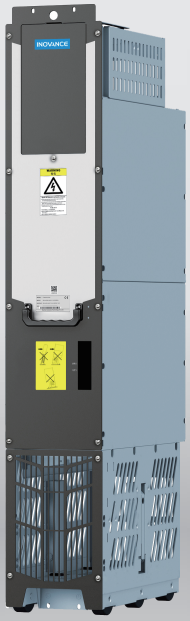
INOVANCE

FORWARD, ALWAYS PROGRESSING





MD880(LC)-20 Series Basic Rectifier

Commissioning Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19012700A00

Preface

Introduction

This product targets at high-end transmission applications and features high-performance speed and torque control, high reliability, flexible system integration, easy commissioning and maintenance, and high power density. It is applicable to a wide range of industries, including metallurgy, paper making, vessels, cables, port machinery, and other large-scale lifting equipment.

This guide describes the commissioning tool, commissioning flow, specific commissioning procedure, and related parameters of the product. For complete information on parameters and fault codes, see the *MD880(LC)-20 Series Basic Rectifier Parameter Guide* (data code: 19012701).

More Data

Name	Data Code	Description
MD880(LC)-20 Series Basic Rectifier Function Guide	19012613	Describes the function applications, fault codes, and parameters of the product.
MD880(LC)-20 Series Basic Rectifier Commissioning Guide (this guide)	19012700	Describes the commissioning tool, commissioning flow, specific commissioning procedure, and parameters of the product.
MD880(LC)-20 Series Basic Rectifier Parameter Guide	19012701	Describes the parameters and fault codes of the product.
MD880 Series AC Drive Communication Guide	19012451	Describes the communication overview, specifications, networking, and communication configuration of the product.
MD880LC-20M Series Basic Rectifier Module Hardware Guide	19011723	Describes the system composition, technical specifications, components, dimensions, options (including installation accessories, cables, and peripheral electrical components), certifications, and standards.
MD880LC-20M Series Basic Rectifier Module Installation and Maintenance Guide	19011722	Describes preparations before installation, unpacking and transportation, mechanical installation, electrical installation, daily maintenance, and component replacement.
MD880-20 Series Basic Rectifier Hardware Guide	19011491	Describes technical specifications, components, dimensions, mechanical installation, electrical installation, and daily maintenance of the product.

Revision History

Date	Version	Description
September 2024	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:

- **Inovance website:** Visit *www.inovance.com*, go to Support > Download, search by keyword, and then download the PDF file.
- **QR code**: Scan the QR code on the product with your smart phone.
- **My Inovance app:** Scan the QR code below to install the My Inovance app, and search for the file in the app.

Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that occurs during normal operation. Maintenance will be charged after the warranty expires.

Within the warranty period, maintenance will be charged for repair of the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (such as natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to our latest Price List if not otherwise agreed upon.

For details, see the Product Warranty Card.

Table of Contents

Preface 1
Safety Precautions 5
1 Description of Parameter Setpoint and Output Value 13
2 Commissioning Tools 15
2.1 Commissioning Tool List 15
2.2 SOP-20-880 Smart Operating Panel 15
2.2.1 Overview 15
2.2.2 Components 16
2.2.3 Display 18
2.2.4 Setting Parameters 20
2.2.5 Viewing Parameters 21
2.2.6 Status Indicator 21
2.2.7 Connecting the Relay to PC 22
2.3 Commissioning Software InoDriveStudio 23
2.3.1 Installation 24
2.3.2 Common Functions 24
2.3.2.1 Main Interface 24
2.3.2.2 Creating Projects 25
2.3.2.3 Control Panel 31
2.3.2.4 Viewing Faults and Alarms 32
2.3.2.5 Viewing and Modifying Parameters 33
2.3.2.6 Comparing Parameters 34
2.3.2.7 Backing up and Downloading Parameters 36
2.3.2.8 Customizing Parameter Groups 39
2.3.2.9 Viewing Modified Parameters 41
2.3.2.10 Search 42
2.3.3 Waveform Records and Analysis 43
2.3.3.1 Continuous Oscilloscope 43
2.3.3.2 Black Box Function 49
2.3.3.3 Log Function 52
2.3.3.4 Waveform Analyzer 56
3 Commissioning and Operation 59
3.1 Overview 59
3.1.1 Topology of the Basic Rectifier (Single-Rectifier System) 59
3.1.2 Topology of the Basic Rectifier (Parallel-Rectifier System) 61
3.2 Description of HCU Control Module 63
3.2.1 Indicators 63
3.2.2 Standard Peripheral Terminals and Parameter Settings 64
3.2.3 HCU Expansion Modules and Their Usage 65

3.3 Commissioning Flowchart 66
3.4 Check Before Commissioning 66
3.5 Powering On the Control Circuit 67
3.6 Restoring Default Parameters 67
3.7 Disabling Rectifier Operation 68
3.8 Checking and Setting the Power Module 68
3.8.1 Setting Parameters for Single and Parallel Modes 68
3.8.2 Checking Equipment Information 69
3.8.3 Setting Load Mode 71
3.9 Setting Basic Parameters 72
3.10 Trial Run 72
3.10.1 Device Start Through Local Control 72
3.10.2 Device Start Through Factory Default Configuration 72
3.10.3 Device Start/Stop Control Through Digital Input 73
3.10.4 Device Start/Stop Control Through Fieldbus 73
3.10.5 Device Start/Stop Control Through Modbus (Mailbox Addresses) 76
4 Troubleshooting 81
4.1 Viewing Faults 81
4.2 Fault Reset 83
4.3 Fault Code List 84

Safety Precautions

Safety Disclaimer

- This chapter provides essential safety instructions for proper use of the product. Before using this product, read through the user guide, especially the safety instructions. Failure to observe the safety instructions may result in equipment damage, personal injuries, or even death.
- "DANGER", "WARNING", and "CAUTION" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Categories and Definitions



indicates that failure to comply with the notice will result in severe personal injuries or even death.



indicates that failure to comply with the notice may result in severe personal injuries or even death.



indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

Safety Precautions

- Some drawings in the guide show the product without covers or protective guards to display more details. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- Product illustrations in this guide are for reference only. Actual products may vary.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking



- Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.
- Do not install the product if you find water seepage or any components being missing or damaged upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.



- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package in accordance with the package sequence. Do not hit the package with force.
- Check whether there is damage, rust, or signs of bumping on the surface of the equipment and equipment accessories before unpacking.
- Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation



- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure that components, such as the front cover and terminal blocks, are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.



- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the product for more than three months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the product with devices or materials that may damage or negatively impact the product.

Installation



- The equipment must be operated only by professionals with electrical knowledge. Non-professionals are not allowed to perform operations on the equipment.



- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object, such as metal, and do not touch or attach the product to combustibles. Failure to comply may result in fire accidents.



- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects, such as metal chippings, oil, and water, from falling into the equipment and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



- Equipment installation, wiring, maintenance, inspection, and component replacement must be performed only by professionals.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. Measure the DC voltage in the main circuit and ensure the DC voltage is in the safe range. Failure to comply will result in electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board while power is on. Failure to comply will result in electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even fire.
- When connecting a drive to a motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross-sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the guide. Improper tightening torque may overheat or damage the connecting part, resulting in fire.
- After wiring, check that all cables are connected properly and no screws, washers, or exposed cables are left inside the equipment. Failure to comply may result in electric shock or equipment damage.



- Follow the proper electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit of the product.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on



- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets product requirements to prevent product damage or even fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in electric shock.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in fire accidents.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in personal injuries or even death.

Operation



- The equipment must be operated only by professionals. Failure to comply can result in personal injuries or even death.
- Do not touch any terminal of the device or remove any part of the device during operation. Failure to comply will result in electric shock.



- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in scalds.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, and component replacement must be performed only by professionals.
- Do not maintain the equipment while power is on. Failure to comply can result in electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals even after power-off because there is still induced voltage generated during rotation. Failure to comply will result in electric shock.



- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair



- Equipment installation, wiring, maintenance, inspection, and component replacement must be performed only by professionals.
- Do not repair the equipment while power is on. Failure to comply can result in electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in equipment damage, personal injuries, or even death.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment in according with the replacement instructions.
- Do not perform operations on damaged equipment. Failure to comply may result in severe equipment damage, personal injuries, or even death.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal
WARNING • Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

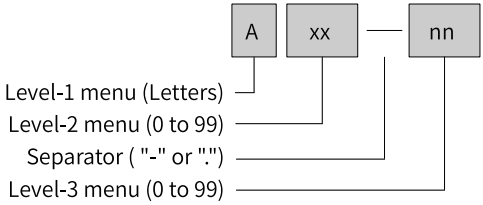
Safety Signs

To ensure safe operations, comply with safety signs on the device and do not damage or remove the safety signs. See the following table for descriptions of the safety signs.

Safety Sign	Description
	• Risk of electric shock! Hazardous voltage remain present within 10 minutes after power-off. • Risk of burns and scalds! • See instructions!

1 Description of Parameter Setpoint and Output Value

The parameters of HCU-20 are represented by a three-level menu, as shown in the following figure.



- A indicates the level-I menu, which is represented by a letter, corresponding to a group of functions. Groups A to P contain common parameters. Group U contains connector parameters, which are divided into bit (B) connector and word (K) connector parameters.
- xx indicates the level-II menu, which is represented by one or two digits, corresponding to the function category when combined with level-I menus.
- nn indicates the level-III menu, which is represented by a 2-digit number, corresponding to a specific parameter or connector parameter when combined with level-I and level-II menus.

Note

- The separator for the parameter menu can be a hyphen (-) or dot (.), which have the same meaning. That is, A0-00 and A0.00 have the same meaning. Hyphen (-) is usually used in user guides, whereas dot (.) is usually used in the LED panel.
- Level-I menus can contain the following letters: A, b, C, d, E, F, H, L, n, o, P, and U. The letters are case sensitive for the purpose of display on the LED panel.

- The setpoint of a parameter is the value set by the user for the parameter.
- The output value of a parameter is the value obtained by the drive reading the parameter.

For most parameters, the output value is equal to the setpoint. However, in HCU-20 control module, there is a type of parameters known as reference source parameters. The setpoint of such a parameter (A) indicates that the value of parameter A is sourced from another parameter (B). In this case, the output value of parameter A is equal to that of parameter B.

In this guide, the value of a parameter represents the setpoint, whereas the value of a [parameter] represents the output value. For example:

- U5-03 = 3800
- n1-04 = 1503
- n1-04 = 3800

n1-04 represents the process data output 1 of bus adapter A, which is sourced from U5-03. When U5-03 is set to 3800, the actual setpoint of [n1-04] is 3800.

For n1-04, the setpoint 1503 indicates the source of the process data output 1, which is the U5-03 connector value. The value of [n1-04], which is 3800, indicates the actual setpoint of n1-04.

2 Commissioning Tools

2.1 Commissioning Tool List

The HCU-20 series products support the following commissioning tools:

- SOP-20-880 smart operation panel (SOP-20-880 for short)
- InoDriveStudio commissioning software

For the HCU-20 series products, you can use SOP-20-880 to modify and view parameters, perform simple commissioning, and view operation status.

Note

You also need to confirm and record the operating waveform, perform visualized commissioning, view fault information and black box. It is recommended to use InoDriveStudio for commissioning.

2.2 SOP-20-880 Smart Operating Panel

2.2.1 Overview

SOP-20-880 is a new-generation commissioning tool of Inovance that applicable to single-drive/multi-drive systems.

- It features a wide power supply range and LCD display.
- It provides rich functions, such as parameter settings, status monitoring, parameter copy, fault analysis and diagnosis, parameter upload and download, and USB relay/mass storage.

2.2.2 Components

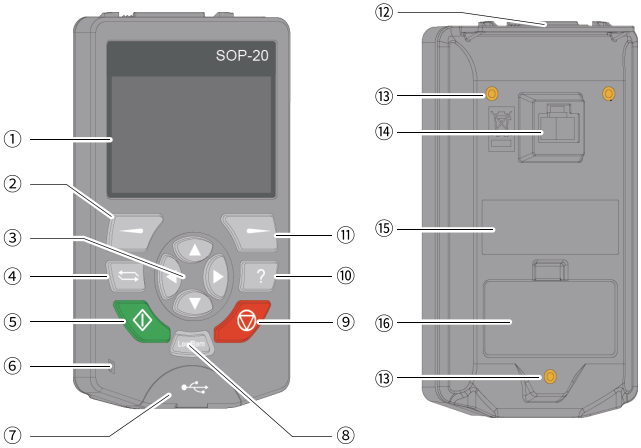


Figure 2-1 Appearance and keys of SOP-20-880

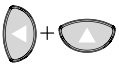
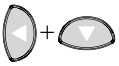
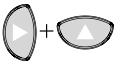
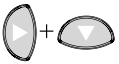
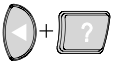
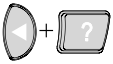
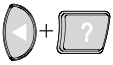
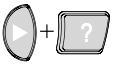
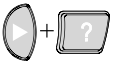
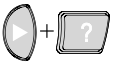
Table 2–1 SOP-20-880 components

No.	Name
①	Display
②	Left soft key
③	Arrow key
④	Shift key
⑤	Run key
⑥	Status indicator
⑦	USB port
⑧	LOC/REM switchover key
⑨	Stop/Reset key
⑩	Help key
⑪	Right soft key
⑫	Snap-fit joint
⑬	Fixing screw
⑭	RJ45 port
⑮	Nameplate
⑯	Battery cover

Table 2–2 Description of the keys

Key	Name	Description
	Left soft key	Used for exit or cancellation. This key is located on the left below the display. It corresponds to different functions in different situations. On the home page, pressing this key enters the device list.
	Right soft key	Used for enter or confirmation. This key is located on the right below the display. It corresponds to different functions in different situations. On the home page, pressing this key enters the menu page.
	Shift key	Used to quickly enter the device list. On pages that do not allow operations to be interrupted, quick device switchover is not allowed and this key is disabled.
	Help key	Used to open the help page. The content on the help page depends on the context, such as the current menu or page.
	Run key	Used in the local control mode to start the device.
	Stop/Reset key	Used in the local control mode to stop the device. When the device is in the fault state, use this key to reset the fault.
	LOC/REM switchover key	Used to switch the control permission of the device. Local: The device start/stop is controlled by SOP-20-880. Remote: The device start/stop is controlled by the parameters and functions of the device.
	Arrow key	The up and down keys are used to select options in a displayed menu and list, scroll up and down a text page, and adjust a value (such as setting time, entering a password, or changing a parameter value). The left and right keys are used to move the cursor left and right.

Table 2–3 Shortcuts

Shortcut	Illustration	Applicable Page	Function
Left+Up		All	Adjusts the backlight brightness.
Left+Down			
Right+Up		All	Adjusts the contrast ratio.
Right+Down			
Left+Help		Parameter list	Adds the parameter that the cursor is directed at to the quick commissioning page.
Left+Help		Quick commissioning	Deletes the parameter from the quick commissioning page.
Left+Help		Startup screen	Deletes the parameter from the startup screen.
Right+Help		Parameter list	Adds the parameter that the cursor is directed at to the startup screen.
Right+Help		Quick commissioning	Clears all parameters from the quick commissioning page.
Right+Help		Startup screen	Clears all parameters from the startup screen.

2.2.3 Display

SOP-20-880 adopts the monocolour LCD with white backlight and a resolution of 240 x 160 pixels.

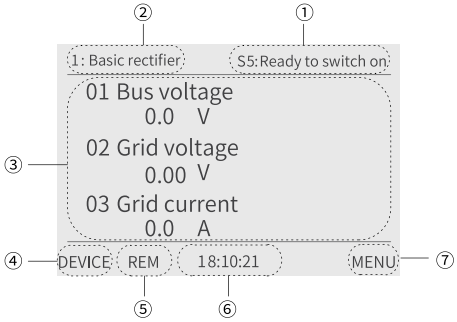


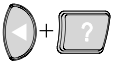
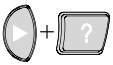
Figure 2-2 Homepage

Table 2–4 Descriptions of the homepage

No.	Display	Description
①	Device status and fault information	Displays information about the operation status of the device, including the state machine, fault, and alarm. When a fault occurs on the device, the fault information and the operation status are displayed alternately.
②	Current device information	1: ID of the current device Basic rectifier: Name of the current device
③	Content area	Displays monitoring data in real time.
④	DEVICE	Displays the list of devices in the current network.
⑤	LOC/REM	LOC: The device is controlled by SOP-20-880 (local control). REM: The device is controlled by I/O or bus (remote control). Blank: This function is unavailable on the device.
⑥	SOP-20-880 clock time	Displays the current clock time of SOP-20-880.
⑦	MENU	Accesses the function menu of the current device.

2.2.4 Setting Parameters

Table 2–5 Description of parameter setting

Function	Key	Description
Viewing or modifying parameters	Key operations	Choose "Menu" > "Parameter setting", then select the parameter group to be changed, select the parameter to be changed, view or modify the parameter, and finally click "BACK" or "OK".
Viewing or deleting quick commissioning parameters		• Adding a parameter to the quick commissioning page: On the parameter setting page, enter any parameter group, move the cursor to the specific parameter, and press the Left key and Help key at the same time for more than 1.5 seconds to add the parameter to the quick commissioning page. • Deleting a parameter from the quick commissioning page: On the quick commissioning page, move the cursor to the parameter to be deleted, press  and  at the same time for more than 1.5 seconds to delete the parameter from the quick commissioning page.
Clearing parameters from the quick commissioning page		Clearing parameters from the quick commissioning page: On the quick commissioning page, press and at the same time for more than 1.5 seconds to clear all the parameters from the quick commissioning page.
Viewing quick commissioning parameters	Choose "Menu" > "Quick commissioning".	-

Modifying digit parameters

The following example shows how to set multi-reference 1 (C6-05) to 200%.

