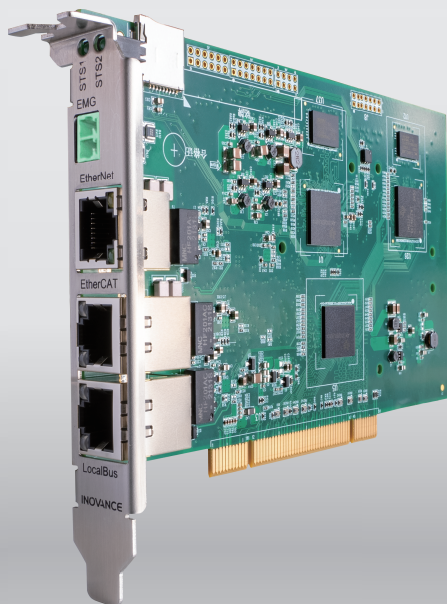




IMC30G-E Card Software User Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code P500021276A00

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Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

Introduction

Thank you for purchasing the IMC30G-E series motion control card (motion controller).

InoMotionController is the software for Inovance motion control card. This guide describes the general operation of the InoMotionController software, including software overview, software introduction, parameter configuration, and motion function test, card information, firmware upgrade, and new functions.

Before using the software, carefully read this guide and other guides described in this guide. Follow the safety instructions when using the software.

More Documents

Data Name	Code	Description
IMC30G-E Series Motion Control Card Hardware Guide	19010818	Describes the safety precautions, product information (nameplate, model, parts, dimensions, technical specifications), installation and maintenance, and hardware connection.
IMC30G-E Series Motion Control Card (Motion Controller) Software Programming Guide	19010821	Describes the software programming information of the product, including the instruction system, description of specific functions, and description of common error codes.

Revision History

Date	Version	Revision
September 2025	A00	First release.

Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways

- Do keyword searching under Service and Support at <http://www.inovance.com>.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.



Table of Contents

Legal and Disclaimer	1
Preface	2
Fundamental Safety Instructions	5
1 Overview	6
1.1 About InoMotionController	6
1.2 System Architecture	6
2 Getting Started	7
2.1 Software Installation	7
2.2 Interface Introduction	10
2.3 Overall Process	11
2.4 Starting the Software and Opening Cards	13
3 Parameter Configuration	18
3.1 Device Parameter Configuration	18
3.1.1 Device Parameter Setting Interface	18
3.1.2 Device Parameter Configuration Process	21
3.2 System Parameter Configuration	33
3.2.1 System Parameter Setting Interface	33
3.2.2 System Parameter Configuration Process	34
3.3 Descriptions of Parameter Files Invoked By API	41
4 Motion Function Test	42
4.1 Drive Self-homing	42
4.2 Single-axis Motion Test	44
4.3 Hand Wheel Following Function Test	59
4.4 Interpolation Motion Function Test	63
4.5 DI and DO Operation	68
4.6 AD and DA	69
4.7 PWM Wave Output	71
4.8 Position Comparison Output	73
4.9 Two-dimensional Comparison Output	77
4.10 Electronic Gear Ratio Setting	81
4.11 SDO Parameter Reading/Writing	83
4.12 Servo Parameter Reading and Writing	85
5 Card Information and Firmware Upgrade	88
5.1 Card Information and Firmware Upgrade	88

6 New Functions 89

 6.1 Slave Alias Function..... 89

 6.2 Card Log Printing 95

 6.3 Error Query 96

 6.4 PDO Object Adding, Deletion, and Edition..... 96

 6.5 PDO Object Detection 98

 6.6 CoEonline Function 99

7 Appendix 102

 7.1 PDO Adding/Deleting Procedure..... 102

 7.2 Quick Start Example..... 109

 7.3 Device Parameter Configuration Flow 117

 7.4 Motion Function Test Flow 118

Service and Support..... 119

Fundamental Safety Instructions

Safety Precautions

- Only trained and qualified personnel should install, operate, and maintain the product described in this document, or perform other operations. Qualified personnel can identify risks and avoid potential hazards when using these products.
- Before performing any operation on the drive system, ensure that you have read the commissioning guide and function guide of the servo drive carefully.
- The servo drive system may present safety risks due to electric power, heat, and other hazardous reasons. Failure to comply with the safety instructions may result in personal injury or equipment damage.

General Safety Precautions



The computer on which the software is installed must not be in an uncontrolled area.

The computer on which the software is installed cannot be used for other purposes.

Back up the data on the computer regularly.

Keep the software updated.

Check all safety-related settings before trial running. The machine may fail due to incorrect or changed parameters, which may result in personal injury or death. After commissioning is completed, check all safety-related settings again.

Use the emergency stop button or other appropriate measures to deal with possible accidents.

The information in this document applies only to the hardware or software products specified in this document.

Inovance does not guarantee that the use of the product software will be uninterrupted or error-free.

Inovance has made every effort to ensure that the content of this document is qualified and free from major errors or omission.

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1 Overview

1.1 About InoMotionController

InoMotionController is the software for Inovance motion control card (controller) developed based on the C# environment. This software allows you to configure the bus parameters of the controller and motion control parameters, and test motion functions, such as homing, single-axis motion, hand wheel following, interpolation, DIO, AD-DA, PWM wave output, one-dimensional (1D) position comparison, and two-dimensional (2D) position comparison. Thereby, you can commission the motor system quickly.

1.2 System Architecture

The InoMotionController software is at the application layer in the overall system architecture, as shown below.

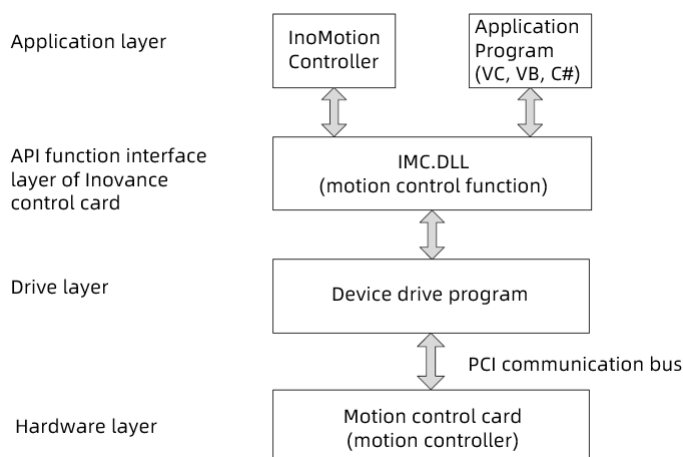


Figure 1-1 System architecture of InoMotionController

- **Hardware layer:** The motion control card (motion controller) is used as the basic hardware carrier to enable data exchange through the PCI communication bus.
- **Drive layer:** It provides hardware access support to the upper layer through device drivers.
- **API function interface layer of Inovance control card:** The hardware interaction logic is encapsulated through IMC.DLL (motion control function library) to expose the invoking interface to the upper layer.
- **Application layer:** It contains the InoMotionController software and user-developed applications based on VC, VB, and C# to implement functions and interaction logic.

2 Getting Started

2.1 Software Installation

1. Obtain the software installation package (note: Select version V1.10.16) from the Inovance official website or after-sales service personnel.
2. Before installation, close the anti-virus program. Then double-click the .exe file in the installation package to start the installation.

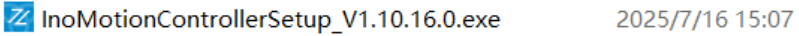
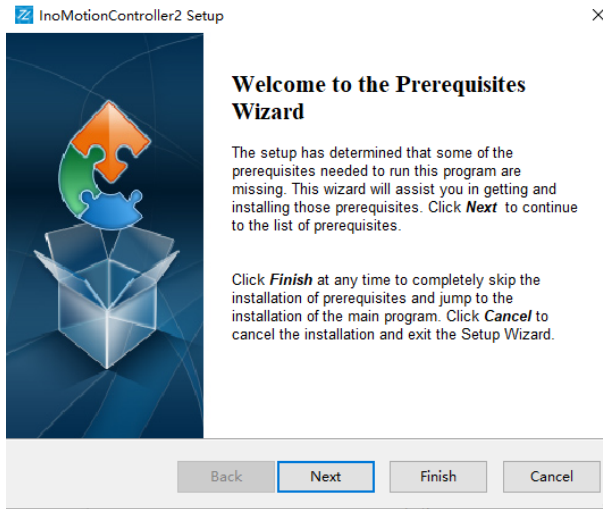
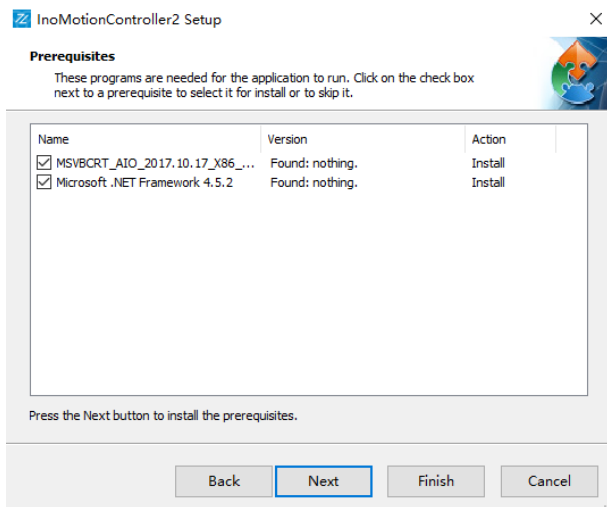


Figure 2-1 Software package

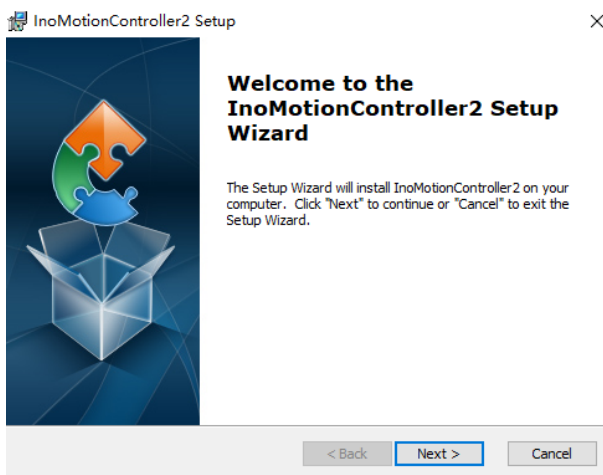
3. Go to the installation wizard and click **Next**.



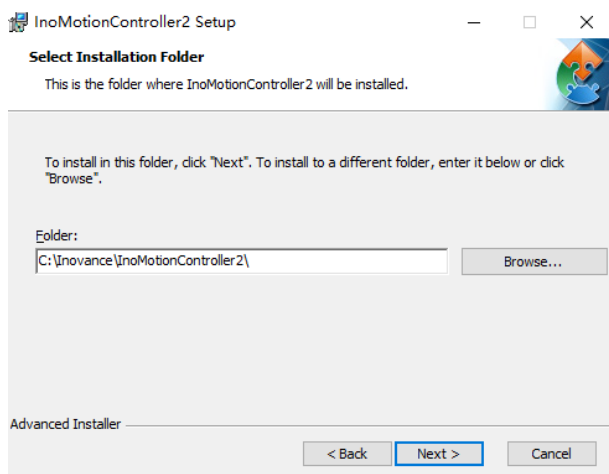
4. Click **Next** to download the system runtime library and .NET framework required.



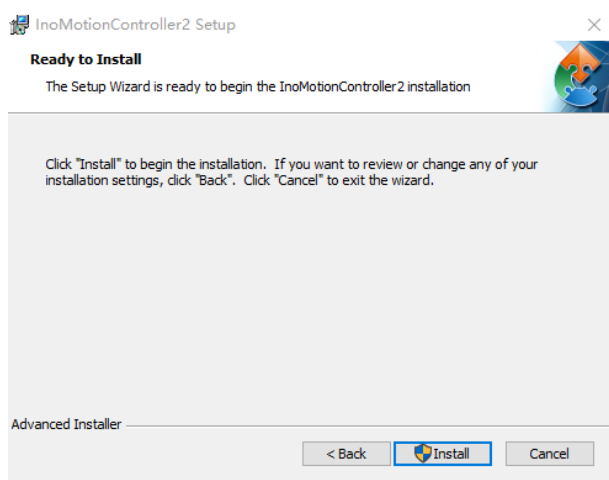
5. Click **Next**.



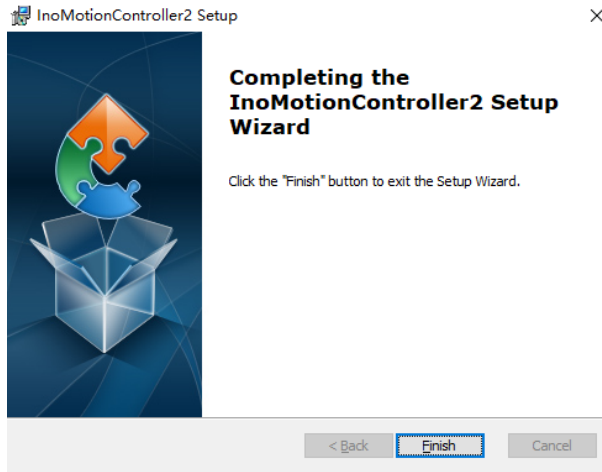
6. Select the installation path.



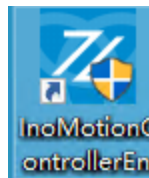
7. Click **Install**.



8. Click **Finish** to complete the installation.



9. Check the icon after installation.



2.2 Interface Introduction

The InoMotionController software interface is divided into five functional areas, as described below.

- ① **Tool bar:** The tool bar contains five tabs, including **Card**, **DeviceConfig**, **SysConfig**, **Motion**, and **Version**. Each tab has different buttons, which allow you to click to enter different function operation areas.
- ② **Device tree:** It displays all master and slave stations.
- ③ **Function operation area:** After clicking different buttons in the tool bar, you can perform different operations, such as viewing the card status, setting the card type and cycle, configuring device parameters and system parameters, and testing motion functions.
- ④ **Emergency stop status area:** In the case of emergency stop, **EMG ON** is highlighted in red. In the case of non-emergency stop, **EMG OFF** is highlighted in green.
- ⑤ **Log bar:** It allows you to print operation records, status prompts, and alarms.

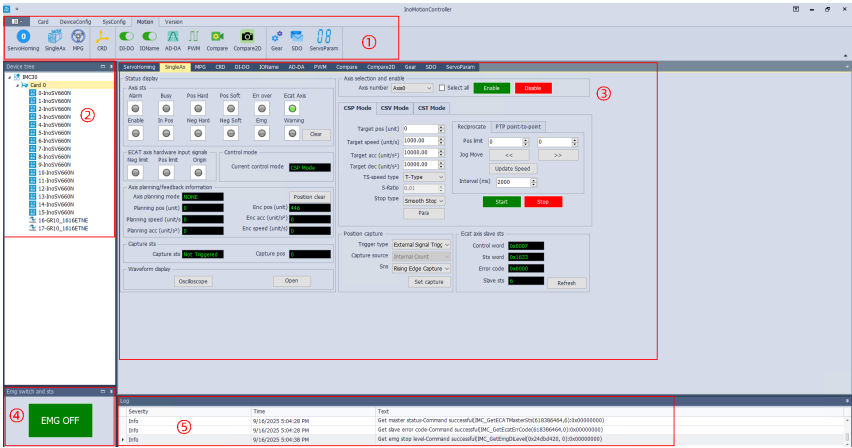


Figure 2-2 Function areas of the software interface

2.3 Overall Process

The overall flow of the InoMotionController software is divided into two modes, including device parameter configuration mode and motion function test mode, as shown in the following figure.

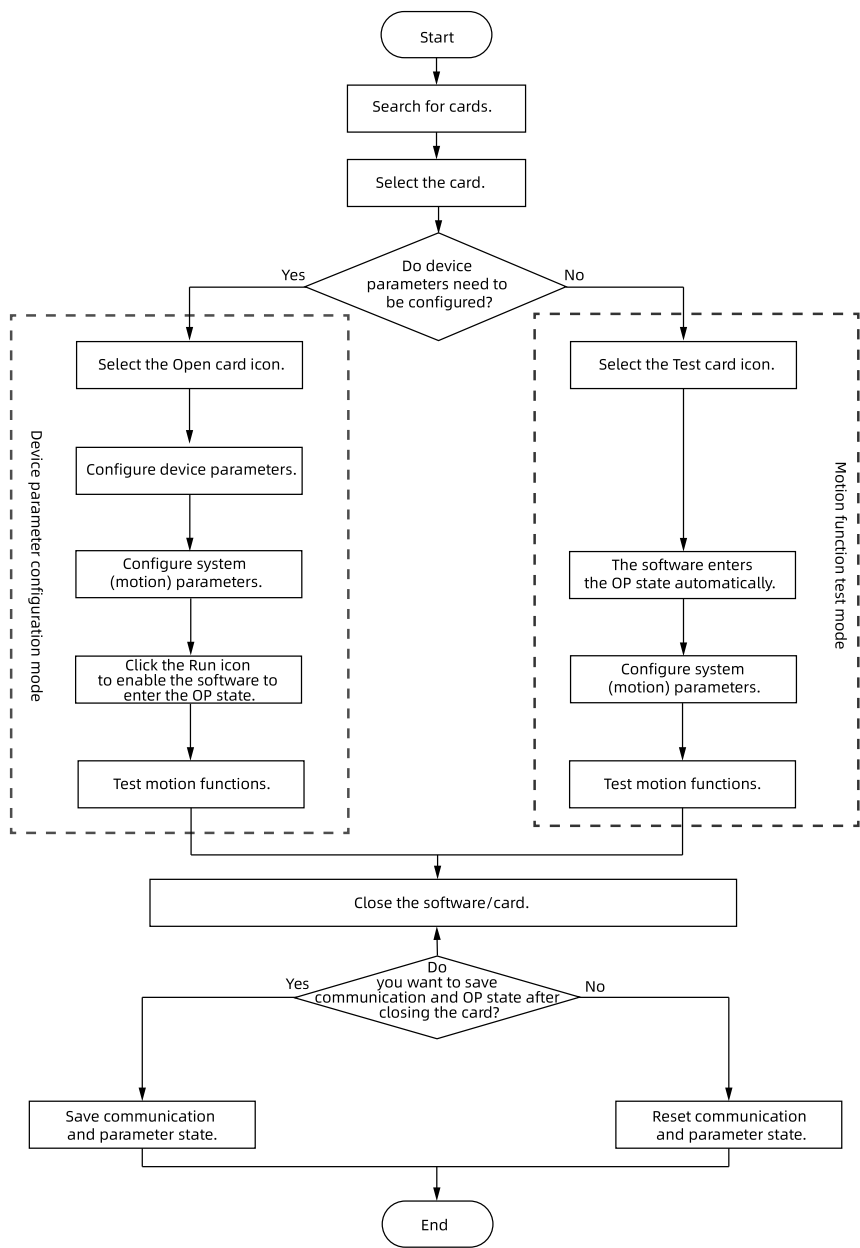


Figure 2-3 Overall process

Note:

Mode	Difference	Similarity	Detailed flowchart
Device parameter configuration mode	Device parameters can be configured.	System parameters can be configured.	"7.3 Device Parameter Configuration Flow" on page 117
Motion function test mode	Device parameters cannot be configured.		"7.4 Motion Function Test Flow" on page 118

Note

Device and system parameters:

- Device parameters: Include descriptions of the slave (such as the XML file of the slave), and the card type and control cycle of the IMC30G-E master card.
- System parameters: Indicate the system motion parameters, such as emergency stop parameters, axis parameters (axis No., axis binding, and axis safety running parameters), encoder parameters, and I/O parameters.

2.4 Starting the Software and Opening Cards

Note

Before using this software, choose **Control Panel > All Control Panel Items > Programs and Functions** and check that .net framework4.0 or a later version has been installed on your industrial PC. If this program is not installed, find dotNetFx40Full_x86_x64.exe in the ...InoMotionController-x86\Install\dotnetfx40_full_x86_x64.zip or ...InoMotionController-x64\Install\dotnetfx40_full_x86_x64.zip directory and install it.

1. After the installation is complete, double-click the software icon on the desktop, or double-click InoMotionController.exe in the software installation folder to open the software, as shown in the following figure.

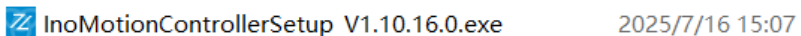


Figure 2-4

2. Enter the InoMotionController start interface. In this case, the software automatically scans the card inserted in the computer and displays it in the left device tree.

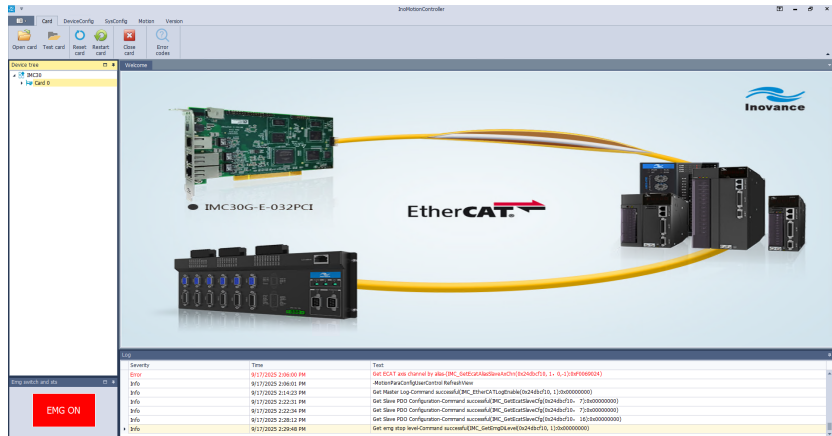
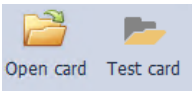


Figure 2-5

You need to open a card to enable communication with the motion control card. On the **Card** tab of the tool bar, click **Open card** or **Test card**.



The following table shows the differences between **Open card** and **Test card**.

Type	Description
Open card	It is the common card opening mode. Select this mode if you want to enter the DeviceConfig tab. After you click Open card , the DeviceConfig tab is automatically displayed. You need to configure device parameters and system parameters, and enable the system to enter the OP state. Then you can test motion functions. For details, see "3.1.1 Device Parameter Setting Interface" on page 18 .
Test card	If you need to enter the Motion tab directly without configuring device parameters, select this mode. After you click Test card , the default device parameters and system parameters are used. The system enters the OP state automatically and the Motion tab is displayed. For details, see "3.2.1 System Parameter Setting Interface" on page 33 .

Click the card to be opened in the device tree (if there is only one card in the device tree, you do not need to click the card), and then click the required card opening mode (**Open card** or **Test card**). The following section takes "Card 0" as an example.

Flow for Open card mode

The flow for Open card mode is as follows.

- ① Check that the number of obtained cards is 1. If it is 0, check whether the card and card drive are installed successfully.
- ② In the device tree, select the control card to be opened.
- ③ Click **Open card**.



Pay attention to the log bar information during card opening.

Log		
Severity	Time	Text
Info	9/16/2025 5:14:55 PM	Get Motion Control Card Handle-Command successful[IMC_OpenCardHandle(0,0x24dbd108):0x00000000]
Info	9/16/2025 5:14:55 PM	Get Board Arm Clock-Command successful[IMC_GetArmClock(0x24dbd108,45436,45436):0x00000000]
Info	9/16/2025 5:14:55 PM	Get emg stop level-Command successful[IMC_GetEmgDLevel(0x24dbd108,1):0x00000000]
Info	9/16/2025 5:14:55 PM	Upload Controller Device Configuration File-Command successful[IMC_UploadDeviceConfig(0x24dbd108, D:\Inovance\InoMotionController_V1.10.16.0_en\InoMotionController\DeviceKntfMaster\MASTER_CONF.xml):0x00000000]

After the card is opened, the icon of the card in the device tree changes from  to , and the **CardSts** tab under the **DeviceConfig** tab is automatically displayed.

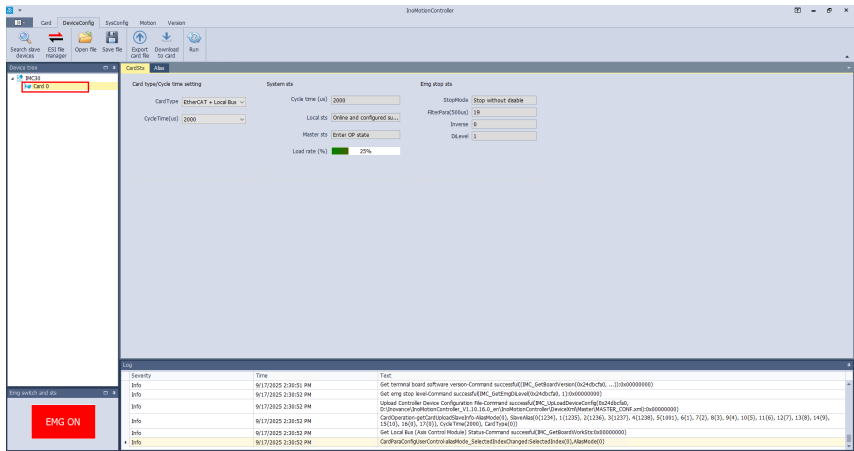
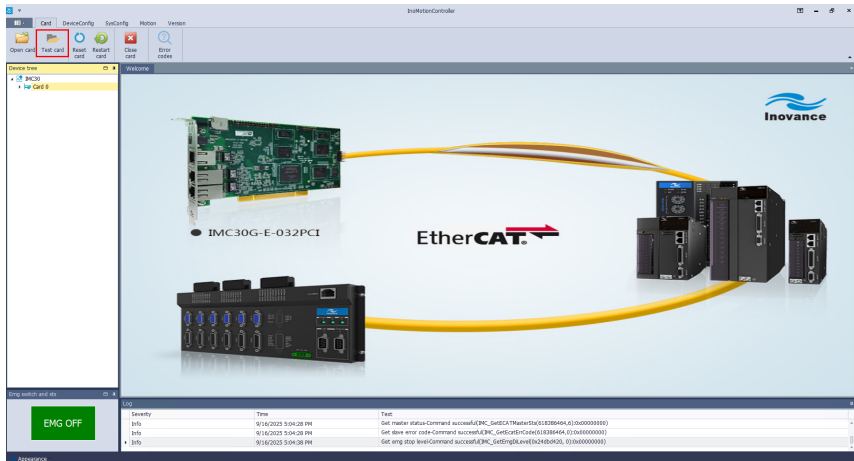


Figure 2-6 **DeviceConfig** tab after card opening is completed

Flow for Test card mode

Click **Test card** to enable one-click card opening. Before card opening, check that the slaves are in normal state.



After the test card is opened successfully, the card icon in the device tree changes from  to , and the **SingleAx** tab under the **Motion** tab is automatically displayed. In this case, the log bar displays "Bus initialization successful, system entered OP state", as shown below.

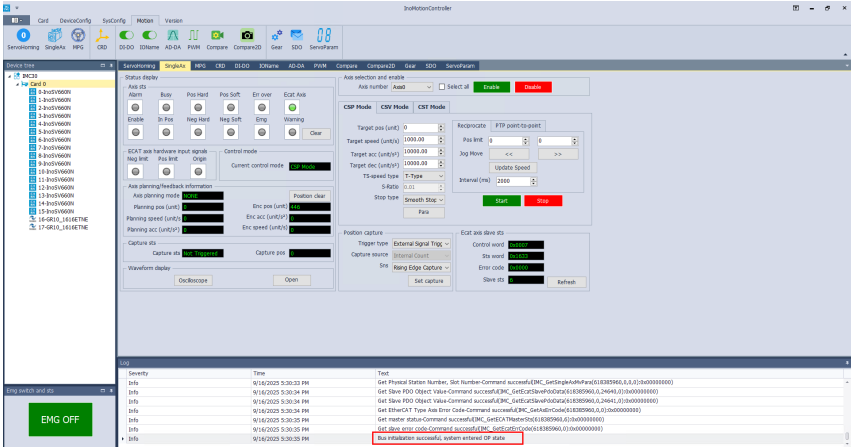


Figure 2-7 Interface after the Test card mode is selected

3 Parameter Configuration

Before setting parameters, read ["7.3 Device Parameter Configuration Flow" on page 117](#) again to understand the process clearly.

Note

- In the Inovance motion control card system, two types of parameters need to be configured: device parameters and system parameters.
 - Device parameters: Include descriptions of the slave (such as the XML file of the slave), and the card type and control cycle of the IMC30G-E master card.
 - System parameters: Indicate the system motion parameters, such as emergency stop parameters, axis parameters (axis No., axis binding, and axis safety running parameters), encoder parameters, and I/O parameters.
 - By default, all safety switches (such as positive limit signals, negative limit signals, and alarm signals) are off. You need to manually turn on the switches.
 - Precautions for emergency stop parameters: In view of safety issues, if the emergency stop circuit is not connected, the system determines that emergency stop is triggered by default. Therefore, before motion function test, enable the inversion function or disable the emergency stop switch manually. Otherwise, the motor cannot rotate.
-

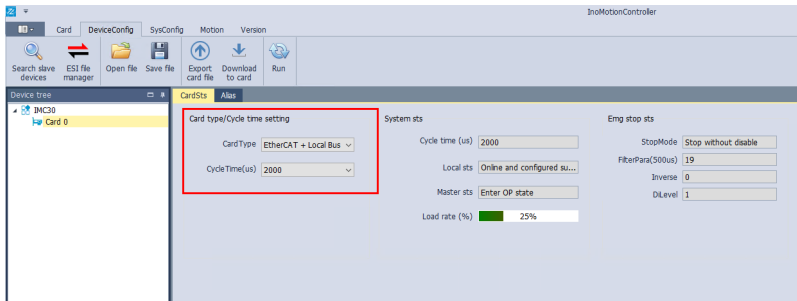
3.1 Device Parameter Configuration

3.1.1 Device Parameter Setting Interface

The device parameters mainly include the card type, card cycle, and descriptions of the slave device.

