



ECAT-2601 User Manual

Modbus/OPC UA to EtherCAT Main Device Accelerator

Ver. 1.0.1, May 2025

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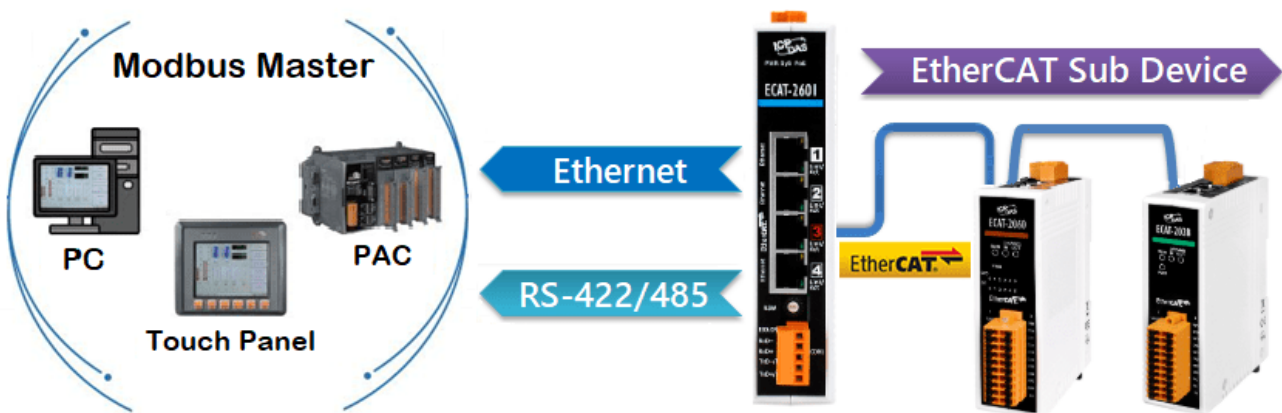
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1. Introduction

The ECAT-2600 is a Modbus/OPC to EtherCAT Main Device Gateway with a built-in web server (HTTP/HTTPS), allowing users to configure the module, monitor, and control I/O directly through a standard web browser, enabling remote control systems. The operation is as simple as regular web browsing. It supports logic function rule settings with IF, THEN, ELSE for configuring logical judgments between I/O and software points. It also features a scheduling function, allowing predefined rules to be executed at specific times. Equipped with dual-port Ethernet switches, it supports the construction of a Daisy Chain network topology, simplifying wiring configuration and reducing maintenance complexity, cabling costs, and the need for additional switches while enhancing network scalability.

In the event of a power failure in an individual ECAT-2600 module, the automatic LAN Bypass function ensures that the Daisy Chain network continues to communicate, maintaining the stability of Ethernet communication.



The ECAT-260x series is equipped with multiple cybersecurity mechanisms, offering comprehensive protection for industrial communications. Its built-in web server supports authentication and HTTPS encrypted communication, ensuring the security of web communication and RESTful API data, preventing information leakage. It supports various industrial IoT communication protocols, including Modbus, OPC UA Server/Client, MQTT Client, and LwM2M Client, with the option to use TLS/DTLS communication certificates and encryption mechanisms. This provides additional protection for valuable data and devices, preventing unauthorized access, interception, or tampering during transmission. Additionally, the ECAT-260x series includes an IP address filtering feature, allowing users to permit or block access from specific IP addresses. In case of network

anomalies, the system can activate defense mechanisms to minimize potential damage, providing comprehensive cybersecurity protection. Here’s a comparison between the ECAT-260x series and traditional Ethernet I/O:

Series Features	ECAT-260x	Traditional Gateway
Modbus	Modbus TCP/UDP/TLS	Modbus TCP/UDP
OPC UA	Account/Password, Anonymous, Certificate	-
MQTT	Account/Password, Anonymous, Certificate	-
LwM2M	Account/Password, Anonymous, Certificate	
Web/Restful API	HTTP/HTTPS	HTTP
Transmission Encryption	AES-128 、 AES-256 、 SHA-256	-
Active Transmission	Yes	-
IEEE 802.1X	EAP 、 PEAP	-

The ECAT-260x series supports IPv4/IPv6 Dual-stack technology, allowing it to simultaneously hold both IPv4 and IPv6 addresses and communicate with either IPv4 or IPv6 devices. It automatically analyzes packet sources and determines network protocols without the need for additional configuration by the user. The module supports SLAAC (Stateless Address Auto configuration) for automatic IPv6 address assignment, enabling true plug-and-play functionality for IPv6.

Additionally, the ECAT-260x series features built-in 802.1Q VLAN technology, providing enhanced cybersecurity and real-time industrial communication. Through the VLAN function, network communication resources can be partitioned or reserved, improving flexibility in network management.

1.1 Features

1. COMPREHENSIVE CYBERSECURITY MECHANISMS

The ECAT-260x series has a built-in HTTP/HTTPS web server, with HTTPS providing a secure web service interface. Users can configure module settings, control output channels, and monitor connections and I/O status via the web interface or RESTful API, all without the need for additional software installation. The ECAT-260x series supports industrial IoT communication protocols such as Modbus, OPC UA Server/Client, MQTT Client, and LwM2M Client, with the option to enable SSL/TLS certificates and encryption. This ensures that sensor data is encrypted during transmission, preventing unauthorized access. Additionally, the ECAT-260x series includes an IP address filtering function, allowing users to set specific IP addresses for permitted or blocked access. The Netstat feature helps users check the real-time connection status of listening TCP ports and connected clients.



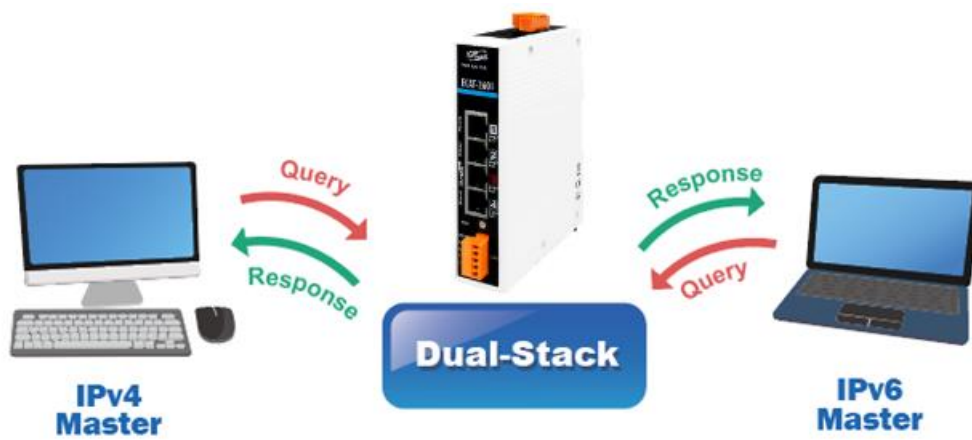
2. DENIAL-OF-SERVICE (DoS/DDoS) ATTACK DEFENSE

The ECAT-260x series is equipped with built-in defense mechanisms against DoS/DDoS attacks. It can actively regulate network traffic to mitigate the interference caused by a large volume of abnormal network packets on Ethernet I/O operations. When the network experiences a surge in abnormal packets, the ECAT-260x series detects it in real-time and activates its defense mechanisms, managing and controlling network traffic to prevent the negative impact of packet floods. This ensures the stable operation of the Ethernet I/O system.



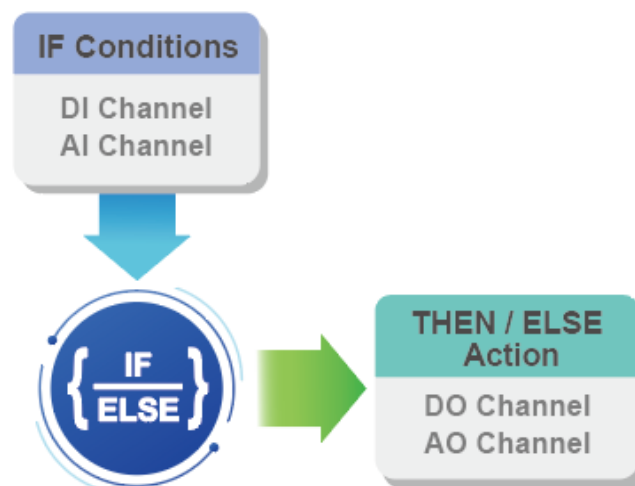
3. SUPPORT FOR IPV4/IPV6 DUAL-PROTOCOL

The ECAT-260x series utilizes Dual-stack technology, allowing it to monitor packets from both IPv4 and IPv6 networks and maintain both IPv4 and IPv6 addresses simultaneously. Users do not need to perform additional configurations, as the system automatically analyzes packet sources and determines the appropriate network protocol. The ECAT-2600 is equipped with SLAAC (Stateless Address Auto configuration), enabling true plug-and-play functionality for IPv6. Despite the complexity of IPv6 addresses, the module automatically requests IP information from the router using SLAAC technology, eliminating the need for manual configuration while ensuring IPv6 plug-and-play convenience.



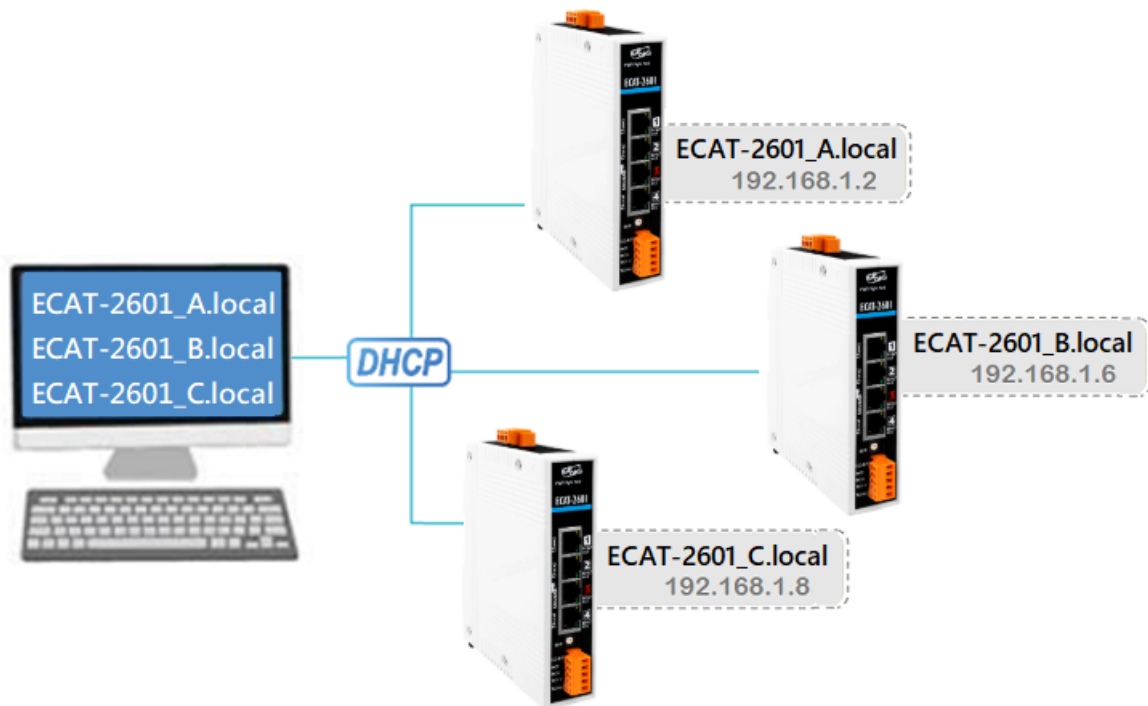
4. RULE LOGIC ENGINE

The ECAT-260x series has a built-in logic function engine that supports IF-THEN-ELSE rules for configuring logical decisions between physical I/O and software points. This allows for stable and rapid execution of automated monitoring procedures. The logic engine also supports encrypted (or unencrypted) email notifications. Users can incorporate email sending actions into the IF-THEN-ELSE logic to promptly send email messages to relevant personnel when specified events occur.



5. SUPPORT FOR MDNS HOSTNAME RESOLUTION

The ECAT-260x series supports the mDNS (Multicast DNS) protocol, which provides easy-to-remember and fixed domain names ending in **.local** (e.g., EthernetIO.local) for local network communication. Browsers or software that support mDNS can communicate with the ECAT-2600 using its mDNS domain name. Regardless of whether the network uses a static IP address or DHCP, if the IP address changes, users can still communicate with the ECAT-260x series using the fixed mDNS domain name. This avoids communication problems that may occur due to IP address changes.



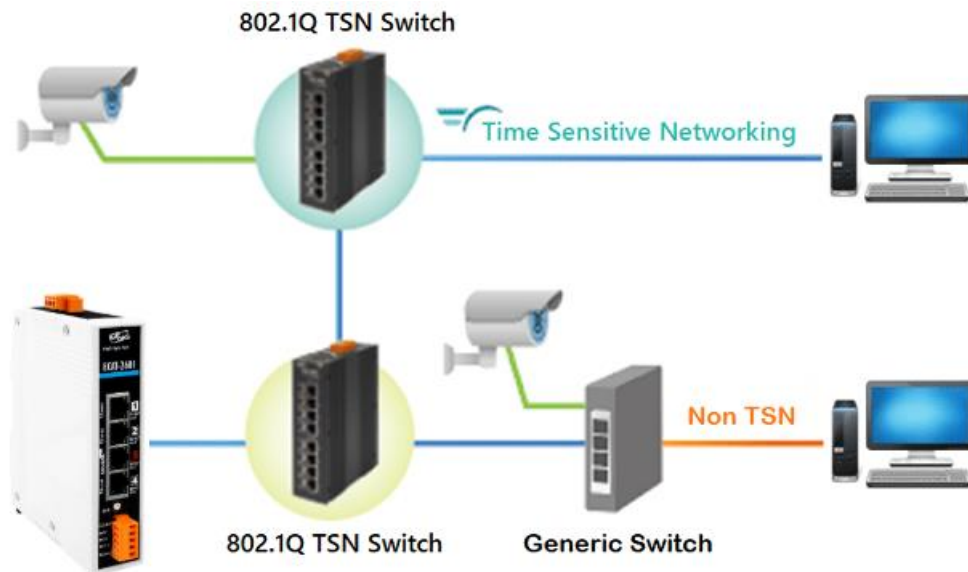
6. DATA LOGGING AND BACKUP FUNCTIONALITY

The ECAT-2600 features a Data Logger function that can record real-time values from I/O module channels either periodically (by time intervals) or based on event triggers. The recorded data is stored in .csv format files, which can be downloaded. Additionally, data log files can be automatically sent back to a backend management center via FTP/OneDrive/Google Drive for data consolidation and analysis.



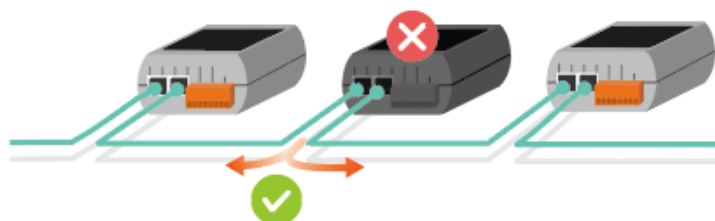
7. 802.1Q AND 802.1P PRIORITY TAGGING

Supporting 802.1Q and 802.1p priority tagging, the ECAT-2600 module tags data frames on selected network protocols for use with 802.1Q compliant switches. In environments with limited network bandwidth, this configuration effectively preserves network resources for time sensitive network communication, ensuring low-latency and high-reliability transmission.



8. DUAL ETHERNET PORTS, SUPPORTING DAISY-CHAIN AND LAN BYPASS

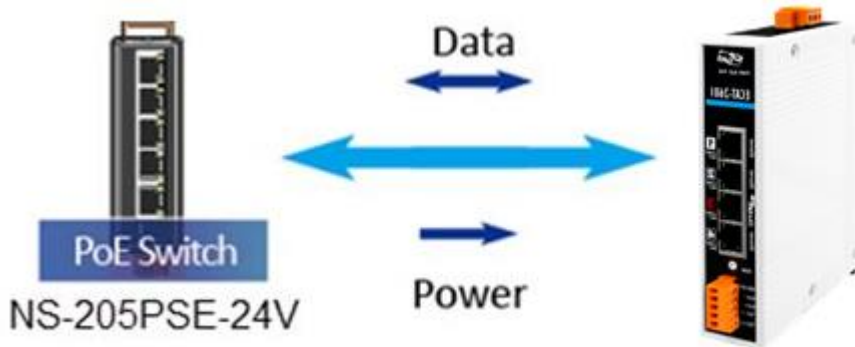
The ECAT-260x series are equipped with a dual-port Ethernet switch, supporting the construction of a Daisy-Chain network topology. The benefits of using a Daisy-Chain topology include simplified wiring and maintenance complexity, reduced wiring and maintenance costs, and improved network scalability. Additionally, the ECAT-260x is equipped with a LAN Bypass function, which ensures Ethernet communication stability. If any ECAT-2600 module loses power, this function automatically activates to maintain network connectivity.



9. POWER OVER ETHERNET (PoE)

The module has integrated Power-over-Ethernet (PoE), it allows power and data to be carried over a single Ethernet cable, so a device can operate solely from the power it receives through the data cable. This innovation allows greater flexibility in office design, higher efficiency in systems design, and faster turnaround time in set-up and implementation. The module feature true IEEE 802.3af-compliant (classification, Class 1) Power over Ethernet (PoE) using both Ethernet pairs (Category 5 Ethernet cable).

The module can receive power from an auxiliary power sources like AC adapters and battery in addition to the PoE enabled network. This is a desirable feature when the total system power requirements exceed the PSE's (power sourcing equipment) load capacity. Furthermore, with the auxiliary power option, the module can be used in a standard Ethernet (non-PoE) system.



1.2 Applications

- ✓ Factory Automation
- ✓ Building Automation
- ✓ Home Automations
- ✓ Remote Diagnosis and Management



More Information

- **Software- eSearch Utility**

https://www.icpdas.com/en/product/guide+Software+Utility_Driver+eSearch__Utility

- **ECAT-2601 download center
(Documentation, Firmware..., etc.)**

<https://www.icpdas.com/en/product/ECAT-2601>

1.3 Web Server Technology

Web server technology enables the ECAT-2601 to be configured via a standard web browser interface, e.g., Google Chrome, Internet Explorer, or Firefox, etc. This means that it is easy to check the configuration of the ECAT-2601 via an Ethernet network without needing to install any other software tools, thereby reducing the learning curve required for maintaining the device.

The screenshot shows a web browser window with the URL 10.1.0.110. The page title is "EtherCAT MainDevice" and the logo for ICP DAS is visible. The navigation menu includes links for Home, EtherCAT, Modbus, OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout.