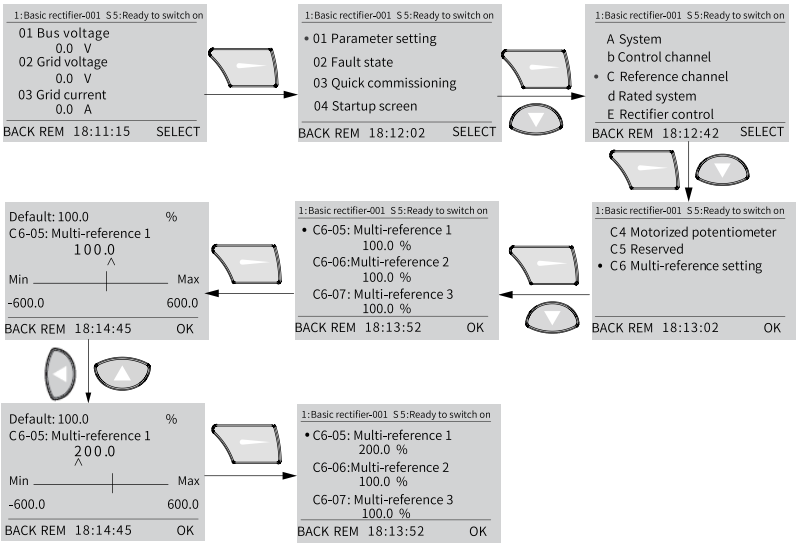


Figure 2-3 Modifying digit parameters

After setting the parameter, press  to save the setting and exit, or press  to cancel the setting and exit.

Alternatively, press  and  at the same time for more than 1.5 seconds to restore the parameter to default value and then press  to activate the default value.

2.2.5 Viewing Parameters

Parameter groups are arranged by name. If you select a parameter group, all the parameters in this group will be displayed, and you can view and edit these parameters.

Press  to display the help information.

When the cursor points at a read-only parameter, the right soft key  is disabled, and the "SELECT" button is not displayed in the lower right corner on the screen.

If "0x" is displayed before a parameter, the parameter setpoint is a hexadecimal value.

2.2.6 Status Indicator

The status indicator on SOP-20-880 is used to indicate whether a fault or alarm exists.

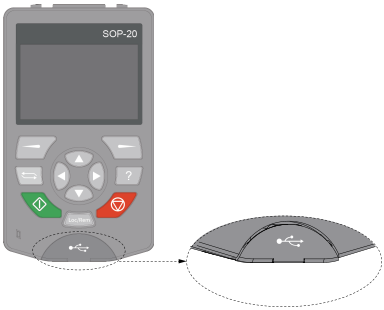
Table 2–6 Status indicator

Indicator	Illustration	Meaning
Green light steady ON		The equipment is running properly.
Green light flashing		Data is being transmitted between the SOP-20-880 and PC with USB.
Red light steady ON		Communication between SOP-20-880 and equipment is normal, but the equipment is faulty.
Red light flashing		Communication between SOP-20-880 and equipment is interrupted.

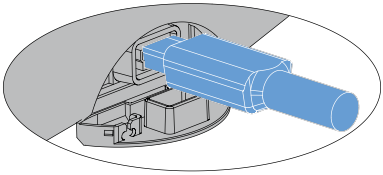
2.2.7 Connecting the Relay to PC

The B-type mini USB terminal on the lower part of SOP-20-880 is used to connect to PC. The connection cable cannot exceed 3 m. The USB2.0 communication protocol is used between the SOP-20-880 and the PC.

1. Open the USB terminal cover.

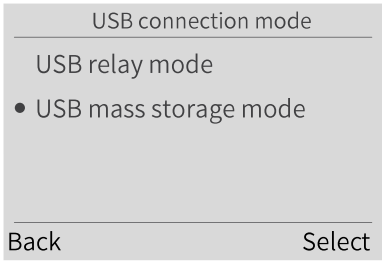


2. Insert the USB cable and connect the cable with ferrite core (recommended) to the PC.



3. After the SOP-20-880 is connected to the PC, you will be prompted to choose the USB relay mode or USB mass storage mode.

- When "USB relay mode" is selected, the SOP-20-880 can be used as a relay to enable communication between the device and the PC. To perform commissioning with InoDriveStudio, select "USB relay mode".
- In the “USB mass storage mode”, the SOP-20-880 can be used as a memory.



Note

For details, see *SOP-20-880 Series Smart Operating Panel User Guide*.

2.3 Commissioning Software InoDriveStudio

- The InoDriveStudio (hereinafter referred to as IDS) is a commissioning software developed by Inovance for high-performance engineering drives. It can be used to commission, troubleshoot, and monitor the operating status of devices.
- The InoDriveStudio supports only the Windows operating systems, including but not limited to those listed below: WindowsXP Professional, Windows2003 Server, Windows Vista, Windows7, Windows8, and Windows10.

2.3.1 Installation

1. To obtain InoDriveStudio, do as follows:
   a. Log in to the official website of Inovance (www.inovance.com).
   b. Choose “Support” > “Download” > “Search”, and then enter InoDriveShop.
   c. Click "Download".
2. Unzip the package downloaded.
3. Click to start installing InoDriverShop.

2.3.2 Common Functions

2.3.2.1 Main Interface

Double-click the icon 

to open the InoDriveStudio. The following interface appears.

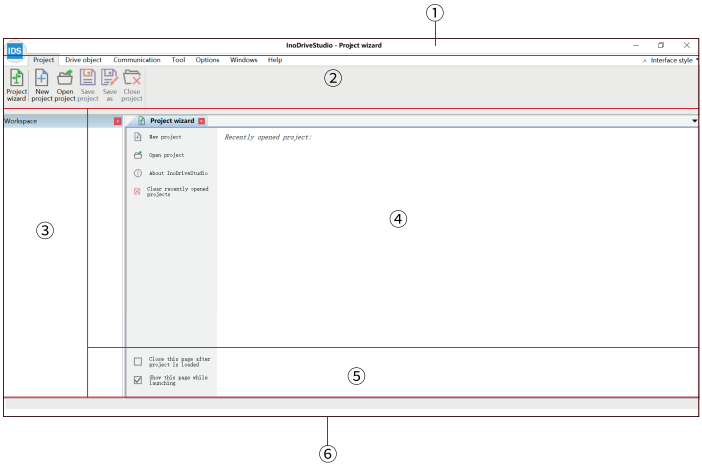


Figure 2-4 Start interface

No.	Name	Description
①	Title bar	Displays information such as the window title or file that is opened.
②	Menu bar	Displays function modules by category.
③	Workspace	Displays navigation information such as the current project.
④	Window area	Displays the specific content of an item specified in the workspace.
⑤	Multi-function area	Displays panes including the log pane, monitoring pane, control panel pane, and fault pane.
⑥	Status bar	Displays the current project status.

2.3.2.2 Creating Projects

1. Choose "Project" > "New project". The interface shown in *"Figure 2-6 New project" on page 26* is displayed.

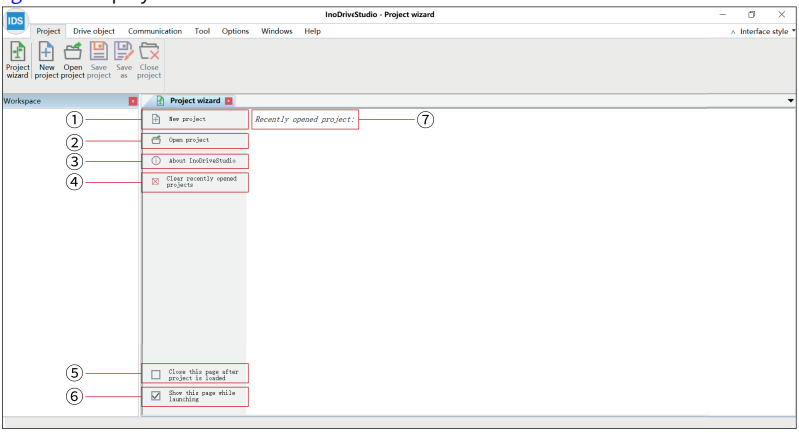


Figure 2-5 Homepage for creating projects

No.	Name	Description
①	New project	Click "New project" to create a project in the displayed dialog box.
②	Open project	Click "Open project" to open a wanted project.
③	About InoDriveStudio	Click "About InoDrive Studio" to view information about the current InoDriveStudio version.
④	Help	Click "Help" to show the help document.
⑤	Close this page after project is loaded	If this option is selected, the project wizard will be closed automatically after the project is loaded. Otherwise, the project wizard will not be closed.
⑥	Show this page while launching	If this option is selected, the project wizard will appear automatically after the software is launched. If this option is not selected, you can choose "Project" > "Project wizard" to open the project wizard.
⑦	Recently opened project	You can view eight recently opened projects in the descending order of time. Double-click a file name to open the specified recent project. Move your cursor over the file name. The file name will be highlighted in light blue and  is displayed. Click the icon to hide the project from the recently opened project list.

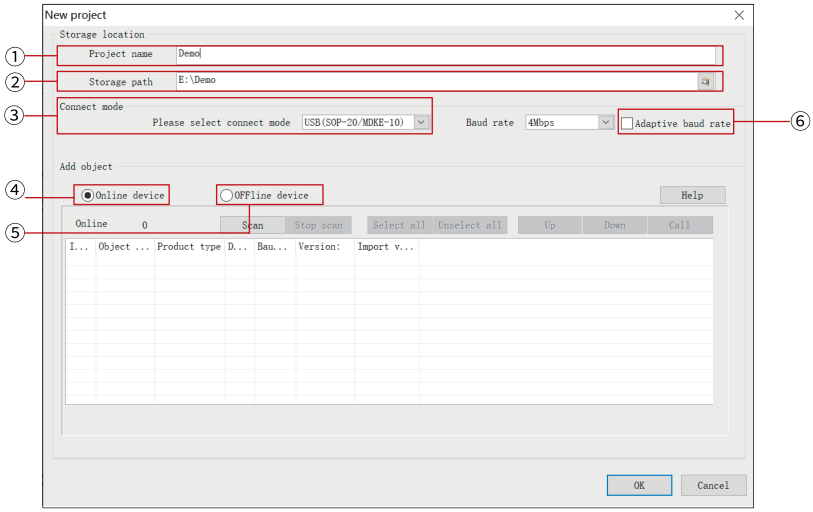


Figure 2-6 New project

No.	Name	Description
①	Project name	Specify a name for the project to be created.
②	Storage path	Specify a path on the computer for storing the project to be created.
③	Connect mode	Specify a connection mode and relevant parameters for the project to be created. The USB, TCP/IP, and gateway modes are supported. To change the connection mode after a project is loaded, choose "Communication" > "Communication settings". For details, see *"Figure 2-7 Modifying connection mode" on page 27*. The InoDriveStudio project will connect to the device using the set connection method.
④	Online device	Specify an online object to be added to the project you are creating. Online objects can be searched by scanning.
⑤	Offline device	Specify an offline object to be added to the project you are creating. Offline objects can be specified by information such as product model and version.
⑥	Adaptive baud rate	When the connection mode is set to USB, specify whether to use the adaptive baud rate mode for drive controller scanning. If this option is selected, objects whose baud rates are supported will be scanned; otherwise, only objects with the specified baud rate will be scanned.

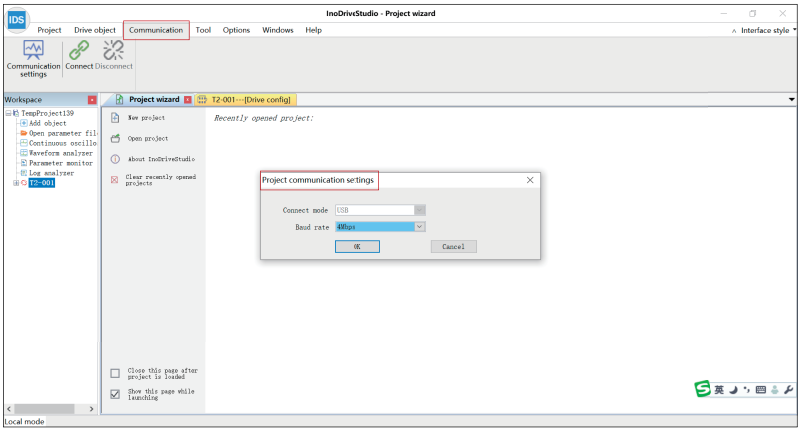


Figure 2-7 Modifying connection mode

Note

- When multiple devices are cascaded, ensure that the communication addresses of the devices are unique and the communication baud rates of the devices are consistent. Set the communication address through A10-03 and communication baud rate through A10-04.
- When multiple devices are cascaded, ensure that the device names are unique. Otherwise, the new project cannot be created.

2. Click "Scan".

   - In the following figure, USB connection is selected.

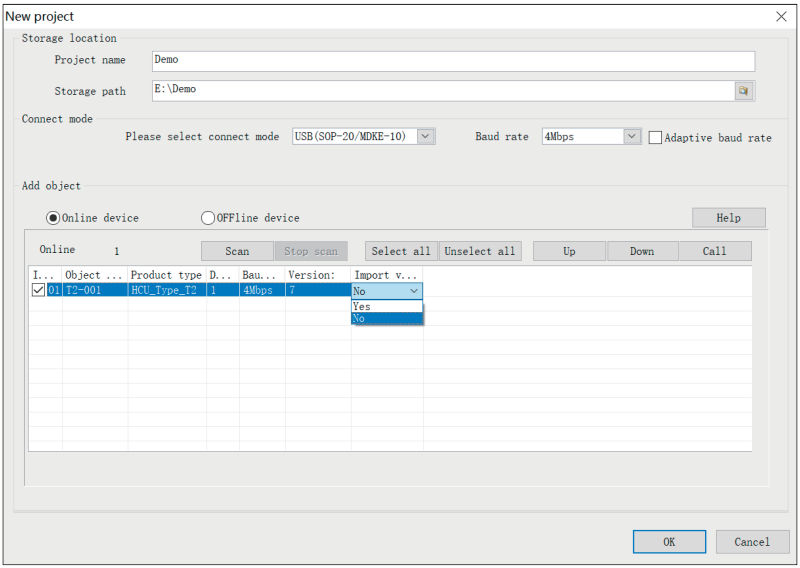


Figure 2-8 Scanning when USB connection is selected

Note

When you import the configuration table for the first time, set "Import version" to "Yes".

- In the following figure, TCP/IP(HETN-10) is selected.

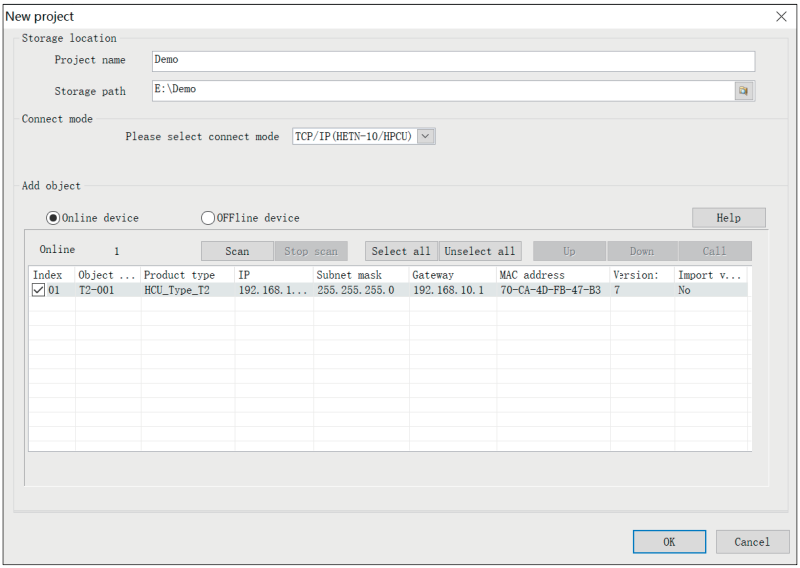


Figure 2-9 Scanning when TCP/IP(HETN-10) connection is selected

Note

For the settings of IP address, subnet mask, and gateway address, see the *HETN-10 Ethernet Commissioning Module User Guide*.

- In the following figure, TCP/IP(HGW-10) is selected.

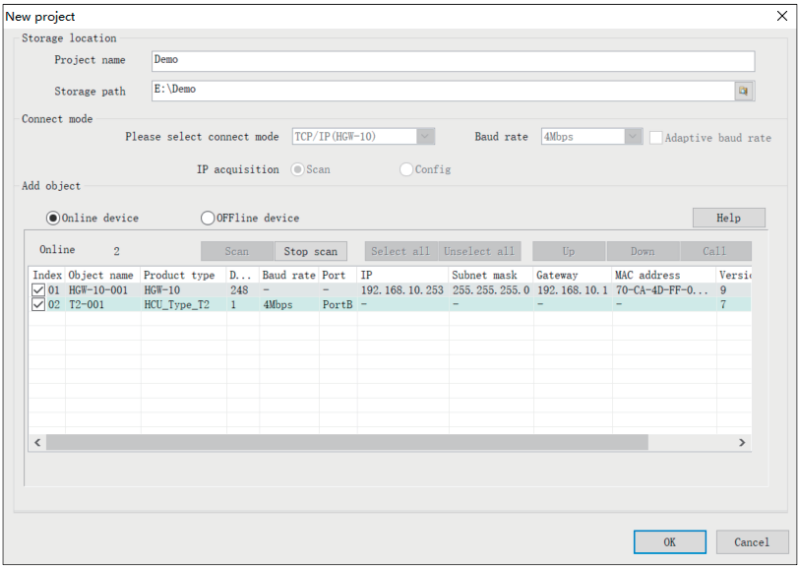


Figure 2-10 Scanning when TCP/IP(HGW-10) connection is selected

Note

As there are multiple gateway on the Ethernet network, when the IP is obtained through scanning, an excessive number of devices may be scanned. It is recommended to scan via configuration. After you click “IP config” or “Config”, the IP configuration dialog box automatically pops up. You can add up to ten HGW-10 IP addresses manually. After you configure an IP, click “Scan” to display all devices under that IP in the list. When the check button is not checked, the IP address will not be scanned.