Setting the card type and card cycle

After selecting **Open card**, you will automatically jump to the **CardSts** tab under the **DeviceConfig** tab, as shown in the following figure.

Figure 3-1 CardSts tab under the **DeviceConfig** tab

Setting the card type

The IMC30G-E supports EtherCAT bus control and terminal board pulse control. The software automatically sets the card type to "EtherCAT+ terminal board" or "EtherCAT" based on whether the card is installed with a terminal board. However, you need to select a card type based on the actual conditions, as shown in the following table.

Table 3-1 Card type of the IMC30G-E

Number	Peripheral device	Card type
1	Only the EtherCAT slave is connected.	EtherCAT
2	Both the EtherCAT slave and IMC30-6G terminal board are connected.	EtherCAT + terminal board
3	Only the terminal board of the IMC30-6G axis control module is connected.	Terminal board (and then click the Search slave devices icon in the tool bar).

After the setting is completed, the value is written to the card automatically.

Setting the card cycle

If the cycle set automatically is not appropriate, you can adjust the bus communication cycle (in μs) in the **CycleTime(us)** drop-down box.

- The larger the cycle, the poorer the control real-time performance. The smaller the cycle, the higher the load rate of the card. Adjust the cycle based on actual conditions such as the number of slaves and resource utilization.
- Recommended value: 1000 μs

After the setting is completed, the value is written to the card automatically.

Introduction to the DeviceConfig tab

There are seven icons under the **DeviceConfig** tab.

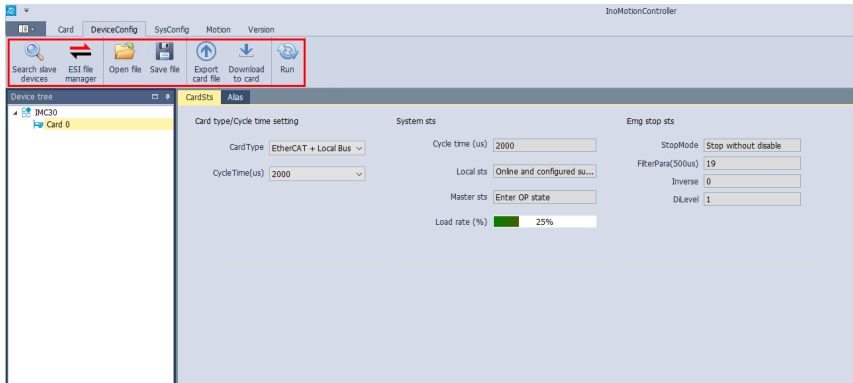


Figure 3-2 DeviceConfig tab

- **Search slave devices:** You can scan the EtherCAT slave device on the card link, identify the slave device mounted on the link, and view the slave device displayed on the device tree. If the card is connected to a terminal board, the terminal board is also displayed on the device tree.
- **ESI file manager:** The ESI file is the slave device description file (in xml format). The slave can be identified through ESI file matching in the background during search. If an unknown slave exists on the link, you can add the ESI file of the slave through this icon to identify the slave.
- **Open file:** You can import the ENI file in the local file path to the card. Being the device parameter file (in xml format), the ENI file stores master and slave device parameters and configuration information for establishing the bus.
- **Save file:** You can save the device parameters set as an ENI file. After saving the file, you can download it to other cards through **Open file**.
- **Export card file:** You can export the ENI file that is valid internally on the card and save it locally. After exporting the file, you can download it to other cards through **Open file**.
- **Download to card:** You can add the device parameters to an ENI file and download the file to the card.
- **Run:** After you click **Run**, the master station will set up the EtherCAT bus based on the device parameters stored in the ENI file on the card and complete the bus initialization and configuration process. Then the system enters the OP mode.

Note

You can download an ENI file to the card when you click **Open file** and **Download to card**. The difference is as follows:

- **Open file:** Download the local ENI file to the card.
- **Download to card:** Save the parameters set in the software interface in an ENI file and download it to the card.

Therefore, do not click **Download to card** after clicking **Open file**. Otherwise, incorrect parameters set on the interface will overwrite the parameters stored in the card, which may cause the system to fail to enter the OP state.

3.1.2 Device Parameter Configuration Process

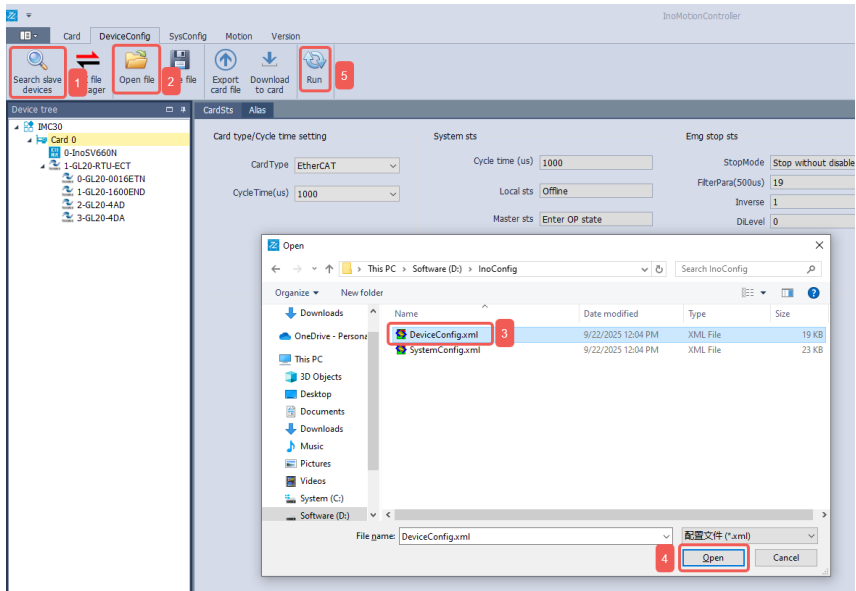
Device parameters can be configured in two ways:

1. If an ENI file is available locally, you can import the ENI file to configure automatically.
2. Configure manually in the software interface.

Method 1: Import the ENI file for automatic configuration

1. Click **Search slave devices** in the tool bar. After successful scanning, the software identifies the network topology on the site and displays the slave on the device tree.
2. Make sure that the device parameter file (ENI) to be imported is ready locally, and click **Open file**. (Ensure that the network topology contained in the ENI file is consistent with that on the site. The file can be a device parameter file exported locally or from other devices or local machines, or can also be a device parameter file saved locally or on other devices.)
3. Locate the ENI file to be imported in the pop-up file manager and select the ENI file.
4. Click **Open** to set parameters to the motion control card automatically. After successful downloading, the log bar displays a prompt.
5. Click **Run**. The system continues to complete EtherCAT initialization and configuration, and enters the OP status.

The following figure shows the operation flow.



Method 2: Manually configure device parameters in the software interface

Configure parameters one by one on the InoMotionController software interface.

1. Search for slave devices.

Click **Search slave devices** to scan the EtherCAT slave. After successful scanning, the software identifies the slave device that is mounted on the link and displays it on the device tree. The log bar prints "Scan slave devices complete!" and the number of scanned slave devices, as shown below.

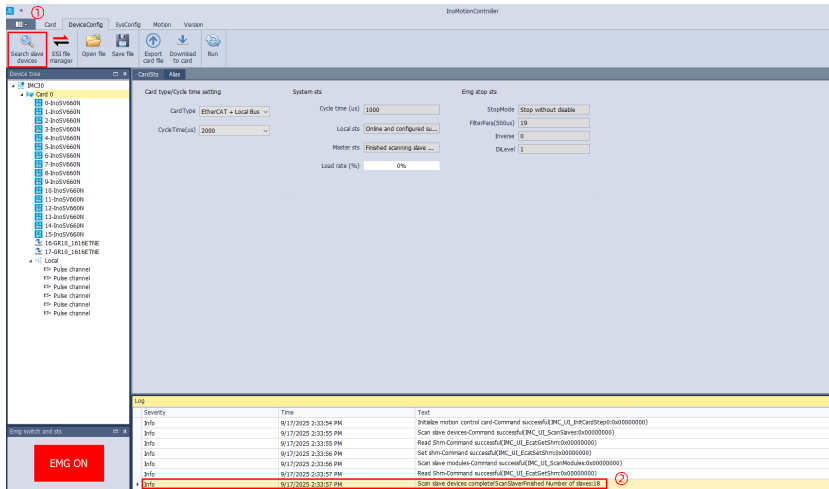


Figure 3-3

2. If any device is not recognized, add an ESI file. Skip this step if all devices are recognized.

During scanning, slave identification is achieved by matching the device description file (ESI file) stored in the software with the slave device code. If the ESI file of a slave is missing in the software, the slave is not recognized. After the scanning is done, the slave is marked as "UnkownBox" in the device tree. If you click this slave in the device tree, a dialog box indicating "No corresponding ESI file was found" will be displayed and the device code of the unrecognized slave will be displayed, as shown in the following figure.

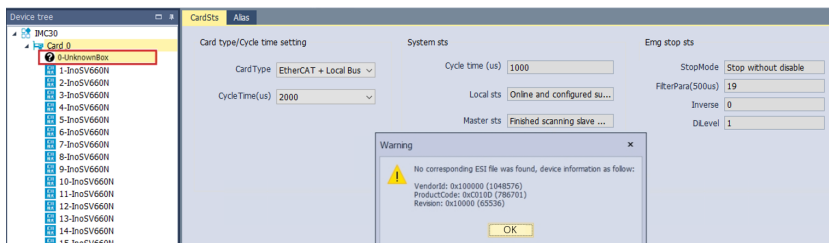


Figure 3-4 Scanning the unrecognized slave and clicking the slave in the device tree

When an unrecognized device is scanned, you can contact the slave manufacturer to obtain the ESI file (in xml format) of the slave device and add it to the background using the ESI file manager. Follow the steps below.

- a. Click **ESI file manager** in the tool bar. Click the import and check duplicate button in the displayed dialog box.

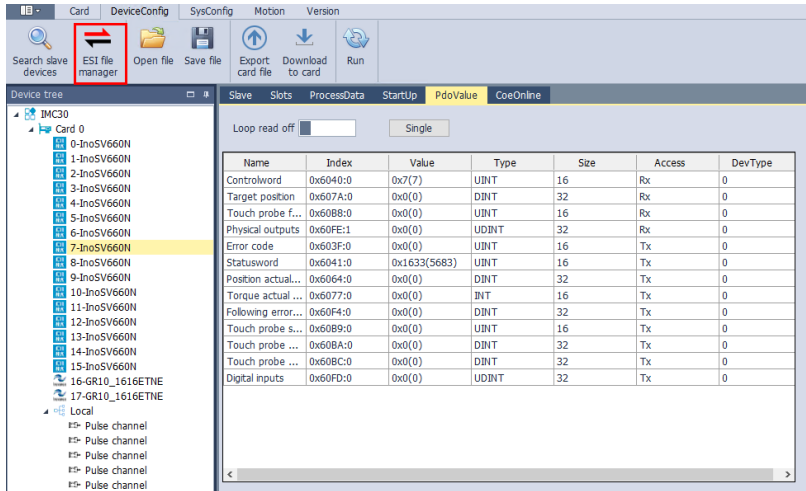


Figure 3-5 ESI file manager dialog box

- b. After clicking the import and check duplicate button, the **Open** dialog box is displayed. Select the ESI file to be added and click **Open**.
 - c. After opening the file, the ESI file manager checks whether the selected file and the existing ESI file are repetitive, and pops up a dialog box indicating whether to archive the file. Click **OK** to import the ESI of the unrecognized slave into the software.
 - d. After the importing is complete, click **OK** in the displayed dialog box. Close the ESI file manager, restart the software, and scan again. The device that is not recognized will be recognized normally.
3. **Configure the device parameters of the slave. Skip this step if default device parameters are used.**

Based on the slave ESI file, the software configures default device parameters. If the ESI file is correct, the default parameters can be used directly to establish the bus. The system enters the OP state. However, if the default device parameters provided in the ESI file are not appropriate, you can configure them in the software interface.

The slave device parameter configuration tabs are **Slave**, **Slots**, **ProcessData**, and **StartUp**. Click the slave in the device tree to switch to the **ProcessData** tab automatically, as shown below.

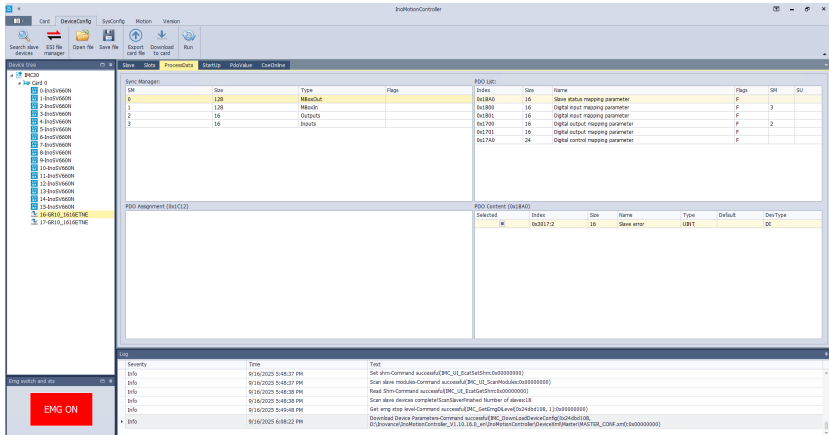


Figure 3-6 Device parameter configuration

- **Slave: Parameters related to the control mode**

The **Slave** tab mainly includes parameters related to the EtherCAT control mode. Click the **Slave** tab to modify the following information:

- **OpMode**: Free protocol mode switch. 0. Disabled: The slave control follows the standard EtherCAT application layer protocol. 1. Enabled: The slave is controlled directly by object word, and the slave control does not comply with the standard protocol.
- **ReferenceClock**: Reference clock switch 0. Disabled: The reference clock of the slave is disabled. The slave is in the Free-Run mode, and is not synchronized with other slaves. 1. Enabled: The reference clock of the slave is enabled and the slave is in the DC synchronous control mode.

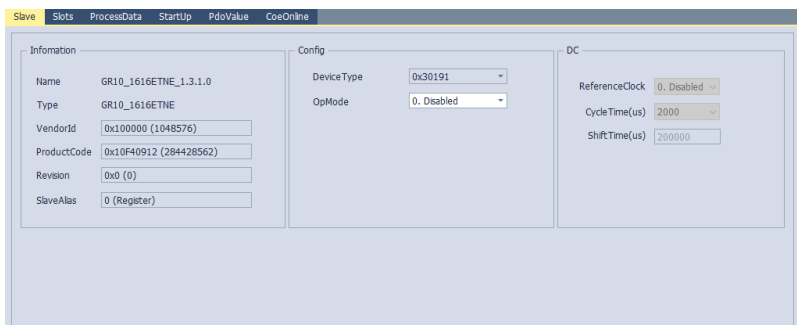


Figure 3-7 Slave tab

- **Slots: Slot module allocation**

If a slave such as a coupler or multi-axis servo motor is connected to a sub-module (slot), the slave belongs to the module slave. If no device is connected to the sub-module, skip this part.

On the **Slots** tab, you can add and delete slots based on the actual number of slot modules. After selecting the module in the device tree, click the **Slots** tab, as shown below.

- ①**Selected slot list:** It displays the slot that has been added to the current slave.
Note: The model, number, and sequence of the slots in the selected slot list must be the same as those of the actual slots connected to the module. Otherwise, the system will fail to enter the OP state.
- ②**Optional slot list:** It displays the slot supported by the slave. You can select the slot and add it to the slave.
- ③**Add/Delete button:** "<" is the Add button. Select a slot to be added in the optional slot list and click this button to add the slot to the current slave. The slot is displayed to the last row of the selected slot list. "X" is the Delete button. Select a slot to be deleted in the selected slot list and click this button to delete the slot.

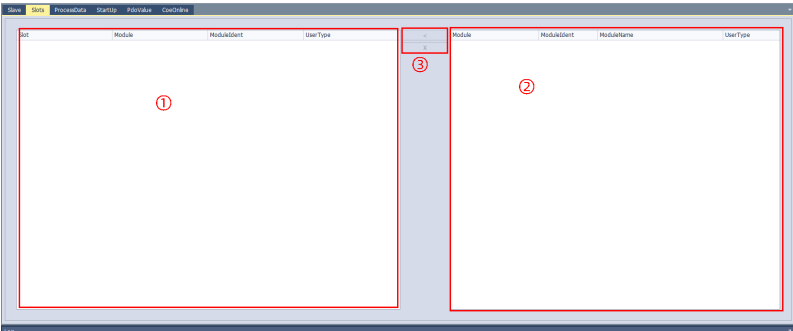


Figure 3-8 Slots tab

Browse and set the slot module.

In the device tree, click the slot below the slave to automatically switch to the **ModuleInfo** tab, where you can view the basic information of the slot module, as shown below.

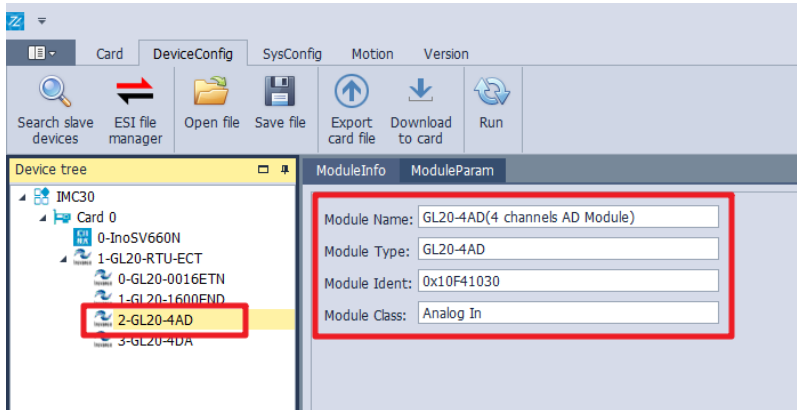


Figure 3-9 Slot module information tab

Click the **ModulePara** tab to configure the device parameters. Configurable items vary with different slot modules. As shown in the following figure, the slot module has four AD analog input channels. You can set the channel conversion mode (Convert Mode), enable or disable the channel, and set filter parameters, etc.

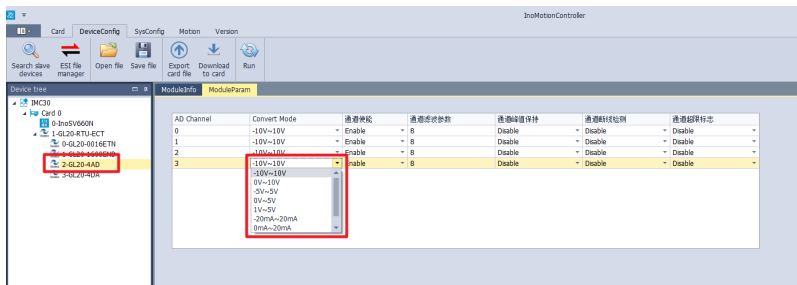


Figure 3-10 Slot module parameter configuration tab

- **ProcessData: PDO object configuration**

Real-time communication between the EtherCAT master and slave is achieved through PDO objects in data frames transmitted and operated during each communication cycle.

PDO objects are divided into RxPDO and TxPDO. The slave receives the master's instructions through RxPDO and feeds its own status to the master through TxPDO, as shown in the following figure.

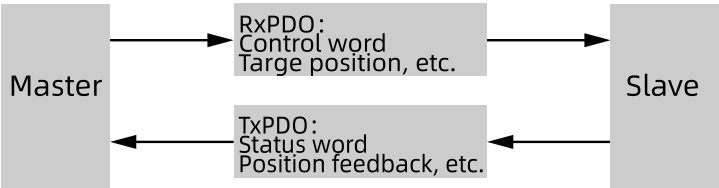


Figure 3-11 PDO process data communication between master and slave

The software configures the default PDO objects based on the information provided by the device description file (ESI) of the slave. These default PDO objects basically meet user requirements. Select the slave in the device tree and click **ProcessData** to enter the PDO object configuration tab. You can view the PDO configured by default. The tab is divided into four panes, as shown in the following figure.

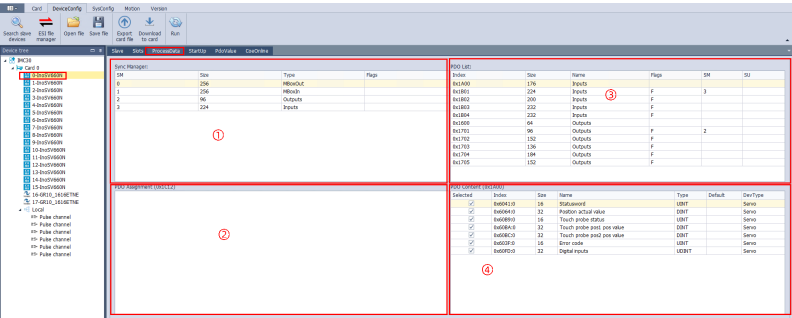


Figure 3-12 ProcessData (PDO object configuration) tab

①Sync Manager

You can view the size and type of each Sync Manager (SM channel). Select a row of SM. The **PDO Assignment** pane will refresh the PDO group assignment for this SM channel.

②PDO Assignment

You can view the PDO group assignment for the selected SM channel. This pane lists all PDO groups that can be added to the selected SM channel. Checked items are PDO groups that have been added to the SM channel.

③PDO List

You can view the basic information of all available PDO groups of the selected slave, including the PDO group type, modifiable status, and SM channel assignment.

Field	Meaning	Description
Name	PDO group type	"Input" indicates that the PDO group is the TxPDO group and "Output" indicates that the PDO group is the RxPDO group.
Flags	PDO group status	"F" or "FM" indicates that the PDO group cannot be modified. If this column is empty, the group is a user-defined group. You can add or delete PDO objects in the group.
SM	It is the SM channel to which the PDO group is assigned.	If this column is empty, the PDO group is not used.

If you select a PDO group in the **PDO List** pane, the **PDO Content** pane will refresh the PDO object assignment of the group.

④PDO Content

You can view the PDO object assignment of the selected PDO group. This pane displays all PDO objects that can be added to the selected PDO group. The "Selected" field is described as follows.

Table 3-2 "Selected" status description

Status	Meaning
Hollow rectangle	The PDO object is not added to the group.
Checked box	The PDO object has been added to the group.
Black solid rectangle	The PDO object has been added to the group and the status cannot be modified (this status only occurs in the non-modifiable PDO group).

Note

In the **PDO Content** pane, you can add and delete the PDO content of the slave as needed. This will directly affect the establishment of the bus and the use of some slave functions. For details, see ["7.1 PDO Adding/Deleting Procedure" on page 102](#).

- **StartUp: Setting for default value startup**

When the bus is established, the startup default value for the object word can be set through SDO (mailbox communication) during the pre-running phase (before the EtherCAT bus enters the OP state). On the **StartUp** tab, you can configure the startup default values, which are sent to the slave through SDO during the pre-running phase.

The tab lists the startup default values automatically generated based on the slave device description file. The default values basically meet the requirements and do not need to be set. The selected row is highlighted in yellow. You can use the buttons at the bottom operating bar.

- **Move UP:** Move the selected object word up one line.
- **Move Down:** Move the selected object word down one line.
- **New:** Add the startup default value for an object word.
- **Delete:** Delete a row.
- **Edit:** Modify the startup default value of the selected object word.

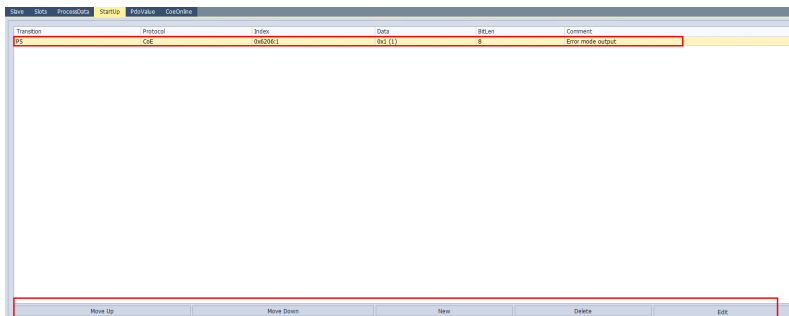


Figure 3-13 StartUp tab

If you click **New** or **Edit**, the **New Item** dialog box appears. You can manually enter the PDO information to be added, or you can select a PDO in the table to automatically fill in the information. Fields in the **New Item** dialog box are described as below.

- **Transition:** You can omit it.
- **Comment:** You can add texts to the object word.
- Fill in the index and sub-index of the object word in **Index** and **SubIndex**.
- Select the size of the object word from the **BitLen** drop-down box.
- In the **Data** text box, fill in the decimal value. You can also click **hex** to fill in the hexadecimal value in the displayed **Hex Editor** dialog box.
- Click **OK** to complete the configuration.

New Item

Transition: PS Comment: New Item

Index(hex): 0x0 SubIndex: 0

BitLen: 32 Data(dec): 0 hex

Index	SubIndex	Bitlen	Value	Name
0x1000	0	32	131474	Device type
0x1001	0	8	0	Error Register
0x1008	0	80	0	Device name
0x1009	0	32	0	Hardware v...
0x100a	0	32	0	Software v...
0x1c00	0	0	0	Sync manag...
0x1018	1	32	0	Vendor ID
0x1018	2	32	0	Product Code
0x1018	2	32	0	Revision

OK Cancel

Figure 3-14 New Item dialog box

4. Download the device parameters to the card to make the parameters take effect.

After the device parameters are set, click **Download to card** to download the parameters to the motion control card. After the download is successful, a prompt appears in the log bar, as shown in the following figure.

Severity	Time	Text
Info	9/17/2025 2:34:05 PM	Scan slave modules Command successful [MC_Ut_ScanModules:cb00000000]
Info	9/17/2025 2:34:06 PM	Read Shm-Command successful [MC_Ut_GetShm:cb00000000]
Info	9/17/2025 2:34:06 PM	Scan slave devices complete[ScanSlaveFinished Number of slaves:18]
Debug	9/17/2025 2:34:06 PM	Local bus online and configured successfully
Debug	9/17/2025 2:34:06 PM	Local bus online and configured successfully
Info	9/17/2025 2:42:32 PM	Download Device Parameters-Command successful [MC_DownloadDeviceConfig:b24dc0b0] [D:\Source\bin\InsulatorControler_V17_16_0\bin\InsulatorControlerDev\bin\MasterMASTER_CONF_vrb-b000000000]

Figure 3-15 Prompt indicating successful download of device parameters

5. Make the system enter the OP state.

After the device parameters are set, click **Run** in the tool bar. The system continues to complete EtherCAT initialization and configuration, and enters the OP state, indicating that the bus is established. View the log information to check that the system has entered the OP state.

Severity	Time	Text
Info	9/17/2025 2:45:17 PM	Download Device Parameters-Command successful[IMC_DownloadDeviceConfig(0x24dbcfa0, D:\Inovance\InoMotionController_V1.10.16.0_en\InoMotionController\DeviceXml\Master\MASTER_CONF.xml):0x00000000]
Info	9/17/2025 2:45:20 PM	Get ECAT motion control card sts-Command successful[IMC_GetECATMasterSts(0x24dbcfa0,5):0x00000000]
Info	9/17/2025 2:45:24 PM	Configure slave-Command successful[IMC_Ui_ConfSlaves:0x00000000]
Info	9/17/2025 2:45:35 PM	Get master status-Command successful[IMC_GetECATMasterSts(0x24dbcfa0,6):0x00000000]
Info	9/17/2025 2:45:35 PM	Get Local Bus (Axis Control Module) Status-Command successful[IMC_GetBoardWorkSts(2):0x00000000]
Info	9/17/2025 2:45:35 PM	Bus initialization successful, system entered OP state

Figure 3-16 Prompt for entering the OP state

After the system enters the OP state, select the card in the device tree. The load rate is refreshed on the **CardSts** tab. The load rate not higher than 80% is recommended. If the load rate exceeds 80%, select a longer card cycle from the **CycleTime** drop-down box on the **CardSts** tab. After the setting, the system enters the OP state.

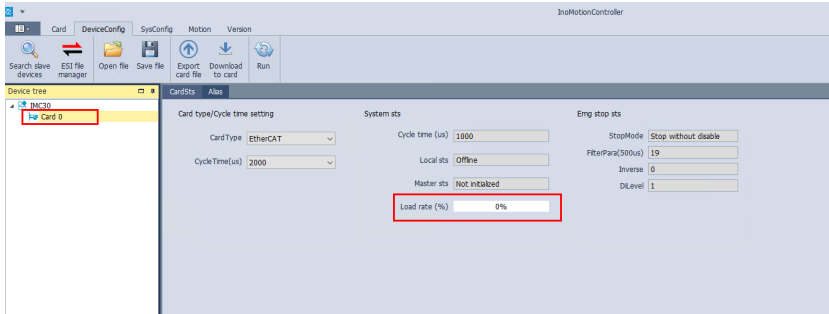


Figure 3-17 CardSts tab after the system enters the OP state

Note

If the card load rate is too high, the error indicating that the DSP is always busy may be reported, and the system cannot enter the OP state.

6. Save the device parameter file.

If you need to initialize the card parameters for your host controller program, or import the same device parameter settings as the local device for other devices in the same model, you need to save the device parameters currently set for subsequent usage. The steps for saving device parameters are as follows:

- ① Check the log box and ensure that the system has entered the OP state.
- ② Click **Save file** in the tool bar to open the **Please select file** dialog box.
- ③ Set a proper storage path.
- ④ Name the device parameter file.
- ⑤ Click the **Save** button.

