ECAT-261x EtherCAT to Modbus RTU Gateway Module

User Manual

English Ver. 1.1, Jan. 2019

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SUPPORT

This manual relates to the following modules: ECAT-2060 and ECAT-2611



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Packing List

The shipping package contains the following items:



ECAT-2610/2611 x 1



Quick Start x 1



CA-0915 Cable x 1

NOTE	If any of these items is missing or damaged, contact your local distributor for more information. Keep the shipping materials and overall package in case you need to return the module in the future.

More Information

- Manual/Quick Start/Datasheet:
http://ftp.icpdas.com/pub/cd/fieldbus_cd/ethercat/slave/ecat-2000/manual/

- XML Device Description (ESI):
http://ftp.icpdas.com/pub/cd/fieldbus_cd/ethercat/slave/ecat-2000/software/

- FAQ:
http://www.icpdas.com/root/support/faq/faq.html

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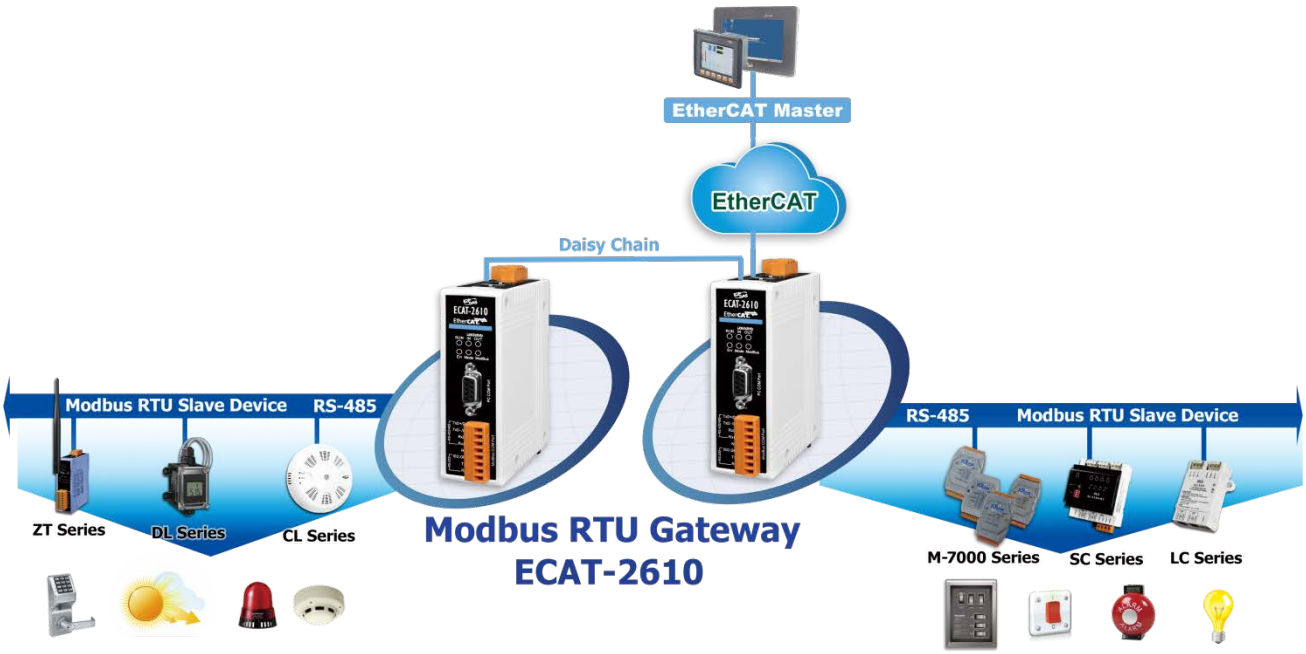
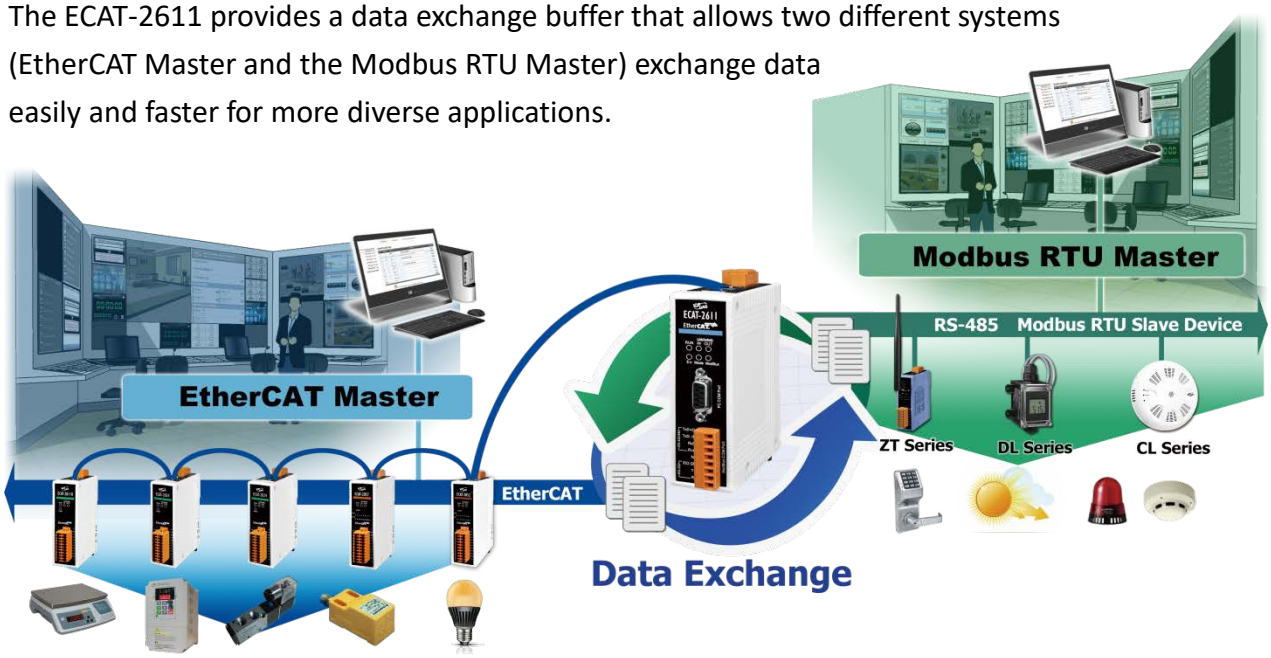
1. Introduction

The ECAT-2610/2611 Communicator is a proven and trusted protocol converter gateway module that can be used to connect non-networked industrial devices and equipment to an EtherCAT system.

The ECAT-2610 allows serial-based RS-232/422/485 industrial devices and equipment to be easily integrated into an EtherCAT control system without the need to make any changes to the device. Simply connect the ECAT-2610 and configure the device and you are ready to go.



The ECAT-2611 provides a data exchange buffer that allows two different systems (EtherCAT Master and the Modbus RTU Master) exchange data easily and faster for more diverse applications.



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1.1 Features

- Powerful MCU that efficiently manages network traffic.
- Two RJ-45 bus EtherCAT connectors.
- Allows system integration engineers to retrofit older automation devices into modern EtherCAT communication structures.
- Requires no adjustments to be made to the hardware or software on the connected device.
- Compatible with all PLCs that provide EtherCAT support.
- Performs complete serial protocol conversion, no PLC function blocks required.
- Supports a maximum of 256 WORD of input data and 256 WORD of output data.
- Supports a maximum Baud Rate of 115200 bps.