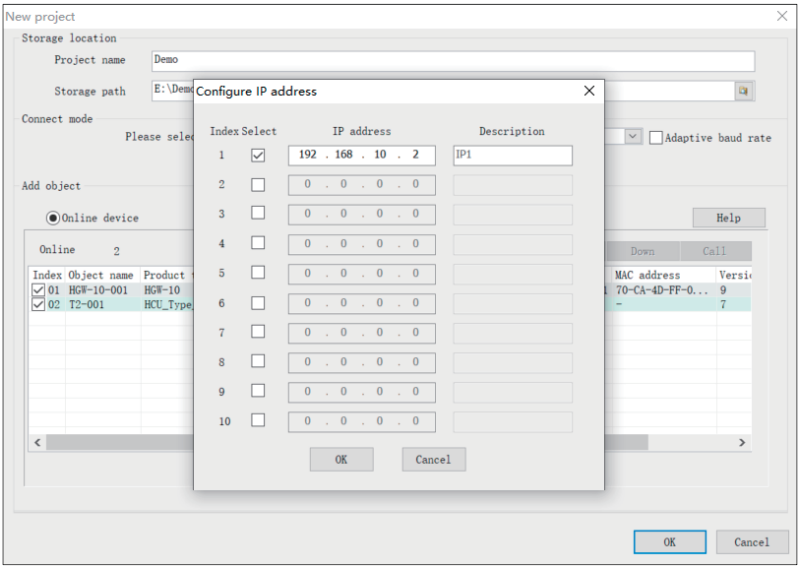


Figure 2-11 Dialog box for configuring the IP address manually

3. Click "OK". The project is created and the interface shown in *"Figure 2–12 Main interface" on page 31* appears. You can proceed with settings and commissioning work.

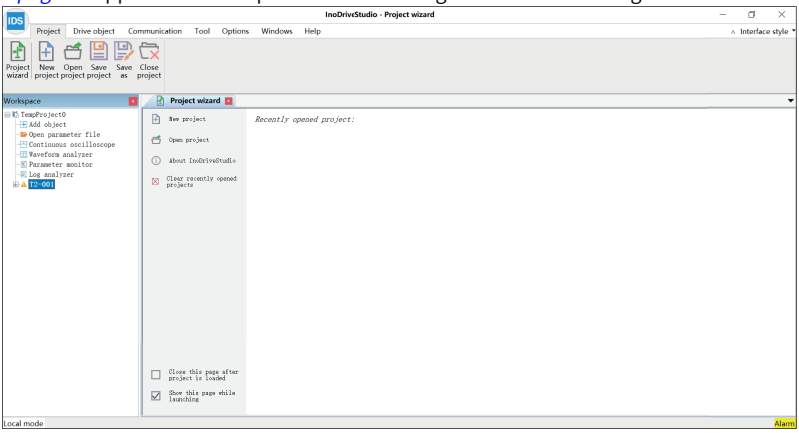


Figure 2-12 Main interface

2.3.2.3 Control Panel

The control panel of InoDriveStudio can be used to start/stop devices and reset faults. Choose "Basic rectifier-001" > "Diagnostic and debug" > "Debug" > "Control panel" to open the control panel.

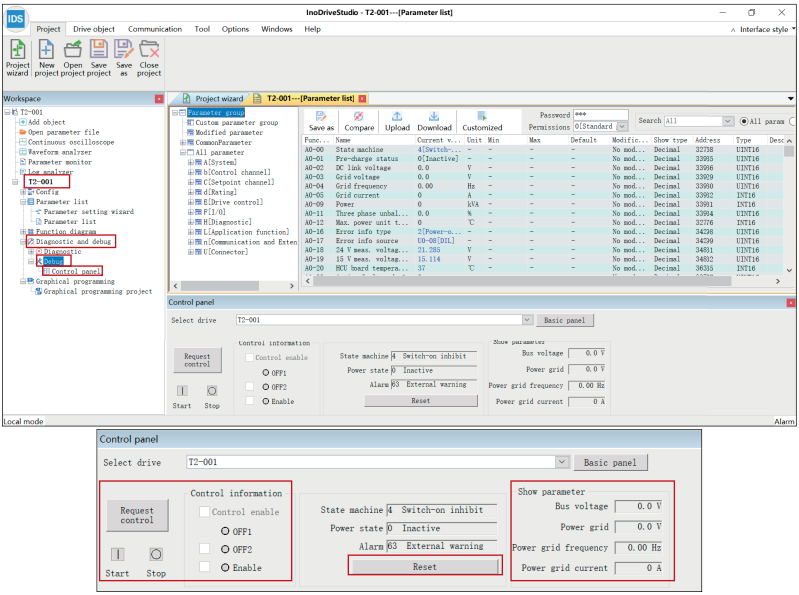


Figure 2-13 Control panel

- You can start or stop the device and monitor the device status on the control panel.
- Before controlling a device through the control panel, click "Request control" to gain control of the device.
- After you obtain control permission, you can click "Start" or "Stop" to start or stop the device.
- After the "Control enable" is checked, you can click "OFF2" or "Enable" to switch the control word directly, achieving control of the device.

2.3.2.4 Viewing Faults and Alarms

There are two ways to view faults through InoDriveStudio.

- Viewing current faults
  - Method 1: Choose "Basic rectifier-001" > "Diagnostic and debug" > "Diagnostic" > "Faults and alarms" to open the alarm/fault list, as shown below.

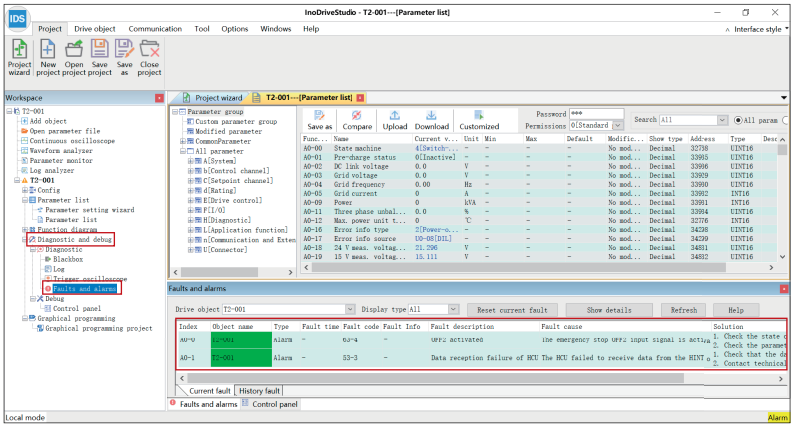


Figure 2-14 Alarm/Fault list

- Method 2: Click parameters in groups H2 to H7 to view previous faults and alarms, as shown below.

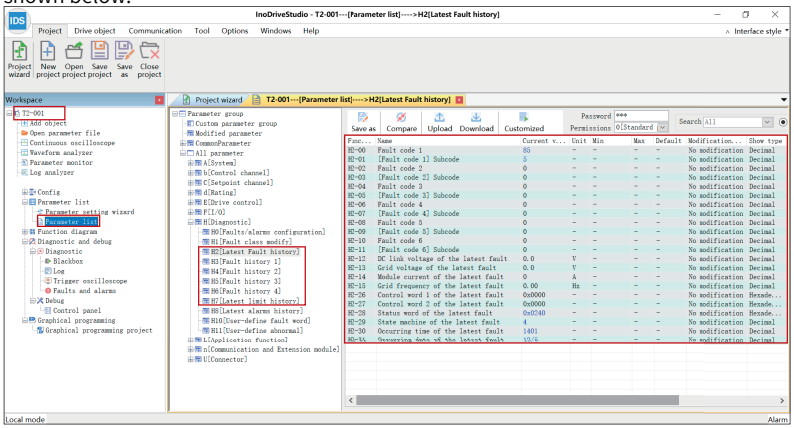


Figure 2-15 Viewing previous faults

2.3.2.5 Viewing and Modifying Parameters

You can view and modify parameters through InoDriveStudio. After the device is connected, choose "Basic rectifier-001" > "Parameter list" > "Parameter list" on the workspace of the IDS. The parameter list of the current device is displayed, as shown in the following figure.

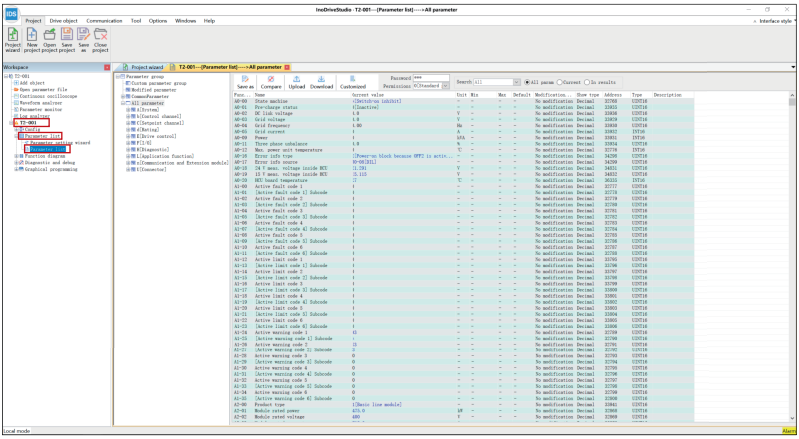


Figure 2-16 Parameter list

- Parameter groups are displayed on the left, and parameters in a selected parameter group are displayed on the right.
- You can view information such as the parameter name, current value, default value, unit, modification method, and communication address of a parameter.
- After parameters are modified, they are downloaded to the device.
- When the current value of a parameter differs from the default value, the current value is blue.
- When the parameter is changed to a value outside the allowable range, the modification does not take effect.
- If a parameter supposed to be modified only at stop is modified during device running, the modification does not take effect.

2.3.2.6 Comparing Parameters

InoDriveStudio allows you to compare parameters. You can access the comparison function in two ways:

- In the menu bar, choose "Drive object" > "Compare".
- In the parameter list interface, click "Compare".

The figure below shows the two ways.

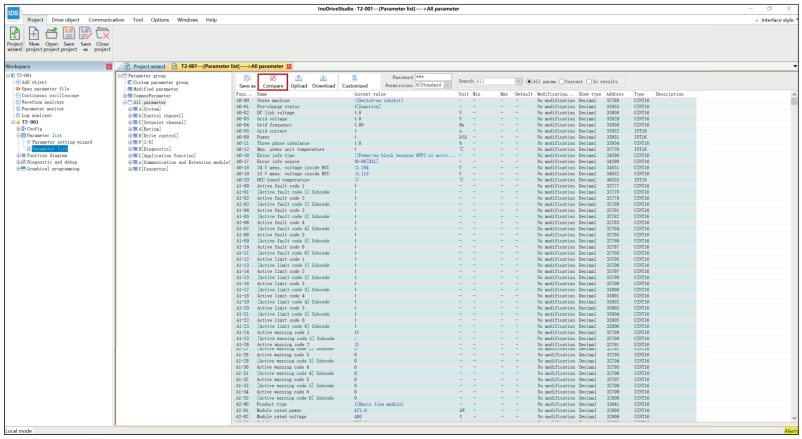


Figure 2-17 Accessing the comparison function

As shown in the figure below, you can compare two offline parameter files. Also, you can compare the current parameters and the default parameters of the basic rectifier module. You can select to show the different parameters, the same parameters, or all parameters.

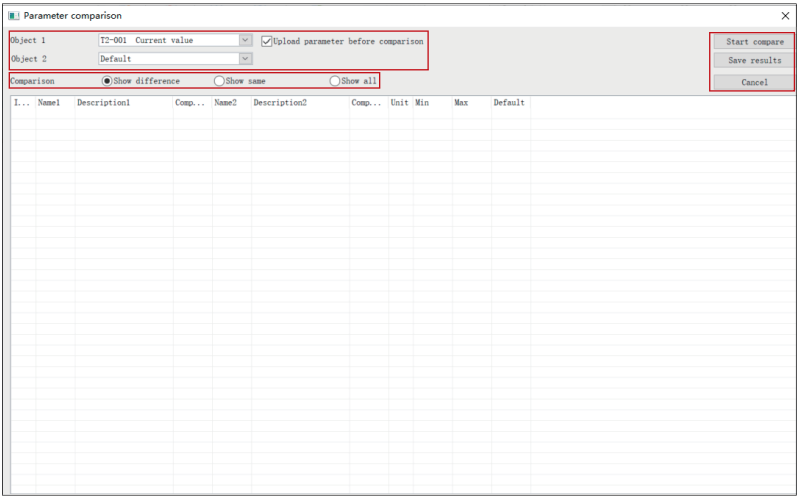


Figure 2-18 Comparison page

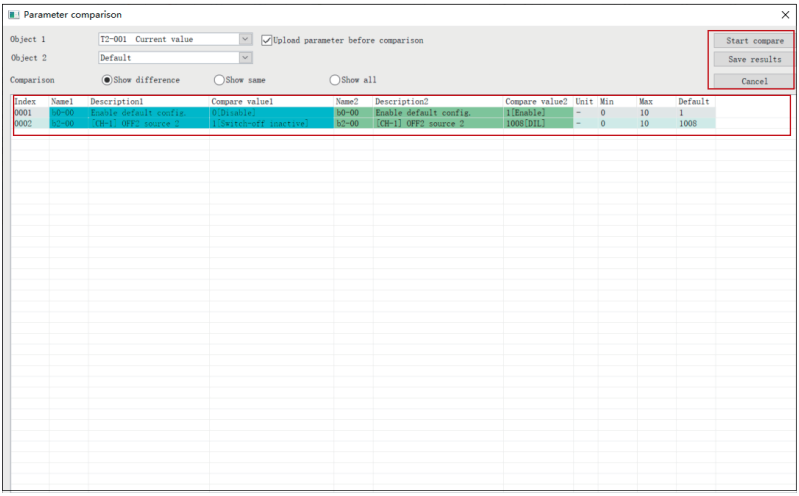


Figure 2-19 Example of comparing current values and default values

2.3.2.7 Backing up and Downloading Parameters

You can use InoDriveStudio to back up parameters to your computer through the "Upload" or "Save as" function. Also, you can restore the backup parameters from your computer to the drive through the "Download" function.

- The following shows how to back up parameters through the "Upload" function. Choose "Parameter list" > "Upload". Set a file name and set the save type to "Parameter file (*. inoprm)". Click "Save". Wait for uploading to be done.

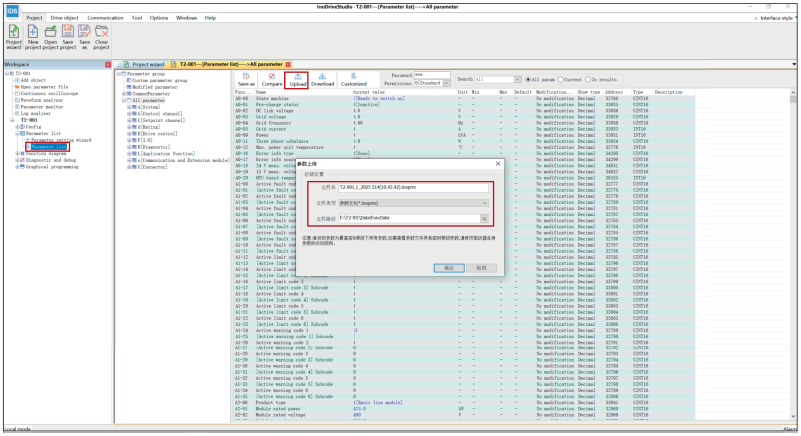


Figure 2-20 Parameter backup through the upload function

- The following shows how to back up parameters through the "Save as" function. Choose "Parameter list", select the parameter group to be backed up, and click "Save as". Set a file name, set the save type to "Parameter file (*.inoprm)", check "Upload parameter before saving", and click "Save". Wait for uploading to be done.

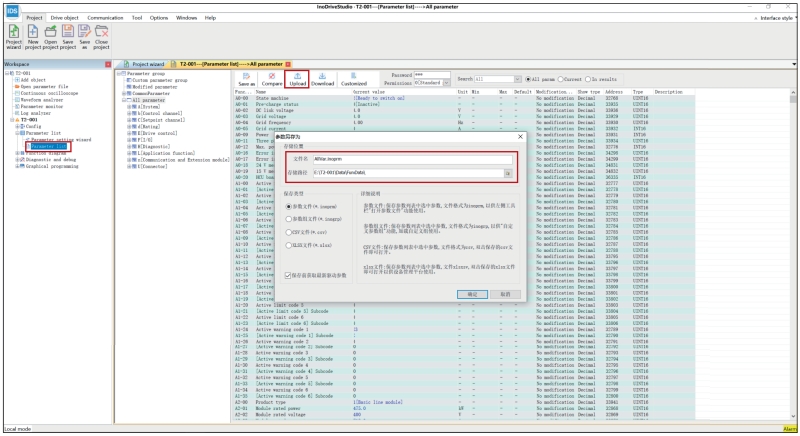


Figure 2-21 Parameter backup through the "Save as" function

Note

- When you click "Upload" to back up parameters, all parameters are backed up.
- To specify parameters to back up, see *"2.3.2.8 Customizing Parameter Groups" on page 39*.
- When you click "Save as" to back up parameters, select "Parameter file (*.inoprm)" as the file type and check "Upload parameters before saving".