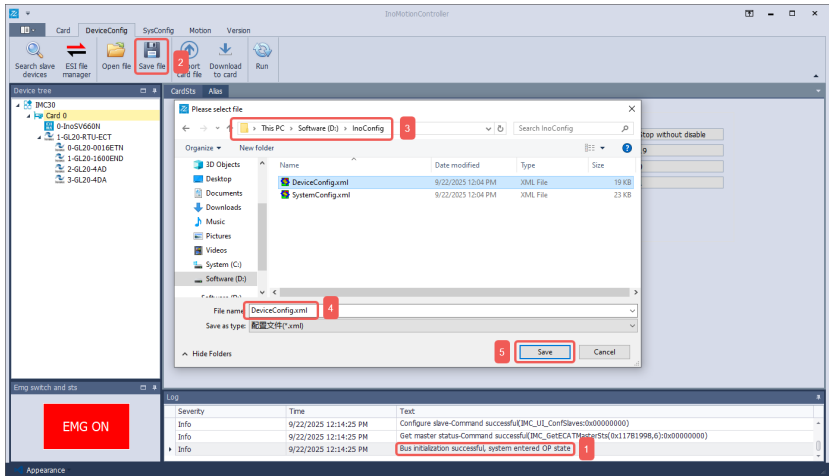


Figure 3-18 Process for saving device parameters

3.2 System Parameter Configuration

3.2.1 System Parameter Setting Interface

View the log bar and check that the system has entered the OP state. Then configure the system parameters. System parameters are motion-related parameters, including emergency stop parameters, axis parameters, local encoder/pulse parameters, and I/O parameters.

Under the **SysConfig** tab, there are **Open file**, **Save file**, and **Download to card** icons.

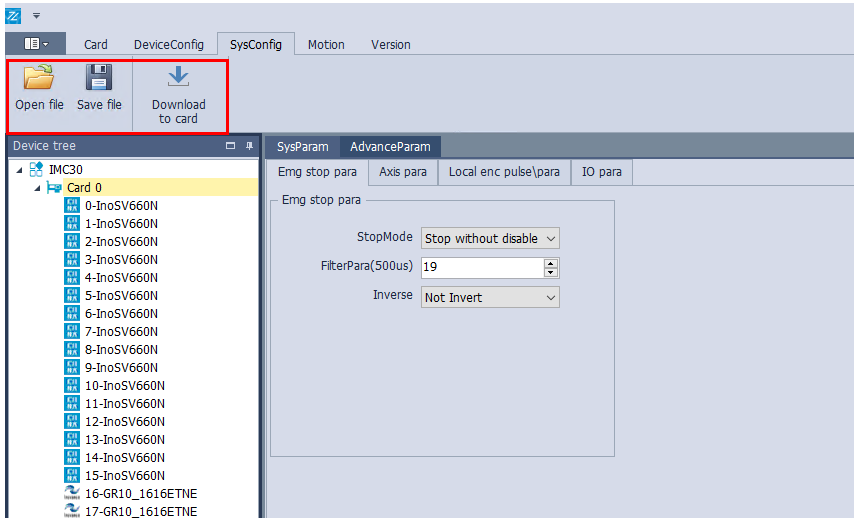


Figure 3-19 SysConfig tab

- **Open file:** You can click this icon to import the correct local system parameter file (in XML format) directly to avoid setting them one by one.
- **Save file:** You can save the system parameters set in the software interface in XML file. After saving the file, you can download it to other control cards through **Open file**.
- **Download to card:** You can download the system parameters imported from the XML file or set in the software to the motion control card.

3.2.2 System Parameter Configuration Process

System parameters can be set in two ways: importing XML files for automatic configuration and manual configuration in the software interface.

Method 1: Import XML files for automatic configuration.

- ① Click **Open file**.
- ② Select the system parameter file to be imported.
- ③ Open the file.
- ④ Click **Download to card** to complete the settings.

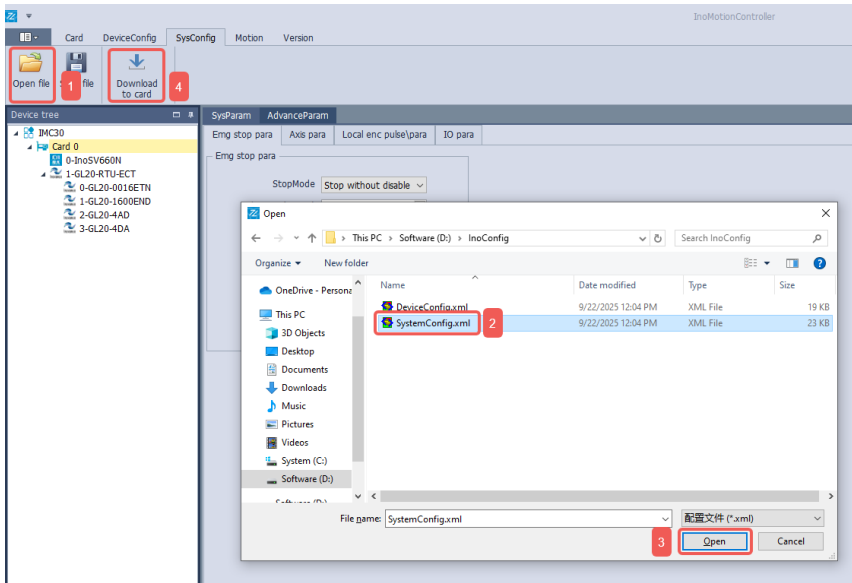


Figure 3-20 Process for importing the system parameter file

Method 2: Manually configure system parameters in the software interface.

Configure system parameters in the InoMotionController software interface.

1. Set parameters related to emergency stop.

The following figure shows the emergency stop parameter interface, which includes three parameters.

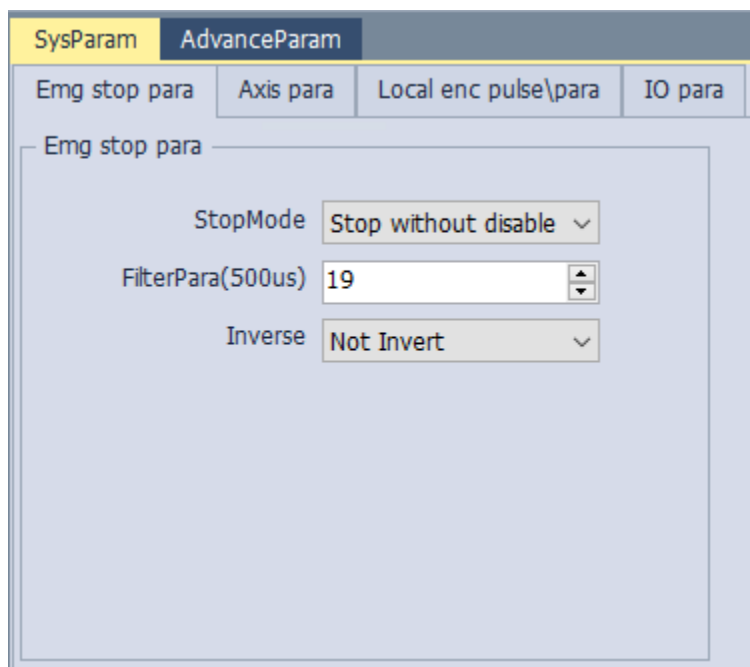


Figure 3-21 Parameter settings for emergency stop

- StopMode (emergency stop mode): Select **Servo off directly**, **Stop without disable**, or **Servo off after stop** from the drop-down box.
- FilterPara (filter parameter setting): The parameter ranges from 1 to 65535 in the unit of 500 μ s. Filter time constant = FilterPara x 500 μ s. If FilterPara is set to 2, the filter time constant is 2 x 500 μ s = 1 ms.
- Inverse (inverse of emergency stop input): By default, if the emergency stop circuit is not connected, the system determines that emergency stop is triggered. Therefore, when the emergency stop circuit is not connected, reverse the emergency stop input.

2. Set the axis parameters.

The screenshot shows a software interface for configuring axis parameters. It is organized into several panels:

- Axis number:** A dropdown menu showing 'Axis9'.
- Axis binding:**
 - AxType:** A dropdown menu showing 'ECAT Axis'.
 - OutputChn:** A dropdown menu showing 'Output Channel9'.
 - LocalEncSrc:** A dropdown menu showing 'External Encoder'.
 - DirInverse:** A dropdown menu showing 'Not Invert'.
- Axis properties:**
 - ArrivalError(unit):** A text input field with '1000'.
 - ArrivalTime(ms):** A text input field with '40'.
 - TrackingError(unit):** A text input field with '1048576'.
 - SoftPosLmtPos(unit):** A text input field with '2147483647'.
 - SoftNegLmtPos(unit):** A text input field with '-2147483647'.
 - Property para:** A button at the bottom right of this section.
- Axis safety operation para:**
 - StartVel(unit/s):** A text input field with '0.0'.
 - MaxVel(unit/s):** A text input field with '52428000.0'.
 - MaxAcc(unit/s²):** A text input field with '500000000.0'.
 - MaxDec(unit/s²):** A text input field with '500000000.0'.
 - MaxJerk(unit/s³):** A text input field with '499999993495552.0'.
 - StopDec(unit/s²):** A text input field with '100000000.0'.
 - EStopDec(unit/s²):** A text input field with '2000000000.0'.
 - Safety para:** A button at the bottom right of this section.
- Axis safety check enable:**
 - AlarmActive:** A dropdown menu showing 'Enable'.
 - SoftLmtActive:** A dropdown menu showing 'Disable'.
 - HwLmtActive:** A dropdown menu showing 'Enable'.
 - ErrorLmtActive:** A dropdown menu showing 'Disable'.

Figure 3-22 Configuring axis parameters

Axis parameters mainly include **Axis number**, **Axis binding**, **Axis properties**, **Axis safety operation para**, and **Axis safety check enable**, as described below:

- **AxNo:** Select the axis to be configured (axis 0 to 31 are available). After an axis is selected, the parameters are set for the selected axis.
- The **Axis binding** area contains the following parameters:
 - **AxType** (axis type): Three options are available, including **Local Axis**, **Virtual Axis**, and **ECAT Axis**. The default value is **Virtual Axis**. Select the actual axis type.
 - **OutputChn** (output channel): Each axis maps to one or multiple output channels. The default value is no output. Configure the output channel according to actual conditions. Note: Do not map multiple axes to the same channel.
 - **LocalEncSrc** (local encoder source): This parameter is valid when **AxType** is set to **Virtual Axis**. It specifies whether the counting source of the local axis position feedback is internal counter or encoder.
 - **DirInverse** (EtherCAT axis inversion): This parameter is valid when **AxType** is set to **ECAT Axis**. It sets whether the EtherCAT axis rotation direction is reversed.

Note

Observe the following precautions for the output channels when using the local axis and EtherCAT axis:

1. OutputChn (local output channel): Select a channel from output channels 0 to 5, as shown in the following figure.

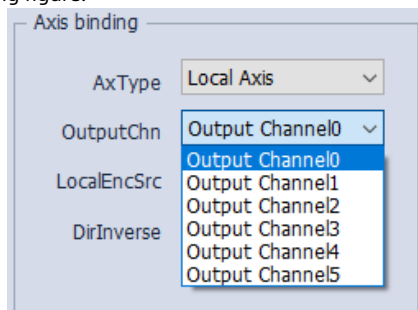


Figure 3-23 Binding of local axis and output channel

2. OutputChn (EtherCAT output channel): Select a channel from output channels 0 to 31, as shown in the following figure.

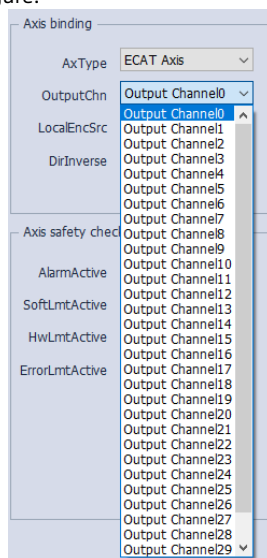


Figure 3-24 Binding of EtherCAT axis and output channel

3. The total number of output channels selected cannot exceed 32. The channel number of the EtherCAT axis and of the local axis starts from 0.

For example, if a system uses two local axes (AXIS0 and AXIS1) and two EtherCAT axes (AXIS2 and AXIS3), the axis output channels are configured as follows:

AXIS0 -> Output channel 0, local axis

AXIS1 -> Output channel 1, local axis

AXIS2 -> Output channel 0, EtherCAT axis

AXIS3 -> Output channel 1, EtherCAT axis

- Axis properties: It contains **ArrivalError** (arrival error), **ArrivalTime** (arrival time), **TrackingError** (position tracking error), **SoftPosLmtPos** (positive soft limit), and **SoftNegLmtPos** (negative soft limit). Set these parameters according to actual conditions. These parameters are valid only when the corresponding enabling bits are valid.
 - Axis safety operation para: It contains **StartVel** (start velocity), **MaxVel** (maximum velocity), **MaxAcc** (maximum acceleration), **MaxDec** (maximum deceleration), **MaxJerk** (maximum jerk), **StopDec** (stop deceleration), and **EStopDec** (emergency stop deceleration). Set these parameters according to actual conditions.
 - Axis safety check enable: It contains **AlarmActive** (alarm enable), **SoftLmtActive** (soft limit enable), **HwLmtActive** (hard limit enable), and **ErrorLmtActive** (error limit enable). These parameters are disabled by default. You need to determine whether to enable them based on actual conditions. Note that enabling of the safety check functions triggers the system response, for example, stopping or reporting alarms.
3. Set the local encoder/pulse parameters.

If the terminal board is connected, you can enter the **Local enc pulse\para** tab to set the parameters. If the terminal board is not connected, all parameters cannot be set on this tab. The following figure shows the **Local enc pulse\para** tab.

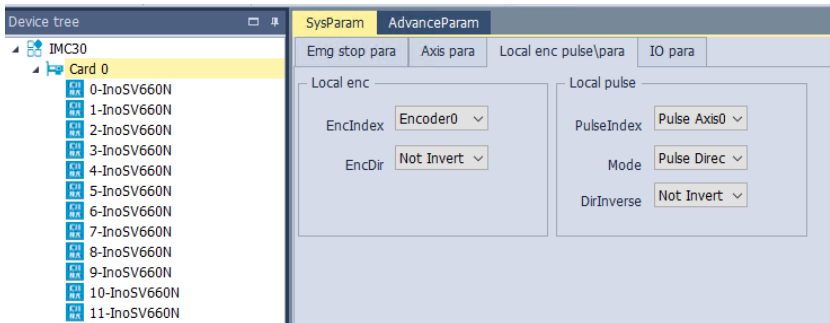


Figure 3-25 Local enc pulse\para tab

The **Local enc pulse\para** tab contains the **Local enc** pane and **Local pulse** pane. This interface is valid only when the local axis is used.

- Local enc: It contains **EncIndex** (encoder input channel), and **EncDir** (encoder direction)

- Local pulse: It contains **PulseIndex** (pulse output channel), **Mode** (output mode), and **DirInverse** (pulse direction reversal). **Mode** can be set to **Pulse Direction** or **Positive/Negative**. Set the parameters according to actual conditions.

4. Set the I/O parameters.

The screenshot shows the 'IO para' tab in a software interface. It contains seven main configuration panes:

- EtherCAT DI inversion:** Includes 'GroupNo' (dropdown, value 2) and 'InverseMask' (dropdown, value 'NotInvert').
- Local DI filter time:** Includes 'Index' (dropdown, value 0) and 'FilterPara(500us)' (input field, value 1).
- Local DI inversion:** Includes 'InverseMask' (dropdown, value 'NotInvert').
- Local special IO inversion:** Includes a vertical list of dropdowns: 'Ready' (NotInvert), 'Arrive' (NotInvert), 'Alarm' (NotInvert), 'PosLmt' (NotInvert), 'NegLmt' (NotInvert), 'Clear' (NotInvert), and 'Sv' (NotInvert).
- EtherCAT DO inversion:** Includes 'GroupNo' (dropdown, value 0) and 'InverseMask' (dropdown, value 'NotInvert').
- Local DO inversion:** Includes 'InverseMask' (dropdown, value 'NotInvert').
- Local Home/positive-negative limit/probe filter time:** Includes three input fields: 'HomeFilterPara(500us)' (0), 'LmtFilterPara(500us)' (0), and 'ProbeFilterPara(500us)' (0).

Figure 3-26 I/O parameter configuration

The **IO para** tab contains the following panes: EtherCAT DI inversion, Local DI filter time, Local DI inversion, Local special IO inversion, EtherCAT DO inversion, Local DO inversion, and Local Home/positive-negative limit/probe filter time. If the axis control module (terminal board) is not installed, local terminal board I/Os (including special I/Os) are invalid and cannot be configured.

The filter parameter (FilterPara) ranges from 1 to 65535 (unit: 500 μ s). The filter time constant equals FilterPara x 500 μ s. Example: When **FilterPara** is set to 2, the time constant is 1 ms (2 x 500 μ s).

5. Download the system parameters to the card to make the parameters take effect.

All system parameters have been set. Then click **Download to card** in the tool bar to download system parameters to the card. The parameters take effect immediately.

6. Save system parameters to a file.

Note

Unlike device parameters, system parameters are not stored in ROM by the card. After the card control system is powered on again, the system parameters are restored to the default values. You need to reset them again (that is, repeat all the preceding steps). Therefore, it is recommended to save system parameters as a file after setting for the first time by clicking **Save file**.

The process for saving system parameters to a file is as follows:

- ① Click **Save file** in the tool bar to open the **Please select file** dialog box.
- ② Set a proper storage path.
- ③ Name the system parameter file.
- ④ Click the **Save** button.

After saving the file, you can click **Open file** to select the saved system parameter file and download it to the card when you restart the system and enter the **SysConfig** tab.

3.3 Descriptions of Parameter Files Invoked By API

The device parameter file and system parameter file may be required during application development. Therefore, during parameter configuration, pay attention to the device parameter file and system parameter file.

- Device parameter file (ENI): On the **DeviceConfig** tab, you can click **Export card file** in the tool bar to save the device parameter file stored in the card to a local path. Or after setting device parameters in the software interface, you can click **Save file** to save the device parameters to the local path as a file. It is recommended to name the file as DeviceConfig.xml. You can download device parameters to the card through the API function IMC_DownloadDeviceConfig (UINT32 cardHandle, const char *pathName).
- System parameter file (motion parameters): On the **SysConfig** tab, you can click **Save file** to save system parameters to a local path. It is recommended to name the file as SystemConfig.xml. You can download system parameters to the card through the API function IMC_DownloadSystemConfig (UINT32 cardHandle, const char *pathName).
- After the device parameter file is configured successfully, you do not need to configure it again (that is, you do not need to invoke API functions when the software-based configuration is used). However, during application development, API functions are required during initialization by the system parameter file (motion parameters). For details, see Figure I/O parameter configuration.

4 Motion Function Test

After the system enters the OP state and system parameters are set, you can test each function through the InoMotionController software. The motion control function mainly includes drive homing, host controller homing, single-axis motion, hand wheel following, interpolation, DIO, AD/DA, PWM, position comparison output, electronic gear ratio setting, SDO read/write, and servo parameter read/write.

Click the **Motion** tab in the tool bar to jump to the **SingleAx** tab, as shown below.

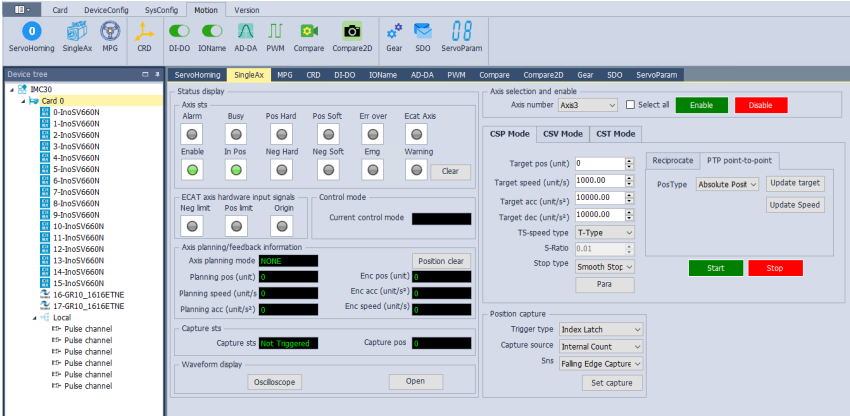


Figure 4-1 Main interface of the motion function test

4.1 Drive Self-homing

Drive self-homing means that the card invokes the function of the drive to complete homing.

For EtherCAT bus axes, the software supports 35 homing modes provided by the EtherCAT protocol. However, servo drive slaves may be designed differently. Therefore, refer to the corresponding servo drive guide for the specific homing method supported. The control card is responsible only for parameter setting and homing triggering. The actual homing action is performed by the servo drive.

This interface is also used for homing of local axes (pulse axes of the axis control module). You can refer to 35 homing modes provided by the standard EtherCAT protocol.

Click the **ServoHoming** button on the **Motion** tab to enter the drive homing interface, which contains the image, the **Homing para** pane, the **Status** pane, and the **Start-stop control** pane.

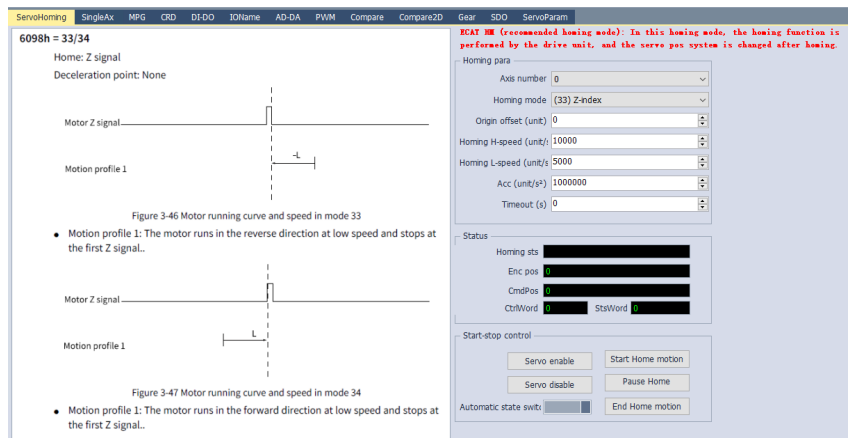


Figure 4-2 Drive homing interface

The preceding figure is used as an example. For axis 0, select **(33) Z-index** (encoder Z signal) as the homing mode. The left pane describes the homing mode selected. The homing procedure is as follows:

1. In the **Homing para** pane, configure related parameters:

- **Axis number:** Select the axis number that needs homing from the drop-down box.
- **Homing mode:** Select the homing mode from the drop-down box. When you select a homing mode, the left pane displays the image of the homing mode.
- **Origin offset:** This parameter sets the position value that the axis stop position is relative to the desired zero point after homing. The unit is the reference unit, which is related to the pulse equivalent set. Pulse is the default value.
- **Homing H-speed:** This parameter indicates the axis speed for deceleration point search at high speed. The unit is unit/s and the default unit is pulse/s.
- **Homing L-speed:** This parameter indicates the axis speed for homing search at low speed. The unit is unit/s and the default unit is pulse/s.
- **Acc:** The unit is unit/s^2 and the default unit is pulse/s^2 .
- **Timeout:** This parameter indicates the homing timeout time. If the homing operation is not completed within the set time, the home mode is automatically exited. The unit is second.
- **Position feedback source:** Select the source used for axis position feedback from the drop-down box. Valid only for terminal board axes, this parameter indicates whether the counting position inside the terminal board or the counting position of the external encoder is used.

Note: In general, use default values of **Homing H-speed**, **Homing L-speed**, **Acc**, and **Timeout**, and settings are not required.

2. In the **Start-stop control** pane, control the homing process.

Click **Servo enable** and then click **Start Home motion**. The selected axis enters the homing mode and starts homing. To stop homing, click **Pause Home** or **End Home Motion**. The two buttons have the same function.

3. In the **Status** pane, monitor the status of homing motion, including:
- Homing sts: You can monitor the stage of the homing process.
 - Enc pos: It displays the feedback position of the selected axis encoder in real time.
 - CmdPos: Reference position, which is reserved.
 - CtrlWord: Control word, which is reserved.
 - StsWord: Status word, which is reserved.

4.2 Single-axis Motion Test

You can perform axis motion commissioning, status monitoring, motion waveform analysis, and position capturing on the **SingleAx** tab.

Click **Motion > SingleAx** to enter the single-axis motion test interface, as shown below.

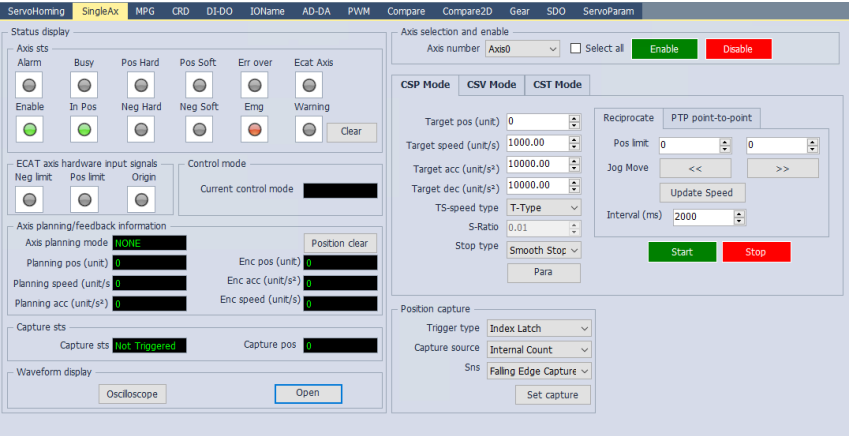


Figure 4-3 Single-axis motion test interface

The interface is divided into four main areas: axis motion state monitoring, axis motion commissioning, position capturing, and motion waveform analysis.

Axis motion state monitoring area

The screenshot displays the 'Axis motion state monitoring area' with the following components:

- Status display**
 - Axis sts**

Alarm	Busy	Pos Hard	Pos Soft	Err over	Ecat Axis
☐	☐	☐	☐	☐	☐
Enable	In Pos	Neg Hard	Neg Soft	Emg	Warning
☒	☒	☐	☐	☒	☐
 - ECAT axis hardware input signals**

Neg limit	Pos limit	Origin
☐	☐	☐
 - Control mode**

Current control mode:
- Axis planning/feedback information**

Axis planning mode	NONE	Position clear	
Planning pos (unit)	0		
Planning speed (unit/s)	0		
Planning acc (unit/s ²)	0		
		Enc pos (unit)	0
		Enc acc (unit/s ²)	0
		Enc speed (unit/s)	0

Figure 4-4 Axis motion status monitoring area

The axis motion state monitoring area consists of four panes: Axis sts, ECAT axis hardware input signals, Control mode, and Axis planning/feedback information.

- **Axis sts:** You can monitor the axis state, including drive alarm, axis running state (busy, axis in place), axis enable, limit, and axis type (bus/pulse). You can clear the alarm information by clicking the **Clear** button. For alarm information that cannot be cleared, check the line or related configuration parameters. For example, if the axis safety setting function is enabled on the **SysConfig** tab and the circuit is not connected for hard limit, the hard limit alarm of the axis state will be displayed and cannot be cleared by clicking **Clear**. In this case, disable the limit function in the axis safety setting or connect the limit to the correct circuit. If the **Emg** indicator is on, click the **EMG ON** button in the lower left corner of the software to deactivate the emergency stop state.
- **ECAT axis hardware input signals:** The EtherCAT bus servo positive and negative limit and home signals are monitored. The function is valid only for the bus axis connected to the signal terminal.
- **Control mode:** It displays the planning mode of the selected axis.
- **Axis planning/feedback information:** You can monitor the axis planning information and feedback information in real time. Unit is the reference unit. Its meaning is related to the pulse equivalent, which is pulse by default. Click the **Position clear** button to

clear the encoder position of the axis. This button is available only when the selected axis is enabled.

Axis motion commissioning area

Figure 4-5 Axis motion commissioning area

The axis motion commissioning area consists of the **Axis selection and enable** pane and the single-axis motion operation pane.

Figure 4-6 Axis selection and enable pane

In the **Axis selection and enable** pane, select the axis to be controlled from the **Axis number** drop-down box. Click the **Enable** button to enable the axis. Click the **Disable** button to disable the enabled axis. If you select **Select all** (✓ appears, as shown below), clicking **Enable** or **Disable** will enable or disable all axes on the link.

Figure 4-7 Selecting Select all

The single-axis motion operation pane contains the **CSP Mode**, **CSV Mode**, and **CST Mode** tabs, as described below.

- **CSP Mode**: In the CSP mode, the axis is in the position closed-loop control state.

- CSV Mode: In the CSV mode, the axis is in the speed closed-loop and position open-loop control state.
- CST Mode: In the CST mode, the axis is in the torque closed-loop and speed open-loop control state.

By default, the CSP Mode tab is displayed, as shown below.

1. Axis operation in the CSP mode

Figure 4-8 Axis operation in the CSP mode

You can set the axis position and speed as follows.

Parameter	Description
Target pos	Target position of the single-axis; unit: reference unit
Target speed	Planned target speed of the single-axis; unit: reference unit/s
Target acc	Planned acceleration of the single-axis; unit: reference unit/s ²
Target dec	Planned deceleration of the single-axis; unit: reference unit/s ²

In addition to position and speed parameters, other parameters are described as follows:

- TS-speed type: In this drop-down box, you can select **T-type** or **S-type** for the axis acceleration/deceleration. By default, **T-type** is used. If you have high requirements on smooth axis acceleration/deceleration, select **S-type**.
- S-Ratio: This parameter is used to set the smoothness planned for S-type speed. The value ranges from 0.01 to 100. The larger the value, the worse the smoothness of S-type speed. The default value is 0.01.
- Stop type: Select **Smooth Stop** or **Quick Stop**. Then when you click the **Stop** button, smooth stop or emergency stop is used based on the selected value. By default, **Smooth Stop** is used.
- Para: Click this button to show the **Axis para management** dialog box.