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

Information:

Module Information	
Module Time	April 21, 2025 at 18:26:10
BIOS Version	Nov 28 2024, 200Mhz
Up Time	47 min, 18 s
Modbus (TCP, Security) Connections	0, 0
Ethernet(E1) Status	Link Up (100Mbps, Full Duplex)
Ethernet(E2) Status	Link Down
Recv Packets	36612
Xmit Packets	480
System Information	
Memory Usage	144880 KB Free
Scan Time	1.1 ms

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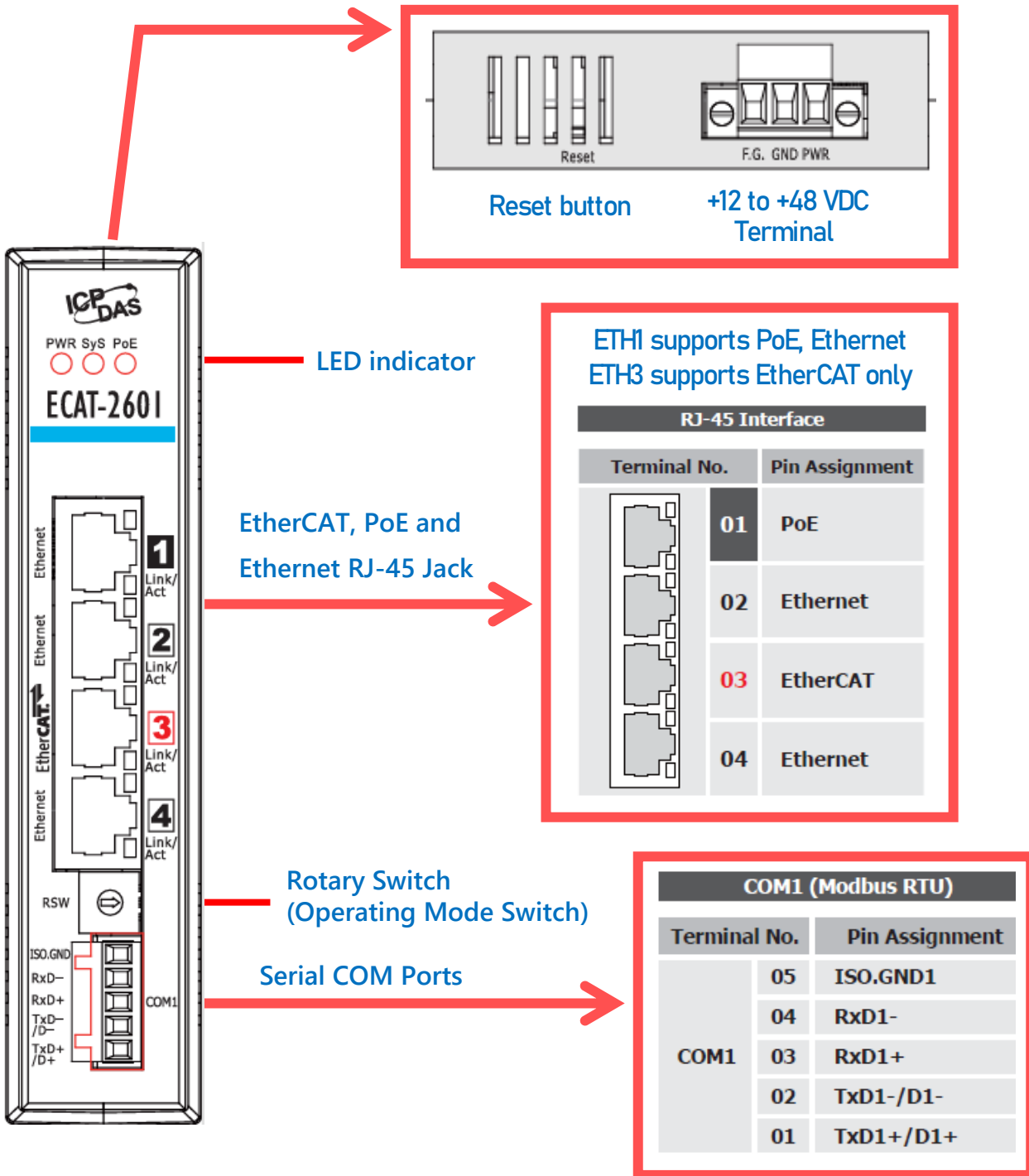
2. Hardware Information

This chapter provides a detailed description of the front panel, the hardware specifications, the pin assignments, the wiring notes and the dimensions for the ECAT-2601 series modules.

2.1 Specifications

Model	ECAT-2601
Software	
Function	Web Interface for Configuration
COM Ports	
Ports	1 x 422/485
Protocol	Modbus RTU (Salve)
EtherCAT	
Ports	RJ-45 x 1 Distance between Stations: Max. 100 m (100BASE-TX) Data Transfer Medium: Ethernet/EtherCAT Cable (Min. CAT 5e)
Cycle Time	0.125 ~ 32ms
Distributed Clocks	Yes
Ethernet	
Ports	RJ-45 x 3 2 x Distance between Stations: Max. 100 m (100BASE-TX) 1 x PoE (IEEE 802.3af, Class 2)
Protocol	Modbus TCP, Modbus TCP/TLS, Modbus UDP, OPC UA, SNTP, HTTP/HTTPS
Power	
Consumption	0.22 A @ 24 VDC
Powered from PoE	IEEE 802.3af, Class 2
Powered from Terminal Block	+12 ~ +48 VDC
Mechanical	
Casing	Plastic
Dimensions (W x L x H)	119 mm x 31 mm x 157 mm
Installation	DIN-Rail Mounting
Environment	
Operating Temperature	-25 ~ +75 °C
Storage Temperature	-30 ~ +80 °C
Humidity	10 ~ 90% RH, non-condensing


2.2 Appearance



PoE and Ethernet RJ-45 Jack

The ECAT-2601 series module is equipped with two RJ-45 jacks that are used as the 10/100 Base-TX Ethernet port and features networking capabilities, only ETH1 supports PoE power supply. When an Ethernet link is detected and an Ethernet packet is received, the **Link/Act LED (Orange)** indicator will be illuminated. When power is supplied via PoE (Power-over-Ethernet), the **PoE LED** indicator will be illuminated.

EtherCAT Port




 The ECAT-2601 module is equipped with one RJ-45 jacks that are used as the EtherCAT port and features networking capabilities, only ETH3 supports EtherCAT connection. When an EtherCAT link is detected and an EtherCAT packet is received, the **Link/Act LED (Orange)** indicator will be illuminated.

+12 to +48 VDC Jack

The ECAT-2600 series is equipped with a +12V_{DC} to +48 V_{DC} terminal that can be used to connect a power supply. If no PoE switch is available on site, a DC adapter can be used to power the ECAT-2601 module.

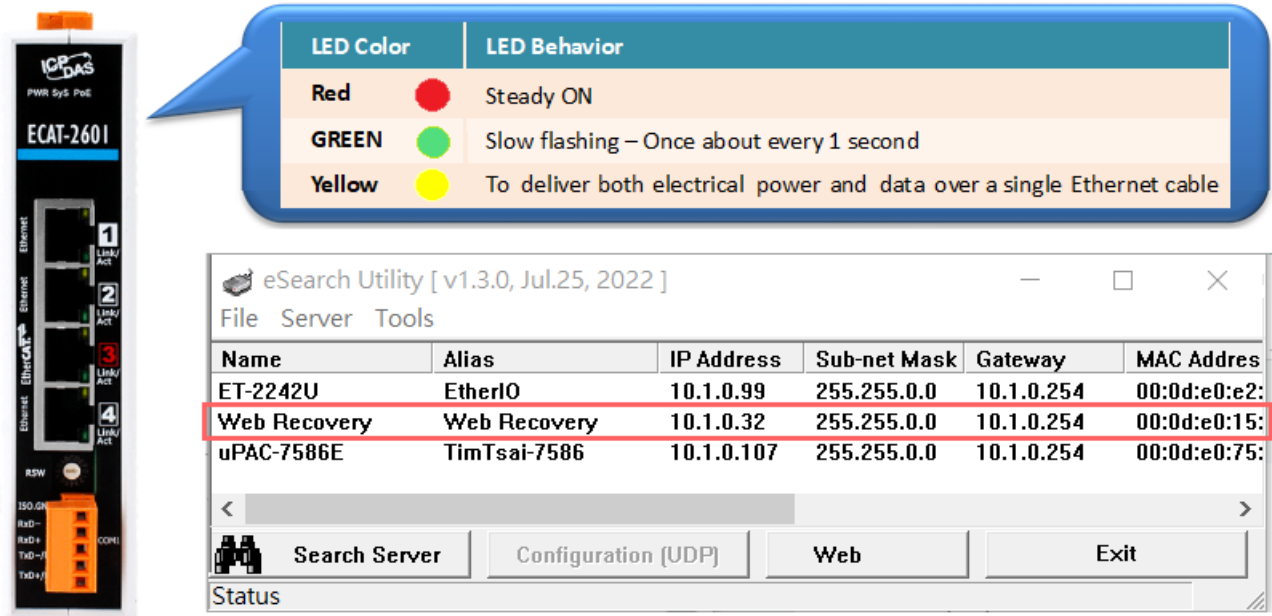
LED Indicator

Once power is supplied to the ECAT-2601 series module, the system LED indicator will illuminate. An overview of the system LED functions is given below:

LED Function	LED Color	LED Behavior
Power on (PWR)	Red 	Steady ON
Running Firmware (Sys.)	GREEN 	Slow flashing – Once about every 1 second
Power over Ethernet (PoE)	Yellow 	To deliver both electrical power and data over a single Ethernet cable.

Reset button

It can help you to upload the firmware in rescue mode when your ECAT-2601 fails to recovery/update firmware in a normal way.



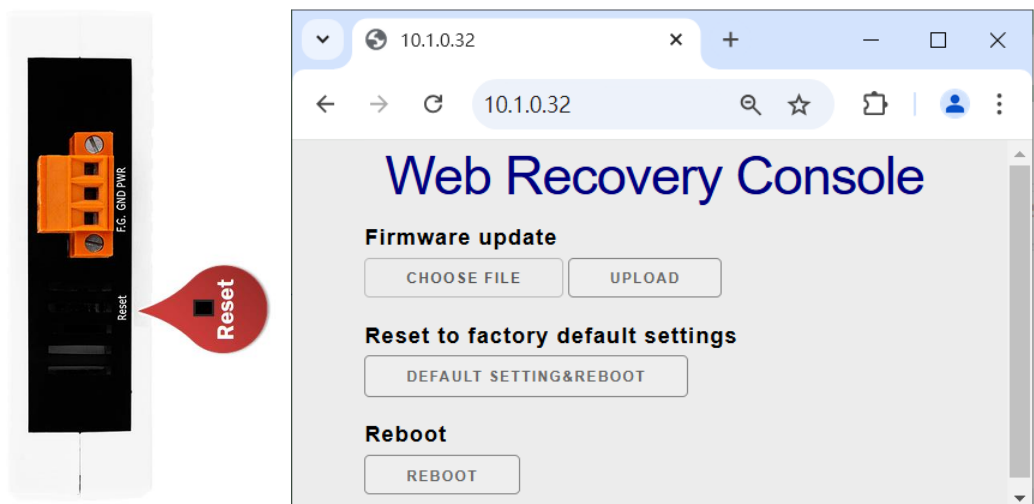
The image shows the ECAT-2601 device on the left and a screenshot of the eSearch Utility software on the right. The utility window displays a table of discovered devices:

Name	Alias	IP Address	Sub-net Mask	Gateway	MAC Address
ET-2242U	EtherIO	10.1.0.99	255.255.0.0	10.1.0.254	00:0d:e0:e2:
Web Recovery	Web Recovery	10.1.0.32	255.255.0.0	10.1.0.254	00:0d:e0:15:
uPAC-7586E	TimTsai-7586	10.1.0.107	255.255.0.0	10.1.0.254	00:0d:e0:75:

Below the table are buttons for 'Search Server', 'Configuration (UDP)', 'Web', and 'Exit'. A 'Status' field is visible at the bottom left of the utility window.

There are 6 recovery processes as shown below:

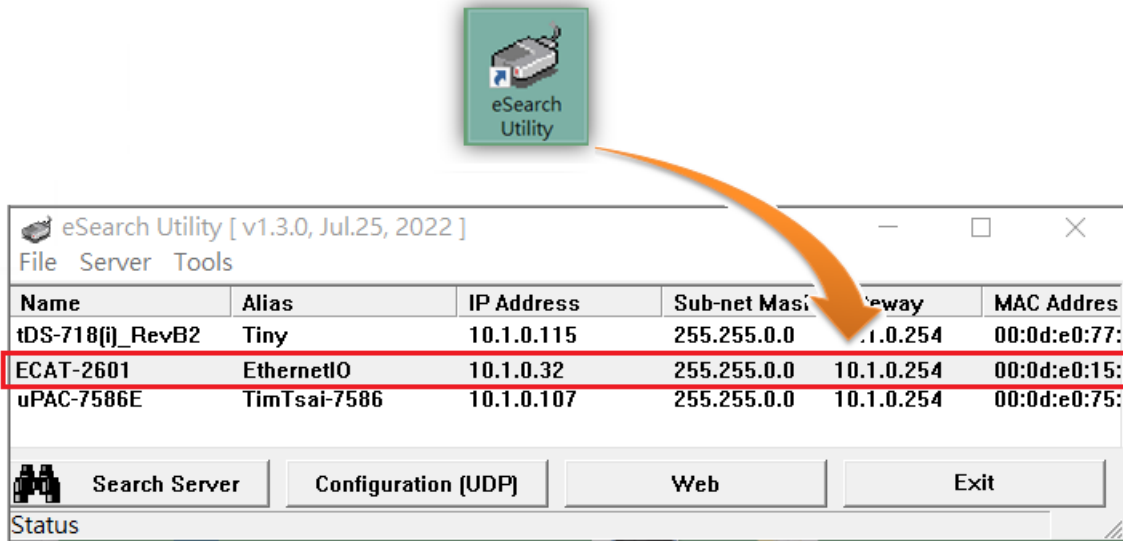
- 1) Turn off the Power.
- 2) Keep pressing the **reset button** then turn on the power.
- 3) Hold the reset button for about 6 seconds, the **Sys.** LED will flashing.
- 4) Open the eSearch Utility and scan devices, you will see that the name is **“Web Recovery”**.
- 5) Open the Web browser, such as Google Chrome, enter the IP address of the ECAT-2601 module in the address bar and then click “Enter”, you will see the Recovery menu.
- 6) Click **“Firmware update”** or **“Reset to factory default settings”** button to begin the restore process.



The image shows the physical reset button on the ECAT-2601 device on the left, which is a small square button labeled 'Reset'. On the right is a screenshot of a web browser at the IP address 10.1.0.32, displaying the 'Web Recovery Console' interface. The console includes the following sections and buttons:

- Firmware update**: CHOOSE FILE, UPLOAD
- Reset to factory default settings**: DEFAULT SETTING&REBOOT
- Reboot**: REBOOT

Clicking “Search Server” button on eSearch Utility again, you will see that the name is “ECAT-2601”.



Rotary Switch

Rotary switch is a mode selector. All selectors can be set by the user (range 0~15).



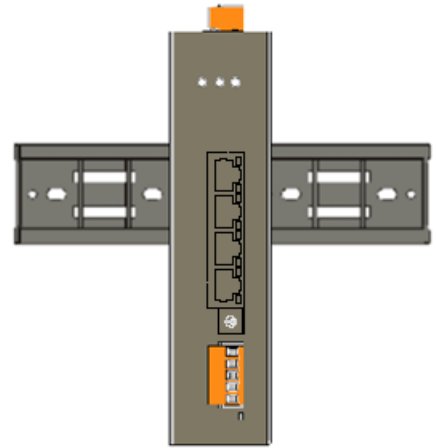
Serial COM1 Ports

The number of serial COM Ports available depends on the type of ECAT-2601 module. For more detailed information regarding the pin assignments for the Serial COM1 port.

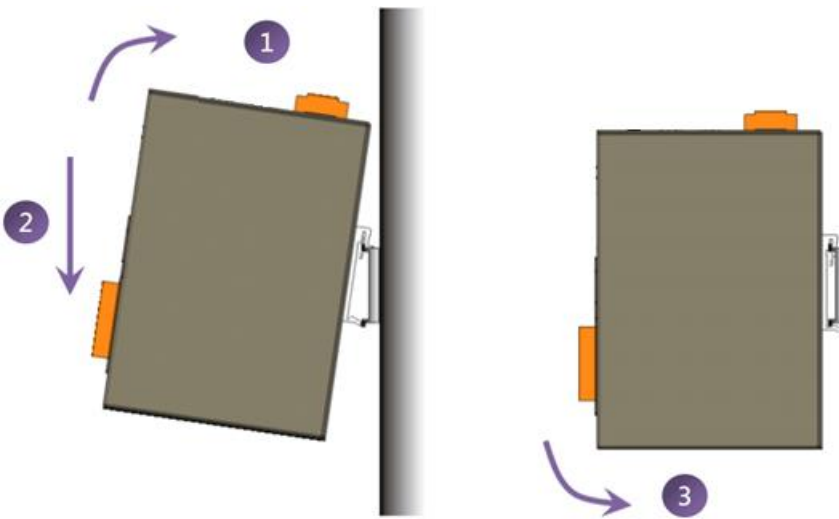
ECAT-2601		
	Terminal No.	Pin Assignment
COM1	05	ISO.GND
	04	RxD1-
	03	RxD1+
	02	TxD1-/D1-
	01	TxD1+/D1+

DIN-Rail Mounting

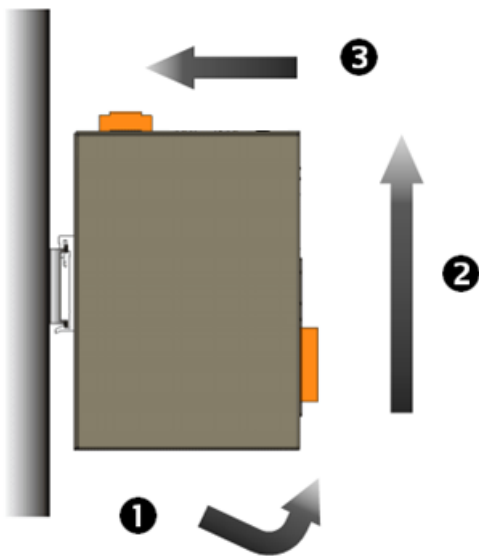
The ECAT-2600 series modules include simple rail clips on the bottom of the chassis that allow them to be reliably mounted on a DIN-Rail or a wall. For more detailed information regarding DIN-Rail Mounting, refer to the illustration in figure below.



Mounting on a DIN-Rail

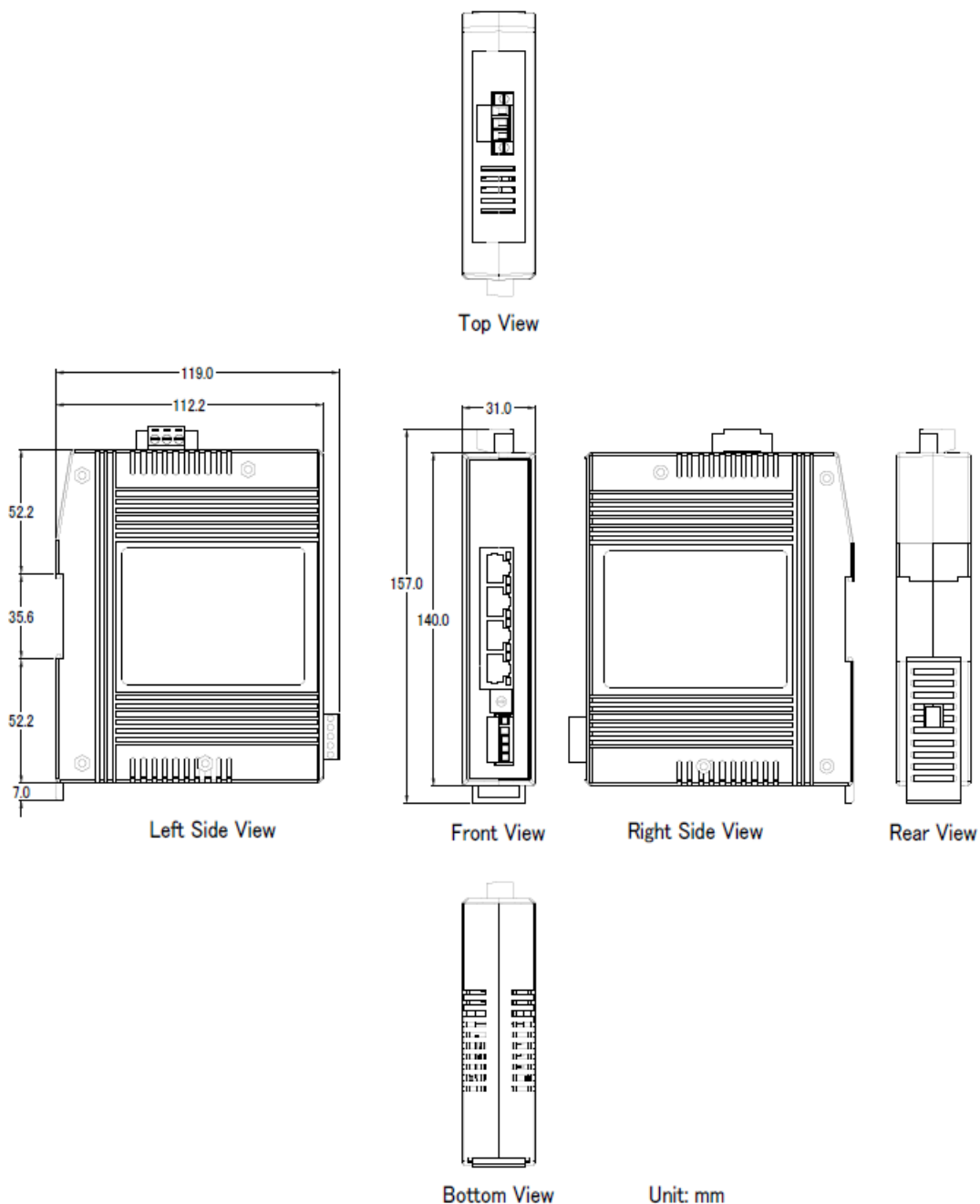


Dismounting form a DIN-Rail



2.3 Dimensions

The following diagrams provide the dimensions of the ECAT-2601 series module. All dimensions are in millimeters.