- The following shows how to download parameters. Choose "Parameter list" > "Download". Select the file to be downloaded, select a download mode, and click "Open". Wait for download to be done.

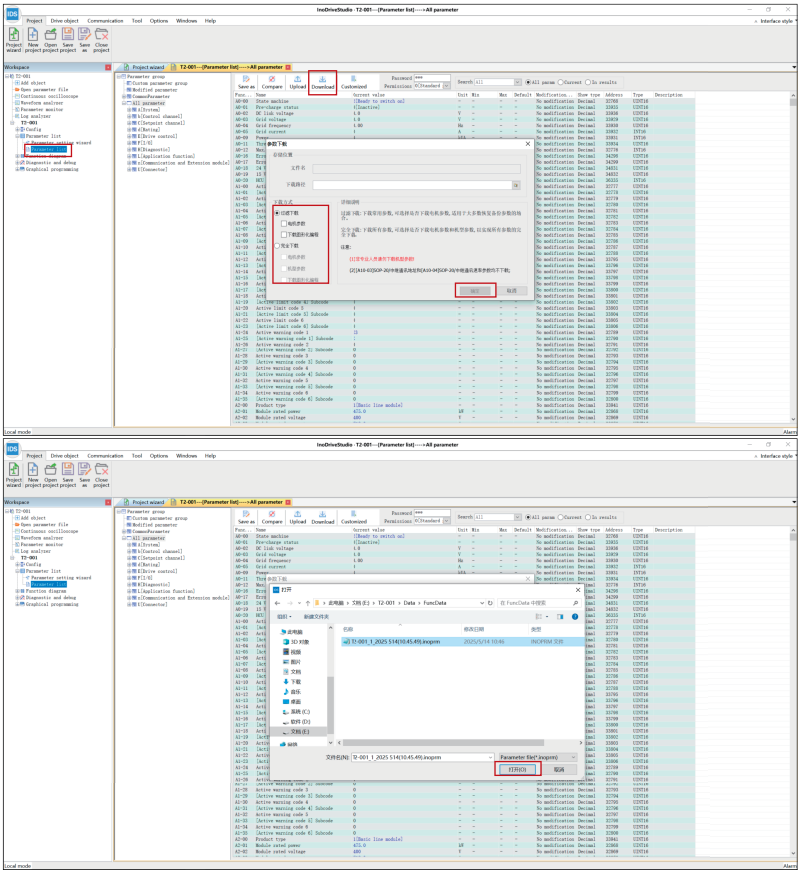


Figure 2-22 Parameter download

Parameters can be downloaded in two modes:

- Filtered download: Download all the parameters except model-related parameters, A10-04 (communication rate), and A10-03 (communication address). Filtered download mode is suitable for most of cases where backup parameters need to be restored.
- Complete download: Download all the parameters except model-related parameters. If A10-04 (communication rate) and A10-03 (communication address) differ from current parameters, the system informs you to make necessary modification (take caution during modification to prevent communication failure caused by repetitive station number). You can check "Download model parameter" to download all parameters.

Caution

Be cautious when downloading model parameters. Model parameters can be downloaded by professionals only.

2.3.2.8 Customizing Parameter Groups

In InoDriveStudio, you can select parameters to create a custom parameter group. You can save the custom parameter group as a parameter file or a configuration file.

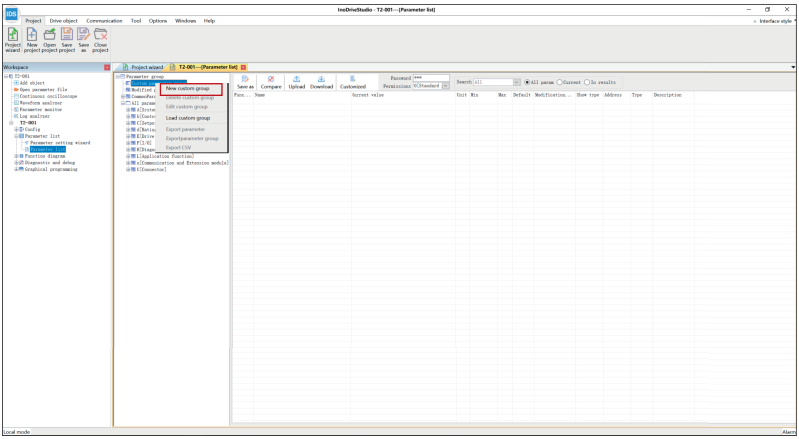


Figure 2-23 Accessing the parameter group customization page

Steps of customizing a parameter group

1. Select "Parameter list". Right-click "Custom parameter group" and select "New custom group" or "Load custom group". In the dialog box that appears, set a group name, click "Add" or "Delete" to add or delete parameters, and click "OK". The custom parameter group is generated.

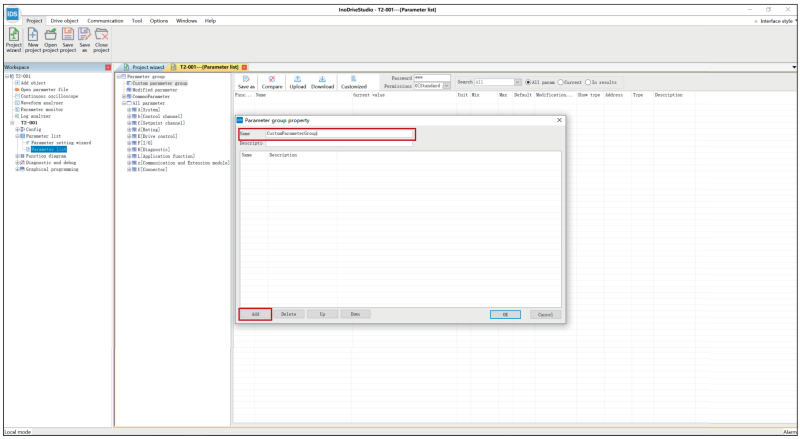


Figure 2-24 Parameter group customization page

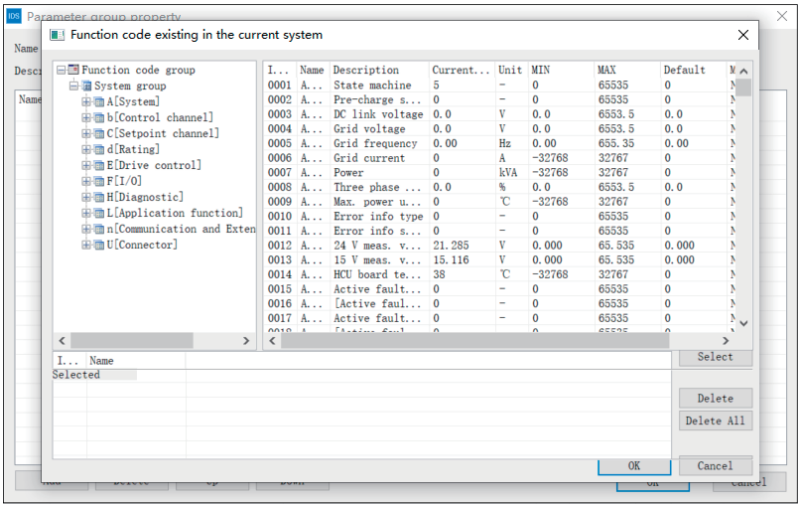


Figure 2-25 Parameters in a custom parameter group

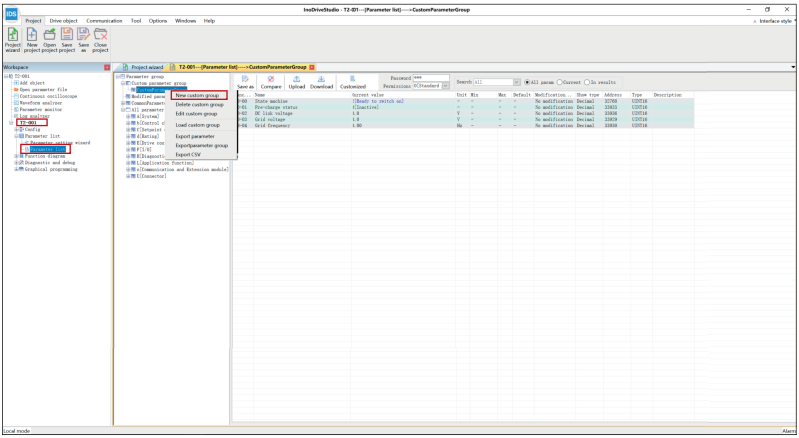


Figure 2-26 Newly created custom parameter group file

2. Right-click the newly created custom parameter group to delete, edit, load, or export it as needed, as shown in the following figure.

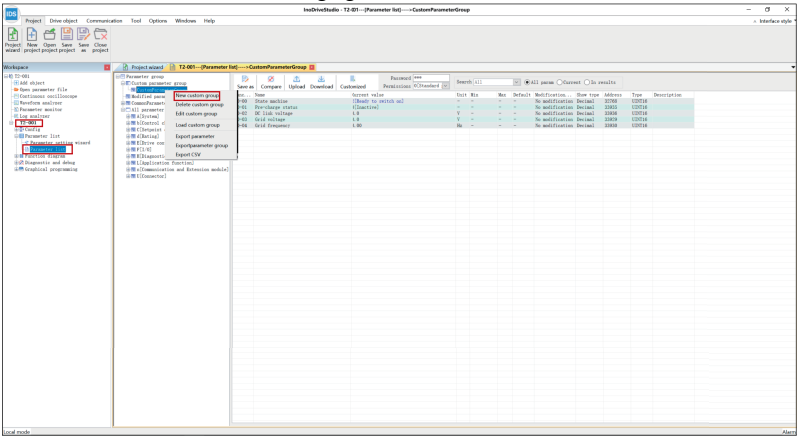


Figure 2-27 Operations on the custom parameter group

2.3.2.9 Viewing Modified Parameters

InoDriveStudio allows you to view parameters with default values changed. Choose "Basic rectifier-001" > "Parameter list" > "Parameter group" > "Modified parameter". Double-click "Modified parameter". The "Uploading parameter, please wait…" message box pops up. After the upload is complete, modified parameters will be displayed.

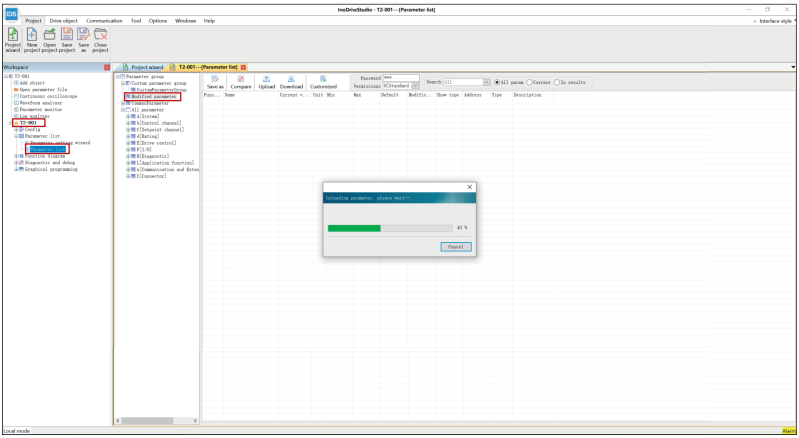


Figure 2-28 Double-clicking "Modified parameter"

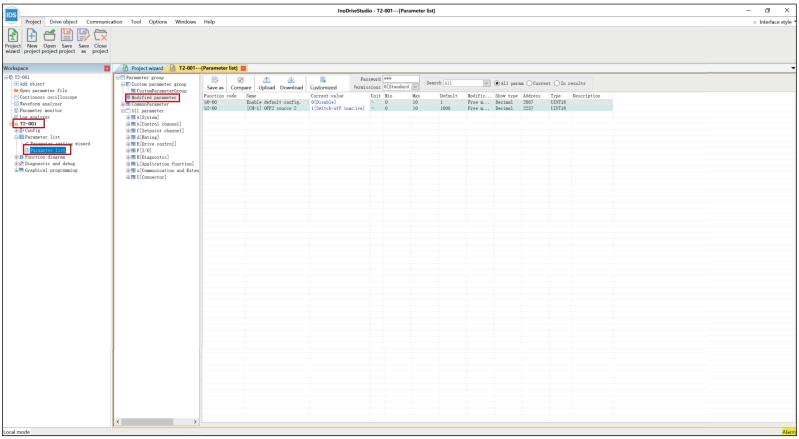


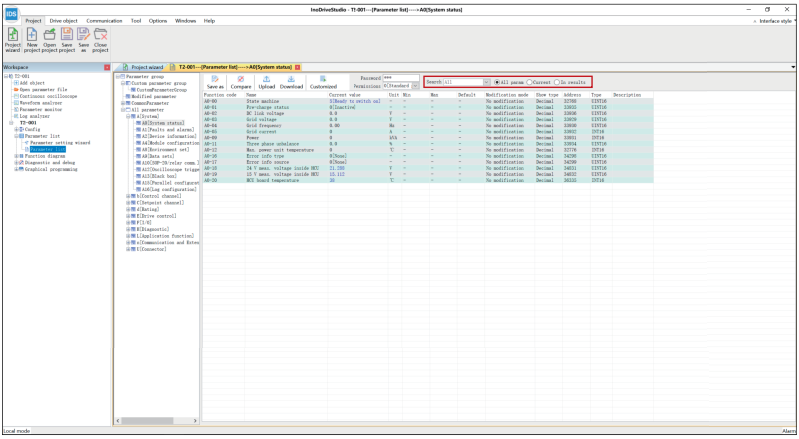
Figure 2-29 Modified parameter

2.3.2.10 Search

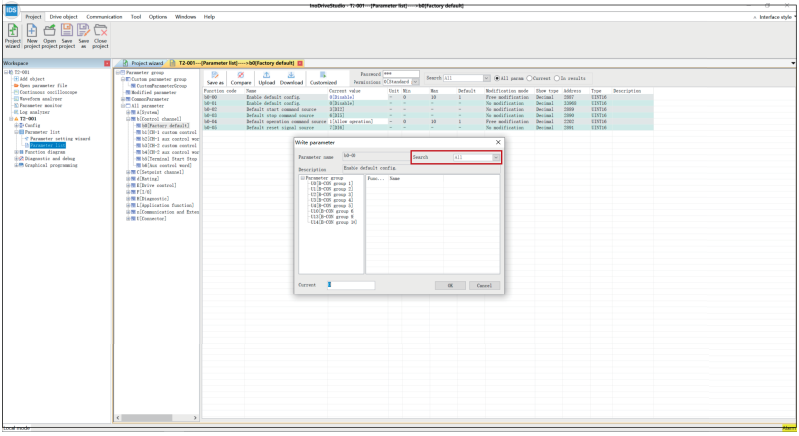
InoDriveStudio allows you to search for parameters and connectors by keyword.

You can specify a range for searching parameters:

- "All param": Used to search for all parameters in the parameter list.
- "Current": Used to search for parameters in the current parameter group.
- "In results": Used to search for parameters in the current list.



When a parameter is set to a connector, you can search for required connectors quickly, as shown below.



2.3.3 Waveform Records and Analysis

Real-time analysis of data curves is key for commissioning performance. InoDriveStudio provides three ways for online real-time recording of data curves, conditional recording of data curves, and offline view of waveforms.

2.3.3.1 Continuous Oscilloscope

The operation status of the equipment needs to be monitored in real time during on-site commissioning. The continuous oscilloscopes in InoDriveStudio can be used to monitor and record relevant data or status of the equipment in real time. Click "Continuous oscilloscope" in the workspace pane to open the oscilloscope. The oscilloscope consists of

the channel selection area, waveform display area, waveform configuration area, and toolbar, as shown in the following figure.

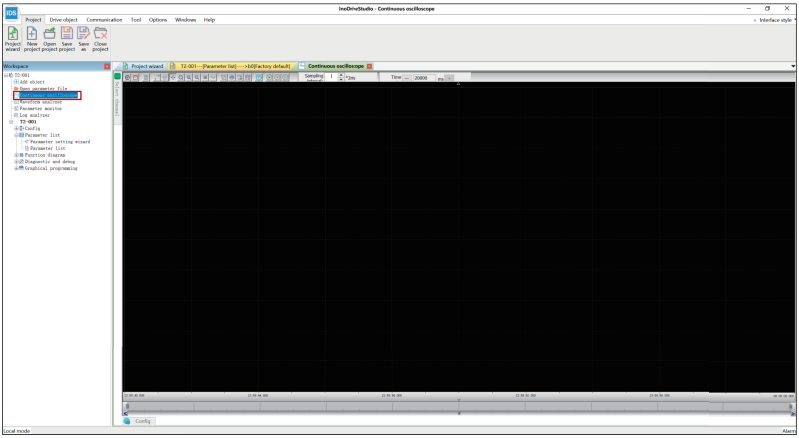


Figure 2-30 Opening the continuous oscilloscope

Only one continuous oscilloscope can be opened for each project. The oscilloscope is used to record and analyze waveform of all equipment in the current project, as shown in the following figure.