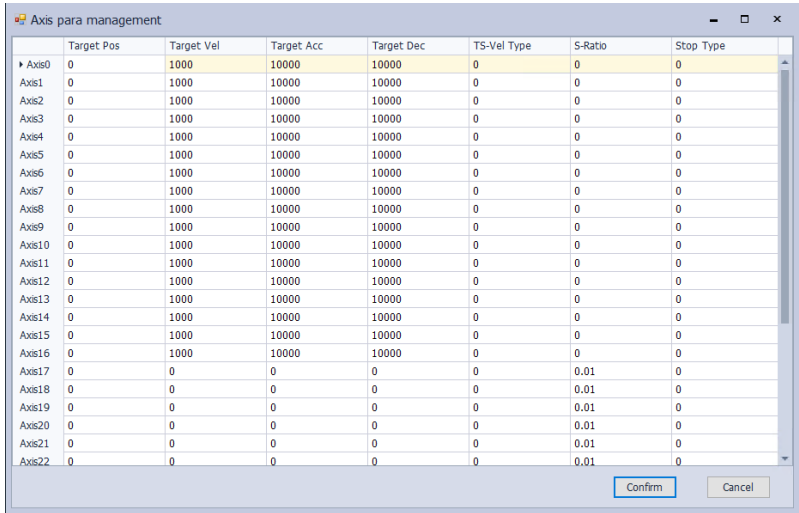


Figure 4-9 Axis para management dialog box

In this dialog box, you can modify axis motion parameters in the table. If all axes on the link have similar motion parameter configurations, you can set the parameters of an axis and right-click the axis and select **Synchronize to other axes**.

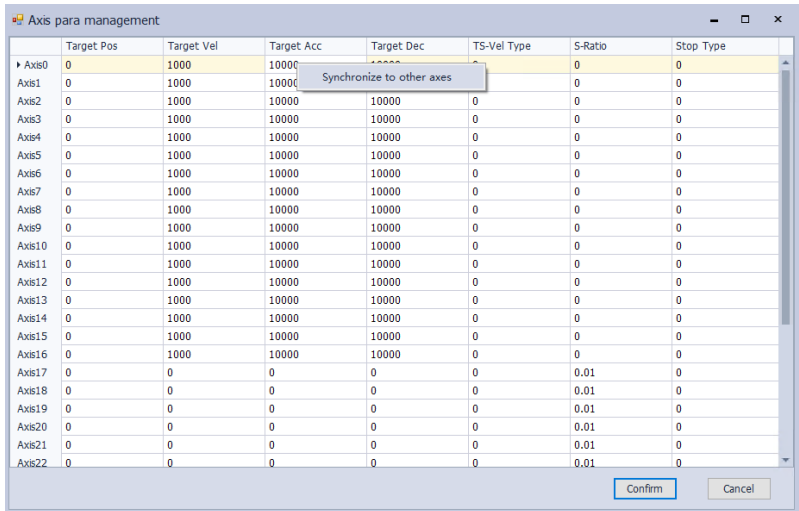


Figure 4-10 Synchronizing to other axes

In this case, motion parameters of the axis will be copied to all axes, as shown in the following figure. Click **Confirm** to set motion parameters of all axes.

Axis para management

	Target Pos	Target Vel	Target Acc	Target Dec	TS-Vel Type	S-Ratio	Stop Type
Axis0	0	1000	10000	10000	0	0	0
Axis1	0	1000	10000	10000	0	0	0
Axis2	0	1000	10000	10000	0	0	0
Axis3	0	1000	10000	10000	0	0	0
Axis4	0	1000	10000	10000	0	0	0
Axis5	0	1000	10000	10000	0	0	0
Axis6	0	1000	10000	10000	0	0	0
Axis7	0	1000	10000	10000	0	0	0
Axis8	0	1000	10000	10000	0	0	0
Axis9	0	1000	10000	10000	0	0	0
Axis10	0	1000	10000	10000	0	0	0
Axis11	0	1000	10000	10000	0	0	0
Axis12	0	1000	10000	10000	0	0	0
Axis13	0	1000	10000	10000	0	0	0
Axis14	0	1000	10000	10000	0	0	0
Axis15	0	1000	10000	10000	0	0	0
Axis16	0	1000	10000	10000	0	0	0
Axis17	0	1000	10000	10000	0	0	0
Axis18	0	1000	10000	10000	0	0	0
Axis19	0	1000	10000	10000	0	0	0
Axis20	0	1000	10000	10000	0	0	0
Axis21	0	1000	10000	10000	0	0	0
Axis22	0	1000	10000	10000	0	0	0

Confirm Cancel

Figure 4-11 Setting motion parameters of all axes

After setting motion parameters, you can start point-to-point, reciprocation, and jog commissioning of the axis. By default, the **Reciprocate** pane is displayed, as shown below.

Reciprocate PTP point-to-point

Pos limit 0 0

Jog Move << >>

Update Speed

Interval (ms) 2000

Start Stop

Figure 4-12 Reciprocation/Jog operation

The steps for reciprocation commissioning are as follows:

- Ensure that the emergency stop state is cleared, the axis is enabled and the motion parameters are set.
- Set the positive and negative limit positions for reciprocation in **Pos limit**. The axis will move reciprocally between these two positions.

- c. In **Interval**, set the interval (in milliseconds) during which the axis is static during reciprocation. The default value is 2000 ms. The minimum value is 10 ms. If the input value is less than 10 ms, the value 10 ms will take effect.
- d. Click the **Start** button to start reciprocation. If you need to end the motion, click the **Stop** button. To change the axis speed and acceleration/deceleration during reciprocation, modify the parameters on the left side of the pane and click the **Update Speed** button. The axis changes speed without stopping motion.

The steps for jog commissioning are as follows:

- a. Ensure that the emergency stop state is cleared, the axis is enabled and the motion parameters are set.
- b. Press and hold the << or >> button of **Jog Move** to enable the axis to jog in the forward or reverse direction. Release the button to stop the axis.

Click **PTP point-to-point** to switch to the related tab, as shown below.

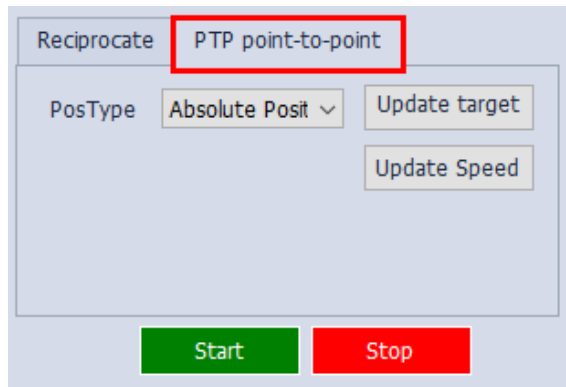


Figure 4-13 PTP point-to-point tab

The steps for point-to-point commissioning are as follows:

- a. Ensure that the emergency stop state is cleared, the axis is enabled and the motion parameters are set.
- b. Select the position planning mode **Absolute Position** or **Relative Position** from the **PosType** drop-down box. Absolute position means that the target position is calculated based on the axis home, and relative position is calculated based on the axis current position, which is a relative value.
- c. Set the end position in **Target pos** on the left side of the **CSP Mode** tab.
- d. Click the **Start** button to start the point-to-point motion. If you need to end the motion, click the **Stop** button. To change the end position during motion, you can modify the end position in **Target pos** and then click the **Update target** button. If you need to change the speed, click the **Update Speed** button. The button has the same function as that for reciprocation motion.

2. Axis operation in the CSV mode

To switch the axis to the CSV mode, configure the following PDO object word.

Parameter	PDO mapping	EtherCAT object index	Sub-index	Data type	Remarks
Servo mode selection	RPDO	6060h	00	INT8	Mandatory
Target speed	RPDO	60FFh	00	INT32	Mandatory
Positive torque limit	RPDO	60E0h	00	UINT16	Optional
Negative torque limit	RPDO	60E1h	00	UINT16	Optional
Maximum torque limit	RPDO	6072h	00	UINT16	Optional

- a. Select **DeviceConfig > ProcessData** to configure object words. Check the mandatory PDO objects 6060 and 60FF after re-scanning slaves, as shown in the following figure.

Selected	Index	Size	Offs	Name	Type	Default	DevType
☒	0x6040:0	16	0	ControlWord	UINT		0
☒	0x607A:0	32	16	Target position	DINT		0
☐	0x608B:0	16	48	Touch probe function	UINT		0
☐	0x6071:0	16	64	Target torque	JNT		0
☐	0x6082:0	16	80	Torque offset	UINT		0
☐	0x6081:0	32	96	Velocity offset	UDINT		0
☒	0x60FF:0	32	128	Target velocity	DJNT		0
☒	0x6060:0	8	160	Modes of Operation	SJNT		0
☐	0x6087:0	32	168	Torque slope	UDINT		0
☐	0x60FE:1	32	200	Physical outputs	UDINT		0
☐	0x6072:0	16	232	Max Torque	UINT		0
☐	0x607F:0	32	248	Max profile velocity	UDINT		0
☐	0x60E0:0	16	280	Positive torque limit value	UINT		0
☐	0x60E1:0	16	296	Negative torque limit value	UINT		0
☐	0x2008:1	16	312	Speed-loop Gain	UINT		0
☐	0x2008:2	16	328	Speed-loop integral time constant	UINT		0

Figure 4-14 Checking the mandatory PDO object for the CSV mode

- b. After the object word is checked, click **Download to card** and **Run** to enable the system to enter the OP state. In this case, the slave supports the CSV mode.
- c. Re-enter the **SingleAx** tab, and then click the **CSV Mode** tab. **Current control mode** is switched to **CSV Mode** accordingly, as shown in the following figure.

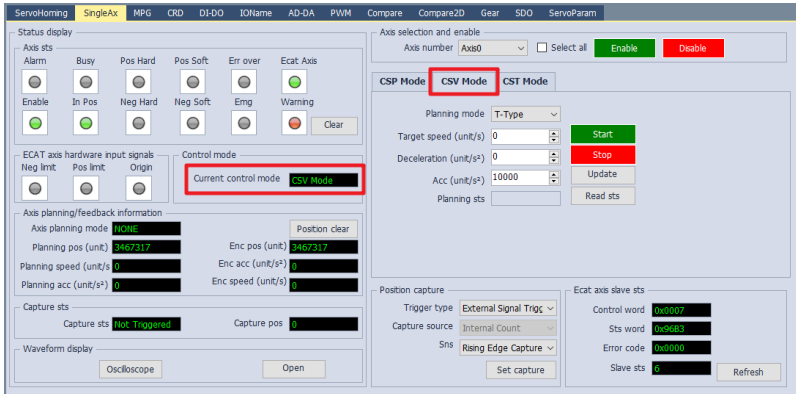


Figure 4-15 CSV control mode

d. After entering the CSV mode, you can control the axis speed in the pane.

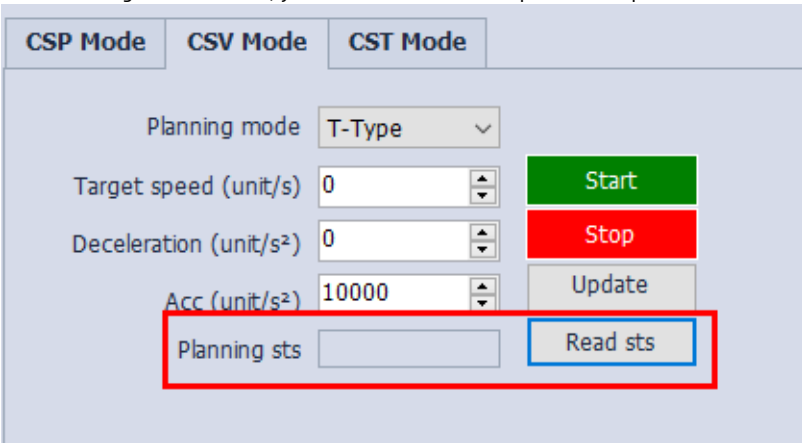


Figure 4-16 Axis operation in the CSV mode

The motion parameters that can be set in this pane are as follows.

Parameter	Description
Planning mode	Select T-type or S-type for acceleration/deceleration of the selected axis. T-type is used by default.
Target speed	Single-axis planned target speed; unit: reference unit/s; default value: pulse/s
Acc	Single-axis planned acceleration; unit: reference unit/s ²
Deceleration	Single-axis planned deceleration; unit: reference unit/s ²

- e. After setting parameters (①), enable the selected axis (②), and click the **Start** button to rotate the axis at a fixed speed (③). If you need to stop the axis, click the **Stop** button. Click **Read sts** to check whether the axis is in motion planning (④).

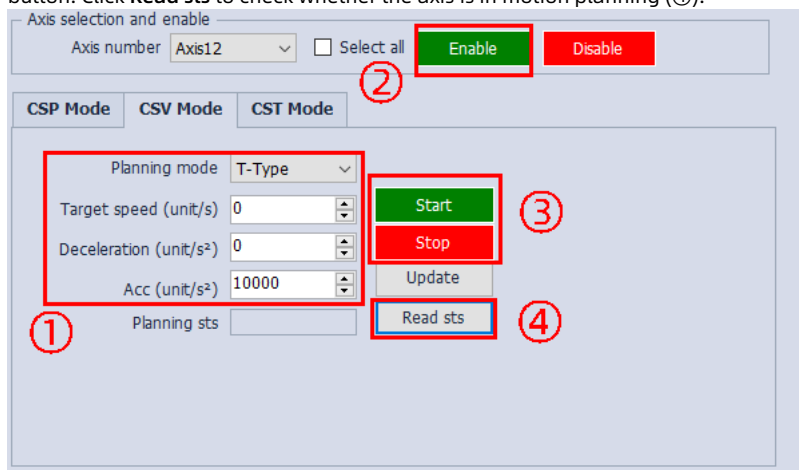


Figure 4-17

3. Axis operation in the CST mode

To switch the axis to the CST mode, configure the following PDO object.

Parameter	PDO mapping	EtherCAT object index	Sub-index	Data type	Remarks
Servo mode selection	RPDO	6060h	00	INT8	Mandatory
Target torque	RPDO	6071h	00	INT16	Mandatory
Actual torque	TPDO	6077h	00	INT16	Mandatory
Maximum speed limit	RPDO	607Fh	00	UDINT32	Optional

- a. Select **DeviceConfig > ProcessData** to configure object words. Check the mandatory PDO objects 6060, 6071, and 6077 after re-scanning slaves, as shown in the following figure.

PDO Content (0x1600)						
Selected	Index	Size	Name	Type	Default	DevType
☒	0x6040:0	16	Controlword	UINT		Servo
☒	0x6060:0	8	Modes of operation	SINT		Servo
☒	0x6065:0	32	Following error window	UDINT		Servo
☒	0x6072:0	16	Max Torque	UINT		Servo
☒	0x6066:0	16	Following error time out	UINT		Servo
☒	0x6071:0	16	Target torque	INT		Servo
☒	0x607A:0	32	Target position	DINT		Servo
☒	0x6088:0	16	Touch probe function	UINT		Servo

Figure 4-18 Checking the mandatory PDO object for the CST mode

- b. After the object word is checked, click **Download to card** and **Run** to enable the system to enter the OP state. The slave can support the CST mode.
- c. Re-enter the **SingleAx** tab, and then click the **CST Mode** tab. **Current control mode** is switched to **CST Mode** accordingly, as shown in the following figure.

The screenshot shows the 'SingleAx' control interface. The 'CST Mode' tab is selected. The 'Current control mode' is set to 'CST Mode'. The interface includes various status indicators, control parameters, and a waveform display.

Status display:

- Axis sts: Alarm, Busy, Pos Hard, Pos Soft, Err over, Ecst Axis
- Enable, In Pos, Neg Hard, Neg Soft, Emg, Warning
- Clear

ECAT axis hardware input signals:

- Neg limit, Pos limit, Origin

Control mode:

- Current control mode: **CST Mode**

Axis planning/feedback information:

- Axis planning mode: NONE
- Planning pos (unit): 8467317
- Planning speed (unit/s): 0
- Planning acc (unit/s²): 0
- Enc pos (unit): 8467317
- Enc acc (unit/s²): 0
- Enc speed (unit/s): 0

Capture sts:

- Capture sts: Not Triggered
- Capture pos: 0

Waveform display:

- Oscilloscope
- Open

Axis selection and enable:

- Axis number: Axis0
- Select all
- Enable
- Disable

CSP Mode, CSV Mode, CST Mode:

- Actual torque (0.1%): 0
- Read actual
- Target torque (0.1%): 0
- Start
- Time (ms): 0
- Stop

Position capture:

- Trigger type: External Signal Trigg
- Capture source: Internal Count
- Sns: Rising Edge Capture
- Set capture

Ecst axis slave sts:

- Control word: 0x0007
- Sts word: 0x0003
- Error code: 0x0000
- Slave sts: 0
- Refresh

Figure 4-19 CST control mode

- d. After entering the CST mode, you can control the axis torque in the pane.

Axis selection and enable

Axis number ☐ Select all

CSP Mode **CSV Mode** **CST Mode**

Actual torque (0.1%)

Target torque (0.1%)

Time (ms)

Figure 4-20 Axis operation in the CST mode

The motion parameters that can be set in this pane are as follows.

Parameter	Description
Target torque	The expected operating torque of the motor is 0.1% of the rated motor torque in N. m.
Time	It specifies the time (unit: ms) from start to the time when the target torque is reached.

- e. After setting parameters, start CST motion. ① Complete parameter setting. ② Enable the selected axis. ③ Click the **Start** button to start the axis rotation at a fixed speed. If you need to stop the axis, click the **Stop** button. ④ Click **Read actual** to display the actual torque (unit: 0.1% of the rated motor torque).

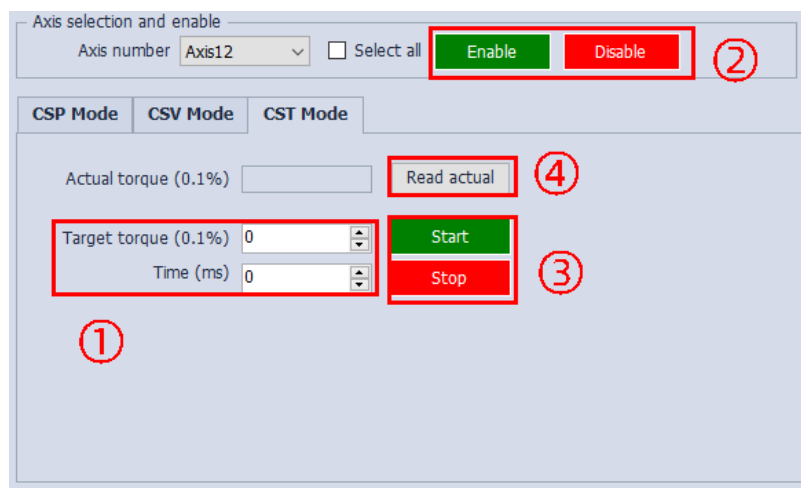


Figure 4-21

Position capture

The card supports both EtherCAT axis capture and pulse axis capture, including index (encoder Z signal) capture, home capture, probe capture, positive limit capture, and negative limit capture.

To enable position capture of the EtherCAT axis, configure the following PDO object word.

Parameter	PDO mapping	EtherCAT object index	Sub-index	Data type	Remarks
Probe capture function	RPDO	60B8h	00	UINT16	Mandatory
Probe capture status	TPDO	60B9h	00	UINT16	Mandatory
Position latch value at the rising edge of the probe	TPDO	60BAh	00	UINT32	Mandatory
Position latch value at the falling edge of the probe	TPDO	60BBh	00	UINT32	Mandatory

For details, see axis operation in CST mode" in ["Figure 4-17 " on page 54 .](#)

Located on the single-axis motion operation pane, the position capture operation pane contains ① **Capture sts** area (used to monitor the capture status) and ② **Position capture** area (used to set related parameters).

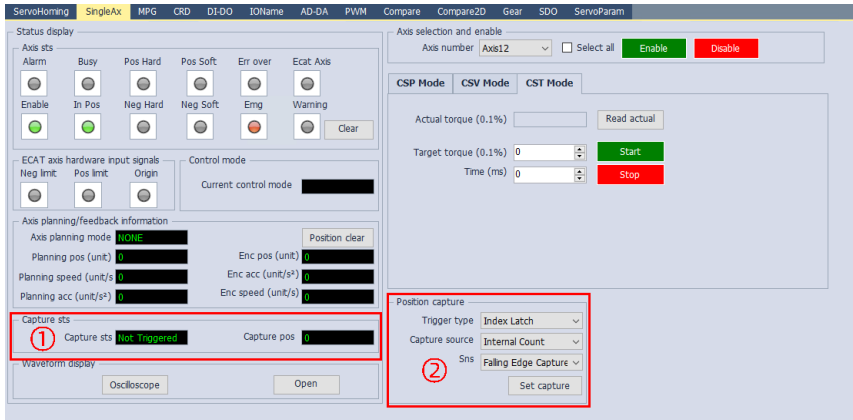


Figure 4-22 Position capture operation pane

The steps for position capture are as follows:

1. Set position capture parameters.

Parameters description:

- **Trigger type:** Select the correct trigger mode through the drop-down box. The following table shows the capture trigger types supported by the EtherCAT axis and pulse axis respectively.

Axis type	Trigger mode	Remarks
EtherCAT axis	External signal	Triggered by the probe 1 signal of the servo I/O terminal
	Z signal	Triggered by motor encoder Z signal
Local pulse axis	Index latch	Triggered by Z signal
	Home latch	Triggered by the terminal board home signal
	Probe capture	Not supported
	Positive limit signal	Triggered by positive limit signal of the terminal board
	Negative limit signal	Triggered by positive limit signal of the terminal board

- **Capture source:** This parameter is valid only for the local pulse axis. It is invalid for the EtherCAT axis and does not need to be set. If the operation object is a local pulse axis, you can select **Internal Count** and **External Encoder Count** from the **Capture source** drop-down box.

- Sns (trigger edge): Select **Rising Edge Capture** or **Falling Edge Capture** from the drop-down box.
2. Check whether the trigger signal is connected correctly. See the servo manual for wiring.
 3. Start capturing and monitoring. Click the **Set Capture** button to complete the parameter setting and start the position capture. In this case, view the capture status and the captured position value in the **Capture sts** area.

Oscilloscope

During running, in the **Waveform display** area, you can click **Oscilloscope** to open the oscilloscope to view the real-time curve of motion parameters, or click **Open** to view the motion curve stored in the oscilloscope.

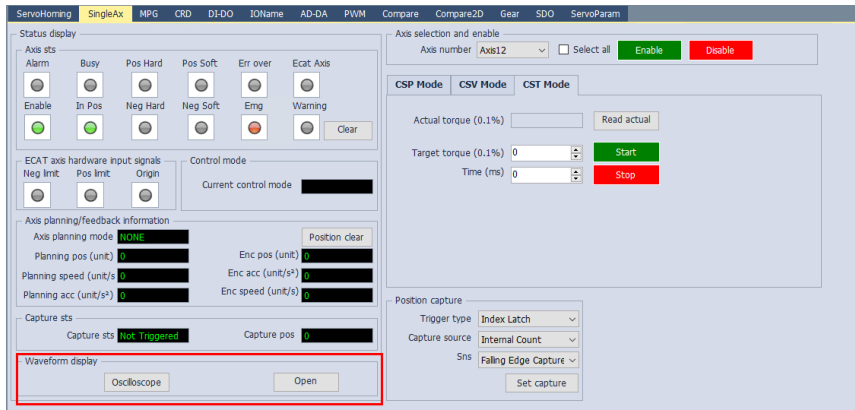


Figure 4-23 Oscilloscope

1. Click the **Oscilloscope** button to pop up the oscilloscope interface. Follow the steps below to start sampling. ① Select the parameter to be monitored in the left channel, such as the curve position and speed. ② Select the sampling interval. ③ Click the start button to acquire the curve.
2. To view the curve at a certain time, drag the time axis control to the time and click the



self-adaption button . The following two figures show the curves before and after self-adaption.

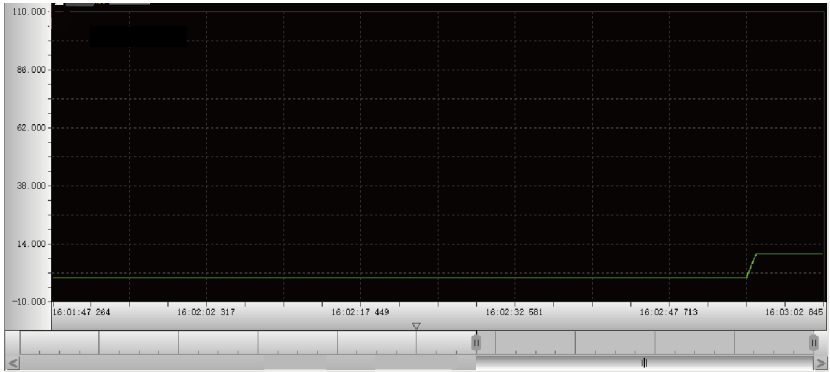


Figure 4-24 Before oscilloscope self-adaption

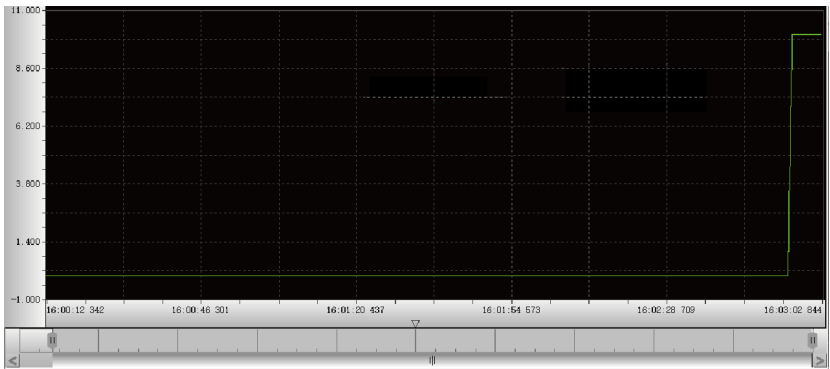


Figure 4-25 After oscilloscope self-adaption

3. To analyze the speed and acceleration of a certain time, use the cursor tool to view the value of the time, as shown in the following figure.



Figure 4-26 Cursor tool of the oscilloscope

4.3 Hand Wheel Following Function Test

The hand wheel following function is used to drive the axis to follow the hand wheel. The pulse change is collected through the terminal board encoder or EtherCAT bus encoder module, and the following axis is controlled by preset parameters. The function is mainly used to assist interpolation. Note that the function is **speed following** (the slave axis and

the hand wheel are set at the same speed). The axis can only be moved to the general area and cannot be accurately positioned.

The conditions for entering hand wheel motion are as follows:

1. The following hand wheel axis is in the static state.
2. The encoder is not bound to the axis and is used for axis position feedback.
3. The following axis is enabled.
4. The following axis is not set to hand wheel mode.

Click the **MPG** tab in the tool bar to enter the hand wheel following interface, which contains the **Mpg sts** area, **Slave axis sts** area, and **Set** area (used to set hand wheel function parameters and contains operation buttons).



Figure 4-27 Hand wheel following interface

The following steps are used to test the hand wheel following function.

1. Select the slave axis from the **Slave axis number** drop-down box, as shown below.

Set

Slave axis number: Axis0

Mpg input type: Local Encoder

Mpg channel number: 0

Mpg max speed (unit/s): 10000.00

Speed follow ratio: 1.00

Slave axis acc (unit/s²): 1000000.00

Servo enable Enter handwheel

Servo disable Exit handwheel follow

Switch follow speed

Figure 4-28 Slave axis selection

2. Connect the hand wheel and set the hand wheel input type and channel number.
The hand wheel input types are as follows.

Hand wheel type	Application scenario
Local Encoder	The hand wheel encoder is connected to the ENC port on the terminal board (common).
EtherCAT Encoder	The hand wheel encoder or the axis slave as the hand wheel encoder is connected to the EtherCAT bus.

The hand wheel channel number refers to the ID of the channel that inputs the hand wheel signal. In this case, the hand wheel is connected to the ENC-0 port on the terminal board, that is, encoder input port 0 of the terminal board. Then, set **Mpg input type** to **Local Encoder** and **Mpg channel number** to **0**. The following figure shows the setting interface.

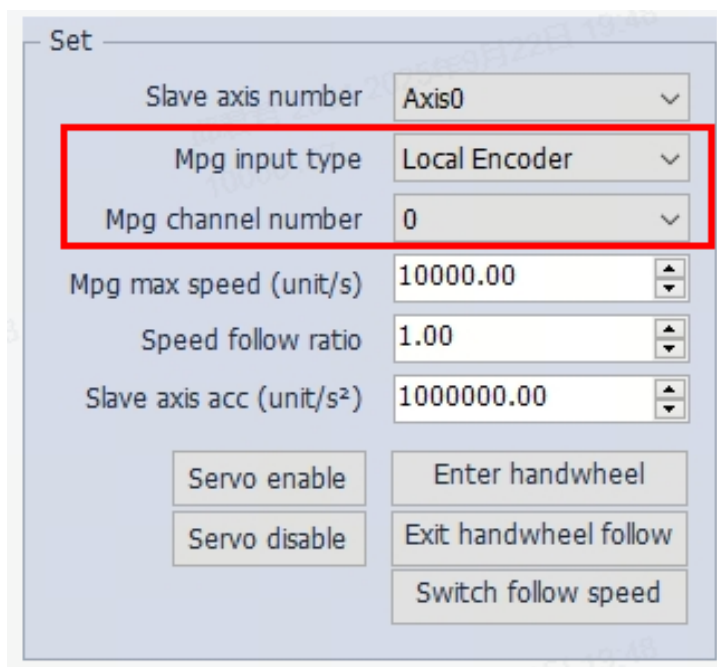


Figure 4-29 Hand wheel input type selection

3. Set the hand wheel following parameters, as shown below:

Mpg max speed: Unit: Reference unit/s; default: Pulse/s.