ECAT-2610

- Enable serial-based RS-232/422/485 devices to be integrated into an EtherCAT network via an EtherCAT interface.
- Supports serial port interface.
  - Supports Modbus RTU (Master) protocol
  - Supports RS-232/422/485 Port
  - Supports Maximum Baud Rate 115200 bps

ECAT-2611

- Transfer of I/O data between two networks.
- Supports serial port interface.
  - Supports Modbus RTU (Slave) protocol
  - Supports RS-232/422/485 Port
  - Supports Maximum Baud Rate 115200 bps
  - Supports Modbus Function code 03, 04, 06 and 16

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1.2 Block Diagram

The following is the block diagram for the ECAT-2610/2611 module:

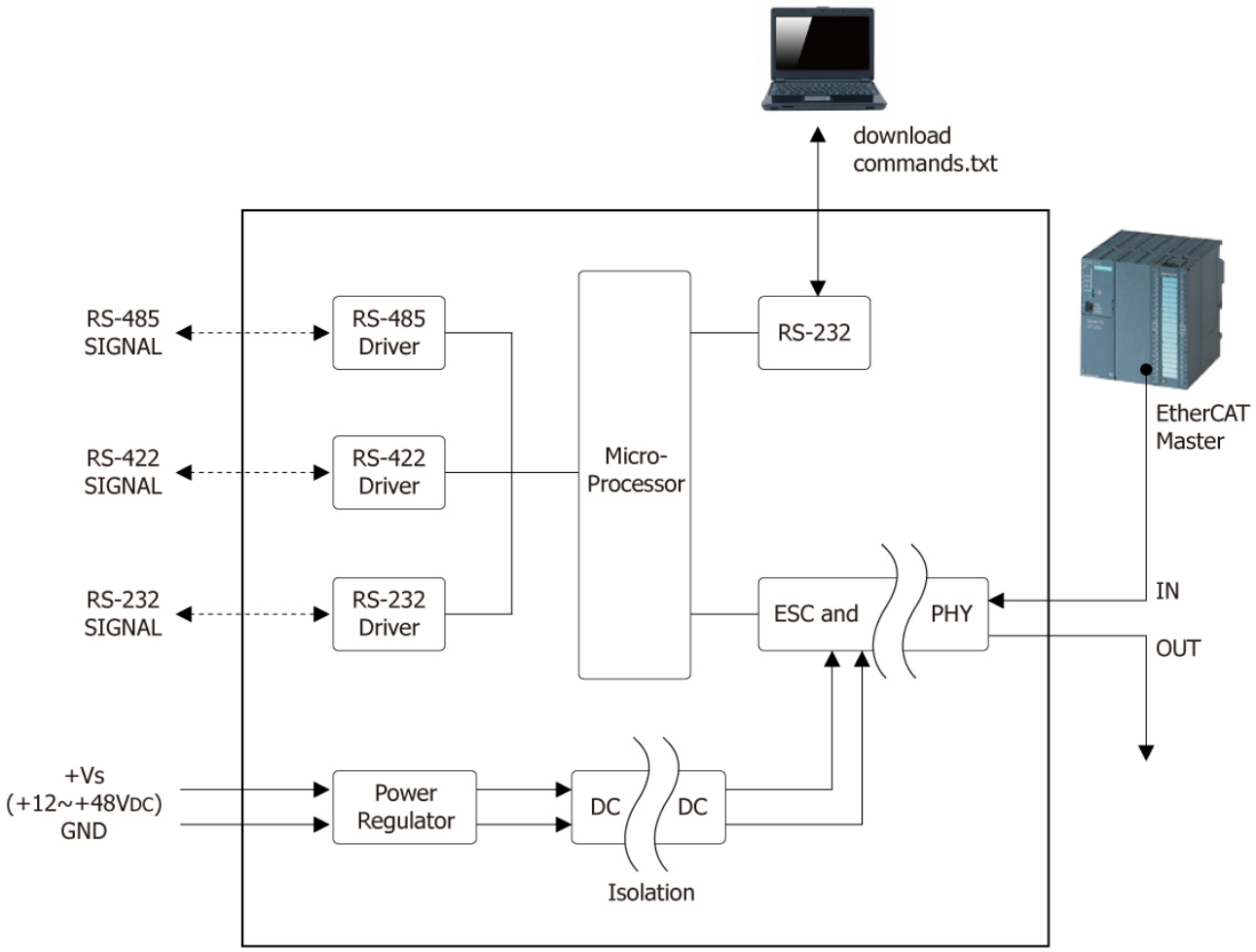

Figure 1-2 Block Diagram for the ECAT-2610/2611

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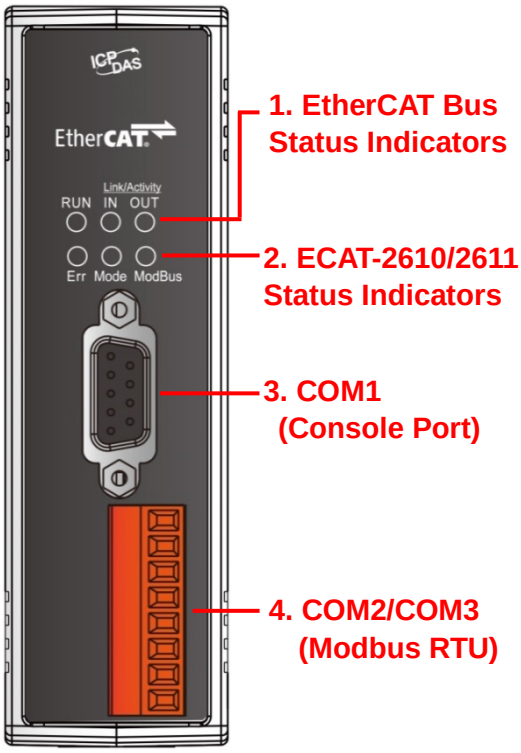
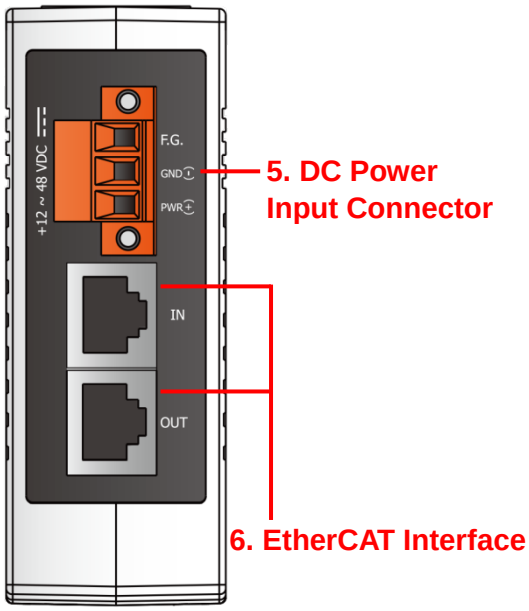
2. Hardware Information

2.1 Appearance

Front Panel



Top Panel



1. EtherCAT Bus Status Indicators

Notation	Color	State	Description
RUN	Red	OFF	The device is in the INIT state
		Blinking	The device is in the PRE-OPETARIONAL state
		Single Flash	The device is in the SAFE-OPERATIONAL state
		ON	The device is in the OPETARIONAL state
Link Activity IN/OUT	Green	OFF	No connection established
		Flashing	Connection established and there is network activity
		ON	Connection established but there is not network activity

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2. ECAT-2610/2611 Status Indicators

Notation	Color	State	Description
Err	Red	OFF	Normal operation
		Blinking	An error has occurred
Mode	Green	Flashing once every 0.3 seconds	DC enabled
		Flashing once every 1 seconds	Normal operation
		Flashing once every 2 seconds	No configuration file or there is an error in the configuration data
		Flashing once every 4 seconds	Configuration CRC error
Modbus	Green	OFF	No Modbus Command
		Flashing once every 1 seconds	Normal operation

3. COM1 (Console Port, DB9-Male)

COM1 is the Configuration/Diagnostic Port. For more detailed information related to the pin assignments for the Console Port, refer to Section 2.3 “Pin Assignments”.

4. COM2/COM3 (Modbus RTU)

COM2 and COM3 are used to connect to Modbus RTU devices. For more detailed information related to the pin assignments for the Modbus COM Ports, refer to Section 2.3 “Pin Assignments”.

5. DC Power Input Connector

The **“PWR(+)”** and **“GND(-)”** pins are used to connect the power supply and is common to all types of ECAT-2610/2611 module. The valid power voltage range is from **+12 to +48 V_{DC}**.

“F.G.” (Frame Ground): Electronic circuits are constantly vulnerable to Electrostatic Discharge (ESD), which becomes worse in a continental climate area. The ECAT-2610/2611 module features a new design for the frame ground, which provides a path that bypasses ESD, resulting in enhanced ESD protection capabilities and ensuring that the module is more reliable.

