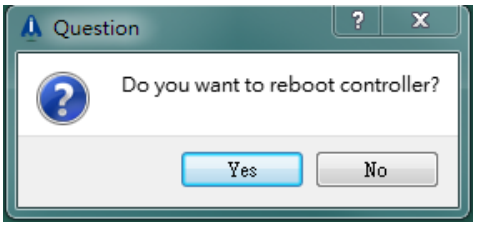

Figure 2.4.2 Reboot Controller question dialog

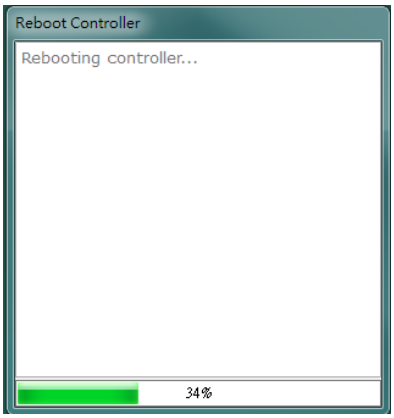

Figure 2.4.3 Pop-up window

Pop-up window will close automatically after reboot finishes.

2.5 Set to factory default

This function can set controller settings and configuration to factory default. Before using this function, please make sure the controller settings and configuration are saved to local disk. To set to factory default, you may follow the steps below.

Step 1: Click on **Controller** on the menu bar.
Step 2: Click on **Set to Factory Default**.

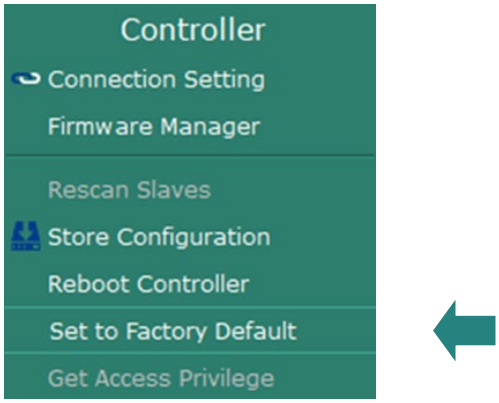

Figure 2.5.1 Set to Factory Default

Step 3: After **Set to Factory Default** is clicked on, a question dialog will appear. Click on **Yes** button to reset. A pop-up window will appear to indicate the reset progress.

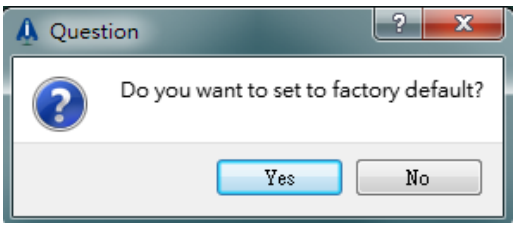

Figure 2.5.2 Set to Factory Default question dialog

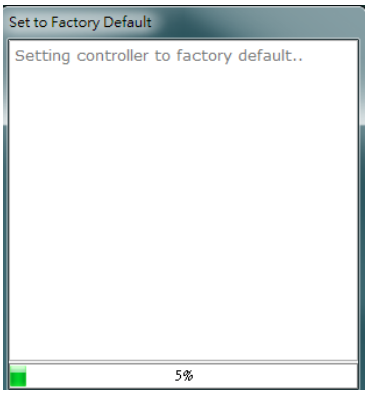

Figure 2.5.3 Pop-up window

Pop-up window will close automatically after reset completes.

2.6 Firmware manager

In Firmware Manager, users can inspect the firmware information of controller. The controller firmware is bundled with iA Studio and can only be updated to the controller via iA Studio.

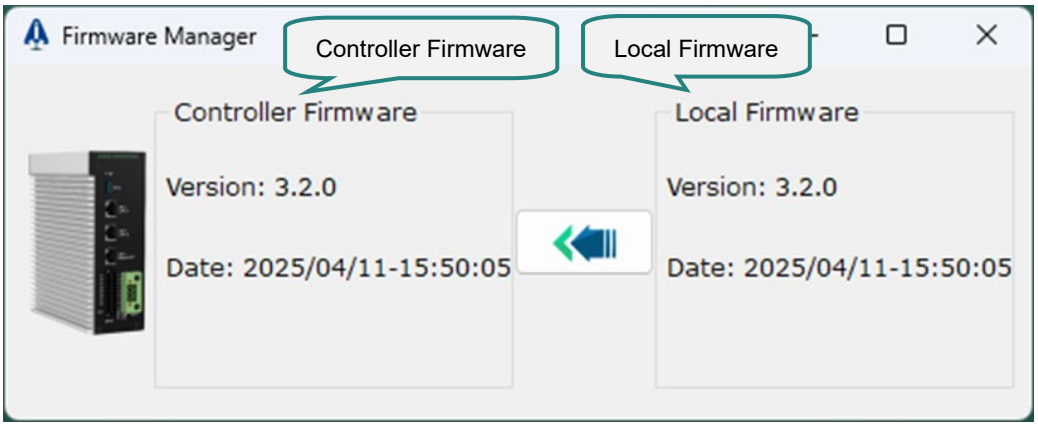

Figure 2.6.1 Firmware Manager

iA Studio 3.2 and above supports controlling controller hardware (HIMC and HIMC3) with CoE communication, but there are rules and limitations on firmware version upgrading / downgrading (listed in table 2.6.1). iA Studio 3.2 and above can only update HIMC3's firmware.

Table 2.6.1 Rules and limitations of firmware version upgrading / downgrading

Controller		Product Model	iA Studio 3.2 and above	iA Studio 3.1 iA Studio 3.0
	HIMC3	MC-XX-**03**-**01**-XX	✅ Can upgrade / downgrade firmware version	❌ Cannot upgrade / downgrade firmware version
	HIMC	MC-XX-**01**-**01**-XX	❌ Cannot upgrade / downgrade firmware version	✅ Can upgrade / downgrade firmware version

■ Open Firmware Manager

To open Firmware Manager, you may follow the steps below.

Step 1: Click on **Controller** on the menu bar.
Step 2: Click on **Firmware Manager**.

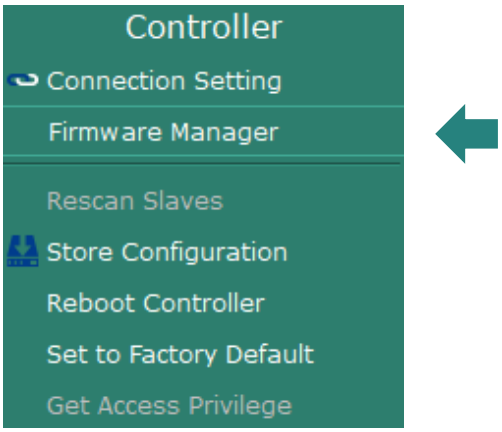

Figure 2.6.2 Firmware Manager

■ Update controller firmware

To update controller firmware, you may follow the steps below.

Step 1: Click on the button indicated in figure 2.6.3. After the button is clicked on, a question dialog will appear.

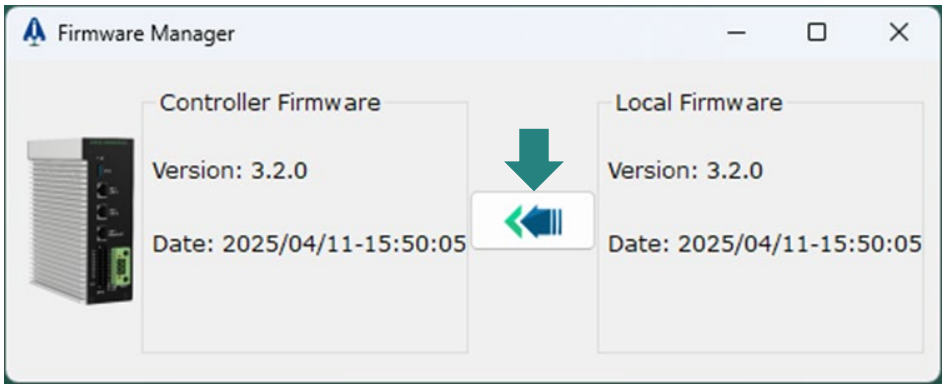

Figure 2.6.3 Firmware Manager

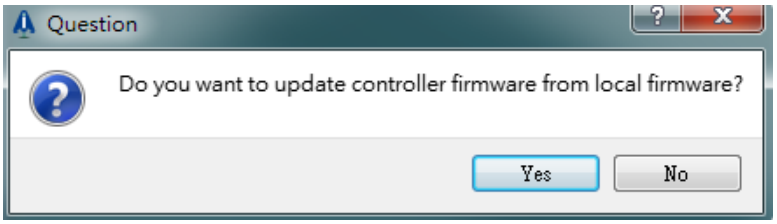

Figure 2.6.4 Question dialog when updating firmware

Step 2: Click on **Yes** button to update controller firmware. A pop-up window will appear to indicate the update progress.

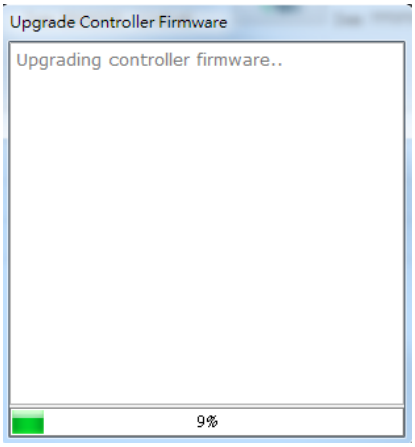

Figure 2.6.5 Pop-up window

Pop-up window will automatically close after update completes. Once the firmware update completes, please check if the controller firmware version is identical with the local firmware version.

2.7 User account

2.7.1 User mode

Three user modes are available in iA Studio. The table below describes what functions are supported in each user mode.

Table 2.7.1.1 User mode

User Mode	Description
User	Default mode. In this mode, users are only allowed to modify motion parameters.
Superuser	Users are allowed to modify motion and safety parameters. **HIWIN is not responsible for any damage, accident or injury caused by incorrect setting.**
Developer	Users are allowed to modify all types of parameters. **This mode can only be selected by HIWIN engineers.**

Users are allowed to change user mode in User Account window, please refer to section 2.7.2 **Change user mode**.

2.7.2 Change user mode

Click on **Tools** on the menu bar to open User Account window. In User Account window, users can change the user mode of iA Studio. To log in to the desired user mode, you may follow the steps below.

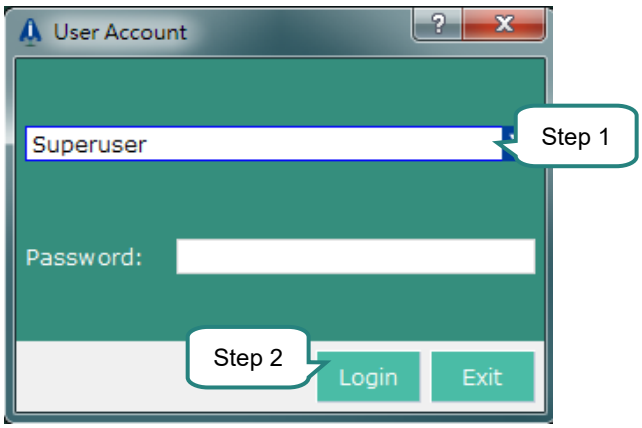

Figure 2.7.2.1 User Account window

Step 1: Select desired user mode. If Superuser is selected, key in software version number for password.
Step 2: Click on **Login** button.

After successful login, the selected user mode will be shown on the status bar.

Figure 2.7.2.2 User mode on the status bar

2.8 System motion unit

iA Studio provides two types of system motion units for users to select from according to their motor types.

Table 2.8.1 System motion unit

Unit for Linear Motor	
Nanometer	nm
Micrometer	um
Millimeter	mm
Centimeter	cm
Meter	m
Inch	inch
Mil	mil
Unit for Rotary Motor	
Radian	rad
Milliradian	mrad
Degree	deg
Revolution	rev
Arc Second	arcsec

Users can select desired unit in drop-down list.

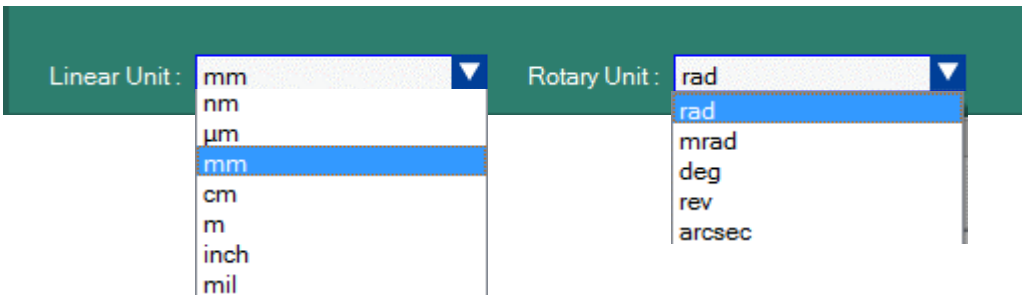

Figure 2.8.1 Select motion unit

2.9 Performance mode

iA Studio provides two types of performance modes for users to select from according to the requirements and applications.

Table 2.9.1 Performance mode

Type of Performance Mode	Display of Tools	Description
Econ Mode	Turn Off Econ Mode	This mode can reduce CPU usage, but it will increase HIMC API average response time. The influence level varies according to the computer specifications.
High Performance Mode (Default)	Turn On Econ Mode	This mode has faster HIMC API average response velocity, but its CPU usage is higher than that of Econ Mode. The influence level varies according to the computer specifications.

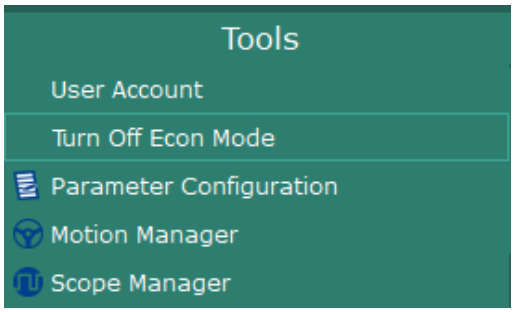

Figure 2.9.1 Click on it to switch to High Performance Mode from Econ Mode

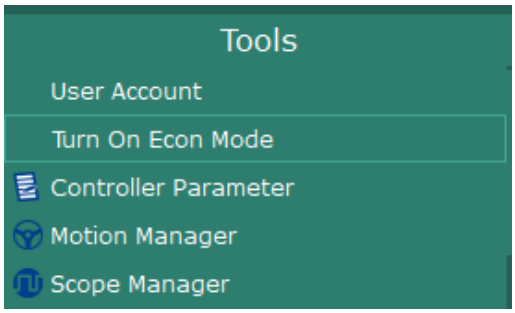

Figure 2.9.2 Click on it to switch to Econ Mode from High Performance Mode

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3. Controller configuration

3.1 Configuration Wizard

Configuration Wizard allows users to scan slave network status, apply slave network status, set up controller configuration, set axis parameters, set PDO mapping, set distributed clock, and set the parameter of the slave. Before starting axis motion control and inspecting IO status of the slave, users should troubleshoot the error of slave network status and finish setting up controller configuration in Configuration Wizard.

3.1.1 Open Configuration Wizard

To open Configuration Wizard, click on **Project** on the menu bar. Then, click on **Configuration Wizard**.

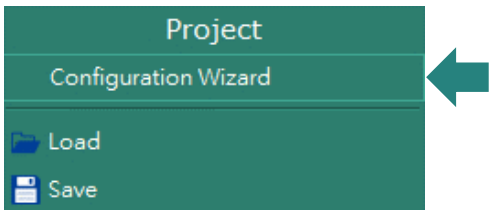


Figure 3.1.1.1 Configuration Wizard

Configuration Wizard window is as follows.

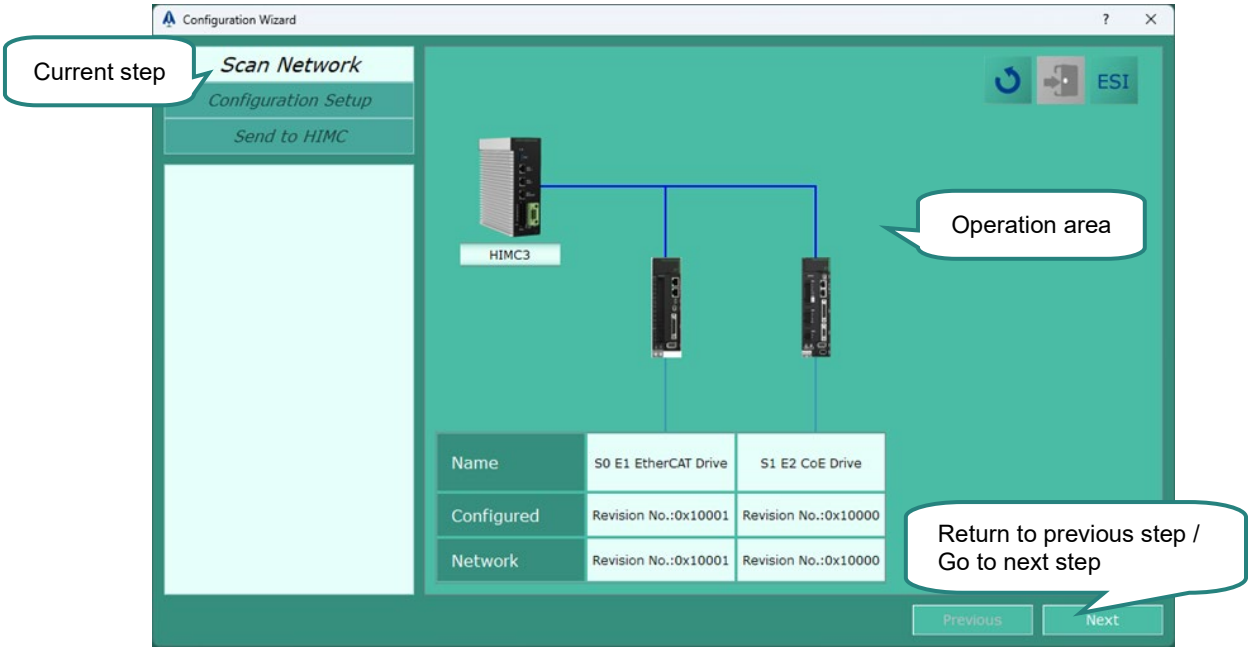


Figure 3.1.1.2 Configuration Wizard window

3.2 Scan Network

Scan Network displays the current slave network status. If an error occurs in the current slave network status, users can troubleshoot it with the functions provided by this page.

Scan Network window is as follows.

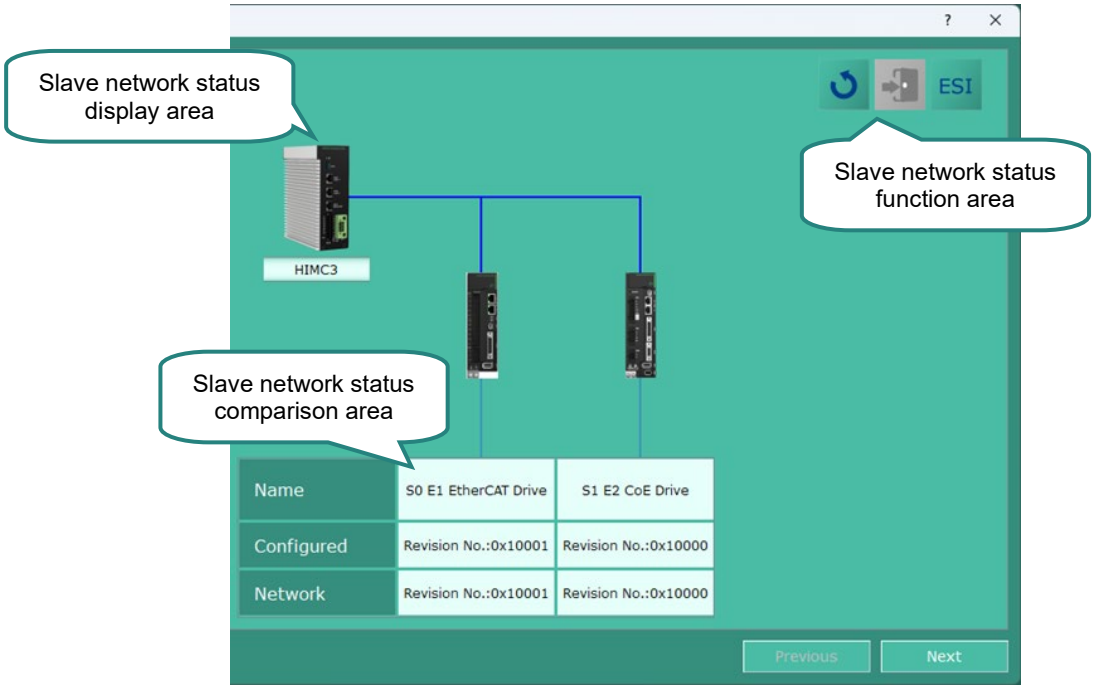


Figure 3.2.1 Scan Network window

Table 3.2.1 Functions in Scan Network window

Icon / Button	Function
	Scan slave network status.
	Apply slave network status.
	ESI Manager and setting.

3.2.1 Scan slave network status

When slave network status changes, ! will appear beside the controller icon, “Slave network error” will appear as users move the mouse cursor toward !.

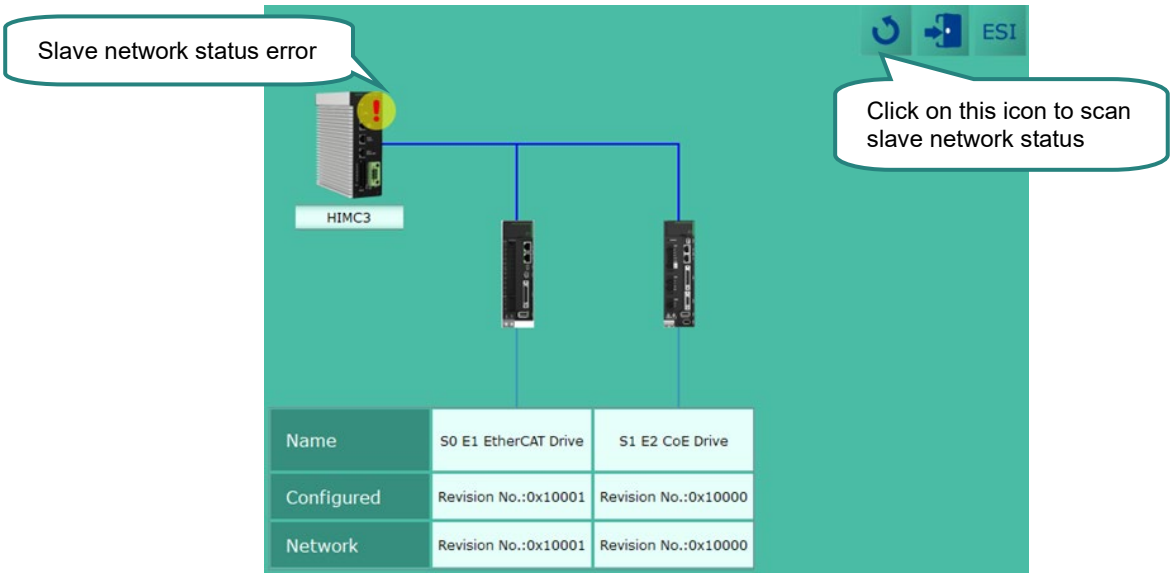


Figure 3.2.1.1 Slave network status changes

Take all slaves after removing “S0 E1 EtherCAT Drive” for example, The following will respectively describe the behavior of window display when users click on to scan slave network status if configuration exists/does not exist in the controller.

■ No configuration exists in the controller

After clicking on to scan slave network status, slave network status of **Configured** and **Network** will be updated to actual connection.

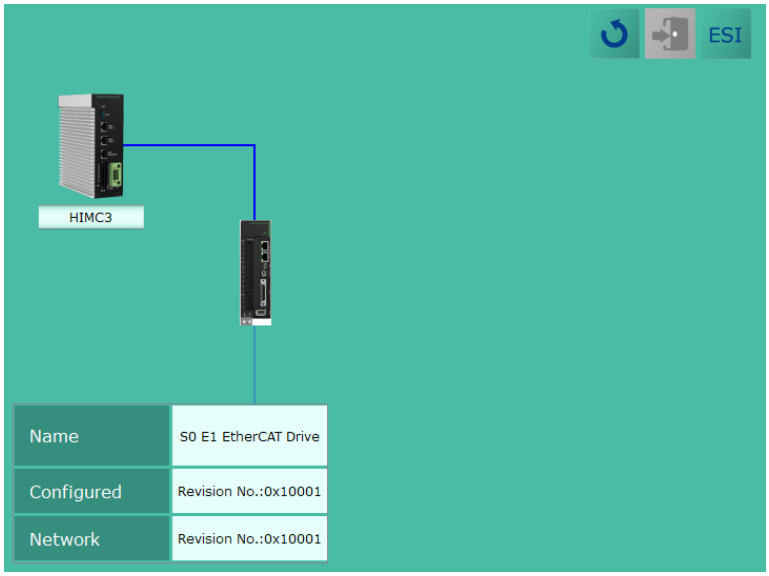


Figure 3.2.1.2 Slave network status is updated to actual connection

■ Configuration exists in the controller

After clicking on to scan slave network status, slave network status of Network will be updated to actual connection and compared with that of Configured. Inconsistency will be noted in red words, and ? will appear beside the slave icon.

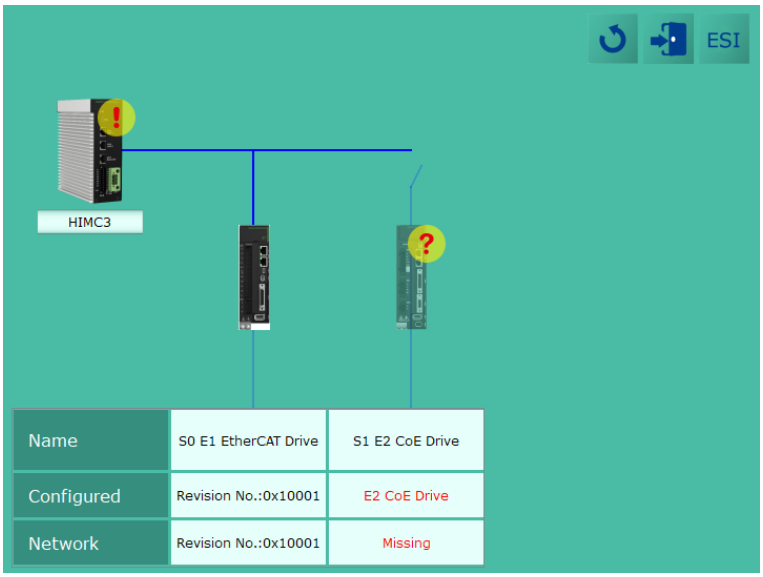


Figure 3.2.1.3 Slave network status of Configured is different from that of Network

Note:

If all the slaves after “S0 E1 EtherCAT Drive” are reconnected, and is clicked on to rescan slave network status, slave network status of Configured and Network will be the same again.

3.2.2 Apply slave network status

When slave network status of Configured is different from that of Network, click on to give up current controller configuration and apply actual connection to Configured and Network. The steps are given as follows.

Step 1: Click on and a question dialog will appear.

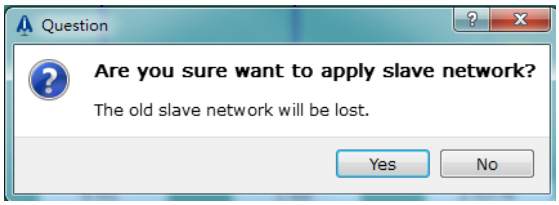


Figure 3.2.2.1 Question dialog for applying slave network status

Step 2: Click on **Yes** button to execute the procedure of applying slave network status.

3.2.3 ESI Manager and setting

ESI (EtherCAT Slave Information) file is an XML file which aims to describe information on the slave device. It allows users to set slave parameters on the interface and operate initialization and communication of slave network by sending parameter value to the controller. After complete setup, the default will provide the ESI file of HIWIN MIKROSYSTEM product. If iA studio cannot find suitable ESI for the slave, **No matched ESI** (as figure 3.2.3.1) will appear in Configured field, and users need to click on ESI for adding.

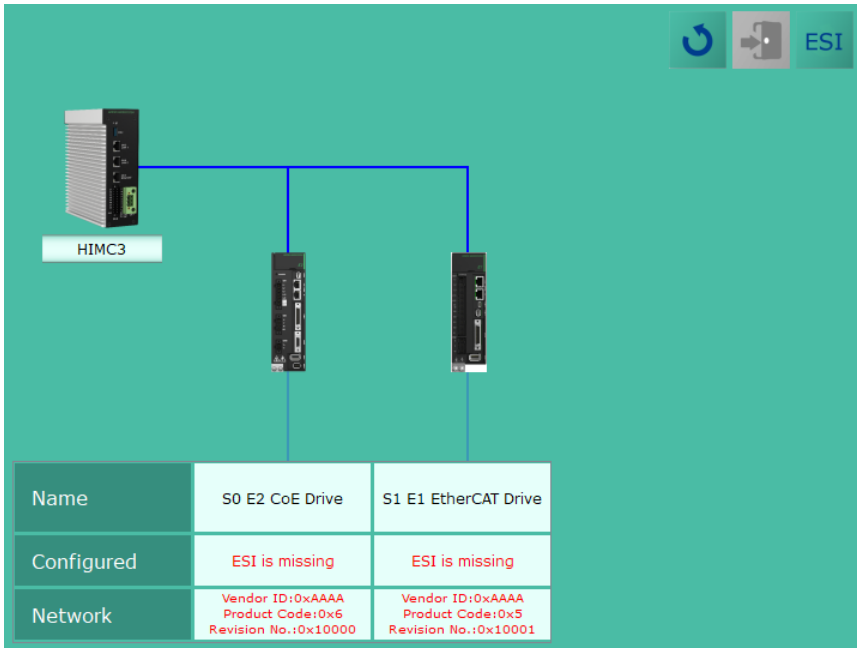


Figure 3.2.3.1 Cannot find suitable ESI for the slave

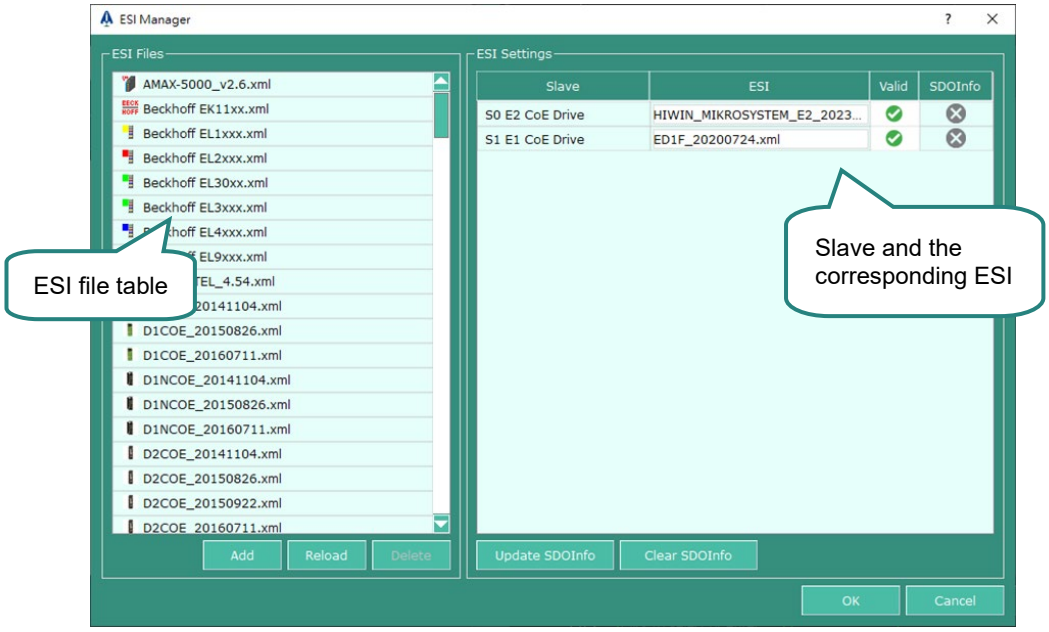


Figure 3.2.3.2 ESI Manager window

As figure 3.2.3.2 shows, there are two tables in ESI Manager window, on the left side is ESI file list, users can add or delete ESI file by clicking on **Add** or **Delete** on the table below; on the right side is ESI file list corresponding to slave device, users can update or clear SDOInfo status by clicking on **Update SDOInfo** or **Clear SDOInfo** on the table below.

■ Add

Click on **Add** to select an (or multiple) ESI file(s) to be added in the file window. After adding, it will automatically set the available ESI for the slave which does not have corresponding ESI, as figure 3.2.3.3. ESI will automatically be included if it has ESI file of affiliated module, object dictionary or diagnosis information. For example, since OMRON Coupler.xml has the affiliated file OMRON Module.xml, users only need to select the former file, and the latter will be added simultaneously.

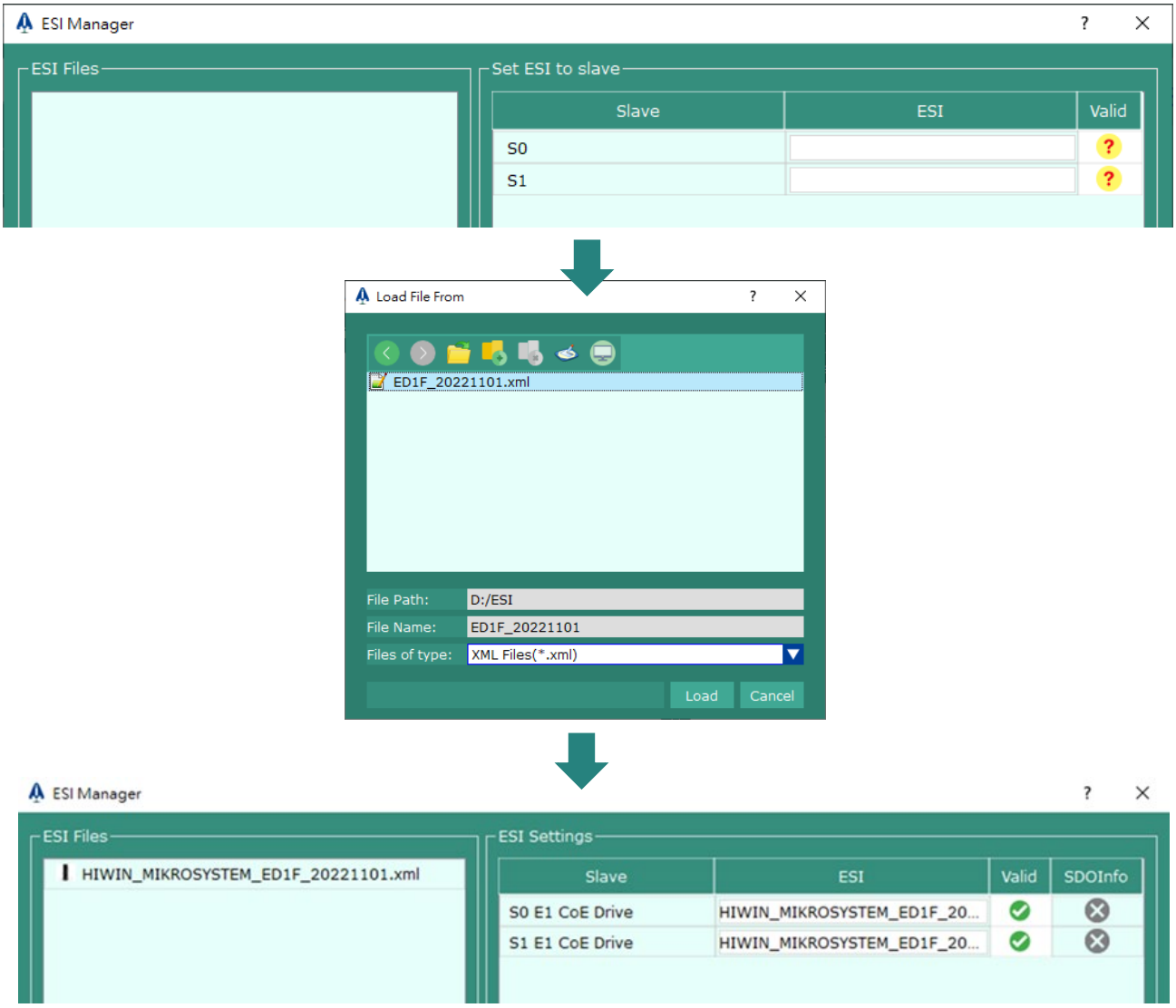


Figure 3.2.3.3 Automatically set the available ESI for the slave which does not have corresponding ESI

■ Reload

After iA studio is opened, if users place the ESI file in ESIFiles folder under the iA Studio path, the ESI file in ESIFiles can be reloaded by clicking the **Reload** button.

Figure 3.2.3.4 Store the ESI files used by ESI Manager in the ESIFiles path

■ Delete

The window of delete confirmation (as figure 3.2.3.5 shows) will appear when clicking on **Delete**. If users click on **Yes** to delete the ESI file, its affiliated ESI file of the module, object dictionary or diagnosis information will also be deleted.

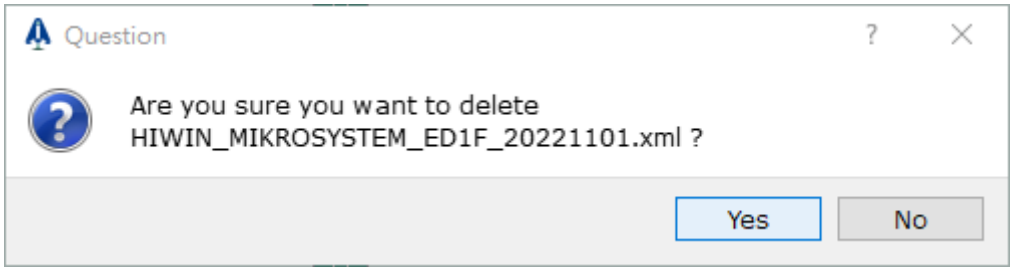


Figure 3.2.3.5 ESI delete confirmation

Table on the right side of figure 3.2.3.2 shows the corresponding ESI of the slave. Users can set the most suitable ESI for the slave when there are various versions of ESI., as figure 3.2.3.6. The result will be checked if it matches the slave, as figure 3.2.3.1. If the match result is correct; click on **OK**; if the result is incorrect, users can move the mouse cursor toward the icon in Valid field to check the reminder.

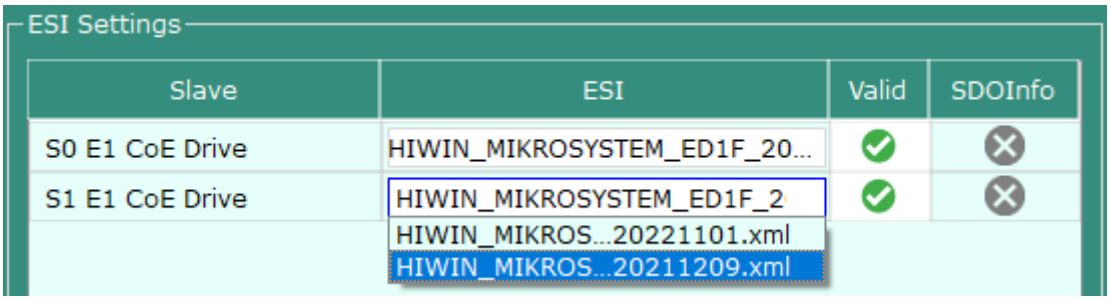


Figure 3.2.3.6 Select suitable ESI

Table 3.2.3.1 Match result of the slave and ESI

Icon	Match result
	Correct
	incorrect
	Does not have the corresponding ESI

■ Update SDOInfo

ESI Manager will read the slave SDOInfo status based on the ESI description.

Table 3.2.3.2 Slave SDOInfo status

Icon	SDOInfo status
	Does not support
	Has not updated
	Successfully update
	Fail to update

SDOInfo is a command format defined by CoE SDO services. After the master and slave establishes connection, the master will initiate a reading request, and the slave will respond with its object dictionary structure.

Take Keyence NQ-EC8L IO-Link device for example. In the first connection, the status of the **SDOInfo** field will shows that it has not updated. When clicking **Update SDOInfo**, the **Update SDOInfo** progress window will appear. After completion, the progress window will automatically close and the status of the **SDOInfo** field will be updated.

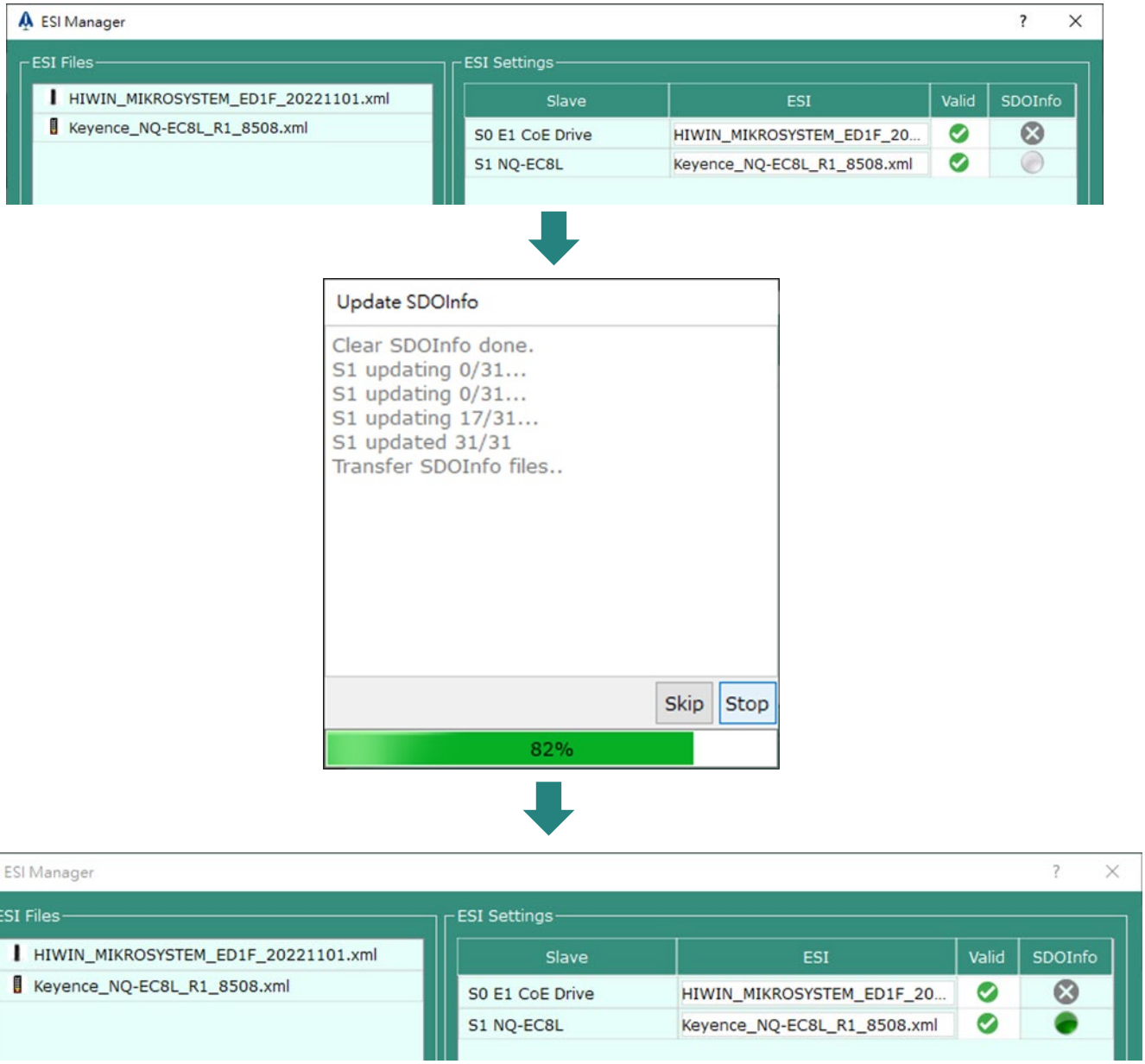


Figure 3.2.3.7 Update slave SDOInfo

■ Clear SDOInfo

After clicking **Clear SDOInfo**, clear the **SDOInfo** status of each slave device.