Speed follow ratio: Slave axis speed = Hand wheel speed x following ratio

Slave axis acc: Unit: Reference unit/s² ; default: Pulse/s²

If there is no special requirement, use the default value, as shown in the following figure.

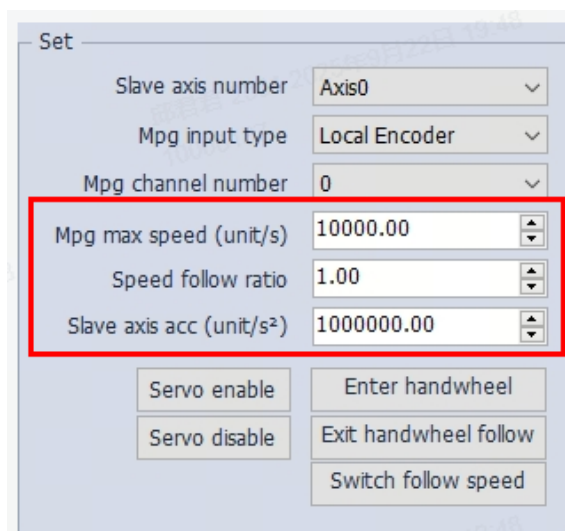


Figure 4-30 Hand wheel following parameter setting

4. Start hand wheel operation.

① In the **Set** area, click **Servo enable**. ② Click **Enter handwheel**. In this case, rotate the hand wheel and the slave axis follows the hand wheel. ③ Monitor the running status of the hand wheel and slave axis in the left **Status** area and **Slave axis sts** area.

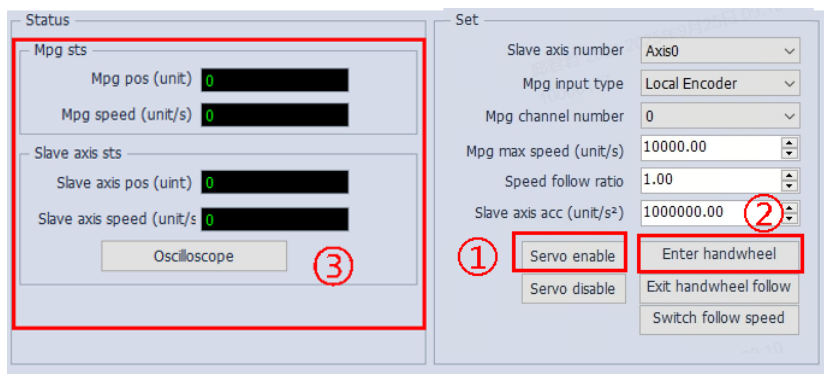


Figure 4-31

4.4 Interpolation Motion Function Test

Interpolation is divided into linear interpolation and circular interpolation. The operation procedure is described as follows.

Click **CRD** to enter the interface.

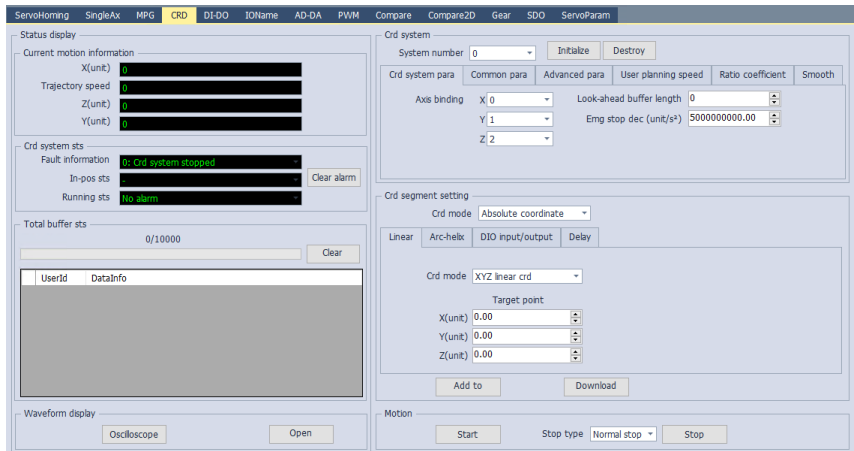


Figure 4-32 Interpolation motion interface

1. Create a coordinate, and select the coordinate system number, which ranges from 0 to 3.

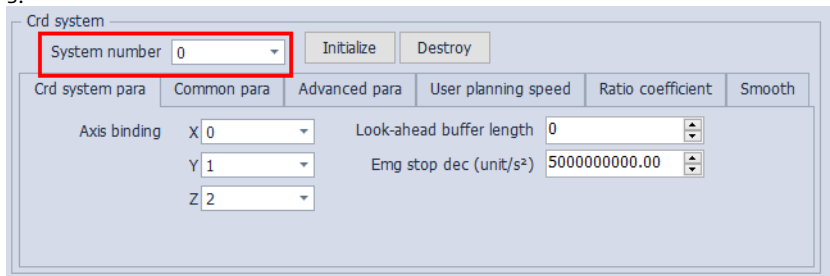
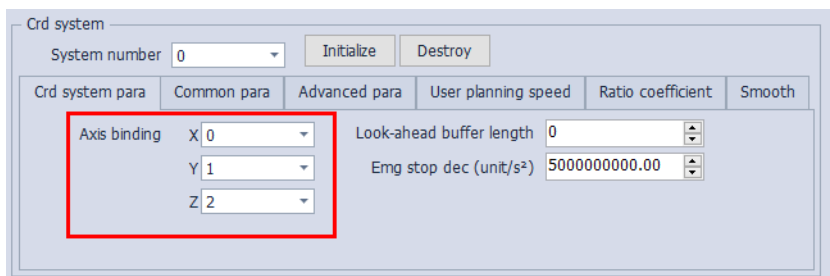


Figure 4-33

2. Set the coordinate parameters, bind the required axis to the coordinate, and establish the axis coordinate.



3. Set the parameters of each tab according to the process. Then click the **Set** button.
 - a. Common para

Parameter	Description
Trajectory speed	Target trajectory speed; unit: reference unit
Trajectory acc	Target trajectory acceleration; unit: reference unit/s ²
Trajectory dec	Target trajectory deceleration; unit: reference unit/s

Crd system para	Common para	Advanced para	User planning speed	Ratio coefficient	Smooth
Trajectory speed (unit/s) 200000.00 ↑ ↓ Trajectory acc (unit/s ²) 1000000.00 ↑ ↓ Trajectory dec (unit/s ²) 1000000.00 ↑ ↓					
				Set	Read

Figure 4-34

b. Advanced para

Parameter	Description
Look-ahead mode	0: System planning 1: User planning The default is 0. In the user planning mode, you can set the start and end speed of the line to manually control the acceleration and deceleration of the entire curve.
Trajectory transition mode	0: Original trajectory 1: Transition trajectory Multi-axis synchronous motion data is pressed into the function in the forward-looking mode in the form of actual speed and acceleration parameters of each axis.
Data stream break protection	0: Disable 1: Enable Check whether the speed of each axis is higher than the set threshold based on the data available in the buffer. If the speed of any axis in the system is higher than the set threshold, the current cut-off protection is enabled. The system stops according to the acceleration for smooth stop.
Arc variable acc	0: Disable 1: Enable When this function is enabled, the acceleration is automatically optimized based on the arc position, but the acceleration cannot be predicted. The acceleration can be predicted when this function is disabled.
Different plane transition	0: Disable 1: Enable This function can smoothly transit any curve connections, but may need additional auxiliary curves which take up the queue position.

Parameter	Description
Corner factor	The parameter value ranges from 0.01 to 50. This function can adjust the acceleration of the circular interpolation. The larger the factor, the larger the circular interpolation trajectory speed. The default value is 1.0.
Corner accuracy	The parameter value ranges from 0 to 1e9. When Look-ahead mode is set to System Planning and Trajectory transition mode is set to Transition trajectory , tol indicates the deviation of the transition corner. The smaller the tol, the smaller the deviation of the planned trajectory from the theoretical trajectory.

- c. User planning speed: This function is used to set the start and end speed of each motion segment in the user planning mode. Generally, the start speed of the current segment is equal to the end speed of the previous segment.

Parameter	Description
User start speed	User start speed; unit: reference unit/s
User stop speed	User stop speed; unit: reference unit/s

Figure 4-35

- d. Ratio coefficient: Interpolation actual feed rate = user interpolation feed rate x ratio. The parameter value ranges from 0 to 10.

Crd system

System number 0 Initialize Destroy

Crd system para Common para Advanced para User planning speed Ratio coefficient Smooth

Ratio coefficient 1.000000

Set Read

e. Smooth: The function enables a smoother interpolation trajectory by setting the smooth level and smooth tolerance.

Parameter	Description
Level	The value ranges from 1 to 20. 1 means smoothness is disabled, and any value greater than 1 means the level of smoothness.
Maintain accuracy	The parameter indicates the smoothness holding accuracy, that is, the trajectory accuracy that should be maintained after the smoothing of the trajectory. The unit is the reference unit.

Crd system

System number 0 Initialize Destroy

Crd system para Common para Advanced para User planning speed Ratio coefficient Smooth

Level 0

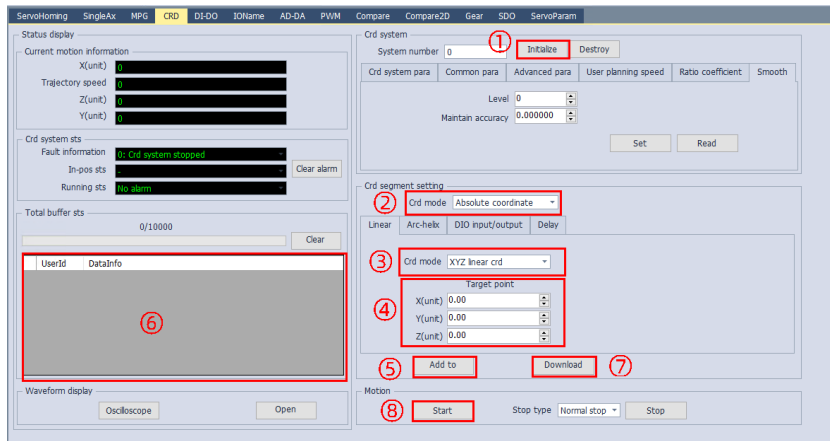
Maintain accuracy 0.000000

Set Read

4. After all parameters are set, do the following:

- ① Click the **Initialize** button in the **Crd system** area.
- ② Set **Crd mode** to **Absolute coordinate** or **Relative coordinate**.
- ③ Set the interpolation mode. There are several different linear interpolation modes and circular interpolation modes.
- ④ Set the target point of interpolation.
- ⑤ Click **Add to** to add the interpolated target point to the cache.
- ⑥ View the interpolation target point.
- ⑦ Click **Download** to download the cached target point to the card.
- ⑧ Click **Start** to complete the interpolation motion.

The same method is used to stop interpolation.



4.5 DI and DO Operation

Click the **DI-DO** tab.

- The DI is divided into ① EtherCAT input; ② Common input of the terminal board; ③ Special input of the terminal board. Select the corresponding channel to display the input status.
- The DO is divided into ④ EtherCAT output and ⑤ Terminal board output. Tap the indicator to turn the output on or off.

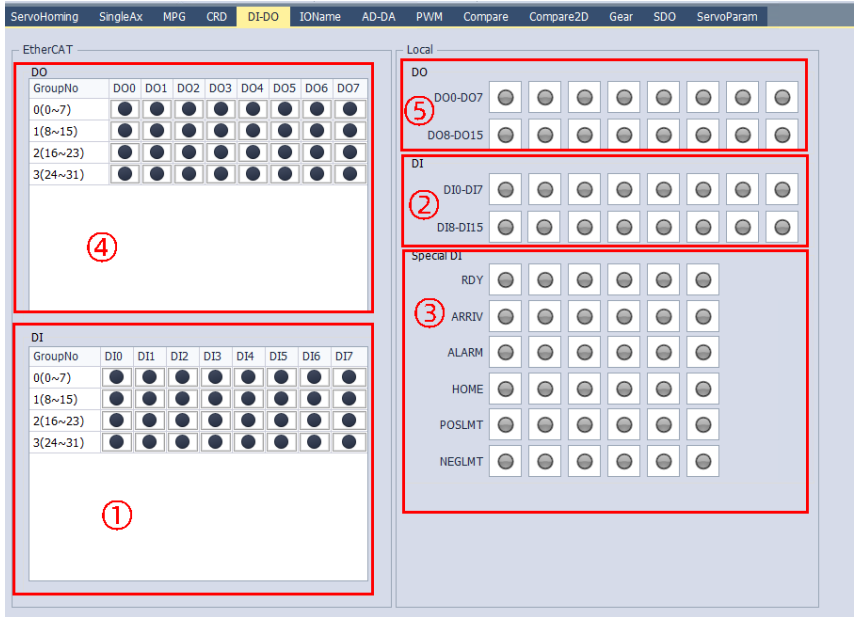


Figure 4-36 DI/DO tab

4.6 AD and DA

The AD/DA operation interface mainly includes the AD monitoring pane, DA operating pane, and PT monitoring pane.

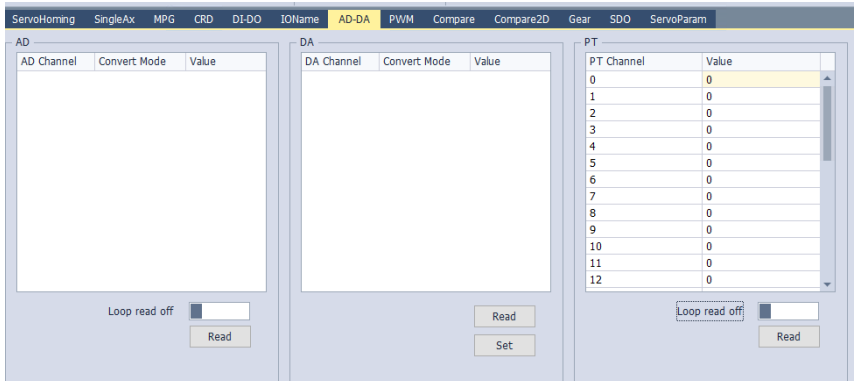


Figure 4-37 AD-DA tab

AD and PT: Click the **Read** button to collect and display the AD or PT channel data on the pane. After you click the **Loop read off** button, it changes to **Loop read on** and highlights

in gray. The data is collected in real time in the background and displayed on the pane, as shown in the following figure.

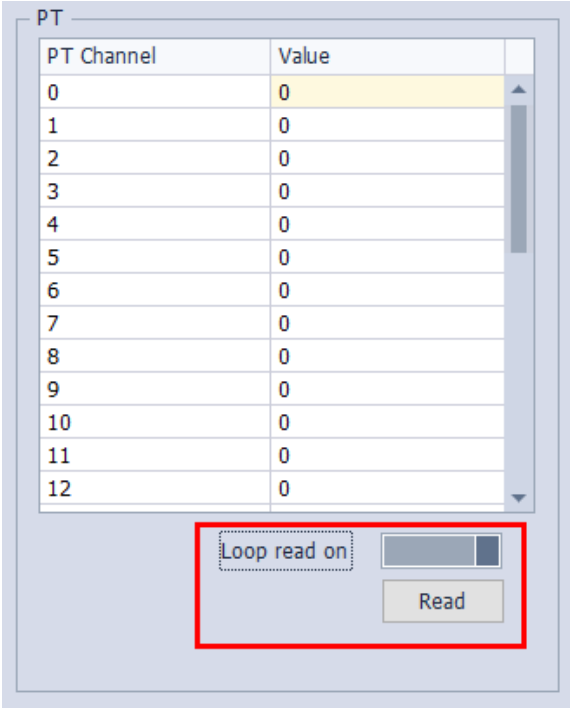


Figure 4-38 Loop read on on the PT pane

DA: ① Edit the value of DA output; ② Click **Set** to complete DA output. ③ Click the **Read** button on the **DA** pane to read the output value of the current DA channel and display it on the pane. See the figure below.

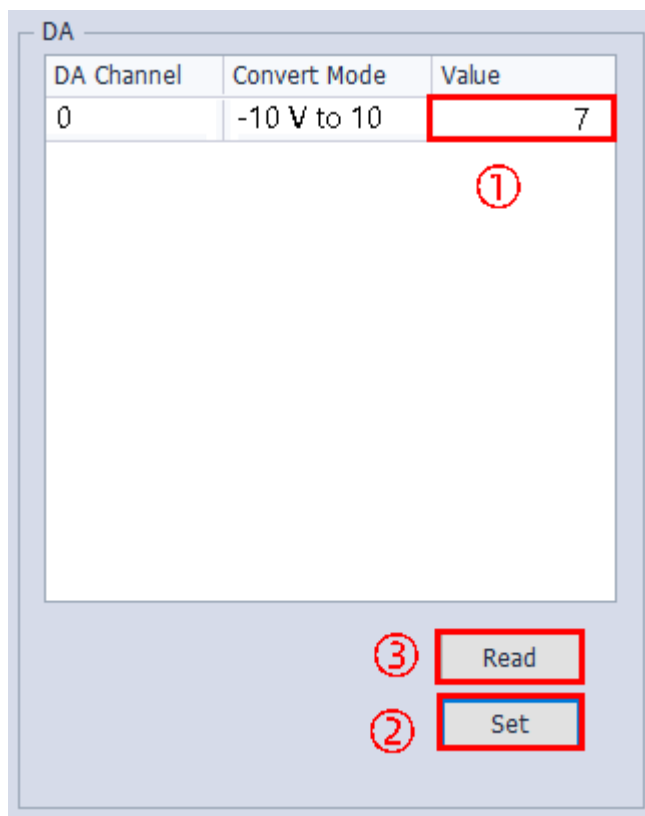


Figure 4-39 DA output setting

4.7 PWM Wave Output

The motion control card supports two PWM pulse width modulation outputs and supports two PWM output modes.

Duty Cycle Mode	Set the PWM frequency first. During output, the frequency remains unchanged. You can change the duty cycle of pulse output dynamically.
Frequency Output Mode	Set the PWM duty cycle first. During output, the duty cycle remains unchanged. You can change the output frequency dynamically.

Parameter description

Click the **PWM** tab to enter the PWM wave output test interface. You can set the following parameters.

Parameter	Description
Channel	The values Channel 0 and Channel 1 are available, corresponding to the two PWM pulse modulation outputs supported by the card.
Mode	The values Duty Cycle Mode and Frequency Output Mode are available, corresponding to two PWM output modes.
Frequency	PWM wave output frequency; unit: Hz
Duty cycle	PWM wave output duty cycle; unit: %
Start delay	PWM wave output switch-on delay in the unit of μs , which cannot be set.
Stop delay	PWM wave output switch-off delay in the unit of μs , which cannot be set.

Setting process

- ① Complete parameter settings.
- ② Click the **Set Para** button to set the PWM wave output parameters to the card. If you set the delay parameters, you need to click **Set start delay** and **Set stop delay**.
- ③ Click the **Start** button to enable PWM wave output.
- ④ If you need to change the frequency or duty cycle during output, set the corresponding parameters again and click the **Update frequency** or **Update duty cycle** button.

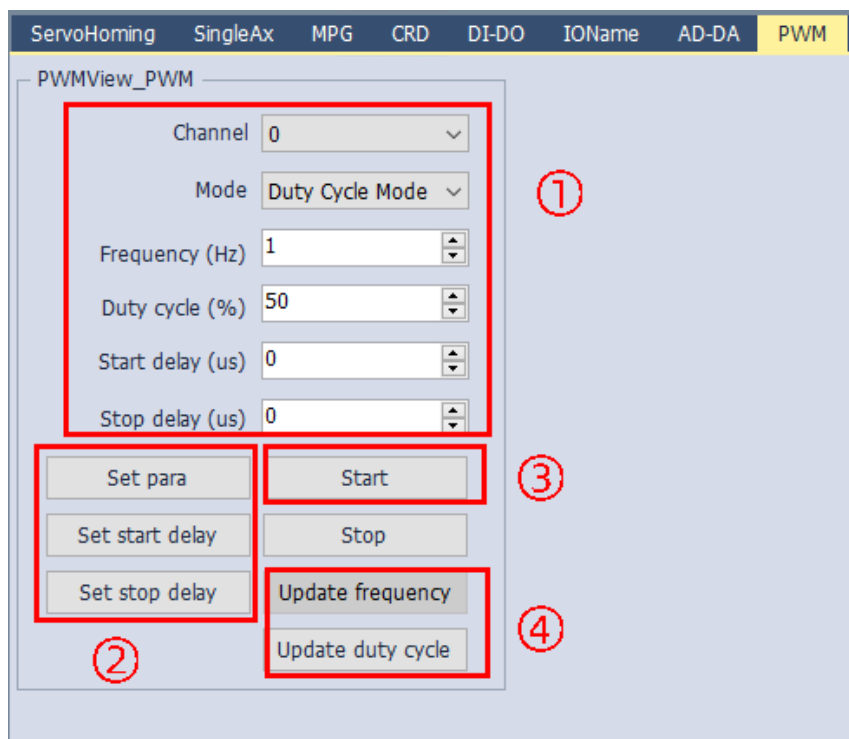


Figure 4-40 PWM wave output test interface

4.8 Position Comparison Output

The position comparison output function of the IMC30G-E series motion control card must be used with the IMC30-6G axis control module. The principle is that the position comparison output unit can be used to compare the encoder or internal counter position with the set position. When the encoder position or internal counter position reaches the set value, the signal is output through the high-speed differential circuit.

The IMC30G-E series motion control card supports four one-dimensional position comparison output channel and two multi-dimensional position comparison output channels, which can be mapped to high-speed position comparison output channels or low-speed position comparison output channels respectively. A dedicated high-speed optocoupler (up to 4 MHz) differential circuit is designed for high-speed position comparison output. Low-speed comparison output shares the general output circuit (EX-0).

Currently, the software InoMotionController supports only one-dimensional position comparison output test. The following section describes the one-dimensional position comparison output.

Click **Compare** to enter the position comparison output interface.

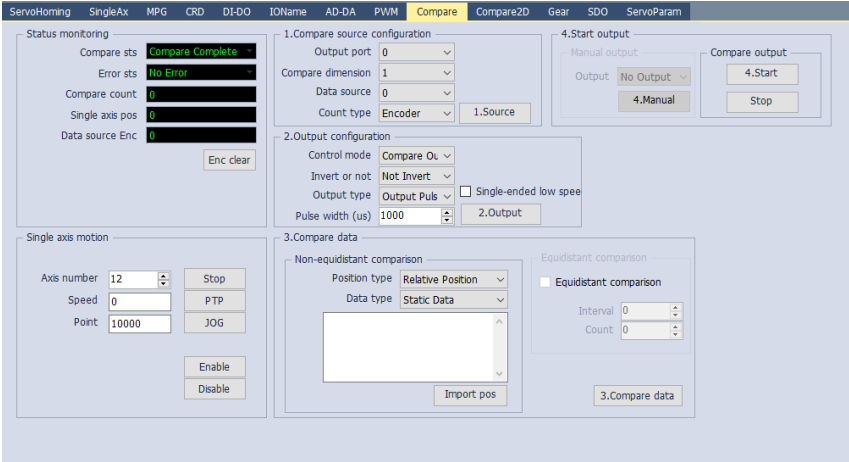


Figure 4-41 Position comparison output interface

The configuration flow for position comparison output is as follows.

1. Configure the comparison source. The related parameters are as follows:

- Output port: Ports 0 to 3 correspond to four comparison output channels.
- Comparison dimension: The software supports only one-dimensional comparison output, and only 1 can be selected.
- Data source: Data sources 0 to 4 correspond to five encoder input channels on the terminal board.
- Count type: **External** (external encoder counting) or **Internal Count** (motor internal encoder counting) are available.

After setting the above parameters, click the **1.Source** button in the lower right corner of the **Compare source configuration** pane to complete the comparison source configuration.

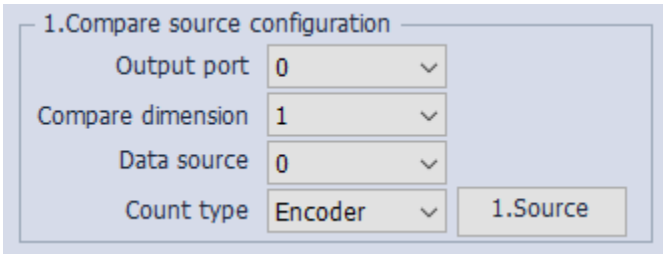


Figure 4-42 Comparison source configuration pane

2. Configure the output parameters as follows:

- Control mode: **Manual Output** or **Compare Output** are available.
- Invert or not: It sets whether the output signal is inverted. You can select **Not Invert** or **Invert**.
- Output type: You can select **Output Pulse** or **Output Level**.
- Pulse width: This parameter is active when the output pulse is selected.
- Single-ended low speed: Check this box to enable the low-speed comparison output channel, that is, terminal board EX0-EX3.

After setting the above parameters, click the **2.Output** button in the lower right corner of the **Output configuration** pane to complete the output configuration.

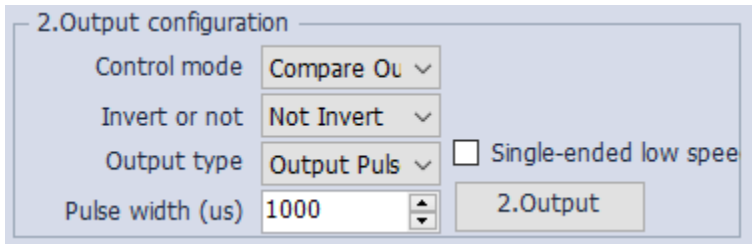


Figure 4-43 Output configuration pane

3. If **Control mode** is set to **Compare Output**, configure comparison data. Otherwise, skip this step.

The comparison type includes equidistant comparison and non-equidistant comparison. You can switch between the two types by checking **Equidistant comparison** on the **Equidistant comparison** pane.

- Equidistant comparison: This parameter applies to scenarios where the distance between multiple comparison points is equal. Set the interval (distance between two comparison points), which can be positive or negative.
- Non-equidistant comparison: It is applicable to scenarios where the distance between multiple comparison points is different. In the text box shown in the following figure, fill in the position data according to the rule of one position per line (the data must be incremented and cannot exceed 50 lines). Or click the **Import pos** button to import the position data in the text file.

After setting parameters, click the **3.Compare data** button in the lower right corner of the **Equidistant comparison** pane to configure the comparison data.

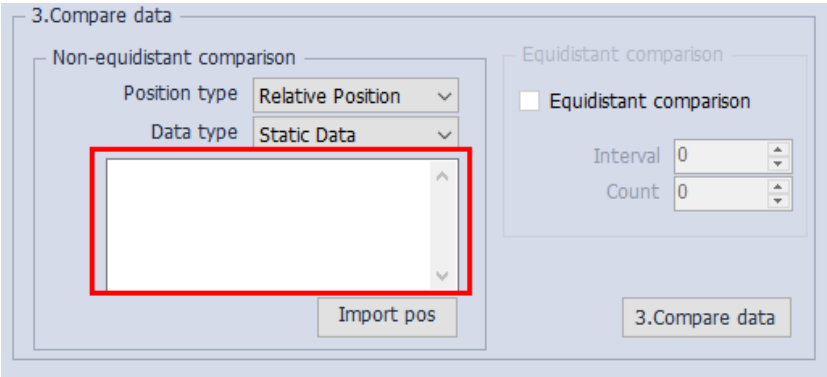


Figure 4-44 Comparison data configuration pane

4. Start position comparison output.
- On the **Start output** pane shown in the following figure, click **4.Manual** or **4.Start** to start position comparison output based on the selected manual or comparison output mode.

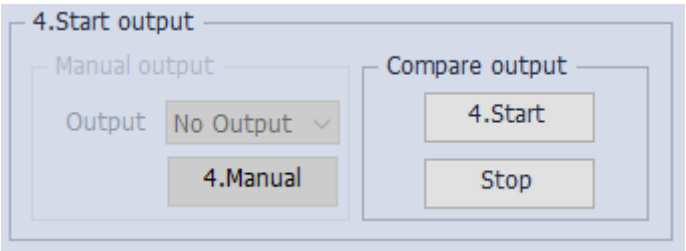


Figure 4-45 Start output pane

5. Monitor the output status in the following figure.

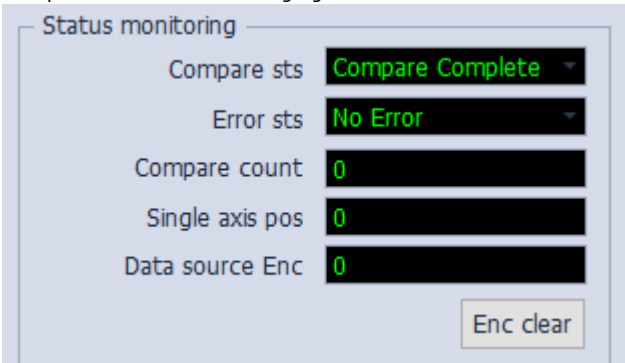


Figure 4-46 Status monitoring pane

4.9 Two-dimensional Comparison Output

The **Compare2D** tab (two-dimensional position comparison) is displayed under **Motion**. Note that the function is available only when the terminal board is connected.