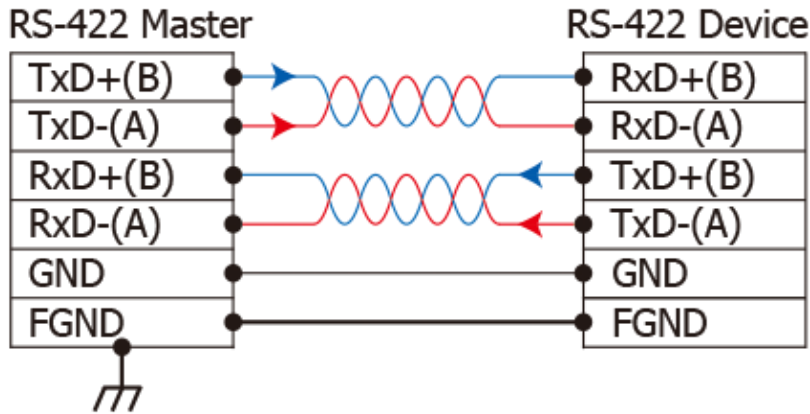
2.4 Pin Assignments



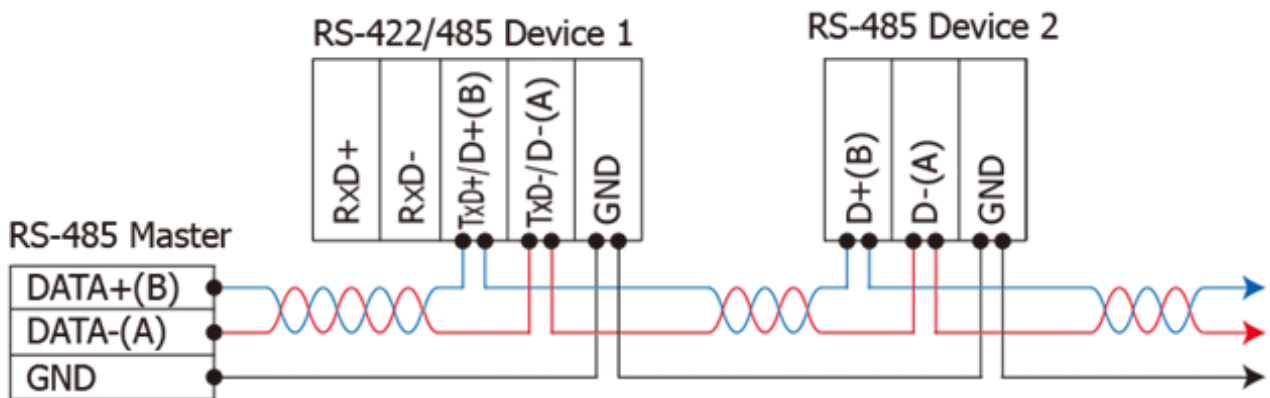
ECAT-2601		
Terminal No.		Pin Assignment
COM1	05	ISO.GND
	04	RxD1-
	03	RxD1+
	02	TxD1-/D1-
	01	TxD1+/D1+

2.5 Wiring Notes for RS-485/422 Interfaces

RS-422 Wiring



RS-485 Wiring



2-wire Only Device

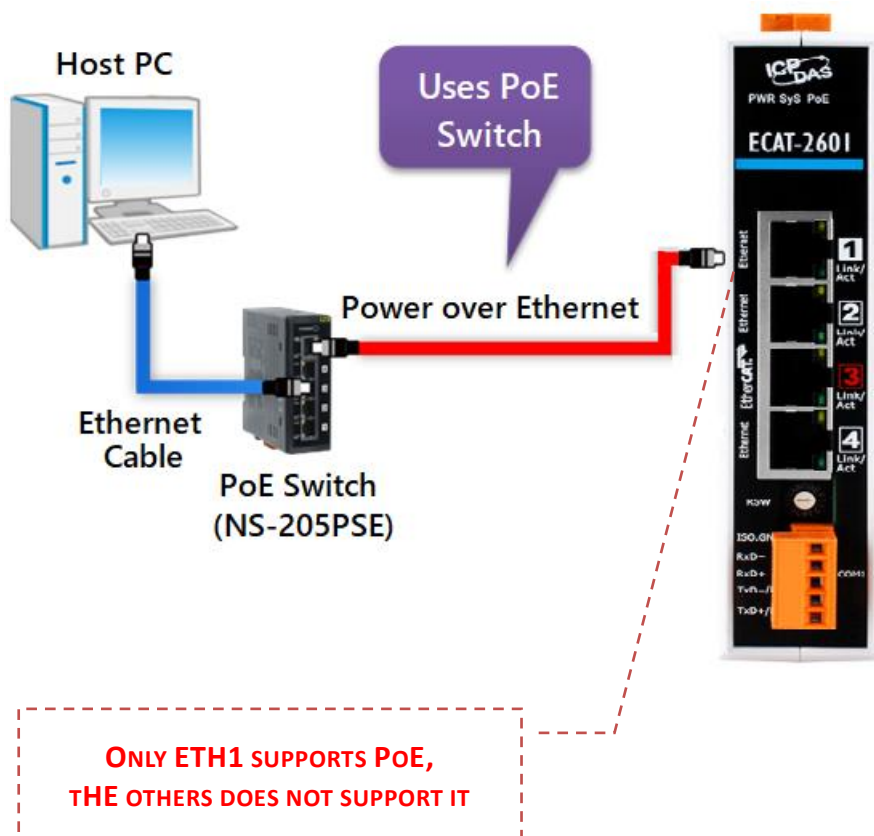
Notes:

1. Usually, you have to connect all signal grounds of RS-422/485 devices together to reduce common-mode voltage between devices.
2. Twisted-pair cable must be used for the D+/- wires.
3. Both two ends of the cable may require a termination resistor connected across the two wires (D+ and D-). Typically 120 Ω resistors are used.
4. The D+ and B pins are positive-voltage pins, and D- and A pins are negative-voltage pins in the above figure. The B/A pins may be defined in another way depending on devices, please check it first.

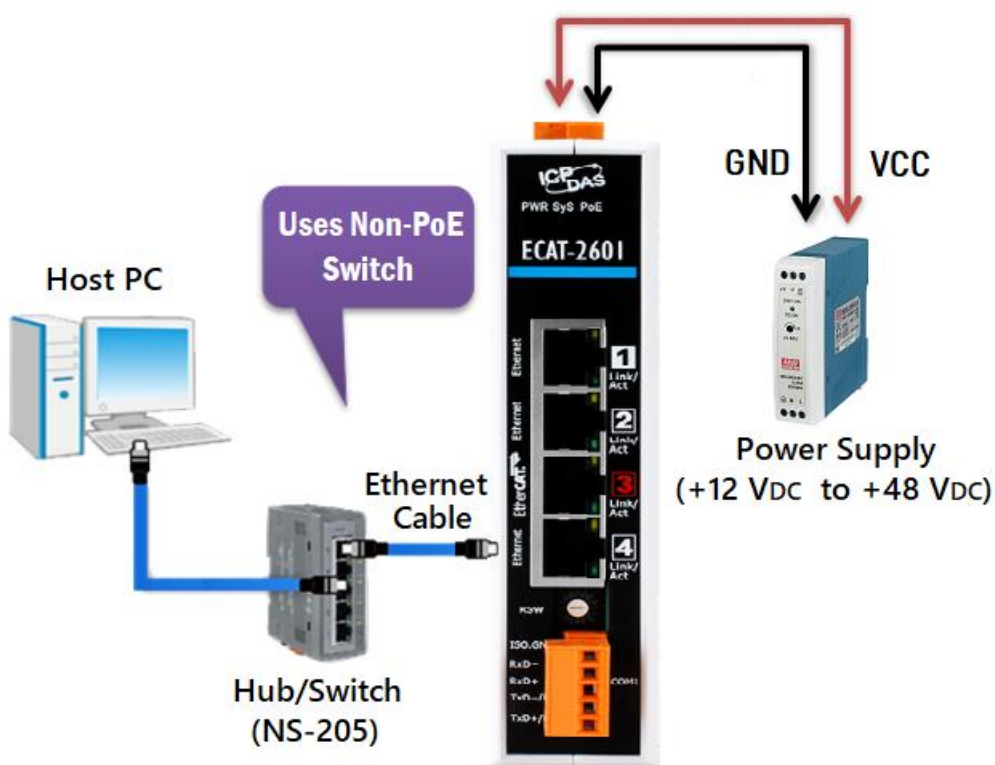
2.6 Connecting the Power and Host PC

1. Ensure that the network settings on your PC are configured correctly.
2. Ensure that the Windows firewall or any Anti-Virus firewall software is correctly configured or temporarily disable these functions; otherwise the **“Search Servers”** function in the eSearch Utility may not work as required. You may need to contact your System Administrator for more details of how to do this.
3. Connect both the ECAT-2601 and the Host computer to the same sub-network or the same Ethernet Switch, and then supply power (PoE or +12 to +48 VDC) to the ECAT-2601.

PoE Power Supply



+12 to +48 VDC Jack Power Supply (Non-PoE)



- 4. Verify that the System (Sys.) LED indicator is flashing.

3. Getting Started for ECAT-2601 series on IPv4

This chapter provides detailed information about the “Self-Test” process, which is used to confirm that the ECAT-2601 series module is operating correctly. Before beginning the “Self-Test” process, the wiring test, Ethernet configuration and search/Modbus utility driver installation procedures must first be fully completed. Follow the procedure described below:

Note: This chapter is based on IPv4 environment.

3.1 Configuring Network Settings

1. Download the **eSearch Utility** and install it according to the installation instructions.

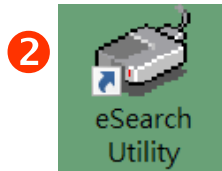
The eSearch Utility can be obtained from the ICP DAS web site.

The location of the download link is shown below:

 https://www.icpdas.com/en/product/guide+Software+Utility_Driver+eSearch_Utility

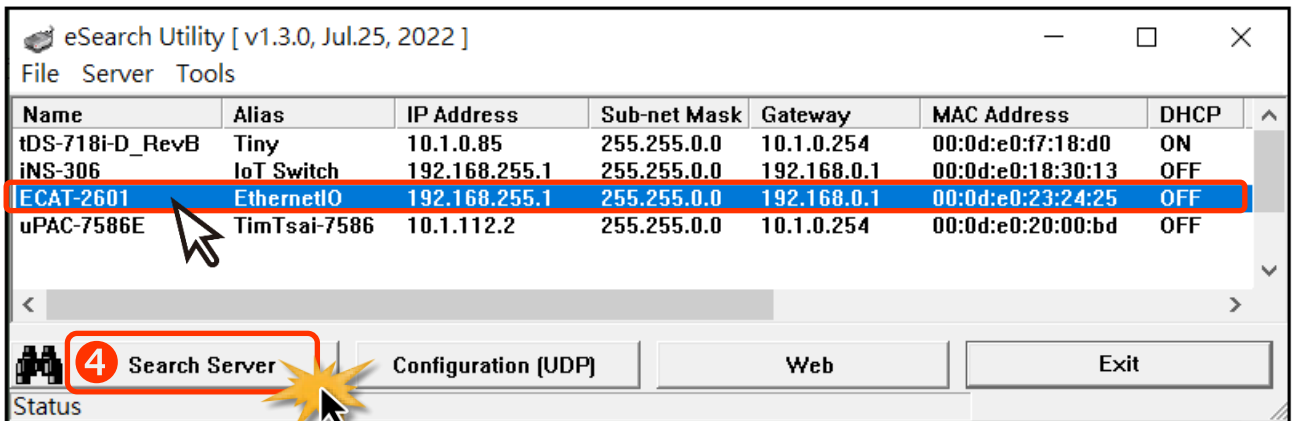


2. Double click the **eSearch Utility** shortcut on the desktop.



3. Click the “**Search Servers**” button to search your ECAT-2601.

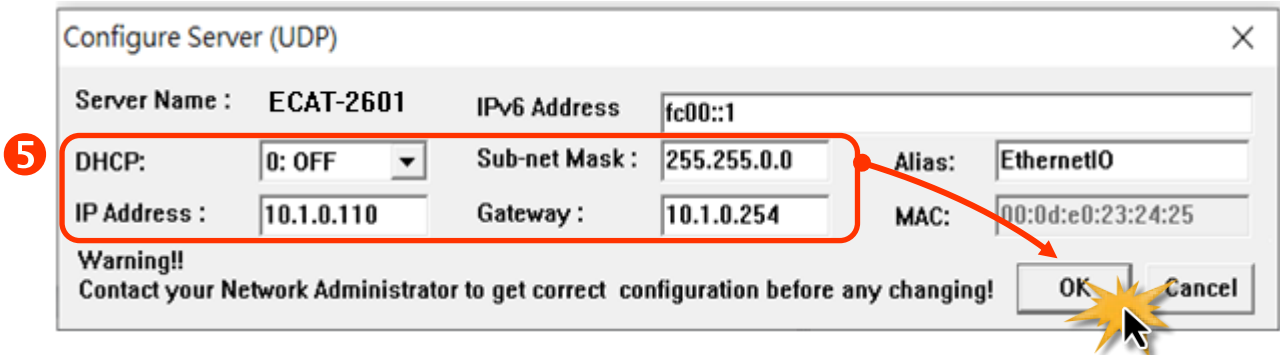
4. Once the search process is complete, double-click on the module name to open the “**Configure Server**” dialog box.



Factory Default Settings of ECAT-2601 Series Module:

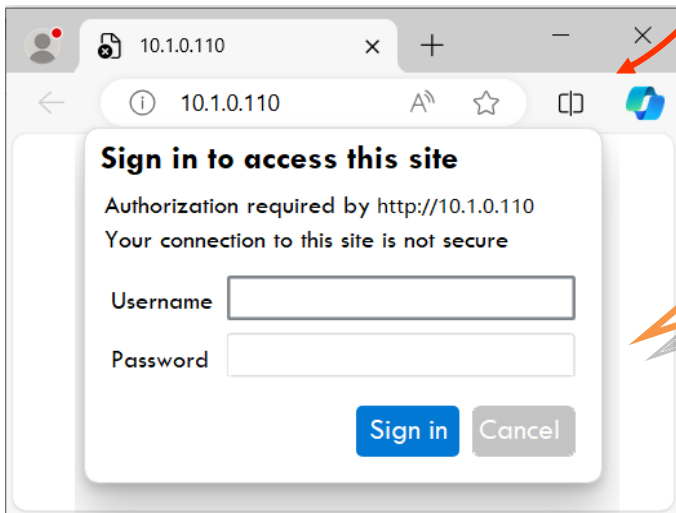
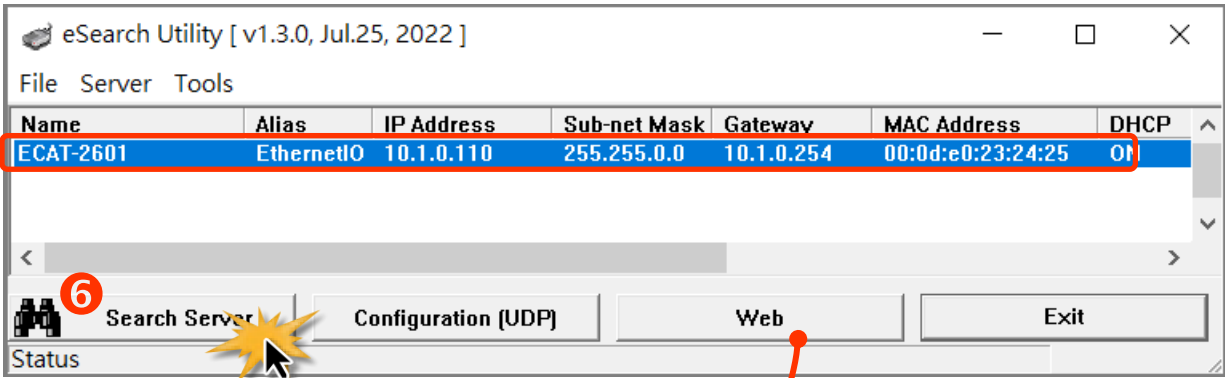
IPv4 settings		Writable
IP Address	192.168.255.1	✓
Subnet Mask	255.255.0.0	✓
Gateway	192.168.0.1	✓
IPv6 settings		Writable
User-defined	fc00::1	✓
Link-Local	EUI-64 format	✗
SLAAC	Auto-Configure	✗

- Enter the network settings information, including the **IP, Mask, Gateway addresses**, and then click **“OK”** button. The new settings for the ECAT-2601 will take effect within 2 seconds. If you don't know the correct network configuration information, contact your Network Administrator to obtain the details.



Note: The DHCP feature is only valid on IPv4.

- 6. Wait 2 seconds and click **“Search Servers”** button again to ensure the ECAT-2601 is working well with new configuration.
- 7. Click the **“Web”** button to log in to the web configuration pages.
(Or enter the URL address of the ECAT-2601 in the address bar of the browser.)

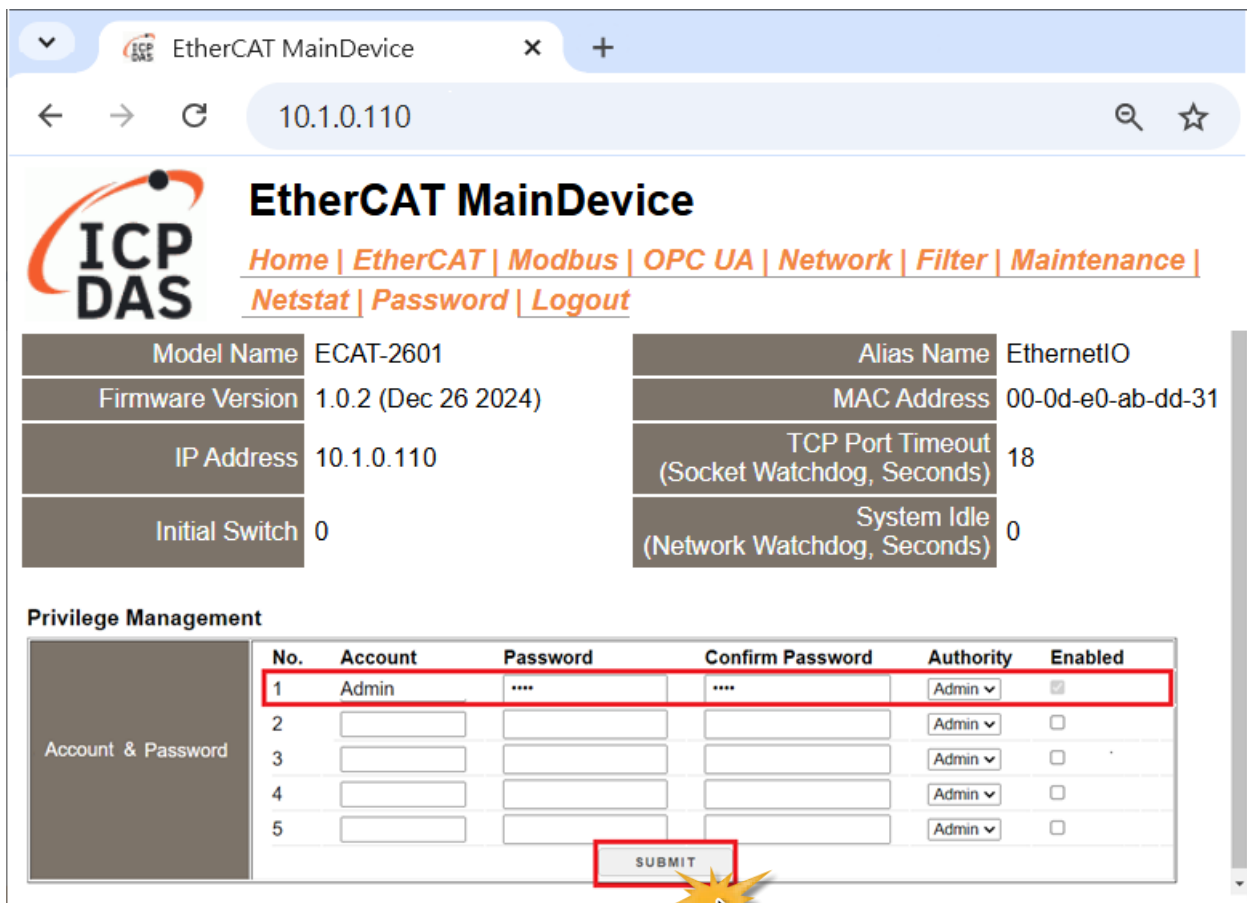


Default value:
User Name : **Admin**
password : **Admin**

- 8. Enter the **Username** and **password** in the login password field.