6. EtherCAT Interface

ECAT-2610/2611 module is equipped with two RJ-45 EtherCAT Interface ports. The **IN** port is the EtherCAT signal input port that can be connected to either the EtherCAT Master or the signal output from the previous EtherCAT slave module. The **OUT** port is the EtherCAT signal output that is connected to the EtherCAT signal input on the next EtherCAT slave module.

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2.2 Specification

Model		ECAT-2610	ECAT-2611
Protocol			
Protocol		EtherCAT	
RJ-45 Port		RJ-45 x 1 Max. distance between stations: 100 m (100BASE-TX) Data Transfer Medium: Ethernet/EtherCAT Cable (Min.CAT 5e)	
Communication			
Protocol		Modbus RTU (Master)	Modbus RTU (Slave)
Serial Interface	RS-232	Note that the RS-232, RS-422 and RS-485 interfaces cannot be used simultaneously ● TxD, RxD, GND ● TxD+, TxD-, RxD+, RxD- ● Data+, Data-	
	RS-422		
	RS-485		
Power Input			
Redundant Input Range		+12 ~ +48 V_{DC}	
Power Consumption		0.1 A @ 24 V_{DC}	
Protection		Power reverse polarity protection	
Connector		3-pin Removable Terminal Block (5.08 mm)	
Mechanical			
Dimensions (H x W x D)		110 mm x 90 mm x 33 mm	
Installation		DIN-Rail Mounting	
Environment			
Operating Temperature		-25 to +75°C	
Storage Temperature		-30 to +80°C	
Relative Humidity		10 to 90% RH, Non-condensing	

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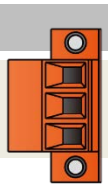
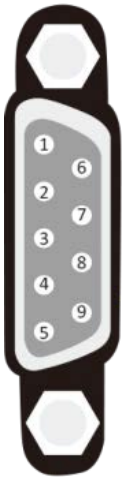
2.3 Pin Assignments

EtherCAT Interface

Pin Assignment	
F.G. GND(-) PWR(+)	
IN	
OUT	

COM1 (Console Port)

Pin Assignment	Terminal No.
-	01
RxD	02
TxD	03
-	04
GND	05



Terminal No.	Pin Assignment
06	-
07	-
08	-
09	-

COM2/COM3 (Modbus RTU)

Terminal No.	Pin Assignment
COM2	TxD+/D+
	TxD-/D-
	RxD+
	RxD-
	N/A
COM3	ISO.GND
	TxD
	RxD



NOTE

Note that the RS-232, RS-422 and RS-485 interfaces cannot be used simultaneously.

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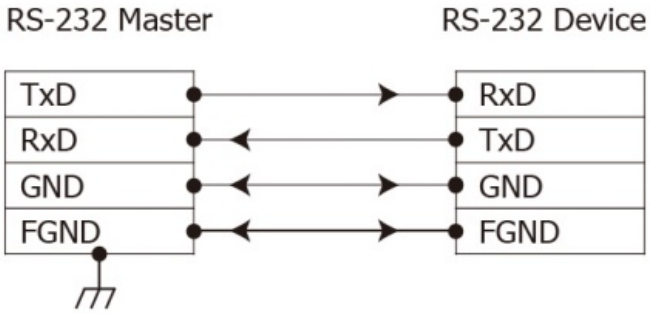
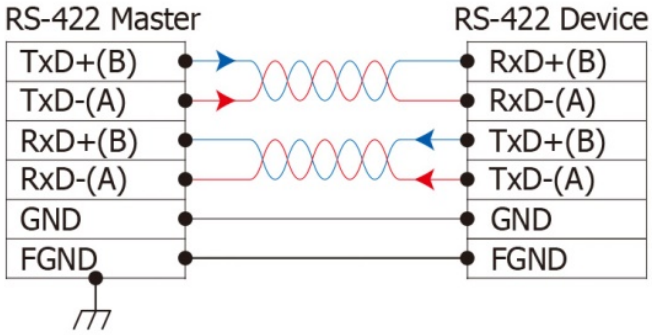
2.4 Wiring Connections

3-wire RS-232 Wiring



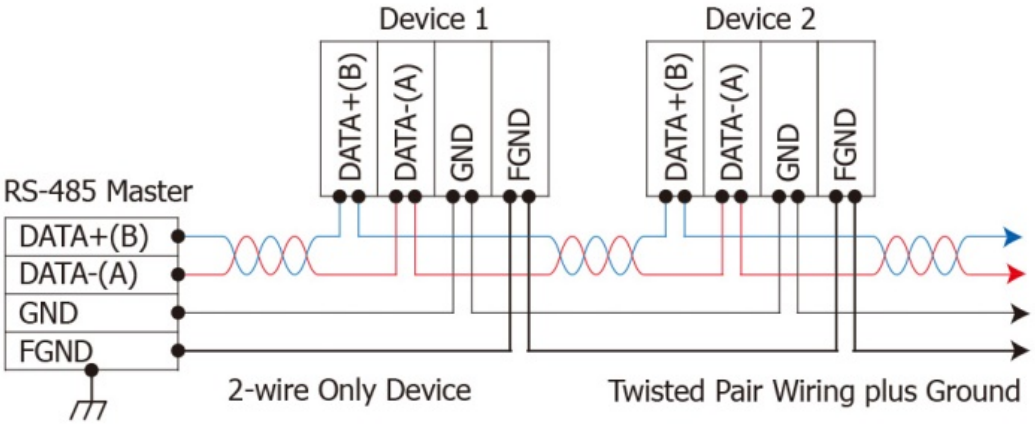
4-wire RS-422 Wiring



NOTE

1. Typically, all the signal grounds on RS-422/485 devices need to be connected together in order to reduce the common-mode voltage between devices.
2. Twisted-pair cable must be used for the DATA+/- wires.
3. Both ends of the twisted-pair cable may require a termination resistor connected across the two wires (DATA+ and DATA-). Typically 120 Ω resistors are used.
4. The Data+ and B pins in the figure are positive-voltage pins, and the Data- and A pins are negative-voltage pins. The B/A pins may be defined differently depending on the device, so ensure that you please check it first.

2-wire RS-485 Wiring



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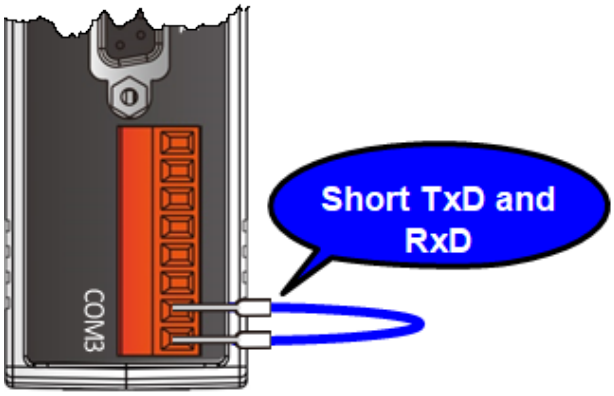
2.5 Init/Normal Operating Mode

The ECAT-2610/2611 module provides two operating modes that can be selected, each of which will be described in more detail below.

➢ Init Mode

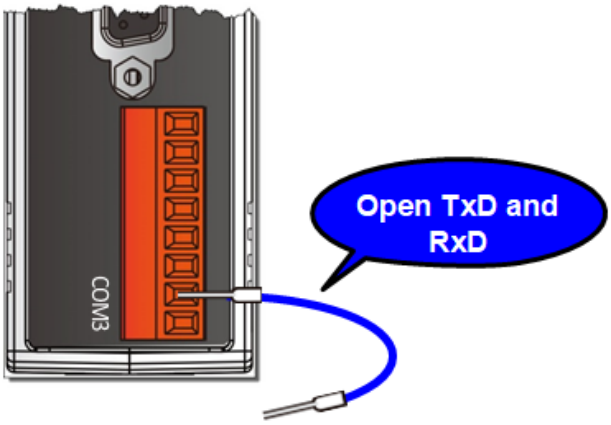


Note that **Init Mode** should only be selected when troubleshooting.