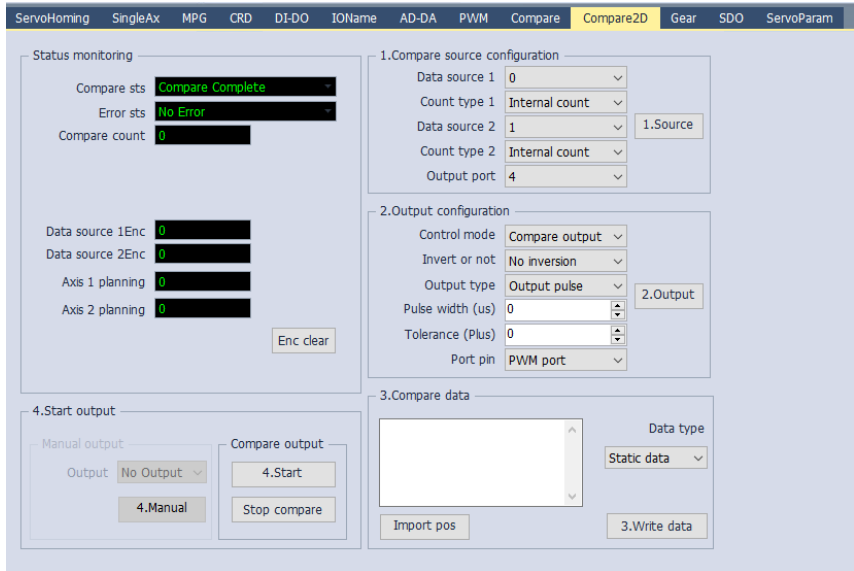


Figure 4-47 Two-dimensional position comparison output

With the two-dimensional position comparison function enabled, points of two axes moving on the plane are compared. Therefore, to commission the function, enable the interpolation function to make the axis run. Do as follows to access the **CRD** tab (interpolation):

1. Click and hold the **CRD** tab to drag it to the right part of the interface.

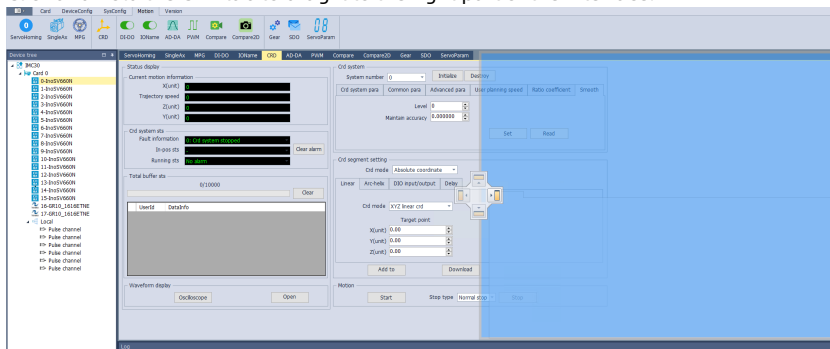


Figure 4-48

- Click the **Compare2D** tab, and drag the intersection line between the two tabs to facilitate viewing.

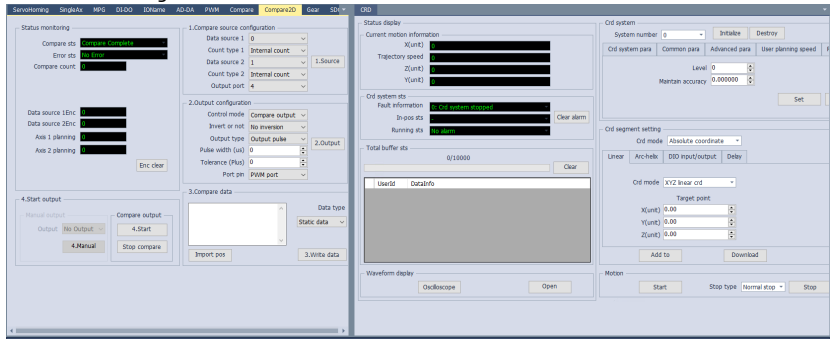


Figure 4-49

- Configure two-dimensional position parameters. The configuration parameters are similar to position comparison output parameters. For details, see ["4.8 Position Comparison Output" on page 73](#). Note: In the **Compare source configuration** area, the index corresponding to data source 1/2 corresponds to the axis number on the terminal board. In the **Output configuration** area, you must set **Pulse width** and **Tolerance**. Otherwise, the function cannot be used properly.

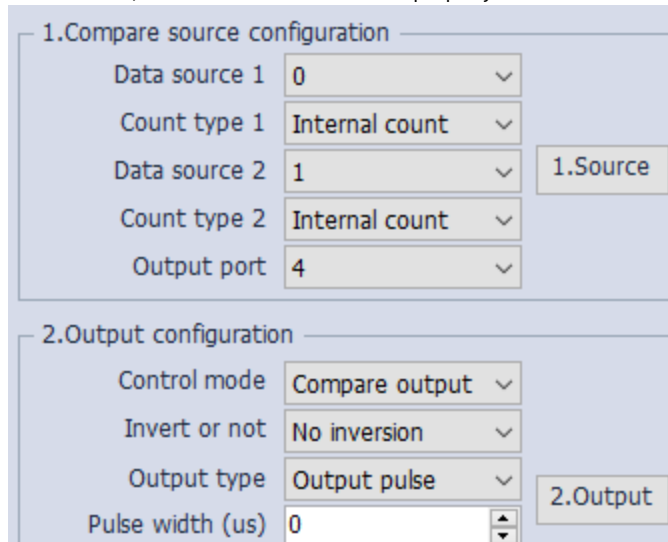


Figure 4-50

- Set the position comparison data. Click **3. Write Data** after the setting is done. See detailed descriptions below.

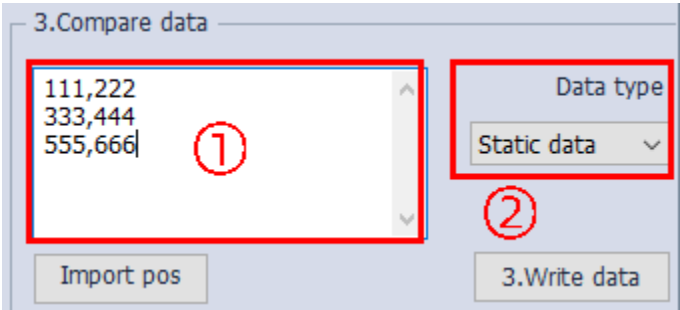


Figure 4-51

Parameter	Value	Remarks
① Data input text box	Fill in directly.	Fill in two comparison position values separated by comma in each row, as shown in the preceding figure.
	Import pos	Click Import pos , and select a TXT or CSV file (TXT file recommended). The imported data is displayed in the text box. (The imported file data must also conform to the preceding format.)
Data type	Static data	If you select this type, you cannot add data again during comparison after the data is written. If you click 3.Write data again, the text box remains unchanged.
	Dynamic data	If this type is selected, the data can be added again during comparison after the data is written. If you click 3.Write data again, the text box will be cleared and wait for the next input. This is designed to prevent repetitive comparison point input.

5. Click **4.Start**.

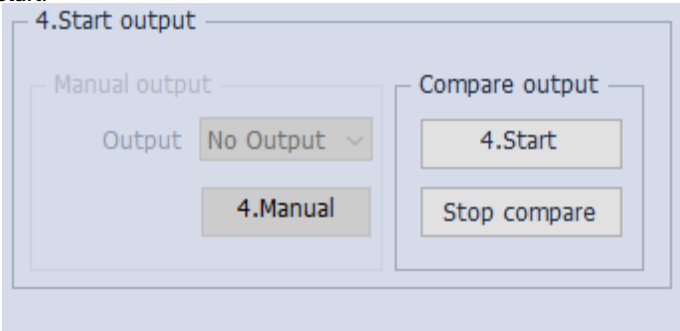


Figure 4-52

6. On the **CRD** tab, compare the interpolation motion of two axes. Ensure that the interpolation trajectory contains the comparison point and that the axis number is bound correctly.

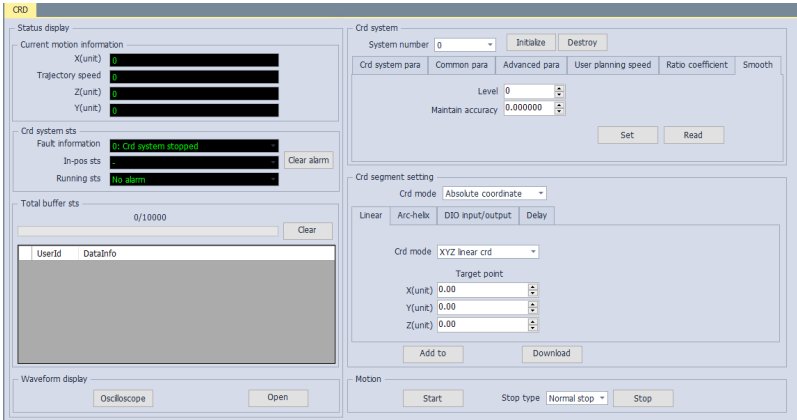


Figure 4-53

7. After the interpolation motion, you can monitor the current position comparison status in the **Status monitoring** area on the **Compare2D** tab, as shown in the following figure.

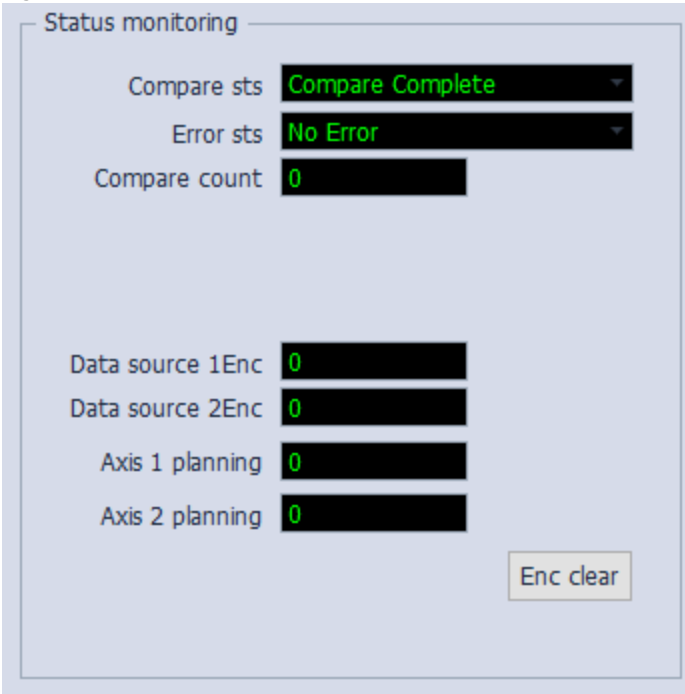
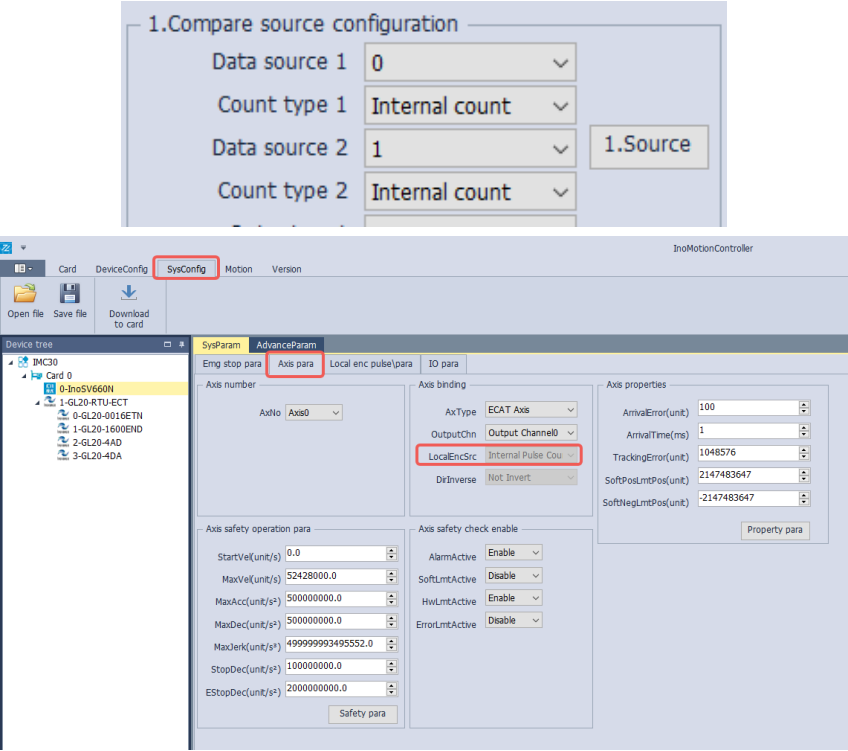


Figure 4-54

Note

If you set **Count type** in the **Compare source configuration** pane to **Internal count** during commissioning, you need to set **LocalEncSrc** of the axis corresponding to the data source to **Internal Pulse Count** on the **SysConfig** tab. Otherwise, the comparison cannot be completed properly.



4.10 Electronic Gear Ratio Setting

On the **Gear** tab, you can read and set the electronic gear ratio.

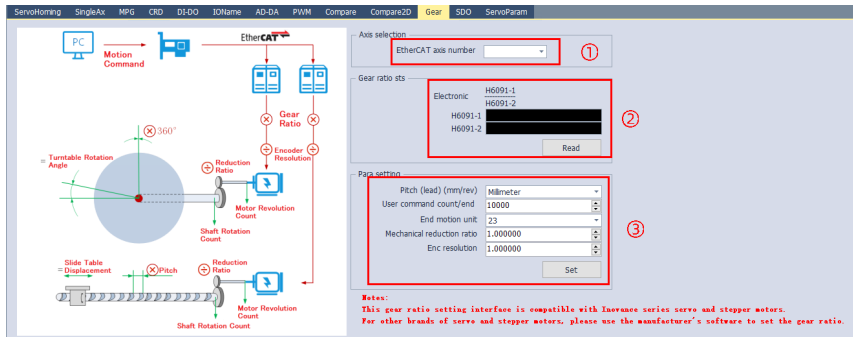


Figure 4-55 Electronic gear ratio

- ① Select an axis.
- ② Read the current electronic gear ratio and encoder information by reading the ratio of H6091-1 and H6091-2. The electronic gear ratio is set by the ratio of 6091h.01h and 6091h.02h (namely, 6091h.01h/6091h.02h).

Index	Sub-index	Name/Description	Unit	Range	Data type	Access	PDO	Op-mode	EE PROM
6091h	-	Gear ratio (Set the electronic gear ratio.)	-	-	-	-	-	-	-
	00h	Number of entries (Number of sub-indexes of 6091h)	-	2	U8	RO	NO	ALL	No
	01h	Motor revolutions (Set the motor revolutions.)	r (motor)	1 to 42949 67295	U32	rw	No	ALL	Yes
	02h	Shaft revolution (Set the shaft revolution.)	r (axis)	1 to 42949 67295	U32	rw	No	ALL	Yes

③ Set the electronic gear ratio. H6091-1 is the encoder bit value, and H6091-2 is the value for one axis revolution. For example, if H6091-2 is set to 10000, the axis rotates one revolution when the card sends 10000. Other parameters, such as mechanical deceleration ratio, pitch, and end motion unit, must be set according to the actual process.

4.11 SDO Parameter Reading/Writing

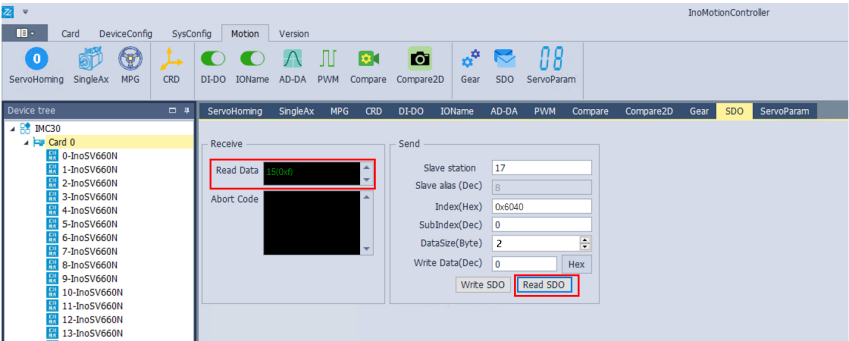
Reading SDOs

Take 0x6040 as an example. The address index is 0x6040, the sub-index is 0, and the byte size (DataSize) is 2 (unit: byte). As shown in the following figure, for 0x6040: 0, the sub-index is **0**, **Index** is **0x6040**, and **Size** is **16** (unit: bit; equals two bytes). Therefore, **DataSize** is 2 (two bytes).

Selected	Index	Size	Offs	Name	Type	Default	Dev type
☒	0x6040:0	16	0	ControlWord	UINT		0
☒	0x607A:0	32	16	Target position	DINT		0
☐	0x6088:0	16	48	Touch probe function	UINT		0
☐	0x6071:0	16	64	Target torque	INT		0
☐	0x60B2:0	16	80	Torque offset	UINT		0
☐	0x60B1:0	32	96	Velocity offset	UDINT		0
☐	0x60FF:0	32	128	Target velocity	DINT		0
☐	0x6060:0	8	160	Modes of Operation	SINT		0
☐	0x6087:0	32	168	Torque slope	UDINT		0
☐	0x60FE:1	32	200	Physical outputs	UDINT		0
☐	0x6072:0	16	232	Max Torque	UINT		0
☐	0x607F:0	32	248	Max profile velocity	UDINT		0
☐	0x60E0:0	16	280	Positive torque limit value	UINT		0
☐	0x60E1:0	16	296	Negative torque limit value	UINT		0
☐	0x2008:1	16	312	Speed-loop Gain	UINT		0
☐	0x2008:2	16	328	Speed-loop integral time constant	UINT		0

Figure 4-56 Reading SDOs

Click **Read SDO** to read the value in **Read Data**, as shown in the following figure.



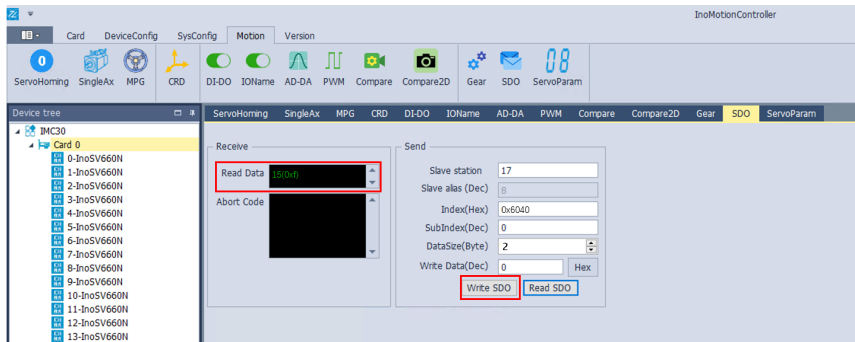
Writing SDOs

Take 0x6040 as an example. The address index is 0x6040, the sub-index is 0, and the byte size (DataSize) is 2 (unit: byte). As shown in the following figure, for 0x6040: 0, the sub-index is **0**, **Index** is **0x6040**, and **Size** is **16** (unit: bit; equals two bytes). Therefore, **DataSize** is 2 (two bytes).

PDO Content (0x1600)						
Selected	Index	Size	Offs	Name	Type	Default
☒	0x6040:0	16	0	ControlWord	UINT	0
☐	0x607A:0	32	16	Target position	DINT	0
☐	0x60B8:0	16	48	Touch probe function	UINT	0
☐	0x6071:0	16	64	Target torque	INT	0
☐	0x60B2:0	16	80	Torque offset	UINT	0
☐	0x60B1:0	32	96	Velocity offset	UDINT	0
☐	0x60FF:0	32	128	Target velocity	DINT	0
☐	0x6060:0	8	160	Modes of Operation	SINT	0
☐	0x6087:0	32	168	Torque slope	UDINT	0
☐	0x60FE:1	32	200	Physical outputs	UDINT	0
☐	0x6072:0	16	232	Max Torque	UINT	0
☐	0x607F:0	32	248	Max profile velocity	UDINT	0
☐	0x60E0:0	16	280	Positive torque limit value	UINT	0
☐	0x60E1:0	16	296	Negative torque limit value	UINT	0
☐	0x2008:1	16	312	Speed-loop Gain	UINT	0
☐	0x2008:2	16	328	Speed-loop integral time constant	UINT	0

Figure 4-57 Writing SDOs

Write 0 to 0x6040. As shown in the following figure, **Index** is **0x6040**, **SubIndex** is **0**, **DataSize** is **2**, and **Write Data** is **0**. Click the **Write SDO** button.



4.12 Servo Parameter Reading and Writing

Click the **ServoPara** tab, as shown below.

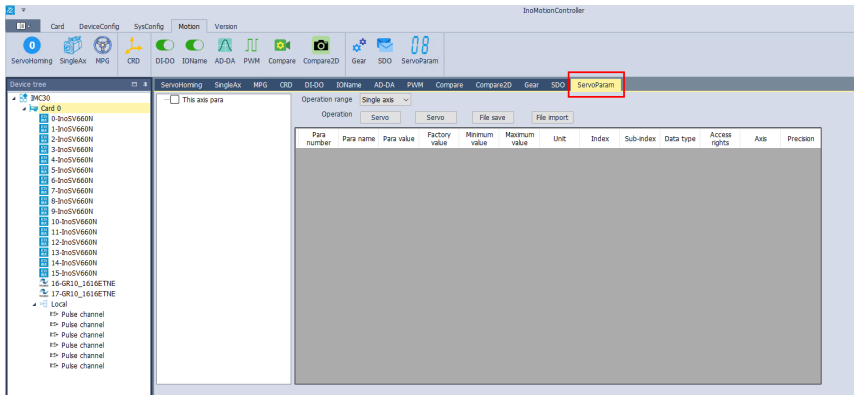
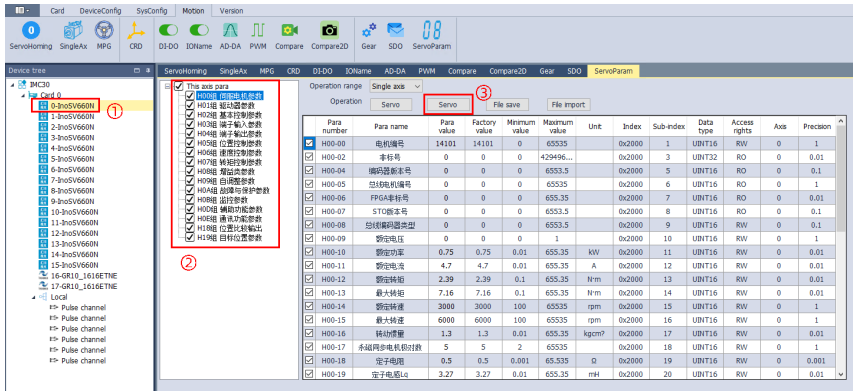


Figure 4-58 Servo parameter reading/writing interface

To read servo parameters, do as follows:

- ① Select the servo drive whose parameters need to be read.
- ② Select the parameters to be read.
- ③ Click the servo upload button to read the parameters.



To write parameters to the servo drive, do as follows:

- ① Select the servo drive whose parameters need to be read.
- ② Check the servo parameters to be modified.
- ③ Edit the values in the parameter value column.
- ④ Click the servo download button to modify the selected servo parameters.

The screenshot shows the 'ServoParam' window with the 'Operation' dropdown set to 'Servo'. The 'File save' and 'File import' buttons are highlighted with red boxes. The parameter list is as follows:

Para number	Para name	Para value	Factory value	Minimum value	Maximum value	Unit	Index	Sub-index	Data type	Access rights	Axis	Precision
H00-00	电机编号	14101	14101	0	65535		0x2000	1	UINT16	RW	0	1
H00-02	非标号	5	0	0	429496...		0x2000	3	UINT32	RO	0	0.01
H00-04	编码器版本号	0	0	0	65535		0x2000	5	UINT16	RO	0	0.1
H00-05	总线电机编号	0	0	0	65535		0x2000	6	UINT16	RO	0	1
H00-06	PPID参数号	0	0	0	65535		0x2000	7	UINT16	RO	0	0.01
H00-07	STID参数号	0	0	0	65535		0x2000	8	UINT16	RO	0	0.1
H00-08	总线编码器类型	0	0	0	65535		0x2000	9	UINT16	RW	0	0.1
H00-09	额定电压	7	0	0	1		0x2000	10	UINT16	RW	0	1
H00-10	额定功率	5	0.75	0.01	655.35	kW	0x2000	11	UINT16	RW	0	0.01
H00-11	额定电流	4.7	4.7	0.01	655.35	A	0x2000	12	UINT16	RW	0	0.01
H00-12	额定转矩	2.39	2.39	0.1	655.35	Nm	0x2000	13	UINT16	RW	0	0.01
H00-13	最大转矩	7.16	7.16	0.1	655.35	Nm	0x2000	14	UINT16	RW	0	0.01
H00-14	额定转速	3000	3000	100	65535	rpm	0x2000	15	UINT16	RW	0	1
H00-15	最大转速	6000	6000	100	65535	rpm	0x2000	16	UINT16	RW	0	1
H00-16	转动惯量	1.3	1.3	0.01	655.35	kgcm²	0x2000	17	UINT16	RW	0	0.01
H00-17	半轴同步电机积数	5	5	2	65535		0x2000	18	UINT16	RW	0	1
H00-18	定子电阻	0.5	0.5	0.001	65.535	Ω	0x2000	19	UINT16	RW	0	0.001
H00-19	定子电感Ld	3.27	3.27	0.01	655.35	mH	0x2000	20	UINT16	RW	0	0.01

To save parameters, do as follows:

Click **File save** to save all parameters as an XML file to the selected path.

To import parameters, do as follows:

Click **File import** to import parameters saved locally.

The screenshot shows the 'ServoParam' window with the 'Operation' dropdown set to 'Servo'. The 'File save' and 'File import' buttons are highlighted with red boxes. The parameter list is as follows:

Para number	Para name	Para value	Factory value	Minimum value	Maximum value	Unit	Index	Sub-index	Data type	Access rights	Axis	Precision
H00-00	电机编号	14101	14101	0	65535		0x2000	1	UINT16	RW	0	1
H00-02	非标号	5	0	0	429496...		0x2000	3	UINT32	RO	0	0.01
H00-04	编码器版本号	0	0	0	65535		0x2000	5	UINT16	RO	0	0.1
H00-05	总线电机编号	0	0	0	65535		0x2000	6	UINT16	RO	0	1
H00-06	PPID参数号	0	0	0	65535		0x2000	7	UINT16	RO	0	0.01
H00-07	STID参数号	0	0	0	65535		0x2000	8	UINT16	RO	0	0.1
H00-08	总线编码器类型	0	0	0	65535		0x2000	9	UINT16	RW	0	0.1
H00-09	额定电压	7	0	0	1		0x2000	10	UINT16	RW	0	1
H00-10	额定功率	0.75	0.75	0.01	655.35	kW	0x2000	11	UINT16	RW	0	0.01
H00-11	额定电流	4.7	4.7	0.01	655.35	A	0x2000	12	UINT16	RW	0	0.01
H00-12	额定转矩	2.39	2.39	0.1	655.35	Nm	0x2000	13	UINT16	RW	0	0.01
H00-13	最大转矩	7.16	7.16	0.1	655.35	Nm	0x2000	14	UINT16	RW	0	0.01
H00-14	额定转速	3000	3000	100	65535	rpm	0x2000	15	UINT16	RW	0	1
H00-15	最大转速	6000	6000	100	65535	rpm	0x2000	16	UINT16	RW	0	1
H00-16	转动惯量	1.3	1.3	0.01	655.35	kgcm²	0x2000	17	UINT16	RW	0	0.01
H00-17	半轴同步电机积数	5	5	2	65535		0x2000	18	UINT16	RW	0	1
H00-18	定子电阻	0.5	0.5	0.001	65.535	Ω	0x2000	19	UINT16	RW	0	0.001
H00-19	定子电感Ld	3.27	3.27	0.01	655.35	mH	0x2000	20	UINT16	RW	0	0.01

5 Card Information and Firmware Upgrade

5.1 Card Information and Firmware Upgrade

Click the **Version** tab in the tool bar to enter the tab, which is divided into two parts:

- ① Version information and Board internal information area: It displays the version information and internal information of the card.
- ② Firmware burning: Click the **Select file** button to select the firmware, select the burning mode, and then click **Start**. After burning is completed, restart the computer.

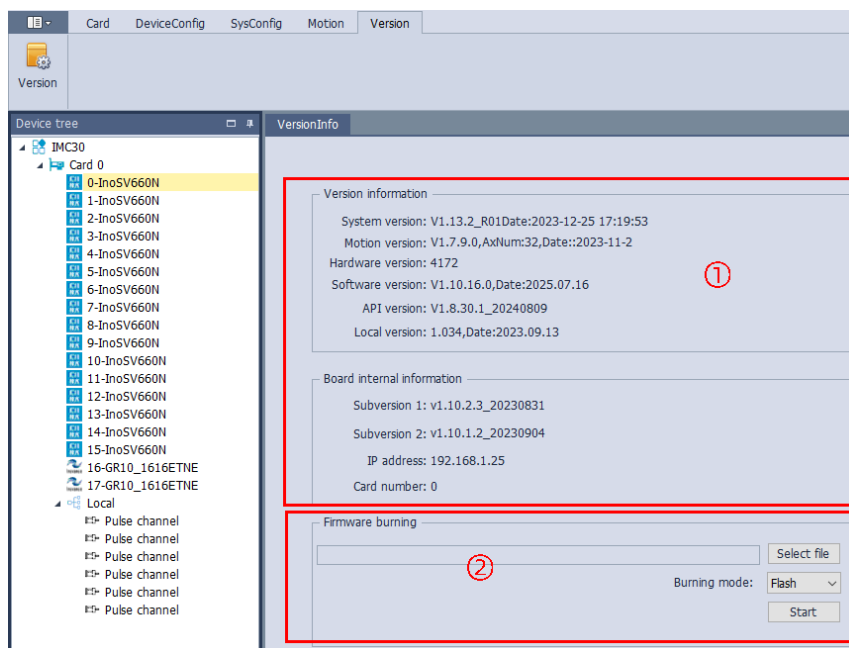


Figure 5-1 Version information

6 New Functions

6.1 Slave Alias Function

Slaves are operated based on axis numbers through the card API. The axis numbers are assigned according to the order in the link by default. When the wiring sequence changes, the corresponding relationship between the axis number and the axis of the slave also changes. The alias is the unique identifier of the slave. After the alias function is enabled, the axis numbers correspond to axes of the slave in the ascending order of the alias, regardless of the link sequence.