3.2 Configuring the Password

1. Open a web browser, such as Google Chrome, Internet Explorer, or Firefox, enter the IP address of the ECAT-2601 module in the address bar and then click “Enter”, or click the “Web” button in the **eSearch Utility**.
2. To enhance the security, you are prompted to change the password when you login to the module for the first time.
3. Go to the “**Password**” setting, user can modify the default password: **Admin** in the **Current password** field. Next, input your new password in the **Password** and **Confirm password** fields, then click the “**Submit**” button.



3.3 Configuring the EtherCAT

Click the “EtherCAT” tab to display the EtherCAT Settings page. Select the appropriate Cycle Time from the relevant drop down options, and then click “Update Settings” button.

The screenshot shows the web interface for the EtherCAT MainDevice. The browser address bar shows the URL 10.1.0.110. The page title is "EtherCAT MainDevice". The navigation menu includes Home, EtherCAT (highlighted with a red box), Modbus, OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout.

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.2 (Dec 26 2024)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

MainDevice Configuration

Cycle Time	1 (ms)
Actual Cycle Time	0.963 (ms)
Event Count	0

SDO Statrup Entry

SDO Write	Tag Name	Pos.	Index	Subindex	Bit length	Value	CA
							<input type="button" value="NEW"/>

Upload SDO Settings:

SubDevice Status

SubDevice Status	Pos.	ID(Dec)	Name	Mode	Status
	0	11	ECAT-2028 8 Ch. Ana.	Free Run	OPERATIONAL

Click the “Modbus” tab to display the EtherCAT I/O Settings page.

The screenshot shows a web browser window with the URL 10.1.0.110. The page title is "EtherCAT MainDevice" and the logo "ICP DAS" is visible. The navigation menu includes "Home", "EtherCAT", "Modbus", "OPC UA", "Network", "Filter", "Maintenance", "Netstat", "Password", and "Logout". The "Modbus" tab is highlighted with a red box and a yellow starburst. Below the navigation menu, there are two columns of device information:

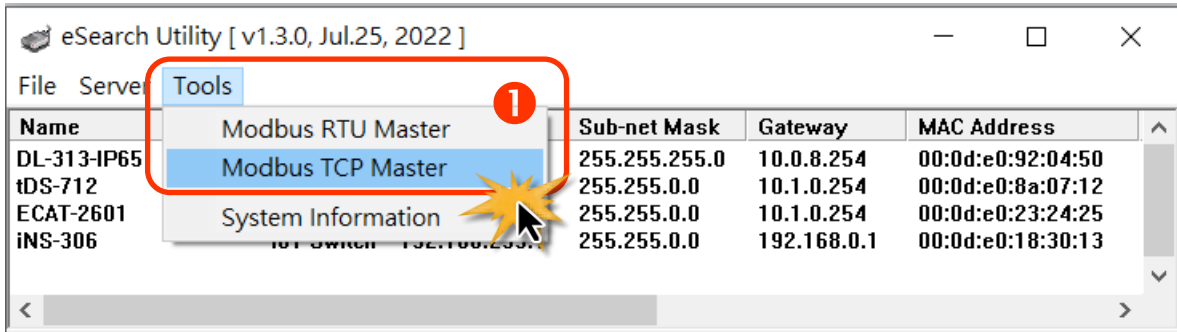
Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.2 (Dec 25 2024)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

Below this information is the "EtherCAT I/O" section. It shows the connection status as "THIS COMPUTER - ECAT-2600" with a cloud icon. There are five position tabs: POS.0, POS.1, POS.2, POS.3, and POS.4. The "I/O Mapping" table is shown below:

Channel No.	Alias	Status	Action	Modbus Mapping
bitIn0	Over power 0 Voltage	OFF		11000
bitIn1	Under power 0 Voltage	OFF		11001
bitIn2	Over power 1 Voltage	OFF		11002
bitIn3	Under power 1 Voltage	ON		11003
bitIn4	Over bus Current	OFF		11004
intIn0	Value	7677	SCALE	31000
intIn1	Value	102	SCALE	31001
intIn2	Value	834	SCALE	31002
intIn3	SubIndex 006	0	SCALE	31003

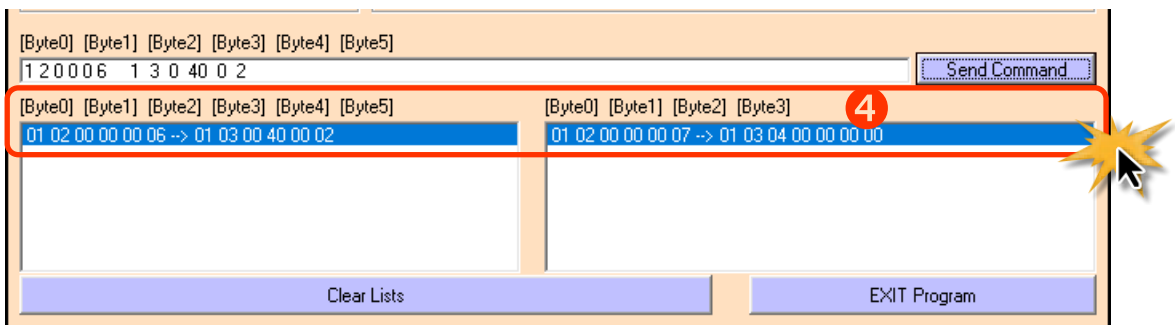
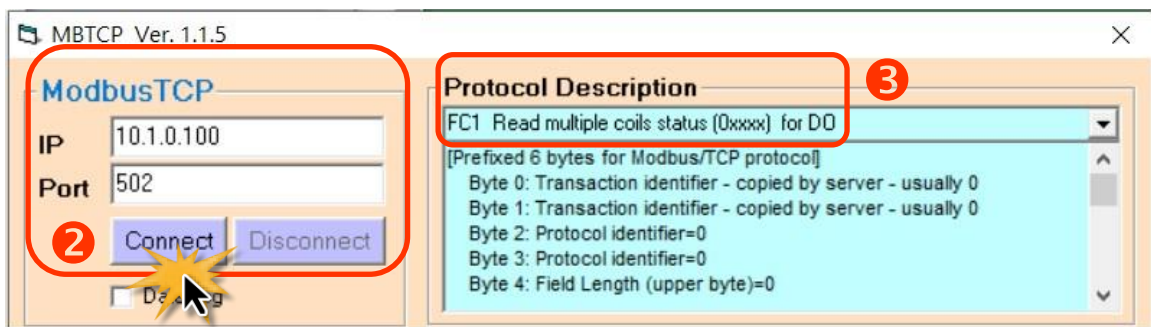
3.4 Self-Test

1. In the eSearch Utility, select the **“Modbus TCP Master”** item from the **“Tools”** menu to open the Modbus TCP Master Utility.



2. In the Modbus TCP Master Utility, enter the **IP address of ECAT-2601** in the **“Modbus TCP”** section, and then click the **“Connect”** button to connect to the ECAT-2601.
3. Refer to **“Protocol Description”** section and type the Modbus command in the **“Command”** field then click the **“Send command”** button.
4. If the response data is correct, it means the test is success.

Note: The Modbus command settings depends on your Modbus device.



4. Getting Started for ECAT-2601 series on IPv6

This chapter provides detailed information about the “Self-Test” process, which is used to confirm that the ECAT-2601 series module is operating correctly. Before beginning the “Self-Test” process, the wiring test, Ethernet configuration and search/Modbus utility driver installation procedures must first be fully completed. Follow the procedure described below:

Note: This chapter is based on IPv6 environment.

4.1 Configuring Network Settings

1. Download the **eSearch Utility** and install it according to the installation instructions.

1

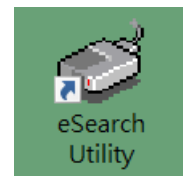


The eSearch Utility can be obtained from the link below:

https://www.icpdas.com/en/product/guide+Software+Utility_Driver+eSearch_Utility

2. Double click the **eSearch Utility** shortcut on the desktop.
3. Click the “**Search Servers**” button to search your ECAT-2601.

2



The screenshot shows the eSearch Utility application window. At the top, there are two red arrows pointing down to the 'User-defined' and 'Link-Local' columns in the table below. The table lists several network devices, with the 'ECAT-2601' device highlighted in blue. The 'User-defined' and 'Link-Local' columns for this device contain the values 'fc00::1' and 'FE80::20D:E0FF:FE15...' respectively, which are also enclosed in a red box. At the bottom of the window, there are four buttons: 'Search Server', 'Configuration (UDP)', 'Web', and 'Exit'. The 'Search Server' button is highlighted with a red box, and a mouse cursor is pointing at it. A red circle with the number '3' is placed next to the 'Search Server' button.

Name	Alias	IP Address	Sub-net Mask	Gateway	MAC Address	DHCP	Version	User-defined	Link-Local	SLAAC
DL-302-IP65	EtherIO	192.168.255.1	255.255.0.0	192.168.0.1	00:0d:e0:ff:ff:ff	OFF	B4.9 [Aug. 17 2020]	N/A	N/A	N/A
iNS-306	IoT Switch	192.168.255.1	255.255.0.0	192.168.0.1	00:0d:e0:18:30:13	OFF	v1.0.2 [Jul. 19 20...	N/A	N/A	N/A
ECAT-2601	EthernetIO	10.1.0.42	255.255.0.0	10.1.0.254	00:0d:e0:15:16:17	ON	1.0.2 [Aug 15 2024]	fc00::1	FE80::20D:E0FF:FE15...	N/A

- Every IPv6 device has the Link-Local address. You can view the Link-Local address of the ECAT-2601 module in the “**Link-Local**” field without configuring. If your environment supports Stateless Address Auto-configuration (SLAAC), the SLAAC field will display the SLAAC address when the SLAAC configuration is completed. You can click the “**Search Servers**” button again to update the state.

Factory Default Settings of ECAT-2601 Series Module:

IPv4 settings		Writable
IP Address	192.168.255.1	✓
Subnet Mask	255.255.0.0	✓
Gateway	192.168.0.1	✓
IPv6 settings		Writable
User-defined	fc00::1	✓
Link-Local	EUI-64 format	✗
SLAAC	Auto-Configure	✗

4.2 Configuring the Password

1. Right Click on the Link-Local field and click the “Copy to Clipboard” to copy the “Link-Local address” of the ECAT-2601 module.
2. Paste the “Link-Local address” of the ECAT-2601 module in the address bar of the browser and add the brackets, i.e., [Link-Local address].

Note: The Web button use the IPv4 address to access the Web Server, not IPv6 address.

Name	Alias	IP Address	Sub-net Mask	Gateway	MAC Address	DHCP	Version	User-defined	Link-Local	SLAAC
DL-302-IP65	EtherIO	192.168.255.1	255.255.0.0	192.168.0.1	00:0d:e0:ff:ff:ff	OFF	B4.9 [Aug. 17 2020]	N/A	N/A	N/A
iNS-306	IoT Switch	192.168.255.1	255.255.0.0	192.168.0.1	00:0d:e0:18:30:13	OFF	v1.0.2 [Jul. 19 20...	N/A	N/A	N/A
ECAT-2601	EthernetIO	10.1.0.42	255.255.0.0	10.1.0.254	00:0d:e0:15:16:17	ON	1.0.2 [Aug 15 2024]	fc00::1	FE80::20D:E0FF:FE15...	N/A

1. FE80::20D:E0FF:FE15:1617

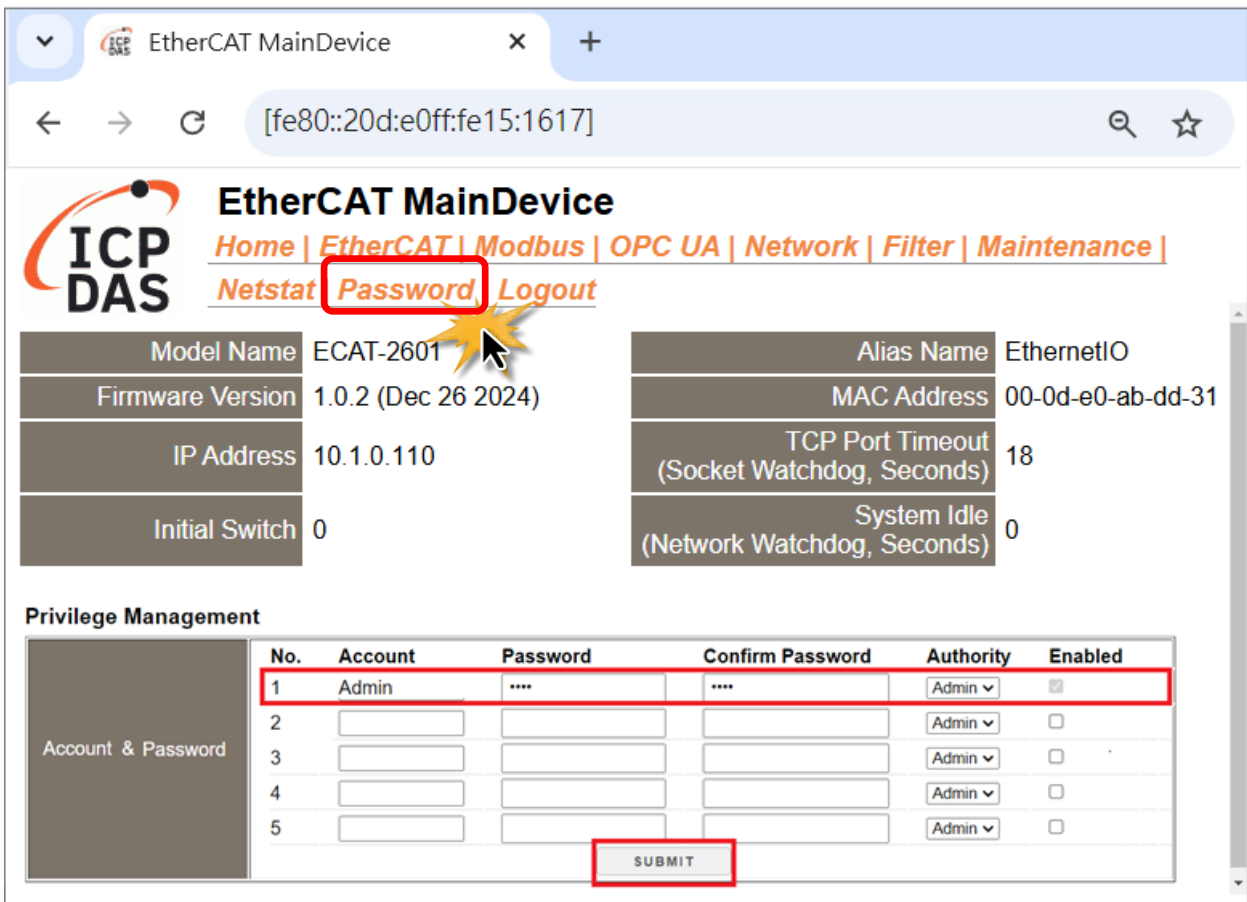
2. [fe80::20d:e0ff:fe15:1617]

Also, note that an IPv6 address is always enclosed in square brackets.

Default value:
 User Name : Admin
 password : Admin

Sign in to access this site
 Authorization required by
 http://[fe80::20d:e0ff:fe15:1617]
 Your connection to this site is not secure
 Username
 Password
 Sing in Cancel

- To enhance the security, you are prompted to change the password when you login to the module for the first time.
- Go to the “**Password**” setting, user can modify the default password: **Admin** in the **Current password** field. Next, input your new password in the **Password** and **Confirm password** fields, then click the “**Submit**” button.



4.3 Configuring the EtherCAT

Click the “EtherCAT” tab to display the EtherCAT Settings page. Select the appropriate Cycle Time from the relevant drop down options, and then click “Update Settings” button

The screenshot shows the web interface for the EtherCAT MainDevice. The browser address bar shows the IP address [fe80::20d:e0ff:fe15:1617]. The navigation menu includes Home, EtherCAT (highlighted with a red box), Modbus, OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout.

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.2 (Dec 25 2024)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

MainDevice Configuration

Cycle Time	0.25 (ms)
Actual Cycle Time	0.258 (ms)
Event Count	805

SDO Startup Entry

Tag Name	Pos.	Index	Subindex	Bit length	Value	CA
<input type="button" value="NEW"/>						

SubDevice Status

Pos.	ID(Dec)	Name	Mode	Status
0	0	EC4-EP21	DC-Sync	OPERATIONAL

Click the **“Modbus”** tab to display the EtherCAT I/O Settings page.

The screenshot shows a web browser window with the URL [fe80::20d:e0ff:fe15:1617]. The page title is "EtherCAT MainDevice" and the navigation menu includes Home, EtherCAT, Modbus (highlighted with a red box), OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout.

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

EtherCAT I/O

Connect Status: THIS COMPUTER - - ECAT-2600

POS.0 POS.1 POS.2 POS.3 POS.4

EC4-EP21

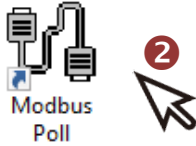
Channel No.	Alias	Status	Action	Modbus Mapping
bitIn0	Over power 0 Voltage	OFF		11000
bitIn1	Under power 0 Voltage	OFF		11001
bitIn2	Over power 1 Voltage	OFF		11002
bitIn3	Under power 1 Voltage	ON		11003
bitIn4	Over bus Current	OFF		11004
intIn0	Value	7677	<input type="button" value="SCALE"/>	31000
intIn1	Value	102	<input type="button" value="SCALE"/>	31001
intIn2	Value	834	<input type="button" value="SCALE"/>	31002
intIn3	SubIndex 006	0	<input type="button" value="SCALE"/>	31003

4.4 Self-Test

1. Download and install the “Modbus Poll” test program at below link.

<https://www.modbustools.com/download.html>

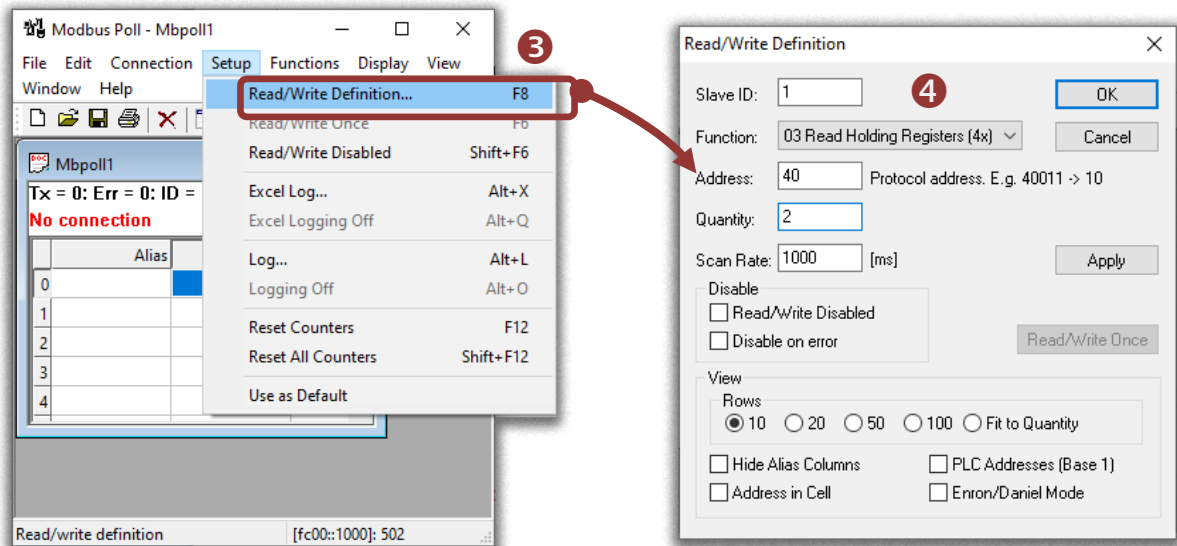
2. Double-click the Modbus Poll shortcut to open.



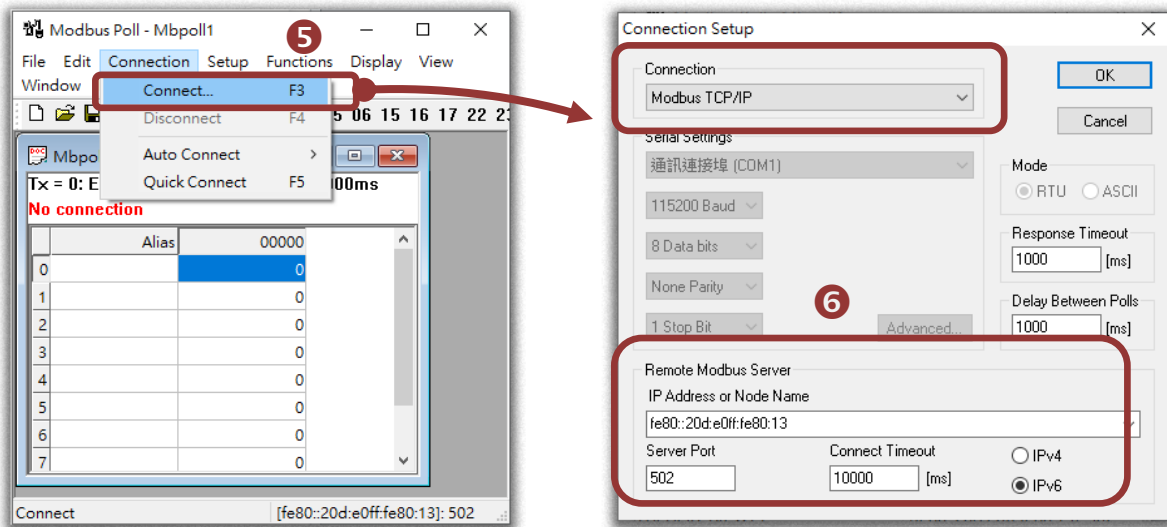
3. Select the “Read/Write Definition...” item from the “Setup” menu to open the “Read/Write Definition” dialog box.