3.3 Configuration Setup

Configuration Setup allows users to set up controller configuration and set slave parameters. Users should set up controller configuration according to actual condition of stage.

Configuration Setup window is as follows.

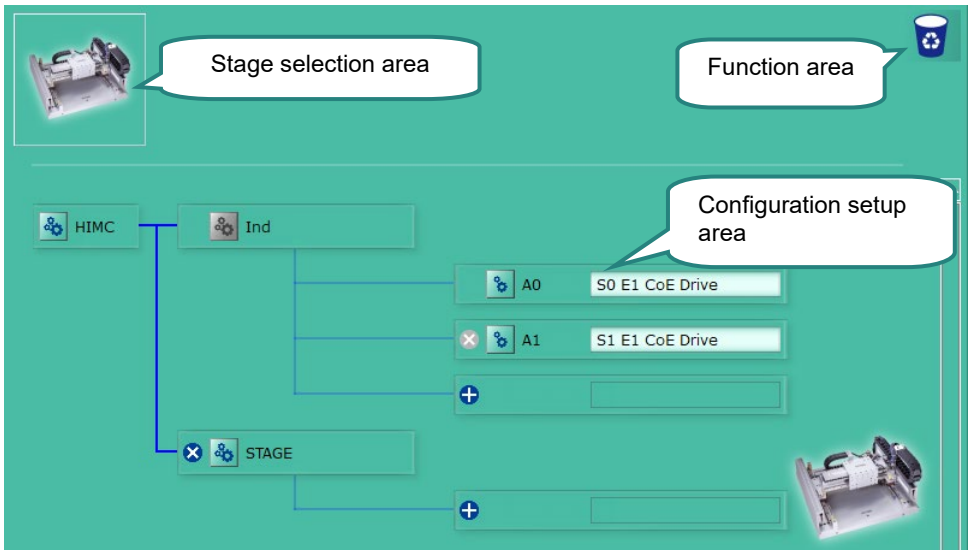


Figure 3.3.1 Configuration Setup window

Functions in Configuration Setup window are described as follows.

Table 3.3.1 Functions in Configuration Setup window

Icon / Button	Function
	Add new stage.
	1. Set HIMC. 2. Modify stage name. Ind is the default motion stage, so the icon is grey, which cannot be modified.
	Modify parameters of each axis.
	Add new parameters of the slave.
	1. Delete stage. If the stage is still connected to axes, all the axes will be connected to stage Ind. after the stage is deleted. 2. Delete axis. Users can only delete from the last axis. An axis can only be deleted when it is not connected to a slave.
	Reset controller configuration.

3.3.1 Set up HIMC

Click  button beside HIMC, the screen will display as figure 3.3.1.1. Users can set up communication cycle time for EtherCAT master.

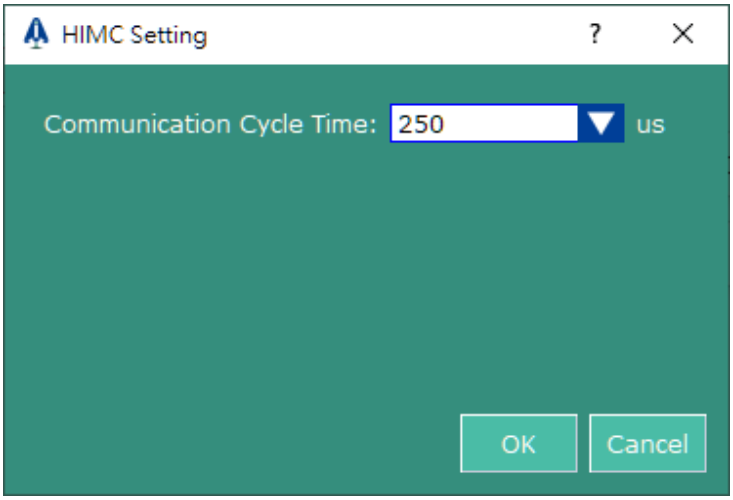


Figure 3.3.1.1 EtherCAT master setting page

3.3.1.1 Set up EtherCAT master communication time

Click the drop-down list beside **Communication Cycle Time** to set up communication cycle time, as shown in figure 3.3.1.1.1.

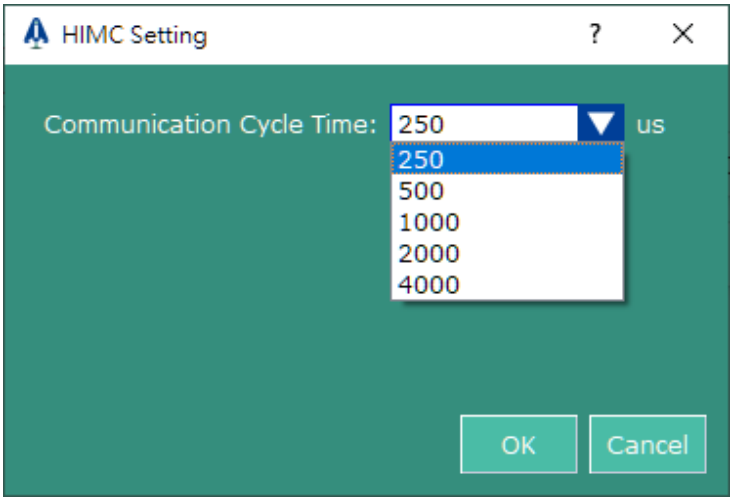


Figure 3.3.1.1.1 Communication cycle setting

Finally, enter the third page of the **Configuration Wizard** and press the **Send to HIMC** button. The function will take effect after the setting is completed.

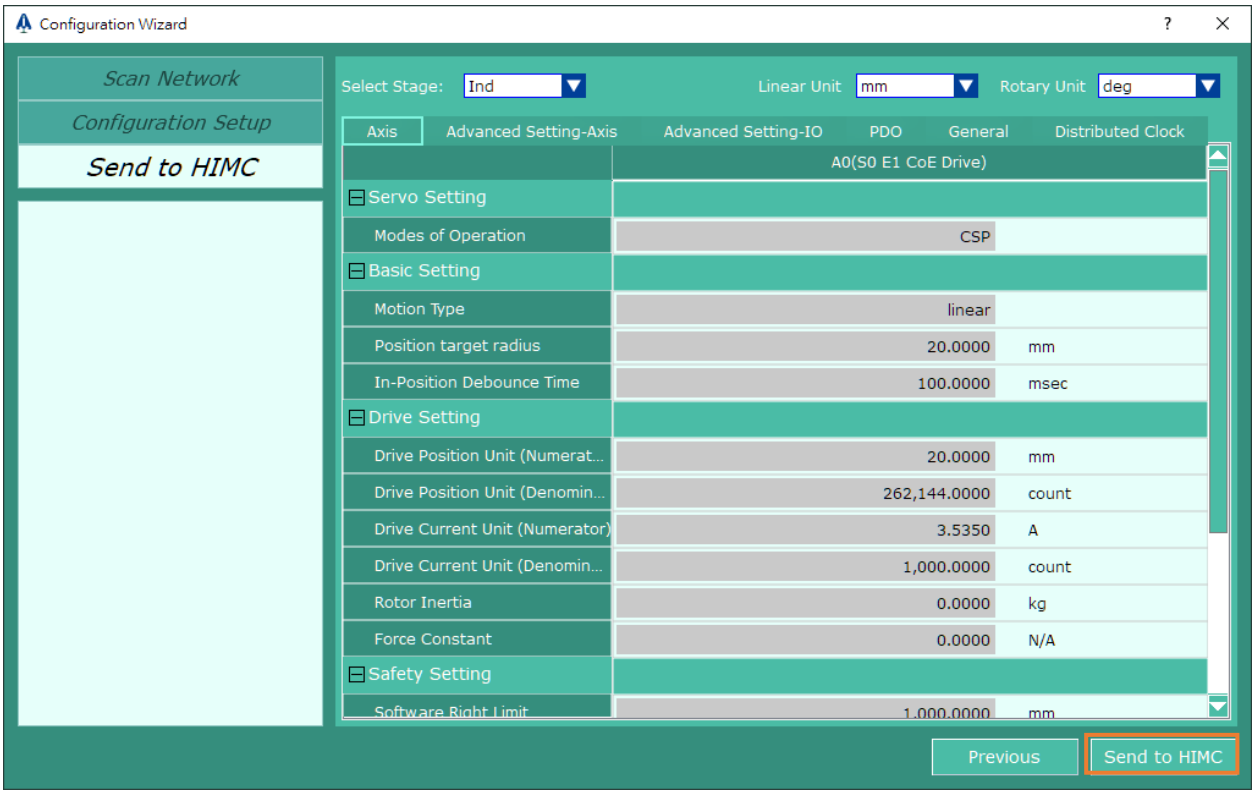


Figure 3.3.1.1.2 Send to HIMC

3.3.2 Set up controller configuration

Follow the steps below to set up controller configuration.

Step 1: Click on  to add new stage.

Figure 3.3.2.1 Add new stage

Step 2: Click on  in  to open Modify Machine Name window. After keying in the desired name, press **Enter** to make input field turn white from yellow, and then click on **OK** button.

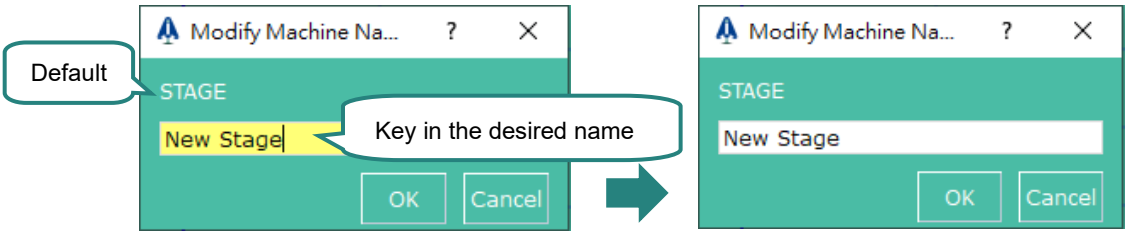


Figure 3.3.2.2 Modify Machine Name window

Step 3: Click on  to add new axis.

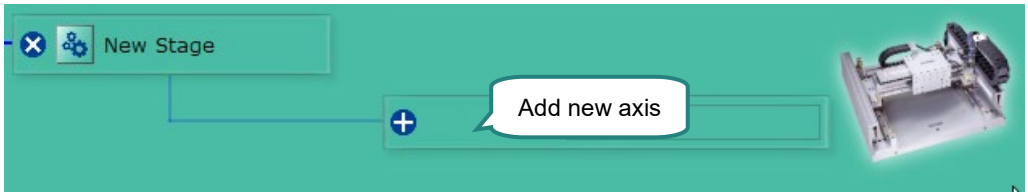


Figure 3.3.2.3 Add new axis

Step 4: Drag axis among stages. For example, users can drag A1 axis from stage Ind. to New Stage.

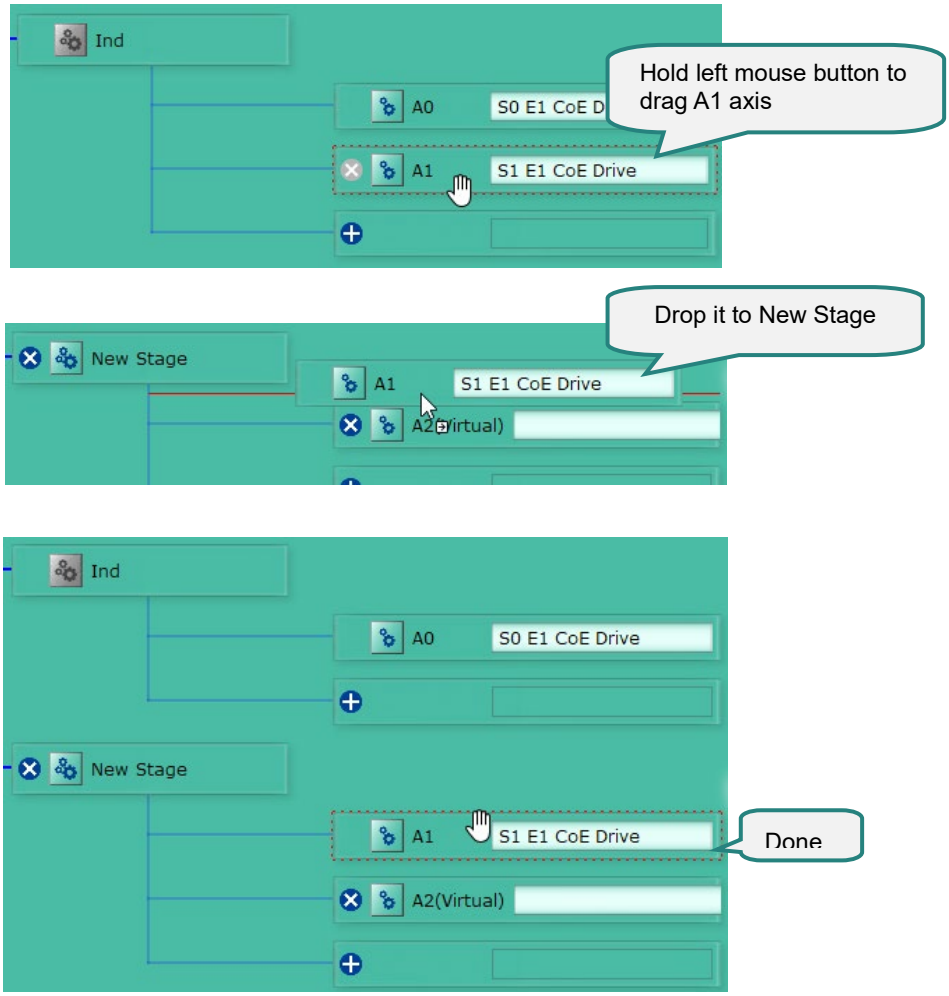


Figure 3.3.2.4 Drag axis to another stage

Step 5: Drag slave among axes. For example, users can drag S0 E1 CoE Drive slave to A2(Virtual) axis of New Stage.

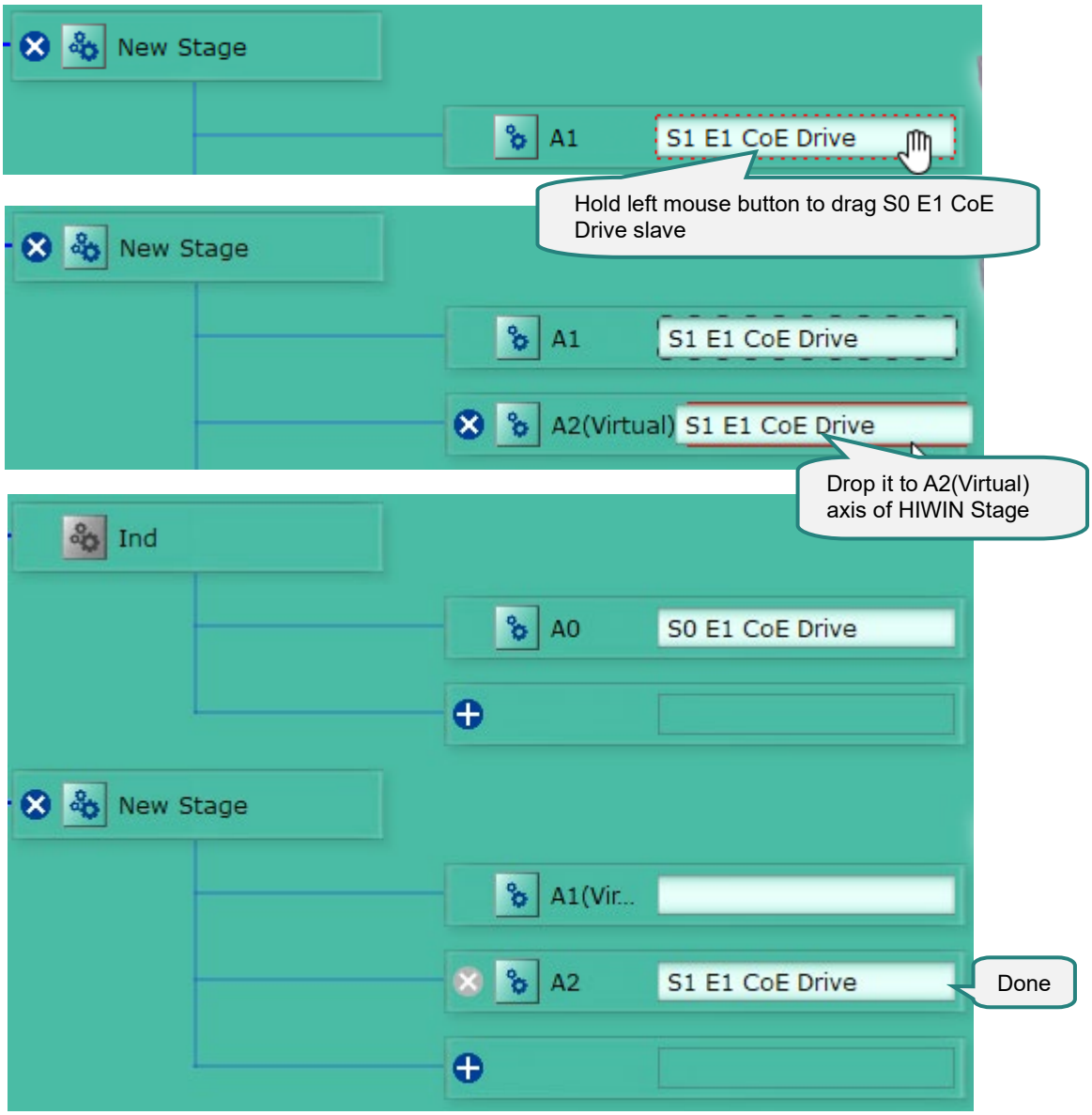


Figure 3.3.2.5 Drag slave to another axis

Step 6: Click on  in 

to open Configuration window. Users can set axis parameters, axis motion type, and other parameters this window, see figure 3.3.4. for more information.

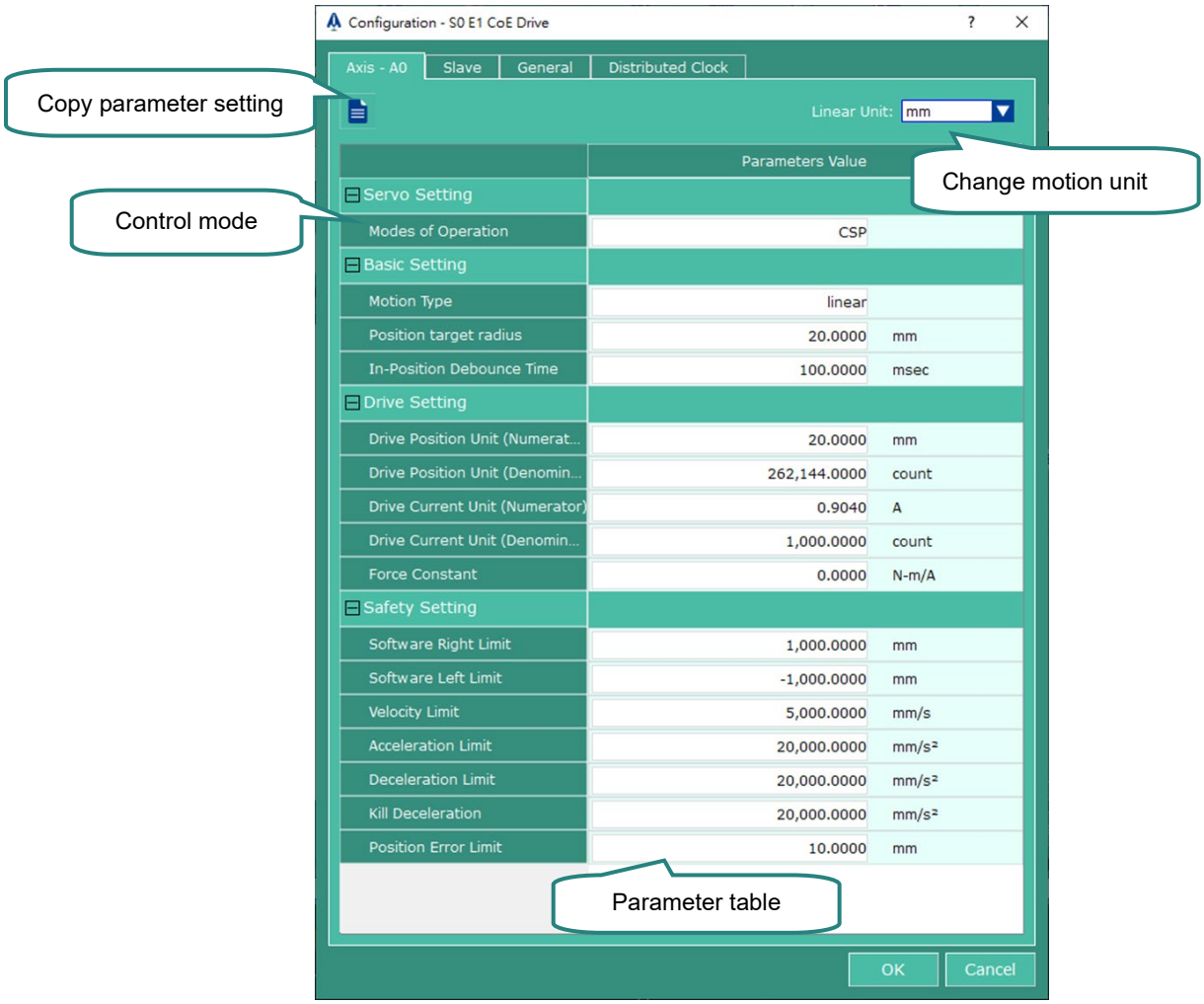


Figure 3.3.2.6 Axis Configuration window

Step 7: Click on to enable the function of copying other axis parameters. After selecting the desired axis, click on Y and OK.

Note: The parameters of Control Mode, Motion Type, Drive Position/Current Unit, and Force Constant are set according to the salve, so they are marked as “Reserved” and cannot be copied from another axis.

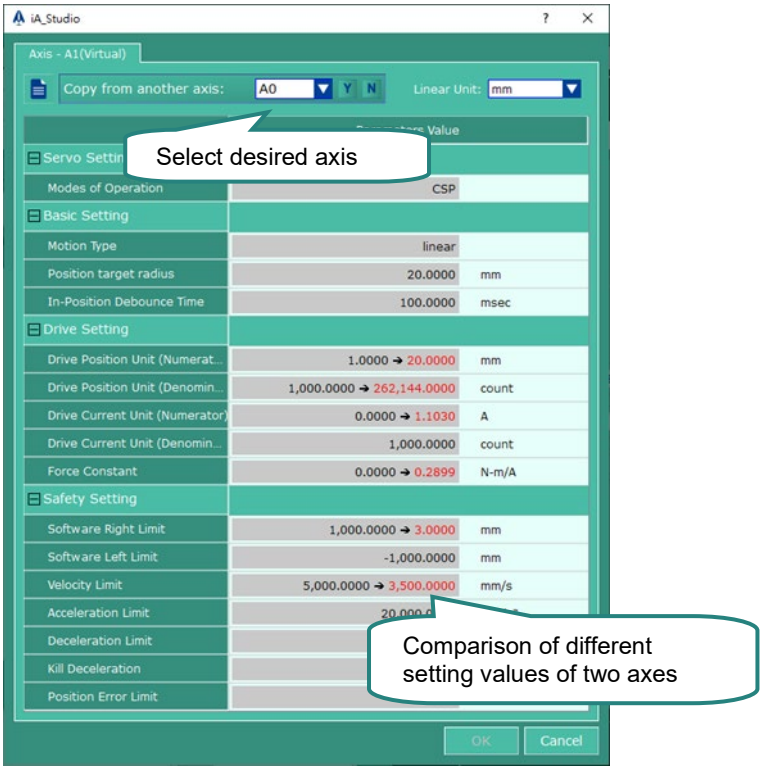


Figure 3.3.2.7 Copy from another axis window

Step 8: To reset controller configuration, please click on . Only stage Ind. will be kept. It will add the corresponding axes according to the number of slaves.

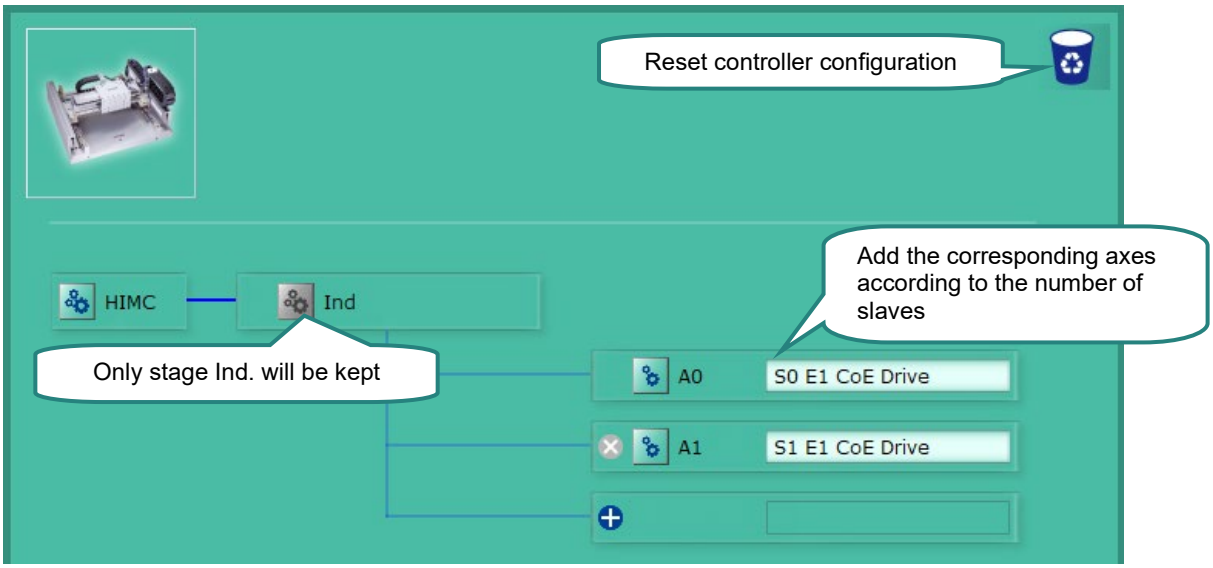


Figure 3.3.2.8 Reset controller configuration

Step 9: When configuration setup is done, click on **Next** button to move to Send to HIMC window. This window displays all the axes under each stage, the combination between axis and slave, parameter setting of each axis and slave. Please check if the parameter values of each slave are correctly set, and then click on **Send to HIMC** button.

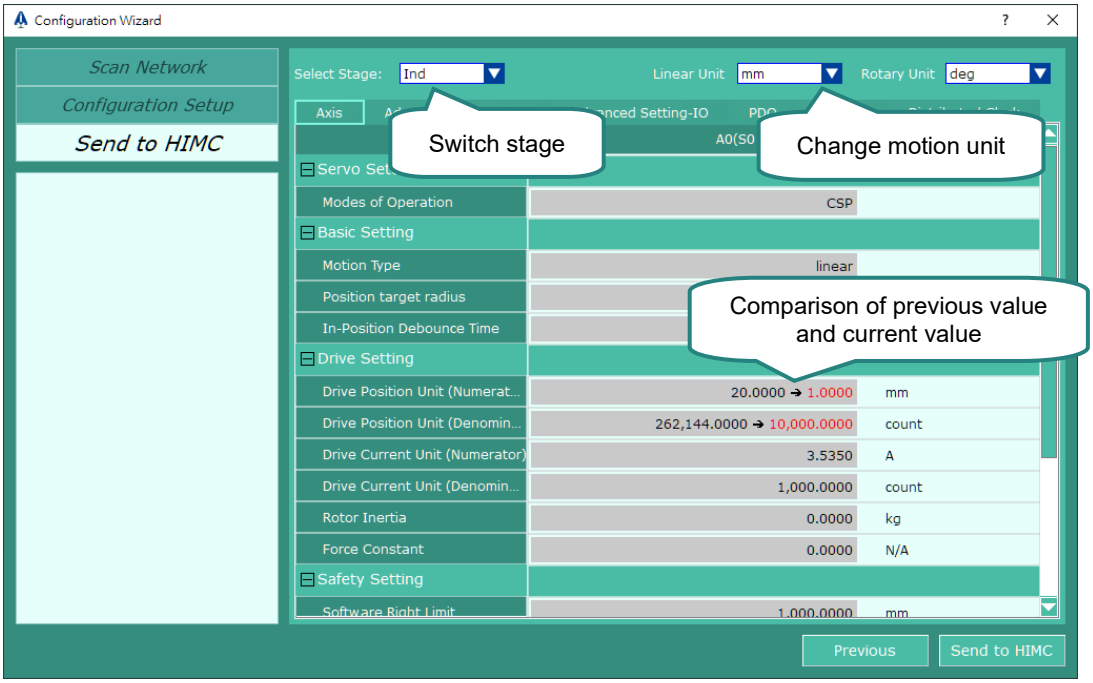


Figure 3.3.2.9 Send to HIMC window

Step 10: A question dialog will appear. Click on **Yes** button to save the parameter settings to the controller RAM. A pop-up window will appear to indicate the saving progress. It will close automatically after the parameter settings are successfully saved.

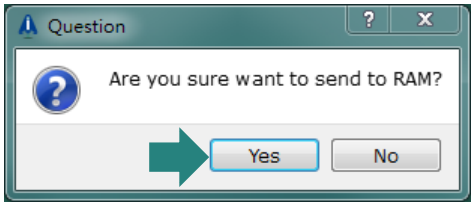


Figure 3.3.2.10 Send to RAM question dialog

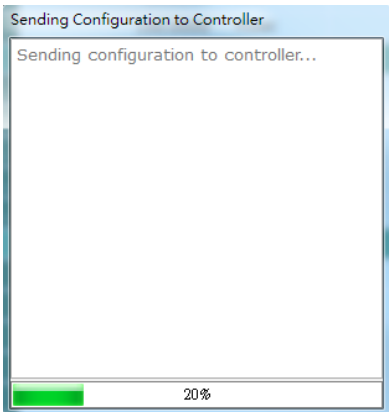


Figure 3.3.2.11 Pop-up window when sending parameter settings to the controller RAM

Step 11: Controller status has been changed to synchronous, and controller configuration has been changed to your setting.

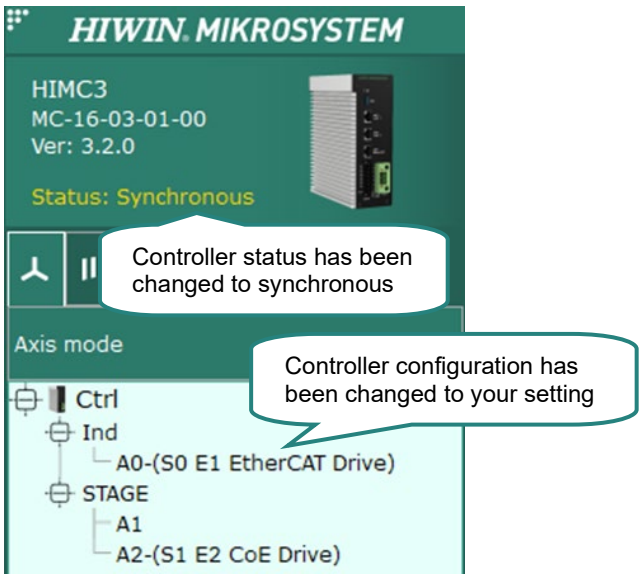


Figure 3.3.2.12 Controller status has been changed

3.3.3 Modify controller configuration

To modify controller configuration after the setting is saved to the controller RAM, please click on **Project** on the menu bar and open **Configuration Wizard** again. Then, follow the steps mentioned in previous section to reset controller configuration and execute Send to RAM.

3.3.4 Modify slave parameter

The setting of slave parameter can be divided into 5 parts: Module, Axis, Slave, General, and Distributed Clock.

■ **Module**

Users can set I/O module models corresponding to each slot on the slave device from Module page. Take OMRON NX-ECC203 coupler (figure 3.3.4.1) which has 4 I/O modules installed on the slots for example, iA Studio will automatically set up the I/O module on the slave's slots generally, but users can also set by themselves depending on the situation.

Note: This page will not appear if the slave is not a coupler module device.

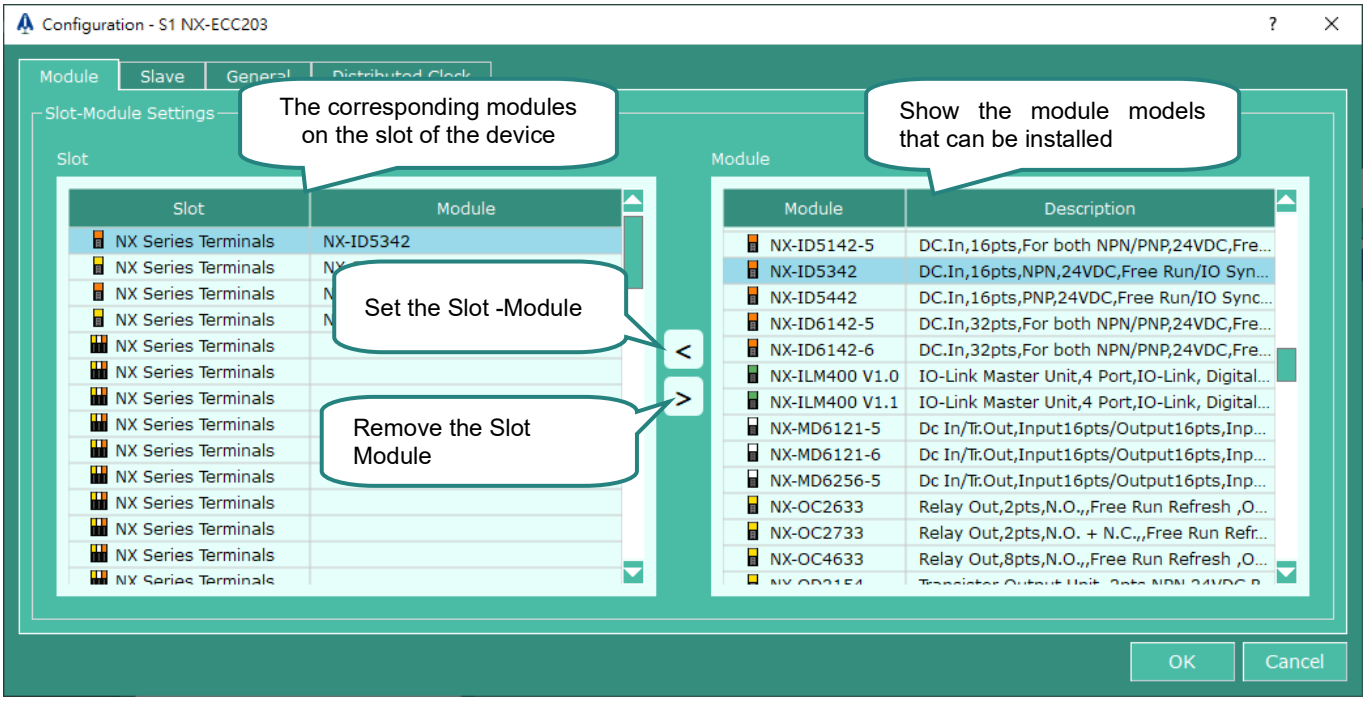


Figure 3.3.4.1 Slot-Module setting

■ Axis

Users can set axis parameter and motion type (Control Mode) on Axis, table 3.3.4.1 lists each motion type and description.

Note: This page will not appear if the slave is not an axis device.

Table 3.3.4.1 Motion Type

Motion Type	Description
CSP (Cyclic Synchronous Position)	The controller deals with the motion command planning and cyclically update the position command of the drive.
CSV (Cyclic Synchronous Velocity)	The controller deals with position loop control and cyclically update the velocity command of the drive.
PP (Profile Position)	On PP, PV, and PT mode, the drive deals with the command planning. Therefore, some of the functions of CSP and CSV modes cannot be used, such as group profile interpolation, gantry, and vibration suppression, etc.
PV (Profile Velocity)	
PT (Profile Torque)	

■ Slave

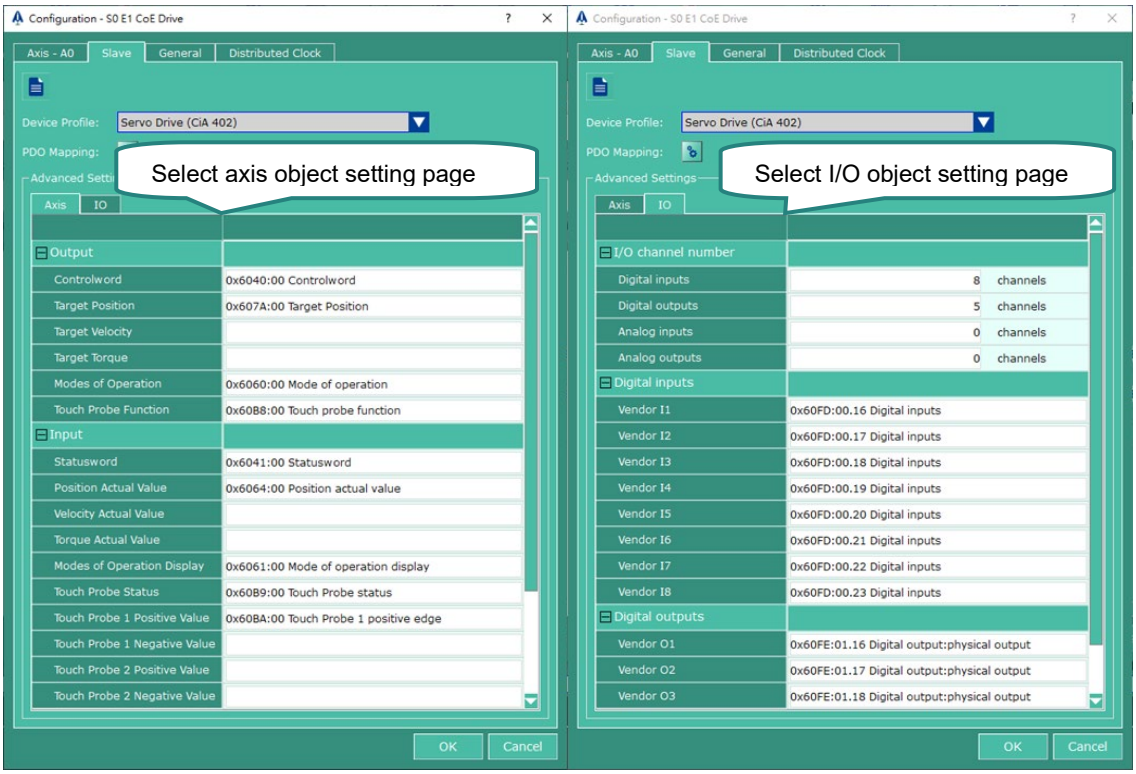


Figure 3.3.4.2 Slave setting

- Device Profile: The selections are Servo Drive (CiA 402), IO (CiA 401), Modular Device (ETG 5001), and General. Though iA Studio will automatically check the device profile of the slave, users still can set by themselves depends on the situation.
- PDO Mapping: Refer to section 3.3.5.
- Advanced Settings: Select Axis and IO page to set the corresponding salve object of HIMC.
- Advanced Settings – Axis: This page includes standard object CiA402 that the slave needs to be set. Take E1 servo drive for example, 0x6040 is the corresponding object of ControlWord, and so on. Though iA Studio will automatically check the corresponding axis object of the slave, users still can set by themselves depends on the situation.

Note: This page will not appear if the slave device is Device Profile rather than Servo Drive (CiA 402).

- Advanced Settings – IO: This page includes digital and analog I/O amounts of the slave, and the object needs to be set. Take E1 servo drive for example, the device provides 8 digital input and 5 digital output channels. The digital inputs correspond to object 0x60FD; digital outputs correspond to object 0x60FE, and so on. Though iA Studio will automatically check the corresponding I/O object of the slave, users still can set by themselves depends on the situation.

Note: This page will not appear if the Device Profile of the slave is General.

■ General

Users can modify slave name and see basic information of the slave on this page.

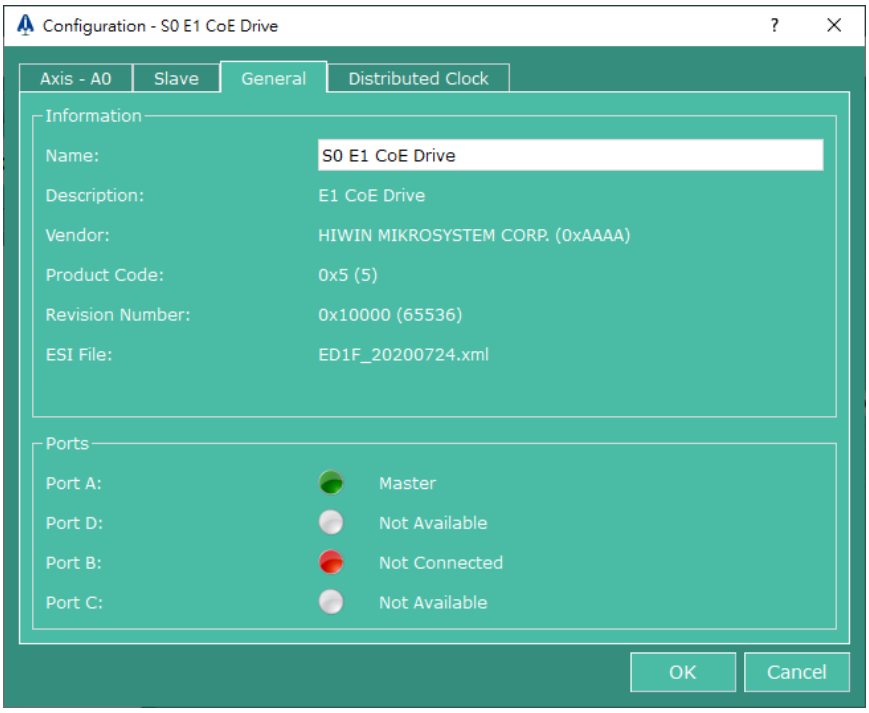


Figure 3.3.4.3 General setting

■ Distributed Clock

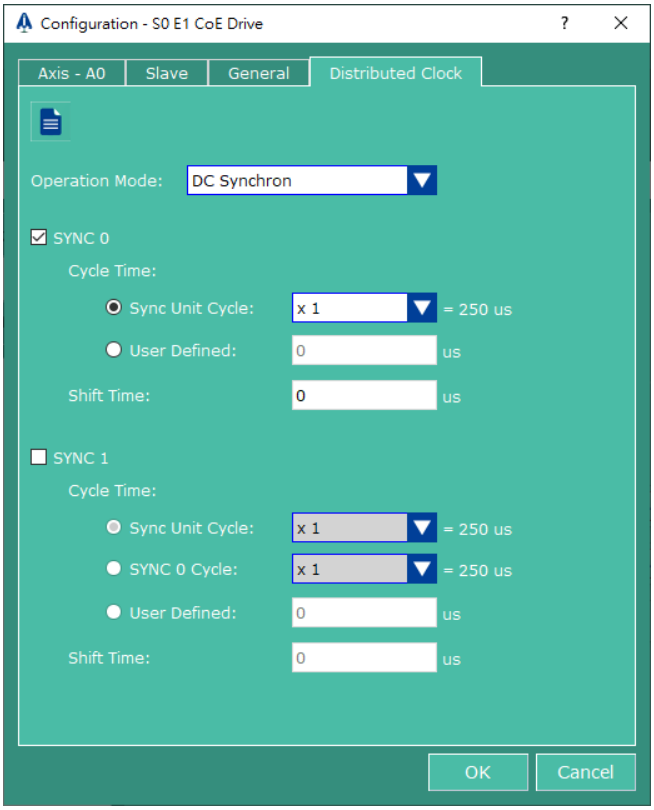


Figure 3.3.4.4 Distributed Clock setting

Distributed Clock (DC) setting makes the time usage of the controller same as the slave to achieve synchronous status and control. iA Studio will set ESI as the default of this page, and users can adjust the parameters depends on the situation.

3.3.5 PDO Mapping Manager

When developing a machine motion system, a user usually needs to read various drive physical parameters to fulfill requirements of motion. Therefore, iA Studio provides PDO mapping manager to allow the user to choose PDO objects to read or revise different drive physical parameters. PDO mapping manager makes it easier to develop a motion system.