For example, there are three slaves in the link, and the aliases are 1001, 1002 (multi-slot axis slave with three axes), and 1003. The sequence is changed to 1001, 1003, and 1002. In this case, the axis number corresponds to the axis as follows and the corresponding relationship remains unchanged:

Axis 0: Axis of slave 1001

Axis 1: 1st axis of slave 1002

Axis 2: 2nd axis of slave 1002

Axis 3: 3rd axis of slave 1002

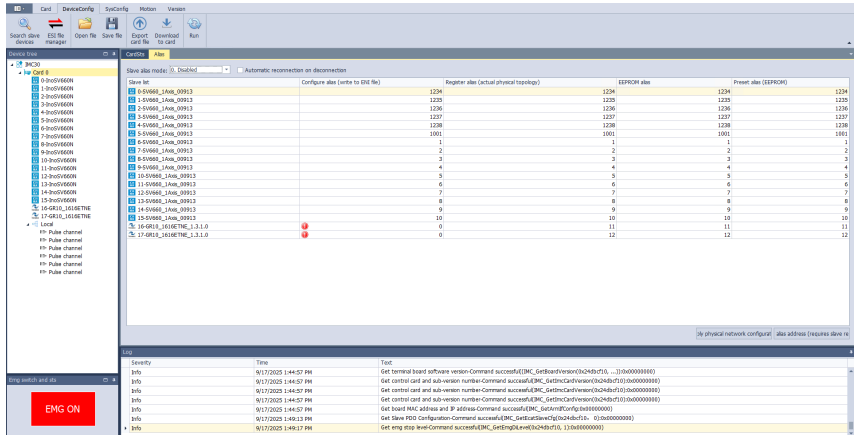
Axis 4: Axis of slave 1003

Note

- The alias range must be outside the current physical link number. For example, if the current link number is 0-1-2, the configured alias range is 3 to 1999. Otherwise, an error may occur (If an error occurs, you need to restore all slaves to default settings and restart the software.)
 - Depending on the supported mode of the slave, you can use the keypad, servo drive panel, or software to set the slave alias.
-

Entering the alias interface

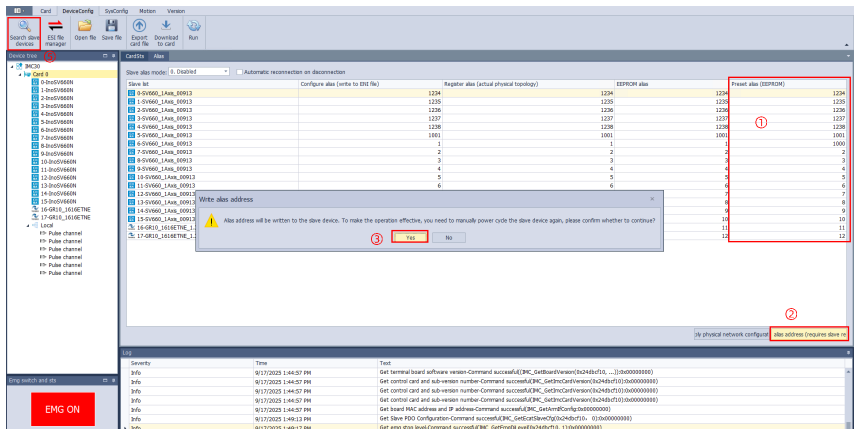
On the **DeviceConfig** tab, after searching for slaves, you can view the slave device in the device tree. Download the device parameters to the card and click **Run** to put the system into the OP state. Then, click the **Alias** tab to enter the interface, as shown in the following figure.



Setting the alias

If the slave in the link supports setting the alias by the software (for example, you can set the alias of Inovance SV660N, SV620N, SV680, and GL10 by using the software), you can set the alias according to the following steps:

- ① After the system enters the OP state with the alias mode disabled, fill in the alias in the **Preset alias** column on the **Alias** tab.
- ② Click **alias address** in the lower right corner.
- ③ When the **Write alias address** dialog box appears, click **Yes**. The alias set in the previous step is refreshed in the **EEPROM alias** column.
- ④ Power off and power on the slave. After restart, the alias is set to the slave.
- ⑤ Click **Search slave devices**. If the set alias is displayed in the **Register alias** column, the alias is set successfully.



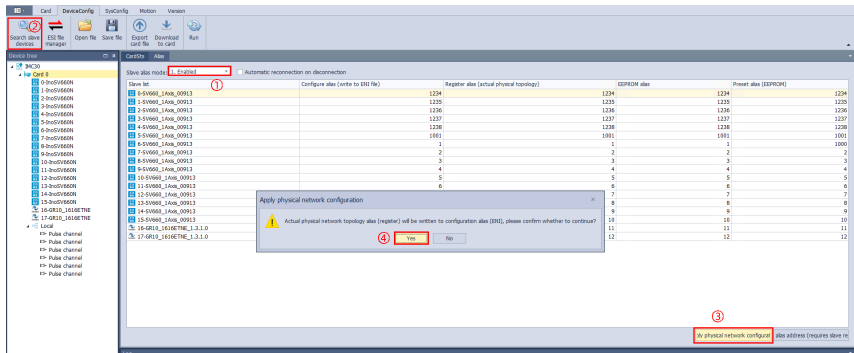
Note

You can set the slave alias only after the system enters the OP state with the alias mode disabled.

Enabling the alias function

Ensure that aliases are set for all slaves. Start the alias function as follows:

- ① Set **Slave alias mode** to **1. Enable** to enable the alias mode.
- ② Click **Search slave devices**. The alias flag will appear on the slave in the device tree.
- ③ Click **Apply physical network configuration**.
- ④ In the displayed **Apply physical network configuration** dialog box, click **Yes** to write the register alias to the ENI file.



- ⑥ Click **Download to card**. If a dialog box appears, click **OK**.
- ⑦ Click **Run** to enable the system to enter the OP state. The card works in the alias mode.

Binding the alias to the axis number

1. After enabling the alias mode and enabling the system to enter the OP state, click the **SysConfig** tab. The axis number corresponds to the alias and is saved in the system parameter file automatically. Click **Download to card** on the tool bar. The system parameter file will be downloaded to the card. The alias and axis number are bound.

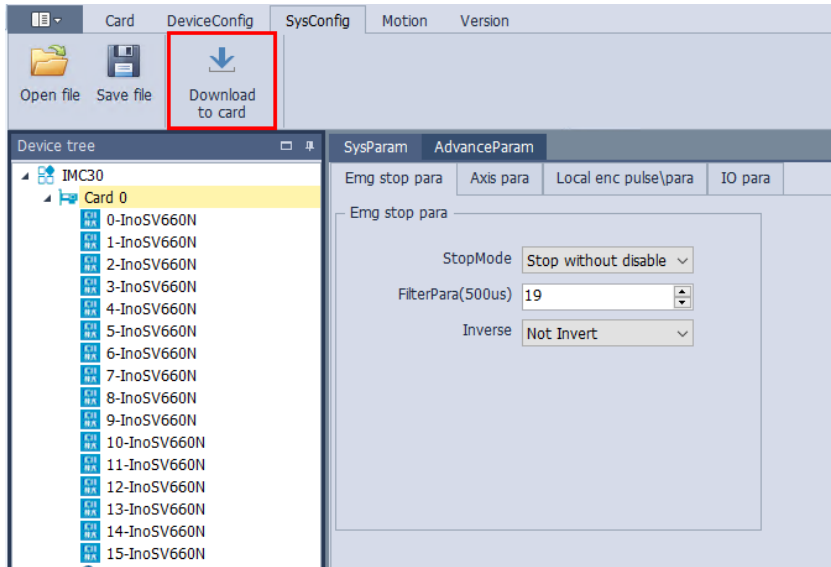


Figure 6-1

2. To verify the binding relationship between the axis number and alias, check the axis number before slave station sequence change.
Select **Motion > SingleAx** to check the axis number. Double-click the slot under an alias in the device tree to display the corresponding axis. For example, double-click the slot under alias 1000 to display axis 0. Double-click the slot under alias 1001 to display axis 1. Double-click the slot under alias 1002 to display axis 2. Double-click the slot under alias 1003 to display axis 3.

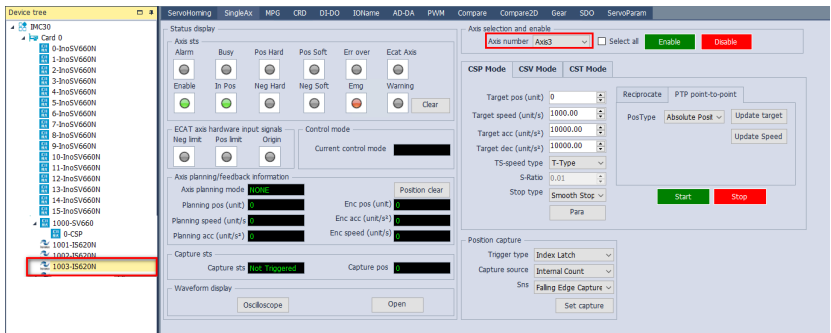


Figure 6-2

3. Change the connection sequence of the slave (for example, connect the slave in the order of 1002-1003-1000-1001-1004). On the **DeviceConfig** tab, click **Search**

slave devices, and click **Download to card** (if there is a warning dialog box, click **OK**). Then click **Run**.

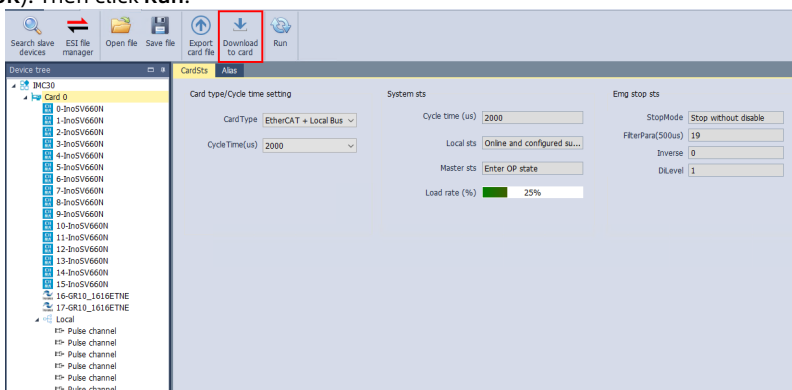


Figure 6-3

4. Click **SysConfig** tab and then click **Download to card**.

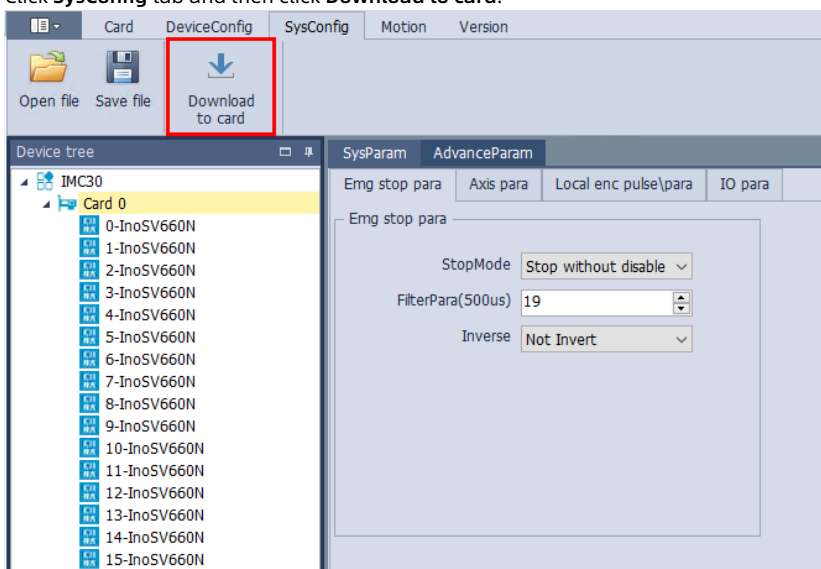
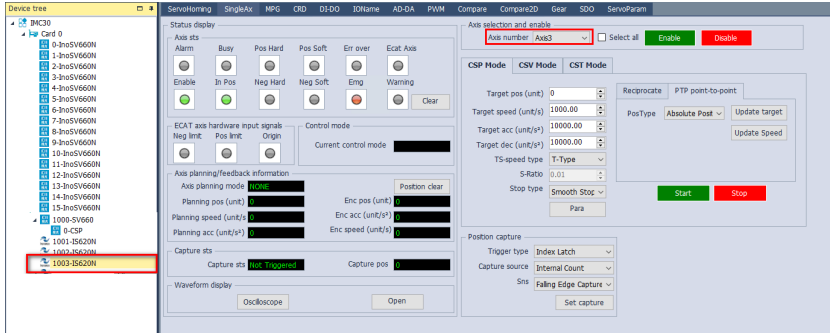


Figure 6-4

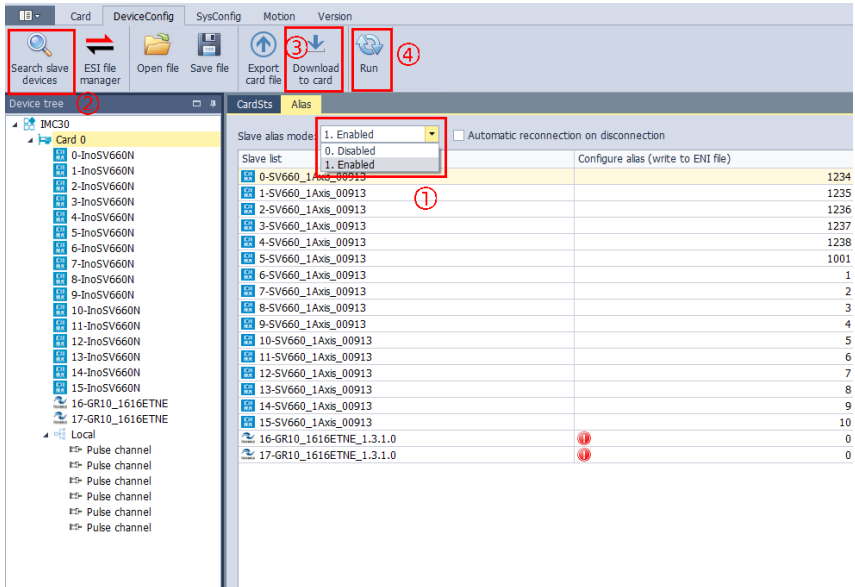
5. Select **Motion > SingleAx**, and check the axis number. Double-click the slave alias in the device tree. The correspondence between the axis number and the alias remains the same.



Disabling the alias mode

To disable the alias mode, do as follows:

- ① Go to the **Alias** tab, and set **Slave alias mode** to **0. Disabled**.
- ② Click **Search slave devices**. After the scanning is done, the alias flag disappears from the device tree.
- ③ Click **Download to card**. The card receives the ENI information to close the alias.
- ④ Click **Run**. The card enters the OP state in the non-alias mode.



Using the alias mode in the host controller program

To use the alias function in the host controller program, save the device parameter file (ENI) and system parameter file in the alias mode. Then you can invoke the files to enable

the alias mode for the card and ensure the correspondence between the alias and the axis number during card initialization by the program. For details, see the IMC30G-E Series Motion Control Card (Motion Controller) Software Programming Guide (2-1-3).

6.2 Card Log Printing

This function is available only for software version V1.10.1.1 and later.

If errors occur from the time when you search for slaves to the time when you start running the system, you need to obtain the card log. Therefore, you can find **Enable Log Recording** and **Save Log** after right-clicking the device tree only on the **DeviceConfig** tab.

1. Right-click the device tree and select **Enable Log Recording** to obtain the log file stream and store it to the memory of the card. In this case, you can click the **Search slave devices**, **Download to card**, and **Run** icons on the **DeviceConfig** tab. When the operation is completed or an error occurs, right-click the device tree and select **Save Log** to disable the log recording function and download the log file to a local path.

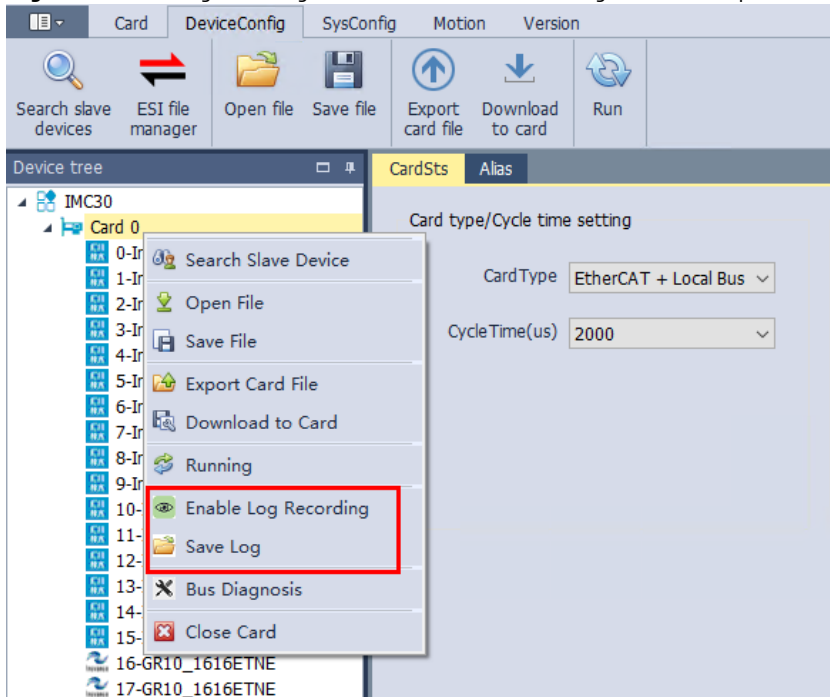
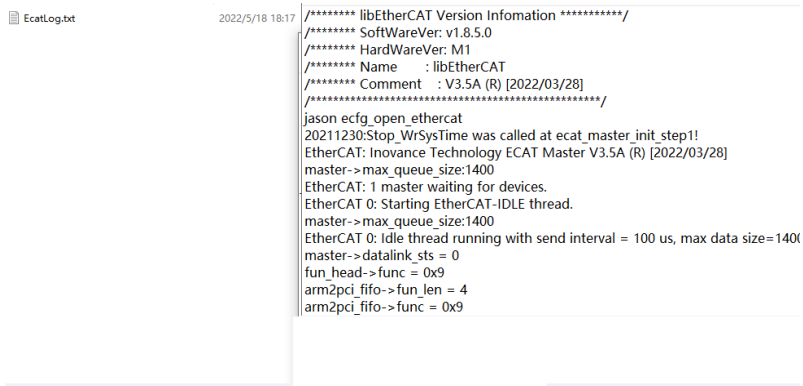


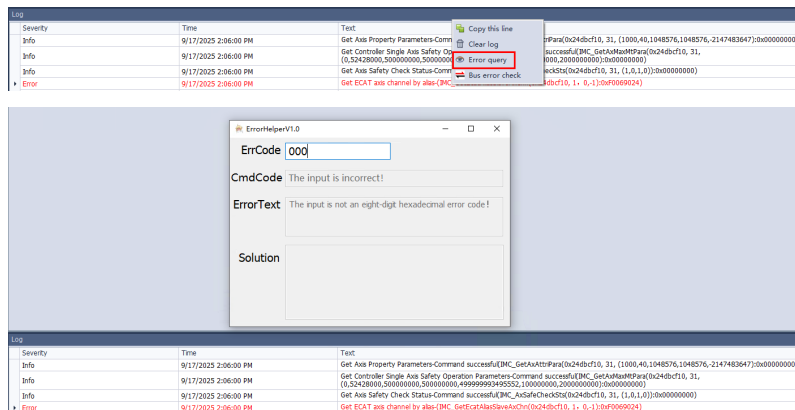
Figure 6-5

2. The log file is saved as the EcatLog.txt in the EcatLog folder under the installation folder of InoMotionController. Open the file to check that the log in the file is the same as that printed in the SecureCRT.



6.3 Error Query

When an API error occurs, right-click the log bar and select **Error Query** to display the **ErrorHelper** dialog box, as shown below.



6.4 PDO Object Adding, Deletion, and Edition

Select **DeviceConfig > ProcessData**.

1. In the **PDO List** pane, select the PDO group to be added, deleted, or edited. If the **Flags** column is **F** or **FM**, the PDO group cannot be modified.
2. In the **PDO Content** pane, the table displays the PDO objects in the selected PDO group. Right-click the PDO and select **Insert**, **Delete**, or **Edit**.

PDO List:						
Index	Size	Name	Flags	SM	SU	
0x1A00	176	Inputs				
0x1801	224	Inputs	F	3		
0x1802	200	Inputs	F			
0x1803	232	Inputs	F			
0x1804	232	Inputs	F			
0x1600	64	Outputs				
0x1701	96	Outputs	F	2		
0x1702	152	Outputs	F			
0x1703	136	Outputs	F			
0x1704	184	Outputs	F			
0x1705	152	Outputs	F			
PDO Content (0x1A00)						
Selected	Index	Size	Name	Type	Default	DevType
☒	0x6041:0	16	Statusword	UINT		0
☒	0x6064:0	32	Position actual value	DINT		0
☒	0x60B9:0	16	Touch probe status	UINT		0
☒	0x60BA:0	32	Touch probe pos1 pos valu	DINT		0
☒	0x60BC:0	32	Touch probe pos2 pos valu	DINT		0
☒	0x603F:0	16	Error code	UINT		0
☒	0x60FD:0	32	Digital inputs	UDINT		0

Figure 6-6

- Take selecting **Insert** as an example. The **New Item** dialog box appears. You can manually enter the PDO information to be added in the upper part, or you can browse the table below to select the PDO to fill in the information automatically. Then click **OK**.

New Item [X]

Index: SubIndex:

Size: DataType:

Name:

Index	SubIndex	Size	Type	Name
0x203F	0	32	UDINT	Manufactur...
0x603F	0	16	UINT	Error code
0x6041	0	16	UINT	Status word
0x6061	0	8	SINT	Modes of o...
0x6062	0	32	DINT	Position de...
0x6063	0	32	DINT	Position act...
0x6064	0	32	DINT	Position act...
0x606C	0	32	DINT	Velocity act...
0x6074	0	16	INT	Torque de...

OK Cancel

Figure 6-7

6.5 PDO Object Detection

Note

This operation can be performed only after the system enters the OP state. Otherwise, an alarm will be reported.

1. Select **DeviceConfig > PdoValue**.
2. The table displays the configured PDO objects. Click **Single** to read the current values of all PDO objects in the table. If you turn on **Loop read on**, the current values of the PDO objects in the table will be refreshed in a cyclic manner.

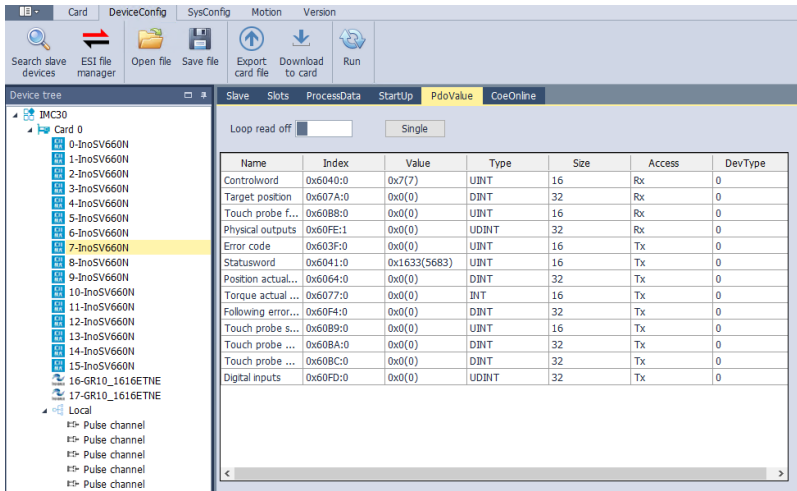


Figure 6-8

6.6 CoEOnline Function

Note

This operation can be performed only after the system enters the OP state. Otherwise, an alarm will be reported.

This function allows you to monitor the slave object through SDO.

1. Select **DeviceConfig > CoeOnline**.
2. By default, all SDO objects of the slave available for query are displayed in the list, as shown in the following figure.

Slave

Slots

ProcessData

StartUp

PdoValue

CoeOnline

List filter

Update list

Index	Name	Flag	Bit size	Value
0x1000:0	Device type	ro	32	0x20192(131474)
0x1001:0	Error Register	ro	8	0x0000(0)
0x1008:0	Device name	ro	80	0x0000(0)
0x1009:0	Hardware version	ro	32	0x0000(0)
0x100A:0	Software version	ro	32	0x0000(0)
0x1C00:0	Sync manager type		0	0x0000(0)
0x1018:1	Vendor ID	ro	32	0x0000(0)
0x1018:2	Product Code	ro	32	0x0000(0)
0x1018:3	Revision	ro	32	0x0000(0)
0x1018:4	Serial number	ro	32	0x0000(0)
0x1600:1	1st Output Object to be mapped	rw	32	0x0000(0)
0x1600:2	2nd Output Object to be mapped	rw	32	0x0000(0)
0x1600:3	3rd Output Object to be mapped	rw	32	0x0000(0)
0x1600:4	4th Output Object to be mapped	rw	32	0x0000(0)
0x1600:5	5th Output Object to be mapped	rw	32	0x0000(0)
0x1600:6	6th Output Object to be mapped	rw	32	0x0000(0)
0x1600:7	7th Output Object to be mapped	rw	32	0x0000(0)
0x1600:8	8th Output Object to be mapped	rw	32	0x0000(0)
0x1600:9	9th Output Object to be mapped	rw	32	0x0000(0)
0x1600:10	10th Output Object to be mapped	rw	32	0x0000(0)
0x1701:1	1st Output Object to be mapped	ro	32	0x0000(0)
0x1701:2	2nd Output Object to be mapped	ro	32	0x0000(0)

Figure 6-9

3. If there are too many objects, which is not easy for users to check or which lowers the refresh efficiency, you can select specific SDO objects to be monitored by clicking the **List filter** button.

Index	Name	Flag	Bit size	Value
0x1000:0	Device type			
0x1001:0	Error Register			
0x1008:0	Device name			
0x1009:0	Hardware version			
0x100A:0	Software version			
0x1C00:0	Sync manager type			
0x1018:1	Vendor ID			
0x1018:2	Product Code			
0x1018:3	Revision			
0x1018:4	Serial number			
0x1600:1	1st Output Object to be mapped			
0x1600:2	2nd Output Object to be mapped			
0x1600:3	3rd Output Object to be mapped			
0x1600:4	4th Output Object to be mapped			
0x1600:5	5th Output Object to be mapped			
0x1600:6	6th Output Object to be mapped			
0x1600:7	7th Output Object to be mapped			
0x1600:8	8th Output Object to be mapped			
0x1600:9	9th Output Object to be mapped			
0x1600:10	10th Output Object to be mapped			
0x1701:1	1st Output Object to be mapped			
0x1701:2	2nd Output Object to be mapped			

New Item

☐ Select all

Index	Name
☒ 0x1000:0	Device type
☒ 0x1001:0	Error Register
☒ 0x1008:0	Device name
☒ 0x1009:0	Hardware version
☒ 0x100A:0	Software version
☒ 0x1C00:0	Sync manager type
☒ 0x1018:1	Vendor ID
☒ 0x1018:2	Product Code
☒ 0x1018:3	Revision
☒ 0x1018:4	Serial number
☒ 0x1600:1	1st Output Object to be mapped
☒ 0x1600:2	2nd Output Object to be mapped
☒ 0x1600:3	3rd Output Object to be mapped
☒ 0x1600:4	4th Output Object to be mapped
☒ 0x1600:5	5th Output Object to be mapped
☒ 0x1600:6	6th Output Object to be mapped
☒ 0x1600:7	7th Output Object to be mapped
☒ 0x1600:8	8th Output Object to be mapped

Figure 6-10

4. After you click **OK**, the list displays only the selected object word. In this case, click **Update list** to refresh the online values of all the objects in the list.

List filter		Update list			
Index	Name	Flag	Bit size	Value	^
0x1000:0	Device type	ro	32	0x20192(131474)	
0x1001:0	Error Register	ro	8	0x0000(0)	
0x1008:0	Device name	ro	80	0x0000(0)	
0x1009:0	Hardware version	ro	32	0x0000(0)	

Figure 6-11

7 Appendix

7.1 PDO Adding/Deleting Procedure

1. EtherCAT axis PDOs

Obtain the axis parameters and attributes, and the PDOs to be operated and their attributes. Set different PDO object groups according to system requirements to implement different functions. The IMC30G-E supports the following PDOs for servo axes.

The following takes the PDO index of the first module of the IS620N and SV820 as an example. If the controlled object is SV820, the PDO object indexes supported by the servo axis (other modules) need to be offset by 0x0800 based on the module, that is:

Module1: 0x6000 > 0x67FF

Module2: 0x6800 > 0x6FFF

...