4. Configure the settings for the Slave.

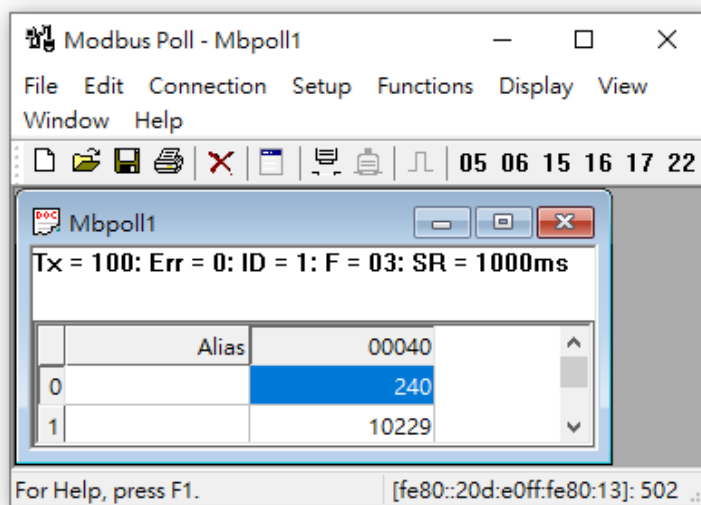
Note: The Modbus Slave settings depends on your Modbus device.



5. Select the “Connect...” item from the “Connection” menu to open the “Connection Setup” dialog box.
6. Configure the IPv6 address and TCP port (default: 502) of ECAT-2601 and click “OK” to connect the ECAT-2601 for testing.



7. If the response data is correct, it means the test is success.



5. Web Configuration

Once the ECAT-2601 series module has been correctly configured and is functioning normally on the network, the configuration details can be retrieved or modified using either the eSearch Utility described above, or via a standard web browser.

5.1 Logging in to the ECAT-2601 Web Server

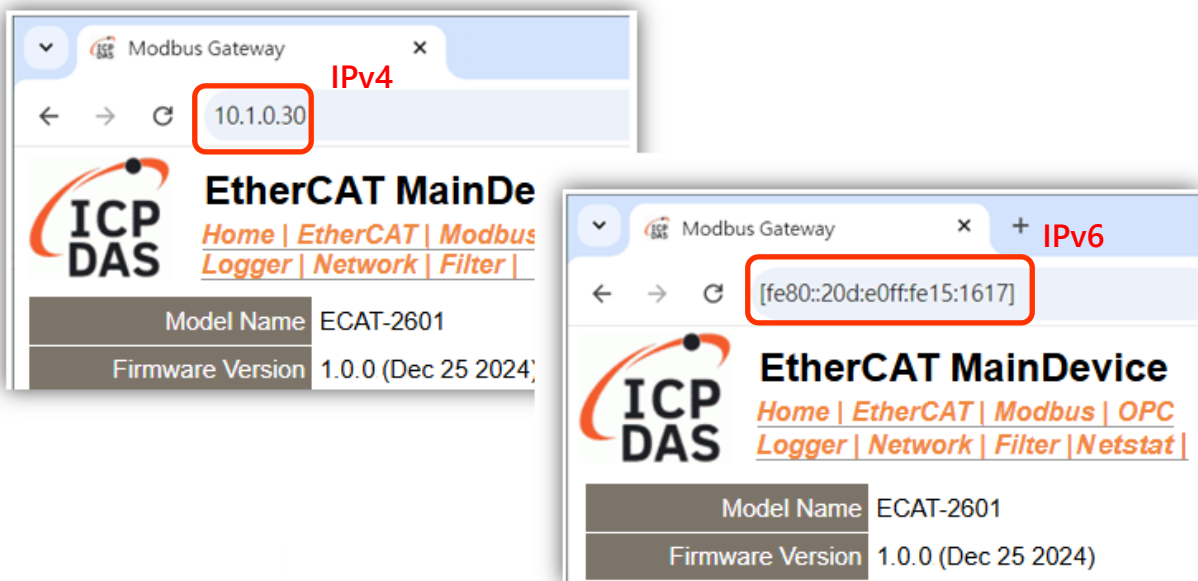
The embedded ECAT-2601 series web server can be accessed from any computer that has an Internet connection.

STEP 1: OPEN A NEW BROWSER WINDOW

Open a web browser, for example, Google Chrome or Firefox, which are reliable and popular Internet browsers that can be used to configure ECAT-2601 series module.

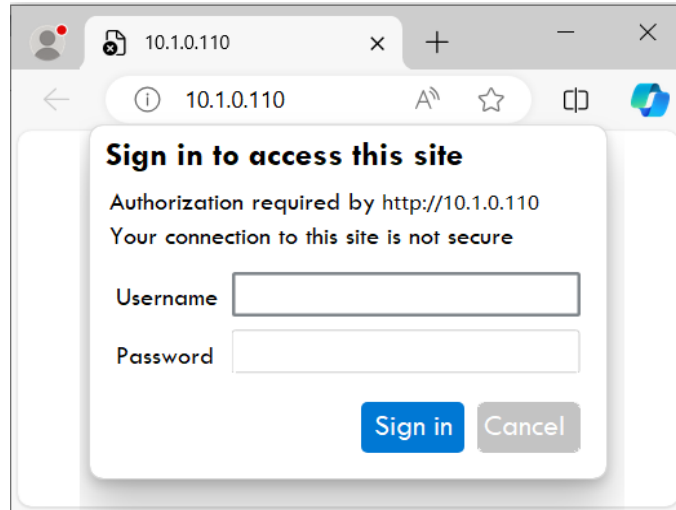
STEP 2: ENTER THE URL FOR THE ECAT-2601 WEB SERVER

Ensure that you have correctly configured the network settings for the ECAT-2601 series module, and then enter the URL for the ECAT-2601 web server in the address bar of the browser.



STEP 3: ENTER THE PASSWORD

After connecting to the IP address, the login page is displayed. Enter your password in the **Login password** field, and then click the “**Submit**” button to continue. (If this is the first time you login, refer to Section 3.4 to change the factory default password.)



STEP 4: LOG IN TO THE ECAT-2601 WEB SERVER

After logging into the ECAT-2601 web server, the main page will be displayed.

EtherCAT MainDevice
[Home](#) | [EtherCAT](#) | [Modbus](#) | [OPC UA](#) | [Network](#) | [Filter](#) | [Maintenance](#) | [Netstat](#) | [Password](#) | [Logout](#)

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

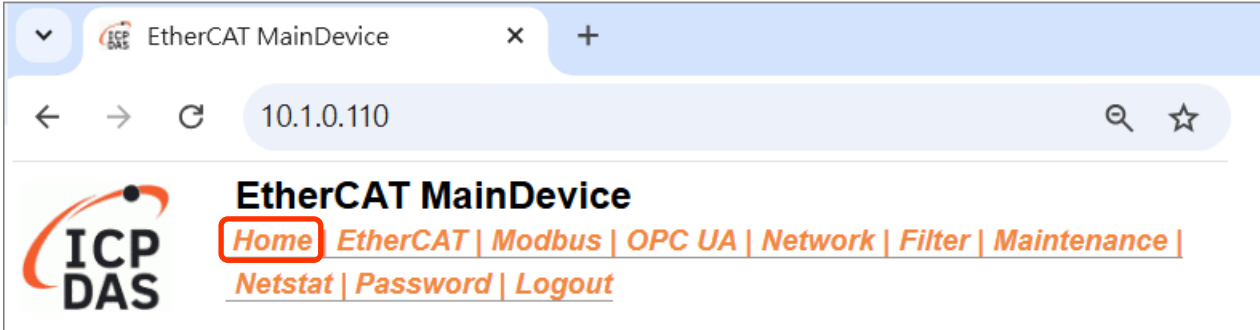
Information:

Module Information	
Module Time	April 21, 2025 at 18:26:10
BIOS Version	Nov 28 2024, 200Mhz
Up Time	47 min, 18 s
Modbus (TCP, Security) Connections	0, 0
Ethernet(E1) Status	Link Up (100Mbps, Full Duplex)
Ethernet(E2) Status	Link Down
Recv Packets	36612
Xmit Packets	480
System Information	
Memory Usage	144880 KB Free
Scan Time	1.1 ms

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5.2 Home Page

The **Home** link connects to the main page, which contains two parts.



The first part of this page provides basic information about the ECAT-2601 hardware and software. The software and hardware information section includes information related to the Model Name, the current Firmware version, the IP Address, the current position of the Initial Switch, the Alias, the MAC Address, and the TCP Port, and the System Timeout values. **If the firmware for the ECAT-2601 module is updated, you can check the version information here.**

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

The lower section provides information related to the module settings and system settings.

Information:	
Module Information	
Module Time	April 21, 2025 at 18:26:10
BIOS Version	Nov 28 2024, 200Mhz
Up Time	47 min, 18 s
Modbus (TCP, Security) Connections	0, 0
Ethernet(E1) Status	Link Up (100Mbps, Full Duplex)
Ethernet(E2) Status	Link Down
Recv Packets	36612
Xmit Packets	480
System Information	
Memory Usage	144880 KB Free
Scan Time	1.1 ms

5.3 EtherCAT Page

After clicking the **EtherCAT** tab, the **EtherCAT Settings** page will be displayed. User can configure the Main Device, setup the startup entry and Sub Device status.

The screenshot shows a web browser window with the URL 10.1.0.110. The page title is "EtherCAT MainDevice". The navigation menu includes: Home, **EtherCAT** (highlighted with a red box), Modbus, OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout.

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.2 (Dec 26 2024)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

MainDevice Configuration

Cycle Time	1 (ms)
Actual Cycle Time	0.963 (ms)
Event Count	0

SDO Statrup Entry

SDO Write	Tag Name	Pos.	Index	Subindex	Bit length	Value	CA
							<input type="button" value="NEW"/>

Upload SDO Settings:

SubDevice Status

SubDevice Status	Pos.	ID(Dec)	Name	Mode	Status
	0	11	ECAT-2028 8 Ch. Ana.	Free Run	OPERATIONAL

5.4 Modbus Page

After clicking the **Network Page** tab, the **EtherCAT I/O Settings** page will be displayed.

The screenshot shows a web browser window with the URL 10.1.0.110. The page title is "EtherCAT MainDevice" and the navigation menu includes: Home | EtherCAT | **Modbus** | OPC UA | Network | Filter | Maintenance | Netstat | Password | Logout.

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

EtherCAT I/O

Connect Status: THIS COMPUTER - - ECAT-2600

POS. 0

ECAT-2028 8 Ch. Ana.

Channel No.	Alias	Status	Action	Modbus Mapping
intOut0	Output	0	<input type="text"/>	APPLY 41000
intOut1	SubIndex 002	0	<input type="text"/>	APPLY 41001
intOut2	Output	0	<input type="text"/>	APPLY 41002
intOut3	SubIndex 002	0	<input type="text"/>	APPLY 41003
intOut4	Output	0	<input type="text"/>	APPLY 41004
intOut5	SubIndex 002	0	<input type="text"/>	APPLY 41005
intOut6	Output	0	<input type="text"/>	APPLY 41006
intOut7	SubIndex 002	0	<input type="text"/>	APPLY 41007
intOut8	Output	0	<input type="text"/>	APPLY 41008
intOut9	SubIndex 002	0	<input type="text"/>	APPLY 41009
intOut10	Output	0	<input type="text"/>	APPLY 41010
intOut11	SubIndex 002	0	<input type="text"/>	APPLY 41011
intOut12	Output	0	<input type="text"/>	APPLY 41012
intOut13	SubIndex 002	0	<input type="text"/>	APPLY 41013
intOut14	Output	0	<input type="text"/>	APPLY 41014
intOut15	SubIndex 002	0	<input type="text"/>	APPLY 41015

5.5 OPC UA Page

After clicking the OPC UA tab, and the OPC UA Server Settings page will be displayed.

ICP DAS EtherCAT MainDevice
[Home](#) | [EtherCAT](#) | [Modbus](#) | **OPC UA** | [Network](#) | [Filter](#) | [Maintenance](#) | [Netstat](#) | [Password](#) | [Logout](#)

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.75	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

OPC UA Server Settings

Enable	<input checked="" type="checkbox"/>
Port	<input type="text" value="4840"/>
Server Name	<input type="text" value="EthernetIO_37DFFD07"/>
Anonymous Login	<input type="checkbox"/>
Certificate Login	<input type="checkbox"/>
Security Policy	<input checked="" type="checkbox"/> None <input checked="" type="checkbox"/> Basic128Rsa15 <input checked="" type="checkbox"/> Basic256 <input checked="" type="checkbox"/> Basic256Sha256 <input checked="" type="checkbox"/> Aes128Sha256RsaOaep

OPC UA Authentication Certificate

Trusted Certificate (Default)	<input type="button" value="CHOOSE FILE"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="REMOVE"/>	
Private Key (Default)	<input type="button" value="CHOOSE FILE"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="GENERATION"/>	<input type="button" value="REMOVE"/>
Certificate (Default)	<input type="button" value="CHOOSE FILE"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="SELF-SIGNED"/>	<input type="button" value="REMOVE"/>

Nodes List

URI	opc.tcp://10.1.0.75:4840
Nodes List	I/O NodeId BrowseName DisplayName

OPC UA connection includes the following settings that will be introduced in 2 sub-sections.

1. OPC UA Server Connection Settings (UA I/O)
2. How to enable secure encrypted function, and download/upload the encrypted certificates

[OPC UA Server Connection Settings \(UA I/O\)](#)

ECAT-2601 built-in OPC UA Server function and itself is the Server side of the connection. So, when setting up the Server, you only need to set the connection port number and choose the login method (via anonymous, username, or certificate). Usually, the user will enable the username login method, so the user can set the username/password of the account besides.

The following is an overview of the parameters contained in the **OPC UA Server Settings** section:

Item	Description	Default
Port	The communication port number of the OPC UA Server.	4840
Anonymous Login	Check to enable the user password login from OPC UA clients. The following are the defaults for username and password: Username: Admin Password: Admin It is necessary that user use the latest ones, if you change your username and password.	Disable
Certificate Login	Check to enable the certificate login from OPC UA clients. (refer to next section, Server Certificate)	Disable
Security Policy	None	Enable
	Basic128Rsa15 Security Mode: Sign, Sign and Encrypt	Enable
	Basic256 Security Mode: Sign, Sign and Encrypt	Enable
	Basic256Sha256 Security Mode: Sign, Sign and Encrypt	Enable
	Aes128Sha256RsaOaep Security Mode: Sign, Sign and Encrypt	Enable
Update Settings	Click this button to save the revised settings to the ECAT-2601.	

To connect the ECAT module (ECAT-2028) with ECAT port, after clicking the **OPC UA** tab, and the **OPC UA Server Settings** page will be displayed.

EtherCAT MainDevice

[Home](#) | [EtherCAT](#) | [Modbus](#) | OPC UA | [Network](#) | [Filter](#) | [Maintenance](#) | [Netstat](#) | [Password](#) | [Logout](#)

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

OPC UA Server Settings

Enable	<input checked="" type="checkbox"/>		
Port	<input type="text" value="4840"/>		
Server Name	<input type="text" value="EthernetIO_37DFFD07"/>		
Anonymous Login	<input type="checkbox"/>		
Certificate Login	<input type="checkbox"/>		
Security Policy	<input checked="" type="checkbox"/> None		
	<input checked="" type="checkbox"/> Basic128Rsa15	<input type="text" value="Sign; Sign and Encrypt"/>	
	<input checked="" type="checkbox"/> Basic256	<input type="text" value="Sign; Sign and Encrypt"/>	
	<input checked="" type="checkbox"/> Basic256Sha256	<input type="text" value="Sign; Sign and Encrypt"/>	
	<input checked="" type="checkbox"/> Aes128Sha256RsaOaep	<input type="text" value="Sign; Sign and Encrypt"/>	
<input type="button" value="Update Settings"/>			

OPC UA Authentication Certificate

Trusted Certificate (Default)	<input type="button" value="CHOOSE FILE"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="REMOVE"/>	
Private Key (Default)	<input type="button" value="CHOOSE FILE"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="GENERATION"/>	<input type="button" value="REMOVE"/>
Certificate (Default)	<input type="button" value="CHOOSE FILE"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="SELF-SIGNED"/>	<input type="button" value="REMOVE"/>

Nodes List

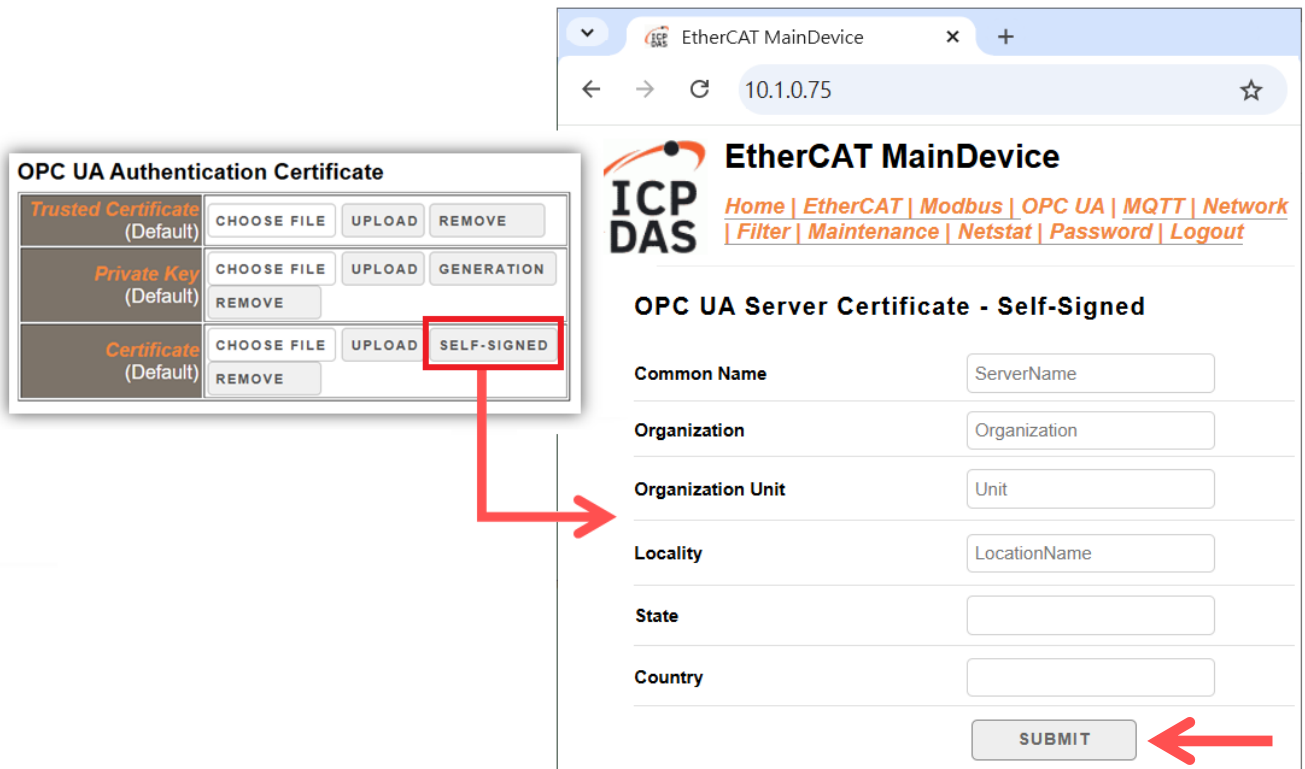
URI	opc.tcp://10.1.0.110:4840			
Nodes List	I/O	NodeId	BrowseName	DisplayName
	Pos0.intOut 0	Slave1.intOut.ch0	Slave1.intOut.ch0	ch0
	Pos0.intOut 1	Slave1.intOut.ch1	Slave1.intOut.ch1	ch1
	Pos0.intOut 2	Slave1.intOut.ch2	Slave1.intOut.ch2	ch2
	Pos0.intOut 3	Slave1.intOut.ch3	Slave1.intOut.ch3	ch3
	Pos0.intOut 4	Slave1.intOut.ch4	Slave1.intOut.ch4	ch4
	Pos0.intOut 5	Slave1.intOut.ch5	Slave1.intOut.ch5	ch5
	Pos0.intOut 6	Slave1.intOut.ch6	Slave1.intOut.ch6	ch6
	Pos0.intOut 7	Slave1.intOut.ch7	Slave1.intOut.ch7	ch7
	Pos0.intOut 8	Slave1.intOut.ch8	Slave1.intOut.ch8	ch8
	Pos0.intOut 9	Slave1.intOut.ch9	Slave1.intOut.ch9	ch9
	Pos0.intOut 10	Slave1.intOut.ch10	Slave1.intOut.ch10	ch10
	Pos0.intOut 11	Slave1.intOut.ch11	Slave1.intOut.ch11	ch11
	Pos0.intOut 12	Slave1.intOut.ch12	Slave1.intOut.ch12	ch12
	Pos0.intOut 13	Slave1.intOut.ch13	Slave1.intOut.ch13	ch13
	Pos0.intOut 14	Slave1.intOut.ch14	Slave1.intOut.ch14	ch14
Pos0.intOut 15	Slave1.intOut.ch15	Slave1.intOut.ch15	ch15	

Secure Encrypted Connection: OPC UA Certificate

When using the OPC UA connection, in addition to the account login for security, users can also enable the certificate login to double the protection by the secure encryption.