3.3.5.1 Open PDO Mapping Manager

When users first set PDO object or are at asynchronous status, they need to click on Configuration Wizard to enter Configuration Setup. After clicking on the device gear button, users need to click on PDO Mapping gear for setting.

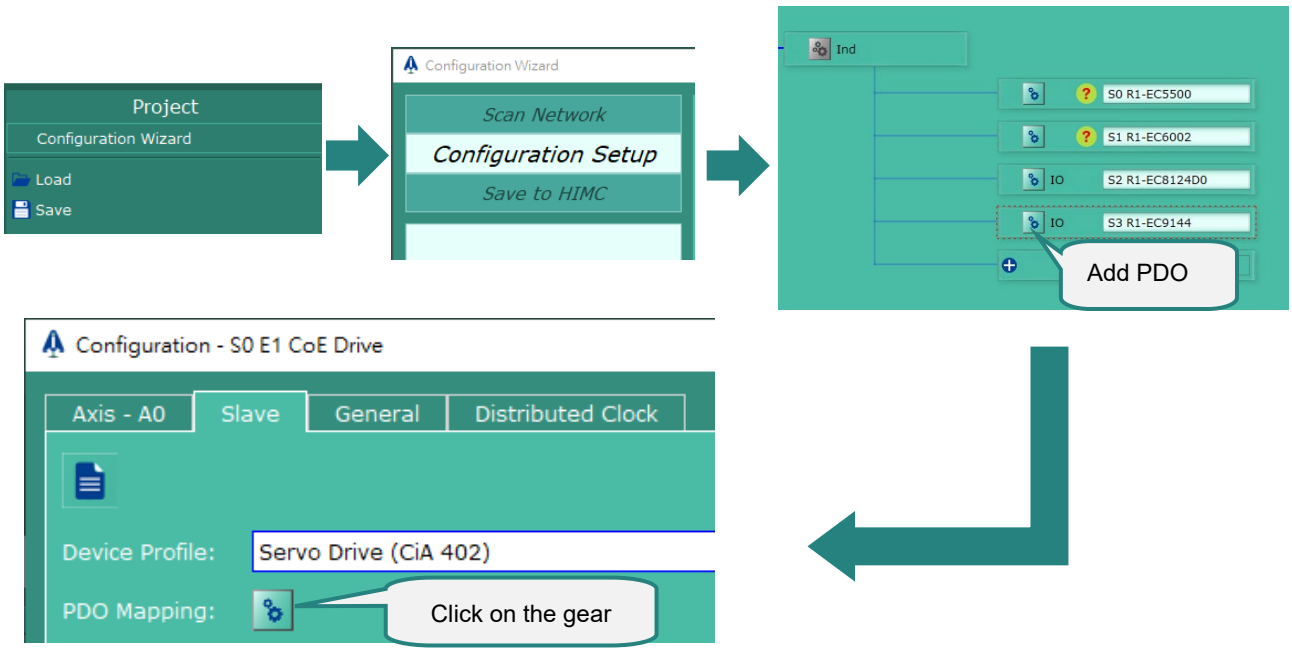


Figure 3.3.5.1.1 Open PDO Mapping Manager from Configuration Wizard

Open PDO Mapping Manager window successfully, as figure 3.3.5.1.2 shows below.

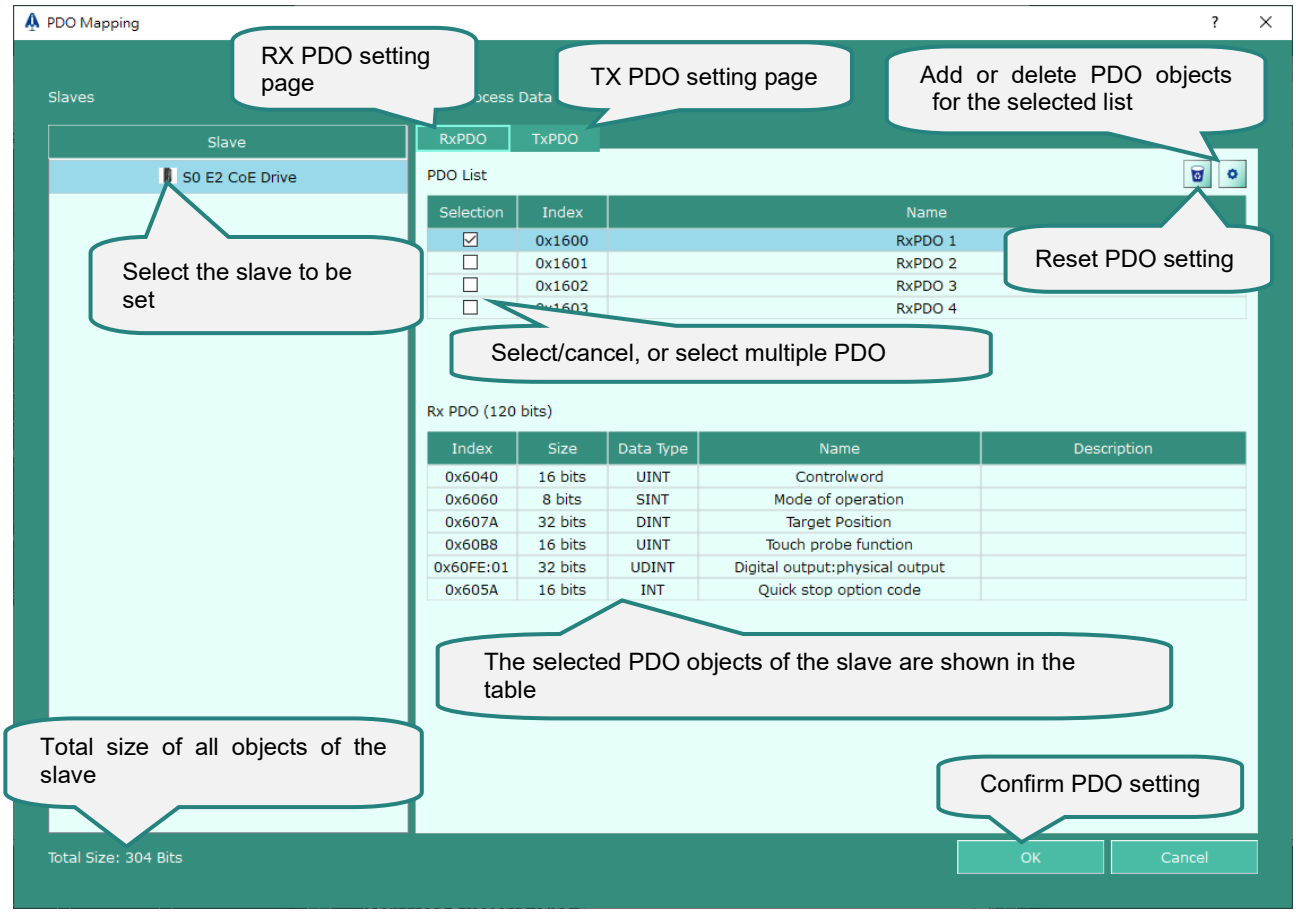


Figure 3.3.5.1.2 PDO Mapping Manager window

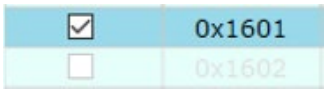
3.3.5.2 Description of operation and function

Table 3.3.5.2.1 Description of operation and function

Icon	Description
	Open Object editing interface for object RxPDO or TxPDO.
	Reset PDO settings to ESI default or HIMC configuration settings.
	After opening PDO object editing interface, users can delete objects using the button.
	PDO Mapping interface: Confirm Rx\Tx object. PDO object editing interface: Confirm the modification of Rx\Tx object.
	Click **Cancel** and choose **Yes,** the new PDO setting will not be saved and PDO Manager will be closed.

Step 1: Select a slave in the slaves table on the left side and select an/multiple item(s) of the slave's PDO List. Click on the gear button  on the right side or double-click left mouse button to modify object items which are highlighted in blue in the table (Refer to Step 2).

Table 3.3.5.2.2 Behavior list for PDO List

Icon	Description
	If the setting icon is highlighted in grey, the item cannot be edited in ESI file.
	If the multiple boxes are clicked and highlighted in grey, the items are in ESI file and are required.
	If item 0x1602 is highlighted in grey after users clicking on item 0x1601, it means 0x1601 and 0x1602 are mutually exclusive in ESI file. Users can select only one item to operate PDO Mapping.

Step 2: After opening the object editing interface, users can add or delete PDO object using < and > in the middle and press **OK** to confirm.

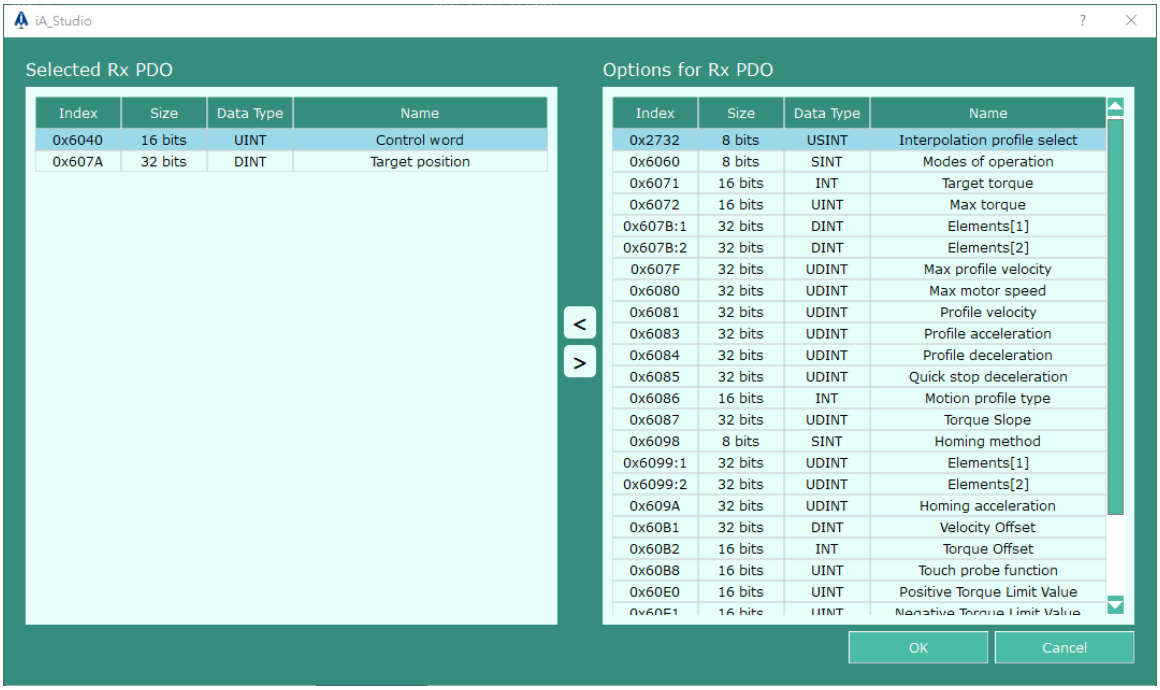


Figure 3.3.5.2.1 Add or delete PDO

Step 3: Confirm the selected Rx\Tx item objects with Rx\Tx PDO list. Press **OK** to confirm the update of PDO objects.

Rx PDO (80 bits)

Index	Size	Data Type	Name	Descr
0x6040	16 bits	UINT	Control word	
0x607A	32 bits	DINT	Target position	
0x6083	32 bits	UDINT	Profile acceleration	

Figure 3.3.5.2.2 PDO List

3.4 Save / Load project file

iA Studio project file includes controller configuration, Modbus settings and HMPL tasks. (Note: The file extension of iA Studio project file is *.iasprj2.)

3.4.1 Save project file

To open save project file window, click on **Project** on the menu bar. Then click on **Save**.

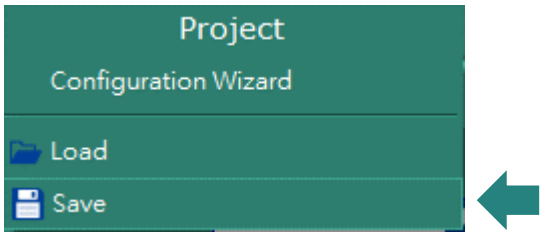


Figure 3.4.1.1 Save project file

The save project file window will appear.

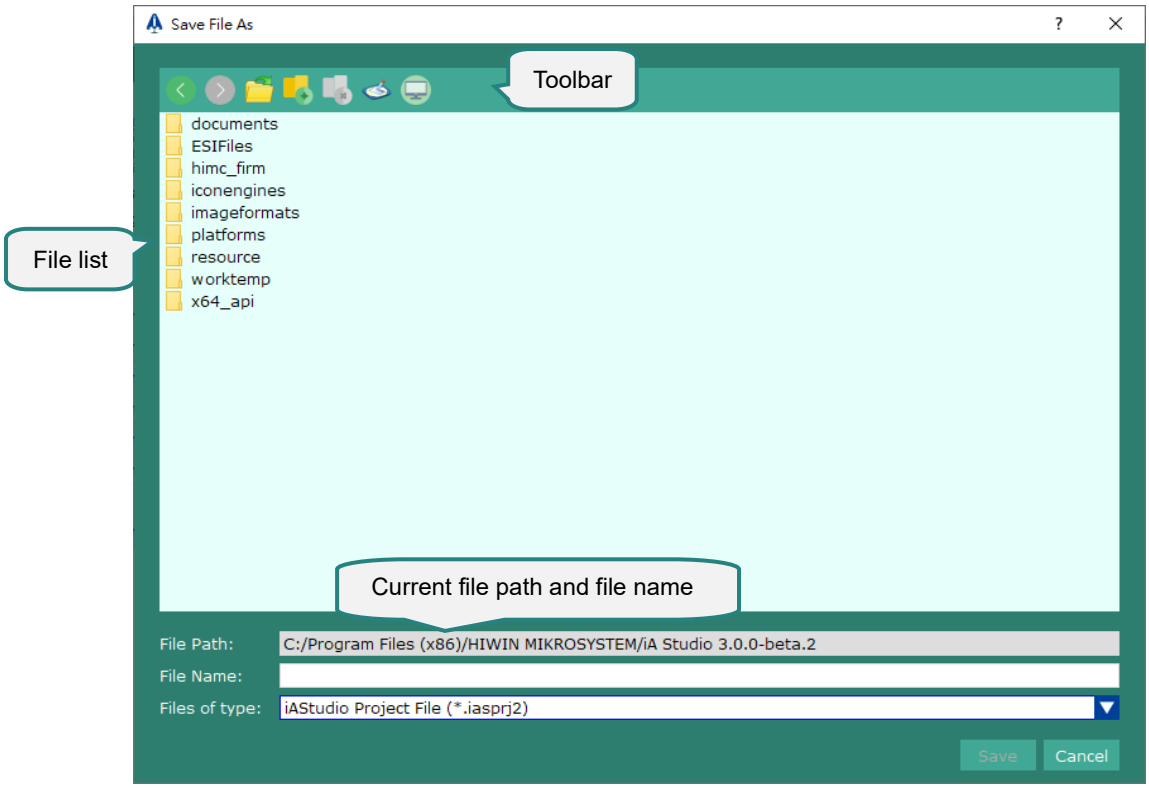


Figure 3.4.1.2 Save project file window

Functions in save project file window are described as follows.

Table 3.4.1.1 Functions in save project file window

Icon / Button	Function
	Go to next file path. If no next file path exists, the icon will be grey.
	Return to previous file path. If no previous file path exists, the icon will be grey.
	Return to upper folder / path.
	Create new folder in the current file path.
	Delete selected file / folder.
	Save project file to my desktop.
	Save project file to my computer.
	Save project file.
	Exit and close the window. The project file will not be saved.

■ How to save project file

Step 1: Open save project file window.

Step 2: Select file path.

Step 3: Enter project file name.

Step 4: Click on **Save** button.

Step 5: Save HMPL task window appears.

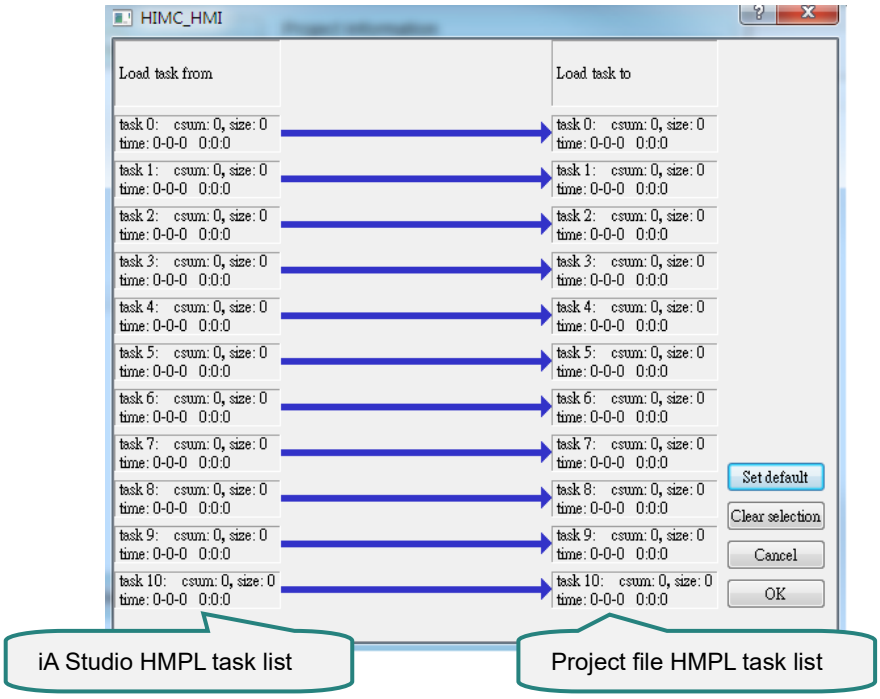


Figure 3.4.1.3 Save HMPL task window

Functions in save HMPL task window are described as follows.

Table 3.4.1.2 Functions in save HMPL task window

Button	Description
Set default	Tasks in iA Studio will be saved to the corresponding tasks in project file. For instance, task 1 in iA Studio will be saved to task 1 in project file. (Note: Users can also drag the arrow to save a task in iA Studio to a desired task in project file. For instance, task 1 in iA Studio can be saved to task 2 in project file.)
Clear selection	Clear all selections.
Cancel	Do not save HMPL task to project file.
OK	Save HMPL task to project file.

Step 6: Click on **OK** button to save project file. A pop-up window will appear to indicate the progress of saving project file from the controller RAM. It will close automatically after the project file is successfully saved.

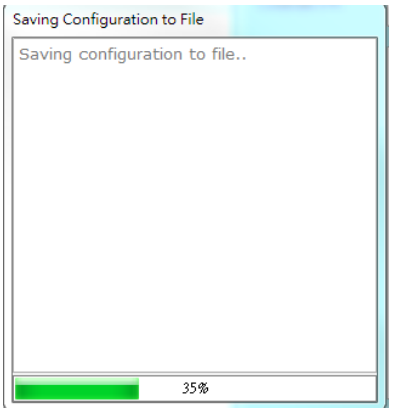


Figure 3.4.1.4 Pop-up window when saving project file from the controller RAM

3.4.2 Load project file

To open load project file window, click on **Project** on the menu bar. Then click on **Load**.

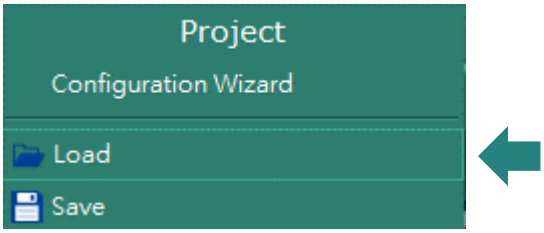


Figure 3.4.2.1 Load project file

The load project file window will appear.

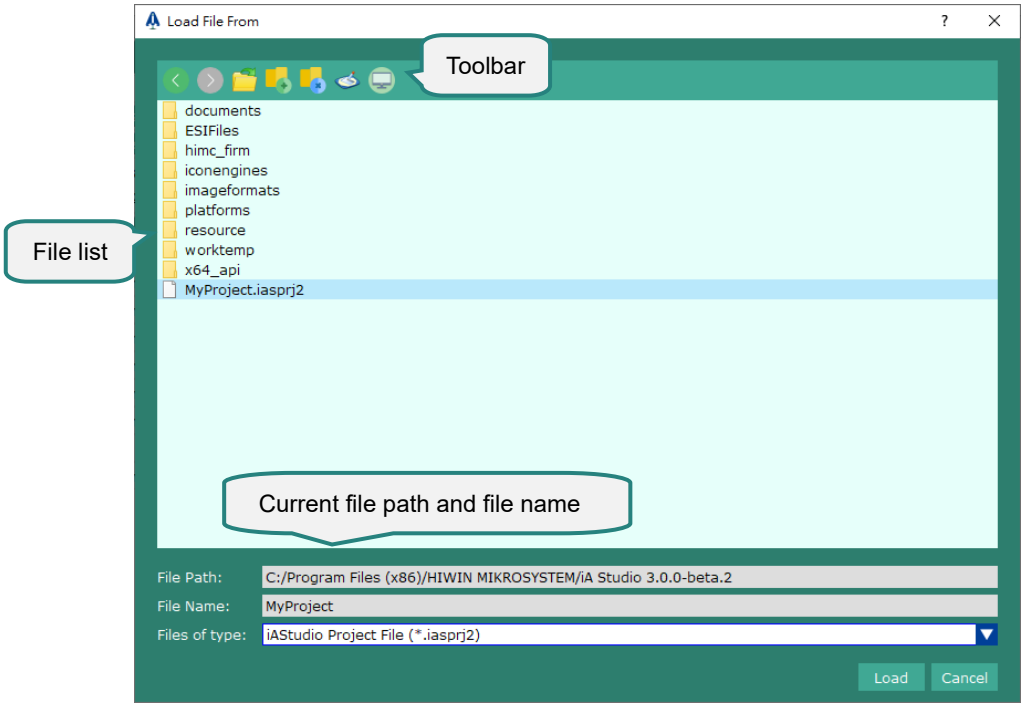


Figure 3.4.2.2 Load project file window

Table 3.4.2.1 Functions in load project file window

Icon / Button	Function
	Go to next file path. If no next file path exists, the icon will be grey.
	Return to previous file path. If no previous file path exists, the icon will be grey.
	Return to upper folder / path.
	Create new folder in the current file path.
	Delete selected file / folder.
	Load project file from my desktop.
	Load project file from my computer.
Load	Load project file.
Cancel	Exit and close the window. No project file will be loaded.

■ How to load project file

Step 1: Open load project file window.

Step 2: Select desired project file to be loaded.

Step 3: Click on **Load** button.

Step 4: Load HMPL task window appears.

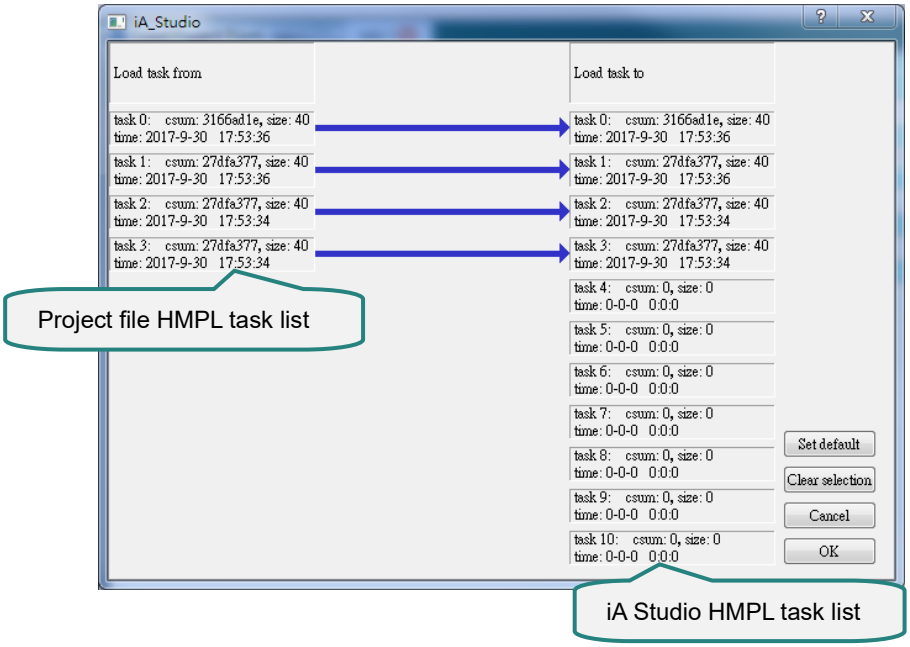


Figure 3.4.2.3 Load HMPL task window

Functions in load HMPL task window are described as follows.

Table 3.4.2.2 Functions in load HMPL task window

Button	Description
Set default	Tasks in project file will be loaded to the corresponding tasks in iA Studio. For instance, task 1 in project file will be loaded to task 1 in iA Studio. (Note: Users can also drag the arrow to load a task in project file to a desired task in iA Studio. For instance, task 1 in project file can be loaded to task 2 in iA Studio.)
Clear selection	Clear all selections.
Cancel	Do not load HMPL task from project file.
OK	Load HMPL task from project file.

Step 5: Click on **OK** button to load project file. A pop-up window will appear to indicate the progress of loading project file to the controller RAM. It will close automatically after project file is successfully loaded to the controller RAM.

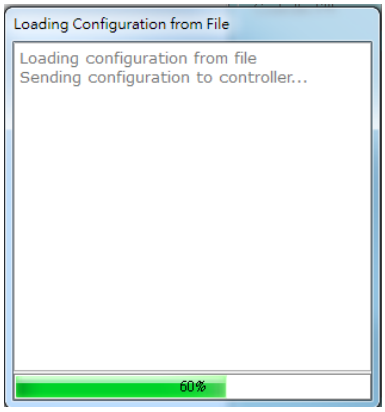


Figure 3.4.2.4 Pop-up window when loading project file to the controller RAM

4. Functional modules

4.1 Motion Manager

Motion Manager is used to configure, control and monitor individual axis motion and status. The following functions are provided in Motion Manager:

- Set motion parameters for each axis
- Monitor axis motion and fault status
- Enable / Disable axis and clear fault status
- Set current position to zero
- Jog
- Perform relative / absolute motion control
- Perform point-to-point (P2P) motion control
- Homing

4.1.1 Open Motion Manager

To open Motion Manager, click on **Tools** on the menu bar. Then click on **Motion Manager**.

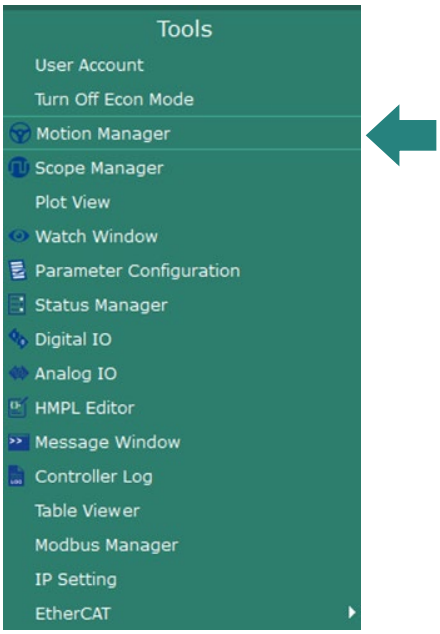


Figure 4.1.1.1 Motion Manager

Motion Manager window is as follows.

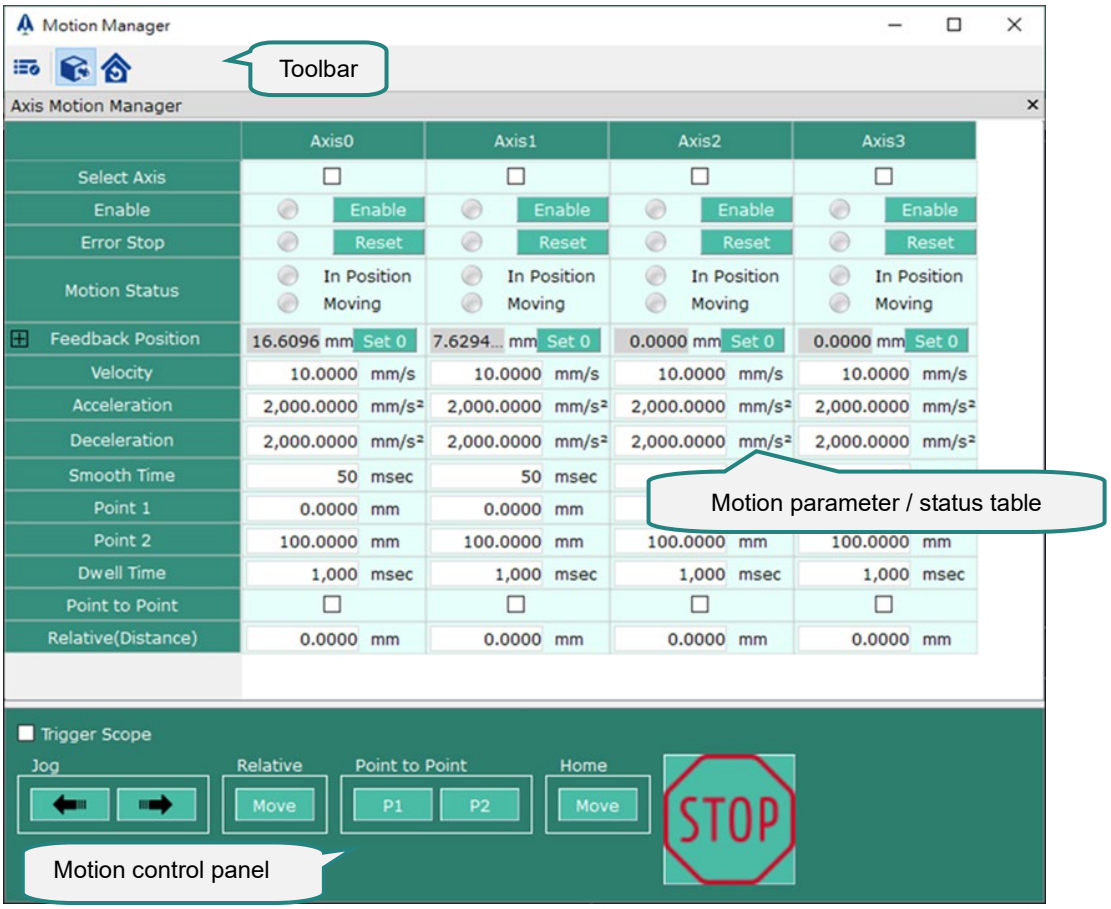


Figure 4.1.1.2 Motion Manager window

4.1.2 Motion Manager toolbar

Table 4.1.2.1 Motion Manager toolbar

Icon	Function
	Open Select Axis window to show / hide axis.
	Switch test run mode to: Axis motion type.
	Switch test run mode to: Homing type.

4.1.3 Motion parameter / status table

Table 4.1.3.1 Axis motion parameter / status table in Motion Manager

Item	Description	
Axis ID	ID of each axis.	
Select axis	Select one or more axes to be controlled via motion control panel.	
Enable	: Axis is enabled. : Axis is disabled.	Enable :Click to enable axis. Disable :Click to disable axis.
Error Stop	: Axis stops due to an error. : No error.	Reset :Click to clear fault status.
Motion Status	The indicator shows whether the axis is in position or moving.	
Feedback Position	The feedback (actual) position will be shown here. Click on Set 0 to set current position to zero.	
Velocity	Maximum velocity of motion profile.	
Acceleration	Maximum acceleration of motion profile.	
Deceleration	Maximum deceleration of motion profile.	
Smooth Time	Smooth time is used to have moderate acceleration and deceleration in motion profile.	
Point 1	Point 1 of point-to-point (P2P) motion.	
Point 2	Point 2 of point-to-point (P2P) motion.	
Dwell Time	Dwell time between point-to-point (P2P) motion.	
Point to Point	Select to start point-to-point (P2P) motion.	
Relative (Distance)	Move by the specified distance.	

Table 4.1.3.2 Homing motion parameter / status table in Motion Manager

Item	Description	
Axis ID	ID of each axis.	
Select axis	Select one or more axes to be controlled via motion control panel.	
Enable	: Axis is enabled. : Axis is disabled.	Enable :Click to enable axis. Disable :Click to disable axis.
Error Stop	: Axis stops due to an error. : No error.	Reset :Click to clear fault status.
Motion Status	The indicator shows whether the axis is in position or moving.	
Feedback Position	The feedback (actual) position will be shown here. Click on Set 0 to set current position to zero.	
Home Method	Set up homing method for homing procedure.	
Home Fast Speed	Set up fast homing velocity for homing procedure.	
Home Slow Speed	Set up slow homing velocity for homing procedure.	
Home Acceleration	Set up homing acceleration for homing procedure.	
Home Offset	Set up homing offset for homing procedure.	
Home Timeout	Set up homing timeout for homing procedure.	

4.1.4 Motion control panel

Users can perform desired motion control on one or more axes via motion control panel.

Table 4.1.4.1 Motion control panel in Motion Manager

Button	Description
Jog	Axis moves at the maximum velocity in negative / positive direction.
	 : Jog in negative direction. : Jog in positive direction.
Relative	Click on **Move** button to start relative motion from the current reference position.
Point to Point	Click on **P1** or **P2** button to move to the absolute position **P1** or **P2**. If the check box in Point to Point field is checked, the axis will move repetitively between absolute position P1 and P2 with defined dwell time.
Home	Click **Move** to start homing motion.
Stop	Click on **Stop** button to stop axis motion. (Note: This function cannot be used as emergency stop and only the selected axis will be stopped.)
Trigger Scope	If the check box of Trigger Scope is checked, Scope Manager will record the motion as axis motion starts. (Note: Scope Manager needs to be opened first.)

4.2 Parameter Configuration

Users can view and modify parameters of all axes in Parameter Configuration window.

4.2.1 Open Parameter Configuration

To open Parameter Configuration, click on **Tools** on the menu bar.

Then click on **Parameter Configuration**.

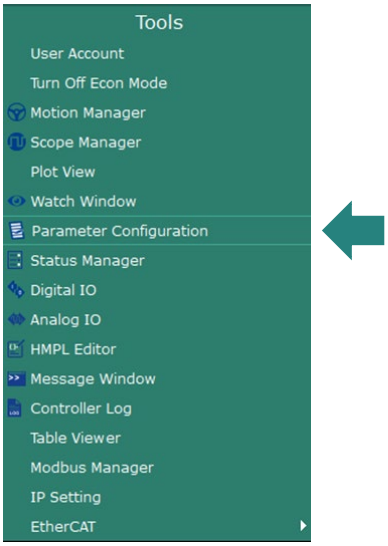
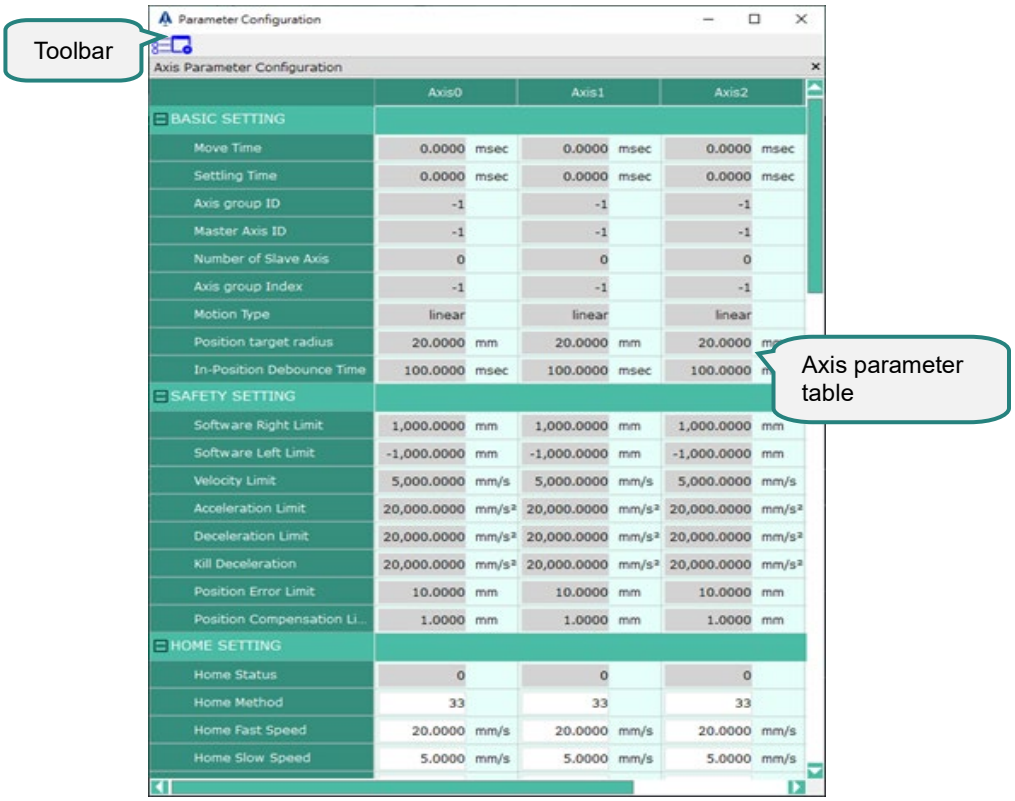


Figure 4.2.1.1 Parameter Configuration

Parameter Configuration window is as follows.



	Axis0	Axis1	Axis2
BASIC SETTING			
Move Time	0.0000 msec	0.0000 msec	0.0000 msec
Settling Time	0.0000 msec	0.0000 msec	0.0000 msec
Axis group ID	-1	-1	-1
Master Axis ID	-1	-1	-1
Number of Slave Axis	0	0	0
Axis group Index	-1	-1	-1
Motion Type	linear	linear	linear
Position target radius	20.0000 mm	20.0000 mm	20.0000 mm
In-Position Debounce Time	100.0000 msec	100.0000 msec	100.0000 m
SAFETY SETTING			
Software Right Limit	1,000.0000 mm	1,000.0000 mm	1,000.0000 mm
Software Left Limit	-1,000.0000 mm	-1,000.0000 mm	-1,000.0000 mm
Velocity Limit	5,000.0000 mm/s	5,000.0000 mm/s	5,000.0000 mm/s
Acceleration Limit	20,000.0000 mm/s²	20,000.0000 mm/s²	20,000.0000 mm/s²
Deceleration Limit	20,000.0000 mm/s²	20,000.0000 mm/s²	20,000.0000 mm/s²
Kill Deceleration	20,000.0000 mm/s²	20,000.0000 mm/s²	20,000.0000 mm/s²
Position Error Limit	10.0000 mm	10.0000 mm	10.0000 mm
Position Compensation Li...	1.0000 mm	1.0000 mm	1.0000 mm
HOME SETTING			
Home Status	0	0	0
Home Method	33	33	33
Home Fast Speed	20.0000 mm/s	20.0000 mm/s	20.0000 mm/s
Home Slow Speed	5.0000 mm/s	5.0000 mm/s	5.0000 mm/s

Figure 4.2.1.2 Parameter Configuration window

4.2.2 Parameter Configuration toolbar

Table 4.2.2.1 Parameter Configuration toolbar

Icon	Function
	Open Select Axis window to show / hide axis.

4.2.3 Modify axis parameters

In Parameter Configuration window, the field will display in grey, white or yellow to indicate whether the parameter value can be modified or not.

Table 4.2.3.1 Modify axis parameters

Field Status	Description
5.0000	The parameter value cannot be modified.
0.1000	The parameter value can be modified. Left click on the field to edit the value.
2	The parameter value is being modified. Press **Enter** key to confirm the modification or press **Esc** key to exit.

Note: The editable parameters will vary with different user mode.

4.2.4 Parameter descriptions

Parameter descriptions of Parameter Configuration window are listed as follows.

Table 4.2.4.1 Parameter descriptions

Basic Setting		
Parameter	Status	Description
Move Time	RO	The moving time of the axis
Settling Time	RO	The settling time of the axis
Axis group ID	RO	This parameter shows the ID of the group which the axis belongs to (Default value -1)
Master Axis ID	RO	The ID of the master axis when gear function is enabled. (Default value -1)
Number of Slave Axis	RO	The number of the slave axes under this axis when gear function is enabled
Motion Type	RO	There are two options for motion types: linear and rotary
Position target radius	RO	The target radius to identify if the axis is in position
In-Position Debounce Time	RO	The Debounce Time to identify if the axis is in position
Safety Setting		
Parameter	Status	Description
Software Right Limit	RO	The limit of the maximum software right limit
Software Left Limit	RO	The limit of the maximum software left limit
Velocity Limit	RO	The limit of the maximum velocity
Acceleration Limit	RO	The limit of the maximum acceleration
Deceleration Limit	RO	The limit of the maximum deceleration
Kill Deceleration	RO	The limit of the maximum deceleration when emergency stop is triggered
Position Error Limit	RO	The limit of the maximum following position error
Position Compensation Limit	RO	The limit of the maximum position compensation
Home Procedure Setting		
Parameter	Status	Description
Home Method	RW	The homing method for homing procedure
Home Fast Speed	RW	The fast homing velocity of homing procedure
Home Slow Speed	RW	The slow homing velocity of homing procedure
Home Timeout	RW	The timeout of homing procedure
Home Acceleration	RW	The acceleration for homing procedure
Home Offset	RW	The home offset of homing procedure

Motion Setting		
Parameter	Status	Description
Max. Profile Velocity	RW	The maximum velocity which could be reached by the axis
Max. Profile Acceleration	RW	The maximum acceleration which could be reached by the axis
Max. Profile Deceleration	RW	The maximum deceleration which could be reached by the axis
Smooth Time	RW	Increasing the value can reduce mechanical vibration during motion, but the total motion time will be affected.
Profile Acceleration Time	RO	The time set for the axis to reach the maximum acceleration
Profile Deceleration Time	RO	The time set for the axis to reach the maximum deceleration
Axis Rollover Value	RO	The position rollover value for the axis
Servo Setting		
Parameter	Status	Description
Modes of Operation	RO	Axis control mode
Position Proportional Gain	RO	Position loop proportional gain
Position Integral Time Constant	RO	Position loop integral constant
Position Integrator Limit	RO	Position loop integrator limit
Velocity Proportional Gain	RO	Velocity loop proportional gain
Velocity Integral Time Constant	RO	Velocity loop integral constant
Moment of Inertia Ratio	RO	Inertia ratio of motor shaft and load side
Velocity Feedforward Gain	RO	Velocity loop feedforward gain
Vpg Notch Filter 1 Enable	RO	Enable velocity loop notch filter 1
Vpg Notech Filter 1 Frequency	RO	Velocity loop notch filter 1 frequency
Vpg Notch Filter 1 Q	RO	Velocity loop notch filter 1 Q
Vpg Notch Filter 1 D	RO	Velocity loop notch filter 1 D
Vpg Notch Filter 2 Enable	RO	Enable velocity loop notch filter 2
Vpg Notech Filter 2 Frequency	RO	Velocity loop notch filter 2 frequency
Vpg Notch Filter 2 Q	RO	Velocity loop notch filter 2 Q
Vpg Notch Filter 2 D	RO	Velocity loop notch filter 2 D
Vpg Low Pass Filter 1 Enable	RO	Enable velocity loop low-pass filter 1
Vpg Low Pass Filter 1 Time Constant	RO	Velocity loop low-pass filter 1 time constant
Vpg Low Pass Filter 2 Enable	RO	Enable velocity loop low-pass filter 2
Vpg Low Pass Filter 2 Frequency	RO	Velocity loop low-pass filter 2 frequency
Vpg Low Pass Filter 2 xi	RO	Velocity loop low-pass filter 2 xi
Vffg Low Pass Filter Enable	RO	Enable low-pass filter with velocity feedforward gain
Vffg Low Pass Frequency	RO	Velocity feedforward gain low-pass filter frequency

Gantry Setting		
Parameter	Status	Description
Gantry Pair Axis ID	RO	The corresponding axis ID in a gantry pair
Drive Setting		
Parameter	Status	Description
Slave ID	RO	The Slave ID of the axis
Drive Enable Time Out	RO	The time allowed to enable the drive
Drive Position Unit (Numerator)	RO	Servo drive position resolution (numerator)
Drive Position Unit (Denominator)	RO	Servo drive position resolution. The unit is count (denominator)
Drive Current Unit (Numerator)	RO	Servo drive current resolution (numerator)
Drive Current Unit (Denominator)	RO	Servo drive current resolution (denominator)
Rotor Inertia	RO	Motor rotor inertia
Force Constant	RO	Motor force constant
Filter Setting		
Parameter	Status	Description
Axis Shaping Frequency	RO	The filter frequency of Input Shape
Axis Shaping Damping Ratio	RO	The damping ratio of Input Shape
Axis Vibration Filter Frequency	RO	The filter frequency of VSF (vibration suppression filter)
Axis Vibration Filter Damping Ratio	RO	The damping ratio of VSF (vibration suppression filter)
Gear Setting		
Parameter	Status	Description
Gear Ratio	RO	The gear ratio when gear function is enabled

4.3 Status Manager

Status Manager is used to monitor axis / group motion and fault status.