Table 7-1 PDO objects supported by the IMC30G-E for servo axes

Parameter	PDO mapping	EtherCAT	Sub-index (HEX)	Data type
Error code (mandatory)	TPDO	603Fh	00	UINT16
Control word (mandatory)	RPDO	6040h	00	UINT16
Status word (mandatory)	TPDO	6041h	00	UINT16
Target position (mandatory)	RPDO	607Ah	00	INT32
Position feedback (mandatory)	TPDO	6064h	00	INT32
DI (mandatory) Includes the homing and LMT hardware signals	TPDO	60FDh	00	UDINT32
Probe mode (optional)	RPDO	60B8h	00	UINT16
Probe status (optional)	TPDO	60B9h	00	UINT16
Latch value at rising edge for probe 1	TPDO	60BAh	00	INT32

Parameter	PDO mapping	EtherCAT	Sub-index (HEX)	Data type
Latch value at falling edge for probe 1	TPDO	60BBh	00	INT32
Actual torque (optional)	TPDO	6077h	00	INT16
Target torque (optional)	RPDO	6071h	00	INT16
Torque feedforward (optional)	RPDO	60B2h	00	INT16
Speed feedforward (optional)	RPDO	60B1h	00	INT32
Position deviation (optional)	TPDO	60F4h	00	INT32
Target speed (optional)	RPDO	60FFh	00	INT32
Servo mode selection (optional)	RPDO	6060h	00	INT8
Actual speed (optional)	TPDO	606Ch	00	INT32
Torque slope (optional)	RPDO	6087h	00	UDINT32
Physical output (optional)	RPDO	60FEh	01	UDINT32
Press control word (optional for customized SV510N)	RPDO	604Dh	00	UINT16
Press status word (optional for customized SV510)	TPDO	604Eh	00	UINT16
AI1 voltage (optional for customized SV510)	TPDO	6052h	00	UINT16

Parameter	PDO mapping	EtherCAT	Sub-index (HEX)	Data type
AI2 voltage (optional for customized SV510)	TPDO	6053h	00	UINT16
Pressure feedback (optional for customized SV510)	TPDO	6054h	00	UINT16

Table 7–2 PDO objects supported by the IMC30G-E for the AM600-4PME

Parameter	PDO mapping	EtherCAT	Sub-index (HEX)	Data type
Control word (basic parameter)	RPDO	6040h	00	UINT16
Status word (basic parameter)	TPDO	6041h	00	UINT16
Target position (basic parameter)	RPDO	607Ah	00	INT32
Position feedback (basic parameter)	TPDO	6064h	00	INT32
Position deviation (optional parameter)	TPDO	60F4h	00	INT32

Note

All axes are controlled by CSP by default. To switch modes, you need to use advanced API instructions.

The other axis operations can be performed via SDO interfaces.

2. Default PDO configuration

By default, the system provides two PDO lists: receiving PDO list 0x1701 and sending PDO list 0x1B01. The following figure shows the contained PDO objects.

- Receiving PDO objects

PDO Content (0x1B01)						
Selected	Index	Size	Name	Type	Default	DevType
☒	0x603F:0	16	Error code	UINT		Servo
☒	0x6041:0	16	Statusword	UINT		Servo
☒	0x6064:0	32	Position actual value	DINT		Servo
☒	0x6077:0	16	Torque actual value	INT		Servo
☒	0x60F4:0	32	Following error actual value	DINT		Servo
☒	0x60B9:0	16	Touch probe status	UINT		Servo
☒	0x60BA:0	32	Touch probe pos1 pos value	DINT		Servo
☒	0x60BC:0	32	Touch probe pos2 pos value	DINT		Servo
☒	0x60FD:0	32	Digital inputs	UDINT		Servo

Figure 7-1 Receiving PDO (0x1701) objects

The system selects the receiving PDOs 0x6040 (Controlword) and 0x607A (Target position) as default configuration objects. If you need other PDO objects, you can add and delete PDOs according to the steps described below.

- Sending PDO objects

PDO Content (0x1701)						
Selected	Index	Size	Name	Type	Default	DevType
☒	0x6040:0	16	Controlword	UINT		Servo
☒	0x607A:0	32	Target position	DINT		Servo
☒	0x60B8:0	16	Touch probe function	UINT		Servo
☒	0x60FE:1	32	Physical outputs	UDINT		Servo

Figure 7-2 Sending PDO (0x1B01) objects

The system selects the sending PDOs 0x6041 (Statusword), 0x6064 (Position actual value), and 0x60FD (Digital input) as default configuration objects. If you need other PDO objects, you can add and delete PDOs according to the steps described below.

3. Add or delete PDOs.

The following section takes adding PDO objects for the probe capture function as an example.

- Select the slave device to which the PDO object is added and enter the **ProcessData** tab.

SMI	Size	Type	Page
0	128	Word	
1	128	Word	
2	16	Byte	
3	16	Byte	

SubIndex	Index	Size	Name	Type	Default	Data Type
0	0x1A00	16	Word	Word		Word

Figure 7-3 ProcessData tab

- b. Select the PDO index in **PDO List**. For example, if you select 0x1A00, all the PDOs included in the PDO index are displayed in **PDO Content (0x1A00)**.

PDO List:						
Index	Size	Name	Flags	SM	SU	
0x1A00	30	1st transmit PDO Mapping		3		
0x1600	21	1st receive PDO Mapping		2		
PDO Content (0x1A00)						
Selected	Index	Size	Offs	Name	Type	Default
☒	0x6041:00	2	0	Statusword	UINT	
☒	0x6064:00	4	2	Position actual value	DINT	
☒	0x60FD:00	4	6	Digital inputs	UDINT	
☐	0x60B9:00	2	10	Touch probe status	UINT	
☐	0x60BA:00	4	12	Touch probe pos1 pos value	DINT	
☐	0x60BB:00	4	16	Touch Probe pos 1 neg value	DINT	
☐	0x6077:00	2	20	Torque actual value	INT	
☐	0x60F4:00	4	22	Following error actual value	DINT	
☐	0x606C:00	4	26	Velocity actual value	DINT	

Figure 7-4 PDO content included in 0x1A00

- c. Select the object related to the probe capture function in PDO Content to add PDO objects, as shown in the following figure. View the check box status before the selected PDO.

PDO Content (0x1A00)						
Selected	Index	Size	Offs	Name	Type	Default
☐	0x6041:00	2	0	Statusword	UINT	
☐	0x6064:00	4	2	Position actual value	DINT	
☐	0x60FD:00	4	6	Digital inputs	UDINT	
☒	0x60B9:00	2	10	Touch probe status	UINT	
☒	0x60BA:00	4	12	Touch probe pos1 pos value	DINT	
☒	0x60BB:00	4	16	Touch Probe pos 1 neg value	DINT	
☒	0x6077:00	2	20	Torque actual value	INT	
☐	0x60F4:00	4	22	Following error actual value	DINT	
☐	0x606C:00	4	26	Velocity actual value	DINT	

Figure 7-5 Selecting new sending PDO objects

- d. Add the receiving PDO object in the same way, as shown in the following figure.

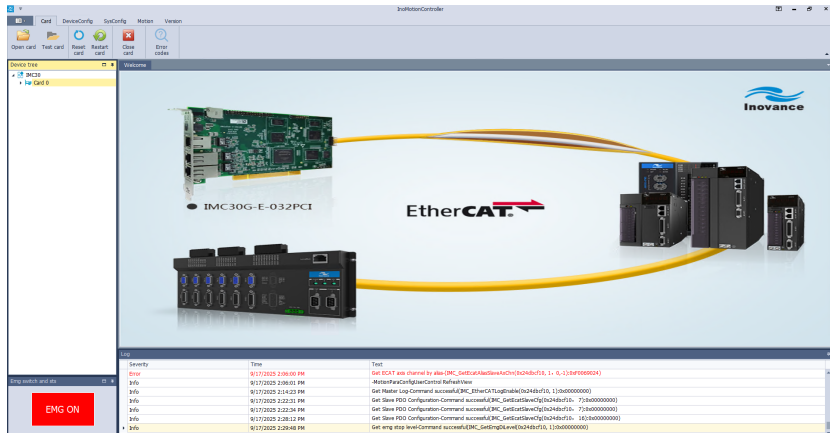
PDO Content (0x1600)						
Selected	Index	Size	Offs	Name	Type	Default
☐	0x6040:00	2	0	Controlword	UINT	
☐	0x607A:00	4	2	Target position	DINT	
☒	0x60B8:00	2	6	Touch probe function	UINT	
☒	0x6071:00	2	8	Target torque	INT	
☐	0x60B2:00	2	10	Velocity offset	INT	
☐	0x60B1:00	4	12	Velocity offset	DINT	
☐	0x60FF:00	4	16	Target velocity	DINT	
☐	0x6060:00	1	20	Modes of Operation	SINT	

Figure 7-6 Selecting new receiving PDO objects

- e. Configure other slaves in the same way.
- f. Click **Download to card** to download the new configuration to the control card (controller) or click **Save file** to save the newly configured device parameters in a file to enable automatic configuration through API functions.

7.2 Quick Start Example

1. Open the software. Click the software icon to enter the initial interface. In this case, the software automatically searches for the card and displays the searched card in the **Device tree** pane, as shown below.



2. Open a card. On the **Card** tab, you can click **Open card** or **Test card**.
 - **Open card**: After clicking this icon, you need to configure the device parameters and system parameters as required, and test motion functions on the **Motion** tab. This is a common card opening mode.
 - **Test card**: The default device parameters and system parameters are used. The motion function test interface is opened automatically. If you ensure that the current slave link can enter the OP state and only motion function test is required, you can select this mode.

If you click **Open card**, the card icon changes to light blue after card opening is successful, and the software switches to the **DeviceConfig** tab, as shown in the following figure.

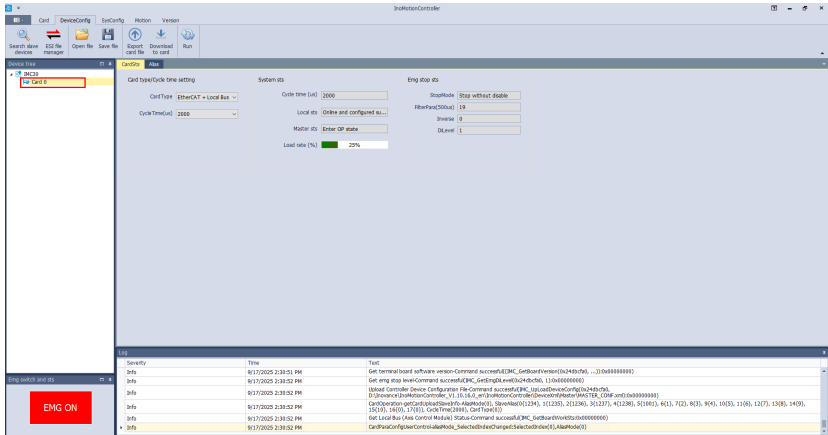


Figure 7-7 DeviceConfig tab after card opening is completed

If you click **Test card**, the software jumps to the **Motion** tab directly.

3. Set the card type (CardType) and card cycle (CycleTime). The IMC30G-E motion control card supports both EtherCAT bus control and terminal board pulse control. Therefore, set the card type according to the actual link so that it can be in the correct working mode. Otherwise, the bus cannot be started.

Set **CardType** to **EtherCAT**, **EtherCAT + Local Bus**, or **Local Bus**, as described below:

- EtherCAT: Only EtherCAT slaves are available.
- EtherCAT + Local Bus: Both EtherCAT slaves and terminal board slaves are available.
- Terminal board: Only terminal board slaves are available.

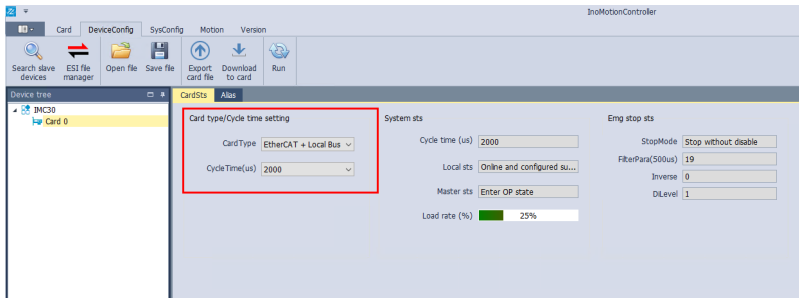


Figure 7-8 CardSts tab under the DeviceConfig tab

Select a value from the **CycleTime** drop-down box to set the bus communication cycle of the card. The larger the cycle value, the worse the real-time control performance. The smaller the cycle value, the larger the load rate of the card. Set a proper cycle

based on the number of slaves and the resource consumption of slaves. The recommended value is 1000 in normal conditions.

4. Set device parameters: After you set card-related parameters, set device parameters on the **DeviceConfig** tab.

On this tab, you can search for slaves, configure the slave device parameters, download the ENI file (device parameter file) to the card, and make the system enter the OP state (running state). You can also manage ESI files, save ENI files to a local path, export ENI files from the card, or directly open local ENI files to import the files to the card. For details, see ["3.1.2 Device Parameter Configuration Process" on page 21](#).

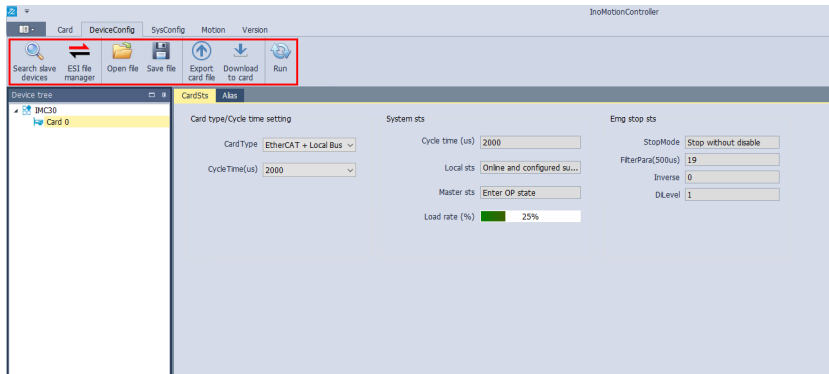


Figure 7-9 DeviceConfig tab

- a. Search for slaves.

Click **Search slave devices**. The software searches for the slaves mounted on the link and displays all the slaves and slave modules in the **Device tree** pane.

- If the log bar indicates "Scan slave devices complete" after search, proceed with the next step.

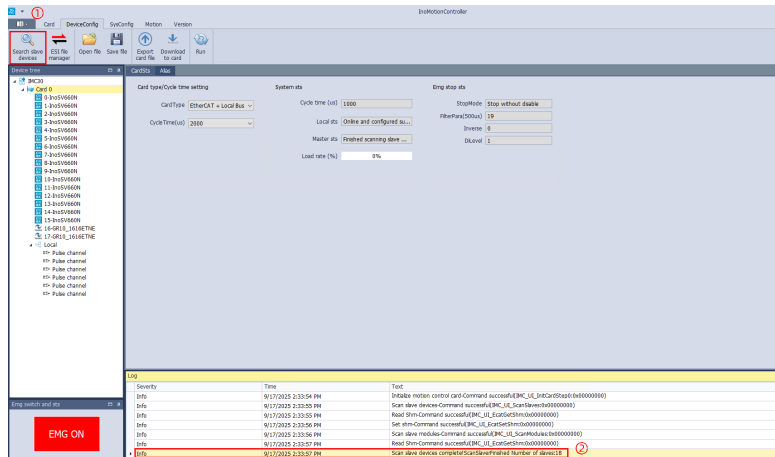


Figure 7-10

- If **UnkownBox** (unrecognized slave) appears in the device tree after search, you need to add the device description file of the slave using the ESI file manager. For details, see ["3.1.2 Device Parameter Configuration Process" on page 21](#).

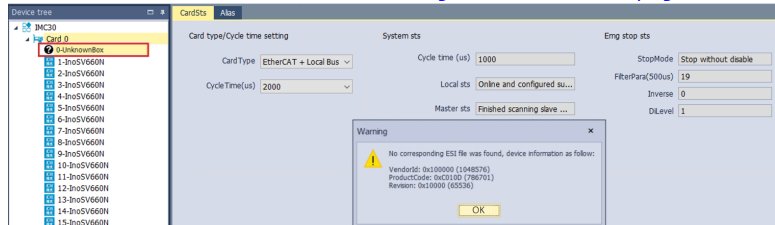


Figure 7-11 Scanning the unrecognized slave and clicking the slave in the device tree

- Configure the device parameters of the slave. After you click a slave in the device tree, the **ProcessData** tab is displayed to allow you to configure PDOs. You can set the bus parameters of the slave. For detailed descriptions and operations, see ["3.1.2 Device Parameter Configuration Process" on page 21](#) and ["6.4 PDO Object Adding, Deletion, and Edition" on page 96](#). In this example, the default parameters are used and are not modified.

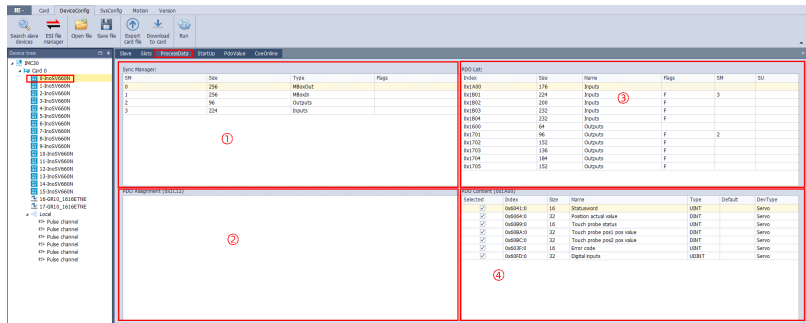


Figure 7-12 Four panes for PDO object configuration

- c. Download the ENI file to the card. Click **Download to card** on the tool bar to download the configured device parameter file (ENI file) to the card. The log bar indicates "Download Device Parameters-Command successful", as shown below.

Severity	Time	Text
Info	9/17/2025 2:34:05 PM	Scan slave modules Command successful(BMC_UI_ScanModules:0x00000000)
Info	9/17/2025 2:34:06 PM	Read Shm-Command successful(BMC_UI_ECATGetShm:0x00000000)
Info	9/17/2025 2:34:06 PM	Scan slave devices complete/ScanSlaveFinished Number of slaves:18
Debug	9/17/2025 2:34:06 PM	Local bus online and configured successfully
Info	9/17/2025 2:42:32 PM	Download Device Parameters-Command successful(BMC_DownloadDeviceConfig:0x244bdcfa, D:\Inovance\InoMotionController_V1.10.16.0_en\InoMotionController\DeviceXm\Master\MASTER_CONF.xml:0x00000000)

Figure 7-13 Prompt indicating successful download of device parameters

- d. Enter the OP state. After downloading the ENI file to the card, click the **Run** button on the tool bar. The card configures the bus using the ENI file downloaded to the card. If the bus starts successfully, the log bar indicates "Bus initialization successful, system entered OP state".

Severity	Time	Text
Info	9/17/2025 2:45:17 PM	Download Device Parameters-Command successful(BMC_DownloadDeviceConfig:0x244bdcfa, D:\Inovance\InoMotionController_V1.10.16.0_en\InoMotionController\DeviceXm\Master\MASTER_CONF.xml:0x00000000)
Info	9/17/2025 2:45:20 PM	Get ECAT motion control card sts-Command successful(BMC_GetECATMasterSts:0x244bdcfa,5:0x00000000)
Info	9/17/2025 2:45:34 PM	Configure slave-Command successful(BMC_UI_ConfigureSlave:0x00000000)
Info	9/17/2025 2:45:35 PM	Get master status-Command successful(BMC_GetECATMasterSts:0x244bdcfa,6:0x00000000)
Info	9/17/2025 2:45:35 PM	Get Local Bus (Axis Control Module) Status-Command successful(BMC_GetBoardWorkSts(2):0x00000000)
Info	9/17/2025 2:45:35 PM	Bus initialization successful, system entered OP state

Figure 7-14 Prompt for entering the OP state

5. Set system parameters. After the system enters the OP state, click the **SysConfig** tab on the tool bar to set emergency stop parameters, axis parameters, local encoder pulse parameters, and I/O parameters.

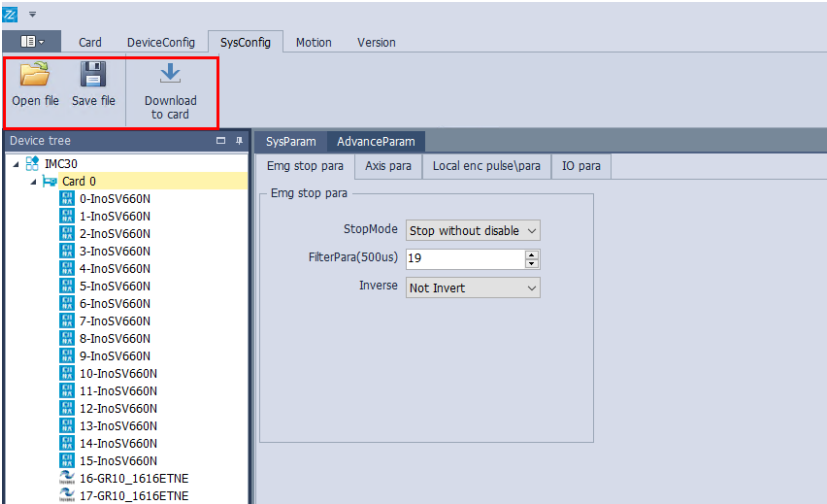


Figure 7-15 SysConfig tab

By default, the emergency stop circuit is not connected. In this case, the system determines that emergency stop is triggered. Therefore, the emergency stop parameter is inverted in this example. Do as follows: ① Set **Inverse** to **Invert**. ② Click **Download to card**. ③ View the emergency stop status change. ④ View the corresponding prompt in the log bar.

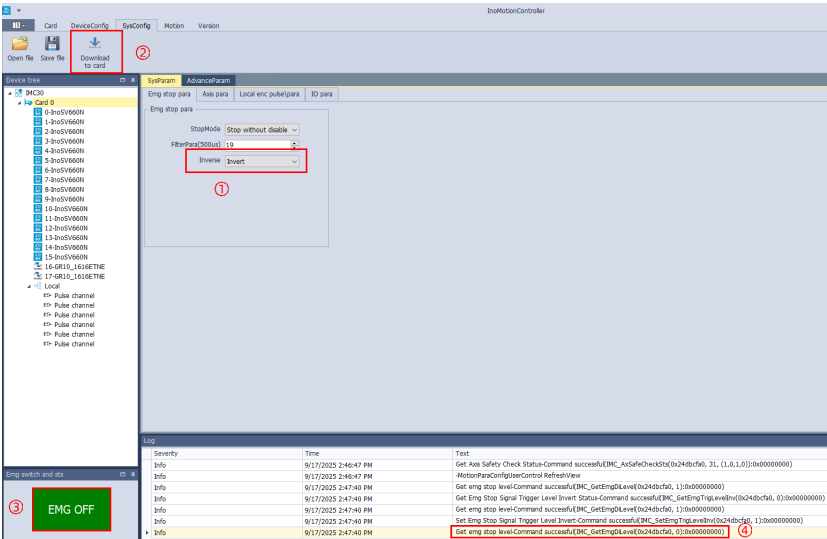


Figure 7-16 Downloading system parameters

6. After setting system parameters as needed, click **Download to card** on the tool bar. The log will prompt that the system parameter configuration file is downloaded successfully and the parameters take affect.
7. Test motion functions. Click **Motion** to enter the motion function test interface. This interface contains several tabs such as **ServoHoming**, **SingleAx**, and **AD-DA**, on which you can test related motion functions. The system opens the **SingleAx** tab by default. You can perform motion tests on a single servo axis on the tab, as shown in the following figure.

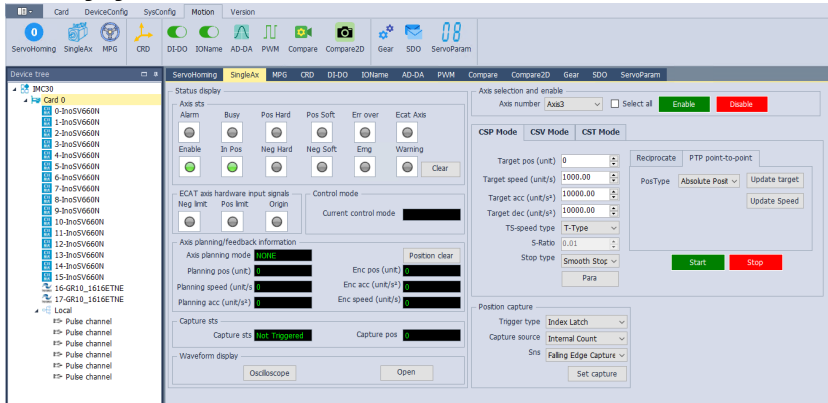


Figure 7-17 Main interface of the motion function test

8. Close the card and close the software. If you have finished operations, right-click the card icon in the device tree and select **Close Card**. The following dialog box appears.

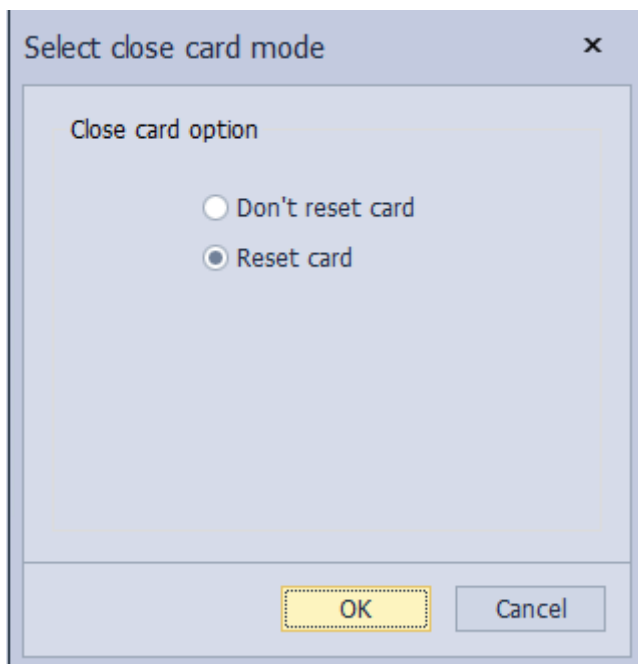


Figure 7-18 Selecting close card mode

- Don't reset card: After the card is closed, the card remains in the OP state and bus communication with the slave. If you use the host controller to operate the card, opening cards and bus configurations are not required.
- Reset card: After the card is closed, the card exits the OP state and bus communication with the slave is disconnected.

To exit the software, click **x** in the upper right corner of the software. The **Select close card mode** dialog box appears. Select an option and click **OK** to close the software.

7.3 Device Parameter Configuration Flow

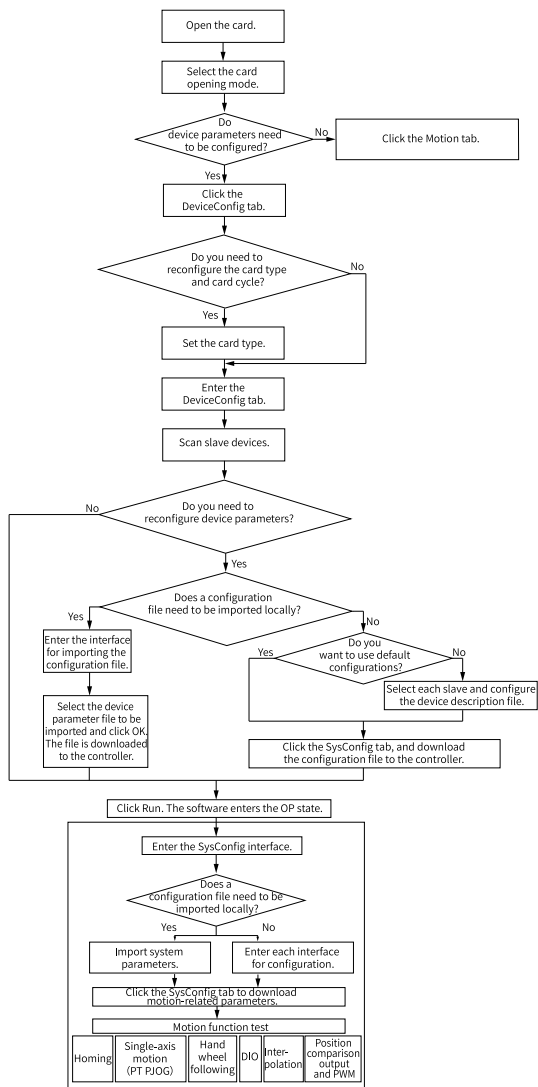


Figure 7-19 Device parameter configuration flow

7.4 Motion Function Test Flow

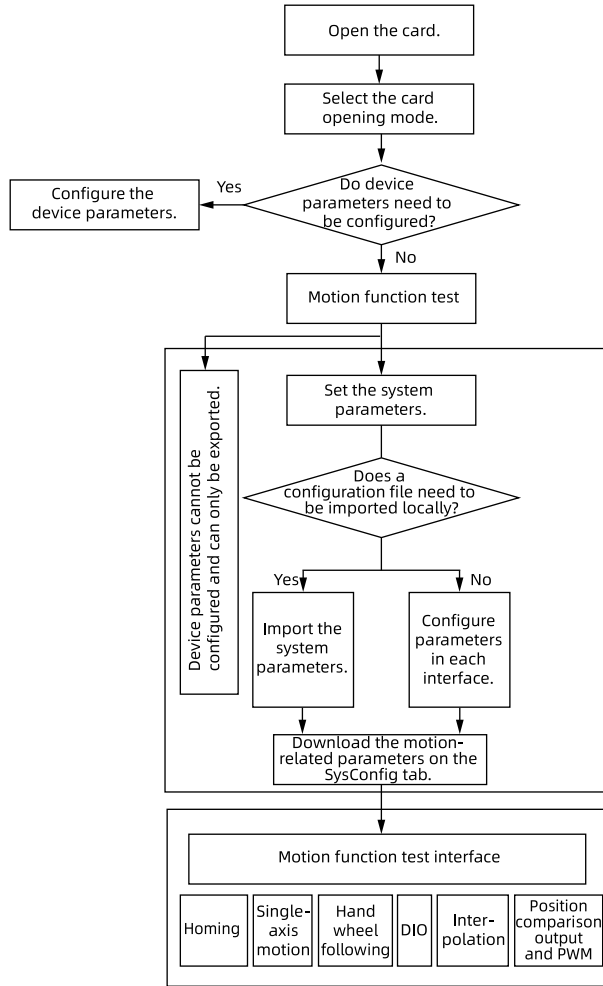


Figure 7-20 Motion function test flow

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- Channel #3: Download My Inovance app (<https://zshc-eu.inovance.com/download-pc/>) where you can access products info and documentation, and query product parameters.

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