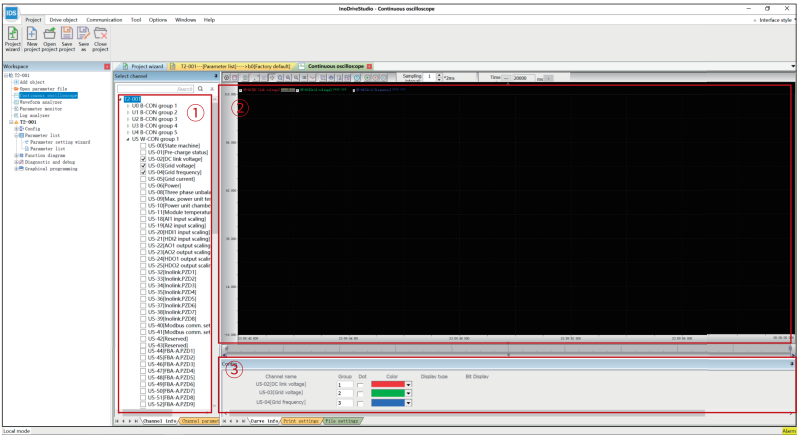


Figure 2-31 Continuous oscilloscope interface

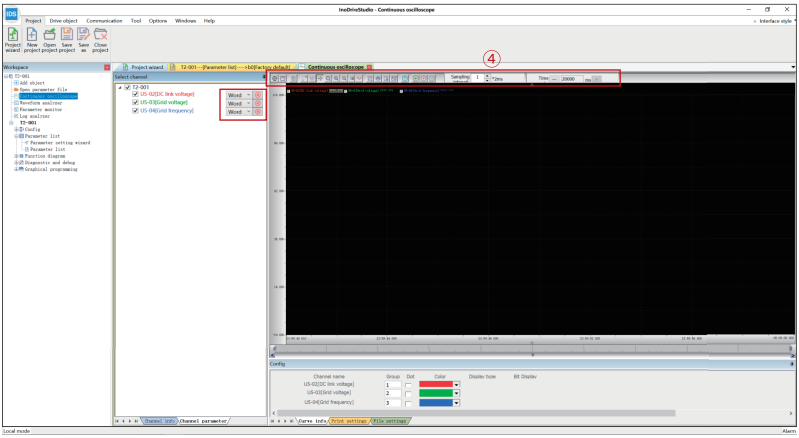


Figure 2-32 Deleting channels from the continuous oscilloscope

Table 2–7 Descriptions of continuous oscilloscope interface

No.	Name	Function
①	Channel selection	-
②	Main screen for waveform display	-
③	Waveform configuration	Connectors with the same physical meanings will be displayed in the same coordinate system if their "Group" fields are set to the same value.
④	Toolbar	You can start, stop, pause, and zoom in/out the toolbar. To delete a channel, click the Stop button, select the "Channel parameter" tab, select the channel, and then click the Delete button.

In the "Select channel" pane, customize the data channel to be monitored. All parameters in the U group can be used as the data source to record curves, wherein:

- When U5 to U8 and U15 to U18 are used as the data source to record curves, each data occupies one recording channel.
- By default, when U9 and U19 are used as the data source to record curves, each data occupies one recording channel. If you want to obtain more accurate waveform, you can also modify the configuration to double-word recording, and this results in each data occupying two recording channels.
- Parameters U0 to U4 and U10 to U14 are digital values. Up to eight digital values in a device can be recorded. All digital waveforms in a device only occupy one recording channel.

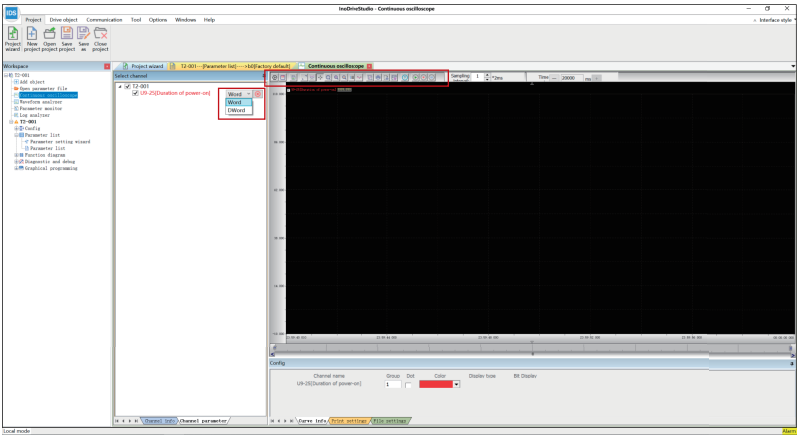


Figure 2-33 Single- or double-word display of connectors

The maximum number of channels is dependent on the communication baud rate and sampling interval, as shown in the following table.

Table 2–8 Relationship of channel quantity with baud rate and sampling interval

Baud Rate	Sampling Interval	Max. Number of Channels	Sampling Interval	Max. Number of Channels	Sampling Interval	Max. Number of Channels
115200 bps	2 ms	4	4 ms	7	> 4 ms	8
1 Mbps	2 ms	8	4 ms	8	> 4 ms	8
2 Mbps	2 ms	8	4 ms	8	> 4 ms	8
4 Mbps	2 ms	8	4 ms	8	> 4 ms	8

For details on waveform configuration and toolbar usage, see the help documentation of the InoDriveStudio software.

Button descriptions:

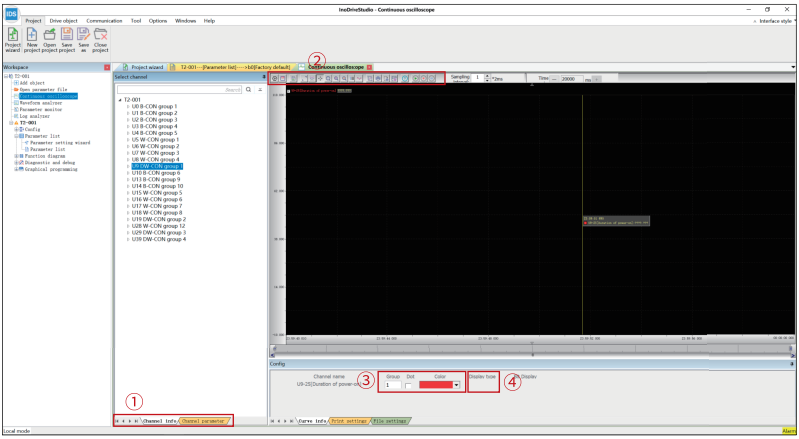


Figure 2-34 Using the continuous oscilloscope

① In the lower part of the "Select channel" pane, click the "Channel info" tab to select a device and configure the oscilloscope channel for the device. Click the "Channel parameter" tab to show the current and configured oscilloscope channels. You can also select the recording accuracy of the 32-bit connector. Selecting Dword indicates higher accuracy, but occupies two oscilloscope channels.

② The following table describes buttons in the oscilloscope tool bar.

Button	Function
	Save Waveform button. During operation, the continuous oscilloscope automatically saves waveforms in the project directory. When the number of waveform files exceeds the limit, the earlier waveforms are automatically deleted. For important waveforms, it is recommended to manually save them to another directory for backup.
	Auto-Scale Y-Axis button. After you click this button, all curves are scaled on the Y-axis based on the current display range, ensuring all curve points are within the visible area.
	Pan button. After you click this button, you can drag and pan the current curve using the left mouse button.
	Zoom button. Click this button and select an area with the mouse to zoom it to the current screen display. Only the Y-axis range of the current curve changes; the time axis of all curves changes synchronously. Single-axis zooming is possible on both X and Y axes.

Button	Function
	Scale button. This button enables one-level zoom-in or zoom-out. Only the Y-axis range of the current curve changes; the time axis of all curves changes synchronously.
	Show/Hide Cursor button. You can use two cursors to measure curve data.
	Screenshot button. You can use this button to capture the entire oscilloscope interface and save the captured interface as a *.bmp, *.jpg, or *.png file.
	Background Setting button. You can set the background color, axis color, font size, grid color, and cursor color of the oscilloscope. After setting, click the Save button to save the settings.

③ On the "Curve info" tab, you can set colors for curves. After you tick a checkbox in the "Dot" column, every sampling point on the corresponding curve is displayed in bold. When the group numbers of two curves are set to the same, the two curves share the same Y-axis and are zoomed in or out synchronously.

④ You can set the display type for some signals. For example, you can set the display type of speed to per-unit value in percentage or raw data.

Table 2–9 Common shortcut descriptions

Shortcut	Function
Right mouse button	Automatically scales both X and Y axes for all curves.
Mouse wheel	Zooms in or out curves. In the waveform area, this shortcut works on both X and Y axes at the same time. In the coordinate area, this shortcut only works on the selected axis. Only the Y-axis range of the current curve changes; the time axis of all curves changes synchronously.
Ctrl+mouse wheel	Pans the curve. In the waveform area, this shortcut works on both X and Y axes at the same time. In the coordinate area, this shortcut only works on the selected axis. Only the Y-axis range of the current curve changes; the time axis of all curves changes synchronously.
Up (↑) and down (↓) arrows	Moves the current curve up or down.
Alt+key	Forces operations on all curves. For example, Alt+↑ or Alt+↓ moves all curves up or down.

Shortcut	Function
Shift+key	Forces a zoom operation. For example, Shift+↑ or Shift+↓ zooms the Y-axis of the current curve.
Ctrl+key	Forces a pan operation. For example, Ctrl+mouse wheel enables curve panning.

2.3.3.2 Black Box Function

The HCU-20 series products are equipped with the built-in black box function. The black box function is enabled automatically upon power-on. The black box records when a fault occurs or when user-defined conditions are met.

When a fault occurs, the HCU-20 controller collects the data generated 1.5 seconds before the fault and 0.5 seconds after the fault. The data includes 16 entries of ADC internal interruption data, 48 entries of internal data collected at a cycle of 2 ms, and 16 entries of customized data collected at a cycle of 2 ms. The data collected will be automatically saved to the SD of the HCU. Up to 1000 groups of fault data can be saved.

- Automatic fault trigger condition: When the basic rectifier module enters to the fault state, black box record will be triggered once automatically.
- Customized command trigger condition: You can set H0-06 to trigger the black box record once at the rising edge. Parameters related to customized command trigger are shown in *"Table 2–10 Parameters related to customized command trigger" on page 49*.

Table 2–10 Parameters related to customized command trigger

Param.	Name	Setpoint
H0-06	Customized black box trigger command source	0: Disable Other: B connector

To view the waveform recorded by the black box, do as follows:

1. Choose "Basic rectifier-001" > "Diagnostic and debug" > "Diagnostic" > "Blackbox" to open the black box interface. Click "Refresh" to view the fault list and the occurrence time.

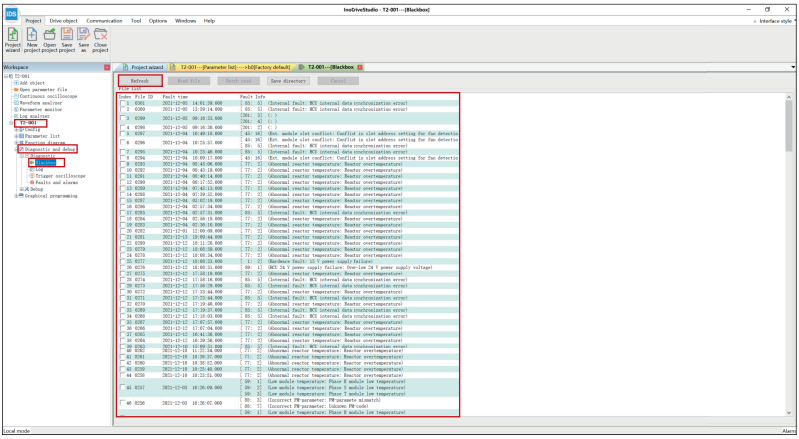


Figure 2-35 Black box interface

2. Select one of the faults, click "Read file", and name and save the file.

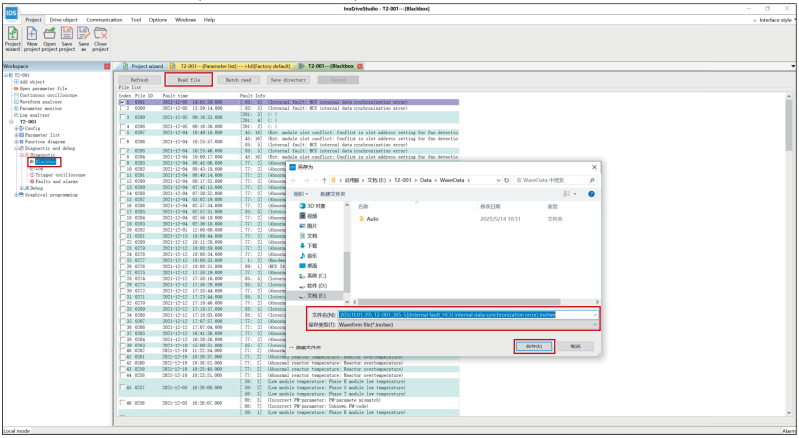


Figure 2-36 Saving interface of the black box

3. After you click "Save", InoDriveStudio automatically opens the waveform that has been saved. Select the channel to be viewed, and the corresponding waveform will be shown.

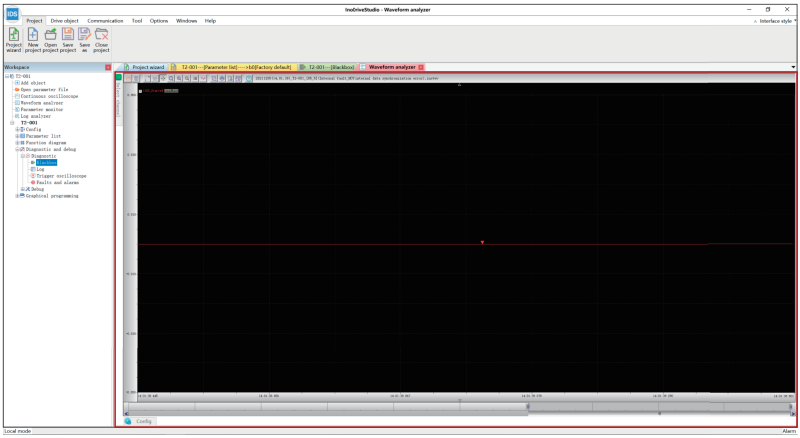


Figure 2-37 Black box waveform

Batch reading of black box files is supported, as shown in the following figure. Click "Batch read" and select the directory for saving the files. You can read multiple black box files consecutively. Note that the progress bar only represents the reading process of individual black box files.

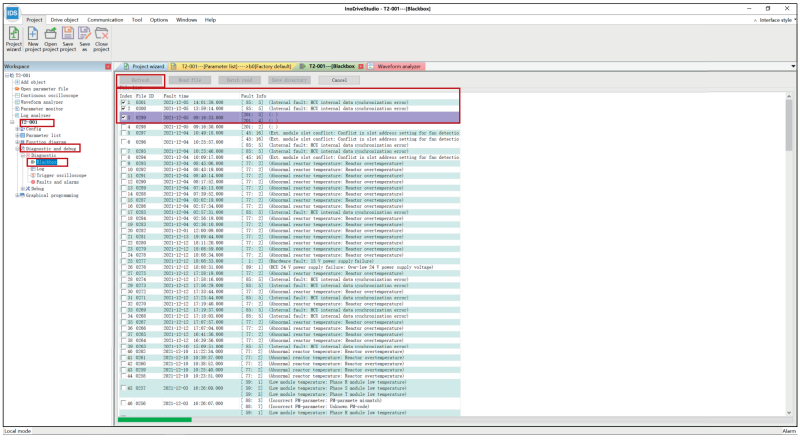


Figure 2-38 Batch reading of black box files

The following shows how to clear the black box records.

1. Set A8-00 to 4 (Clear black box records).
2. Set A8-01 to 1 to confirm the operation of A8-00.

Parameter files backed up on the SD card of HCU-20 are deleted without affecting any parameters.

2.3.3.3 Log Function

The system log records information about software, hardware, and issues in the system, including specific data and time of occurrence. You can monitor related events such as operating events, state changes, faults, active limits, and alarms in the system.

Users and manufacturers can locate the fault causes through the log for easy fault tracking and equipment maintenance. The log contains the change process of key system states (including power-on/power-off, changes of state machine, command settings, and automatic fault reset) and restoration of factory parameters.

Log reading

Connect InoDriveStudio to HCU-20. Choose "Basic rectifier-001" > "Diagnostic and debug" > "Diagnostic" > "Log" to open the log interface. Click "Refresh" to view the generated log files and the time of generation.

The time in the following figure refers to the power-on time of HCU-20. You can only see the time of each event after the log is opened. Every time HCU-20 is powered on, a new log file is created to record logs. During the entire power-up period, all records are stored in the newly-created log file. When the current log file is full, another new log file is created. The system supports a total of 400 log files and each log file can store up to 1000 records.