4.3.1 Open Status Manager

To open Status Manager, click on **Tools** on the menu bar. Then click on **Status Manager**.

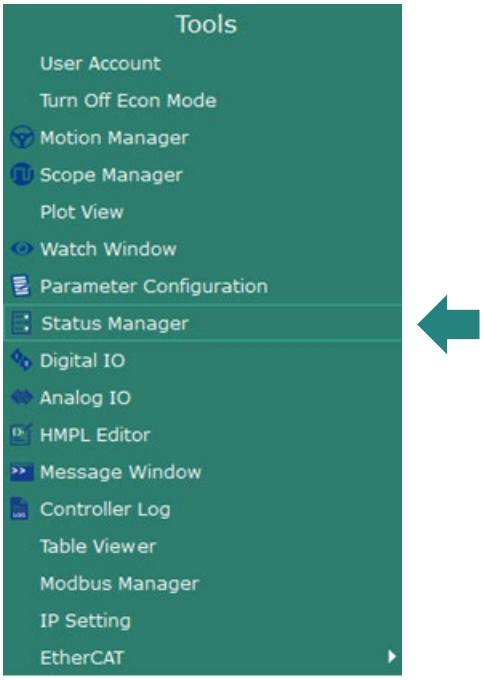


Figure 4.3.1.1 Status Manager

Status Manager window is as follows.

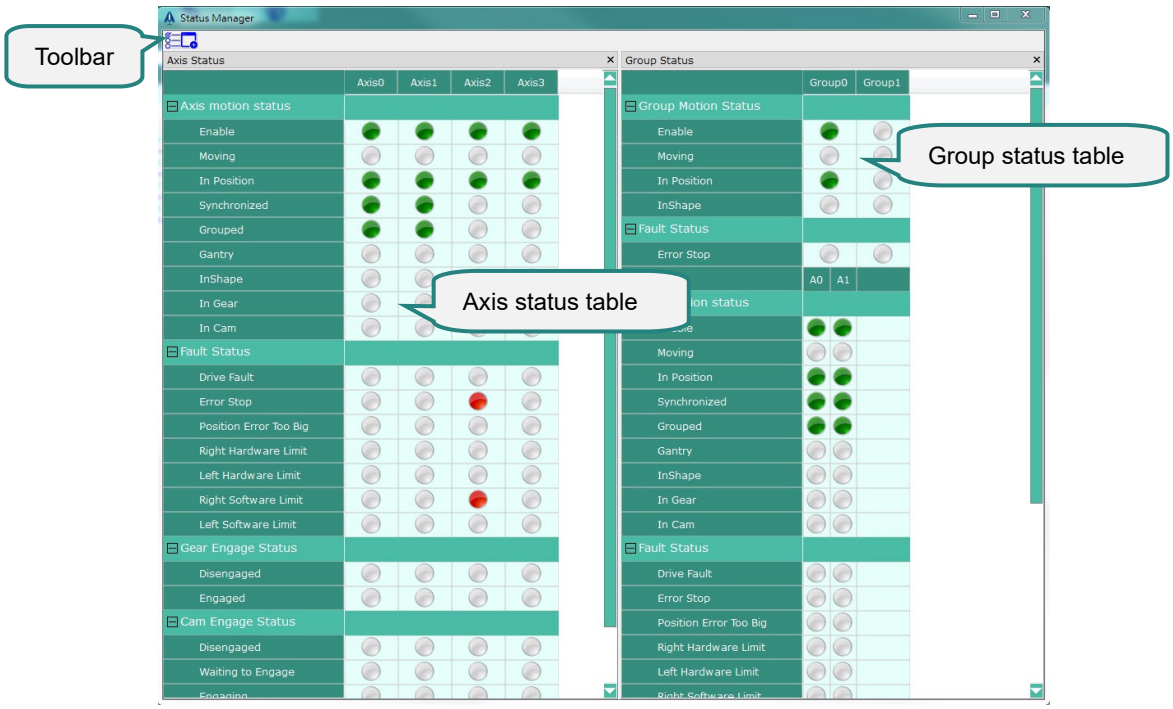
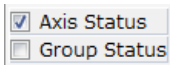


Figure 4.3.1.2 Status Manager window

4.3.2 Status Manager toolbar

Table 4.3.2.1 Status Manager toolbar

Icon	Function
	Open Select Axis window to show / hide axis. Open Select Group window to show / hide axis group.
	Open / Close axis status table. Open / Close group status table. 

4.3.3 Axis Status

The items in axis status table are described as follows.

- Motion Status

Table 4.3.3.1 Description of axis motion status

Motion Status	Description
Enabled	Axis is ready for motion control.
Moving	Axis is moving.
In Position	Axis reaches target position.
Synchronous	Axis is in synchronized motion state.
Group	Axis is grouped in an axis group.
Gantry	Axis is in gantry state.
Input Shape	Axis position command shaping function is activated.
VSF	Axis vibration filter is enabled.
Gear	Axis is in gear state.
Accelerating	Axis is accelerating.
Homed	Axis has completed homing procedure.
Homing	Axis is executing homing procedure.

- Fault Status

Table 4.3.3.2 Description of axis fault status

Fault Status	Description
Drive Fault	Drive has reported an error.
Error Stop	Axis stops due to an error.
Position Error Too Big	Position error exceeds the position error limit.
Right Hardware Limit	Axis reaches right hardware limit.
Left Hardware Limit	Axis reaches left hardware limit.
Right Software Limit	Axis reaches right software limit.
Left Software Limit	Axis reaches left software limit.

- Gear Engage Status

Table 4.3.3.3 Description of gear engage status

Engage Status	Description
Disengaged	Axis gear clutch is in “disengaged” state.
Engaged	Axis gear clutch is in “engaged” state.

4.3.4 Group Status

The items in group status table are described as follows.

- Motion Status

Table 4.3.4.1 Description of group motion status

Motion Status	Description
Enabled	Group is ready for motion control.
Moving	Group is moving.
In Position	Group reaches target position.
Input Shape	Group position command shaping function is activated.

- Fault Status

Table 4.3.4.2 Description of group fault status

Fault Status	Description
Error Stop	Group stops due to an error.

4.4 Digital IO

Digital IO allows users to view the status of digital inputs and outputs of the controller and slaves.

4.4.1 Open Digital IO window

To open Digital IO window, click on **Tools** on the menu bar. Then click on **Digital IO** to open the device menu.

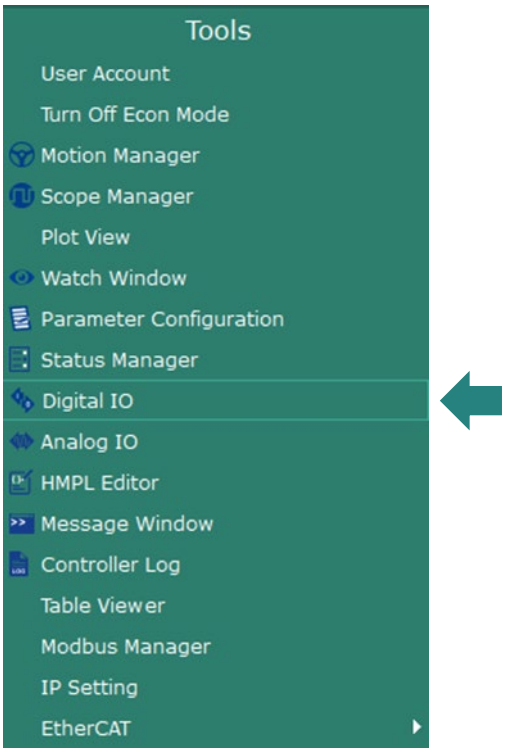


Figure 4.4.1.1 Digital IO

Select the device to be shown in the menu bar and click on **OK**.

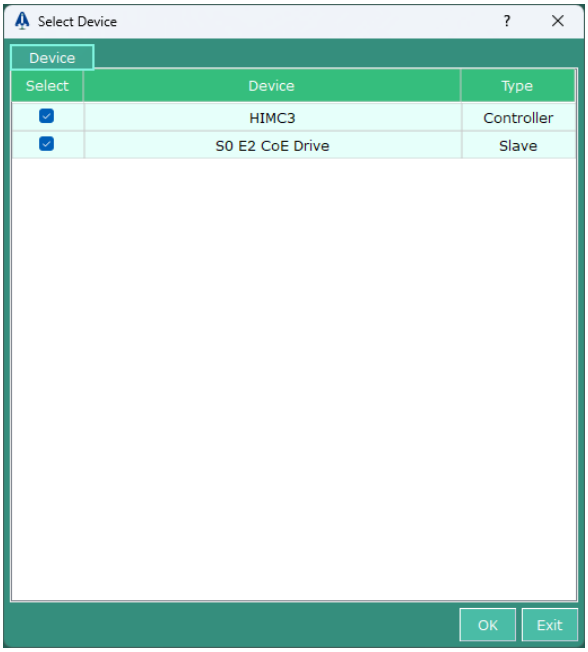


Figure 4.4.1.2 Click the Device to be shown

The Digital IO window is as follows.

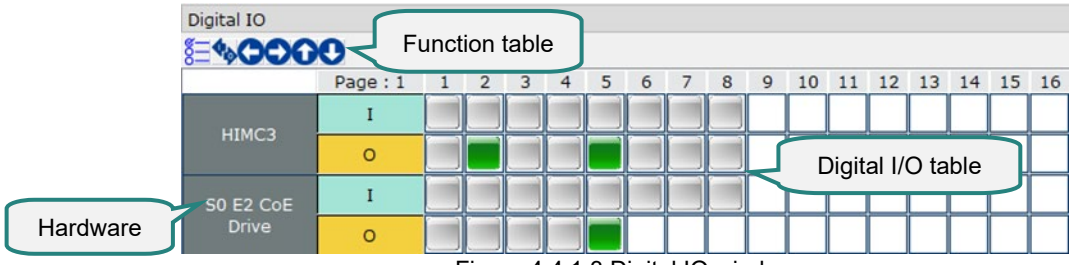


Figure 4.4.1.3 Digital IO window

4.4.2 Digital Input / Output status

The indicators in digital I/O table will display the status of each digital input and output.

Table 4.4.2.1 Digital input / output status

Indicator	Description
	The digital input or output is ON.
	The digital input or output is OFF.

4.4.3 Change output status

The status of digital output can be changed by clicking on the indicator.

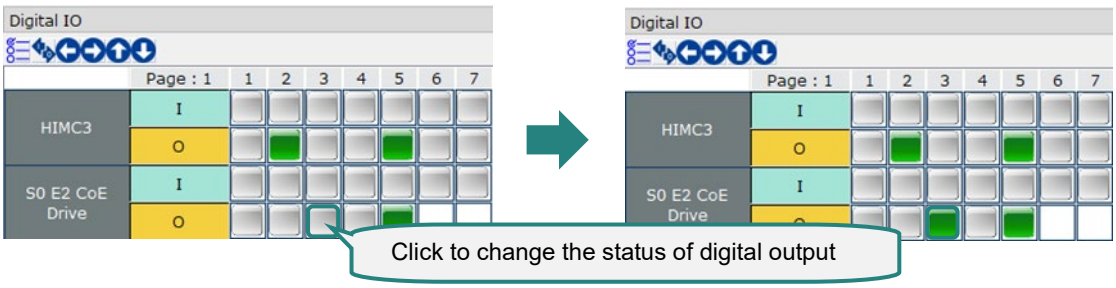


Figure 4.4.3.1 Change the status of digital output

4.4.4 Function table

Table 4.4.4.1 Digital IO Toolbar

Icon	Function
	Open Select Device window to show or hide the device.
	Open DIO index switching window, as figure 4.4.4.1 shows. Users can search and jump to the page which includes column value via the window.
	Adjust IO pages to be read via left and right buttons. (32 IO per page).
	Adjust Device pages to be read using up and down buttons. For large numbers of IO devices, switch with this function. (It will be blank if there is no device).

After switching to this page, it will be blank if there is no IO or device, as figure 4.4.4.2.

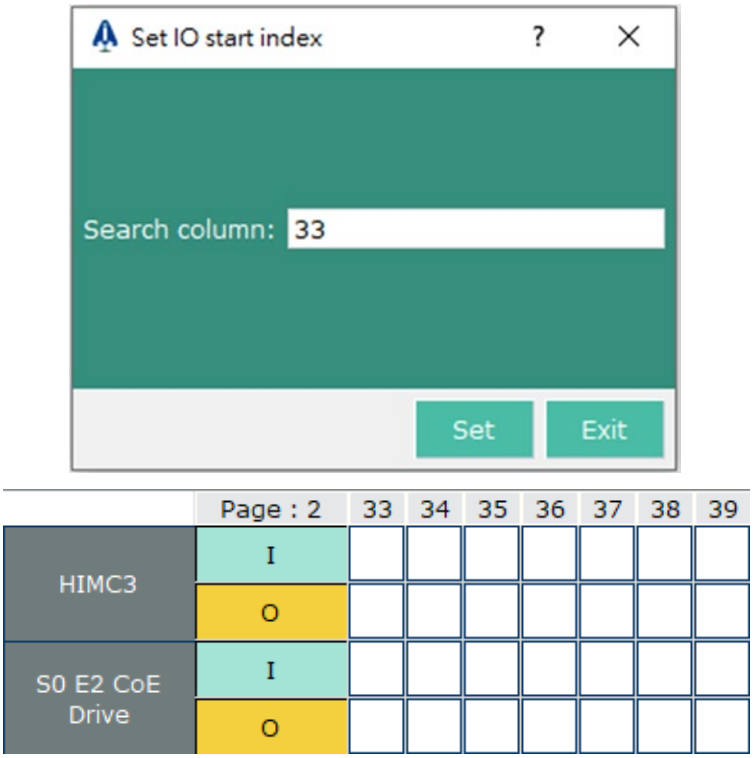


Figure 4.4.4.1 Switch to DIO index window

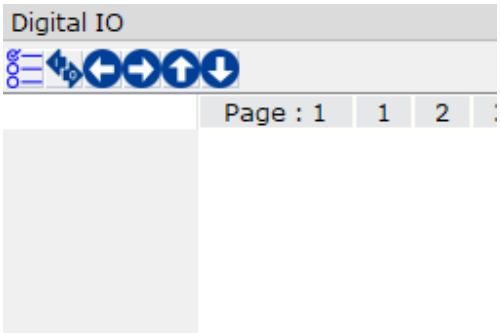


Figure 4.4.4.2 The table will be blank if there is no IO or device.

4.5 Analog IO

Analog IO allows users to observe analog inputs or monitor analog output values of the slaves.

4.5.1 Open Analog IO window

To open Analog IO window, click on **Tools** on the menu bar. Then click on **Analog IO**.

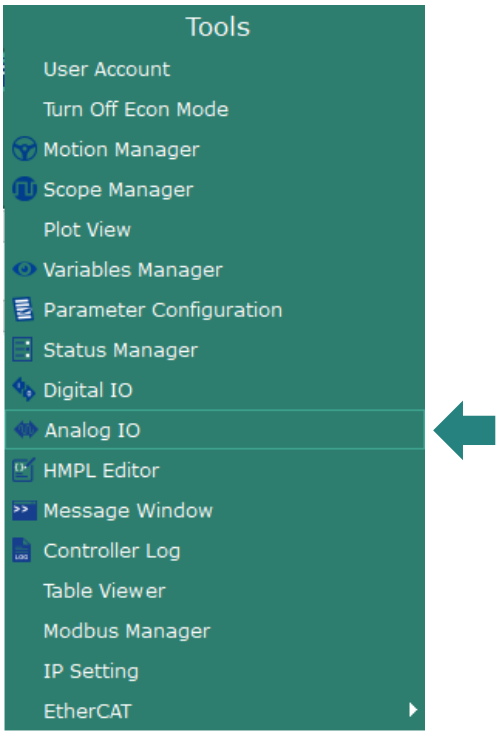


Figure 4.5.1.1 Analog IO

Note:
If the slave Analog IO is not set, a window showing “No analog IO module detected” will pop up after clicking, as shown in Figure 4.5.1.1. Refer to section 3.3.4 to modify slave parameters and select the IO object setting page. After setting, users must click Send to HIMC. The setting value will not take effect until the controller enters synchronous status again.

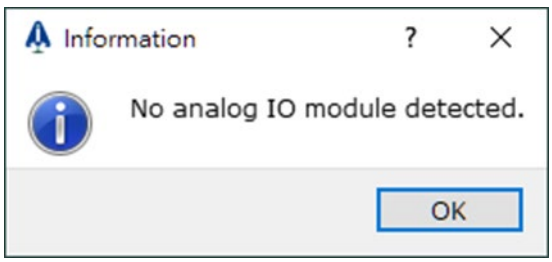


Figure 4.5.1.2 Pop-up screen when Analog IO is not set

The Analog IO interface is as follows.

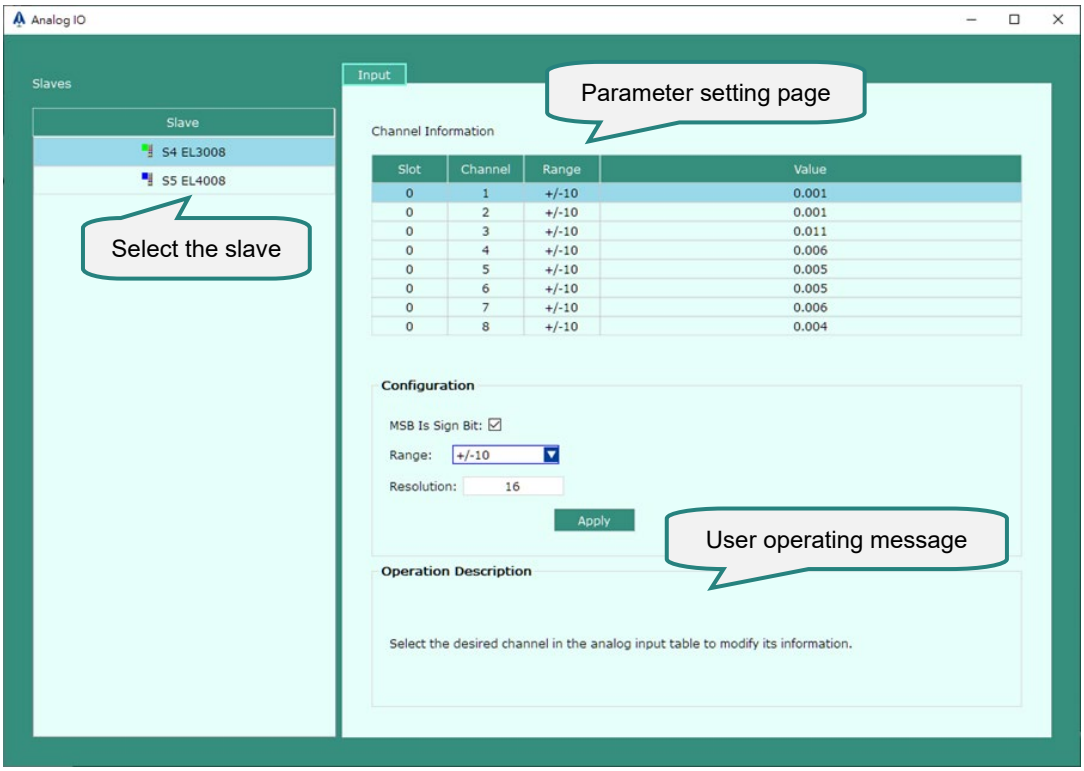


Figure 4.5.1.3 Analog Output interface

4.5.2 Analog Output

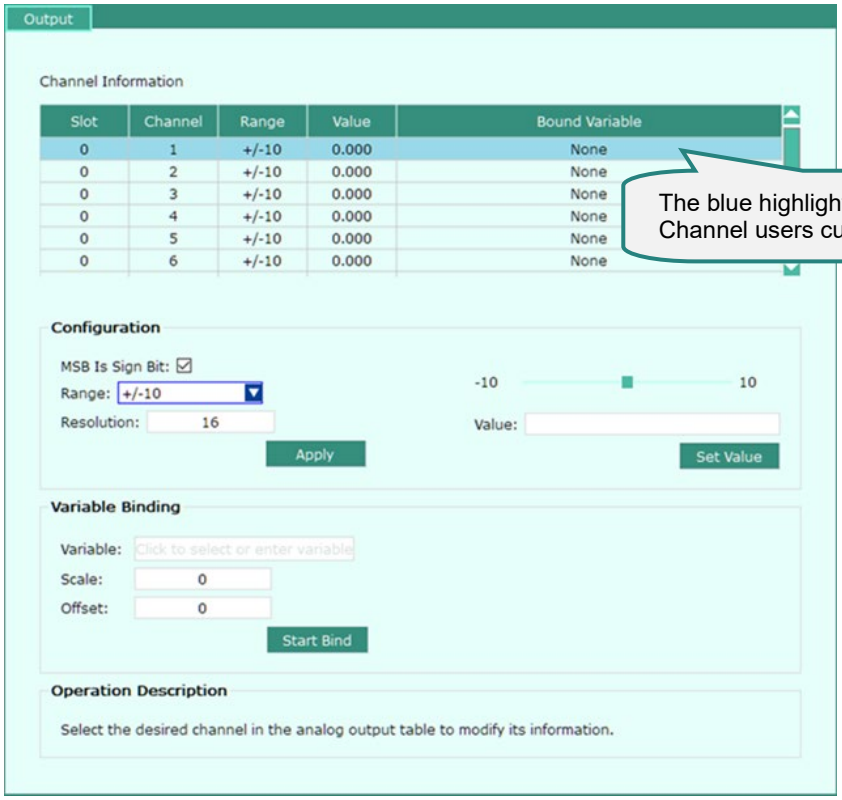


Figure 4.5.2.1 Analog Output interface

Table 4.5.2.1 Channel Information description

Field name	Description
Slot	Slot ID, the default is 0. It is used to identify the slot position of coupling module (Coupler) device.
Channel	Channel ID, assigned by users on the IO object setting page.
Range	Output convert range of **Analog Output**, the default is Default.
Value	Output value of **Analog Output**, which will be changed according to the setting of output range. Please note that this function is only for mathematical conversion, the physical quantity of actual output (voltage, current, etc.) depends on the slave device.
Bound Variable	Binding parameter name, the default is None.

Table 4.5.2.2 Configuration description

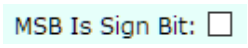
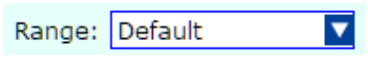
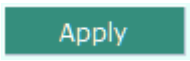
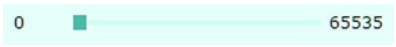
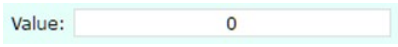
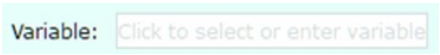
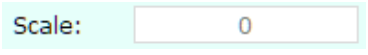
Setting	Description	
	MSB Is Sign Bit	Determines if the setting is a signed digital value, take **Resolution** = 16 for example: ■ Unsigned: 0~65536 ■ Signed: -32768~32767
	Range	The value range of digital-to-analog conversion, the default is Default, other types are as follows: ■ Default (not converted) ■ +/-10 ■ 0-10 ■ +/-5 ■ 0-20 ■ 4-20 ■ +/-20
	Resolution	The digital-to-analog conversion resolution of the channel.
	Apply	Press **Apply** to activate the setting value.
	Scroll bar	Set the output value with **Scroll bar**. The range is related to the setting of **MSB Is Sign Bit / Range / Resolution**.
	Value	Enter numbers on the keyboard to set the output value.
	Set Value	Press **Set Value** to activate the setting value.

Table 4.5.2.3 Variable Binding description

Setting	Description	
	Variable	Bind the controller variable, the default is Null. It is invalid when **Range** is Default.
	Scale	The default is 0. It is invalid when **Range** is Default.
	Offset	The default is 0. It is invalid when **Range** is Default.
	Start Bind	Press **Start Bind** to activate the setting value. The controller will multiply the current value of the internal variable by **Scale** and plus **Offset**, as the output value of the **Channel**.

4.5.3 Analog Input

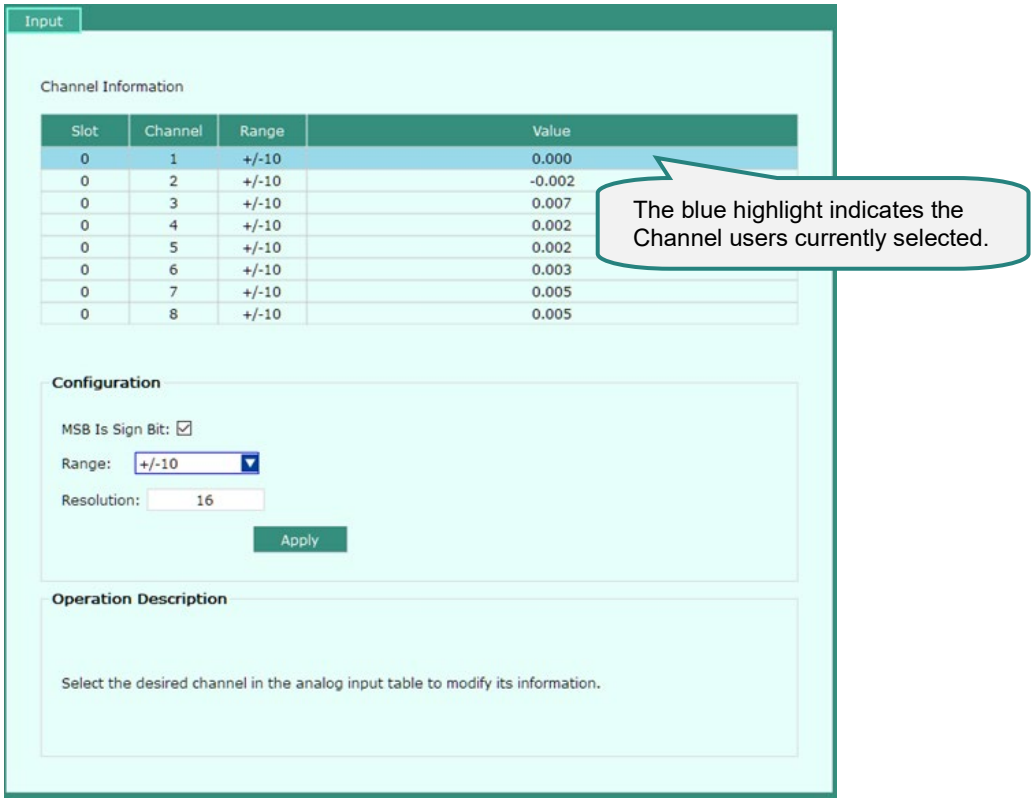


Figure 4.5.3.1 Analog Input interface

Table 4.5.3.1 Channel Information description

Field name	Description
Slot	Slot ID, the default is 0. It is used to identify the slot position of coupling module (Coupler) device.
Channel	Channel ID, assigned by users on the IO object setting page.
Range	Output convert range of **Analog Input**, the default is Default.
Value	Output value of **Analog Input**, which will be changed according to the setting of input range. Please note that this function is only for mathematical conversion, the physical quantity of actual input (voltage, current, etc.) depends on the slave device.

Table 4.5.3.2 Configuration description

Setting	Description	
MSB Is Sign Bit: ☐	MSB Is Sign Bit	Determines if the setting is a signed digital value, take **Resolution** = 16 for example: ■ Unsigned: 0~65536 ■ Signed: -32768~32767
Range: Default	Range	The value range of digital-to-analog conversion, the default is Default, other types are as follows: ■ Default (not converted) ■ +/-10 ■ 0-10 ■ +/-5 ■ 0-20 ■ 4-20 ■ +/-20
Resolution: 16	Resolution	The digital-to-analog conversion resolution of the channel.

4.6 Message Window

Message Window enables users to enter command directly to the controller and view system message.

4.6.1 Open Message Window

To open Message Window, click on **Tools** on the menu bar. Then click on **Message Window**.

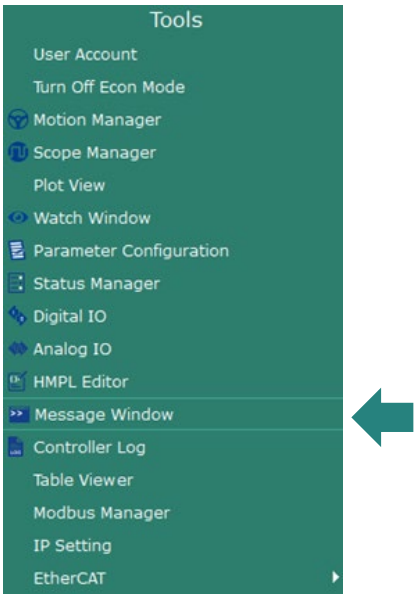


Figure 4.6.1.1 Message Window

Message Window is as follows.

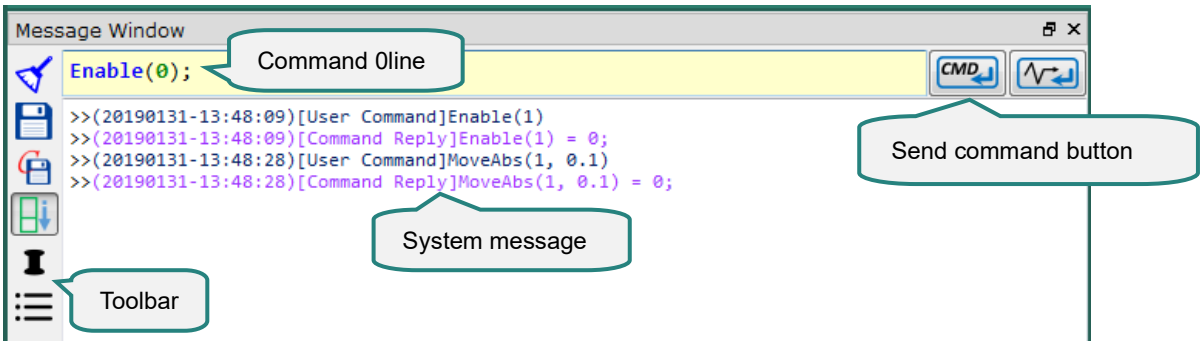
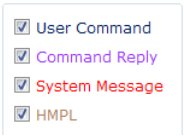


Figure 4.6.1.2 Message Window

Functions in Message Window are described as follows.

Table 4.6.1.1 Functions in Message Window

Icon	Description
	Clear all messages.
	Save all messages to a file.
	Activate / Deactivate Continue Save function.
	Activate / Deactivate the function to display the latest message.
	 : Message Window can be covered by other windows.  : Message Window will always display on top and cannot be covered by other windows.
	Select filter to catch the current desired message type. 
	Users can click on the icon or press **Enter** key to send command.
	Send command and start to record motion in Scope Manager. (Note: Scope Manager needs to be opened first.)

4.6.2 Command line

Message Window command line provides smart completion for users to easily enter command.

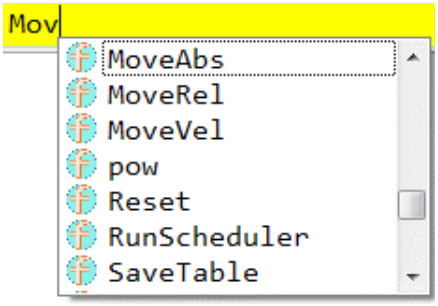


Figure 4.6.2.1 Command line

4.6.3 Continue Save

Message Window provides Continue Save function to record all the messages displayed in Message Window. The maximum file size for storing the messages is 10 MB. If the messages are over 10 MB, a new file will be automatically created to continuously record the messages.

Step 1: Click on  to activate Continue Save function.

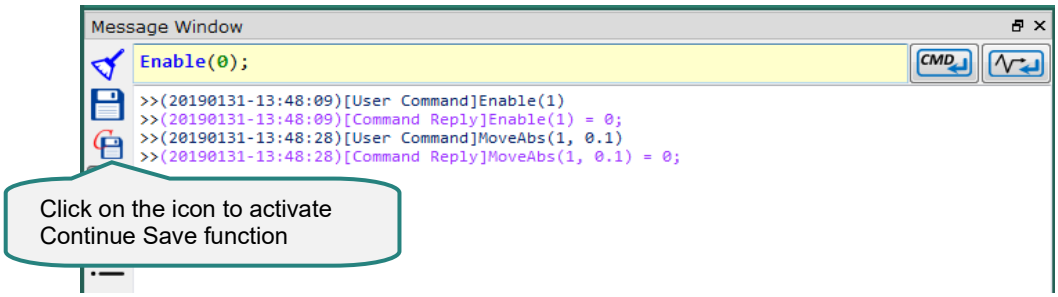


Figure 4.6.3.1 Activate Continue Save function

Step 2: A window will appear for users to select file path and input file name.

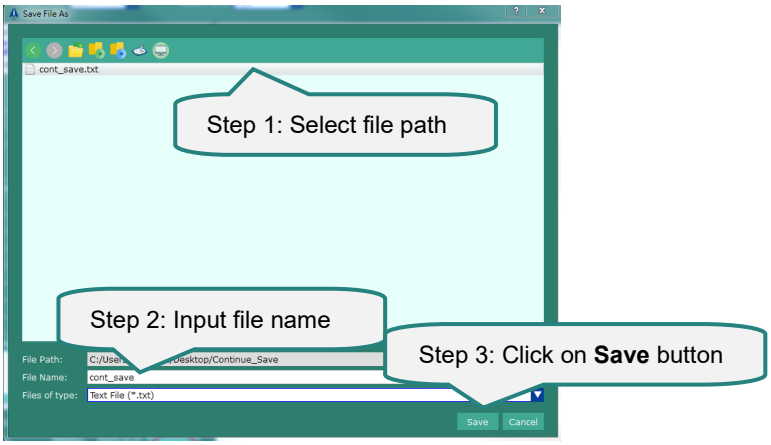


Figure 4.6.3.2 Select file path and input file name

Step 3: The maximum file size for storing the messages is 10 MB. If the messages are over 10 MB, a new file will be automatically created under the same path to continuously record the messages. The name of the automatically created file will be “file name_yyyymmdd_hms.txt”.

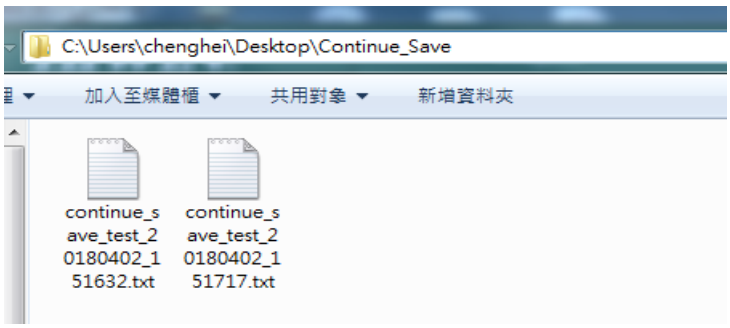


Figure 4.6.3.3 Files of Continue Save function

Step 4: Click on  again and a question dialog will appear, asking users if they would like to deactivate Continue Save function. Click on **Yes** button to deactivate this function.

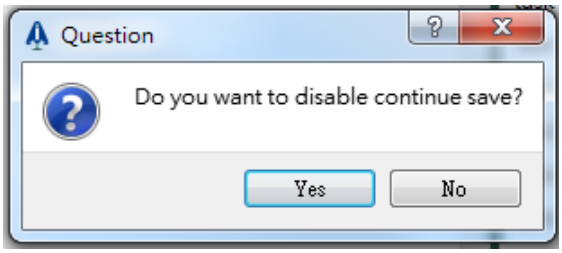


Figure 4.6.3.4 Question dialog for deactivating Continue Save function

4.7 Error Message

Error message window allows user to know what error occurs in the controller. It will appear immediately as an error occurs.

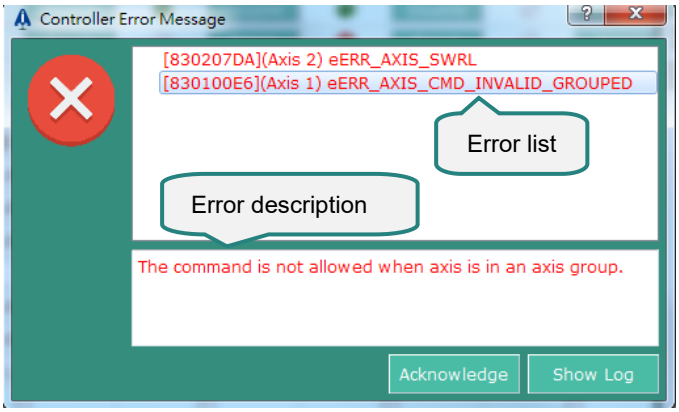


Figure 4.7.1 Error message

Note: Error description varies with selected error from the error list.

Table 4.7.1 Buttons in error message window

Button	Description
Acknowledge	Close the current error message window. (Note: By doing so, the error will not be cleared. Users need to check the description of each error to troubleshoot it.)
Show Log	Open Controller Log.

4.8 Controller Log

Controller Log allows user to monitor and inspect all controller errors and system logs.

4.8.1 Open Controller Log

To open Controller Log, click on **Tools** on the menu bar. Then click on **Controller Log**.

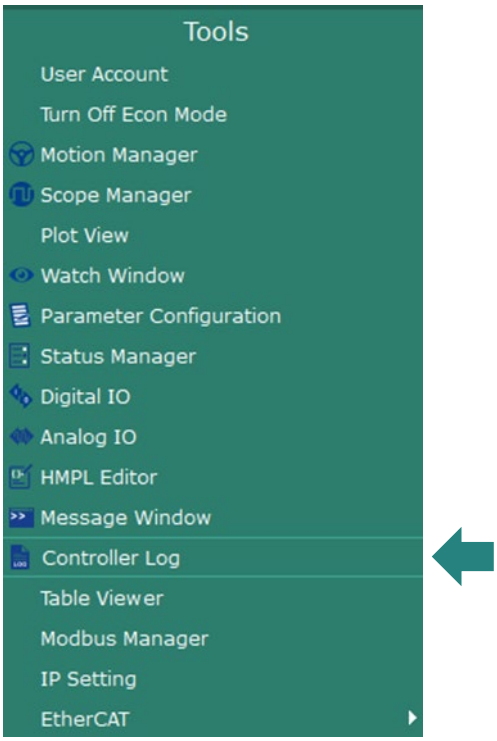


Figure 4.8.1.1 Controller Log

Controller Log window is shown as Figure 4.8.1.2. It will display Debug Log when users are in Superuser mode, as shown in Figure 4.8.1.3.

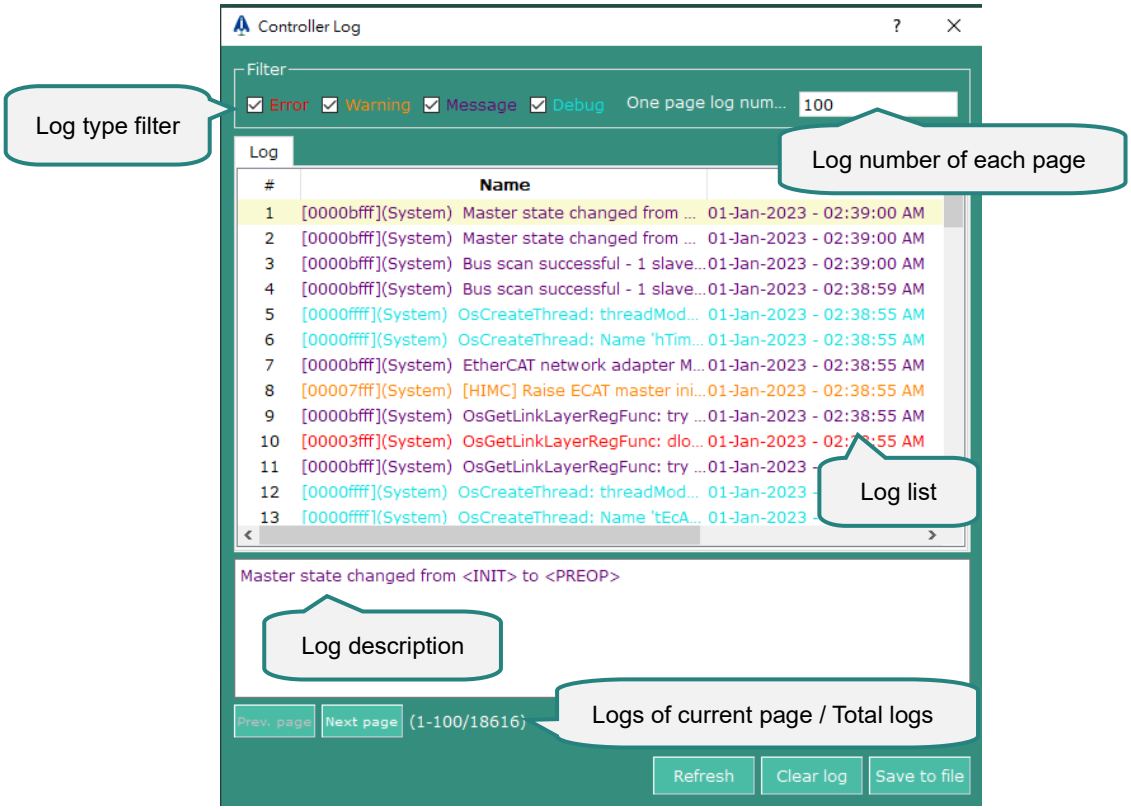


Figure 4.8.1.2 Controller Log window

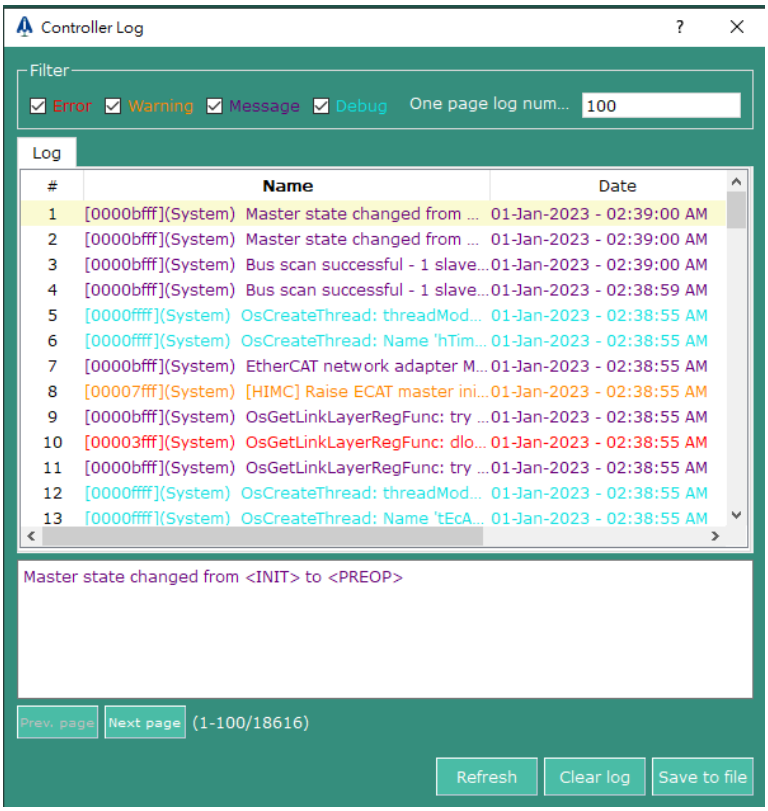
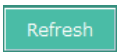
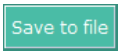


Figure 4.8.1.3 Controller Log window in Superuser mode

Functions in Controller Log window are described as follows.

Table 4.8.1.1 Functions in Controller Log window

Selection / Button	Description
	Show error log. (☑: Show log ☐: Hide log)
	Show warning log. (☑: Show log ☐: Hide log)
	Show system log. (☑: Show log ☐: Hide log)
	Show Debug log. (☑: Show log ☐: Hide log)
	Refresh controller log.
	Clear all controller log.
	Save controller log to a file.
	Go to previous page.
	Go to next page.