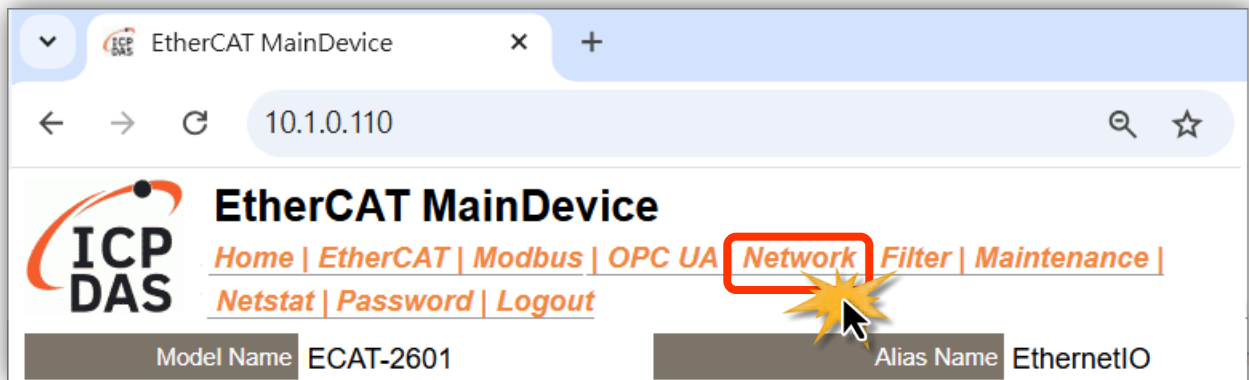
When enabling the OPC UA certificate login, the Server/Client both sides of the connection need to add certificates to each other's trust zones.

User can also create a Self-Signed OPC UA Compliant Certificate by clicking the “SELF-SIGNED” button.



5.6 Network Page

After clicking the **Network** tab, the **Network** page will be displayed, allowing you to verify the current settings, configure the IP Address, and the general parameters, and restore the default settings for the ECAT-2601 module, each of which will be described in more detail below.



5.6.1 IP Address Selection

The **Address Type**, **Static IPv4 Address**, **Subnet Mask** and **Default Gateway** values are the most important network settings and should always correspond to the LAN configuration. If they do not match, the ECAT-2601 module will not operate correctly in IPv4.

The **IPv6 Link Local Address** always effective in the same link layer. The **IPv6 SLAAC Address** will be configured by the Router automatically, and the default router is the link-local address of the router. The **IPv6 User-defined Address** can be defined by the User. It's more convenient for using in the simple application. The **IPv6 User-defined Address** can be routed if its prefix as same as **IPv6 SLAAC Address**.

If the settings are changed while the module is operating, any connection currently in use will be lost and an error will occur. If your environment doesn't support the IPv6, please ignore the **IPv6 Address** fields.

The following is an overview of the parameters contained in the **IP Address Selection** section:

Item	Description
Address Type	Static IP: If no DHCP server is installed on the network, the network settings can be configured manually. Refer to Section “Manual Configuration” for more details.
	DHCP: The Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns an IPv4 address to each device. Refer to Section “Dynamic Configuration” for more details.
	Note: The DHCP function doesn’t effective on IPv6.
Static IPv4 Address	Each ECAT-2601 connected to the network must have its own unique IP address. This parameter is used to assign a specific IPv4 address.
Subnet Mask	This parameter is used to assign the subnet mask for the ECAT-2601. The subnet mask indicates which portion of the IPv4 address is used to identify the local network or subnet.
Default Gateway	This parameter is used to assign the IPv4 Address of the Gateway to be used by the ECAT-2601. A Gateway (or router) is a device that is used to connect an individual network to one or more additional networks.
MAC Address	This parameter is used to set a user-defined MAC address, which must be in the format FF-FF-FF-FF-FF-FF.
IPv6 Link Local Address	Each IPv6 device connected to the network must have a link-local address. It always effective in the same link layer. It is auto-configured by EUI-64. If your environment doesn’t support the IPv6, please ignore this field.
IPv6 SLAAC Address	The ECAT-2601 supports stateless address auto configuration (SLAAC). It will be configured by the Router automatically, and the default router is the link-local address of the router. The router should provide the prefix and the tGW-700 will calculate the Host ID by EUI-64. If your environment doesn’t support the SLAAC, please ignore this field.
SLAAC Timeout (SLAAC Watchdog)	This parameter is used to configure the SLAAC timeout value. If the SLAAC address doesn’t be configured in the specified time, the system will be rebooted to configure the SLAAC address again. Timeout value range: 30 to 65535 (seconds); Disable = 0;
IPv6 User-defined Address	It can be defined by the User. It’s more convenient than using the link-local address in the simple application. This address can be routed if the prefix as same as IPv6 SLAAC Address. If your environment doesn’t support the IPv6, please ignore this field.
Update Settings	Click this button to save the revised settings to the ECAT-2601.

Manual Configuration

When using manual configuration, the network settings should be assigned in the following manner:

Step 1: Select the “Static IP” option from the “Address Type” drop-down menu.

Step 2: Enter the relevant details in the respective **network settings** fields. If your environment doesn’t support the IPv6, please ignore the “IPv6 User-defined Address” fields.

Step 3: Click the “Update Settings” button to complete the configuration.

IP Address

IPv4 Address	
Address Type	Static IP 1
Static IPv4 Address	192 . 168 . 255 . 1
Subnet Mask	255 . 255 . 0 . 0 2
Default Gateway	192 . 168 . 0 . 1
MAC Address	00-0d-e0-15-16-17 (Format: FF-FF-FF-FF-FF-FF)
IPv6 Address	
Link Local Address	FE80::20D:E0FF:FE15:1617 2
SLAAC Address	0:0:0:0:0:0:0
SLAAC Timeout	0 (30 ~ 65000 seconds, 0 = Default Disabled)
User-defined Address	fc00::1
DNS Settings	
Auto DNS Configuration	Enable 3 (Auto DNS Server Configuration by IPv4 DHCP, default enabled.)
Preferred DNS Server IP	8.8.8.8 IPv4 example: 208.67.222.222 , IPv6 example: 2620:119:35::35
Alternate DNS Server IP	8.8.4.4 IPv4 example: 208.67.220.220 , IPv6 example: 2620:119:53::53
Update Settings 3	

Note: The IPv6 Link Local Address is auto-configured by EUI-64.

Note: The IPv6 SLAAC Address is auto-configured by Router. The router should provide the prefix and the ECAT-2601 will calculate the Host ID by EUI-64.

Dynamic Configuration

Dynamic configuration is very easy to perform. If a DHCP server is connected to you network, an IPv4 network address can be dynamically configured by using the following procedure:

Step 1: Select the “DHCP” option from the “Address Type” drop-down menu.

Step 2: Click the “Update Settings” button to complete the configuration.

IP Address

IPv4 Address	
Address Type	DHCP <input type="button" value="1"/>
Static IPv4 Address	192 . 168 . 255 . 1
Subnet Mask	255 . 255 . 0 . 0
Default Gateway	192 . 168 . 0 . 1
MAC Address	00-0d-e0-15-16-17 (Format: FF-FF-FF-FF-FF-FF)
IPv6 Address	
Link Local Address	FE80::20D:E0FF:FE15:1617
SLAAC Address	0:0:0:0:0:0
SLAAC Timeout	0 (30 ~ 65000 seconds, 0 = Default Disabled)
User-defined Address	fc00::1
DNS Settings Client Mode Only	
Auto DNS Configuration	Enable <input type="button" value="2"/> (Auto DNS Server Configuration by IPv4 DHCP, default enabled.)
Preferred DNS Server IP	8.8.8.8 IPv4 example: 208.67.222.222 , IPv6 example: 2620:119:35::35
Alternate DNS Server IP	8.8.4.4 IPv4 example: 208.67.220.220 , IPv6 example: 2620:119:53::53
<input type="button" value="Update Settings"/> <input type="button" value="2"/>	

Note: The DHCP is ineffective on IPv6.

Note: The IPv6 Link Local Address is auto-configured by EUI-64.

Note: The IPv6 SLAAC Address is auto-configured by Router. The router should provide the prefix and the ECAT-2601 will calculate the Host ID by EUI-64.

5.6.2 General Settings

The **General Settings** section is used to configure the setting as below:

General Settings

Ethernet Speed	Auto <input type="button" value="v"/> (Auto=10/100 Mbps Auto-negotiation)
HTTP port	80 <input type="text"/> (Default= 80)
Alias Name	EthernetIO <input type="text"/> (Max. 18 chars)
UDP Heartbeat	0 <input type="text"/> (20 ~ 300 seconds, 0 = Default Disabled)
UDP Configuration	Enable <input type="button" value="v"/> (Enable/Disable the UDP Configuration, Enable=default.)
<input type="button" value="Update Settings"/>	

The following is an overview of the parameters contained in the **General Settings** section:

Item	Description	Default
Ethernet Speed	This parameter is used to set the Ethernet speed. The default value is Auto (Auto = 10/100 Mbps Auto-negotiation).	Auto
HTTP Port	This parameter is used to assign specific a HTTP port of ECAT-2601. The ECAT-2601 needs to be restarted when the HTTP port is changed. You need manually type the new HTTP port in the address bar of the browser. The default is 80. For example: if the HTTP port is set to 81, then enter the "IP address: HTTP port" (10.0.8.123:81).	80
Alias Name	This parameter is used to assign an alias for each ECAT-2601 to assist with easy identification.	EthernetIO
UDP Heartbeat	This parameter is used to configure the interval of the UDP heartbeat packet. Interval value range: 20 to 300 (seconds); Disable = 0;	20
UDP Configuration	This parameter is used to enable or disable UDP configuration function.	Enable
Update Settings	Click this button to save the revised settings to the ECAT-2601.	

5.6.3 Modbus Server Settings

The **Modbus Server Settings** section is used to configure the Modbus setting.

Modbus Server Settings

Modbus Net ID	<input type="text" value="1"/> (Default: 1)
Modbus TCP/UDP	
Enable	<input checked="" type="checkbox"/>
Port	<input type="text" value="502"/> (Default: 502)
MODBUS/TCP Security	
Enable	<input checked="" type="checkbox"/>
Port	<input type="text" value="802"/> (Default: 802)
Certificate Login	<input type="checkbox"/> Require
Modbus RTU	
Baud Rate	<input type="text" value="115200"/> ▾
Data Size	<input type="text" value="8"/> ▾
Parity	<input type="text" value="None"/> ▾
Stop Bits	<input type="text" value="1"/> ▾
Flow Control	<input type="text" value="None"/> ▾
<input type="button" value="Update Settings"/>	

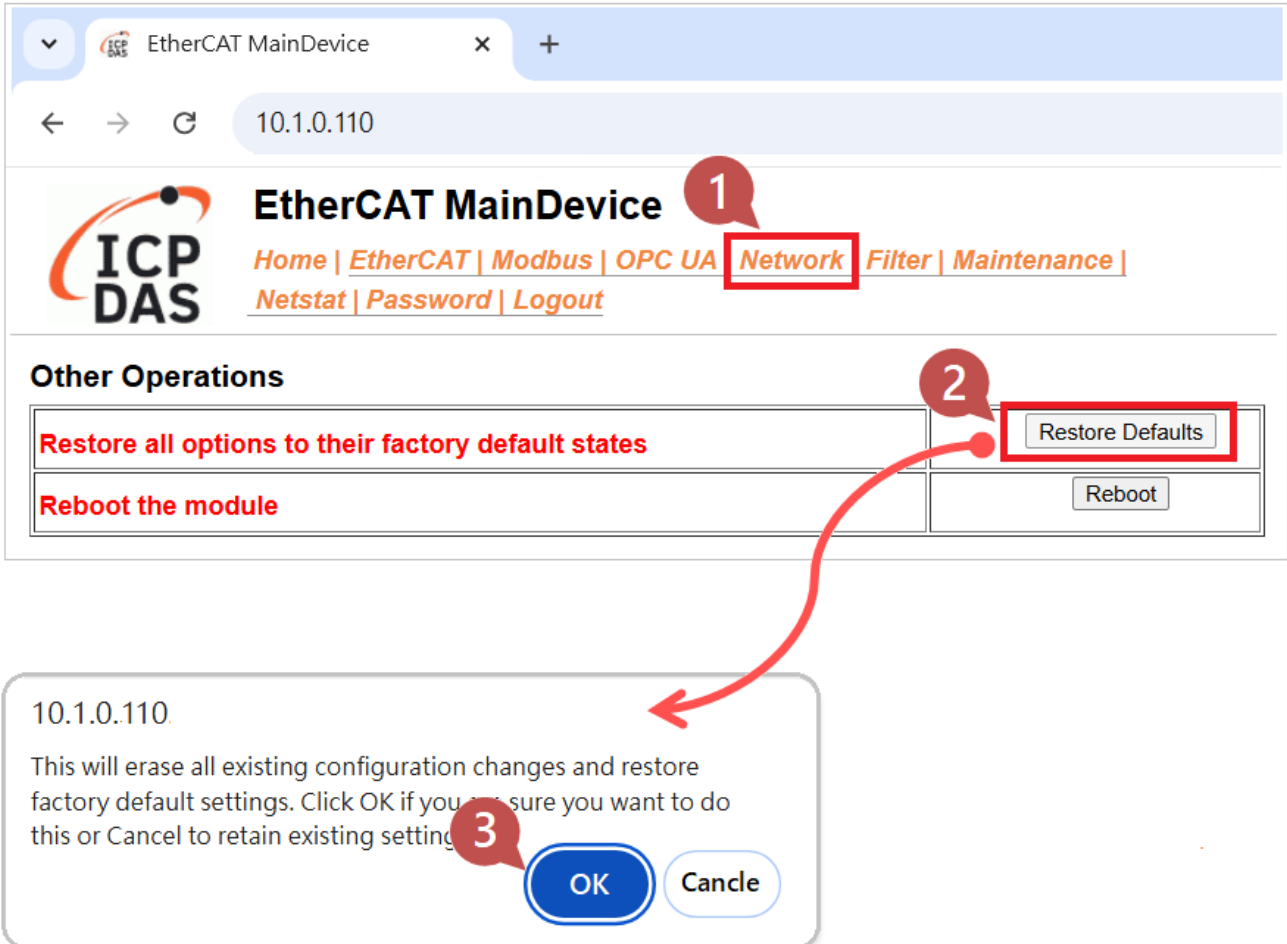
The following is an overview of the parameters contained in the **Modbus Server Settings** section:

Item	Description	Default
Modbus Net ID	This is reserved for gateway. (Not used to set the slave device)	1
Modbus TCP/UDP	This parameter is used to enable or disable Modbus TCP/UDP function. Enable =1; Disable = 0.	Enable Port: 502
Modbus/TCP Security	This parameter is used to enable or disable Modbus/TCP Security function.	Enable Port: 502
Modbus RTU	This parameter is used to configure the Modbus RTU Port, allowing you to configure the settings for the ECAT-2601, including the Baud Rate, Data Format, etc.	Baud Rate=115200 Data Size=8 Parity=None Stop Bits=1 Flow Control=None
Update Settings	Click this button to save the revised settings to the ECAT-2601.	

5.6.4 Restore to factory default states

Use the following procedure to reset all parameters to their original factory default settings:

Step 1: Click the “Restore Defaults” button to reset the configuration.

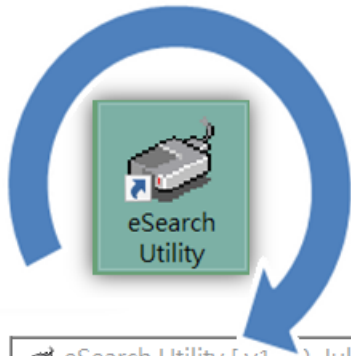


Step 2: Click the “OK” button in the message dialog box.

The following is an overview of the factory default settings:

IPv4 Network Settings		IPv6 Network Settings	
IPv4 Address	192.168.255.1	User-defined	fc00::1
Gateway Address	192.168.0.1	Link-Local	Auto-configure
Subnet Mask	255.255.0.0	SLAAC	Auto-configure
DHCP	Disabled		

Step 3: Check whether the module has been reset to the original factory default settings for use with the eSearch Utility.



eSearch Utility [v1.5.0, Jul.25, 2022]
File Server Tools

Name	Alias	IP Address	Sub-net Mask	Gateway	MAC Address
tDS-718(i)_RevB2	Tiny	10.1.0.115	255.255.0.0	10.1.0.254	00:0d:e0:77:
ECAT-2601	EthernetIO	192.168.255.1	255.255.0.0	192.168.0.1	00:0d:e0:15:
uPAC-7586E	TimTsai-7586	10.1.0.107	255.255.0.0	10.1.0.254	00:0d:e0:75:

Search Server | Configuration (UDP) | Web | Exit

Status

Configure Server (UDP)

Server Name : ECAT-2601 IPv6 Address : fc00::1

DHCP: 0: OFF Sub-net Mask : 255.255.0.0 Alias: EthernetIO

IP Address : 10.1.0.32 Gateway : 192.168.0.1 MAC: 00:0d:e0:15:16:17

Warning!!
Contact your Network Administrator to get correct configuration before any changing!

OK Cancel

The **Reboot** function: can be used to force the ECAT-2601 to reboot or to remotely reboot the module. After the ECAT-2601 module has rebooted, the original login screen will be displayed requesting that you enter your Login Password before continuing.

5.7 Filter Page

The **Filter** page is used to query or edit the IP Filter List. The IP Filter List restricts the access of packets based on the IP header. If the filter function is enabled, only clients whose IP is specified in the IP Filter List can access the ECAT-2601.

The screenshot shows the web interface for the EtherCAT MainDevice. The browser address bar shows the URL 10.1.0.110. The page title is "EtherCAT MainDevice" and the navigation menu includes links for Home, EtherCAT, Modbus, OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout. The "Filter" link is highlighted with a red box and a yellow starburst.

System Information:

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.2 (Dec 25 2024)	MAC Address	00-0d-e0-c1-b1-a1
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

Filter Setting

Accessible IP	IPv4/v6 Address (example: 10.0.8.123, fe80:0:0:0:a8ee:dc07:1cda:5678)
IP0	<input type="text"/>
IP1	<input type="text"/>
IP2	<input type="text"/>
IP3	<input type="text"/>
IP4	<input type="text"/>

Enable IP Filter Check to enable. (Default disabled)

3 Update Setting **2**

Note: Remember to include the IP address of your configuration computer.

Enable the IP Filter:

Step 1: Enter the IP address that is allowed to access the module in the IP0 ~ IP4 fields.

Step 2: Tick the **Check to enable** checkbox in the Enable IP Filter field.

Step 3: Click the **“Update Setting”** button to update the settings.

Disable the IP Filter:

Step 1: Uncheck the **Check to enable** checkbox in the Enable IP Filter field.

Step 2: Click the **“Update Setting”** button to update the settings.

5.8 Maintenance Page

The Maintenance Page allows you to quickly setup Time server setting, Firmware update, Time-Sensitive, networking and IEEE 802.1X Authentication.