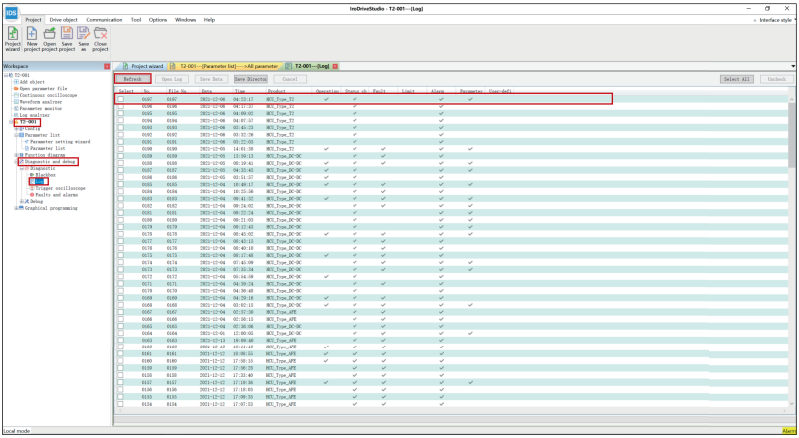


Figure 2-39 Refreshing the log list

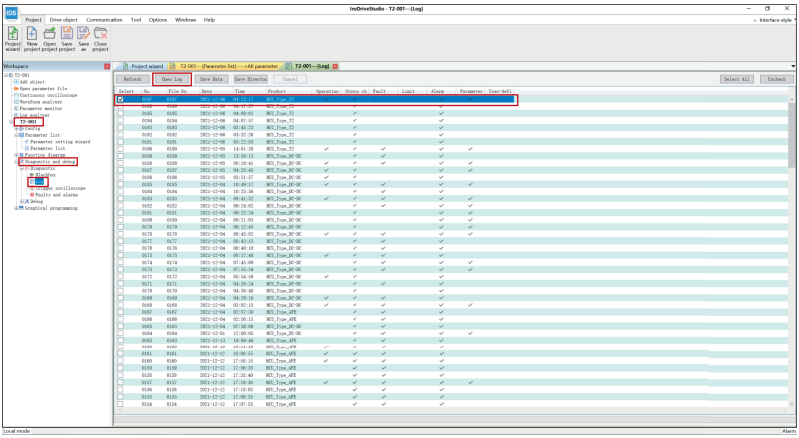


Figure 2-40 Opening the log

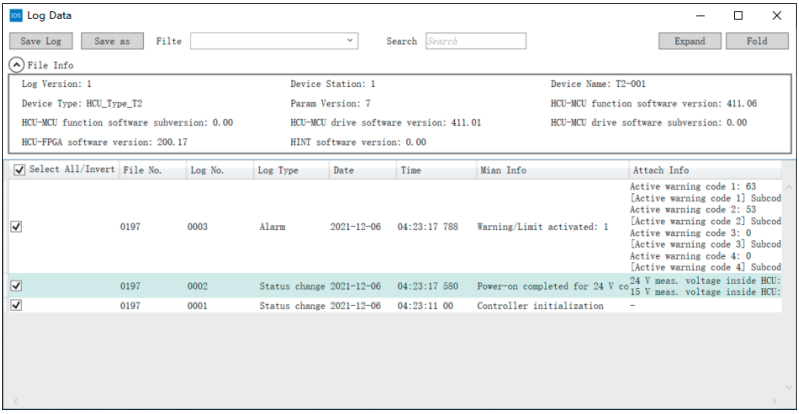


Figure 2-41 Log data

Log clearing

Procedure:

1. Set A8-00 to 5 (Clear log records).
2. Set A8-01 to 1 to confirm the operation of A8-00.

All the log records will be cleared.

Note

Once cleared, the log records cannot be restored.

User-defined log trigger

The log supports user-defined trigger configuration, which includes analog trigger and digital trigger.

- When digital trigger is selected, logging can be triggered once at the edge of digital signal, and the edge signal type can be configured through parameters.
- When analog triggering is used, a log record can be triggered by comparing with the source value setpoint. A total of four groups of user-defined log trigger are supported.

The related parameters are shown below. The parameters of user-defined log 1 are explained here, and the configurations of user-defined logs 2 to 4 are the same.

Table 2–11 Related parameters

Param.	Name	Setpoint	Remarks
A16-03	User-defined log reset function selection	0: No operation 1: Reset user-defined log 1 trigger times 2: Reset user-defined log 2 trigger times 3: Reset user-defined log 3 trigger times 4: Reset user-defined log 4 trigger times 5: Reset trigger times of all user-defined logs 6: Restore parameters of user-define logs	-
A16-04	User-defined log reset function confirmation	0: Cancel 1: Confirm	-
A16-05	[User-defined log 1] Trigger times	-	Trigger times display, read-only
A16-15	[User-defined log 1] Trigger mode selection	0: Disable 1: Analog trigger 2: Digital trigger 3: Analog or digital trigger 4: Analog and digital trigger	When the parameter is set to 3, logging will be triggered once when either the analog or digital trigger condition is met. When the parameter is set to 4, logging will be triggered once when both the analog and digital trigger conditions are met.
A16-16	[User-defined log 1] Analog trigger source	0: Disable Other: K connector	-

Param.	Name	Setpoint	Remarks
A16-17	[User-defined log 1] Analog trigger comparison condition	0: Greater than (>) 1: Less than (<) 2: Equal to (=) 3: Greater than or equal to (≥) 4: Less than or equal to (≤)	-
A16-18	[User-defined log 1] Analog trigger comparison value source	0: Disable Other: K connector	-
A16-19	[User-defined log 1] Digital trigger source	0: Disable Other: B connector	-
A16-20	[User-defined log 1] Digital trigger comparison condition	0: Rising edge (0→1) 1: Falling edge (1→0) 2: Edge (0→1 or 1→0)	-
A16-21	[User-defined log 1] Channel 1 selection	0: 0 Other: K connector	Set the data value to be recorded when the log is triggered, and bind it through the connector.
A16-22	[User-defined log 1] Channel 2 selection		
A16-23	[User-defined log 1] Channel 3 selection		
A16-24	[User-defined log 1] Channel 4 selection		
A16-25	[User-defined log 1] Channel 5 selection		
A16-26	[User-defined log 1] Channel 6 selection		
A16-27	[User-defined log 1] Channel 7 selection		
A16-28	[User-defined log 1] Channel 8 selection		

Enabling the log function

The log function supports trimming and can be set through parameters A16-85 to A16-91. Specific log functions can be enabled or disabled, so that related event records are opened or blocked. The following takes A16-85 as an example.

Table 2–12 Related parameters

Param.	Name	Setpoint
A16-85	Log function enable selection 1	Ones: Reserved 0: Disable 1: Enable Tens: Reserved 0: Disable 1: Enable Hundreds: AI1 disconnected 0: Disable 1: Enable Thousands: AI2 disconnected 0: Disable 1: Enable Ten thousands: Reserved 0: Disable 1: Enable

2.3.3.4 Waveform Analyzer

The waveform analyzer can display waveforms for saved black box files and continuous oscilloscope files. To start it, click "Waveform analyzer" under "Workspace".

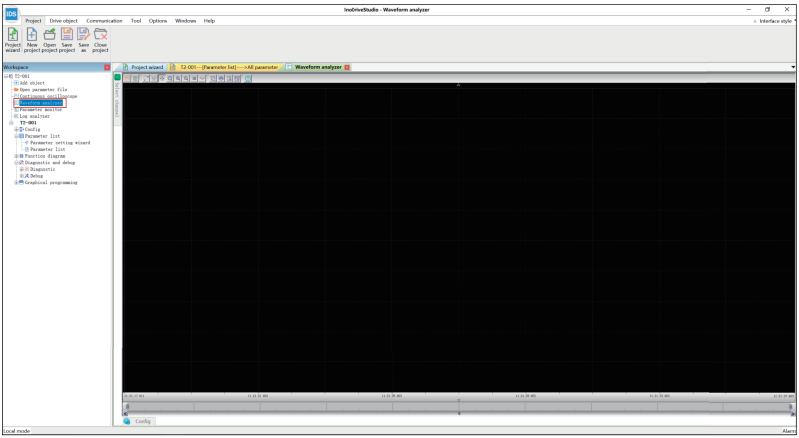


Figure 2-42 Opening the waveform analyzer

This window mainly includes the channel selection area, waveform display area, waveform configuration area, and toolbar, as shown in the following figure.

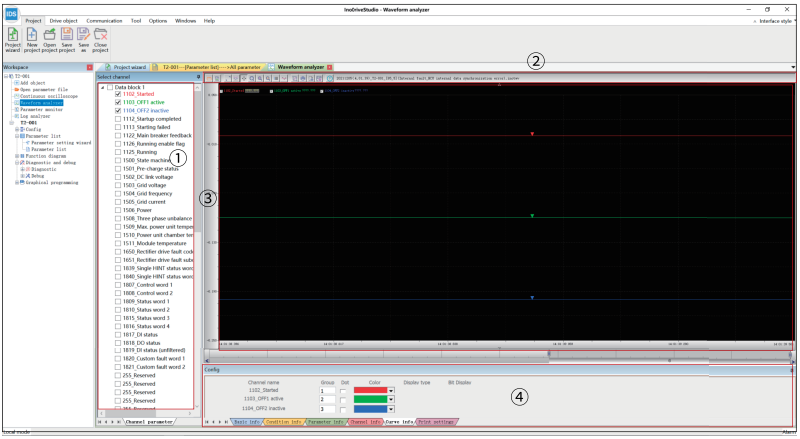


Figure 2-43 Waveform analyzer window

No.	Name	Description
①	Channel selection	Click the channel data you want to check, and the corresponding waveform is displayed in the waveform area.
②	Waveform analyzer toolbar	For toolbar buttons, see *"Table 2–13 Buttons in the waveform analyzer toolbar" on page 57*
③	Waveform display	This area displays the selected channel data in waveform.
④	Waveform configuration	On the "Curve info" tab, you can set colors for curves. After you tick a checkbox in the "Dot" column, every sampling point on the corresponding curve is displayed in bold. When the group numbers of two curves are set to the same, the two curves share the same Y-axis and are zoomed in or out synchronously.

Table 2–13 Buttons in the waveform analyzer toolbar

Button	Function
	Open File button. Opens saved black box files or continuous oscilloscope files for analysis.
	Saves the waveform file as a *.csv file.
	Auto-Scale Y-Axis button. After you click this button, all curves are scaled on the Y-axis based on the current display range, ensuring all curve points are within the visible area.

Button	Function
	Tile button. After you click this button, all curves are displayed tiled along the Y-axis direction.
	Pan button. After you click this button, you can drag and pan the current curve using the left mouse button.
	Zoom button. Click this button and select an area with the mouse to zoom it to the current screen display. Only the Y-axis range of the current curve changes; the time axis of all curves changes synchronously. Single-axis zooming is possible on both X and Y axes.
	Scale button. This button enables one-level zoom-in or zoom-out. Only the Y-axis range of the current curve changes; the time axis of all curves changes synchronously.
	Show/Hide Cursor button. You can use two cursors to measure curve data.
	Show Sample Points button. After you click this button, the sample points of all curves are displayed in bold.
	Screenshot button. You can use this button to capture the entire oscilloscope interface and save the captured interface as a *.bmp, *.jpg, or *.png file.
	Background Setting button. You can click this button to set the background color, axis color, font size, grid color, and cursor color of the waveform analyzer. After setting, click the Save button to save the settings.

3 Commissioning and Operation

3.1 Overview

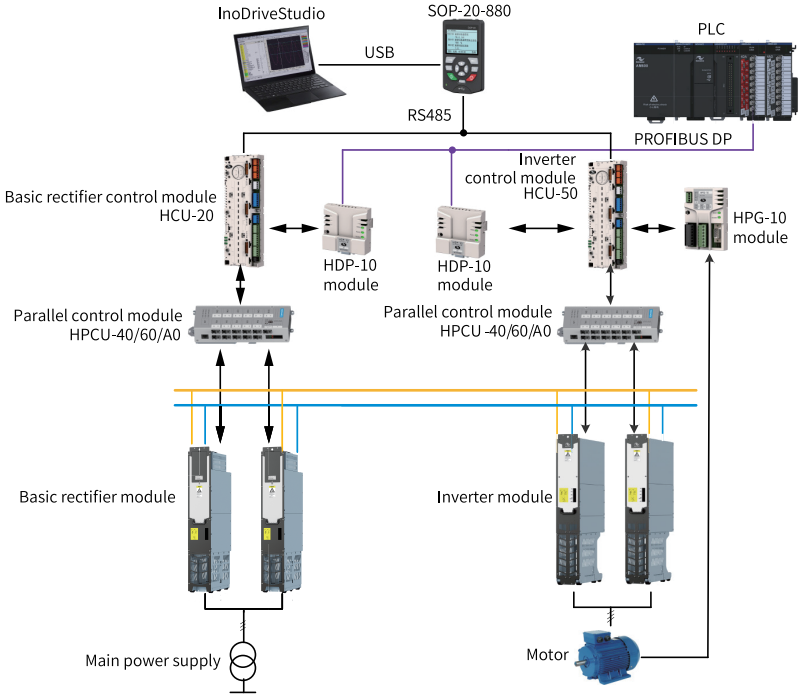


Figure 3-1 Topology of the basic rectifier module

The typical topology of the MD880 multi-drive system is shown in *"Figure 3–1 Topology of the basic rectifier module" on page 59*. The system mainly consists of two parts: the control module and the power module. The control module can be connected to the PLC through the fieldbus for centralized control. Multiple control modules can also be connected through an RS485 bus for centralized commissioning and monitoring. The power module can be expanded in parallel by using the HPCU parallel control module.

3.1.1 Topology of the Basic Rectifier (Single-Rectifier System)

The following figure shows the topology of the basic rectifier module used in a single-rectifier system.

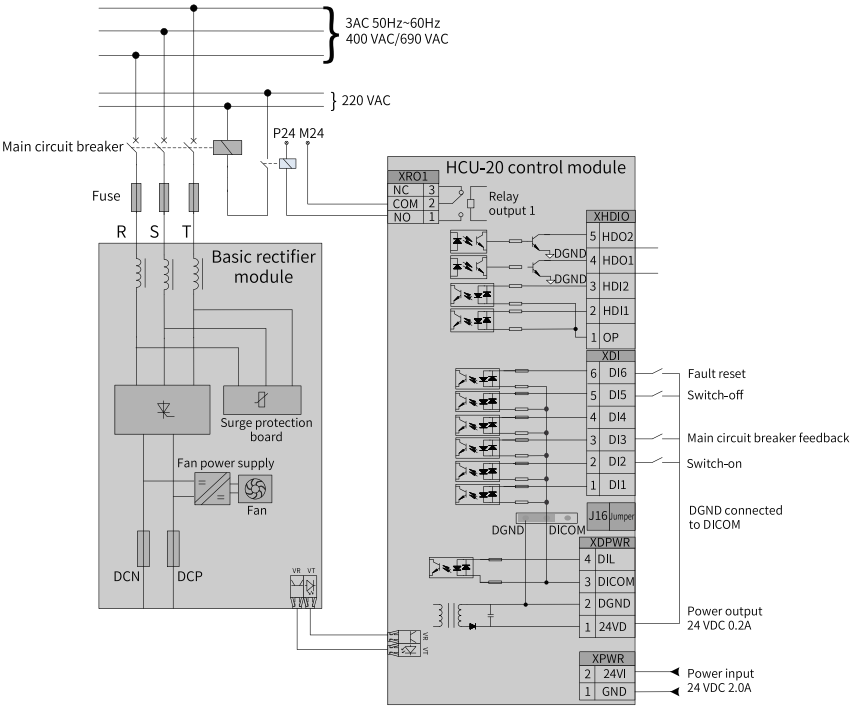


Figure 3-2 Topology of the air-cooled basic rectifier (single-rectifier system)

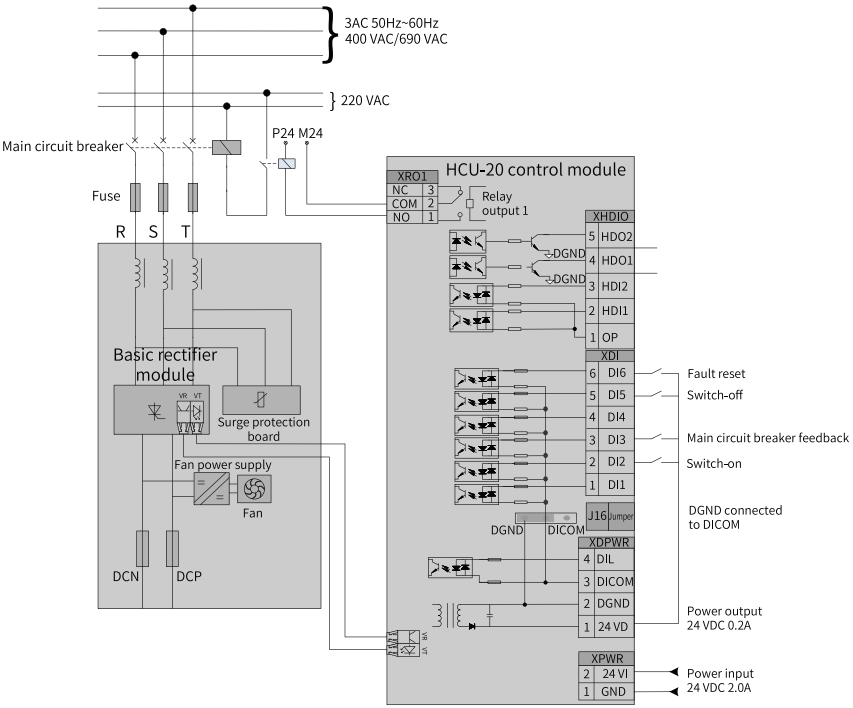


Figure 3-3 Topology of the thyristor basic rectifier module (single-rectifier system)

Note

"Figure 3–2 Topology of the air-cooled basic rectifier (single-rectifier system)" on page 60 shows the default port assignment of HCU-20. For details, see the description of terminal start/stop module in the *MD880(LC)-20 Series Basic Rectifier Function Guide*.

3.1.2 Topology of the Basic Rectifier (Parallel-Rectifier System)

The basic rectifier module achieves parallel control through the HPCU, supporting up to six modules in parallel. The topology for parallel operation of basic rectifiers is divided into 6-pulse basic rectifier system and 12-pulse basic rectifier system. The 6-pulse system is suitable for general-purpose rectification needs. The 12-pulse system is typically used in applications requiring low harmonic distortion.