Note: Log description varies with the selected log from the log list.

4.9 Scope Manager

iA Studio provides a software scope for users to view real-time parameter data in graphic format.

4.9.1 Open Scope Manager

To open Scope Manager, users can click on **Tools** on the menu bar. Then click on **Scope Manager**.

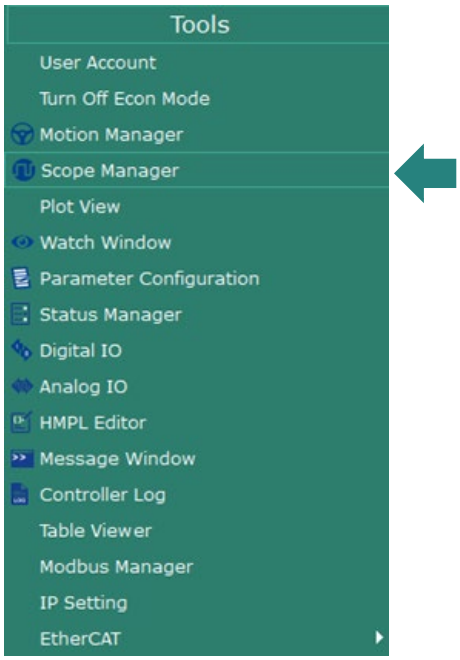


Figure 4.9.1.1 Scope Manager

Scope Manager window is as follows.

Figure 4.9.1.2 Scope Manager window

Functions in Scope Manager are described as follows.

Table 4.9.1.1 Functions in Scope Manager window

Icon	Description
	Start to record and display parameter data.
	Stop recording and displaying parameter data.
	Restart to record and display parameter data.
	Open Plot View window. Display and analyze recorded parameter data.
	Open 1D scope. Click on the icon and select **Y-Time Mode** to open 1D scope. (Note: X axis is time. (Unit: sec))
	Open 2D scope. Click on the icon and select **X-Y Mode** to open 2D scope.
	Open 3D scope. Click on the icon and select **X-Y-Z Mode** to open 3D scope.
	Select the number of channels. 1D scope: 8 channels are available. Channel number: 1 to 8. 2D scope: 1, 2 and 4 channels are available. Channel number: 1, 2 and 4. 3D scope: 1 and 2 channels are available. Channel number: 1 and 2.
	Open Settings window. Set sampling rate and trace style.

4.9.1.1 Open plot view window

To open Plot View window, users can click on the icon below.

Figure 4.9.1.1.1 Open Plot View window

4.9.1.2 1D / 2D / 3D scope

To change between 1D, 2D and 3D scope, please click on the icon below. Select Y-Time Mode (1D scope), X-Y Mode (2D scope) or X-Y-Z Mode (3D scope) from the submenu.

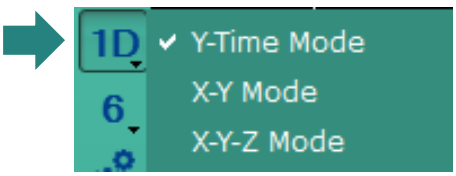


Figure 4.9.1.2.1 1D / 2D / 3D scope

4.9.1.3 Open settings window

Users can modify sampling rate and trace style in Settings window. To open Settings window, users can click on the below icon.

Figure 4.9.1.3.1 Open Settings window

Settings window is as follows.

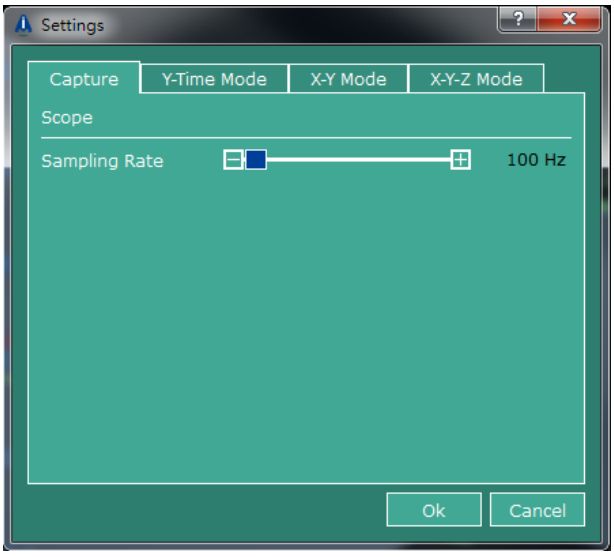


Figure 4.9.1.3.2 Settings window

Table 4.9.1.3.1 Tabs in Settings window

Tab	Description
Capture	Set sampling rate. (Sampling rate range: 100 Hz to 4000 Hz)
Y-Time Mode	Set trace style in 1D scope. Users can define trace color and width.
X-Y Mode	Set trace style in 2D scope. Users can define point color, point diameter and sample number.
X-Y-Z Mode	Set trace style in 3D scope. Users can define point color, point diameter and sample number.

Functions in each tab are described as follows.

■ Capture

In this tab, users can set sampling rate.

Sampling rate range: 100 Hz to 4000 Hz

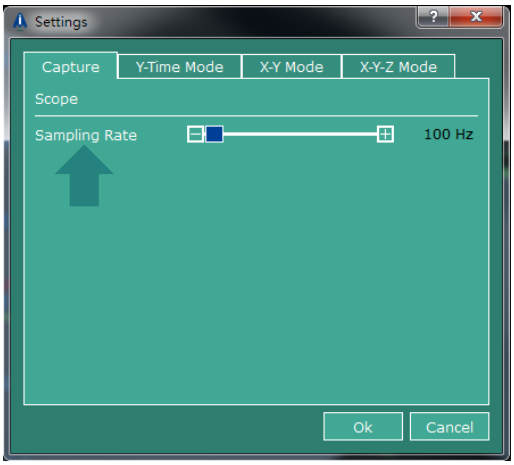


Figure 4.9.1.3.3 Capture tab

■ Y-Time Mode

In this tab, users can set trace color and width in 1D scope.

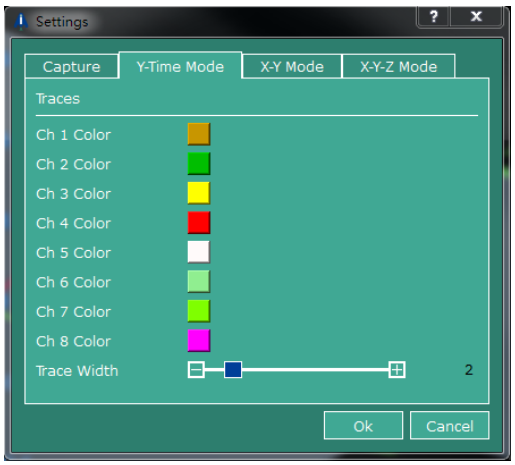


Figure 4.9.1.3.4 Y-Time Mode tab

(1) Trace color

Click on color icon to open color table. Select desired color and click on **OK** button.

Figure 4.9.1.3.5 Trace color

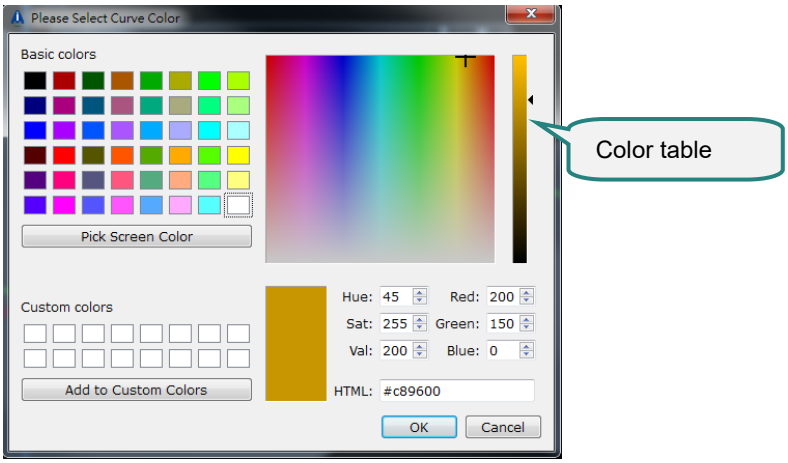


Figure 4.9.1.3.6 Color table

(2) Trace width

Set desired width.

Width range: 1 to 10. (Unit: pixel)

Figure 4.9.1.3.7 Trace width

■ X-Y Mode

In this tab, users can set point color, point diameter and sample number in 2D scope.

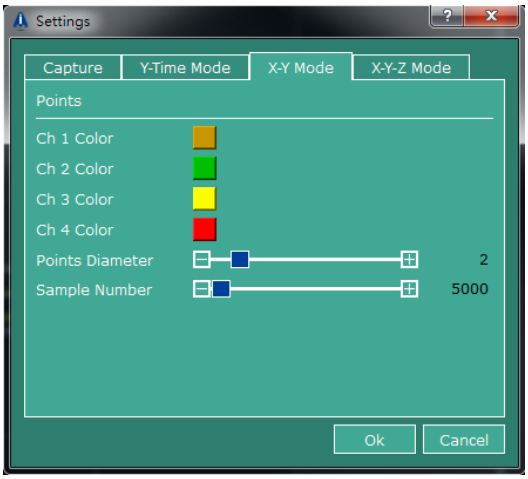


Figure 4.9.1.3.8 X-Y Mode tab

(1) Point color

Click on color icon to open color table. Select desired color and click on **OK** button.

Figure 4.9.1.3.9 Point color

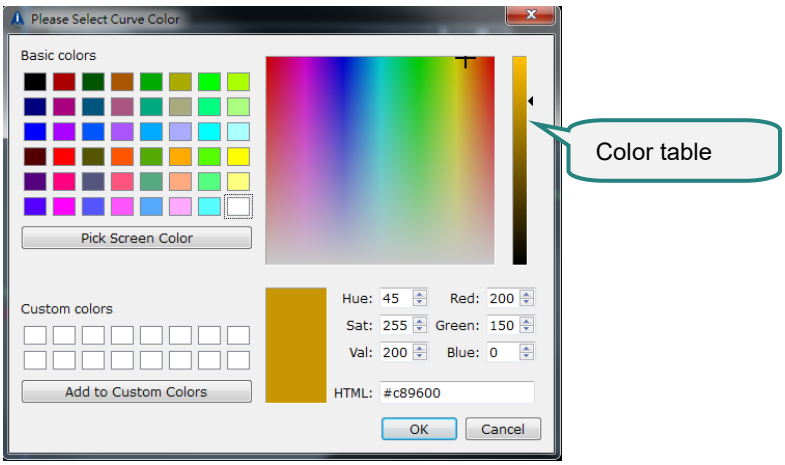


Figure 4.9.1.3.10 Color table

(2) Point diameter

Set point diameter.

Size range: 1 to 10. (Unit: pixel)

Figure 4.9.1.3.11 Point diameter

(3) Sample number

Set sample number. Available setting range: 5000 to 10000.

In 2D scope, the trace is plotted by points. If the sample number is set to be 5000, then 2D scope will only display trace which can be plotted by 5000 points in real time.

Figure 4.9.1.3.12 Sample number

■ X-Y-Z Mode

In this tab, users can set point color, point diameter and sample number in 3D scope.

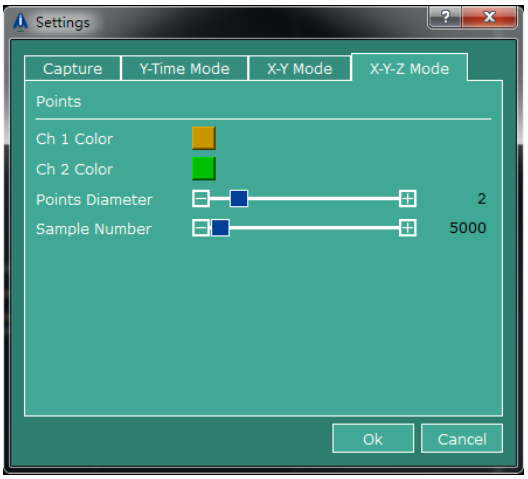


Figure 4.9.1.3.13 X-Y-Z Mode tab

(1) Point color

Click on color icon to open color table. Select desired color and click on **OK** button.

Figure 4.9.1.3.14 Point color

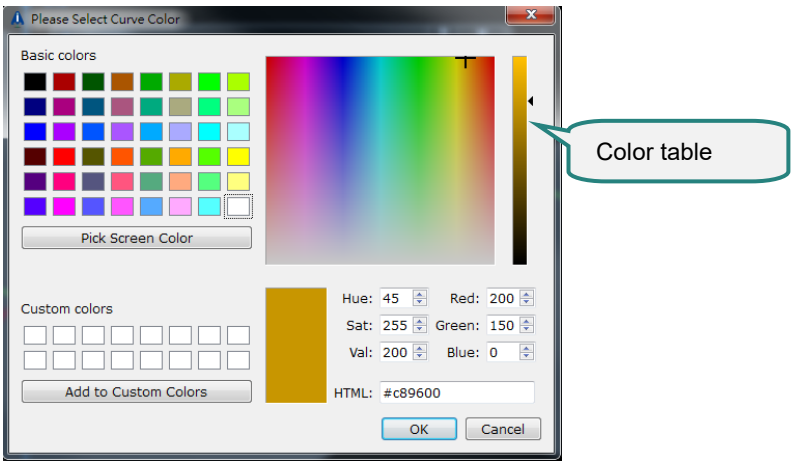


Figure 4.9.1.3.15 Color table

(2) Point diameter

Set point diameter.

Size range: 1 to 10. (Unit: pixel)

Figure 4.9.1.3.16 Point diameter

(3) Sample number

Set sample number. Available setting range: 5000 to 10000.

In 3D scope, the trace is plotted by points. If the sample number is set to be 5000, then 3D scope will only display trace which can be plotted by 5000 points in real time.

Figure 4.9.1.3.17 Sample number

4.9.2 1D scope

1D scope displays the real-time relation between a certain parameter and time in graphic format. 1D scope window is as follows.

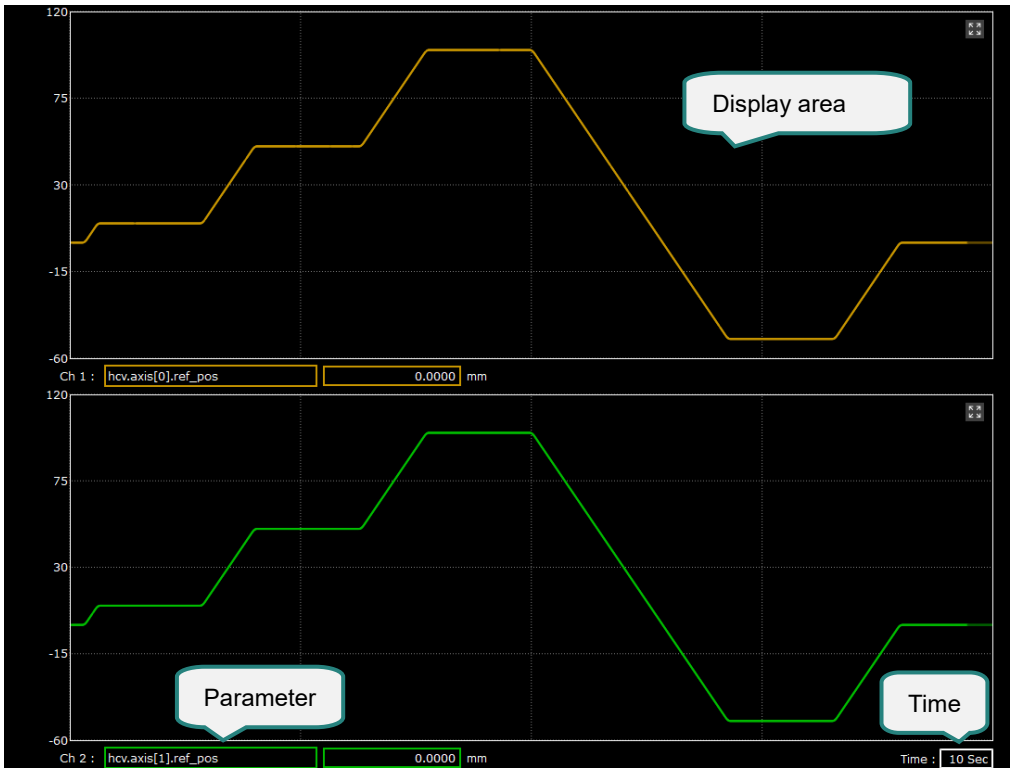


Figure 4.9.2.1 1D scope window

4.9.2.1 1D scope

1D scope can display both the current parameter data and the previous one in display area. The X axis of 1D scope is time, which can be set by the field in the lower-right corner.

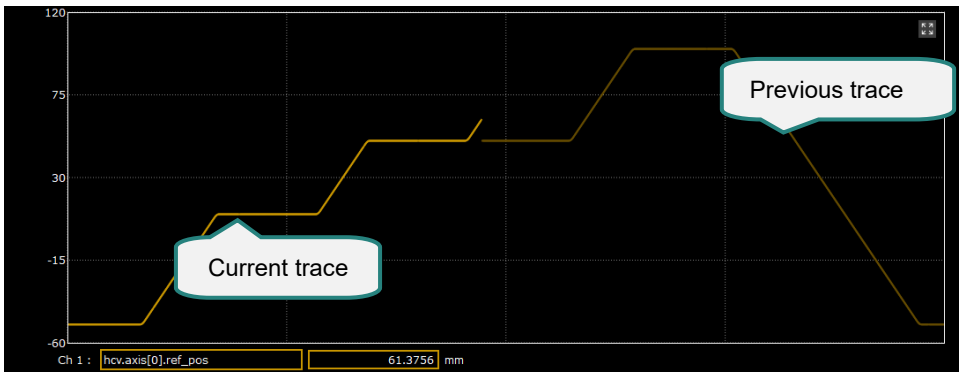


Figure 4.9.2.1.1 1D scope

4.9.2.2 Parameter input area

There are two fields in the parameter input area of 1D scope: parameter list field and parameter data field. Users can set the parameter to be monitored in parameter list field. The parameter data will be displayed in parameter data field.

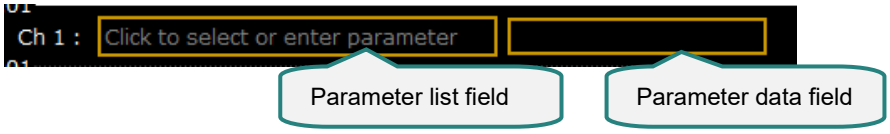


Figure 4.9.2.2.1 Parameter input area

■ **Parameter list field**

Click on parameter list field to open parameter list.

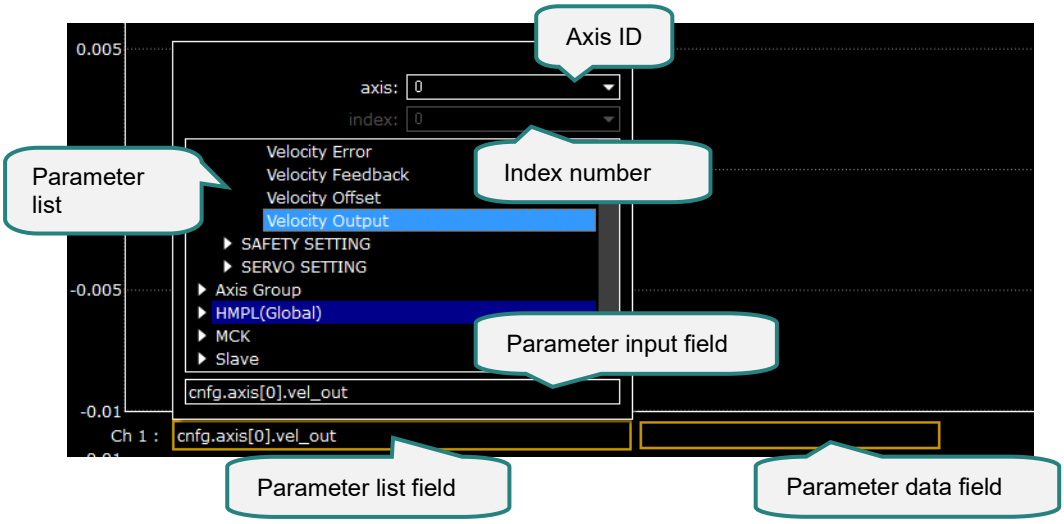


Figure 4.9.2.2.2 Parameter list field

Parameter list includes the following items:

(1) Axis ID

Select axis ID from the drop-down list or directly input axis ID in the field.

(2) Index number

Select index number from the drop-down list or directly input index number in the field.

(3) Parameter list

Select desired parameter from the list.

(4) Parameter input field

Users can directly input parameter in the field. Parameter input field provides smart completion, so users can search for parameters by using keywords.

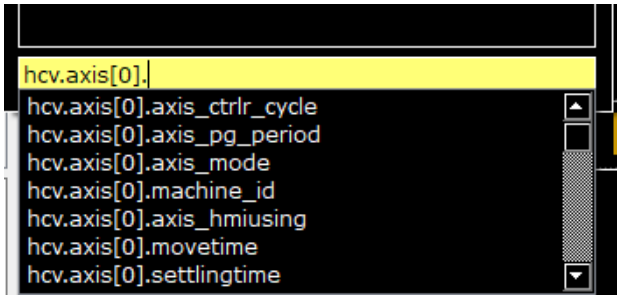


Figure 4.9.2.2.3 Parameter input field

Parameter input field will display in different colors to remind users to check parameter.

Table 4.9.2.2.1 Parameter input field

Status	Description
hcv.axis[0].pos_fb	Correct parameter.
hcv.axis[0].pos_f	Inputting parameter.
hcv.axis[0].pos_f	Incorrect parameter.

■ Parameter data field

Display the parameter data of current position.

4.9.2.3 Time range

The X axis of 1D scope is time. Users can set the time range in the field below. The setting value ranges from 1 to 300 seconds. (Note: The setting value needs to be an integer.)

Figure 4.9.2.3.1 Time range

4.9.3 2D scope

2D scope displays the real-time relation between two parameters in graphic format. 2D scope window is as follows.

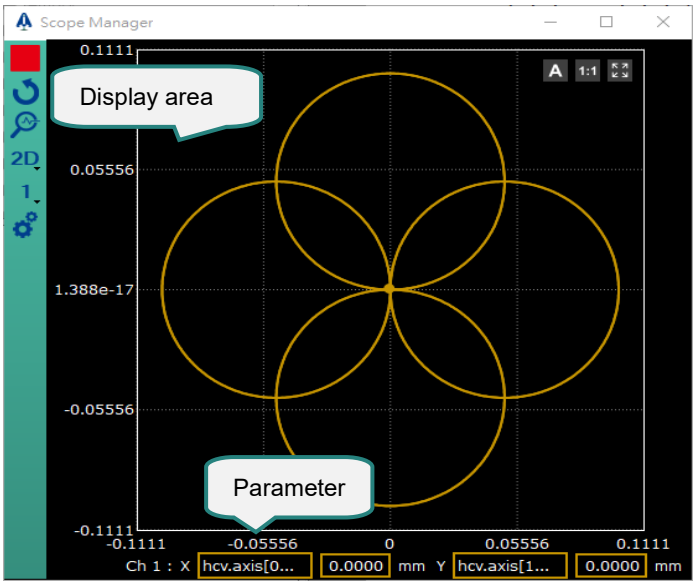


Figure 4.9.3.1 2D scope window

4.9.3.1 2D scope

In display area, the point means the current value of the selected parameters. In 2D scope, the trace is plotted by points. Users can define the sample number of the trace. For setting the sample number, please refer to section 4.9.1.3.

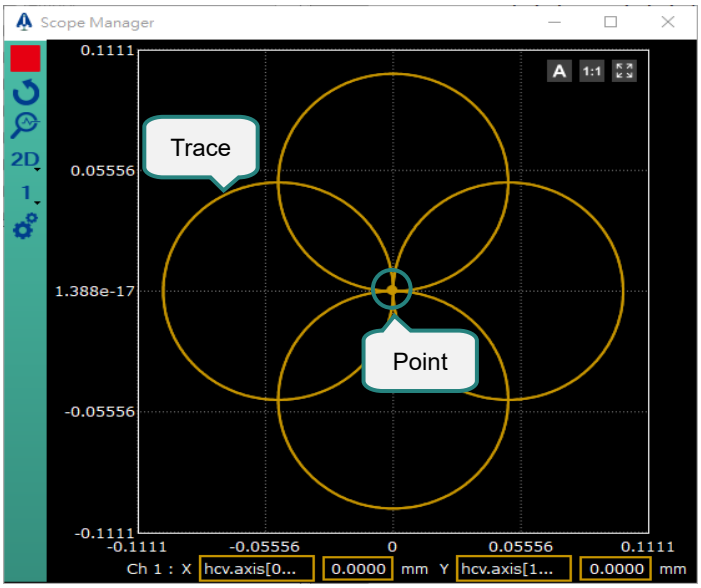


Figure 4.9.3.1.1 2D scope

4.9.3.2 Parameter input area

There are two fields in the parameter input area of 2D scope: parameter list field and parameter data field. Users can set the parameter to be monitored in parameter list field. The parameter data will be displayed in parameter data field.

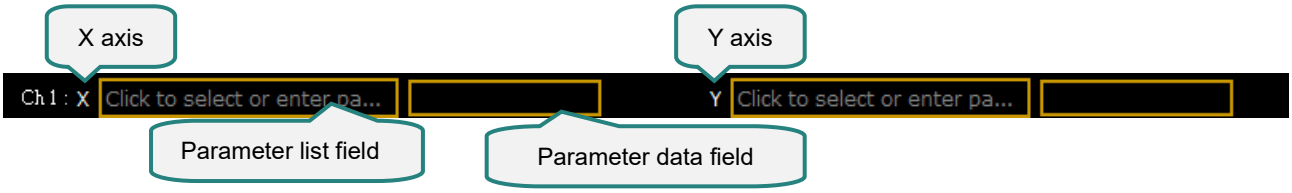


Figure 4.9.3.2.1 Parameter input area

(1) Parameter list field

Click on parameter list field to open parameter list.

(2) Parameter data field

Display the parameter data of current position.

4.9.3.3 Scale function

While using 2D scope, users can decide how the coordinate system is scaled by using the scale function.

■ **Automatic mode / Manual mode**

Figure 4.9.3.3.1 Automatic mode / Manual mode

Table 4.9.3.3.1 Automatic mode / Manual mode

Icon	Mode	Description
A	Automatic mode	Coordinate system is automatically created according to the trace.
M	Manual mode	Coordinate system is scaled manually. Double click on the text on X axis or Y axis to set the scale.

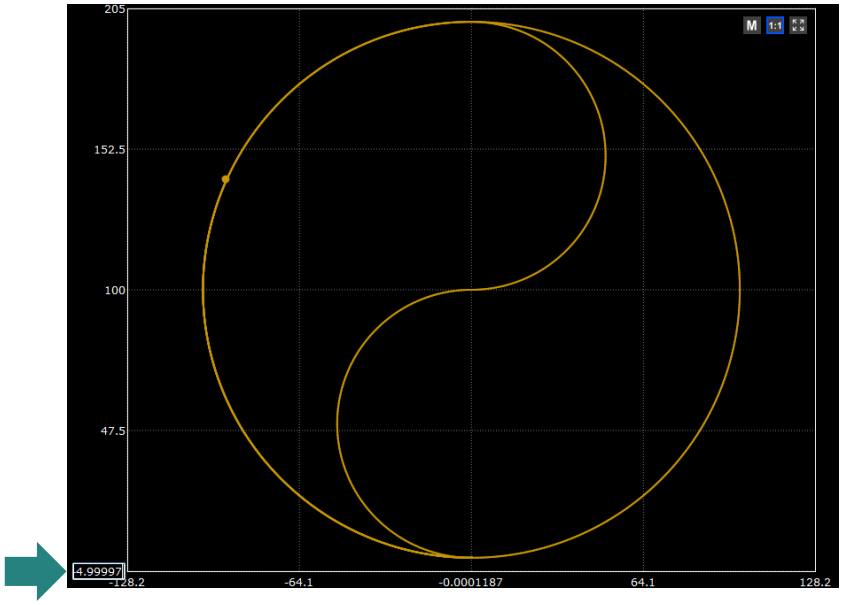


Figure 4.9.3.3.2 Automatic mode / Manual mode

■ **Fixed aspect ratio**

Figure 4.9.3.3.3 Fixed aspect ratio

This function is only available in automatic mode. The aspect ratio of the trace will be fixed in automatic mode. Click on the icon to turn on / turn off this function.

■ **Update to fit the trace**

Figure 4.9.3.3.4 Update to fit the trace

Click on the icon to update the coordinate system to fit the trace.

4.9.4 3D scope

3D scope displays the real-time relation among three parameters in graphic format. 3D scope window is as follows.

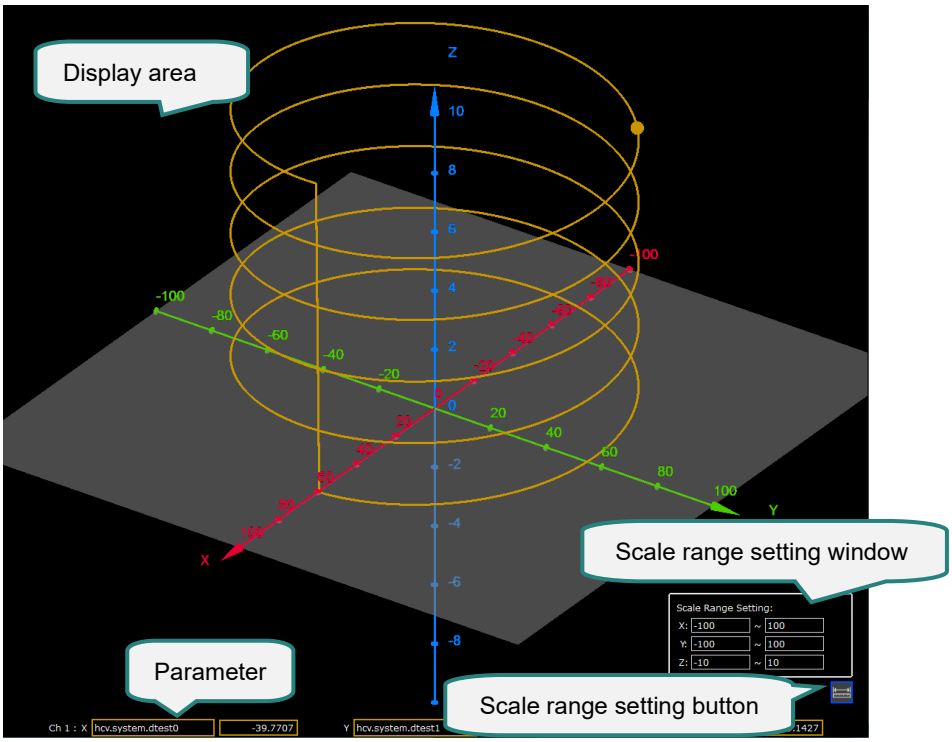


Figure 4.9.4.1 3D scope window

4.9.4.1 3D scope

In display area, the point means the current value of the selected parameters. In 3D scope, the trace is plotted by points. Users can define the sample number of the trace. For setting the sample number, please refer to section 4.9.1.3.

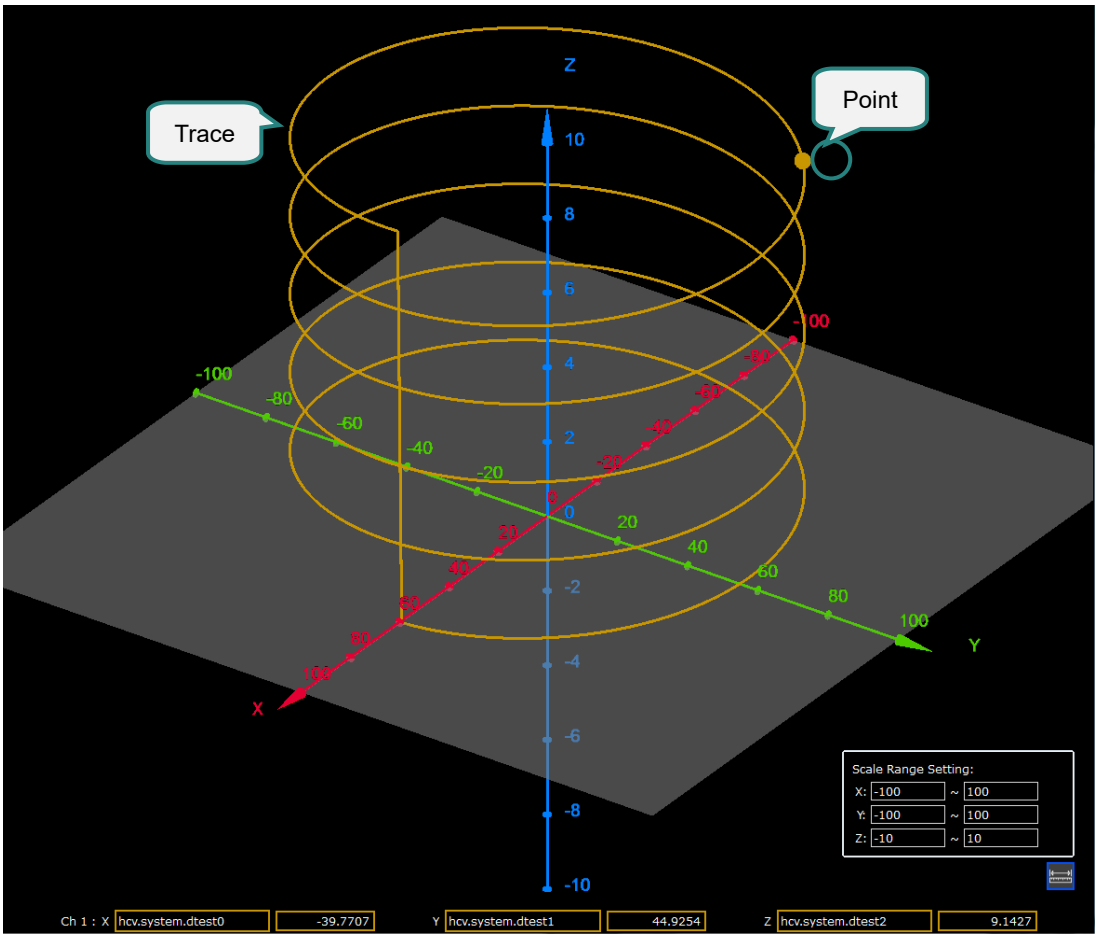


Figure 4.9.4.1.1 3D scope

4.9.4.2 Parameter input area

There are two fields in the parameter input area of 3D scope: parameter list field and parameter data field. Users can set the parameter to be monitored in parameter list field. The parameter data will be displayed in parameter data field.

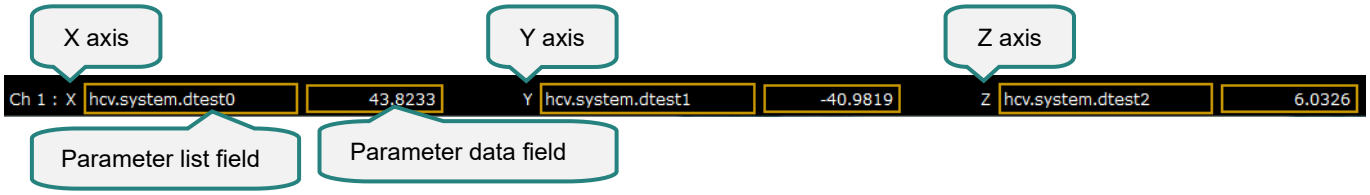


Figure 4.9.4.2.1 Parameter input area

(1) Parameter list field

Click on parameter list field to open parameter list.

(2) Parameter data field

Display the parameter data of current position.

4.9.4.3 Scale range setting

While using 3D scope, users can decide the display range of the scale in the display area by scale range setting.

■ **Scale range setting button**

Table 4.9.4.3.1 Scale range setting button

Icon	Status	Description
	Close	Open scale range setting window.
	Open	Close scale range setting window.

■ **Scale range setting window**

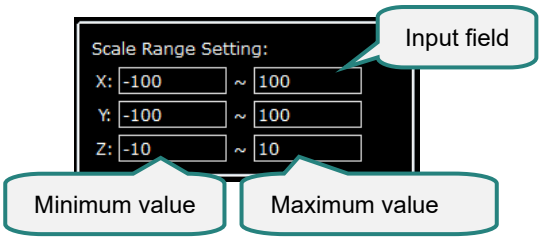


Figure 4.9.4.3.1 Scale range setting window

After users modify the value in input field and press **Enter** key, 3D scope display area will be immediately updated. Scale range of each axis is updated to the value users' input, and small scale of each axis changes based on the minimum value and the maximum value.

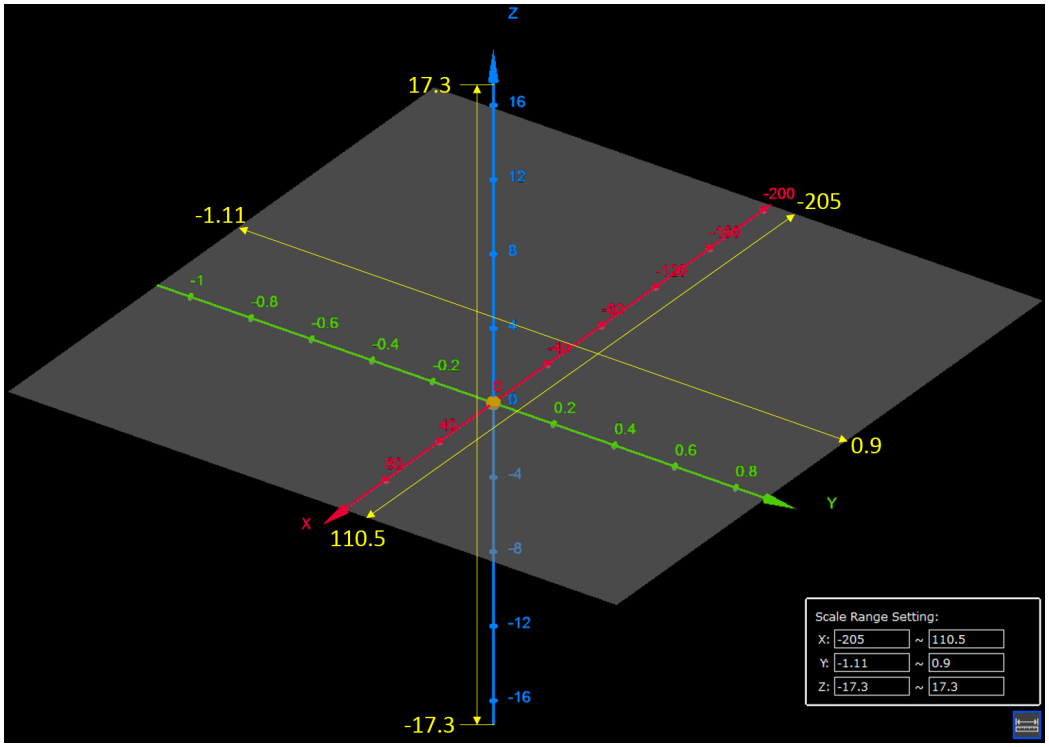


Figure 4.9.4.3.2 Scale range setting of each axis

■ Switching angle

(1) Zoom in / Zoom out 3D scope

Hold **Ctrl** key and scroll the wheel.

(2) Rotate 3D scope

Hold left mouse button and move the mouse.

(3) Translate 3D scope

Hold **Ctrl** key and the wheel. Then, move the mouse.

4.10 Plot View

In Plot View window, users can see the recorded parameter data from scope.

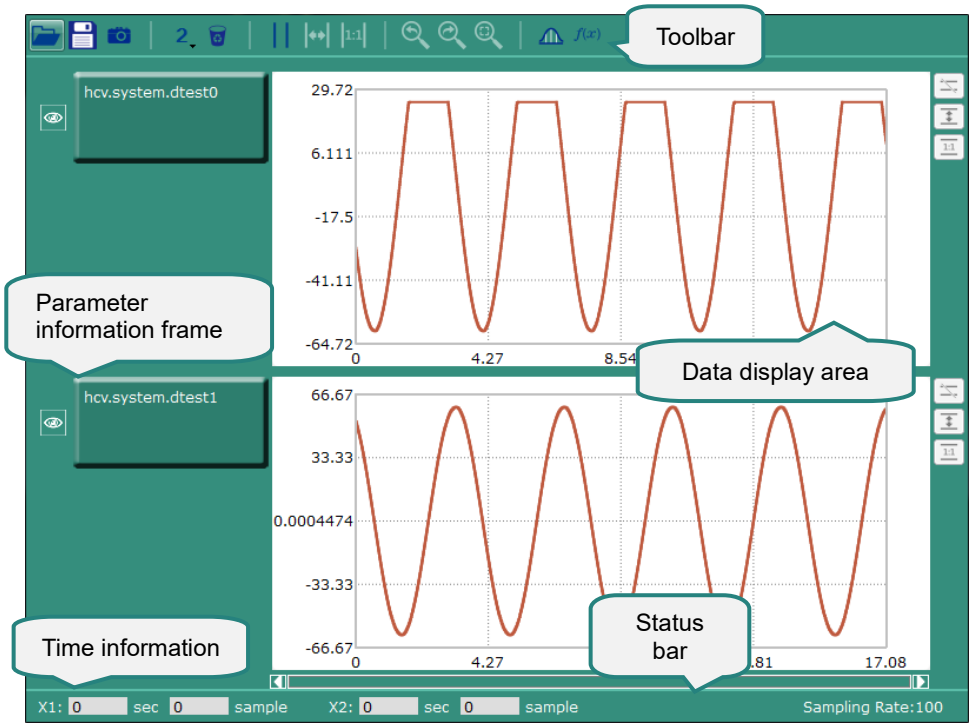


Figure 4.10.1 Plot View window

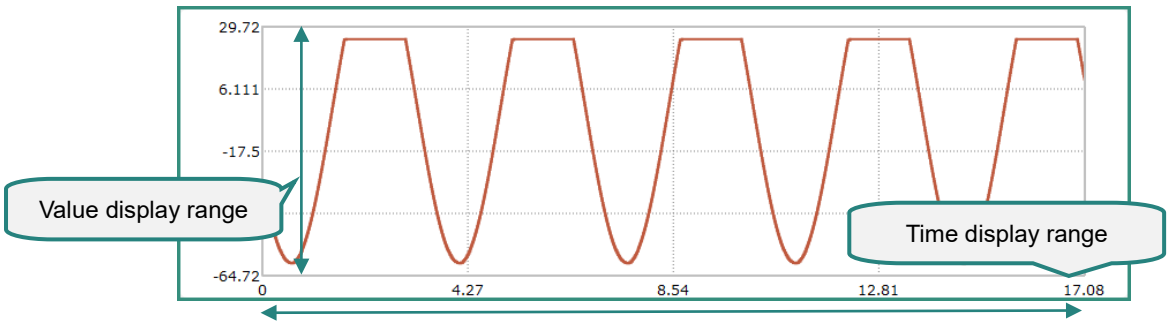


Figure 4.10.2 Data display area

Functions in Plot View window are described as follows.

Table 4.10.1 Functions in Plot View window

Icon / Button	Description
	Open / Insert plot view data file.
	Save parameter data as iA Studio plot view data file (.iaspvd), text file (.txt) or Excel file (.xls).
	Save plot view window as image file (.bmp).
	Clear all the data in plot view window.
	Show / Hide X1 and X2 time cursors.
	Zoom in on the segment between X1 and X2 time cursors.
	Revert to the original time display range.
	Return to previous setting of time display range and value display range. If no previous setting exists, the icon will be grey.
	Go to next setting of time display range and value display range. If no next setting exists, the icon will be grey.
	Revert to the original graph.
	Open Statistics Table.
	Open computation window.
	Hide Y1 and Y2 value cursors.
	Zoom in on the segment between Y1 and Y2 value cursors.
	Revert to the original value display range.

4.10.1 Open Plot View

To open Plot View, users can click on **Tools** on the menu bar. Then click on **Scope Manager**.