5.8.1 Time Server Settings

Time Server Settings

Sntp Server	<input type="text" value="time.nist.gov"/> (Max. 64 chars)
Interval (Seconds)	<input type="text" value="86400"/> (Default= 86400)
Time Zone	(GMT -8:00) Pacific Time (US & Canada) ▼
Last Sync Time	<input type="text" value="2024/12/24 18:28:30"/>
Enable Sntp	Enable ▼ (Enable/Disable the Sntp Configuration, Enable=default.)
<input type="button" value="Update Settings"/>	

Realtime Clock

Module Date&Time	<input type="text" value="2024/12/25 下午 05:06:20"/> 📅
<input type="button" value="Update Settings"/>	

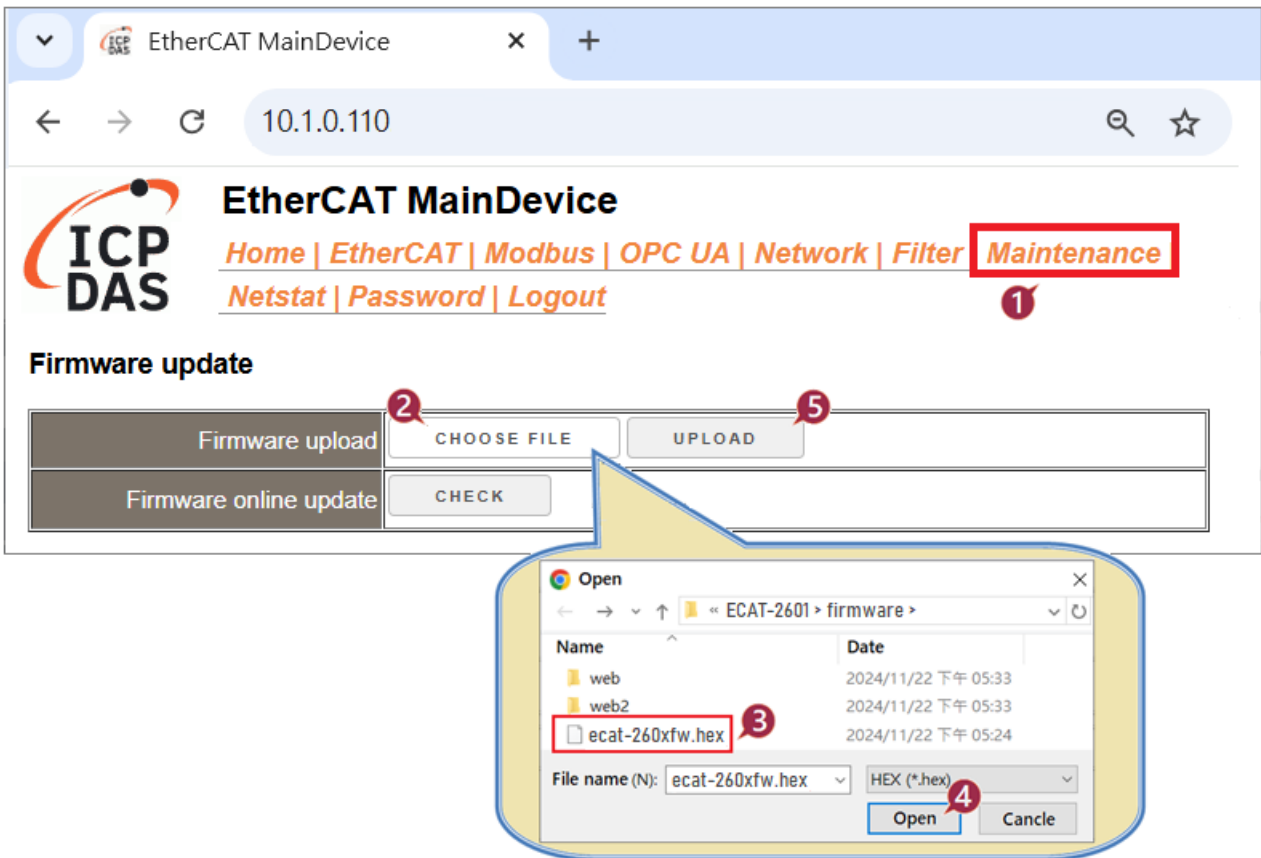
5.8.2 Advanced Setting

Advanced Setting

Web Server	http + https ▼ (Enable/Disable the Web Server, http+https=default.)
HTTPS Port	<input type="text" value="443"/>
mDNS	Enable ▼ (Enable/Disable mDNS, Enable=default.)
NetBIOS	Enable ▼ (Enable/Disable NetBios, Enable=default.)
LLDP	Enable ▼ (Enable/Disable the LLDP Service, Enable=default.)
UPNP	Enable ▼ (Enable/Disable the UPNP Service, Enable=default.)
Bluetooth (option)	Disable ▼ (Enable/Disable the Bluetooth module, Disable=default.)
Telnet Server	Disable ▼ (Enable/Disable the Telnet Server, Disable=default.)
Resource Watchdog	Disable ▼ (Enable/Disable Reboot, if resource low, Disable=default.)
Ethernet Watchdog	Disable ▼ (Enable/Disable Reboot, if Ethernet error, Disable=default.)
Engineering Mode	Disable ▼ (Enable/Disable Engineering Mode, Disable=default.)
Broadcast Storm Protection	Enable ▼ (Enable/Disable Reboot Broadcast Storm Protection, Enable=default.)
CPU Idle Mode	Disable ▼ (Enable/Disable CPU Idle Mode, Disable for maximum performance, Disable=default.)
<input type="button" value="Update Settings"/>	

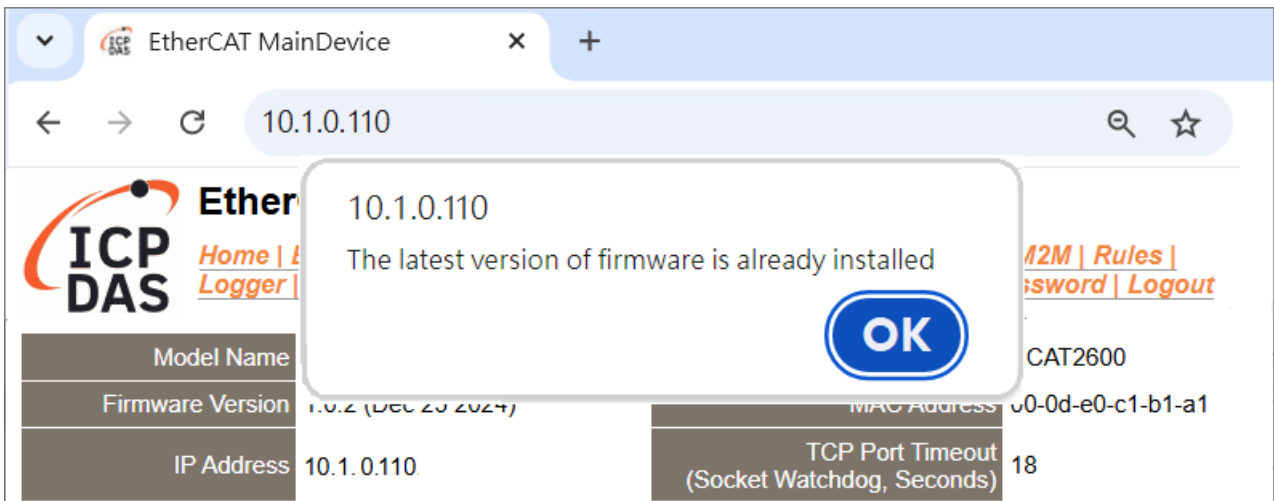
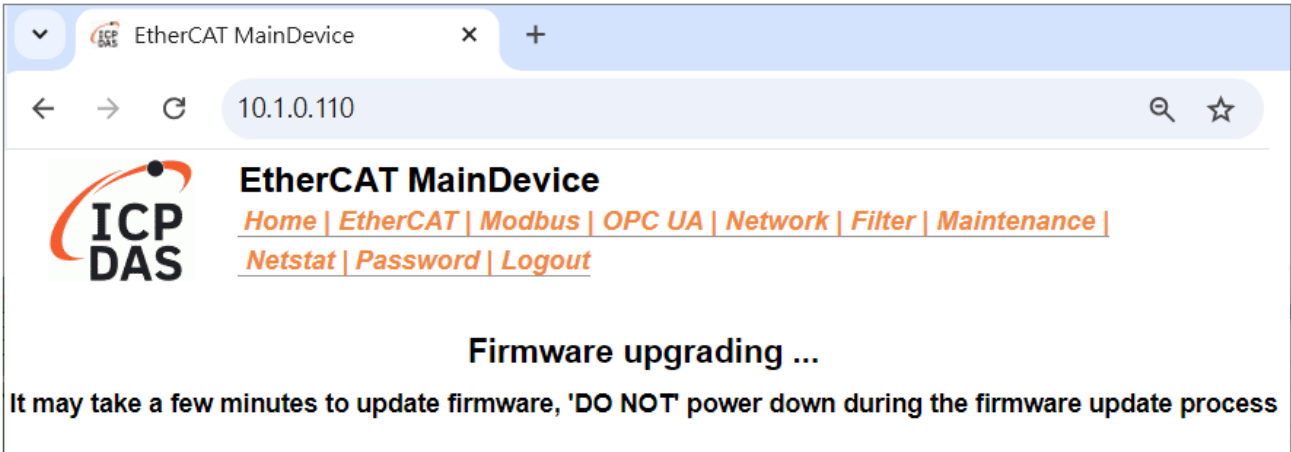
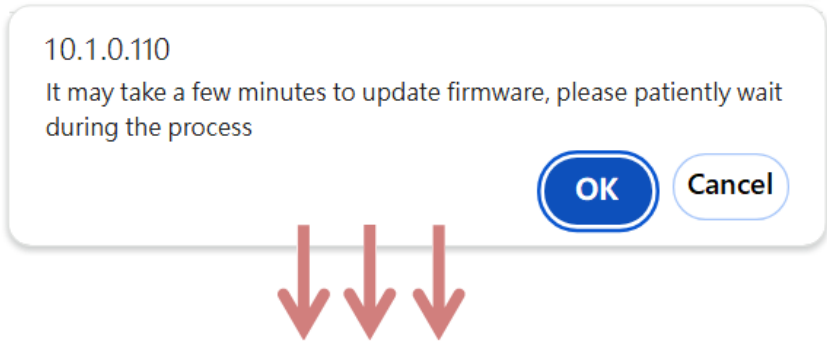
5.8.3 Firmware Update

Firmware update requires initialization and local network operations. Traditional firmware update requires adjusting the Reset button and reboots the module manually for the initialization of firmware update, while new way allows user to initialize the module via web interface without adjusting the hardware switch. Initialization via web is useful when module is installed in remote site and can be accessed by a remote PC.



Note:

If the remote firmware update is failed, then the traditional firmware update (Local) is required to make the module working again.



For detailed information regarding how to use this function to update the Firmware for ECAT-2601 series module, refer to the “ECAT-2601 Firmware Update Manual (EN)”. The download address is shown below:

ECAT-2601 :

<https://www.icpdas.com/en/download/show.php?num=2750>

5.8.4 Time-Sensitive Networking

Time-Sensitive Networking (TSN)

Precision Time Protocol	
Protocol	Disable <input type="button" value="v"/>
PTP Offset	Uncalibrated
802.1Q Tag-based VLAN	
Application	Disable <input type="button" value="v"/>
VLAN ID (Dec)	600
Priority	0 (lowest) <input type="button" value="v"/>
Protocol	TCP <input type="button" value="v"/>
Port	502
<input type="button" value="Update Settings"/>	

5.8.5 IEEE 802.1X Authentication

IEEE 802.1X Authentication

Protocol	Disable <input type="button" value="v"/>
Username	<input type="text"/>
Password	**** <input type="text"/>
Status	Disable
<input type="button" value="Update Settings"/>	



5.8.6 Backup and Authentication certificate

Settings Backup/Restore

Download Settings (Backup)	DOWNLOAD
Upload Settings (Restore)	CHOOSE FILE UPLOAD&REBOOT

Rules Backup/Restore

Download Rules (Backup)	DOWNLOAD
Upload Rules (Restore)	CHOOSE FILE UPLOAD

HTTPS Authentication Certificate

<i>Private Key</i> (Default)	CHOOSE FILE	UPLOAD	GENERATION	REMOVE
<i>Certificate</i> (Default)	CHOOSE FILE	UPLOAD	SELF-SIGNED	REMOVE

MODBUS/TCP Security Authentication Certificate

<i>Trusted Certificate</i> (Default)	CHOOSE FILE	UPLOAD	REMOVE	
<i>Private Key</i> (Default)	CHOOSE FILE	UPLOAD	GENERATION	REMOVE
<i>Certificate</i> (Default)	CHOOSE FILE	UPLOAD	SELF-SIGNED	REMOVE

5.9 Netstat Page

Netstat is a handy tool that can help you understand and troubleshoot your network, as well as detect and resolve network security issues.

The screenshot shows the web interface for the EtherCAT MainDevice. The browser address bar shows the IP address 10.1.0.110. The page title is "EtherCAT MainDevice". The navigation menu includes links for Home, EtherCAT, Modbus, OPC UA, Network, Filter, Maintenance, **Netstat**, Password, and Logout. The Netstat link is highlighted with a red box and a yellow starburst icon.

System Information:

Model Name	ECAT-2601	Alias Name	EthernetIO
Firmware Version	1.0.0 (Mar 5 2025)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

Security event

DoS/DDoS Event	0
----------------	---

TCP Connection

TCP Server	Service (Listen port)	Remote IP	Remote Port
Listen & Established	http (80)		
		10.1.0.94	60729
	opc ua (4840)		
	https (443)		
	modbus/tls (802)		
	modbus/tcp (502)		

System Logger

System Logger	<pre> 2025/04/22,19:33:55:Clear syslog 2025/04/22,21:52:26:EtherCAT is offline 2025/04/22,21:52:27:ec_slave[0].state = 4, ec_slave[0].ALstatuscode = 0x1b 2025/04/22,21:52:27:Pos0 safeop error -> 0x14 Sync manager watchdog 2025/04/22,21:52:27:EtherCAT is online 2025/04/22,21:52:28:EtherCAT online init 2025/04/22,21:52:30:Pos0 safeop state -> 0x4 </pre>
	<input type="button" value="Clear"/>

5.10 Password Page

After clicking the **Password** tab, the **Privilege Management** page will be displayed. Follow the steps below to reset or create a new your account and password.

Step 1: Enter the account and password in the field. (Use the default password “**Admin**” for the first login)

Step 2: Enter the new password in the “**Confirm new password**” fields and make it enable.

Step 3: Click the “**Submit**” button to update the account and password.

The screenshot shows the EtherCAT MainDevice web interface. The browser address bar shows 10.1.0.110. The navigation menu includes Home, EtherCAT, Modbus, OPC UA, Network, Filter, Maintenance, Netstat, Password, and Logout. The Password tab is highlighted with a red box. A yellow starburst points to the Password field in the system information table.

Model Name	ECAT-267	Alias Name	EthernetIO
Firmware Version	1.0.2 (Jan 8 2025)	MAC Address	00-0d-e0-ab-dd-31
IP Address	10.1.0.110	TCP Port Timeout (Socket Watchdog, Seconds)	18
Initial Switch	0	System Idle (Network Watchdog, Seconds)	0

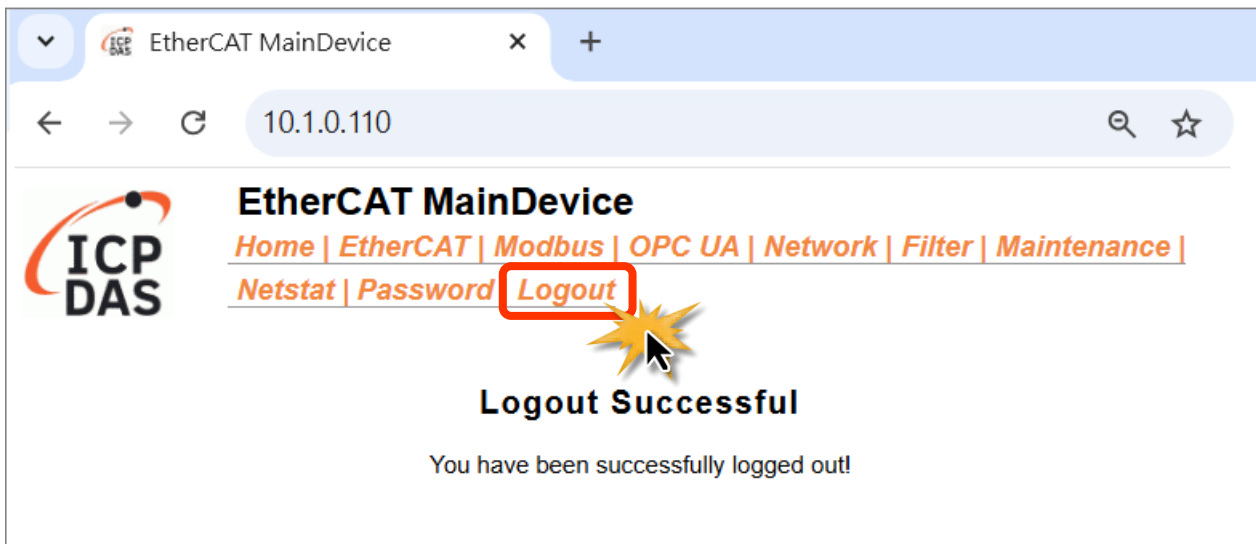
Privilege Management

No.	Account	Password	Confirm Password	Authority	Enabled
1	Admin	Admin	<input checked="" type="checkbox"/>
2	ICPDAS	icpdas	icpdas	Admin	<input checked="" type="checkbox"/>
3				Admin	<input type="checkbox"/>
4				Admin	<input type="checkbox"/>
5				Admin	<input type="checkbox"/>

SUBMIT

5.11 Logout Page

After clicking the **Logout** tab, you will be immediately logged out from the system and be returned to the login page.

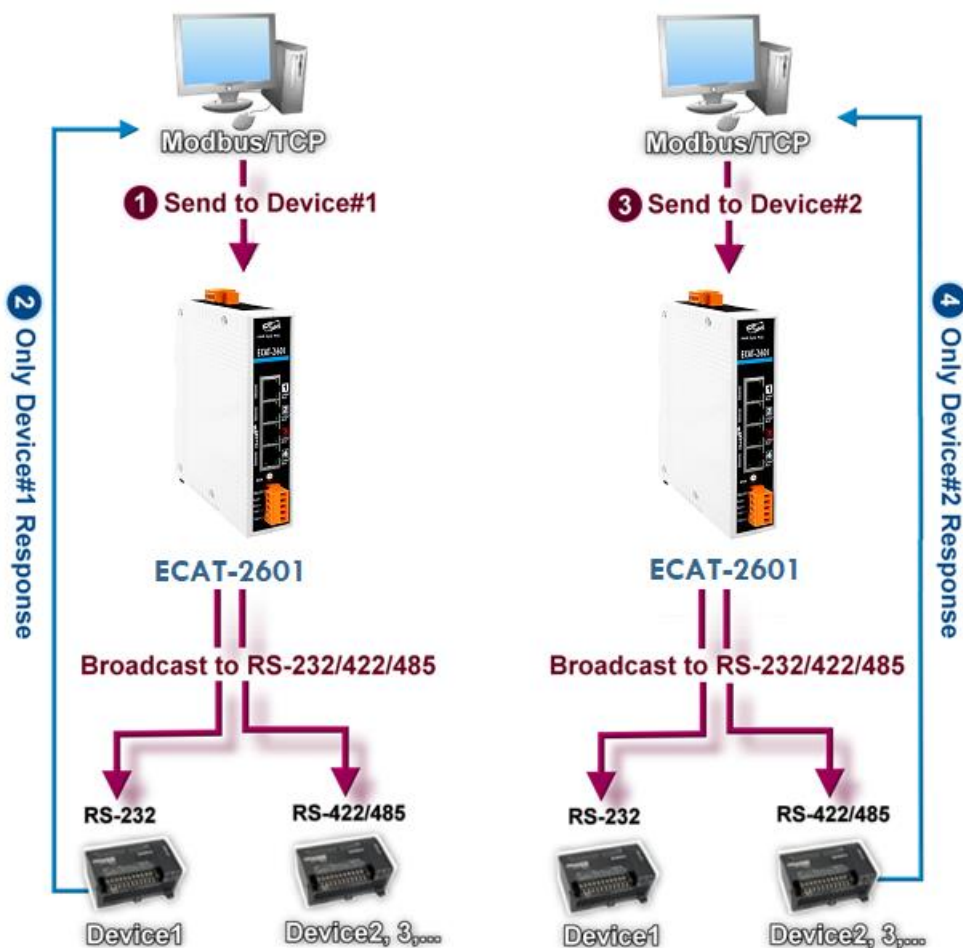


6. Typical Applications

This chapter provides some examples of typical scenarios for the ECAT-2601 module, including applications focused on the Modbus Gateway, Modbus Net ID, Pair-connection and TCP Client Mode, etc...