❶ Power off the ECAT-2610/2611 module, and connect the device to the Host PC using the CA-0915 cable.
❷ **Short the TxD and RxD pins** on the COM3 port to enable **Init mode**.
❸ Launch the 7188ECAT utility on the Host PC and then power on the ECAT-2610/2611 module to verify that **Init mode** has been enabled.
❹ **Disconnect the wire from the TxD and RxD pins** on the COM3 port to return the module to **Normal mode**.
❺ Erase the EEPROM and upload the new configuration file to the EEPROM.
❻ Reboot the ECAT-2610/2611 module to operate in **Normal mode**.

For more detailed information about how to perform the above procedure, refer to Chapter 7 "Upload Commands.txt Operation".

➢ Normal Mode



Normal Mode is the default operating mode and should be used in the majority of cases.

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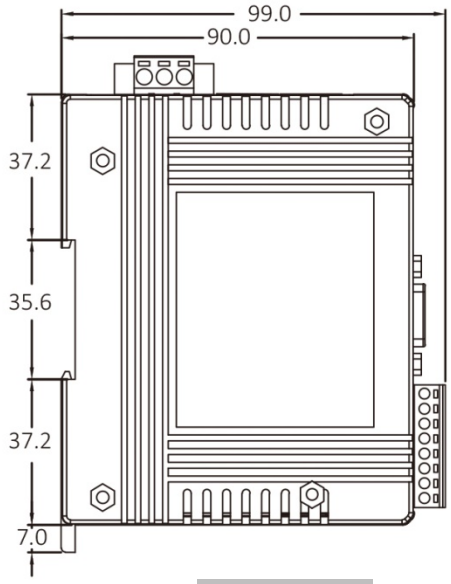
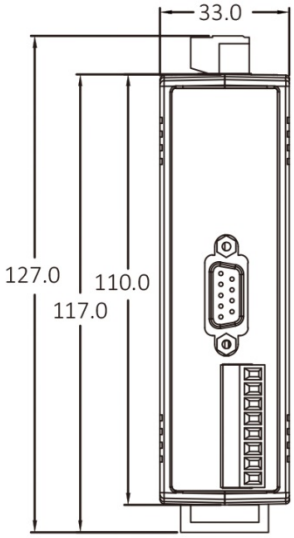
2.6 Dimensions

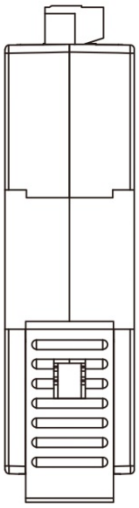
The following diagrams illustrate the dimensions of the ECAT-2610/2611 and can be used as a reference when defining the specifications for any custom enclosures. All dimensions are in millimeters.



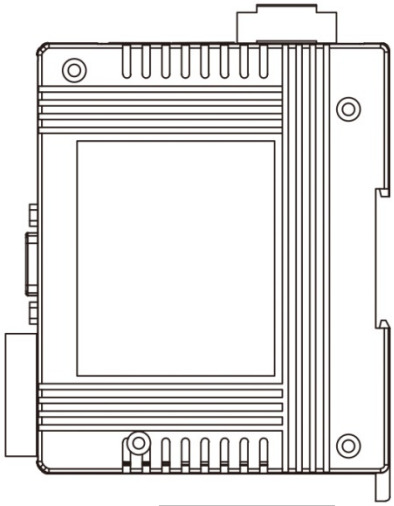
Left Side



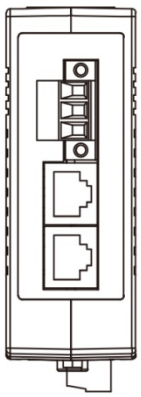
Front



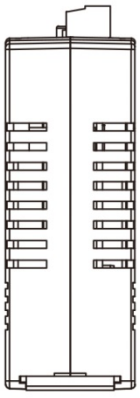
Rear



Right Side



Top



Bottom

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3. Getting Started

This chapter provides detailed information about how to start using the ECAT-2610/2611 module, including details related to the factory default settings and connecting the power supply, etc. which is used to confirm that the device operating correctly.

3.1 Factory Default Settings

The following is an overview of the factory default settings for the ECAT-2610/2611 module:

Item	Default Settings	Reference
InTxPDO	10	Refer to Chapter 9 "Object Description and Parameterization" for more details regarding the InTxPDO and OutRxPDO settings.
OutRxPDO	10	
Run LED	Red	Refer to Section 2.1 "Appearance" for more details regarding the LED indicators.
IN LED	Flashing Green	
Mode LED	Flashing Green	
NetID (for ECAT-2611)	1	Refer to Section 4.2 "Configuring and Uploading" for more details regarding the Baud Rate, Data Format and Command settings of ECAT-2610. Refer to Section 5.1 "Configuring and Uploading" for more details regarding the NetID, Baud Rate and Data Format settings of ECAT-2611.
Baud Rate	115200	
Parity	N (None)	
Stop Bit	1	
Command: Read system status (for ECAT-2610)	FF 03 00 00 00 02	
Command: Delay 1 sec (for ECAT-2610)	FF 06 00 00 00 64	
Command: Delay 0.1 sec (for ECAT-2610)	FF 06 00 01 00 64	
InTxPDO[00] = 2610 SYS0/2611SYS0	Sys_low = 0x0000	Refer to Section 3.3.1 "Module Status and Error Mode" for more details regarding the Sys_low and Sys_hi settings.
InTxPDO[01] = 2610 SYS1/2611SYS1	Sys_hi = 0xA000	

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3.2 Connecting the Power and the Host PC

Step 1 Connect the IN port on the ECAT-2610/2611 to the RJ-45 Ethernet port on the Host PC.

Ensure that the network settings on the Host PC have been correctly configured and the connection is functioning normally. Ensure that the Windows or 3rd-party firewall or any Anti-virus software is properly configured to allow incoming connections, or temporarily disable these functions.

⚠NOTE

Attaching an ESC (EtherCAT Slave Controller) directly to an office network will result in network flooding, since the ESC will reflect any frame – especially broadcast frames – back into the network (broadcast storm).

❶ Connect the Host device to the **IN Port** on the ECAT-2610/2611.
❷ Connect the **PWR(+)** pin on the ECAT-2610/2611 to the positive terminal on a **+12 ~ +48 V_{DC}** power supply, and connect the **GND(-)** pin on the ECAT-2610/2611 to the **negative terminal**.

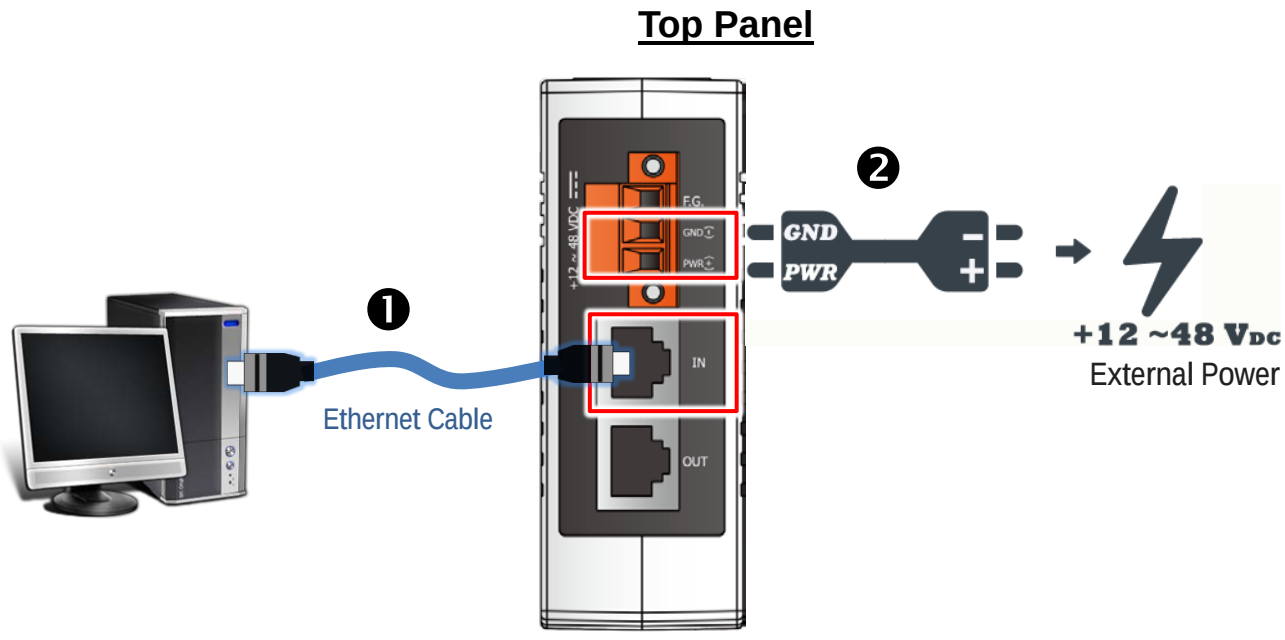

Figure 3-2.1

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Step 2 Verify that the LEDs indicators on the ECAT-2610/2611 are illuminated as illustrated below:

❶ Once the power is connected, the **"IN"** and **"Mode"** LEDs should be flash in green.
❷ Once the ECAT-2610/2611 connected to EtherCAT Master, the **"Run"** LED should be illuminated in red.