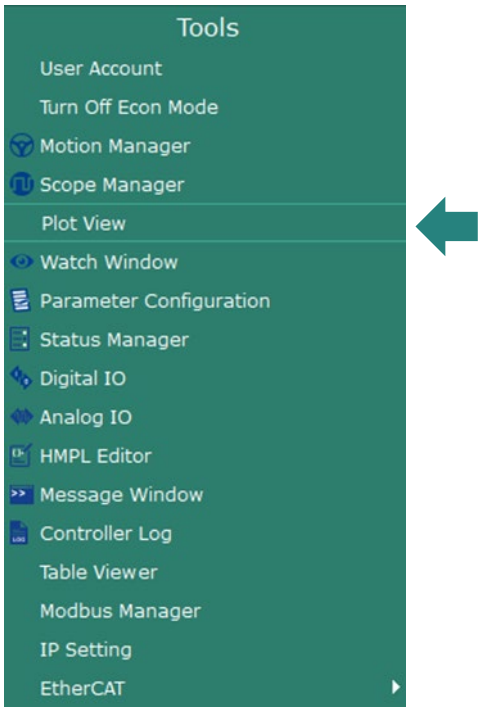


Figure 4.10.1.1 Plot View

4.10.2 Set Time Cursor and Value Cursor

Users can use cursors to select a certain segment of the graph to be inspected.

■ Set X1 / X2 Time Cursor

Left click on the graph to show X1. Right click on the graph to show X2.

Note: Refer to figure 4.10.2.1, click on the icon on the toolbar to show or hide X1 and X2.

■ Move X1 / X2 Time Cursor

(1) Move by mouse

To move X1 or X2, hold left or right mouse button in data display area, and move the mouse.

(2) Move by keyboard

To move X1 or X2, left click or right click on data display area, and press ← or → key.

(3) Set in status bar

To move X1 or X2, left click or right click on data display area, and modify time information or sample index in the input field of status bar.

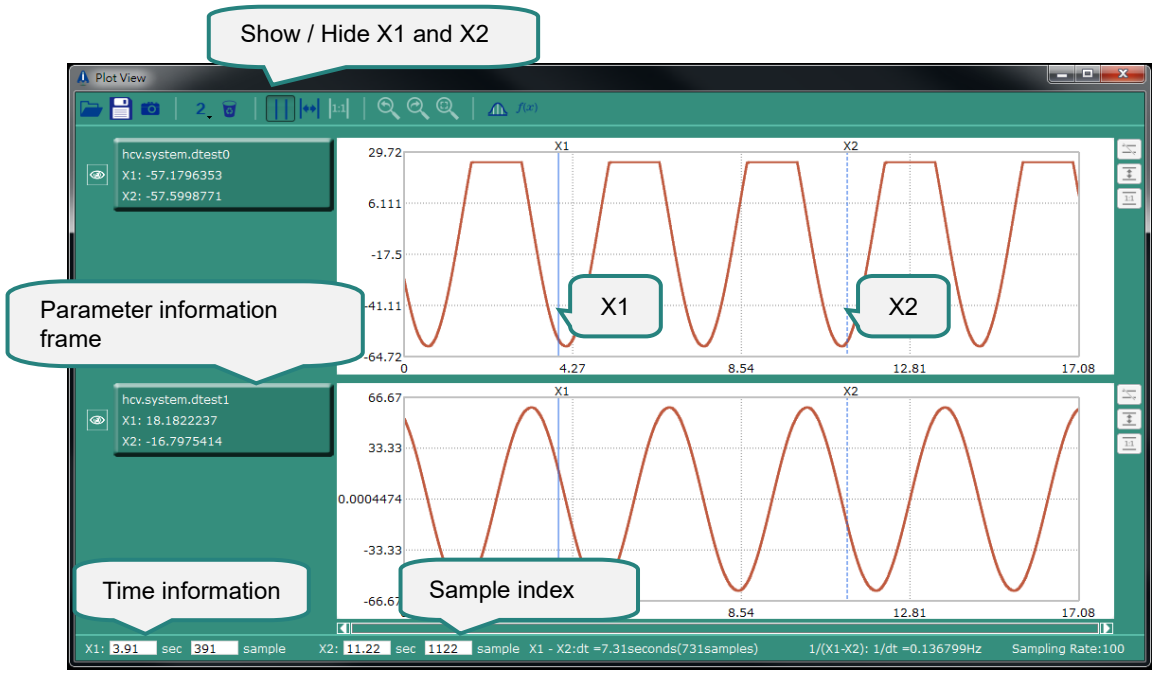


Figure 4.10.2.1 X1 and X2 time cursors

Parameter information at X1 and X2 will be shown on the left. Time information at X1 and X2 will be shown on the bottom.

■ Set Y1 / Y2 value cursor

Hold **Ctrl** key and left click on the graph to show Y1. Hold **Ctrl** key and right click on the graph to show Y2. Note: Refer to figure 4.10.2.2, click on the icon on the toolbar to hide Y1 and Y2.

■ Move Y1 / Y2 value cursor

(1) Move by mouse

To move Y1 or Y2, hold **Ctrl** key and left or right mouse button in data display area, and move the mouse.

(2) Move by keyboard

To move Y1 or Y2, hold **Ctrl** key, left click or right click on data display area, and press ↑ or ↓ key.

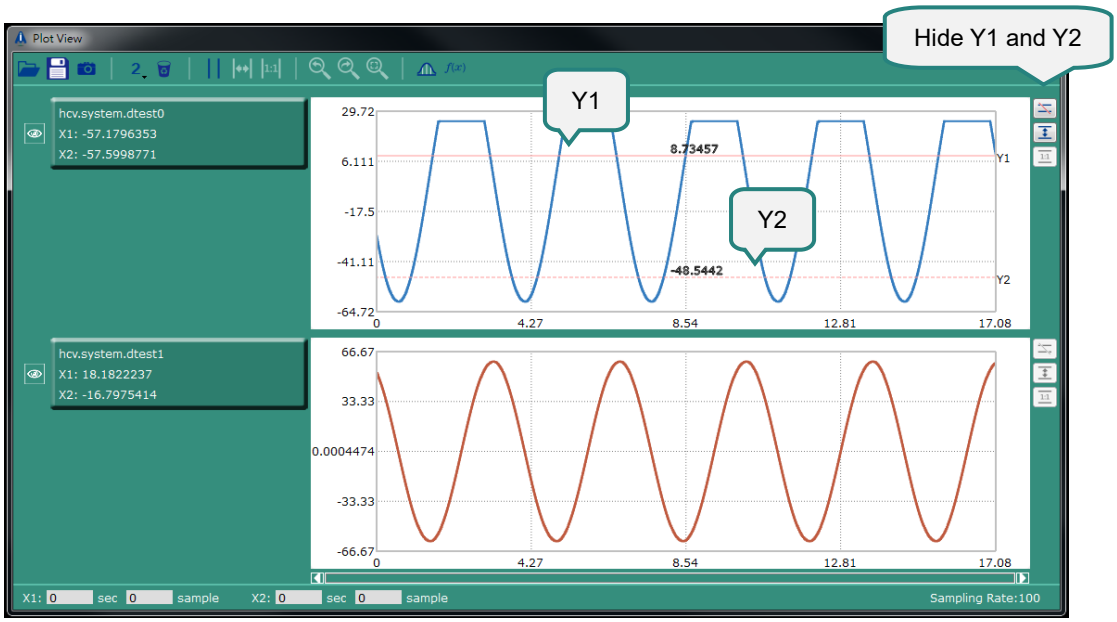


Figure 4.10.2.2 Y1 and Y2 value cursors

4.10.3 Zoom in / revert to the original display range

■ X1 and X2 time cursors

(1) Zoom in

Zoom in function is used to enlarge a certain segment defined by time cursors. Refer to figure 4.10.3.1, click on the icon on the toolbar to zoom in.

(2) Revert to the original time display range

Refer to figure 4.10.3.1, click on the icon on the toolbar to revert to the original time display range.

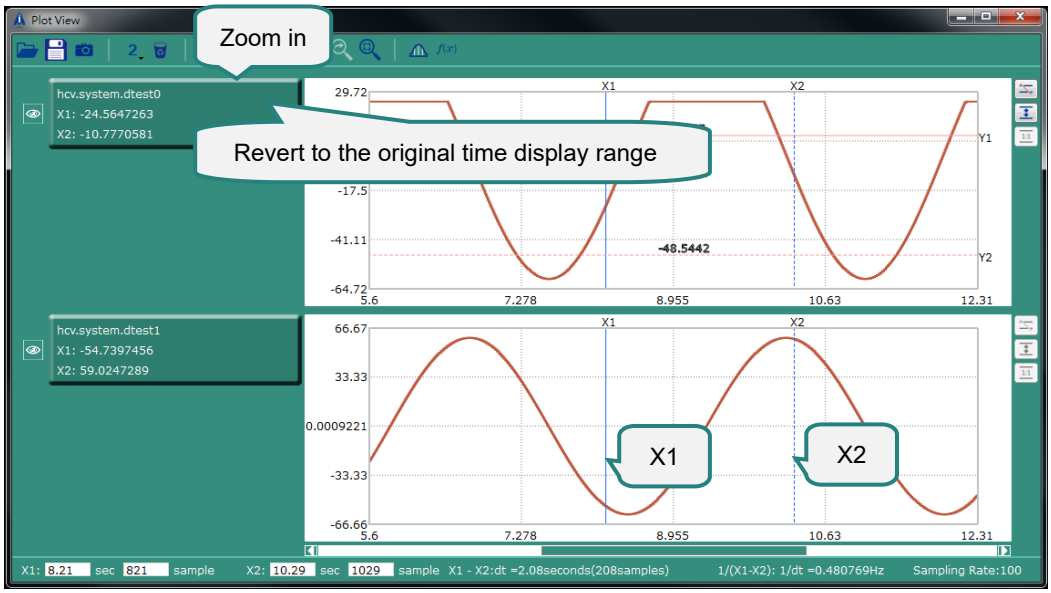


Figure 4.10.3.1 Zoom in / Revert to the original time display range

■ Y1 and Y2 value cursors

(1) Zoom in

Zoom in function is used to enlarge a certain segment defined by value cursors. Refer to figure 4.10.3.2, click on the icon on the toolbar to zoom in.

(2) Revert to the original value display range

Refer to figure 4.10.3.2, click on the icon on the toolbar to revert to the original value display range.

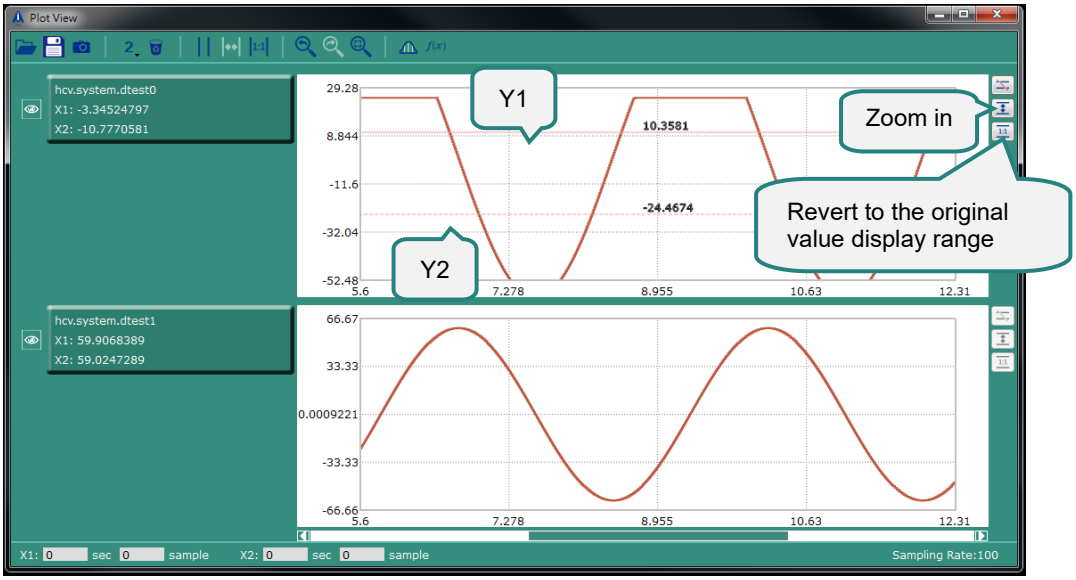


Figure 4.10.3.2 Zoom in / Revert to the original value display range

4.10.4 Merge graphs

Users can merge two graphs into one, please see the example below.

Left click and hold parameter information frame 2, and drag it to parameter information placement area 1.

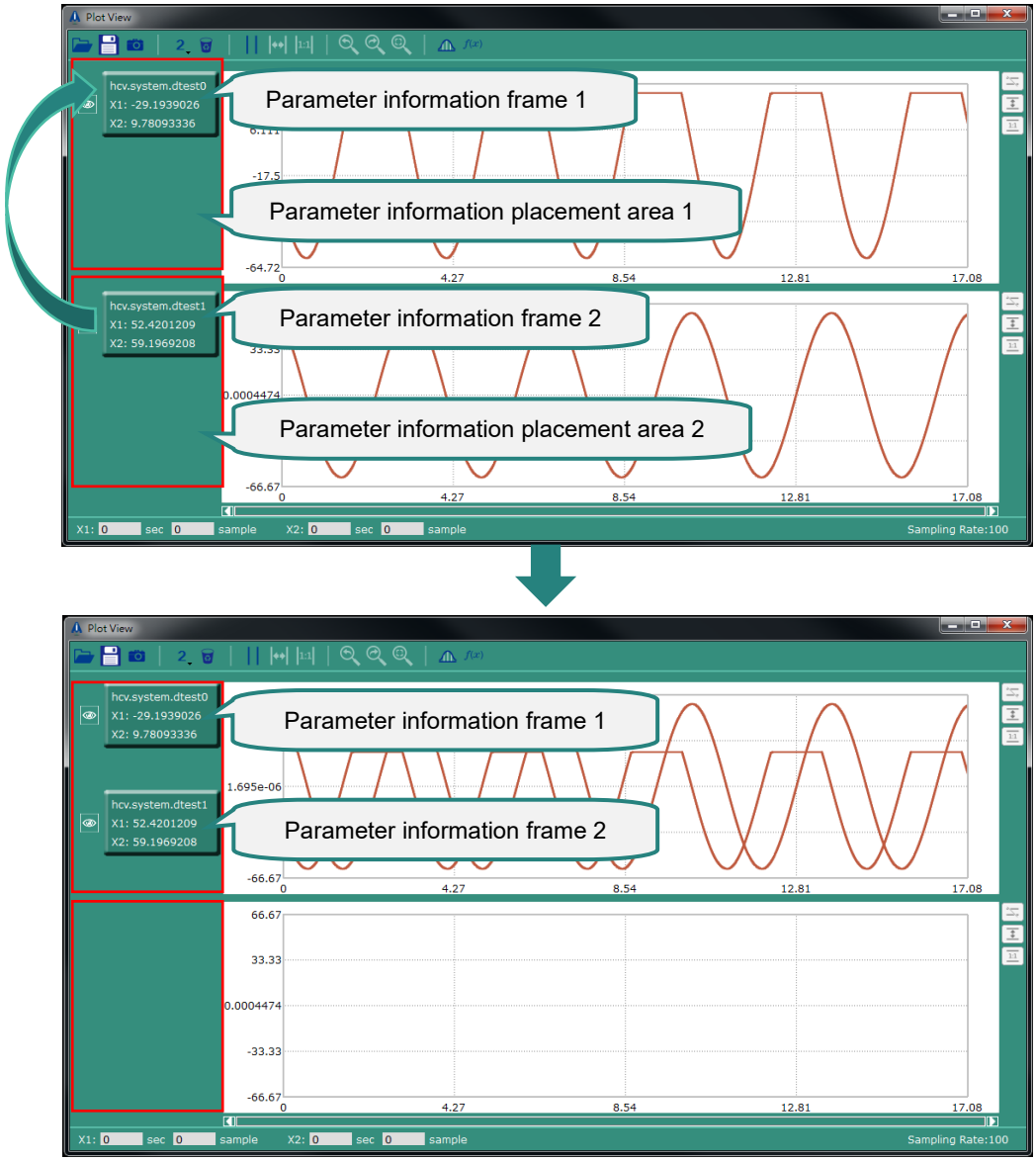


Figure 4.10.4.1 Merge graphs

4.10.5 Modify width of parameter information placement area

Users can modify width of parameter information placement area, please see the example below.

Move the mouse to the position of splitter. After the icon to be dragged appears, press and hold left mouse button, and then move left or right.

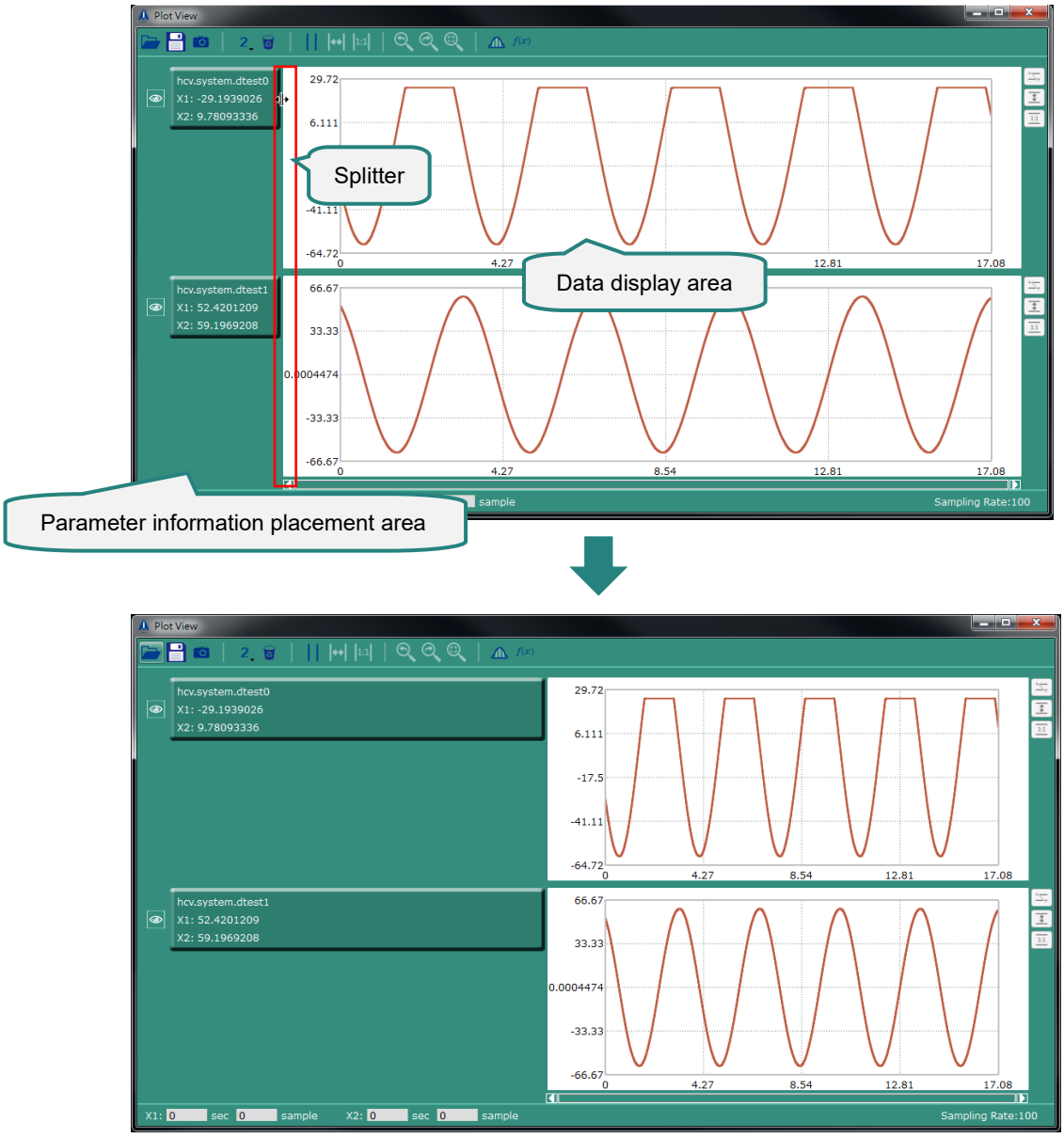


Figure 4.10.5.1 Modify width of parameter information placement area

4.10.6 Data display setting window

Users can modify parameter data color, line width, display name and original file placement via data display setting window. Click on parameter information frame to open data display setting window.

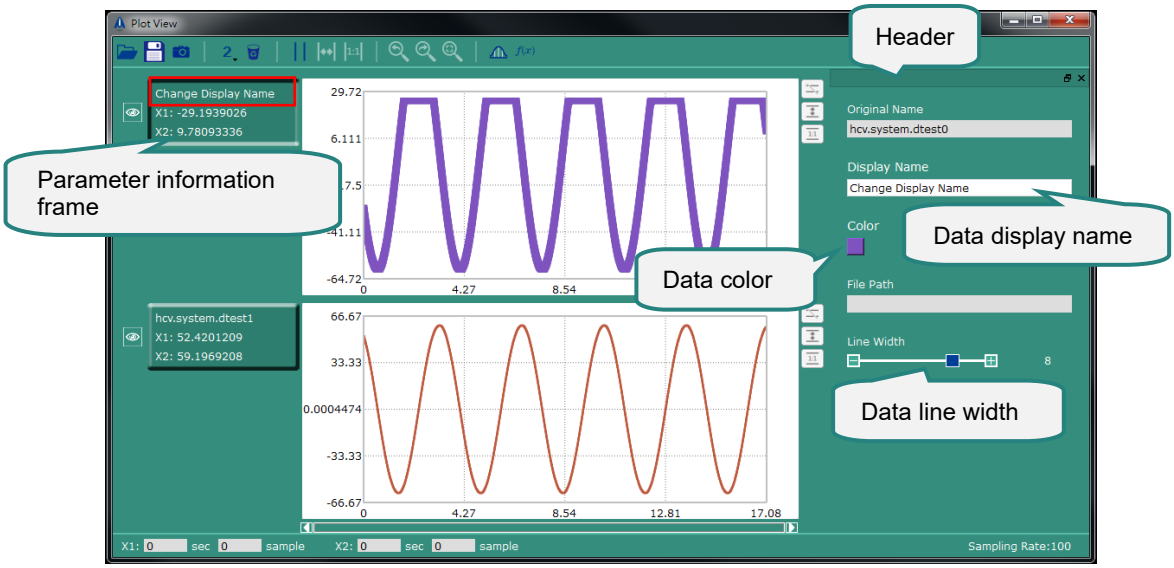


Figure 4.10.6.1 Data display setting window

By holding header and moving the mouse, users can drag data display setting window out of plot view main window, and put it back to the right side of plot view main window.

4.10.7 Statistics Table

Statistics Table shows the value (maximum and minimum), mean and standard deviation of parameter data. For instance, you can zoom in on a segment defined by X1 and X2 and check its parameter data in Statistics Table.

Statistics Table

Parameter	N	Maximum		Minimum		Mean	Std. Deviation
		Data	Time	Data	Time		
hcv.system.dtest0	1709	25	1.71	59.9999876	0.59	-8.24314127	33.2977899
hcv.system.dtest1	1709	59.999991	10.19	59.9990961	1.46	-1.23430075	42.0238677

Figure 4.10.7.1 Statistics Table

To open Statistics Table, refer to figure 4.10.7.2, click on the icon on the toolbar.

Figure 4.10.7.2 Open Statistics Table

4.10.8 Computation window

Plot View provides computation tools, including derived, integral, linear, multiply, shift, scale+offset, square root, best fit, LPF, HPF, and FFT (frequency domain).

Click on $f(x)$ to open computation window.

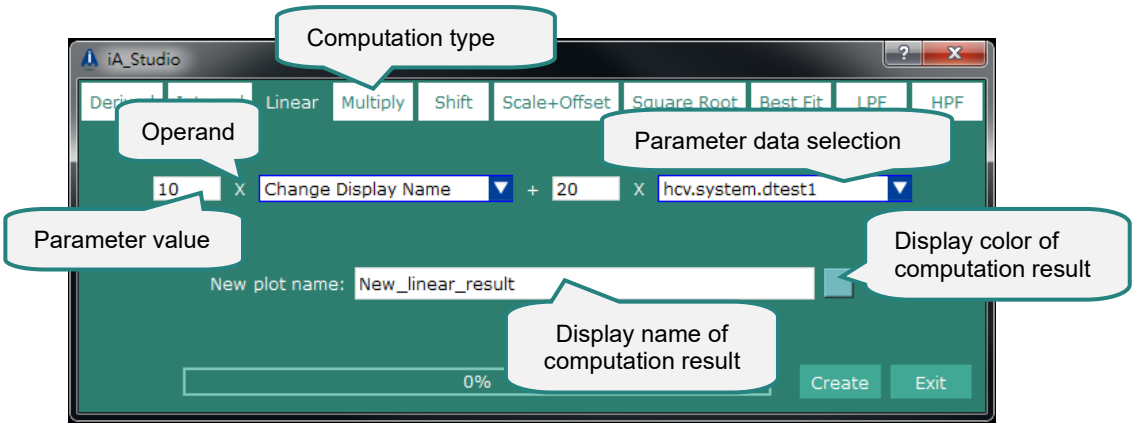


Figure 4.10.8.1 Computation window

Step 1: Select computation type.

Step 2: Select parameter data from the drop-down list, and modify parameter value.

Step 3: Input display name of computation result, and select display color.

Step 4: Click on **Create** button to start computation.

When computation is done, the window close automatically. New parameter data will be shown in the last data display area, refer to figure 4.10.8.2. If using FFT, parameter data will be shown in the new FFT Plot View window, refer to figure 4.10.8.3.

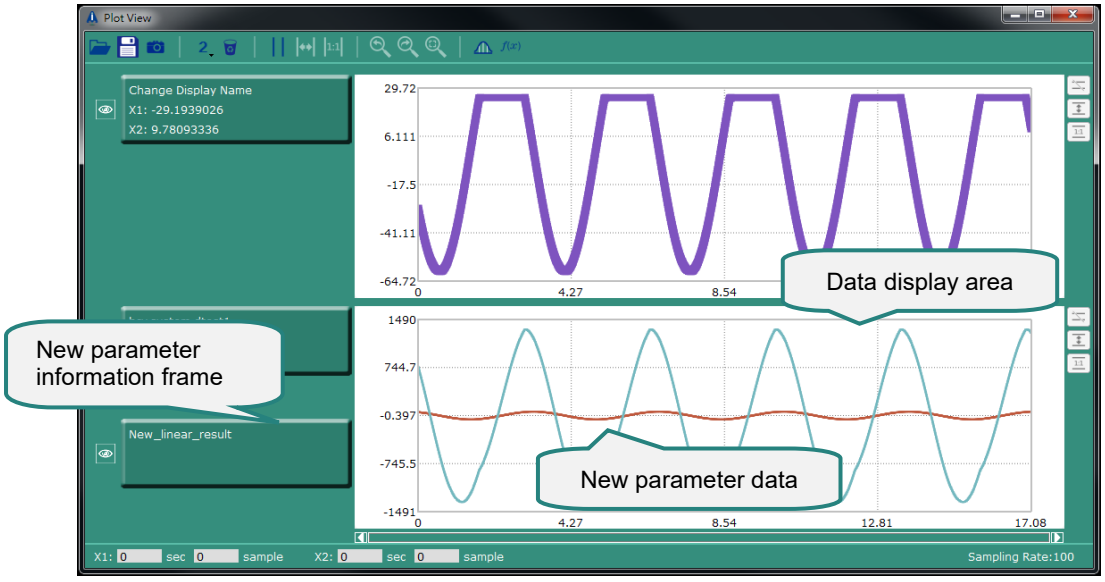


Figure 4.10.8.2 New parameter data generated by computation

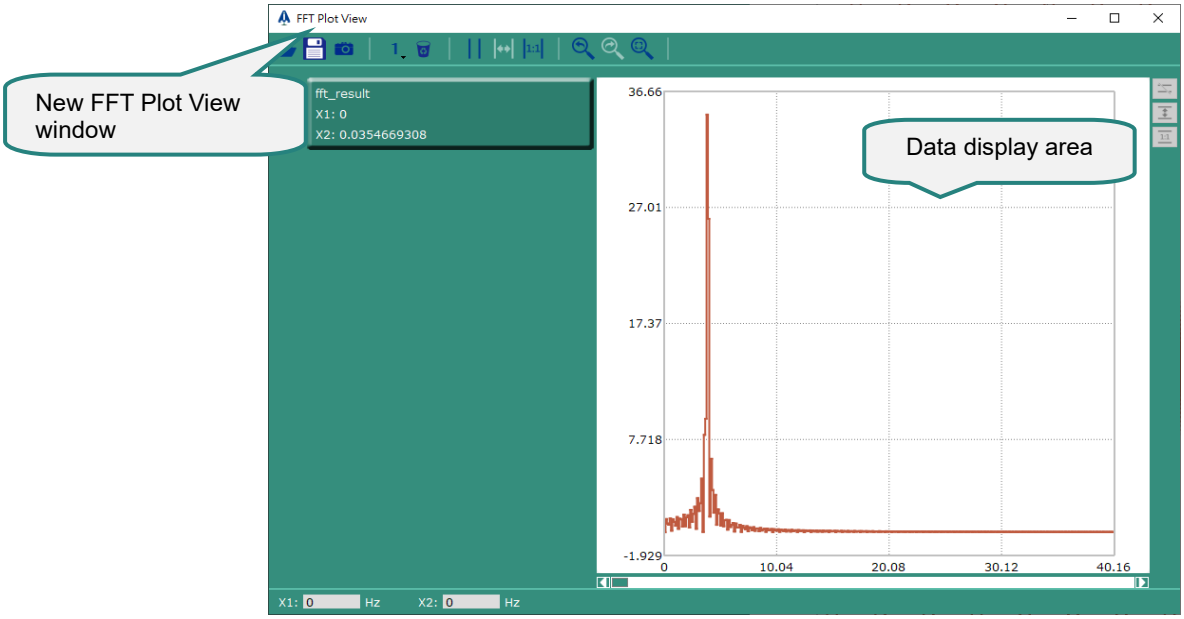


Figure 4.10.8.3 New parameter data of frequency domain generated by computation

4.11 HMPL Editor

HIWIN Motion Programming Language (HMPL) is a programming language which is similar to C language. It is used to create HMPL tasks for controller motion control. HMPL Editor allows users to edit HMPL task. HMPL Editor supports functions below:

- Edit HMPL task and save HMPL task to controller hard disk.
- Import / Export HMPL task from / to local disk.
- Run / Stop HMPL task.
- Debug HMPL task.

4.11.1 Open HMPL Editor

To open HMPL Editor, click on **Tools** on the menu bar. Then click on **HMPL Editor**.

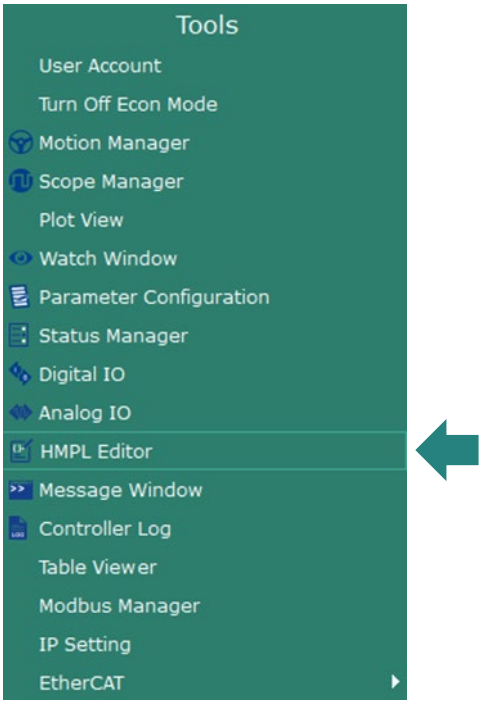


Figure 4.11.1.1 HMPL Editor

HMPL Editor window is as follows.

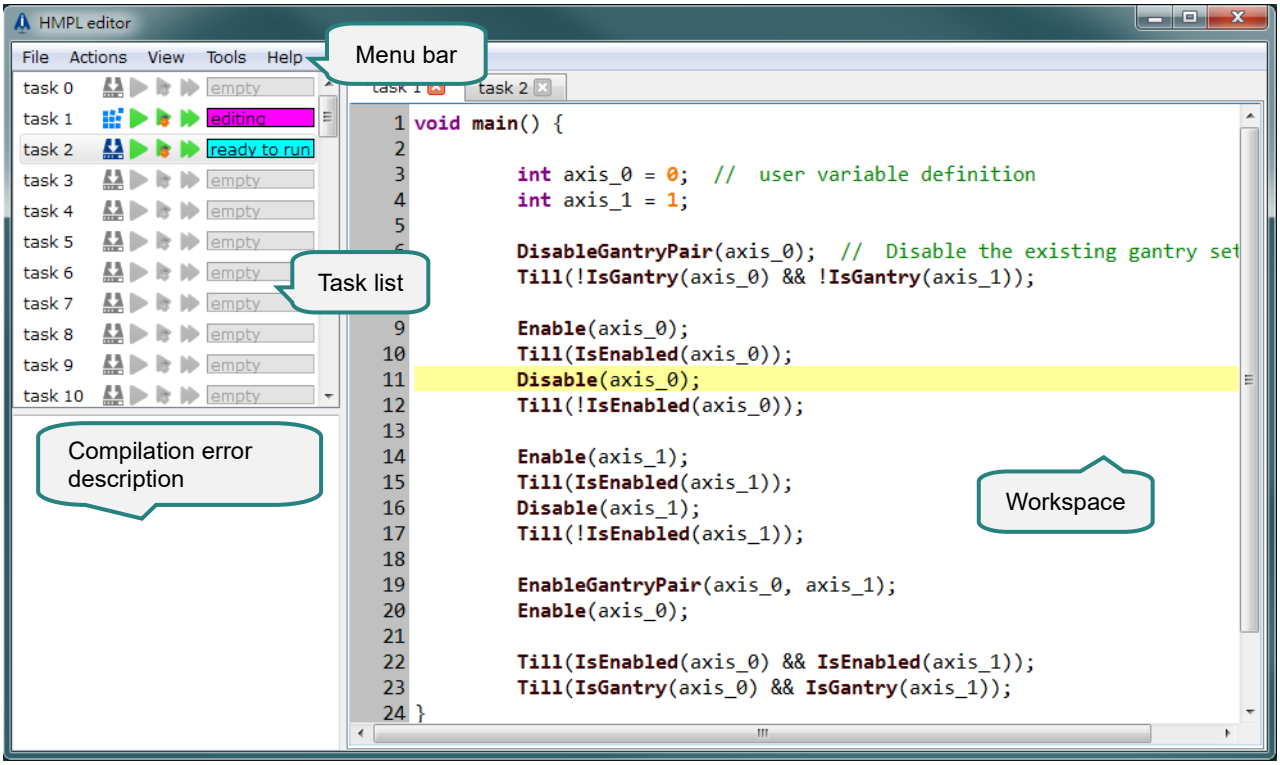


Figure 4.11.1.2 HMPL Editor window

4.11.2 Menu bar

Table 4.11.2.1 Menu bar in HMPL Editor

Menu bar	Submenu	Description
File	Export	Save tasks as a HMPL package file to local disk.
	Save as text file	Save tasks as a text file (.txt).
	Import	Load a HMPL package file from local disk.
Actions	Select all	Select all tasks.
	Compile selected	Compile selected task.
	Save selected	Save selected task.
	Run selected	Run selected task.
	Stop selected	Stop selected task.
	Stop all tasks	Stop all tasks.
	Load example to selected	Load all HNPL examples to task.
View	Show task summary	Show the first summary of task.
Tools	Set\Modify HMPL password	Set or modify HMPL password.
Help	HMPL document	Open HMPL user manual.
	HMPL example	Open HMPL example code folder.

4.11.3 Task list

Figure 4.11.3.1 Task list

Double click on the task number or task status filed to open workspace and edit task. Functions in Task list are described as follows.

Table 4.11.3.1 Functions in Task list

Icon	Function	Shortcut key
	Compile task.	N/A
	Save task to controller hard disk.	N/A
	Run task.	Ctrl + F5
	Stop task.	Shift + F5
	Run task in debug mode.	F5
	Pause task. The pause function is only available when task is running in debug mode.	Ctrl + Alt + Break
	Run one line at a time.	F10

4.11.4 Workspace

Users are allowed to use shortcut keys when editing HMPL task in workspace.

Table 4.11.4.1 Shortcut keys

Shortcut Key	Function
Ctrl + C	Copy selected code.
Ctrl + V	Paste the copied code to workspace.
Ctrl + F	Open find and replace bar.
Ctrl + I	Auto-format selected code.
F1	Open HMPL user manual.
F3	Find string.

■ Find and replace bar

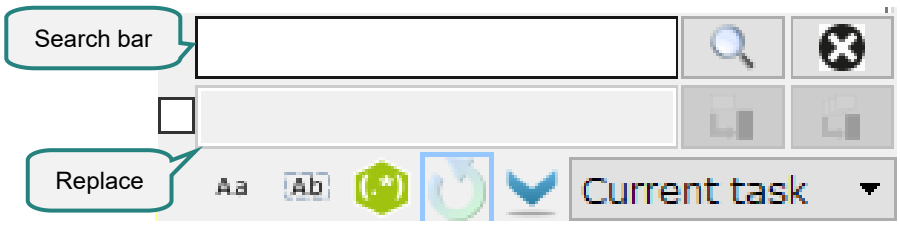


Figure 4.11.4.1 Find and replace bar

Table 4.11.4.2 Functions in find and replace bar

Icon	Description
Aa	Match case.
Ab	Find whole words only.
(.*)	Regular expression.
	Continue to find from the start after reaching the end.
	Find in forward direction.
	Find in backward direction.
	Replace next.
	Replace all.
	Close find and replace bar.
Current task	Searching range.

4.11.5 HMPL password protection

■ Set password

Step 1: Click on **Tools** on the menu bar. Then click on **Set\Modify HMPL password**.

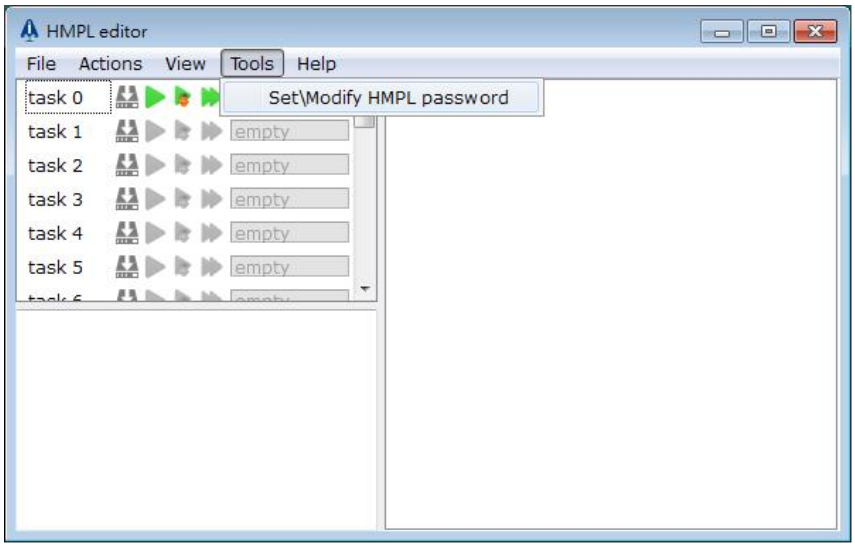


Figure 4.11.5.1 Open Set\Modify HMPL password

Step 2: Set password.

Figure 4.11.5.2 Set password

Step 3: To apply password, click on **Controller** on the menu bar in main screen to execute **Store Configuration**, and click on **Reboot Controller** to reboot controller.

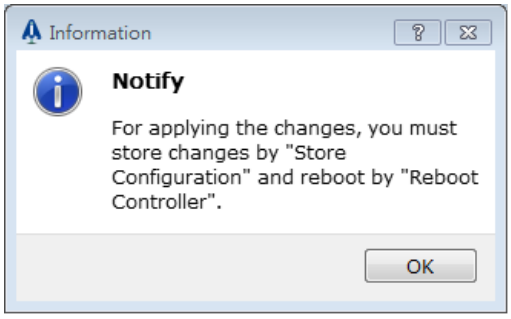


Figure 4.11.5.3 Store password for application

■ Verify password

If there is HMPL password protection, users must key in the correct password first before using HMPL Editor.

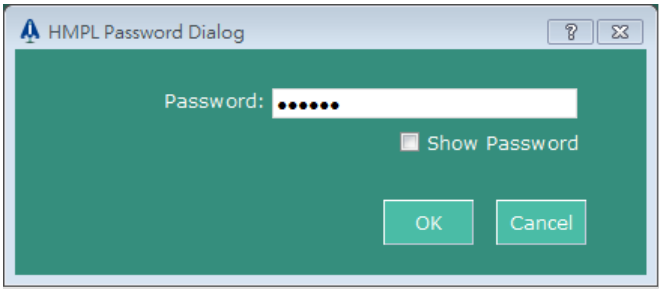


Figure 4.11.5.4 Verify password

■ Modify password

Step 1: Click on **Tools** on the menu bar. Then click on **Set\Modify HMPL password**.

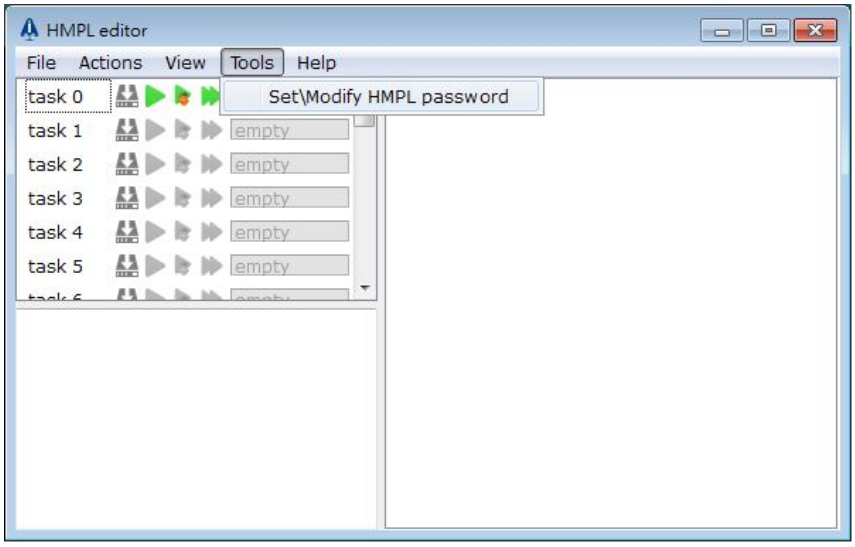


Figure 4.11.5.5 Open Set\Modify HMPL password

Step 2: Key in old password and new password.

Note: If **New Password** and **Confirm Password** are blank, HMPL password protection will be removed.

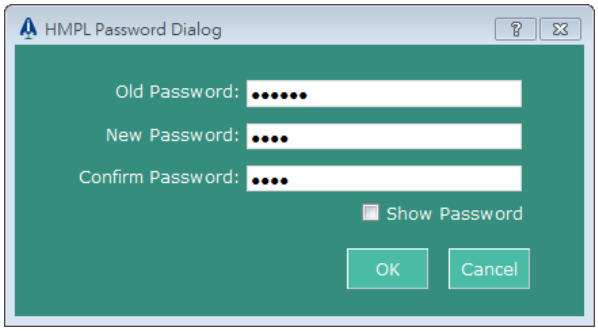


Figure 4.11.5.6 Modify password

Step 3: To apply new password, click on **Controller** on the menu bar in main screen to execute **Store Configuration**, and click on **Reboot Controller** to reboot controller.

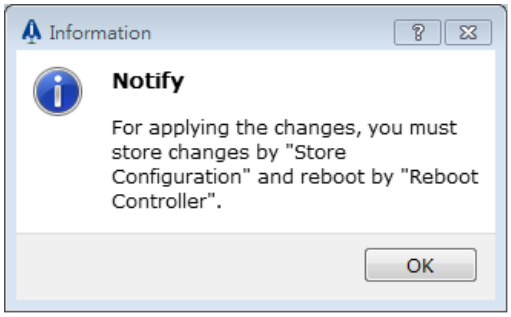


Figure 4.11.5.7 Store new password for application

4.11.6 Example

The following is a simple example of how to create a HMPL task.

Step 1: Open HMPL Editor and Message Window.

Step 2: Double click on task 1 to open workspace.

Figure 4.11.6.1 Open task 1

Step 3: In workspace, enter the below code to show “hello world” in Message Window.

```
void main() {

    Print("hello world");
}
```

Step 4: Click on below icon to compile task 1.