- Topology of 6-pulse basic rectifier parallel operation

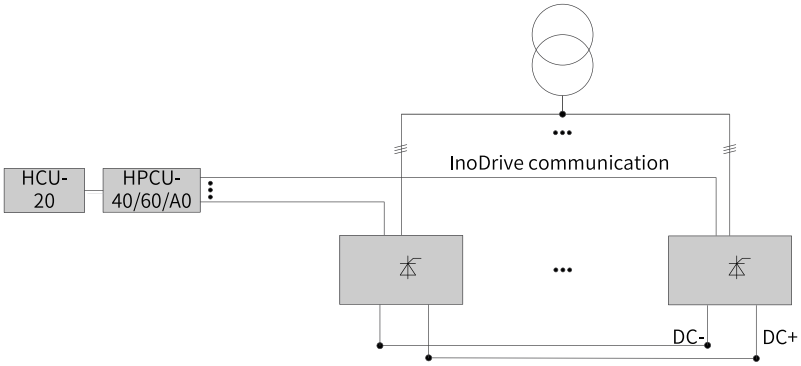


Figure 3-4 Topology of 6-pulse basic rectifier parallel operation

- Topology of 12-pulse basic rectifier parallel operation
  The 12-pulse rectifier system can eliminate the fifth and seventh harmonics, significantly reducing the harmonic distortion of the line current and the conducted emissions. The 12-pulse rectifier system requires a phase-shifting transformer or two separate transformers. The primary and secondary sides must have the same transformation ratio, and there is a phase difference of 30° between the windings on the secondary side. The topology of 12-pulse basic rectifier parallel operation is shown below.

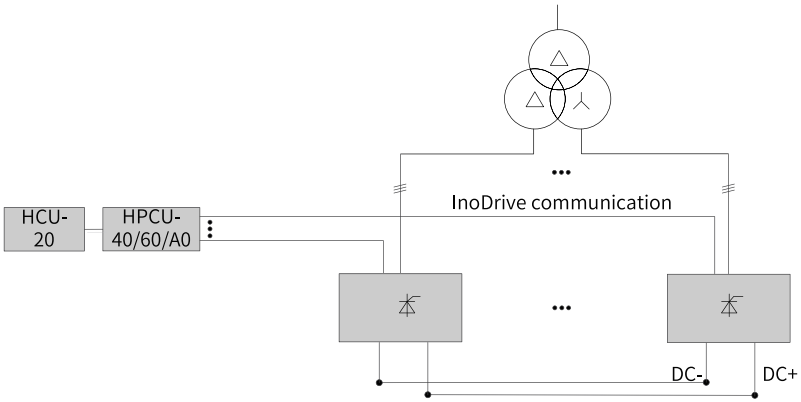


Figure 3-5 Topology of 12-pulse basic rectifier parallel operation

For parameter settings related to power modules and parallel operation, see *"3.8.1 Setting Parameters for Single and Parallel Modes" on page 68*. You can view the basic information of the device through the parameters in the following table.

Table 3–1 Viewing module information

Param.	Name	Description
A0-00	Product type	Displays the device type. Normally displays 1 (Basic rectifier).
A0-01	Rated module power	Displays the rated power of a single module.
A0-02	Rated module voltage	Displays the rated voltage of the module.
A0-03	Rated module current	Displays the rated current of the module.
A0-04	Total rated power in parallel	Displays the total rated power of parallel modules.
A0-05	Total rated current in parallel	Displays the total rated current of parallel modules.

Note

When multiple basic rectifier modules are connected in parallel, the total power and total current shall be derated by 7%.

Example: For two basic rectifier modules with rated power A2-01 = 649 kW and rated current A2-03 = 982 A: Total rated power (A2-04) = 649 x 2 x (1 – 7%) = 1207 kW; Total rated current (A2-05) = 982 x 2 x (1 – 7%) = 1826 A

3.2 Description of HCU Control Module

3.2.1 Indicators

The HCU has three indicators from top to bottom, as shown in the following figure.

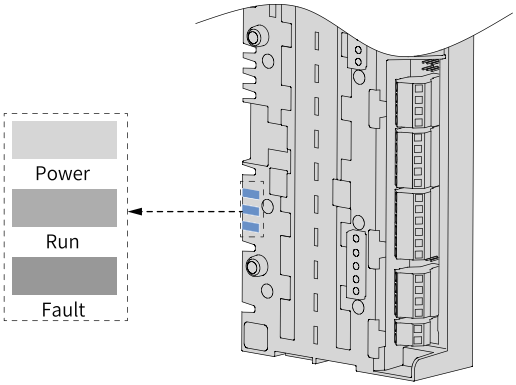


Table 3–2 Location and definition of the LED indicator

No.	Name	Status	Description
1	Power	Steady ON	The HCU power supply is normal.
		OFF	The HCU is not energized or the power supply is faulty.
2	Run	Steady ON	The power module is running.
		OFF	The power module is in the stop state .
3	Fault	Steady red	System fault.
		Steady yellow	System alarm.
		OFF	System OK.
		Flashing in red	HCU auxiliary power supply fault (Check whether 24 V power supply is short-circuited or overloaded.)
4	Fault, Run	Flashing in yellow (FAULT) and green (RUN) simultaneously	This HCU is selected by the PC or SOP-20-880, which ends after 10s.
		Flashing in red (FAULT) and green (RUN) alternately	The FPGA of the HCU is abnormal or the external expansion RAM is abnormal.

3.2.2 Standard Peripheral Terminals and Parameter Settings

For use of the standard peripheral terminals, see *HCU Control Module User Guide.* This section only describes terminals and related parameter groups, as shown in the following table.

Name	Parameter group	Remarks
RS485	A10	Used to set the communication rate and address.
DI	F0	Used to view the DI status and set switch-on/switch-off delay.
RO	F1	Output source selection, displayed in U0-21 to U0-23.
AI	F2	The final result is displayed in U5-18/U5-19.
AO	F3	Output source selection, displayed in U5-22/U5-23.
HDI	F4	High-speed DI setting
HDO	F5	High-speed DO setting
InoLink	n0	Used to transmit data between HCUs. U5-32 to U5-39 are used to display PZD1 to PZD8 data. U2-32 to U2-47 are used to display bit 0 to bit 15 data of PZD1.

3.2.3 HCU Expansion Modules and Their Usage

For details of the expansion module hardware, see the related user guides. Observe the following procedure when using the expansion module.

1. Confirm the module type.
2. Select the slot in which the module is located. For I/O modules, a maximum of three modules can be used simultaneously. Configure each module separately.
3. Configure other parameters of the module. For communication expansion modules, set parameters in n1/n2 fieldbus adapters. For details, see the *MD880 Series AC Drive Communication Guide*.

Table 3–3 Common expansion modules

Model	Module Name	Module Type	Parameter Group	Related Parameter Group
HIO-10	Digital analog expansion module	I/O module	n7/n8/n9	-
HMBA-10	Modbus RTU module	Fieldbus module	n10	n1/n2/n3
HDP-10	PROFIBUS DP fieldbus module		n16	n1/n2/n3
HCAN-10	CANopen fieldbus module		n12	n1/n2/n3
HETC-10/ 20	EtherCAT industrial Ethernet module	Industrial Ethernet module	n14	n1/n2/n3
HPFN-10	PROFINET IO industrial Ethernet module		n17	n1/n2/n3
HMBT-10	Modbus TCP industrial Ethernet module		n18	n1/n2/n3
HETN-10	Ethernet commissioning module	Ethernet module	n13	n1/n2/n3
HSVM-10	Sync voltage detection module	Voltage detection module	n19	-

You can view the inserted communication expansion modules and their versions through parameters in group A2.

Table 3–4 Parameters for viewing expansion module information

Slot	Module Type Parameter	Software Version Parameter	Slot	Module Type Parameter	Software Version Parameter
SLOT1_1	A2-24	A2-25	SLOT2_1	A2-30	A2-31
SLOT1_2	A2-26	A2-27	SLOT2_2	A2-32	A2-33

Slot	Module Type Parameter	Software Version Parameter	Slot	Module Type Parameter	Software Version Parameter
SLOT1_3	A2-28	A2-29	SLOT2_3	A2-34	A2-35
SLOT3_1	A2-36	A2-37	-	-	-

3.3 Commissioning Flowchart

The following figure shows the system commissioning flowchart.

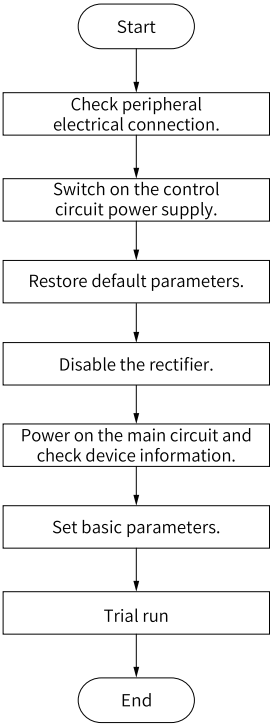


Figure 3-6 Flowchart of commissioning upon first power-on

3.4 Check Before Commissioning

Before powering on the control system for commissioning, ensure all preparatory work is complete and perform the checks listed in the table below.

No.	Item	Check Item	OK
1	Main circuit	No short circuit exists between phases or to ground in the three-phase AC input of the basic rectifier module.	☐
		No short circuit exists between the positive and negative DC busbars or to ground.	☐
		The phase sequence of the input lines for parallel basic rectifier modules must be consistent.	☐
2	Auxiliary circuit	The 24 V power supply wiring is correct.	☐
		Wiring follows the electrical schematic, ensuring secure connections and proper routing.	☐
3	Grounding	All grounding wires in the cabinet are securely fastened to the grounding busbar.	☐
		Each group of cabinets must have their grounding busbars connected into a single line and reliably grounded.	☐
		For TT/TN systems, install the two grounding screws on the surge protection board of the basic rectifier module. See the *MD880-20 Series Basic Rectifier Hardware Guide* and the *MD880LC-20M Series Basic Rectifier Module Hardware Guide*.	☐
4	Power-on	Gradually close the auxiliary power switch.	☐
		Before closing each switch, measure the resistance at the switch output to assess the load condition, and measure the input voltage to ensure the correct voltage class.	☐
5	Communication cable	Ensure proper connection of communication cables.	☐
6	External interface	Ensure proper connection of external interfaces such as I/O interfaces.	☐

3.5 Powering On the Control Circuit

Check the control circuit power supply of the basic rectifier and connect the control power.

3.6 Restoring Default Parameters

Restore parameters to default setting before initial commissioning according to the following procedure.

1. Set A8-00 to 2 to select restoration of all parameters to factory values.
2. Set A8-00 to 1 to confirm the restoration operation.

After execution, the state machine A0-00 enters the S20 state (parameter restoration) and exits this state upon completion.

3.7 Disabling Rectifier Operation

Before closing the main circuit breaker for the first time, disable the basic rectifier module operation for safety and to facilitate power module information checks. Set the following parameters accordingly:

- When controlling the start/stop of the basic rectifier module using the factory default configuration, set b0-04 to 0.
- When controlling through SOP-20-880, set A10-06 to 0.
- When controlling through the InoDriveStudio control panel, check "Control enable" and click "Enable" to switch the command to an invalid state (gray). For details, see *"2.3.2.3 Control Panel" on page 31*.

Note

After commissioning upon first power-on, restore the rectifier operation to "run allowed" to ensure the rectifier module can automatically start when the main circuit breaker is closed for subsequent operations.

3.8 Checking and Setting the Power Module

3.8.1 Setting Parameters for Single and Parallel Modes

- Setting parameters for single-rectifier mode

  1. Enable single-rectifier mode (A15-00 = 0).
  2. Verify that the parallel module status matches the actual configuration (A15-04 to A15-07, A15-15 to A15-24). The normal display should be:
     - A15-04 = 0
     - A15-07 = 0
     - A15-15 = 1, and A15-16 to A15-24 = 0

- Setting parameters for parallel mode (example: two basic rectifier modules in parallel)

  1. Connect the power module to the CH1 and CH2 ports of the HPCU.
  2. Enable multi-rectifier mode (A15-00 = 1).
  3. Enable the CH1 and CH2 ports (A15-02 = 00011, A15-03 = 00000).
  4. Verify that the parallel module status matches the actual configuration (A15-04 to A15-07, A15-15 to A15-24). The normal display should be:
     - A15-04 = 2
     - A15-07 = 2
     - A15-15 and A15-16 = 1, A15-17 to A15-24 = 0

Table 3–5 Parameter setting in single and parallel modes

No.	Param.	Definition	Remarks
1	A15-00	Parallel function selection	0: Single unit 1: Parallel
2	A15-01	HPCU online/offline status	0: Offline 1: Online Ready-only, unchangeable
3	A15-02	Parallel module enable selection 1	00000. The ones to ten thousands positions correspond to modules 1 to 5. 0: Disable 1: Enable
4	A15-03	Parallel module enable selection 2	00000. The ones to ten thousands positions correspond to modules 6 to 10. 0: Disable 1: Enable
5	A15-04	Number of enabled parallel modules	Read-only After A15-01 and A15-02 are set, the value of this parameter is automatically calculated.
6	A15-05	Parallel module online display 1	Read-only
7	A15-06	Parallel module online display 2	Read-only
8	A15-07	Number of online parallel modules	0 to 10
9	A15-15 to A15-24	Status of parallel modules 1 to 10	0: Offline 1: Online Ready-only, unchangeable

3.8.2 Checking Equipment Information

1. Check that the product type matches the actual device (A2-00).
2. Check that the rated power, rated voltage, and rated current of the power module match the nameplate information (A2-01, A2-02, and A2-03).
3. For parallel scenarios, ensure the total rated power and total rated current match the actual values (A2-04 and A2-05). Total rated power and current must account for a 7% derating: Total rated power = Rated module power x Number of modules x (1 – 7%). Example: For two basic rectifier modules with rated power A2-01 = 649 kW and rated current A2-03 = 982 A: Total rated power (A2-04) = 649 x 2 x (1 – 7%) = 1207 kW; Total rated current (A2-05) = 982 x 2 x (1 – 7%) = 1826 A

4. Check that the HCU software type and HCU-DSP function/performance software versions match the actual configuration (A2-07 and A2-08 to A2-11).

Table 3–6 Equipment information parameters

Param.	Name	Description
A2-00	Product type	Displays the product type. Normally displays 1 (Basic rectifier).
A2-01	Rated module power	-
A2-02	Rated module voltage	-
A2-03	Rated module current	-
A2-04	Total rated power in parallel	-
A2-05	Total rated current in parallel	-
A2-07	HCU software type	Displays the HCU software type. Normally displays 1 (Basic rectifier).
A2-08	HCU-MCU function software version	-
A2-09	HCU-MCU function software sub-version	-
A2-10	HCU-MCU performance software version	-
A2-11	HCU-MCU performance software sub-version	-
A2-16	HCU-FPGA software version	-
A2-18	HINT type	Displays the HINT type. Displays 100 (offline) when HINT is not functioning normally.
A2-19	HINT software version	-
A2-22	HPCU software version	-

Note

1. Check that the product type matches the actual device (A2-00).
2. Check that the rated power, rated voltage, and rated current of the power module match the nameplate information (A2-01, A2-02, and A2-03).
3. For parallel scenarios, ensure the total rated power and total rated current match the actual values (A2-04 and A2-05). Total rated power and current must account for a 7% derating. For example, when two basic rectifier modules are connected in parallel:
   - Total rated power = Rated module power x Number of modules x (1 – 7%). If the rated power (A2-01) is 649 kW, then the total rated power (A2-04) is 649 x 2 x (1 – 7%), which is 1207 kW.
   - If the rated current (A2-03) is 982 A, then the total rated current (A2-05) is 982 x 2 x (1 – 7%), which is 1826 A.
4. Check that the HCU software type and HCU-DSP function/performance software versions match the actual configuration (A2-07 and A2-08 to A2-11).

3.8.3 Setting Load Mode

For more information about load modes, see related sections in the *MD880-20 Series Basic Rectifier Hardware Guide* and the *MD880LC-20 Series Basic Rectifier Hardware Guide*.

The controller automatically records the real-time current of the power module and calculates the load rate. When the module load exceeds the limit, fault 10-1 (Drive overload) is reported. In this case, check whether the drive matches the load and whether the current exceeds the allowable limit of the module.

Typical operating conditions:

- No overload mode: The maximum current never exceeds the no-overload current of the drive. This is suitable for long-term operation.
- Light overload mode: In every 300s cycle, the drive runs at up to the light overload current for 240s, followed by up to 1.1 times the light overload current for 60s. A cyclic operation at an interval of 300s is supported.
- Heavy overload mode: In every 300s cycle, the drive runs at up to the heavy overload current for 240s, followed by up to 1.5 times the heavy overload current for 60s. A cyclic operation at an interval of 300s is supported.

Note

The current device supports automatic load mode selection, and no setting is required. For devices of earlier versions, select the load mode in A4-17.

3.9 Setting Basic Parameters

Set the grid frequency: The HCU-20 supports operation on grids with rated frequencies of 50 Hz or 60 Hz, configurable through d0-01.

Param.	Name	Range
d0-01	Rated grid frequency	0: 50 Hz (default) 1: 60 Hz

3.10 Trial Run

During trial run, you can configure device control commands such as start/stop, run enable, and fault reset using the following methods.

3.10.1 Device Start Through Local Control

For the initial trial run, it is recommended to use InoDriveStudio or the SOP-20-880 panel to start the device. For details, see *"2.1 Commissioning Tool List" on page 15*.

3.10.2 Device Start Through Factory Default Configuration

For basic rectifier cabinets provided by the manufacturer, the cabinet provides start, switch-off, and reset buttons. If the factory default configuration is enabled (b0-00 = 1), the device can be started directly. The following table lists the factory default configuration parameters.

Table 3–7 Default configuration parameters

Param.	Name	Setpoint	Description
b0-00	Default configuration enable	0: Disable 1: Enable	Must be set to "Enable".
b0-01	Default configuration validity	0: Invalid 1: Valid	Read-only; Displays if factory configuration is valid.
b0-02	Default start command source	3 [DI2]	The device is started by DI2 by default, which cannot be changed. When DI5 is low level and the DI2 rising edge changes, the start command is active.
b0-03	Default stop command source	6 [DI5]	The device is stopped by DI5 by default, which cannot be changed. When DI5 is high level, the stop command is active.