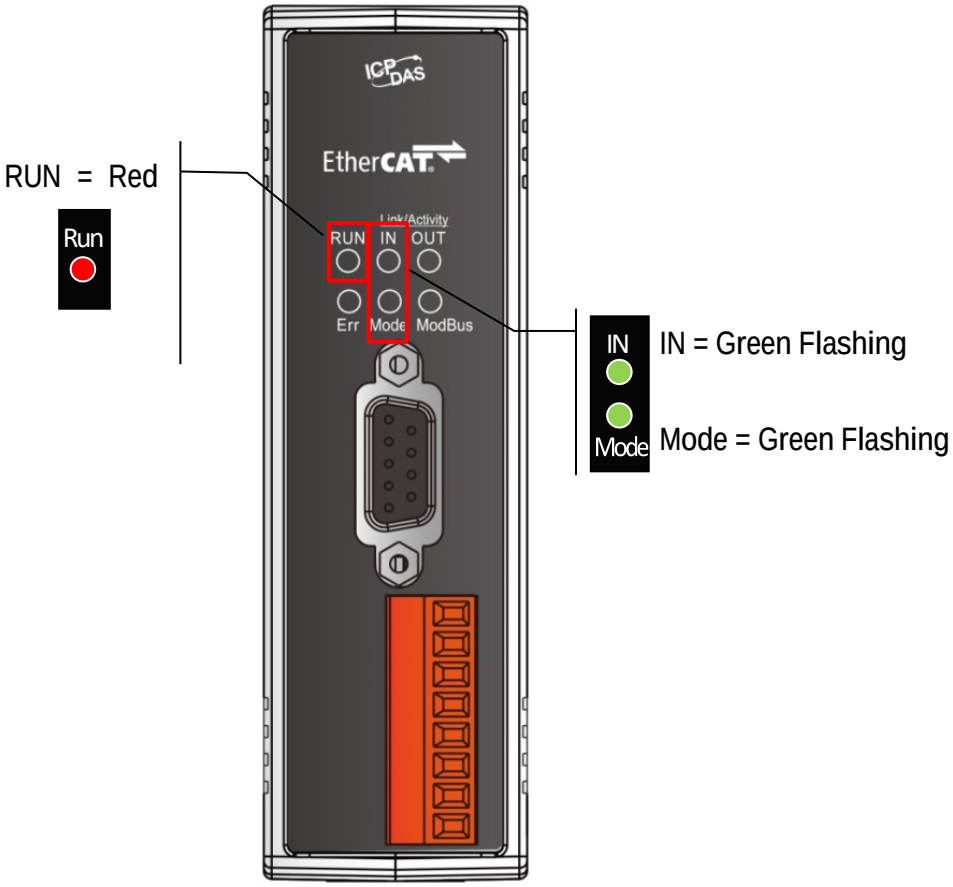

Figure 3-2.2

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3.3 Configuration and Operation

Before following the steps below, you must first install the EtherCAT Master software (e.g., Beckhoff TwinCAT). In this example, we will use **Beckhoff TwinCAT 2.x** to configuring and operating the ECAT-2610/2611, and **Beckhoff TwinCAT 2.X** is the most commonly used EtherCAT Master Software.

NOTE

Install the latest XML device description(ESI)

Ensure that the latest XML device description has been installed in the appropriate TwinCAT folder. The ESI file can be downloaded from the ICP DAS web site (http://ftp.icpdas.com/pub/cd/fieldbus_cd/ethercat/slave/ecat-2000/software/), and should be installed according to the installation instructions.

Step 1 Install the ESI file

Copy the **"ICPDAS ECAT-2610.xml"** or **"ICPDAS ECAT-2611.xml"** file to the **appropriate Master Tools installation folder**, as indicated in the table below.

Software	Default Path
Beckhoff EtherCAT Configuration	C:\EtherCAT Configurator\EtherCAT
Beckhoff TwinCAT 3.X	C:\TwinCAT\3.x\Config\Io\EtherCAT
Beckhoff TwinCAT 2.X	C:\TwinCAT\Io\EtherCAT

Step 2 Automatic Scanning

- The EtherCAT system must be in a safe, de-energized state before the ECAT-2610/2611 is connected to the EtherCAT network!
- Switch on the operating power supply, launch the TwinCAT System Manager (Config mode), and scan in the devices, as illustrated in the image below. Click the **"OK"** button for all dialogs when requested, ensuring that the configuration is set to **"FreeRun"** mode.

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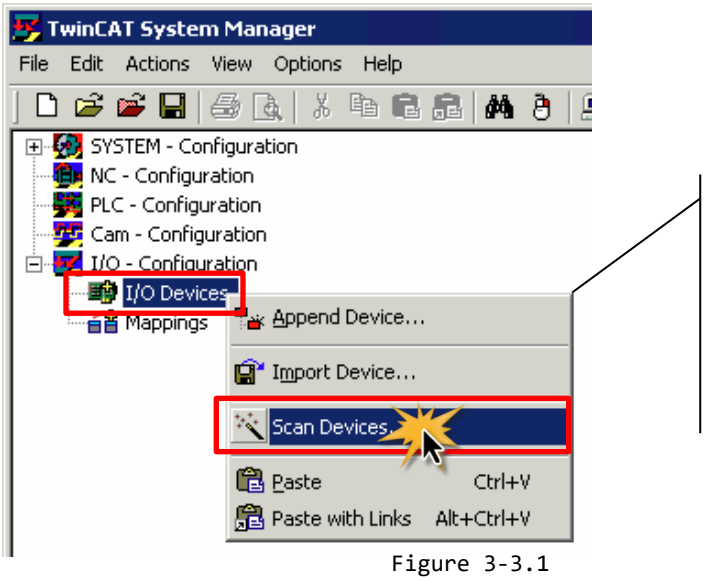

Figure 3-3.1

Scan the configuration by right-clicking the **"I/O Devices"** item in the left-hand pane of the TwinCAT System Manager and selecting the **"Scan Devices…"** option.

Step 3 Verify that the status of 2610/2611SYS1 is 0xA000

❶ In the left-hand pane of the TwinCAT System Manager, click the entry for the EtherCAT device you wish to configure. Click the **"TxPDO 0x00-0x7F"** entry in the right-hand pane to retrieve the current configuration settings.

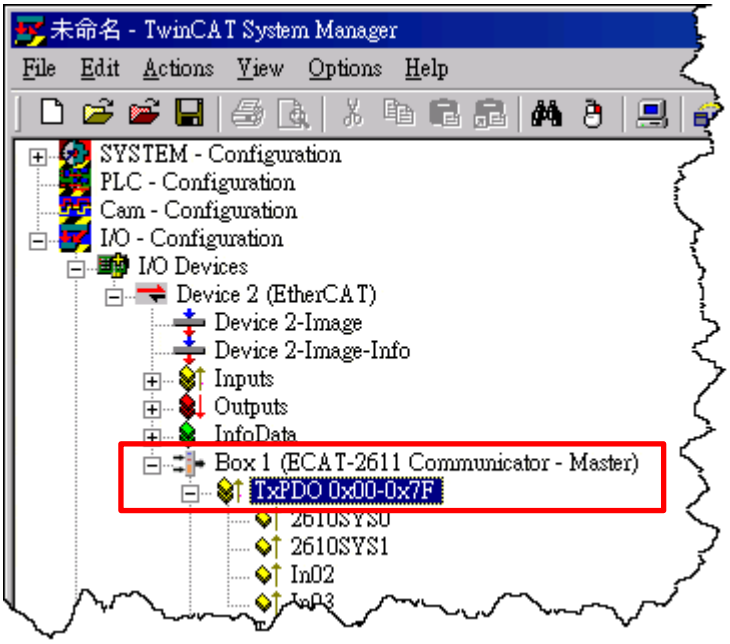

Figure 3-3.2

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❷ In the right-hand pane of the TwinCAT System Manager window, check that the value for **"2610/2611SYS1 is 0xA000"**.