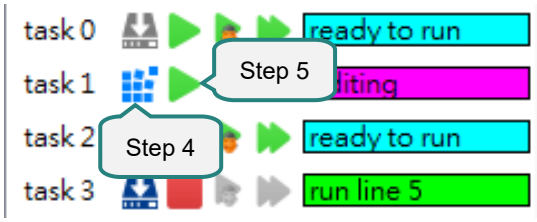


Figure 4.11.6.2 Compile and run task 1

Step 5: Then click on above icon to run task 1. Message Window will show the message “hello world”.

4.12 Modbus Manager

Default parameters will be loaded from HIMC RAM after Modbus Manager is opened. Users can also set the desired controller parameters and HMPL global variables to be accessed via Modbus TCP. The functions in Modbus Manager are as follows:

- Add, delete, arrange and clear user-defined parameters
- Load / Save user-defined parameters

4.12.1 Open Modbus Manager

Click on **Tools** on the menu bar. Then click on **Modbus Manager**.

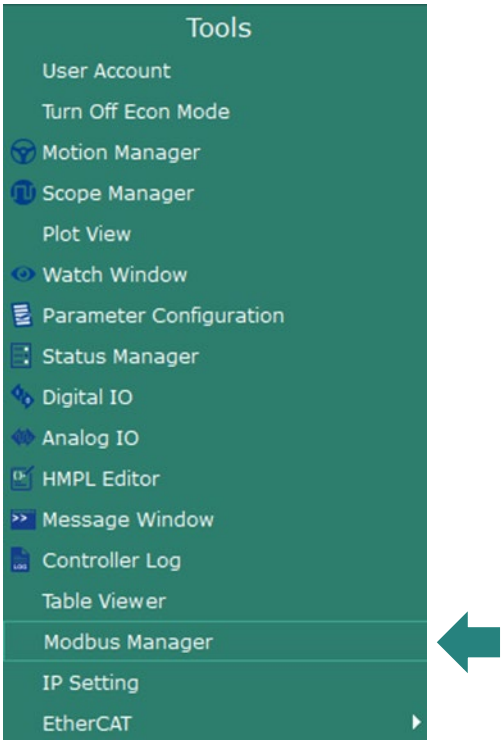


Figure 4.12.1.1 Modbus Manager

After Modbus Manager is opened, parameter list will be automatically loaded from HIMC RAM.

Modbus Manager window is as follows.

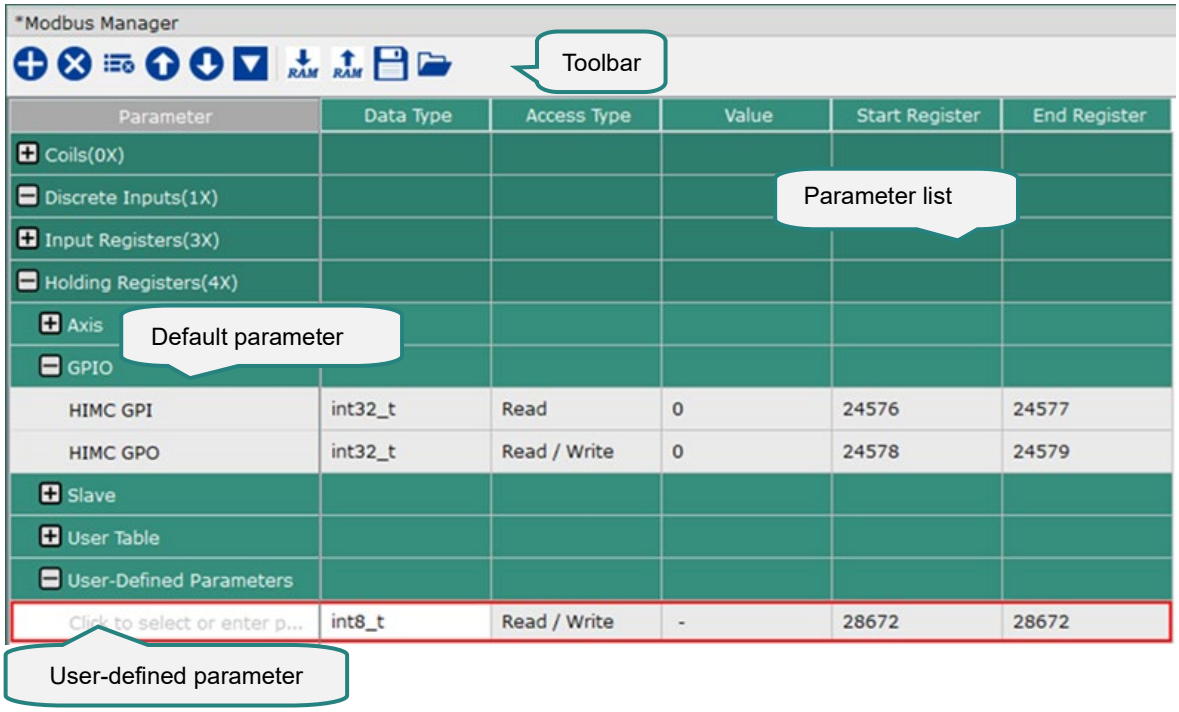


Figure 4.12.1.2 Modbus Manager window

4.12.2 Toolbar

Table 4.12.2.1 Modbus Manager toolbar

Icon	Description
	Add user-defined parameter.
	Delete user-defined parameter.
	Move the selected user-defined parameter upward.
	Move the selected user-defined parameter downward.
	Add all HMPL global variables to the user-defined parameter list of Modbus.
	Clear all user-defined parameters.
	Save all user-defined parameters to HIMC RAM.
	Load parameter list from HIMC RAM.
	Save all user-defined parameters as iA Studio Modbus data file (.iasmbd).
	Read the parameter list of iA Studio Modbus data file (.iasmbd).

Note: User-defined parameters can only be accessed via Modbus TCP after being saved to HIMC RAM.

4.12.3 Parameter list

Parameter list includes default parameters and user-defined parameters. According to their functions, they can be categorized into the following groups:

- Axis (Default)
- System Call (Default)
- Controller Information (Default)
- GPIO (Default)
- HMPL Task (Default)
- User Table (Default)
- User-defined Parameters

4.12.4 Parameter

Parameter list includes default parameters and user-defined parameters. Parameter information will be displayed as follows.

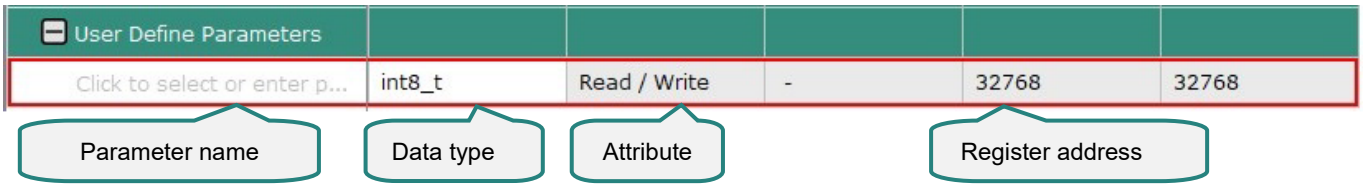


Figure 4.12.4.1 Parameter information

Default parameters are fixed and cannot be modified.

- **Parameter name**

Users can click on parameter name field to select desired parameter.

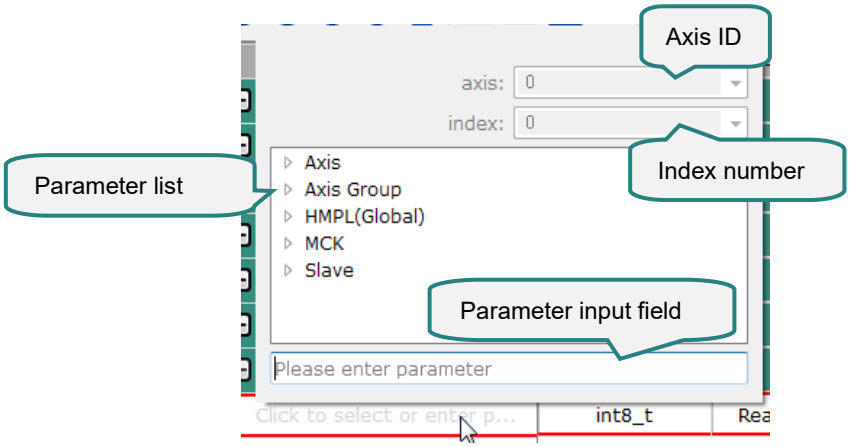


Figure 4.12.4.2 Select desired parameter

Set parameter by using axis ID, index number and parameter list, or directly input parameter name in parameter input field.

Note: To clear parameter name, clear the parameter input field and press Enter.

■ Data Type

Data type will be automatically set according to the selected parameter. Only when no parameter is selected, users are allowed to select data type from the drop-down list.

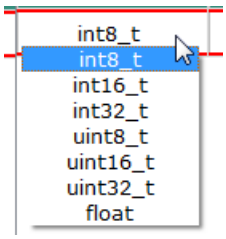


Figure 4.12.4.3 Data type selection

■ Attribute

Attribute will be automatically set according to the selected parameter.
Attribute: read / write and read-only

■ Register address

Register address will be automatically allocated according to the data type of the selected parameter.

4.12.5 Search for user-defined parameters

When using Modbus Manager, users may use shortcut keys **Ctrl+F** to search for the user-defined parameters quickly.

Table 4.12.5.1 Shortcut keys

Shortcut key	Function
Ctrl + F	Open find and replace bar.
F3	Find next matched result.
Shift + F3	Find previous matched result.

■ Find and replace bar

Figure 4.12.5.1 Find and replace bar

Table 4.12.5.2 Functions in find and replace bar

Icon	Description
Aa	Match case.
Ab	Find whole words only.
(.*)	Regular expression.
	Continue to find from the start after reaching the end.
	Find in forward direction.
	Find in backward direction.
	Close find and replace bar.

4.12.6 Example

This example will show how to read the feedback position of axis 0 via Modbus TCP.

Step 1: Open Modbus Manager.

Step 2: Click on the icon indicated in figure 4.12.6.1 to add user-defined parameter.

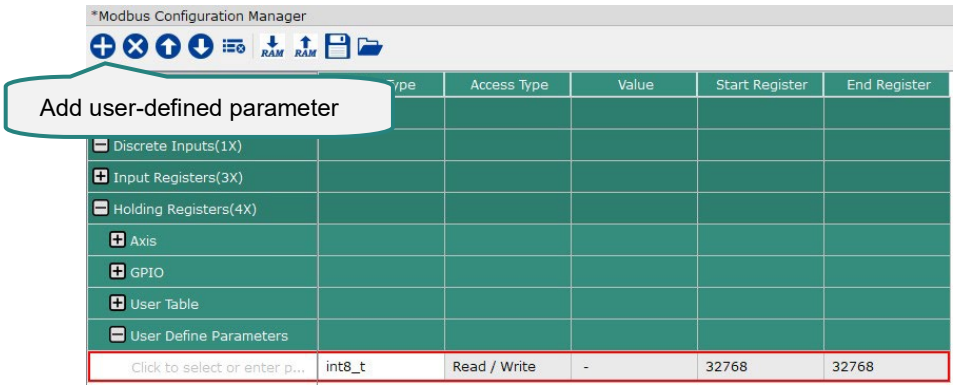


Figure 4.12.6.1 Add user-defined parameter

Step 3: Click on parameter name field to open parameter list. Select **Position Feedback** from parameter list and set **0** in axis field.

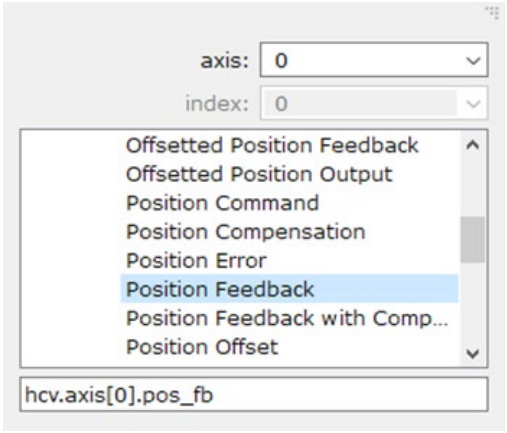


Figure 4.12.6.2 Parameter settings

Step 4: After parameter is set, click anywhere to close parameter list. The data type, attribute and register address of the selected parameter will be automatically set.

User Define Parameters					
hcv.axis[0].pos_fb	float	Read	10.0596	32768	32769

Figure 4.12.6.3 Parameter information

Step 5: Click on the icon indicated in figure 4.12.6.4 to save user-defined parameter to HIMC RAM. Read the specified register address via Modbus TCP to get the feedback position of axis 0.

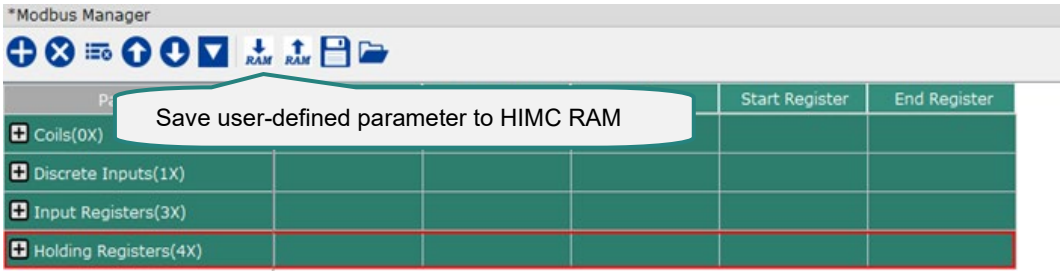


Figure 4.12.6.4 Save user-defined parameter to HIMC RAM

4.13 Table Viewer

In Table Viewer, users can edit the User Table stored in controller RAM. The size of HIMC User Table is 512,000 double data, which is used for HMPL, API Library and Modbus communication. Functions in Table Viewer are as follows:

- Read / Set the User Table stored in controller RAM
- Open / Save User Table data file (*.iasutd / *.txt)

4.13.1 Open Table Viewer

Step 1: Click on **Tools** on the menu bar. Then click on **Table Viewer**.

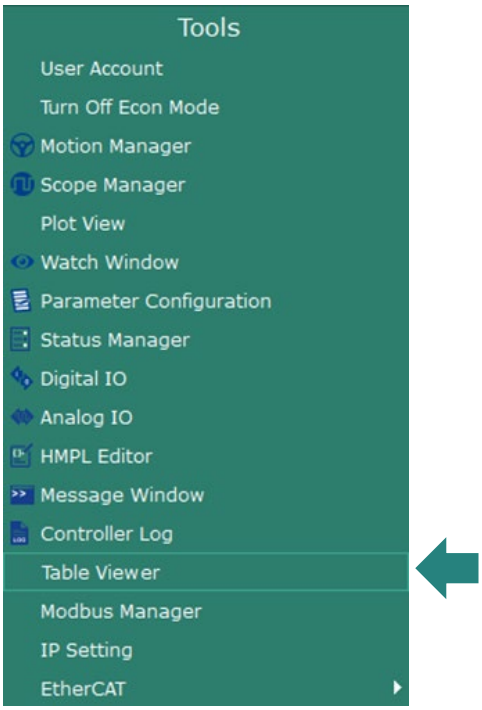


Figure 4.13.1.1 Table Viewer

Step 2: After **Table Viewer** is clicked on, a question dialog will appear, asking users if they would like to load the User Table from controller RAM or open User Table data file (*.iasutd).

Figure 4.13.1.2 Load the User Table from controller RAM or open User Table data file (*.iasutd)

(1) Click on **From controller RAM** button

Users can select to load the User Table from controller RAM in 1D or 2D table.

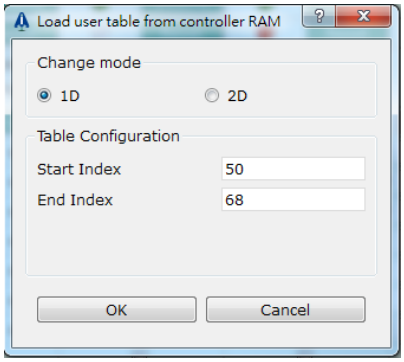


Figure 4.13.1.3 Load the User Table from controller RAM

(2) Click on **From file** button

Users can follow the steps below to open User Table data file (*.iasutd).

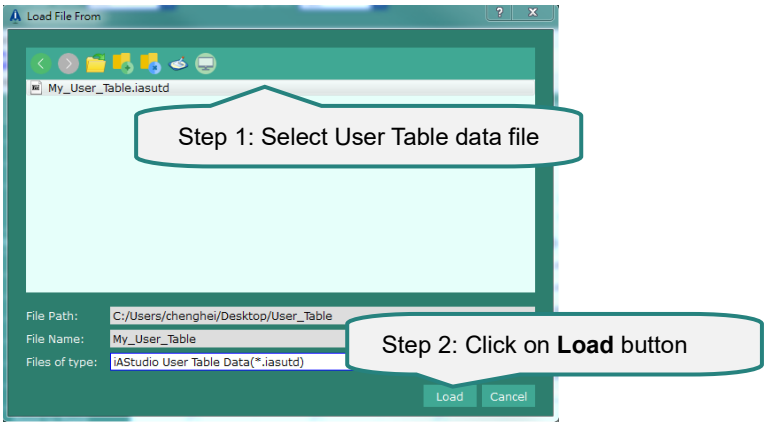


Figure 4.13.1.4 Open User Table data file

■ 1D Table Viewer window

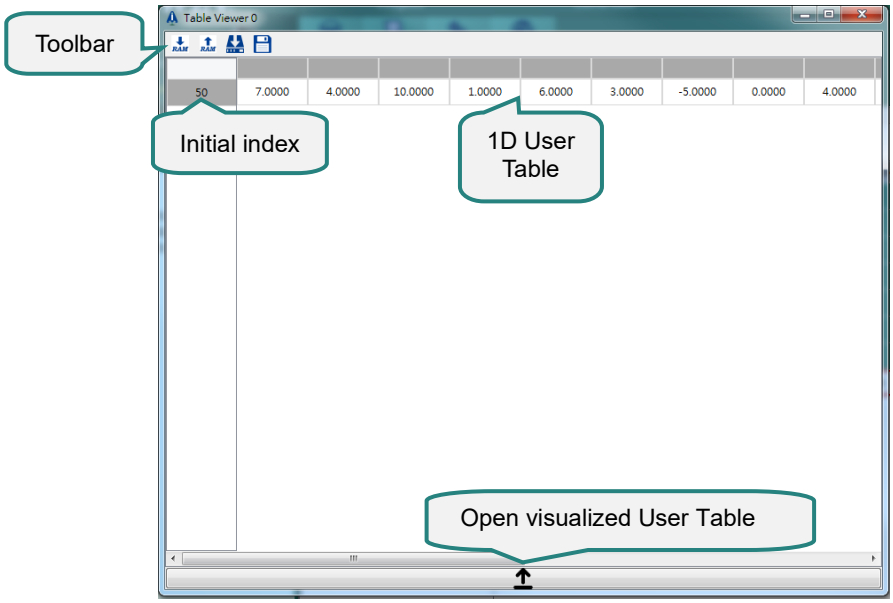


Figure 4.13.1.5 1D Table Viewer window

■ 2D Table Viewer window

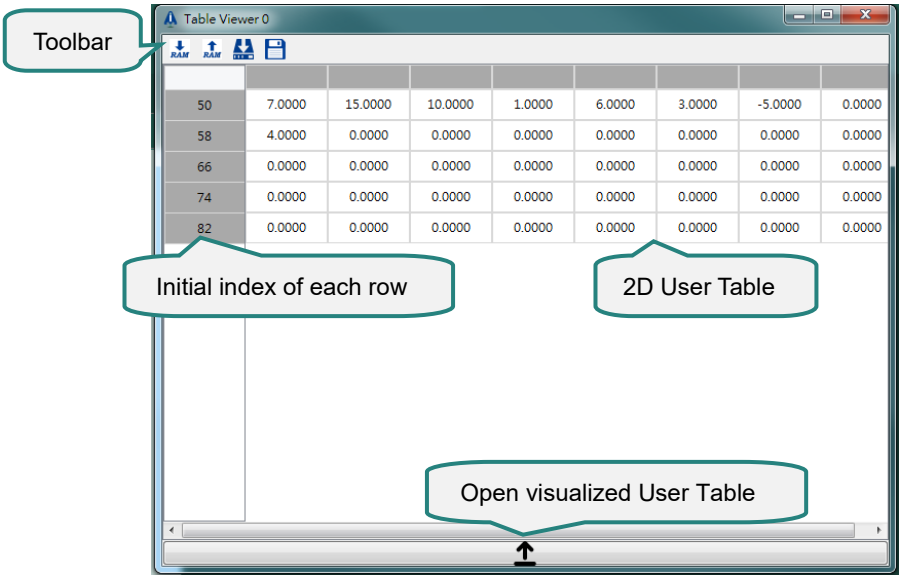


Figure 4.13.1.6 2D Table Viewer window

■ Toolbar

Table 4.13.1.7 Table Viewer toolbar

Icon	Description
	Save current User Table to controller RAM.
	Load the User Table from controller RAM.
	Save the User Table in controller RAM to controller SSD. When the User Table in Table Viewer is not identical with the User Table in controller RAM, this icon will be grey and cannot be used.
	Save current User Table as User Table data file or text file (*.iasutd or *.txt).
	Open visualized User Table. Press **Space** key to open or close visualized User Table.

4.13.2 Edit Table Viewer

■ **Modify the User Table in controller RAM**

Step 1: Load the User Table from controller RAM in 1D or 2D table. For how to load the User Table from controller RAM, please refer to step 2 in section 4.13.1.

Step 2: Click on the field to edit index in Table Viewer. When the field is yellow, it means it is editable.

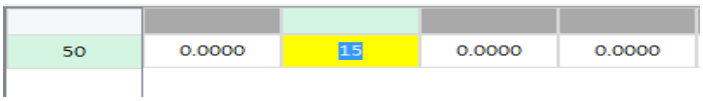


Figure 4.13.2.1 Click on the field to edit index

Step 3: Press **Enter** key to save the modified contents. At this time, the User Table in Table Viewer is not identical with the one in controller RAM. An asterisk will appear next to the window title. Icon will be grey and cannot be used.

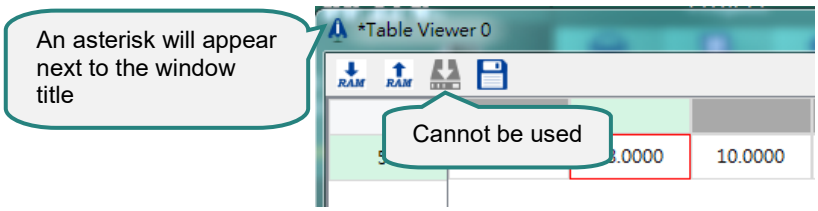


Figure 4.13.2.2 The User Table in Table Viewer is not identical with the one in controller RAM

Step 4: Click on RAM and a question dialog will appear, asking users if they would like to save current User Table to controller RAM. Click on **Yes** button to save current User Table to controller RAM.

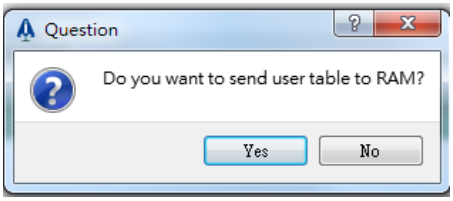


Figure 4.13.2.3 Save current User Table to controller RAM

Step 5: When the User Table in Table Viewer is identical with the one in controller RAM, the asterisk next to the window title will disappear and becomes normal.

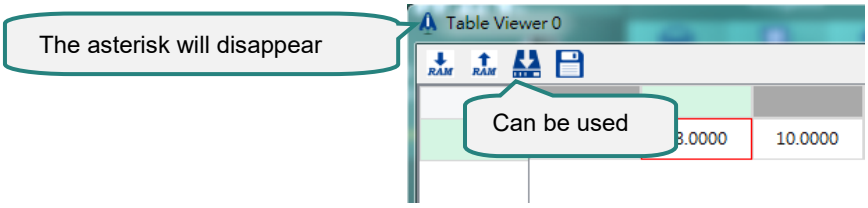


Figure 4.13.2.4 After User Table is saved to controller RAM

■ Read the User Table in controller RAM

Step 1: Click on RAM, a question dialog will appear, asking users if they would like to load the User Table from controller RAM.

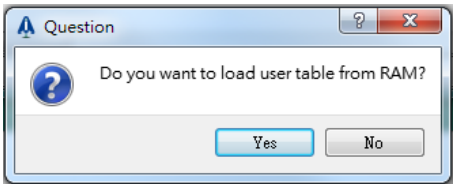


Figure 4.13.2.5 Load the User Table from controller RAM

Step 2: Click on **Yes** button to load the User Table from controller RAM.

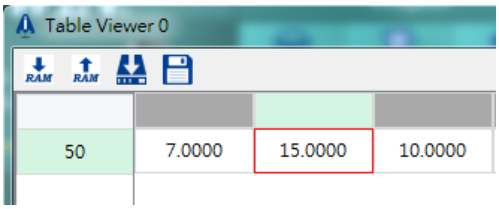


Figure 4.13.2.6 Load the User Table from controller RAM

■ Save the User Table in controller RAM to controller SSD

Click on to save the User Table in controller RAM to controller SSD. The progress window will appear as follows.

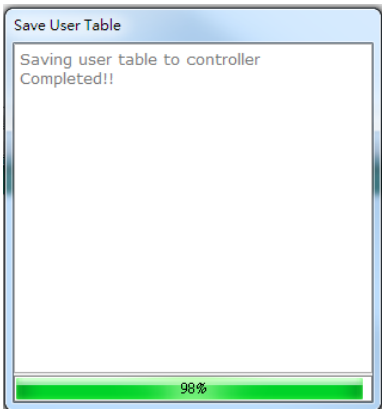


Figure 4.13.2.7 Save the User Table in controller RAM to controller SSD

■ Save current User Table as User Table data file

Click on to save current User Table as User Table data file or text file. The saving window will appear as follows.

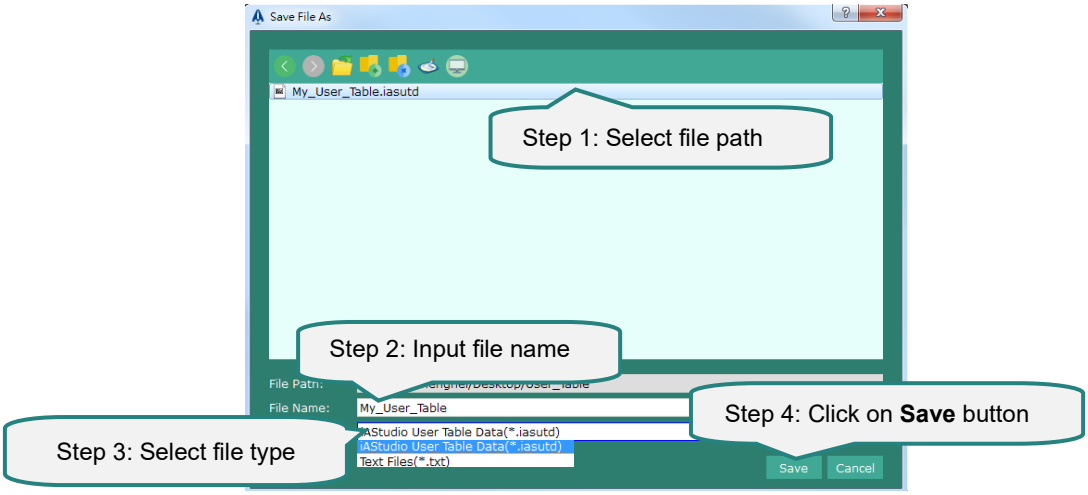


Figure 4.13.2.8 Save current User Table as User Table data file or text file

Note: Only User Table data file (*.iasutd) can be opened in Table Viewer.

■ Open visualized 1D / 2D User Table

Step 1: Click on  or press **Enter** key to open visualized User Table.

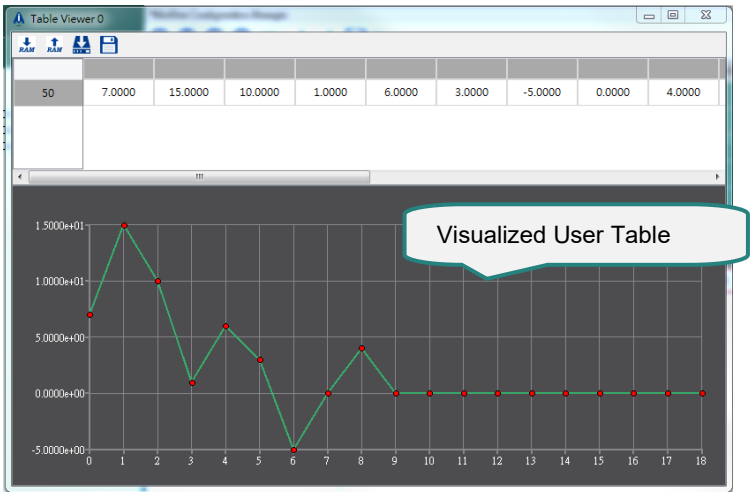


Figure 4.13.2.9 Open visualized User Table

Step 2: When index is modified, the visualized User Table will change accordingly.

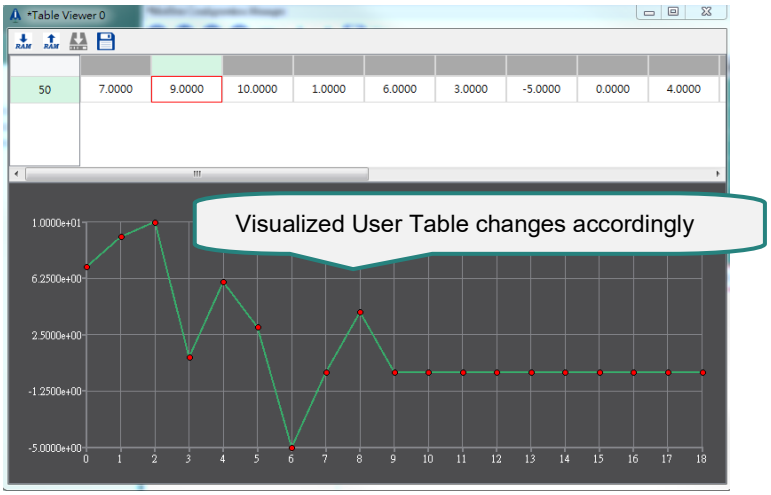


Figure 4.13.2.10 Visualized User Table changes accordingly

Step 3: When the cursor is moved to a red dot, the data of that red dot will be displayed.

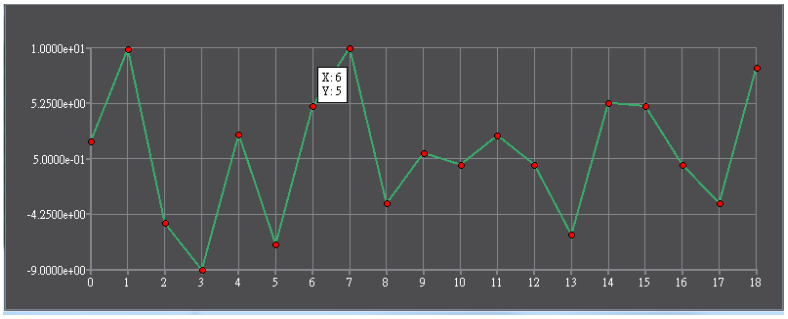


Figure 4.13.2.11 The data of the red dot is displayed

Step 4: Press and hold **Alt** key to display the data of all the red dots. Release **Alt** key to hide the data of all the red dots.

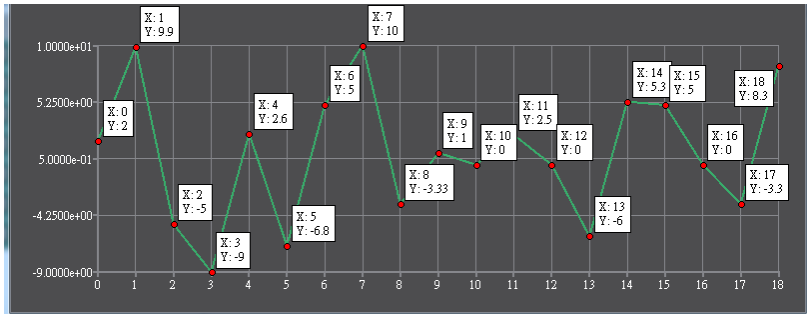


Figure 4.13.2.12 Press and hold **Alt** key to display the data of all the red dots

Step 5: Left click on a red dot to always display its data.

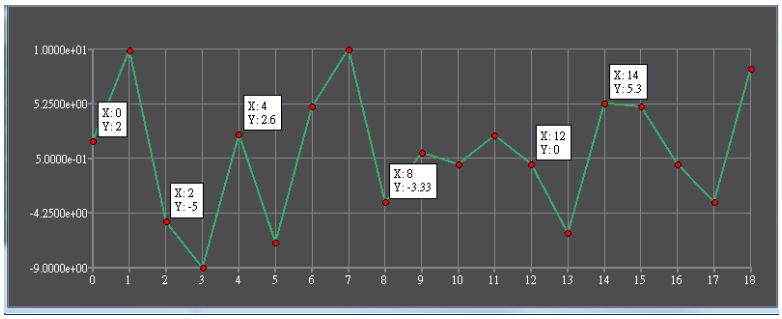


Figure 4.13.2.13 Left click on a red dot to always display its data

Step 6: Left click on the red dot again to hide its data or press **Esc** key to hide the data of all the red dots.

4.14 IP Setting

In IP Setting, users can modify controller's CN3 IP Address, Native ASCII Port and User ASCII Port.

4.14.1 Open IP Setting

To open IP Setting, click on **Tools** on the menu bar. Then click on **IP Setting**.

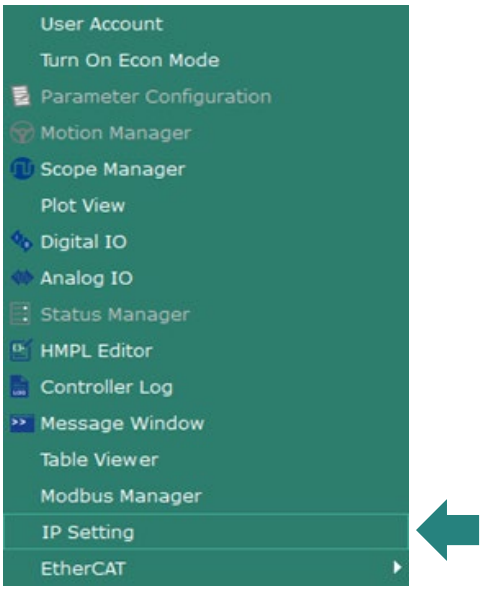


Figure 4.14.1.1 IP Setting

IP Setting window is as follows.

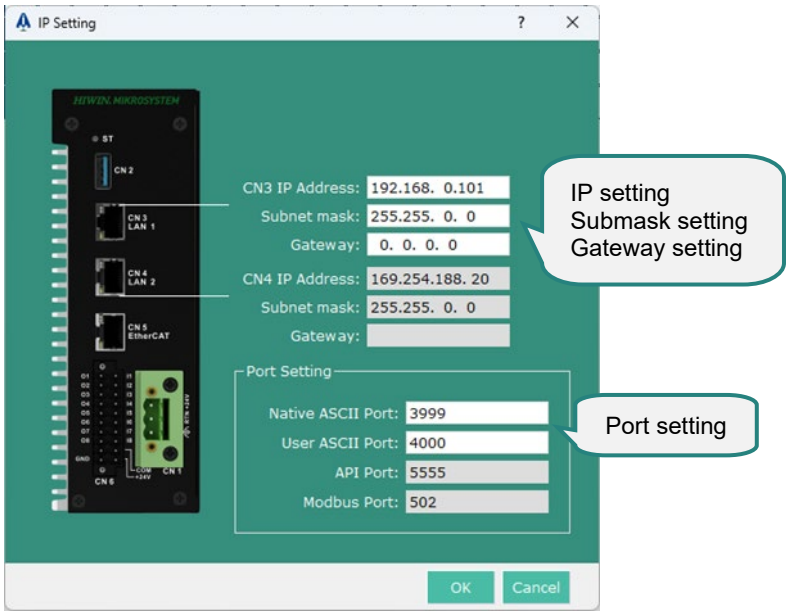


Figure 4.14.1.2 IP Setting window

After opening IP Setting window, the default values of CN3 will be displayed. Users can modify IP, Submask, Gateway setting and Port setting in this window. The fields display in grey cannot be modified. To apply the setting, click on **Controller** on the menu bar in main screen to execute **Store Configuration**, and click on **Reboot Controller** to reboot controller.

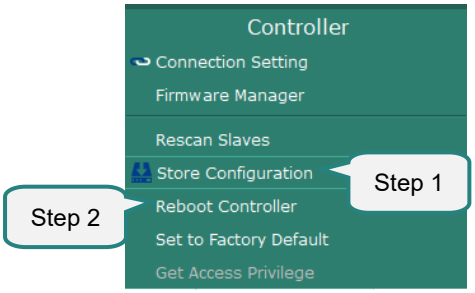


Figure 4.14.1.3 Store setting for application

4.15 EtherCAT

The functions of EtherCAT communication provided by iA Studio include:

- Object Dictionary

4.15.1 Object Dictionary

Object Dictionary interface provides users with an object list of EtherCAT devices through EtherCAT SDO communication. Users can use this function to quickly set related objects and observe their value changes.

4.15.1.1 Open Object Dictionary

After clicking **Tools** in the menu bar, click **EtherCAT**, and a list will appear on the right. Click **Object Dictionary**.

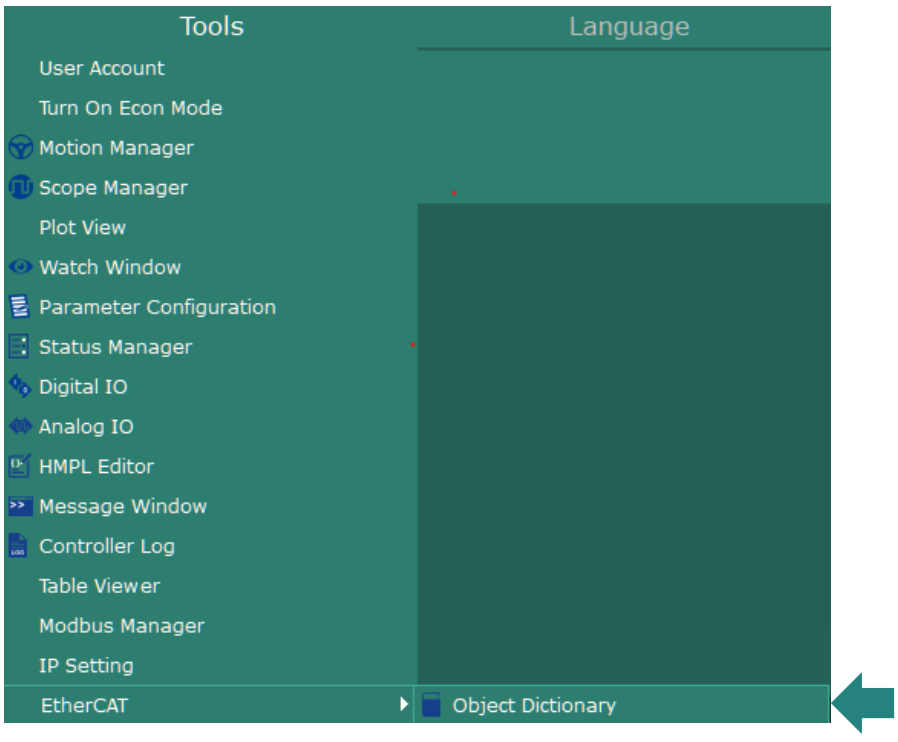


Figure 4.15.1.1.1 Object Dictionary

Object Dictionary interface is opened successfully, shown as follows.

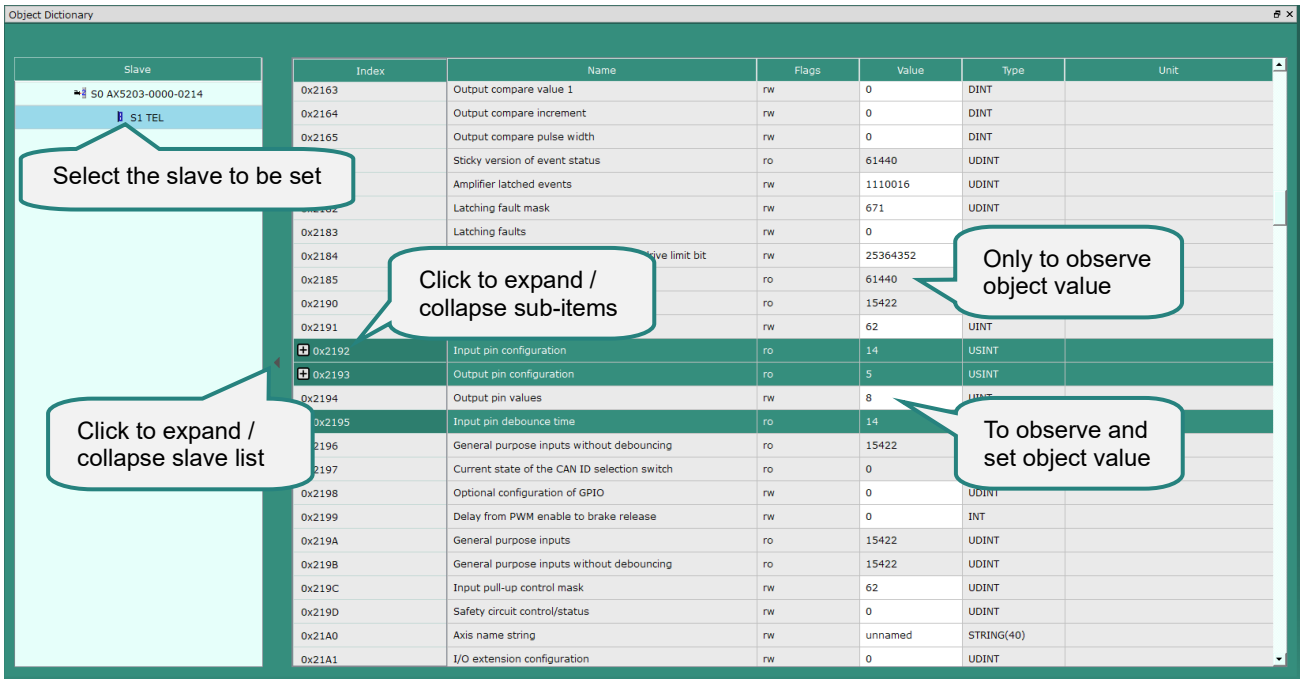
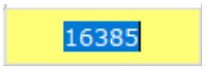


Figure 4.15.1.1.2 Object Dictionary interface

4.15.1.2 Description of operation and function

Table 4.15.1.2.1 Description of operation and function

Icon	Description
	The sub-items of the object are collapsed. Click to expand the sub-items.
	The sub-items of the object are expanded. Click to collapse the sub-items.
	Click the writable objects, which will appear as white words with a yellow background. After inputting, users need to press enter to take effect.
	Fail to read. Possibly due to an invalid object defined additionally in the ESI file.

Step 1: Users can select a slave in the slaves table on the left side. All objects of the slave will be displayed in a tree diagram on the right side.

Step 2: For setting or observing the sub-objects of the object, users can click on  button to expand the sub-items.

Step 3: If the objects are readable and writable, users can click on the Value field, which will turn to white words with a yellow background. Press Enter to take effect.

4.16 Watch Window

The functions in Watch Window are as follows:

- Add, delete, arrange, and clear monitoring parameters
- Import / Export monitoring parameters

4.16.1 Open Watch Window

Click on **Tools** on the menu bar. Then click on **Watch Window**.