6.1 Modbus Gateway

The ECAT-2601 module is a Modbus TCP/UDP to RTU/ASCII gateway that enables a Modbus TCP/UDP host to communicate with serial Modbus RTU/ASCII devices through an Ethernet network, and eliminates the inherent cable length limitations of legacy serial communication devices.

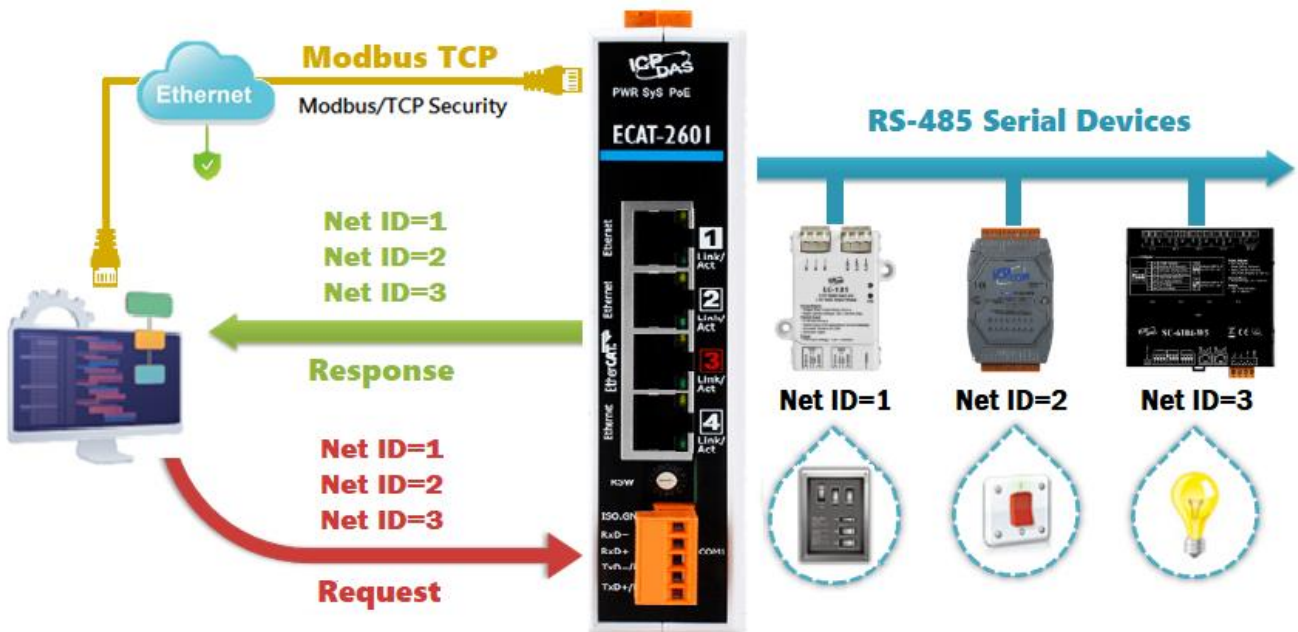


6.2 Modbus Net ID

The ECAT-2601 module is a gateway that can be used to convert between the Modbus TCP/UDP protocol and the Modbus RTU/ASCII protocol.

Consequently, SCADA/HMI applications is able to access each Modbus RTU/ASCII slave device via the ECAT-2601 gateway by specifying correct Net ID of the intended slave device in each Modbus TCP request.

Note that the Net ID of the ECAT-2601 gateway is reserved for specific control purposes, and is not used to access slave devices.



7. Modbus Information

What is Modbus TCP/IP?

Modbus is a communication protocol developed by Modicon in 1979. You can also visit <http://www.modbus.org> to find more valuable information.

The Different versions of Modbus used today include Modbus RTU (based on serial communication interfaces such as RS485 and RS232), Modbus ASCII and Modbus TCP, which is the Modbus RTU protocol embedded into TCP packets.

Modbus TCP is an internet protocol. The protocol embeds a Modbus frame into a TCP frame so that a connection oriented approach is obtained, thereby making it reliable. The master queries the slave and the slave responds with the reply. The protocol is open and, hence, highly scalable.

7.1 Modbus Message Structure

Modbus devices communicate using a master-slave (client-server) technique in which only one device (the master/client) can initiate transactions (called queries). The other devices (slaves/servers) respond by supplying the requested data to the master, or by taking the action requested in the query.

A query from a master will consist of a slave address (or broadcast address), a function code defining the requested action, any required data, and an error checking field. A response from a slave consists of fields confirming the action taken, any data to be returned, and an error checking field.

Modbus TCP Message Structure

Byte 00~05	Byte 06~11
6-byte header	RTU Data

Leading 6 bytes of Modbus TCP protocol:

Byte 00	Byte 01	Byte 02	Byte 03	Byte 04	Byte 05
Transaction identifier		Protocol identifier		Length field (upper byte)	Length field (lower byte)

Transaction identifier: Assigned by Modbus TCP master (client)

Protocol identifier: 0

Length field (upper byte): 0 (since all messages are smaller than 256)

Length field (lower byte): Number of following RTU data bytes

RTU Data Structure

Byte 06	Byte 07	Byte 08-09	Byte 10-11
Net ID (Station number)	Function Code	Data Field	
		Reference number (Address Mapping)	Number of points

- **Net ID (Station Number):** specifies the address of the receiver (Modbus TCP slave).

The first byte in the message structure of Modbus is the receiver's address. The valid addresses are in the range of 0 to 247. Address 0 is used for broadcast, while addresses 1 to 247 are given to individual Modbus devices.

- **Function Code:** specifies the message type.

The second byte in the frame structure of the Modbus RTU is the function code. The function code describes what the slave is required to do. Valid function codes are between 1 and 255. The slave uses the same function code as the request to answer it. Only when an error occurs in the system will the highest bit of the function code be set to '1'. Hence the master will know whether the message has been transmitted correctly or not.

Code	Function	Reference (Address)
01 (0x01)	Read the Status of the Coils (Readback DOs)	0xxxx
02 (0x02)	Read the Status of the Input(Reads DIs)	1xxxx
03 (0x03)	Read the Holding Registers (Readback AOs)	4xxxx
04 (0x04)	Read the Input Registers (Reads AIs)	3xxxx
05 (0x05)	Force a Single Coil (Writes DO)	0xxxx
06 (0x06)	Preset a Single Register (Writes AO)	4xxxx
15 (0x0F)	Force Multiple Coils (Writes DOs)	0xxxx
16 (0x10)	Preset Multiple Registers (Writes AOs)	4xxxx

➤ **Data Field:** is the data block.

Data is transmitted in 8-, 16- and 32-bit format. The data for 16-bit registers is transmitted in high-byte first format. For example: 0x0A0B ==> 0x0A, 0x0B. The data for 32-bit registers is transmitted as two 16-bit registers, and is low-word first. For example: 0x0A0B0C0D ==> 0x0C, 0x0D, 0x0A, 0x0B.

The data field of messages sent between a master and a slave contains additional information about the action to be taken by the master or any information requested by the slave. If the master does not require this information, the data field can be empty.

Reference (Address)	Description
0xxxx	<u>Read/Write Discrete Outputs or Coils.</u> A 0x reference address is used to output device data to a digital output channel.
1xxxx	<u>Read Discrete Inputs.</u> The ON/OFF status of a 1x reference address is controlled by the corresponding digital input channel.
3xxxx	<u>Read Input Registers.</u> A 3x reference register contains a 16-bit number received from an external source, e.g. an analog signal.
4xxxx	<u>Read/Write Output or Holding Registers.</u> A 4x register is used to store 16bits of numerical data (binary or decimal), or to send the data from the CPU to an output channel.

Note: For details regarding address mapping (Reference Number) depends on your slave device.

01(0x01) Read the Status of the Coils (Readback DOs)

This function code is used to read either the current status of the coils or the current digital output readback value.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x01
02-03	Starting DO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of Points (Channels)	2 Bytes	Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x01
02	Byte Count	1 Byte	Byte Count of the Response ($n = (Points+7)/8$)
03	Data	n Bytes	n= 1; Byte 03 = data bit 7 to 0 n= 2; Byte 04 = data bit 15 to 8 n= m; Byte m+2 = data bit (8m-1) to 8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x81
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details

02(0x02) Read the Status of the Input (Read DIs)

This function code is used to read the current digital input value.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x02
02-03	Starting DI Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of Points (Channels)	2 Bytes	Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x02
02	Byte Count	1 Byte	Byte Count of Response ($n = (\text{Points} + 7) / 8$)
03	Data	n Bytes	n= 1; Byte 03 = data bit 7 to 0 n= 2; Byte 04 = data bit 15 to 8 n= m; Byte m+2 = data bit (8m-1) to 8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x82
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details

03(0x03) Read the Holding Registers (Readback AOs)

This function code is used to readback either the current values in the holding registers or the analog output value.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x03
02-03	Starting AO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2 Bytes	Word Count Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x03
02	Byte Count	1 Byte	Byte Count of the Response (n=Points x 2 Bytes)
03~	Register Values	n Bytes	Register Values n= 2; Byte 03 = high byte Byte 04 = low byte n= m; Byte 03 = high byte Byte 04 = low byte Byte m+1 = high byte Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x83
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details

04(0x04) Read the Input Registers (Read AIs)

This function code is used to read either the input registers or the current analog input value.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x04
02-03	Starting AI Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2 Bytes	Word Count Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x04
02	Byte Count	1 Byte	Byte Count of the Response (n=Points x 2 Bytes)
03~	Register Values	n Bytes	Register Values n= 2; Byte 03 = high byte Byte 04 = low byte n= m; Byte 03 = high byte Byte 04 = low byte Byte m+1 = high byte Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x84
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details.

05(0x05) Force a Single Coil (Write DO)

This function code is used to set the status of a single coil or a single digital output value.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x05
02-03	DO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Output Value	2 Bytes	0xFF 00 sets the output to ON. 0x00 00 sets the output to OFF. All other values are invalid and will not affect the coil. Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x05
02-03	DO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Output Value	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x85
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details.

06(0x06) Preset a Single Register (Write AO)

This function code is used to set a specific holding register to store the configuration values.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x06
02-03	AO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Register Value	2 Bytes	Register Value Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x06
02-03	AO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Register Value	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x86
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details.

15(0x0F) Force Multiple Coils (Write DOs)

This function code is used to set multiple coils status or write multiple digital output values.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x0F
02-03	Starting DO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of Output Channels (Points)	2 Bytes	Byte 04 = high byte Byte 05 = low byte
06	Byte count	1 Byte	$n = (Points + 7) / 8$
07	Output value	n Bytes	A bit corresponds to a channel. A value of 1 for a bit denotes that the channel is ON, while a value of 0 denotes that the channel is OFF. n = 1; Byte 07 = data bit 7 to 0 n = 2; Byte 08 = data bit 15 to 8 n = m; Byte m+6 = data bit (8m-1) to 8 (m-1)

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x0F
02-03	Starting DO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Number of Output Channels (Points)	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x8F
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details.

16(0x10) Preset Multiple Registers (Write AOs)

This function code is used to set multiple holding registers that are used to store the configuration values.

[Request]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x10
02-03	Starting AO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2 Bytes	Word Count. Byte 04 = high byte Byte 05 = low byte
06	Byte Count	1 Byte	n = Points x 2 Bytes
07	Register Values	n Bytes	Register Values. n= 2; Byte 03 = high byte Byte 04 = low byte n= m; Byte 03 = high byte Byte 04 = low byte Byte m+1 = high byte Byte m+2 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x10
02-03	Starting AO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Number of 16-bit Registers (Channels)	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1 Byte	1 to 247
01	Function Code	1 Byte	0x90
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details.

7.2 Exception Codes

If an exception occurs during Modbus communication, the slave device will return an Exception Code in the response message. The following is an explanation of the Exception Codes:

➤ Exception Codes:

Code	Name and Description
0x01	ILLEGAL FUNCTION
	Indicates that the function code received in the query is not an allowable action for the slave. If a Poll Program Complete command was issued, this code indicates that no program function preceded it.
0x02	ILLEGAL DATA ADDRESS
	Indicates that the data address received in the query is not an allowable address for the slave.
0x03	ILLEGAL DATA VALUE
	Indicates that a value contained in the query data field is not an allowable value for the slave.
0x04	SLAVE DEVICE FAILURE
	Indicates that an unrecoverable error occurred while the slave was attempting to perform the requested action.
0x05	ACKNOWLEDGE
	Indicates that the slave has accepted the request and is processing it, but it will take an extended period of time to do so. This response is returned to prevent a timeout error from occurring in the master. The master can issue a Poll Program Complete message later to determine whether the processing is complete.
0x06	SLAVE DEVICE BUSY
	Indicates that the slave is engaged in processing a long-duration program command. The master should retransmit the message later when the slave is free.
0x07	NEGATIVE ACKNOWLEDGE
	Indicates that the extended file area failed to pass a consistency check, and the slave cannot perform the program function received in the query. This code is returned when a programming request using function code 13 or 14 decimal was unsuccessful. The master should request diagnostic or error information from the slave.
0x08	MEMORY PARITY ERROR
	Indicates that the slave attempted to read extended memory, but detected a parity error in the memory. The master can retransmit the request, but maintenance may be required on the slave device.

➤ **Defined Exception Codes for ECAT-2601:**

Code	Name and Description
0x0B	GATEWAY TARGET DEVICE FAILED TO RESPOND
	Timeout. The slave device does not respond within the timeout value, the ECAT-2601 will return this code.
0x4B	GATEWAY TARGET DATA FAILED TO RESPOND
	Timeout. The slave device is still sending data when timed out, the ECAT-2601 will return this code. Please use larger Slave Timeout value for the serial port of the ECAT-2601 module.
0x41	MODBUS PROTOCOL FORMAT ERROR
	The ECAT-2601 will return this code when slave response is invalid Modbus message.
0x42	WRONG DATA LENGTH
	The ECAT-2601 will return this code when ECAT-2601 received wrong data length. Please use larger Slave Timeout value for the serial port of the ECAT-2601 module.
0x43	CRC ERROR
	The ECAT-2601 will return this code when the CRC of the slave response is wrong.

Appendix A: Glossary

1. ARP (Address Resolution Protocol)

The Address Resolution Protocol (ARP) is a telecommunication protocol that is used to convert an IP address to a physical address, such as an Ethernet address.

Consider two machines A and B that share the same physical network. Each has an assigned IP address IP_A and IP_B , and a MAC address, MAC_A and MAC_B . The goal is to devise a low-level software application that hides the MAC addresses and allows higher-level programs to work only with the IP addresses. Ultimately, however, communication must be carried out by the physical networks using whatever MAC address scheme the hardware supplies.

Suppose machine A wants to send a packet to machine B across a physical network to which they are both attached, but A only has the Internet address for B, IP_B . The question arises: how does A map that address to the MAC address for B, MAC_B ?

ARP provides a method of dynamically mapping 32-bit IP address to the corresponding 48-bit MAC address. The term dynamic is used since the mapping is performed automatically and is normally not a concern for either the application user or the system administrator.

2. Clients and Servers

The client-server paradigm uses the direction of initiation to categorize whether a program is a client or server. In general, an application that initiates peer-to-peer communication is called a client. End users usually invoke client programs when they use network services.

By comparison, a server is any program that waits for incoming requests from a client program. The server receives a request from a client, performs the necessary action and returns the result to the client.

3. Ethernet

The term Ethernet generally refers to a standard published in 1982 by Digital Equipment Corp., Intel Corp. and Xerox Corp. Ethernet is the most popular physical layer Local Area Network (LAN) technology in use today.

4. Firmware

Firmware is an embedded software program or set of instructions programmed on a device that provides the necessary instructions for how the device communicated with other computer hardware, and is located or stored in a semi-permanent storage area, e.g., ROM, EEPROM, or Flash memory. Firmware can often be updated by downloading a file from the manufacturer's web site or FTP.

5. Gateway

Computers that interconnect two networks and pass packets from one to the other are called Internet Gateways or Internet Routers. Gateways route packets that are based on the destination network, rather than the destination host.

6. ICMP (Internet Control Message Protocol)

ICMP provides a method of communicating between the Internet Protocol software on one machine and the corresponding software on another. It allows a gateway to send error or control messages to other gateways, or allows a host to diagnose problems with the network communication.

7. Internet

Physically, the Internet is a collection of packet switching networks interconnected by gateways that together with the TCP/IP protocol, allows them to perform logically as a single, large and virtual network. The Internet recognizes hosts using 32-bit IP address.

8. IP (Internet Protocol) Address

Each interface on the Internet must have a unique IP address (also called an Internet address). These addresses are 32-bit numbers, and are normally written as four decimal numbers, one for each byte of the address for example “192.168.41.1”. This is called dotted-decimal notation.

9. MAC (Media Access Control) Address

To allow a computer to determine which packets are meant for it, each device attached to an Ethernet network is assigned a 48-bit integer known as its MAC address (also called the Ethernet address, the hardware address or the physical address). A MAC address is normally written as eight hexadecimal numbers, for example “00:71:88: AF: 12:3e:0f:01”. Ethernet hardware manufacturers purchase blocks of MAC addresses and assign them in sequence as they manufacture Ethernet interface hardware. Thus, no two hardware interfaces can have the same MAC address.

10. Packet

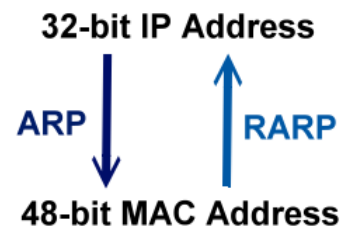
A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

11. Ping

Ping is a network administration utility used to test the whether a host on an Internet network is active, and to measure the round-trip time for messages sent from the originating host to a destination computer. Ping operates by sending an ICMP echo request message to a host, expecting an ICMP echo reply to be returned. Normally, if a host cannot be pinged, Telnet or FTP cannot be used to connect to the host. Conversely, if Telnet or FTP cannot be used to connect to a host, Ping is often the starting point to determine the nature of the problem.

12. RARP (Reverse Address Resolution Protocol)

RARP provides a method of dynamically mapping 48-bit MAC address to the corresponding 32-bit IP address. RARP has now been replaced by the Bootstrap Protocol (BOOTP) and the modern Dynamic Host Configuration Protocol (DHCP).



13. Socket

Each TCP segment contains a source and destination port number that can be used to identify the sending and receiving application. These two values, along with the source and destination IP addresses in the IP header, uniquely identify each connection. The combination of an IP address and a port number is called a socket.

14. Subnet Mask

A Subnet mask, often simply called the “Mask”, is a 32-bit number that masks an IP address, and divides the IP address into the network address and the host address. Given its own IP address and its subnet mask, a host can determine whether a TCP/IP packet is destined for a host that is (1) on its own subnet, or (2) on a different network. If (1), the packet will be delivered directly; otherwise it, will be delivered via a gateway or a router.

15. TCP (Transmission Control Protocol)

TCP is a set of rules used in combination with the Internet Protocol to send data in the form of message units between computers over the Internet. TCP provides a reliable flow of data between two hosts and is associated with tasks such as dividing the data passed to it from an application into appropriately sized chunks for the network layer below, acknowledging received packets, setting timeouts to make certain that the other end acknowledges packets that are sent, and so on.

16. TCP/IP

The Transmission Control Protocol (TCP) and the Internet Protocol (IP) are standard network protocols that are almost always implemented and used together in a formation are known as TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

17. UDP (User Datagram Protocol)

UDP is an internet protocol that provides a much simpler service to the application layer as it only sends packets of data from one host to another, but there is no guarantee that the packets will reach the destination host. UDP is suitable for purposes where error checking and correction is either not necessary or is performed in the application.

Appendix B: Actual Baud Rate Measurement

Ideal Baud Rate (bps)	Actual Baud Rate (bps)	Error
300	298.48	0.51%
600	597.04	0.49%
1200	1197.6	0.20%
2400	2395.2	0.20%
4800	4790.4	0.20%
9600	9568.0	0.33%
14400	14392	0.05%
19200	19136	0.33%
38400	38464	0.17%
57600	57552	0.08%
115200	114960	0.21%
128000	128240	0.18%
230400	229920	0.21%
250000	250000	0.00%
256000	256400	0.15%
460800	459760	0.22%
921600	921600	0.00%

Note:

Recommended max baud rate is 115200 bps or below.

Because the loading of the module, we don't guarantee a proper operation if using a larger baud rate (over 115200 bps).

Appendix C: Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
1.0	Jan. 2025	Initial issue