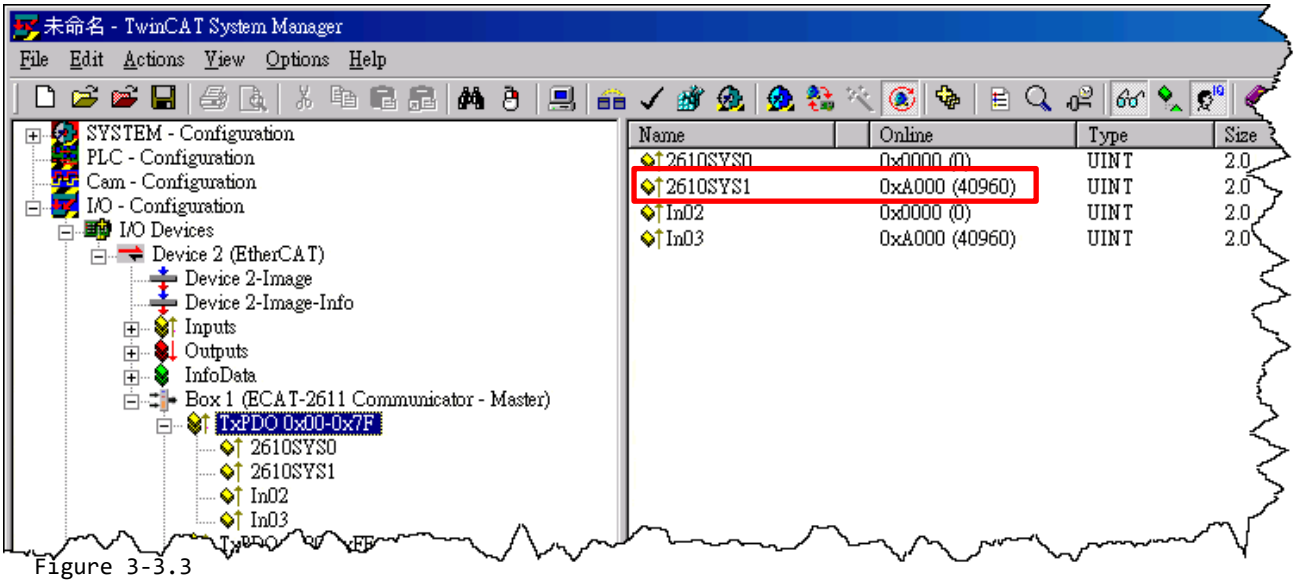

Figure 3-3.3

NOTE

For more detailed information related to the status settings for the ECAT-2610/2611, refer to Section 3.3.1 "Module Status and Error Mode".

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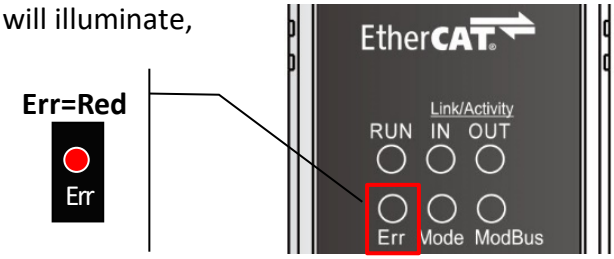
3.3.1 Module Status and Error Mode

The ECAT-2610/2611 will read and verify the configuration data file (commands.txt) from the EEPROM once power is supplied to the ECAT-2610/2611. If an error is detected, the ECAT-2610/2611 will switch to the error mode, the details of which are described below.

NOTE: For detailed information related to the configuration data file (commands.txt), refer to manually configure and upload of Sections A3 and A4.

If an error occurs, the **Err LED** indicator will illuminate, as illustrated below:



To determine the source of the error, check the values of the Baud Rate, Data Format parameters and Modbus command, etc., that are found in the **InTxPDO[00] and InTxPDO[01]** results, the as indicated below.

➢ **(Read) Table 3-3.1: InTxPDO[00] = 2610 SYS0/2611SYS0 = Sys_low** values are defined as:

	ECAT-2610	ECAT-2611
Bit	Description	
15	N/A	
14	N/A	
13	N/A	
12	N/A	
11	InMax/OutMax Error	
10	CmdFun Error: Command Function Error, See Chapter 6 “Modbus Information”	
09	CmdLen Error: Command Length Error, See Chapter 6 “Modbus Information”	
08	CmdNum Error: Command Number Error, Valid Range: 0 to 300 (Max.)	
07	Read EEP CRC Error	
06	Address Error	
05	Delay Value Error: Valid Range: 0 to 255 ms	
04	Timeout Value Error: Valid Range: 0 to 255 ms	
03	Stop_bit Error: Valid Values: 1, 2	
02	Parity_bit Error: Valid Values: N (None), E (EVEN), O (ODD)	
01	Baudrate Error: Valid Values: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	
00	Init_pin is short: Enter the Debug Mode, See Chapter 7 “Upload Commands.txt Operation”	

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➢ **(Read) Table 3-3.2: InTxPDO[01] = 2610 SYS1/2611SYS1 = Sys_hi** values are defined as:

	ECAT-2610	ECAT-2611
Bit	Description	
15	Exec Baud Rate 3: Valid values refer to following table 3-3.3	1
14	Exec Baud Rate 2: Valid values refer to following table 3-3.3	N/A
13	Exec Baud Rate 1: Valid values refer to following table 3-3.3	N/A
12	Exec Baud Rate 0: Valid values refer to following table 3-3.3	N/A
11	Exec Even Parity: Valid Values: 0 (Not EVEN Parity), 1 (Is EVEN Parity)	N/A
10	Exec Odd Parity: Valid Values: 0 (Not ODD Parity), 1 (Is ODD Parity)	N/A
09	Exec Stop Bit: Valid Values: 0 (One Stop Bit), 1 (Two Stop Bit)	N/A
08	Exec Default = 115200 + N81	N/A
07	N/A	N/A
06	N/A	N/A
05	Exec Ext_Sync	N/A
04	Exec CRC Error	
03	Exec return FC (Function Code) Error	
02	Exec return Net_ID Error	
01	Exec with init value	
00	Exec Modbus Timeout	

➢ **Table 3-3.3: Baud Rate** Settings are defined as:

Bit3	Bit2	Bit1	Bit0	Baud Rate
0	0	0	0	Reserved
0	0	0	1	Reserved
0	0	1	0	Reserved
0	0	1	1	1200
0	1	0	0	2400
0	1	0	1	4800
0	1	1	0	9600
0	1	1	1	19200
1	0	0	0	38400
1	0	0	1	57600
1	0	1	0	115200
1	0	1	1	230400
1	1	0	0	460800
1	1	0	1	921600
1	1	1	0	Reserved
1	1	1	1	Reserved

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The **OutRxPDO[00]** and **OutRxPDO [01]** provides system settings for the ECAT-2610/2611 (e.g., No CRC check, clear sys_low and sys_hi… etc.) , the as indicated below.