Param.	Name	Setpoint	Description
b0-04	Default run command source	0: Run disabled 1: Run enabled	The default value is 1, which can be changed.
b0-05	Default reset signal source	7 [DI6]	The fault is reset by DI6 by default, which cannot be changed.

Note

To control device start/stop in other remote modes, set b0-00 to 0 to disable the factory default configuration.

3.10.3Device Start/Stop Control Through Digital Input

The HCU-20 control module supports device start/stop control through digital input terminals. For example, DI1 is used to trigger start/stop, DI2 is used to block output, and DI4 is used to reset faults.

Param.	Name	Setpoint	Description
b0-00	Default configuration enable	0	Default configurations is not enabled.
b1-00	[CH-1] Control source setting	1	Custom start/stop control word
b1-01	[CH-1] User-defined OFF1 source	2	DI1 is selected as the source of OFF1 command.
b1-02	[CH-1] User-defined OFF2 source	3	DI2 is selected as the source of OFF2 command.
b1-03	[CH-1] User-defined run command source	1	Operation is permitted.
b1-04	[CH-1] User-defined reset signal source	4	DI4 is selected as the source of fault reset command.

3.10.4Device Start/Stop Control Through Fieldbus

This section describes how to set the fieldbus as the source of device start/stop command, reset command, and setpoints.

When starting the drive through fieldbus communication, first determine a protocol for data interaction with the automation system and set parameters accordingly. The following example uses a PROFIBUS DP bus with fieldbus adapter A.

The following table defines the control word received by the basic rectifier.

Table 3–8 Control word definition

Bit	1	0	Description
Bit 0	Start	Stop	Started at the rising edge, and kept
Bit 1	Block inactive	Block active	Mandatory condition 1 for start
Bit 2	Reserved	Reserved	-
Bit 3	Run enabled	Run disabled	-
Bit 4	-	-	-
Bit 5	-	-	-
Bit 6	-	-	-
Bit 7	Fault reset	None	Valid on the rising edge
Bit 8	-	-	-
Bit 9	-	-	-
Bit 10	PZD data valid	PZD data invalid	Always high
Bit 11	-	-	-
Bit 12	-	-	-
Bit 13	-	-	-
Bit 14	-	-	-
Bit 15	-	-	-

The status word sent by the basic rectifier is shown in the following table.

Table 3–9 Status word definition

Data	Value Range	Meaning	Description
PZD1	0 to 0xFFFF	Status word 1	For details, see the "Status Word" section in the *MD880(LC)-20 Series Basic Rectifier Function Guide*.
PZD2	0 to 15000	DC bus voltage	For calibration of base values, see the "Communication Module" section in the *MD880(LC)-20 Series Basic Rectifier Function Guide*. One decimal place; 1000 indicates a voltage of 100.0 V.

Set the following parameters:

Table 3–10 Bus definition and settings

Param.	Name	Setpoint	Description
n1-00	Fieldbus adapter bus type	7	Set the bus type for fieldbus adapter A to PROFIBUS DP.
n1-01	Communication disconnection detection delay	1	A communication failure is reported 1s after communication interruption.
n1-03	Continuous CRC error detection on communication	0	No CRC check
n1-04	Process data output 1	1809	Process data 1 is set as "transmit status word 1".
n1-05	Process data output 2	1502	Process data 2 is defined as "DC bus voltage".
n1-20	[Process data output 1] Communication base value	0	The default setting is 4096, which corresponds to 100% of the rated value.
n1-21	[Process data output 2] Communication base value	0	The default setting is 4096, which corresponds to 100% of the rated value.
n1-36	[Process data input 1] Communication base value	0	The default setting is 4096, which corresponds to 100% of the rated value.
n1-37	[Process data input 2] Communication base value	0	The default setting is 4096, which corresponds to 100% of the rated value.
n16-00	Expansion slot selection	7	The PROFIBUS DP communication module is installed in expansion slot 3_1.
n16-02	Expansion module ID	2	The PROFIBUS DP address is set to 2.
n16-10	DP data check bit	0	The PROFIBUS DP data check bit is set to PZD1.bit10, indicating that the communication data is valid only when bit 10 in PZD1 received by HCU is 1.

Set the control channel based on the control word definition.

Param.	Name	Setpoint	Description
b0-00	Default configuration enable	0	Default configurations is not enabled.
b1-00	[CH-1] Control source setting	1	Custom start/stop control word

Param.	Name	Setpoint	Description
b1-01	[CH-1] User-defined OFF1 source	1200	FBA-A.PZD1.0 is selected as the source of OFF1 command.
b1-02	[CH-1] User-defined OFF2 source	1201	FBA-A.PZD1.1 is selected as the source of OFF2 command.
b1-03	[CH-1] User-defined run command source	1203	FBA-A.PZD1.3 is selected as the source of run enable command.
b1-04	[CH-1] User-defined reset signal source	1207	FBA-A.PZD1.7 is selected as the source of fault reset command.

3.10.5Device Start/Stop Control Through Modbus (Mailbox Addresses)

Control through special addresses

As specified by the Modbus communication protocol, parameters are read and written directly through the communication address, without generating process data.

To start/stop through Modbus communication, the HCU-20 control module provides several special communication addresses for accessing Modbus, and updates the written data to a specific connector for reading the source parameters.

Table 3–11 Description of the communication addresses

Address	Connector	Name	Description
34230	U5-40	Modbus communication setting value 1	Value range: –32768 to +32767; used to receive control words or references.
34231	U5-41	Modbus communication setting value 2	
34232	U9-50	Modbus communication double-word setpoint	Value range: -2^{31} to $+2^{31}-1$; used to receive high-accuracy references. The high 16 bits of the data are written to address 34232, whereas the low 16 bits are written to address 34233.
34233			

You can configure the parameters as follows.

Table 3–12 Parameter configuration

Param.	Name	Setpoint	Description
b0-00	Default configuration enable	0	Default configurations is not enabled.
n1-00	Fieldbus adapter bus type	1	Modbus RTU is defined as the bus type for fieldbus adapter A.

Param.	Name	Setpoint	Description
n10-00	Expansion slot selection	7	The Modbus RTU module is installed in expansion slot 3_1.
n10-04	Modbus local address	4	The address of the Modbus RTU module is set to 4.
b1-00	[CH-1] Control source setting	1	Custom start/stop control word
b1-01	[CH-1] User-defined OFF1 source	1248	Word-to-bit output bit 0 is used as the source of OFF1 start/stop command.
L0-00	[W2B 1] Input selection	1540	The data 1 sent by Modbus is used as the word-to-bit input.

After the configuration is completed, writing 0 to communication address 34230 through Modbus stops the device, and writing 1 to address 34230 starts the device.

Control through continuous addresses

The Modbus RTU and Modbus TCP support writing of process data n1-68 to n1-83 (n2-68 to n2-83). After converted by communication base values of n1-36 to n1-51 (n2-36 to n2-51), the process data is updated to the corresponding connector U5-44 to U5-59 (U5-60 to U5-75). Related parameters are as follows.

- Fieldbus adapter A:

Address	Write Parameter	Name	Description
33807	n1-68	[Process data input 1] Data display	Written through Modbus, converted using base value n1-36, and updated to connector U5-44
33808	n1-69	[Process data input 2] Data display	Written through Modbus, converted using base value n1-37, and updated to connector U5-45
33809	n1-70	[Process data input 3] Data display	Written through Modbus, converted using base value n1-38, and updated to connector U5-46
33810	n1-71	[Process data input 4] Data display	Written through Modbus, converted using base value n1-39, and updated to connector U5-47
33811	n1-72	[Process data input 5] Data display	Written through Modbus, converted using base value n1-40, and updated to connector U5-48

Address	Write Parameter	Name	Description
33812	n1-73	[Process data input 6] Data display	Written through Modbus, converted using base value n1-41, and updated to connector U5-49
33813	n1-74	[Process data input 7] Data display	Written through Modbus, converted using base value n1-42, and updated to connector U5-50
33814	n1-75	[Process data input 8] Data display	Written through Modbus, converted using base value n1-43, and updated to connector U5-51
33815	n1-76	[Process data input 9] Data display	Written through Modbus, converted using base value n1-44, and updated to connector U5-52
33816	n1-77	[Process data input 10] Data display	Written through Modbus, converted using base value n1-45, and updated to connector U5-53
33817	n1-78	[Process data input 11] Data display	Written through Modbus, converted using base value n1-46, and updated to connector U5-54
33818	n1-79	[Process data input 12] Data display	Written through Modbus, converted using base value n1-47, and updated to connector U5-55
33819	n1-80	[Process data input 13] Data display	Written through Modbus, converted using base value n1-48, and updated to connector U5-56
33820	n1-81	[Process data input 14] Data display	Written through Modbus, converted using base value n1-49, and updated to connector U5-57
33821	n1-82	[Process data input 15] Data display	Written through Modbus, converted using base value n1-50, and updated to connector U5-58
33822	n1-83	[Process data input 16] Data display	Written through Modbus, converted using base value n1-51, and updated to connector U5-59

- Fieldbus adapter B:

Address	Write Parameter	Name	Description
33839	n2-68	[Process data input 1] Data display	Written through Modbus, converted using base value n1-36, and updated to connector U5-60
33840	n2-69	[Process data input 2] Data display	Written through Modbus, converted using base value n1-37, and updated to connector U5-61
33841	n2-70	[Process data input 3] Data display	Written through Modbus, converted using base value n1-38, and updated to connector U5-62
33842	n2-71	[Process data input 4] Data display	Written through Modbus, converted using base value n1-39, and updated to connector U5-63
33843	n2-72	[Process data input 5] Data display	Written through Modbus, converted using base value n1-40, and updated to connector U5-64
33844	n2-73	[Process data input 6] Data display	Written through Modbus, converted using base value n1-41, and updated to connector U5-65
33845	n2-74	[Process data input 7] Data display	Written through Modbus, converted using base value n1-42, and updated to connector U5-66
33846	n2-75	[Process data input 8] Data display	Written through Modbus, converted using base value n1-43, and updated to connector U5-67
33847	n2-76	[Process data input 9] Data display	Written through Modbus, converted using base value n1-44, and updated to connector U5-68
33848	n2-77	[Process data input 10] Data display	Written through Modbus, converted using base value n1-45, and updated to connector U5-69
33849	n2-78	[Process data input 11] Data display	Written through Modbus, converted using base value n1-46, and updated to connector U5-70

Address	Write Parameter	Name	Description
33850	n2-79	[Process data input 12] Data display	Written through Modbus, converted using base value n1-47, and updated to connector U5-71
33851	n2-80	[Process data input 13] Data display	Written through Modbus, converted using base value n1-48, and updated to connector U5-72
33852	n2-81	[Process data input 14] Data display	Written through Modbus, converted using base value n1-49, and updated to connector U5-73
33853	n2-82	[Process data input 15] Data display	Written through Modbus, converted using base value n1-50, and updated to connector U5-74
33854	n2-83	[Process data input 16] Data display	Written through Modbus, converted using base value n1-51, and updated to connector U5-75

For more information about using Modbus as the source of device start/stop command, reset command, and setpoints, see *"3.10.4 Device Start/Stop Control Through Fieldbus" on page 73*.

4 Troubleshooting

4.1 Viewing Faults

Faults are represented by fault codes and fault subcodes. Fault codes indicate the category of faults, whereas fault subcodes are used to locate specific faults. For example, in F15-2, the fault code 15 indicates an external fault; the fault subcode 2 indicates external fault 2.

Current faults

HCU-20 can record up to six faults that occur at the same time. When more than six faults occur at the same time, the subsequent faults will not be recorded. Faults activated currently can be viewed through parameters in group A1.

Current Fault		Active Limit		Current Alarm	
Fault Code	Fault Subcode	Fault Code	Fault Subcode	Fault Code	Fault Subcode
A1-00	A1-01	A1-12	A1-13	A1-24	A1-25
A1-02	A1-03	A1-14	A1-15	A1-26	A1-27
A1-04	A1-05	A1-16	A1-17	A1-28	A1-29
A1-06	A1-07	A1-18	A1-19	A1-30	A1-31
A1-08	A1-09	A1-20	A1-21	A1-32	A1-33
A1-10	A1-11	A1-22	A1-23	A1-34	A1-35

Previous faults

HCU-20 can record the latest five faults, the latest one limit, and the latest one alarm.

Table 4–1 Previous fault list

Latest Fault		2nd Latest Fault		3rd Latest Fault		4th Latest Fault	
Fault Code	Fault Subcode	Fault Code	Fault Subcode	Fault Code	Fault Subcode	Fault Code	Fault Subcode
H2-00	H2-01	H3-00	H3-01	H4-00	H4-01	H5-00	H5-01
H2-02	H2-03	H3-02	H3-03	H4-02	H4-03	H5-02	H5-03
H2-04	H2-05	H3-04	H3-05	H4-04	H4-05	H5-04	H5-05
H2-06	H2-07	H3-06	H3-07	H4-06	H4-07	H5-06	H5-07
H2-08	H2-09	H3-08	H3-09	H4-08	H4-09	H5-08	H5-09
H2-10	H2-11	H3-10	H3-11	H4-10	H4-11	H5-10	H5-11

5th Latest Fault		Latest Limit		Latest Alarm	
Fault Code	Fault Subcode	Fault Code	Fault Subcode	Fault Code	Fault Subcode
H6-00	H6-01	H7-00	H7-01	H8-00	H8-01
H6-02	H6-03	H7-02	H7-03	H8-02	H8-03
H6-04	H6-05	H7-04	H7-05	H8-04	H8-05
H6-06	H6-07	H7-06	H7-07	H8-06	H8-07

5th Latest Fault		Latest Limit		Latest Alarm	
Fault Code	Fault Subcode	Fault Code	Fault Subcode	Fault Code	Fault Subcode
H6-08	H6-09	H7-08	H7-09	H8-08	H8-09
H6-10	H6-11	H7-10	H7-11	H8-10	H8-11

Fault data record

HCU records data upon fault occurrence while recording the fault.

Data	Latest Fault	2nd Latest Fault	3rd Latest Fault	4th Latest Fault	5th Latest Fault
Bus voltage upon fault occurrence	H2-12	H3-12	H4-12	H5-12	H6-12
Grid voltage upon fault occurrence	H2-13	H3-13	H4-13	H5-13	H6-13
Module current upon fault occurrence	H2-14	H3-14	H4-14	H5-14	H6-14
Grid frequency upon fault occurrence	H2-15	H3-15	H4-15	H5-15	H6-15
Control word 1 upon fault occurrence	H2-26	H3-26	H4-26	H5-26	H6-26
Control word 2 upon fault occurrence	H2-27	H3-27	H4-27	H5-27	H6-27
Status word upon fault occurrence	H2-28	H3-28	H4-28	H5-28	H6-28
State machine upon fault occurrence	H2-29	H3-29	H4-29	H5-29	H6-29
Fault occurrence time	H2-30	H3-30	H4-30	H5-30	H6-30
Fault occurrence date	H2-31	H3-31	H4-31	H5-31	H6-31
Fault interval	H2-32	H3-32	H4-32	H5-32	H6-32

Viewing faults through SOP-20-880

SOP-20-880 allows you to view fault information through the above-mentioned parameters or the fault menu.

Function	Key	Description
Viewing current faults	Key operations	Choose "Menu" > "Fault state" > "Current fault".
Viewing the active limit	Key operations	Choose "Menu" > "Fault state" > "Active limit".
Viewing the current alarm	Key operations	Choose "Menu" > "Fault state" > "Current alarm".
Viewing fault-related help information		Select a fault and press this key, and the help information related to the fault will be displayed.
Viewing previous faults	Key operations	Choose "Menu" > "Fault state" > "History faults".

It is recommended to use the fault menu to view fault information. The fault menu presents all the recorded faults with fault descriptions and help information in text.

Viewing faults through InoDriveStudio

When using InoDriveStudio, you can access the fault/alarm list to view faults. For details, see *"Figure 2–14 Alarm/Fault list" on page 33*.

On the fault/alarm list screen, you can view the fault descriptions, fault causes and solutions, and data recorded when the fault occurs.

4.2 Fault Reset

HCU-20 supports five fault reset methods: SOP-20-880, InoDriveStudio, control channel, parameter setting, and power cycle.

Method	Description
SOP-20-880	After connection, press the STOP key on any interface to reset the fault.
InoDriveStudio	After connection, click the "Reset Current Fault" button in the fault/alarm list to reset the fault. For details, see *"2.3.2.3 Control Panel" on page 31*
Control channel	Set parameters to reset the fault.
Parameter setting	Set H0-07 to 1 and set the fault reset time properly to enable automatic fault reset.
Power cycle	Power off and on the HCU again to reset the fault.

Note

- The reset commands of SOP-20-880 and InoDriveStudio are always active after being connected, regardless of the control source.
- The rising edge of the reset signal triggers a reset.
- When the factory default configuration is enabled, the reset command corresponding to other control words in the control channel can still take effect.
- When the factory default configuration is disabled, the corresponding reset command in the control channel takes effect.

4.3 Fault Code List

For complete information on fault codes, see the *MD880(LC)-20 Series Basic Rectifier Parameter Guide* (data code: 19012701).

19012700A00

Copyright © Shenzhen Inovance Technology Co., Ltd.

Shenzhen Inovance Technology Co., Ltd.

www.inovance.com

Add.: Inovance Headquarters Tower, High-tech Industrial Park,
Guanlan Street, Longhua New District,
Shenzhen 518000, P.R. China
Tel: (0755) 2979 9595 Fax: (0755) 2961 9897

Suzhou Inovance Technology Co., Ltd.

www.inovance.com

Add.: No. 52, Tian E Dang Road, Wuzhong District, 215104,
Suzhou City, Jiangsu Province, P.R. China
Tel: (0512) 6637 6666 Fax: (0512) 6285 6720