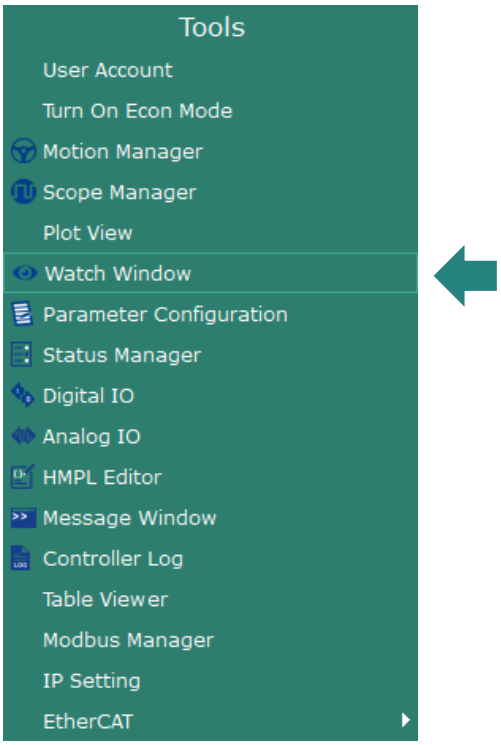


Figure 4.16.1.1 Watch Window

Watch Window is as follows.

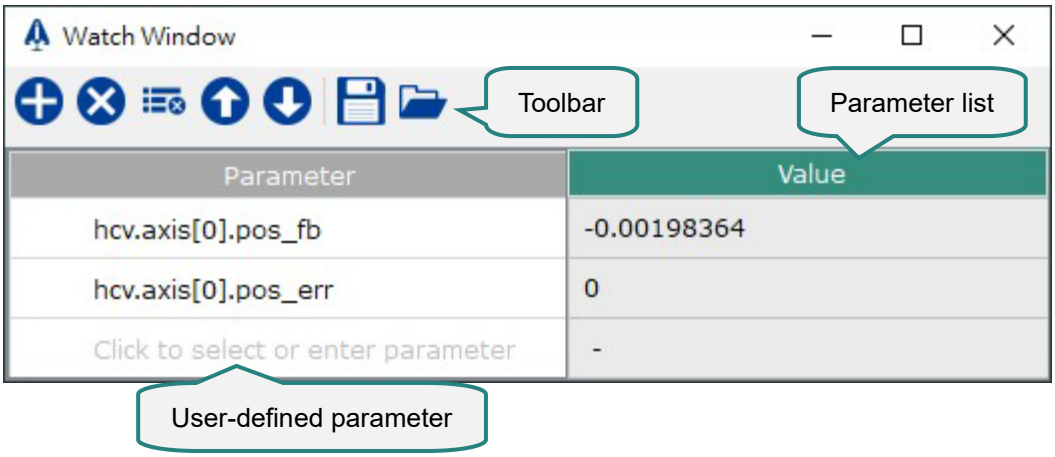


Figure 4.16.1.2 Watch Window

4.16.2 Toolbar

Table 4.16.2.1 Watch Window toolbar

Icon	Description
	Add / Insert user-defined parameter.
	Delete user-defined parameter.
	Clear all user-defined parameters.
	Move the selected user-defined parameter upward.
	Move the selected user-defined parameter downward.
	Save all user-defined parameters as iA Studio Watch Window file (.iaswwd).
	Read the parameter list of iA Studio Watch Window file (.iaswwd).

4.16.3 Parameter

Parameter list includes system default parameters and user-defined parameters. Parameter information is shown as follows.

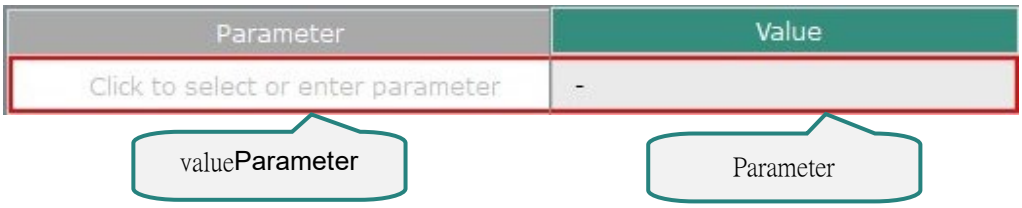


Figure 4.16.3.1 Parameter information

■ **Parameter name**

Users can click on parameter name field to open parameter list and define the desired parameter.

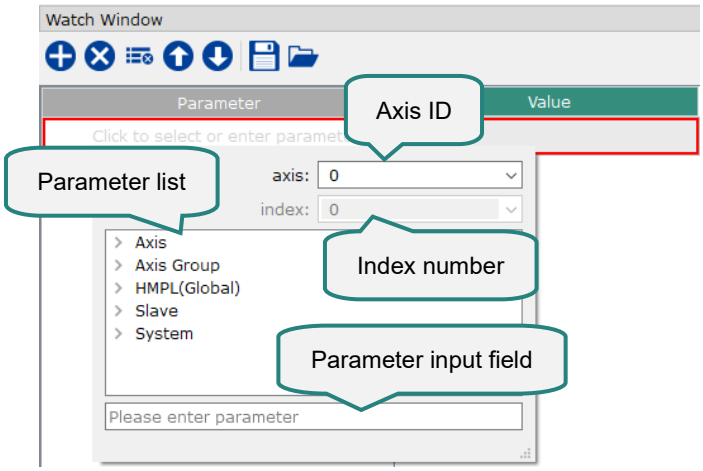


Figure 4.16.3.2 Parameter list

Set parameter by using axis ID, index number and parameter list, or directly input parameter name in parameter input field.

Note: To clear parameter name, clear the parameter input field and press Enter.

4.16.4 Search for user-defined parameters

When using Watch Window, users may use shortcut keys **Ctrl + F** to search for the user-defined parameters quickly.

Table 4.16.4.1 Shortcut keys

Shortcut key	Function
Ctrl + F	Open find and replace bar.
F3	Find next matched result.
Shift + F3	Find previous matched result.

- Find and replace bar

Figure 4.16.4.1 Find and replace bar

Table 4.16.4.2 Functions in find and replace bar

Icon	Description
Aa	Match case.
Ab	Find whole words only.
(.*)	Regular expression.
	Continue to find from the start after reaching the end.
	Find in forward direction.
	Find in backward direction.
	Close find and replace bar.

4.16.5 Example

This example will adopt the value of Axis 0 Position Feedback.

Step 1: Open Watch Window.

Step 2: Click on the icon indicated in figure 4.16.5.1 to add user-defined parameter. (The default table will automatically add a column of blank parameters.)

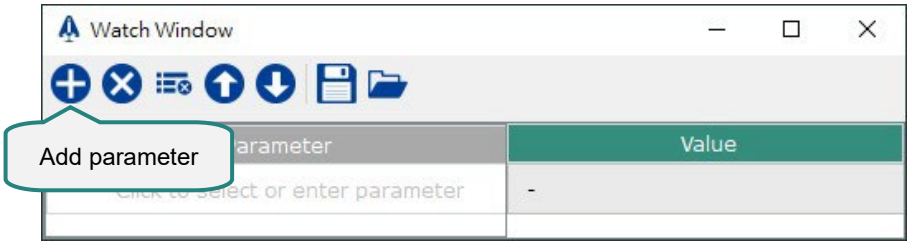


Figure 4.16.5.1 Add user-defined parameter

Step 3: Click on parameter name field to open parameter list. Select **Position Feedback** from parameter list and set **0** in axis drop-down list.

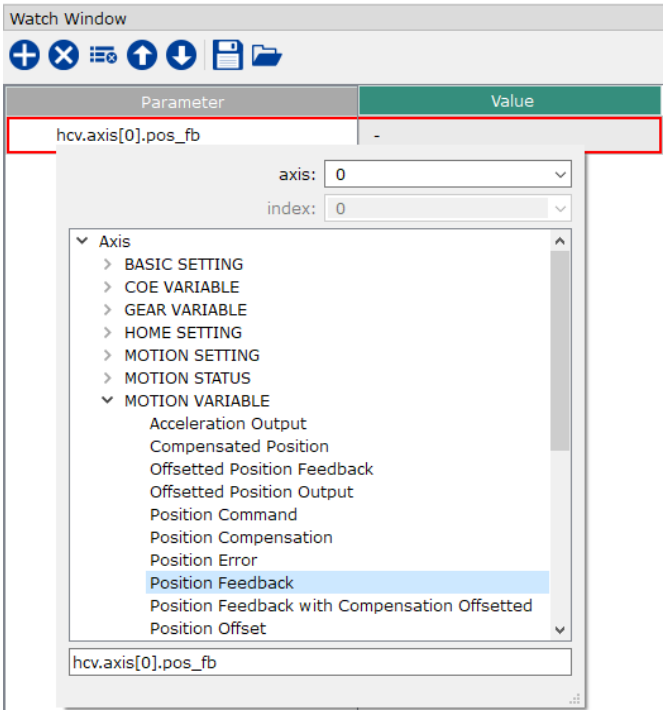


Figure 4.16.5.2 Select parameter

Step 4: After selecting, click anywhere to close the parameter list. The value of the parameter will be automatically acquired.

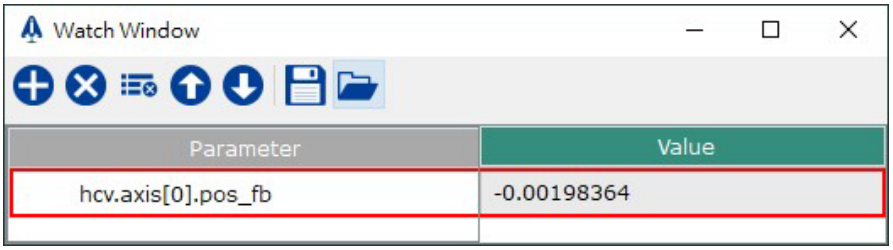


Figure 4.16.5.3 Parameter information

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5. Appendix

5.1 iA Studio error codes

This section lists all the error codes that may appear when using iA Studio, HIWIN controller, API and HMPL.

5.1.1 Controller error codes

The following error codes appear when an error occurs in the controller.

Table 5.1.1.1 Controller error codes

System Error Codes		
Error Code	Error Name	Description
0x00000001	eERR_HCV_ID_NOT_FOUND	The variable ID was not found.
0x00000002	eERR_DATA_EXCEEDED	The requested data is out of range.
0x00000003	eERR_HCV_IS_READ_ONLY	Read-only parameter.
0x00000004	eERR_HCV_VALUE_OUT_OF_RANGE	The input value is out of range.
0x00000050	eERR_EWM_CALLBACK_BUSY	The EWM callback function is busy.
0x00000064	eERR_EMERGENCY_STOP	Emergency stop activated. Disable all axes and stop all tasks.
0x00000107	eERR_NOT_VALID_TASKID	The task ID is invalid.
0x00000108	eERR_TASK_IS_RUNNING	The task is already running.
0x00000109	eERR_FUNC_NOT_IN_TASK	The function was not found in task.
0x0000010a	eERR_TASK_EMPTY	The task is empty.
0x0000010b	eERR_TASK_NOT_RUNNING	The task is not running.
0x0000012c	eERR_NIC_INIT_TOUT	The network port of fieldbus is not ready.
0x0000012d	eERR_HARDWARE_MISMATCH	The hardware is unrecognized.
0x0000012e	eERR_SLAVE_NUM_MISMATCH	The number of slaves is different from configuration.
0x00000130	eERR_INVALID_MCK_CNFG	The configuration of motion kernel is invalid.
0x00000138	eERR_HIMC_LOAD_CONFIG_FAIL	Load configuration from SSD failed. Please save it again.
0x00000139	eERR_HIMC_SAVE_CONFIG_FAIL	Store configuration to HIMC failed. Please save it again.
0x0000013a	eERR_HIMC_SAVE_CONFIG_COPY_FAIL	Store configuration to HIMC failed. Cannot save file into SAVE folder.
0x0000013c	eERR_ETHERCAT_LICENSE_MISMATCH	EtherCAT license mismatch.
0x000001f4	eERR_ISR_NOT_STABLE	The period of interrupt is not stable.
0x000041f4	eWRN_ISR_NOT_STABLE	The period of interrupt is not stable early warning.
0x000001f5	eERR_MCK_OVERLOAD	The motion kernel is overloaded.
0x000001f6	eERR_ISR_OVERLOAD	The CPU is overloaded.
0x00001388	eERR_HMPL_INVALID_ARG	The arguments are invalid in HMPL.
0x00001389	eERR_HMPL_INVALID_PTR	The pointer is invalid in HMPL.
0x0000138a	eERR_HMPL_STACK_OVERFLOW	Stack overflow in HMPL.
0x0000138b	eERR_HMPL_ILLEGAL_MEM_OP	The operation of memory is illegal in HMPL.
0x0000138c	eERR_HMPL_MOTION_NOT_READY	Motion function should be called in synchronized state.

System Error Codes		
Error Code	Error Name	Description
0x0000138d	eERR_HMPL_STR_TOO_LONG	String length is out of range.
0x0000138e	eERR_HMPL_INVALID_STR_FORMAT	String format is invalid.
0x0000138f	eERR_HMPL_ARG_OUT_OF_RANGE	The argument is out of range.
0x00001392	eERR_HMPL_ASCII_AGENT_RUNNING	ASCII agent is already running. Multiple ASCII agents cannot be run at the same time.
0x0000139c	eERR_HMPL_CANNOT_RUN_IN_DEBUG	The function cannot run in debug mode.
0x000013a6	eERR_HMPL_TOO_MANY_BRK_POINT	There are too many break points in the task.
0x000013ec	eERR_HMPL_MUTEX_LOCK_TWICE	Cannot lock the same mutex twice in the same task.
0x00001450	eERR_HMPL_INVALID_SYS_TIME_MEMORY	Buffer too small, minimum size must be 30 Byte.
0x00001451	eERR_HMPL_NOT_SUPPORTED	This HMPL function not supported for this platform.
0x00001452	eERR_HMPL_CLIENT_NOT_CONNECTED	Cannot send as client disconnected.
0x000014b4	eERR_HMPL_NOT_IN_OP_MODE	The function only can run in OP mode.
0x0000176f	eERR_HMPL_INTERNAL_ERROR	HMPL internal error.
0x00001770	eERR_HMPL_EXEC_FAILED	HMPL function execution failed.
0x00001771	eERR_HMPL_ASM_LOAD_FAILED	HMPL compilation failed, assembly file empty or not generated.
0x00001772	eERR_HMPL_STARTTASK_TIMEOUT	HMPL StartTask function timeout.
0x00001773	eERR_HMPL_STOPTASK_TIMEOUT	HMPL StopTask function timeout.
0x000017d4	eERR_ASCII_CONNECT_TIMEOUT	ASCII client connection timeout.
0x000017d5	eERR_ASCII_CONNECT_FAILED	ASCII client connection failed. Please check ip and port.
0x000017d6	eERR_ASCII_MULTI_CONNECTING	Multiple ASCII clients connecting at the same time.
0x000017d7	eERR_ASCII_MULTI_DISCONNECTING	Multiple ASCII clients disconnecting at the same time.
0x000017d8	eERR_ASCII_DISCONNECT_TIMEOUT	ASCII client disconnection timeout.
0x000017de	eERR_ASCII_RECV_TIMEOUT	ASCII client receive timeout. Please try again later.
0x000017df	eERR_ASCII_RECV_FAIL	ASCII client receive failed. Please check if the connection is still alive.
0x000017e0	eERR_ASCII_MULTI_RECVING	Multiple ASCII clients receiving at the same time.
0x000017e8	eERR_ASCII_SEND_TIMEOUT	ASCII client send timeout. Please try again later.
0x000017e9	eERR_ASCII_SEND_FAIL	ASCII client send failed. Please check if the connection is still alive.
0x000017ea	eERR_ASCII_MULTI_SENDING	Multiple ASCII clients sending at the same time.
0x00001838	eERR_MODBUS_CONNECT_TIMEOUT	Modbus client connection timeout.
0x00001839	eERR_MODBUS_CONNECT_FAILED	Modbus client connection failed. Please check ip.
0x0000183a	eERR_MODBUS_MULTI_CONNECTING	Multiple Modbus clients connecting at the same time.
0x0000183b	eERR_MODBUS_MULTI_DISCONNECTING	Multiple Modbus clients disconnecting at the same time.
0x0000183c	eERR_MODBUS_DISCONNECT_TIMEOUT	Modbus client disconnection timeout.
0x0000183d	eERR_MODBUS_DATALENGTH_ERR	Modbus client's read/write data number exceeds the limitation.
0x0000183e	eERR_MODBUS_SOCKET_BUSY	Modbus client deals with two or more

System Error Codes		
Error Code	Error Name	Description
		commands at the same time.
0x0000183f	eERR_MODBUS_JOB_TIMEOUT	Modbus client job execution timeout. Please try again later.
0x00001840	eERR_MODBUS_JOB_FAIL	Modbus client job execution failed. Please check if the connection is still alive.
0x0000b037	eMSG_HIMC_SET_DEFAULT	Set controller to factory default.
0x0000b038	eMSG_HIMC_REBOOT	Reboot controller.
0x0000b039	eMSG_HIMC_BOOT	Controller power is on.
0x0000b03a	eMSG_HIMC_INFO	Controller information.
0x0000b03b	eMSG_HIMC_STORE_CONFIG	Store configuration.
0x0000b03e	eMSG_API_MAIN_ID_CHANGE_GET	API access privilege has changed by get.
0x0000b03f	eMSG_API_MAIN_ID_CHANGE_RELEASE	API access privilege has changed by release.
0x0000b2c8	eMSG_START_HMI_SCOPE	Start HMI scope.
0x0000b2c9	eMSG_STOP_HMI_SCOPE	Stop HMI scope.
0x00003fff	eERR_SYS_LOG	This error is sent from system.
0x00007fff	eWRN_SYS_LOG	This warning is sent from system.
0x0000bfff	eMSG_SYS_LOG	This message is sent from system.
0x0000ffff	eDBG_SYS_LOG	This debug information is sent from system.

5.1.2 API error codes

The following error codes appear when accessing the controller by API.

Table 5.1.2.1 API error codes

API Error Codes		
Error Code	Error Name	Description
0x01000000	eERR_API_COMM_ERR	An error occurred when communicating with the controller.
0x0100000a	eERR_API_CONNECT_FAIL	Cannot connect to controller.
0x01000014	eERR_API_TOUT	This operation returned because the time-out period expired.
0x0100001e	eERR_API_ACCESS_REJECT	The request was rejected.
0x01000028	eERR_API_FIFO_MISMATCH	Fatal API error.
0x01000032	eERR_API_FIFO_FULL	The network is busy.
0x0100003c	eERR_API_HIMC_NOT_READY	The HIMC is not ready.
0x01000046	eERR_API_PROTOCOL_MISMATCH	Fatal API error.
0x01000050	eERR_API_INPUT_ARG_ERR	The arguments are invalid.
0x0100005a	eERR_API_NOT_SUPPORT	The API is not supported for this version.
0x01000064	eERR_API_BUSY	The API is busy.
0x0100006e	eERR_API_FILE_TRANS_FAIL	The file transmission failed.
0x01000073	eERR_API_ZIP_CORRUPT	The ZIP file was corrupted.
0x01000078	eERR_API_ID_NOT_FOUND	The connection ID was not found, maybe not connected yet.
0x01000082	eERR_API_SLV_DB_NOT_READY	The slaves are not ready.
0x0100008c	eERR_API_SLV_ID_INVALID	The slave ID is invalid.
0x01000096	eERR_API_INVALID_VAR_ID	The variable ID is invalid.
0x010000a0	eERR_API_VAR_VAL_OUT_OF_RANGE	The value is out of range.
0x010000a5	eERR_API_VAR_IS_READ_ONLY	The variable is read only.
0x010000aa	eERR_API_FS_ACCESS_DENIED	Unable to access file system, please check your permission.
0x010000b4	eERR_API_TASK_ID_INVALID	The task ID is invalid.
0x010000be	eERR_API_TASK_EMPTY	The task is empty.
0x010000c3	eERR_API_TASK_FUNC_NOT_FOUND	Cannot find the function.
0x010000c8	eERR_API_TASK_NOT_RUNNING	The task is not running.
0x010000d2	eERR_API_TASK_IS_RUNNING	The task is already running.
0x010000d7	eERR_API_TOO_MANY_BRK_POINT	There are too many break points in the task.
0x010000dc	eERR_API_INVALID_ERROR_ID	The error ID is invalid.
0x010000e6	eERR_API_INSUFFICIENT_BUFFER	Insufficient buffer.
0x010000f0	eERR_API_STR_TOO_LONG	String length is out of range.
0x010000fa	eERR_API_HIMC_VERSION_MISMATCH	The API is not compatible with this controller version.
0x010003e8	eERR_API_MOTION_ERROR	Motion control error. Please check error log.
0x010087d0	eMSG_API_PACKET_SYS_CALL	System call message from packet.
0x010047da	eWRN_API_PACKET_BUSY	API data packet in high usage.
0x010047e4	eWRN_API_PACKET_INVALID_SYS_CALL_ID	System call id is invalid.
0x01008bb8	eMSG_API_CONNECT	API client connected.
0x01008bb9	eMSG_API_DISCONNECT	API client disconnect.

API Error Codes		
Error Code	Error Name	Description
0x01008bba	eMSG_API_VERSION	API client version.
0x0100270f	eERR_API_FATAL	Fatal API error.
0x01003fff	eERR_API_LOG	This error is sent from API.
0x01007fff	eWRN_API_LOG	This warning is sent from API.
0x0100bfff	eMSG_API_LOG	This message is sent from API.
0x0100ffff	eDBG_API_LOG	This debug information is sent from API.

5.1.3 Master communication error codes

The following error codes appear when an error occurs in the controller's master communication.

Table 5.1.3.1 Master communication error codes

Master Communication Error Codes		
Error Code	Error Name	Description
0x20000101	eERR_CYCCMD_WKC_ERROR	Cyclic command: working counter error.
0x20000102	eERR_MASTER_INITCMD_WKC_ERROR	Master init command: working counter error.
0x2000010a	eERR_FRAME_RESPONSE_ERROR	Got no response on a sent Ethernet frame.
0x2000010c	eERR_MASTER_INITCMD_RESPONSE_ERROR	Got no response on a sent ecat master init command.
0x2000010f	eERR_NOT_ALL_DEVICES_OPERATIONAL	Not all slave devices are in operational state when receiving cyclic frames.
0x20000110	eERR_ETH_LINK_NOT_CONNECTED	Ethernet link (cable) not connected.
0x20000113	eERR_STATUS_SLAVE_ERROR	At least one slave is in error state when receiving cyclic frames (BRD AL-STATUS).
0x20000126	eERR_SLAVES_UNEXPECTED_STATE	Slaves in unexpected state.
0x20000127	eERR_SLAVES_ERROR_STATUS	Slaves error (AL status code).
0x2000012a	eERR_BAD_CONNECTION	Bad connection.
0x2000012b	eERR_COMMUNICATION_TIMEOUT	Communication timeout.
0x2000012c	eERR_TAP_LINK_STATUS	TAP link status.
0x02003fff	eERR_MASTER_LOG	This error is sent from master.
0x02007fff	eWRN_MASTER_LOG	This warning is sent from master.
0x0200bfff	eMSG_MASTER_LOG	This message is sent from master.
0x0200ffff	eDBG_MASTER_LOG	This debug information is sent from master.

5.1.4 Motion control error codes

■ General

The following error codes appear for invalid motion command or controller fails to execute motion command.

Table 5.1.4.1 Motion control error codes: general

General Error Codes		
Error Code	Error Name	Description
0x8000006e	eERR_MCK_UNKNOWN_CMD	Unknown command name.
0x8000006f	eERR_MCK_UNKNOWN_VAL	Unknown command value.
0x80000078	eERR_MCK_INVALID_CMD	The command is invalid in current context.
0x80000082	eERR_MCK_INVALID_AXIS_ID	Axis ID is out of allowable range.
0x8000008c	eERR_MCK_INVALID_AXIS_GRP_ID	Axis group ID is out of allowable range.
0x80000096	eERR_MCK_INVALID_MASTER_SLAVE_CONNECTION	Master-Slave connection is failed.

■ Axis Group

The following error codes appear due to an error or invalid operation in an axis group. Symbols □□ will be the axis group ID in hexadecimal format. For example, 01 stands for axis group index 01; 0f stands for axis group index 15.

Table 5.1.4.2 Motion control error codes: axis group

Axis Group Error Codes		
Error Code	Error Name	Description
0x82□□000a	eERR_CRD_CMD_UNKNOWN	The axis group command is unknown.
0x82□□0014	eERR_CRD_CMD_REACH_MAX_NUM_AXIS	The axis group reaches its maximum number of axes.
0x82□□001e	eERR_CRD_CMD_INVALID_KIN_SETTING	The kinematics type setting is invalid.
0x82□□001f	eERR_CRD_CMD_INVALID_SPECIFIC_KIN	The command is invalid when axis group is in specific kinematics type.
0x82□□0028	eERR_CRD_CMD_AXIS_DUPLICATED	Could not add the axis since it is already in the group.
0x82□□0032	eERR_CRD_CMD_GRP_SIZE_EMPTY	The axis group is empty.
0x82□□003c	eERR_CRD_CMD_GRP_SIZE_FULL	The axis group is full and cannot hold any more axis.
0x82□□0046	eERR_CRD_CMD_INVALID_MOVING	The command is invalid while the axis group is moving.
0x82□□0050	eERR_CRD_CMD_INVALID_DISABLED	The command is invalid while the axis group is disabled.
0x82□□005a	eERR_CRD_CMD_INVALID_INPUTSHAPING_PARAMETER_INCOMPLETE	The parameters of axis group inshape function is incomplete.
0x82□□006e	eERR_CRD_CMD_INVALID_STATE	The axis group is unable to execute the command in current motion state.
0x82□□0078	eERR_CRD_CMD_QUEUE_FULL	Please wait till the last command is done.
0x82□□0082	eERR_CRD_CMD_GRP_AXIS_INVALID	The group axis is invalid.

Axis Group Error Codes		
Error Code	Error Name	Description
0x82□□008c	eERR_CRD_CMD_QUEUE_IS_NOT_EMPTY	The command queue is not empty.
0x82□□0096	eERR_CRD_CMD_INVALID_QUEUE_SIZE	The size of command queue is invalid.
0x82□□00d2	eERR_CRD_CMD_INVALID_POS	The axis group target position or orientation is out of allowable range.
0x82□□00dc	eERR_CRD_CMD_INVALID_LIN_VEL	The linear velocity setting of axis group is out of allowable range.
0x82□□00e6	eERR_CRD_CMD_INVALID_LIN_ACC	The linear acceleration setting of axis group is out of allowable range.
0x82□□00f0	eERR_CRD_CMD_INVALID_LIN_DEC	The linear deceleration setting of axis group is out of allowable range.
0x82□□00fa	eERR_CRD_CMD_INVALID_LIN_JERK	The linear jerk setting of axis group is out of allowable range.
0x82□□0104	eERR_CRD_CMD_INVALID_LIN_SM_TIME	The linear smooth time setting of axis group is out of allowable range.
0x82□□010e	eERR_CRD_CMD_INVALID_DAMPINGRATIO	The damping ratio setting of axis group is out of allowable range.
0x82□□0118	eERR CRD_CMD_INVALID_FREQUENCY	The frequency setting of axis group is out of allowable range.
0x82□□0140	eERR_CRD_CMD_INVALID_ANG_VEL	The angular velocity setting of axis group is out of allowable range.
0x82□□014a	eERR_CRD_CMD_INVALID_ANG_ACC	The angular acceleration setting of axis group is out of allowable range.
0x82□□0154	eERR_CRD_CMD_INVALID_ANG_DEC	The angular deceleration setting of axis group is out of allowable range.
0x82□□015e	eERR_CRD_CMD_INVALID_ANG_JERK	The angular jerk setting of axis group is out of allowable range.
0x82□□0168	eERR_CRD_CMD_INVALID_ANG_SM_TIME	The angular smooth time setting of axis group is out of allowable range.
0x82□□0190	eERR_CRD_CMD_INVALID_VEL_SCALE	The velocity scale of axis group is out of allowable range.
0x82□□019a	eERR_CRD_CMD_INVALID_TRANS_VEL	The transition velocity of axis group is invalid.
0x82□□01a4	eERR_CRD_CMD_INVALID_TRANS_DIS	The transition distance of axis group is invalid.
0x82□□01a5	eERR_CRD_CMD_INVALID_TRANS_DEV	The transition deviation of axis group is invalid.
0x82□□01a6	eERR_CRD_CMD_INVALID_TRANS_CURVE	The transition curvature of axis group is invalid.
0x82□□01b8	eERR_CRD_CMD_TRANS_MODE_UNKNOWN	The path transition mode name is unknown.
0x82□□01c2	eERR_CRD_CMD_COORD_SYS_UNKNOWN	The coordinate system is unknow.
0x82□□01cc	eERR_CRD_CMD_BLEND_MODE_UNKNOWN	The path blending mode name is unknown.
0x82□□01fe	eERR_CRD_CMD_LIN_INVALID_PARAM	The parameters are invalid for linear path planning.
0x82□□0262	eERR_CRD_CMD_CIRC_INVALID_PARAM	The parameters are invalid for circular path planning.
0x82□□026c	eERR_CRD_CMD_CIRC_INVALID_CENTER	The center position of circular path is too close to start / end point.
0x82□□0276	eERR_CRD_CMD_CIRC_ANGLE_SMALL	The central angle of circular path is too small.
0x82□□0280	eERR_CRD_CMD_CIRC_INVALID_RADIUS	The radius of circular path is invalid.
0x82□□028a	eERR_CRD_CMD_CIRC_INVALID_COORD	The coordinate system of circular path is invalid.
0x82□□02c6	eERR_CRD_CMD_BEZIER_INVALID_PARAM	The parameters are invalid for Bezier curve path planning.
0x82□□02d0	eERR_CRD_CMD_BSPLINE_INVALID_PARA	The parameters are invalid for BSpline curve

Axis Group Error Codes		
Error Code	Error Name	Description
	M	path planning.
0x82□□02da	eERR_CRD_CMD_CURVE_INVALID_STARTPOS	The start position is invalid for curve path planning.
0x82□□02e4	eERR_CRD_CMD_COORD_INVALID_PARAM	The parameters are invalid for coordinate transformation.
0x82□□02ee	eERR_CRD_CMD_NURBS_INVALID_PARAM	The parameters are invalid for NURBS curve path planning.
0x82□□02f8	eERR_CRD_CMD_LOOKAHEAD_INVALID_PARAM	The parameters are invalid for look ahead motion.
0x82□□03f2	eERR_CRD_AXIS_ABNORMALLY_DISABLED	One or more axes in the axis group are abnormally disabled.
0x82□□03fc	eERR_CRD_AXIS_SWL	One of the axes in axis group touches software limit.

■ Axis

The following error codes appear due to an error or invalid operation in an axis. Symbols □□ will be the axis ID in hexadecimal format. For example, 01 stands for axis index 01; 0f stands for axis index 15.

Table 5.1.4.3 Motion control error codes: axis

Axis Error Codes		
Error Code	Error Name	Description
0x83□□000a	eERR_AXIS_CMD_UNKOWN	The command name is unknown.
0x83□□001e	eERR_AXIS_CMD_QUEUE_FULL	Axis command queue is full.
0x83□□0064	eERR_AXIS_CMD_INVALID_STATE	The axis is unable to execute the command in current motion state.
0x83□□006e	eERR_AXIS_CMD_INVALID_ENABLED	The command is not allowed while enabled.
0x83□□0078	eERR_AXIS_CMD_INVALID_DISABLED	The command is not allowed while disabled.
0x83□□0082	eERR_AXIS_CMD_INVALID_MOVING	The axis is unable to execute the command while moving.
0x83□□008c	eERR_AXIS_CMD_INVALID_STOPPING	The command is invalid when axis stops moving.
0x83□□0096	eERR_AXIS_CMD_INVALID_ERROR_STATE	The command is invalid when axis is in ErrorStop state.
0x83□□00a0	eERR_AXIS_CMD_INVALID_IN_SYNC	The command is invalid when axis is in synchronized motion state.
0x83□□00aa	eERR_AXIS_CMD_INVALID_GEAR_MASTER	The command is invalid when axis is the gear master axis.
0x83□□00b4	eERR_AXIS_CMD_INVALID_PP_MODE	The command is invalid when axis is in PP mode.
0x83□□00be	eERR_AXIS_CMD_INVALID_MAP_SWITCHING	The command is invalid when axis is switching the compensation map.
0x83□□00c8	eERR_AXIS_CMD_INVALID_INPUTSHAPING_ENABLED	The axis is unable to execute the command when position command shaping function is activated.
0x83□□00d2	eERR_AXIS_CMD_INVALID_COMP_ENABLED	The axis is unable to execute the command when dynamic compensation is enabled.
0x83□□00dc	eERR_AXIS_CMD_INVALID_GANTRY_MODE	The axis is unable to execute the command in gantry mode.
0x83□□00e6	eERR_AXIS_CMD_INVALID_GROUPED	The command is not allowed when axis is in

Axis Error Codes		
Error Code	Error Name	Description
		an axis group.
0x83□□00f0	eERR_AXIS_CMD_INVALID_CONTROL_MODE	The command is invalid in current control mode.
0x83□□00fa	eERR_AXIS_CMD_INVALID_OP_MODE	The operational mode is invalid.
0x83□□0104	eERR_AXIS_CMD_INVALID_BUFFER_MODE	The axis buffer mode is invalid.
0x83□□0105	eERR_AXIS_CMD_INVALID_SETBUFFERMODE	The command is not allowed when axis has any unfinished command.
0x83□□010e	eERR_AXIS_CMD_INVALID_TP_ENABLED	The command is not allowed when touch probe is enabled.
0x83□□012c	eERR_AXIS_CMD_INVALID_PARAMETER	The parameter of axis command is invalid.
0x83□□0136	eERR_AXIS_CMD_INVALID_POS	Axis target position is out of allowable range.
0x83□□0140	eERR_AXIS_CMD_INVALID_VEL	Axis velocity setting is out of allowable range.
0x83□□014a	eERR_AXIS_CMD_INVALID_ACC	Axis acceleration setting is out of allowable range.
0x83□□0154	eERR_AXIS_CMD_INVALID_DEC	Axis deceleration setting is out of allowable range.
0x83□□015e	eERR_AXIS_CMD_INVALID_JERK	Axis jerk setting is out of allowable range.
0x83□□0168	eERR_AXIS_CMD_INVALID_SM_TIME	Axis smooth time setting is out of allowable range.
0x83□□0172	eERR_AXIS_CMD_INVALID_KILL_DEC	Axis kill deceleration setting is out of allowable range.
0x83□□017c	eERR_AXIS_CMD_INVALID_VEL_SCALE	Axis velocity scale setting is out of allowable range.
0x83□□0190	eERR_AXIS_COMP_NOT_CNFG	Axis dynamic compensation settings have not been configured properly.
0x83□□01c2	eERR_AXIS_CMD_INVALID_MASTER_SLAVE_CONNECTION	Master-slave relationship setting is invalid.
0x83□□01cc	eERR_AXIS_CMD_INVALID_SLAVE_ID	Slave ID setting is invalid.
0x83□□01d6	eERR_AXIS_CMD_INVALID_GEAR_RATIO	The gear ratio setting of slave axis is out of allowable range.
0x83□□01f4	eERR_AXIS_CMD_INVALID_ROLLOVER_POS	Invalid axis rollover position, should be a positive value.
0x83□□01fe	eERR_AXIS_CMD_INVALID_ROLLOVER_PP_MODE	Rollover is not supported in Profile Position mode. Please reset rollover value to 0 before switching to Profile Position mode.
0x83□□0208	eERR_AXIS_CMD_INVALID_FORCECONST_TRQMODE	Invalid force constant for torque mode. Please set the correct force constant first.
0x83□□0258	eERR_AXIS_CMD_INVALID_NO_SPECIFIC_PDO	PDO must have specific CoE object to execute command.
0x83□□03f2	eERR_AXIS_DRIVE_FAULT	The drive has reported a fault. Please check the corresponding error message in the drive.
0x83□□03fc	eERR_AXIS_DRIVE_ABNORMAL_DISABLE	The drive is abnormally disabled.
0x83□□0406	eERR_AXIS_DRIVE_ENABLE_TOUT	It took too long to enable the drive.
0x83□□0407	eERR_AXIS_DRIVE_ENABLE_TOUT_RMT	It took too long to enable the drive. Please check access setting in the drive.
0x83□□0410	eERR_AXIS_DRIVE_CLEAR_ERROR_TOUT	It took too long to clear drive error.
0x83□□041a	eERR_AXIS_DRIVE_DISABLE_TOUT	It took too long to disable the drive.
0x83□□0424	eERR_AXIS_DRIVE_HOME_TOUT	It took too long to home the axis.
0x83□□042e	eERR_AXIS_DRIVE_HOME_FAILED	Axis homing error. Please check error code from drive.
0x83□□0456	eERR_AXIS_VEL_LIMIT	The reference velocity has exceeded the velocity limit.
0x83□□4456	eWRN_AXIS_VEL_LIMIT	The reference velocity has exceeded the

Axis Error Codes		
Error Code	Error Name	Description
		velocity limit, velocity is clipped.
0x83□□0460	eERR_AXIS_ACC_LIMIT	The reference acceleration has exceeded the acceleration limit.
0x83□□046a	eERR_AXIS_CURR_LIMIT	The current command has exceeded the current limit.
0x83□□0474	eERR_AXIS_DAMPINGRATIO_LIMIT	The damping ratio setting of axes is out of allowable range.
0x83□□047e	eERR_AXIS_FREQUENCY_LIMIT	The frequency setting of axis is out of allowable range.
0x83□□07da	eERR_AXIS_SWRL	Axis reference position reached right software limit.
0x83□□07e4	eERR_AXIS_SWLL	Axis reference position reached left software limit.
0x83□□07ee	eERR_AXIS_HWRL	Axis right hardware limit signal triggered.
0x83□□07f8	eERR_AXIS_HWLL	Axis left hardware limit signal triggered.
0x83□□0802	eERR_AXIS_COMP_LIMIT	Axis compensation position has exceeded maximum compensation limit.
0x83□□083e	eERR_AXIS_PERR	Axis position error has exceeded the protection limit. Please first check if there is any mechanical interference for motor motion.
0x83□□0848	eERR_AXIS_VERR	Axis velocity error has exceeded the protection limit. Please first check if there is any mechanical interference for motor motion.
0x83□□08a2	eERR_AXIS_PVT_MOTION_VEL_LIMIT	Velocity of axis PVT motion has exceeded the protection limit. Please first check if the given parameters are valid.
0x83□□08ac	eERR_AXIS_PVT_MOTION_ACC_LIMIT	Acceleration of axis PVT motion has exceeded the protection limit. Please first check if the given parameters are valid.
0x83□□08b6	eERR_AXIS_PVT_MOTION_INVALID_TIME	Time sequence of axis PVT motion is invalid. Please first check if the given parameters are valid.
0x83□□0bb8	eERR_AXIS_CTRL_ERR	Axis internal control error.
0x83□□0fa0	eERR_AXIS_CMD_GEAR_DISABLED	Gear command is not allowed while gear is disabled.
0x83□□0fa1	eERR_AXIS_CMD_INVALID_AXIS_IN_CAM	Gear command is invalid when axis is in cam.
0x83□□1388	eERR_CAM_CMD_INVALID_ENGAGE_WINDOW	Cam engage window is out of allowable range.
0x83□□1389	eERR_CAM_CMD_INVALID_ENGAGE_POSITION	Cam engage position is out of cam table domain.
0x83□□138a	eERR_CAM_CMD_INVALID_MASTER_SCALE_FACTOR	Cam master scale factor is out of allowable range.
0x83□□138b	eERR_CAM_CMD_INVALID_CAM_SCALE_FACTOR	Cam scale factor is out of allowable range.
0x83□□138c	eERR_CAM_CMD_INVALID_CAMTABLE_ID	Cam table ID is out of allowable range.
0x83□□138d	eERR_CAM_CMD_INVALID_DISENGAGE_WINDOW	Cam disengage window is out of allowable range.
0x83□□138e	eERR_CAM_CMD_INVALID_DISENGAGE_POSITION	Cam disengage position is out of allowable range.
0x83□□138f	eERR_CAM_CMD_INVALID_OPERATION_IN_ENGAGED_STATE	Cam command is invalid in engage state.
0x83□□1390	eERR_CAM_CMD_INVALID_START_MODE	Cam start mode does not correspond to a valid enumeration value.
0x83□□1391	eERR_CAM_CMD_INVALID_MOVE_MODE	Cam move mode does not correspond to a valid enumeration value.

Axis Error Codes		
Error Code	Error Name	Description
0x83□□1392	eERR_CAM_ENGAGED_FAILED	CamMaster may pass through the engage window because engage window is too small.
0x83□□1393	eERR_CAM_CMD_NOTINUSE	End of profile mode is not in use right now
0x83□□1394	eERR_CAM_CMD_CAM_DISABLED	Cam command is not allowed while cam is disabled.
0x83□□1395	eERR_CAM_CMD_INVALID_AXIS_NOT_INCAM	Cam command is invalid when axis is not in cam.
0x83□□1396	eERR_CAM_CMD_INVALID_AXIS_NOT_IN_DISENGAGED	Cam command is invalid when axis is not in disengaged.
0x83□□1397	eERR_CAM_CMD_INVALID_AXIS_IN_GEAR	Cam command is invalid when axis is in gear.

5.1.5 Master-slave communication error codes

The following error codes appear due to a communication error between controller and slave. Symbols □□ will be the slave ID in hexadecimal format. For example, 01 stands for slave index 01; 0f stands for slave index 15.

Table 5.1.5.1 Master-slave communication error codes

Master-Slave Communication Error Codes		
Error Code	Error Name	Description
0x84□□000a	eERR_SLAVE_MAILBOX_NO_RES	The mailbox is not responding.
0x84□□0014	eERR_SLAVE_DB_INIT_FAIL	The initialization of slave database has failed.
0x84□□001e	eERR_SLAVE_PRM_MISMATCH	The configuration in slave has been modified.
0x84□□0028	eERR_SLAVE_FIRM_MISMATCH	The type or firmware of slave is different from original configuration.
0x84□□0032	eERR_SLAVE_VAR_INVALID	The slave variable is invalid.
0x84□□003c	eERR_SLAVE_PDO_INVALID	The PDO setting is invalid.
0x84□□0046	eERR_SLAVE_PDO_NUM_EXCEED	The number of PDO is out of range.
0x84□□0050	eERR_SLAVE_MAIL_BOX_BUSY	The mailbox is busy.
0x84□□0103	eERR_SLAVE_INITCMD_WKC_ERROR	Slave init command: working counter error.
0x84□□0107	eERR_EOE_MBXSND_WKC_ERROR	EoE mailbox send: working counter error.
0x84□□0108	eERR_COE_MBXSND_WKC_ERROR	CoE mailbox send: working counter error.
0x84□□0109	eERR_FOE_MBXSND_WKC_ERROR	FoE mailbox send: working counter error.
0x84□□010b	eERR_SLAVE_INITCMD_RESPONSE_ERROR	Got no or unexpected response on a sent ecat init command from slave.
0x84□□010e	eERR_MBSLAVE_INITCMD_TIMEOUT	Timeout when waiting for mailbox init command response.
0x84□□0114	eERR_SLAVE_ERROR_STATUS_INFO	Slave error (AL status code).
0x84□□0117	eERR_SOE_MBXSND_WKC_ERROR	SoE mailbox send: working counter error.
0x84□□0118	eERR_SOE_WRITE_ERROR	SoE mailbox write responded with an error.
0x84□□0119	eERR_MBSLAVE_COE_SDO_ABORT	CoE mailbox SDO abort.
0x84□□011c	eERR_FOE_MBSLAVE_ERROR	FoE mailbox abort.
0x84□□011d	eERR_MBXRCV_INVALID_DATA	Invalid mailbox data received.
0x84□□011e	eERR_PDIWATCHDOG	PDI Watchdog expired on slave.
0x84□□0120	eERR_SLAVE_UNEXPECTED_STATE	Slave in unexpected state.
0x84□□0122	eERR_VOE_MBXSND_WKC_ERROR	VoE mailbox send: working counter error.
0x84□□0123	eERR_EEPROM_CHECKSUM_ERROR	EEPROM checksum error detected.
0x84□□0124	eERR_LINE_CROSSED	Crossed lines detected.
0x84□□0128	eERR_FRAMELOSS_AFTER_SLAVE	Frameloss after slave.
0x84□□0129	eERR_S2SMBX_ERROR	S2S mailbox error.
0x84□□3fff	eERR_SLAVE_LOG	This error is sent from slave.
0x84□□7fff	eWRN_SLAVE_LOG	This warning is sent from slave.
0x84□□bfff	eMSG_SLAVE_LOG	This message is sent from slave.
0x84□□ffff	eDBG_SLAVE_LOG	This debug information is sent from slave.