- **(Write) Table 3-3.4: OutRxPDO[00] = 2610/2611CTL0** and **OutRxPDO[01] = 2610/2611CTL1** values are defined as:

	ECAT-2610	ECAT-2611	ECAT-2610	ECAT-2611
Bit	OutRxPDO[00]		OutRxPDO[01]	
15	N/A		N/A	
14	N/A		N/A	
13	N/A		N/A	
12	N/A		N/A	
11	N/A		N/A	
10	N/A		N/A	
09	N/A		N/A	
08	N/A		N/A	
07	N/A		N/A	
06	N/A		N/A	
05	Start the Ext_Sync operation when High Stop the Ext_Sync operation when Low	N/A	N/A	
04	Enable the Ext_Sync mechanism when High	N/A	N/A	
03	Command TimeOut No Re-send		N/A	
02	No CRC Check		N/A	
01	Clear Sys_low, Sys_hi		N/A	
00	Initial Ready		N/A	

NOTE

The EEPROM is designed to store data that is not changed frequently. It is not suitable for frequent access a large amount of data, and the erase/write cycle is limited, so it should not be changed frequently when testing that it will easily cause damage to the module.

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4. Modbus RTU Device Setup

NOTE

Before beginning the **"Modbus RTU Device Setup"** process, ensure that your **ECAT-2610 module** is operating correctly, refer to Chapter 3 "Getting Started" for more detailed information.

Here, the M-7050D module is used as an example. For other Modbus RTU devices, refer to the Quick Start Guide or User Manual for that specific Modbus RTU device.

This chapter provides a simple overview of how to configure the basic settings for a Modbus RTU slave device, including the Modbus ID, the Baud Rate and the Data Format, etc., and how to modify the configuration data to control the Modbus RTU slave device.

The following illustration is a quick reference to the configuration and setup process that can be used when setting up your Modbus RTU slave device.

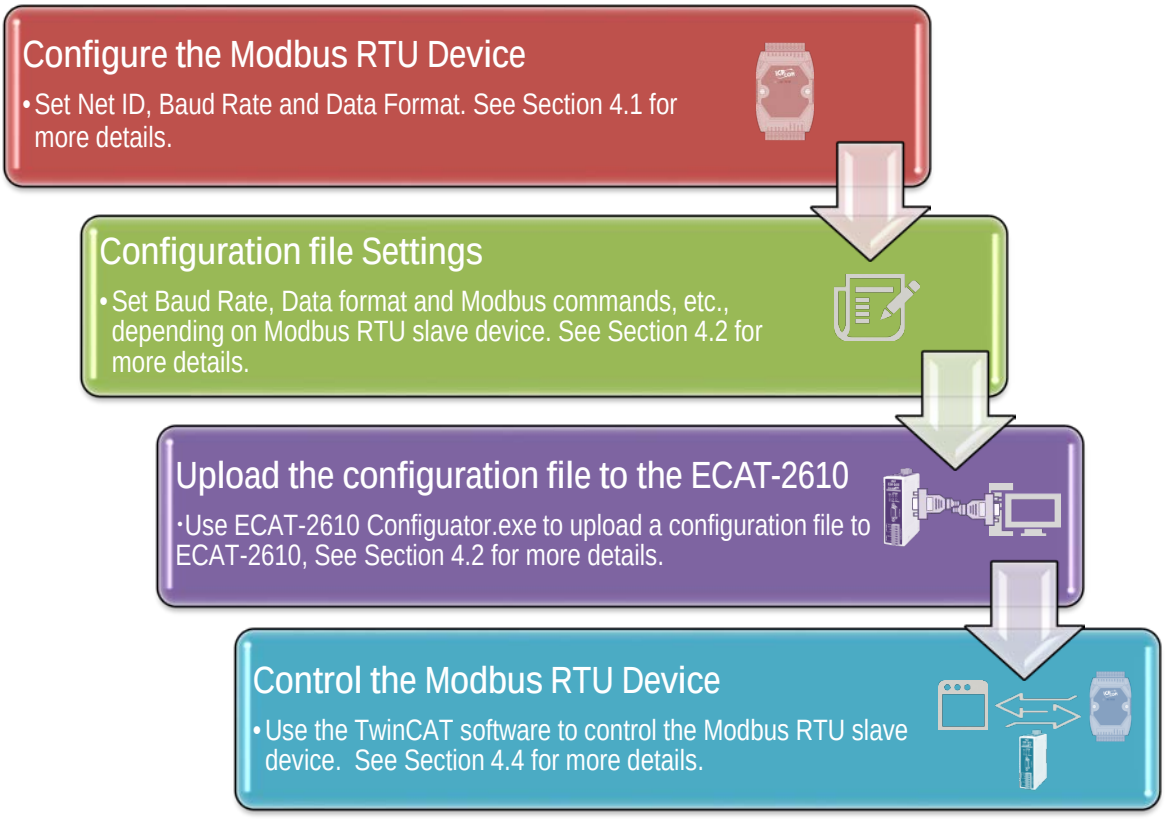

Figure 4.1: Modbus RTU Device Setup

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4.1 Configuring the Modbus RTU Device

The following configure method relates to an ICP DAS Modbus RTU slave device. If your device is a third party Modbus RTU slave device, refer to the Quick Start Guide or User Manual for that specific Modbus RTU slave device for details of how to set the Modbus ID (Net ID), Baud Rate and Data Format, etc.

Step 1 Connect the Modbus slave device (e.g., an M-7050D module, optional) to the Host PC

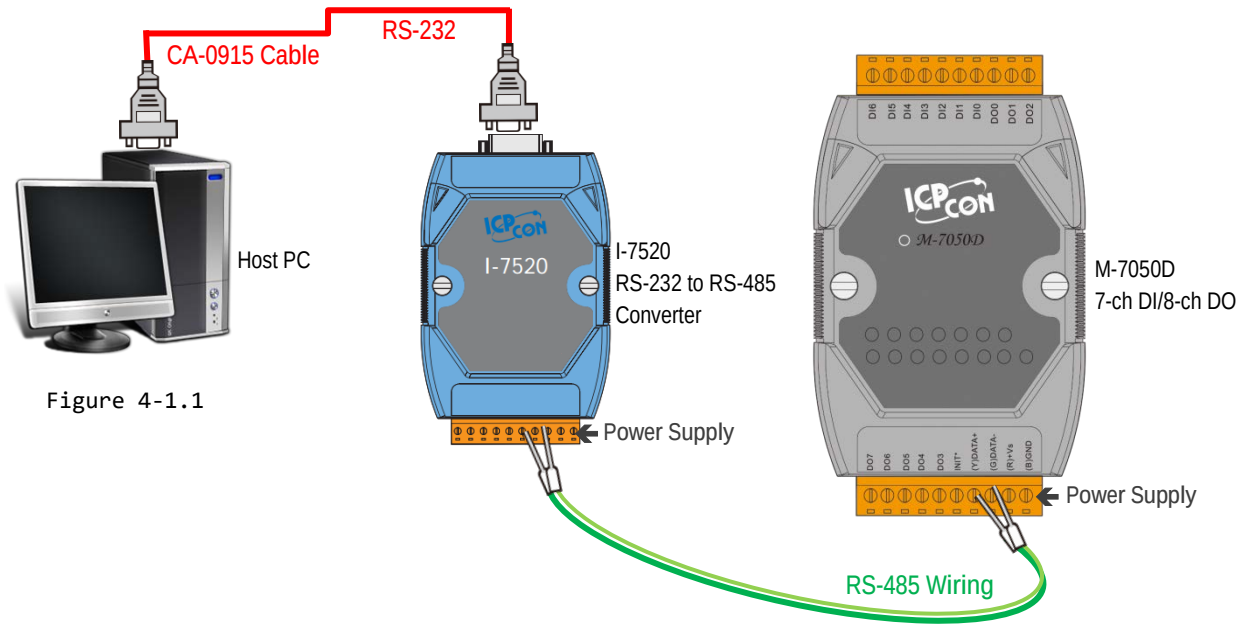

Figure 4-1.1

Step 2 Launch the DCON Utility Pro Software

The DCON Utility Pro is a free tool for ICP DAS Modbus RTU slave devices that can be download from the ICP DAS website at:
http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon_utility/



Install the utility and launch it to search for Modbus RTU slave modules connected to the network and then configure the devices that are discovered.

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Step 3 Search for Connected Modules

❶ In the DCON Utility, click the **"COM Port"** button to select the COM Port (e.g., COM1). Note that this value depends on which COM Port is used to connect the Host PC to the M-7050D module. Click the **"OK"** button to continue.

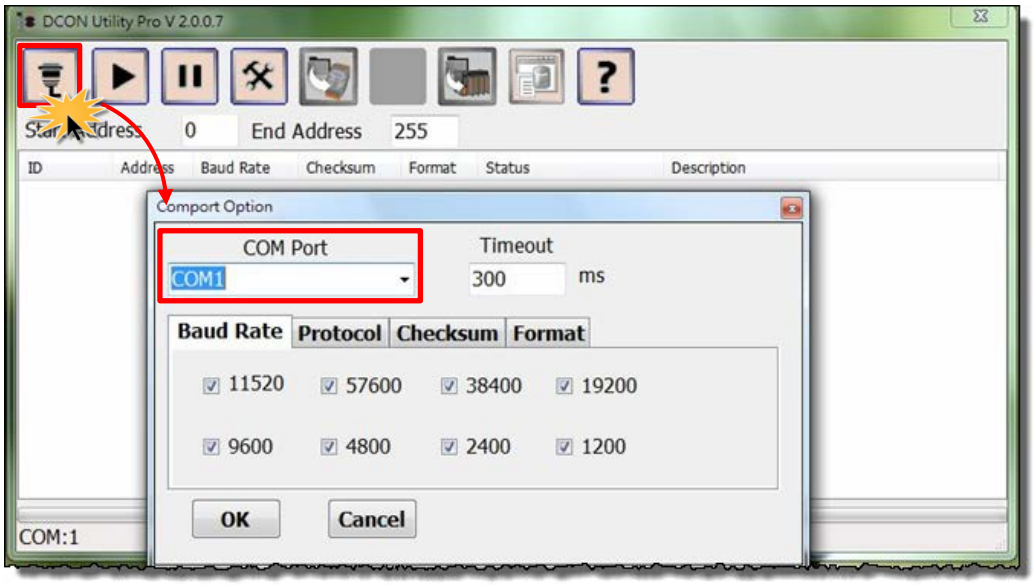

Figure 4-1.2

❷ Click the **"Start Search"** button to begin searching for connected Modbus RTU slave devices.



Figure 4-1.3

❸ Once the desired Modbus RTU slave device is found, click the **"Stop Search"** button.

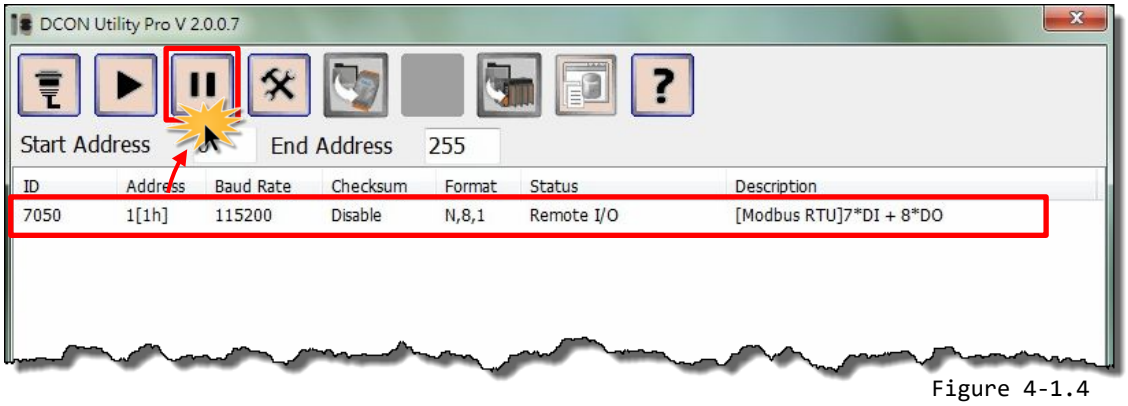

Figure 4-1.4

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Step 4 Configure the Net ID , Baud Rate and Data Format

❶ Click the **name of the module** in the **ID** column to open the configuration dialog box.

❷ **Enter the Address** (Net ID)**, Baud Rate and Data Format** information for the Modbus RTU slave device.

❸ Click the **"Set Module Configurations"** button to save the new configuration information.

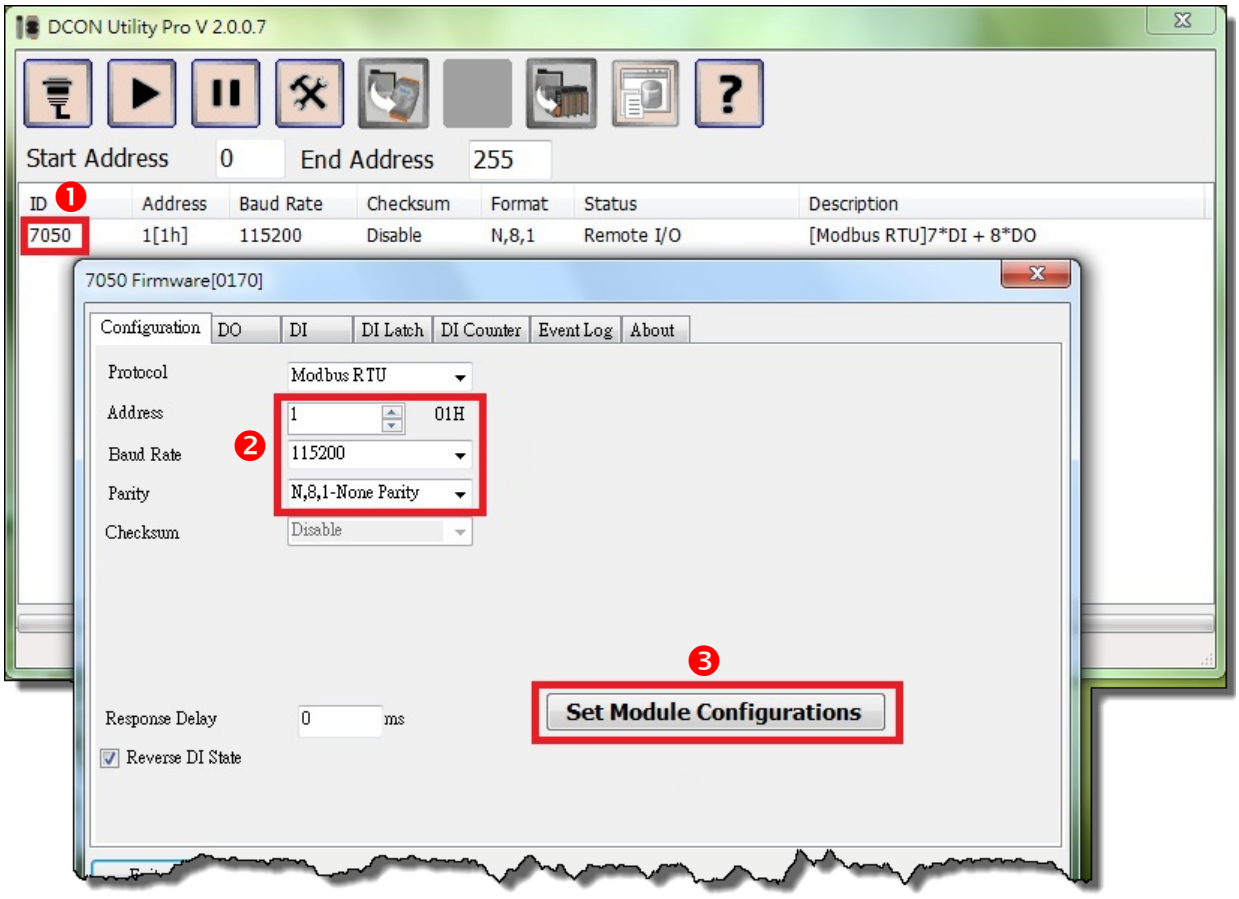

Figure 4-1.5

⚠NOTE

If multiple Modbus RTU slave devices are connected to the RS-485 network, a unique Net ID needs to be assigned to each device.

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4.2 Configuring and Uploading

Step 1 Connect the ECAT-2610 module to the Host PC.

Follow the procedure described below to connect the CA-0915 cable from the ECAT-2610 module to the Host PC.

❶ **Power off** the ECAT-2610 module.

❷ Connect the COM1 port on the ECAT-2610 module to the COM Port on the Host PC using the CA-0915 cable, as illustrated in the diagram below.

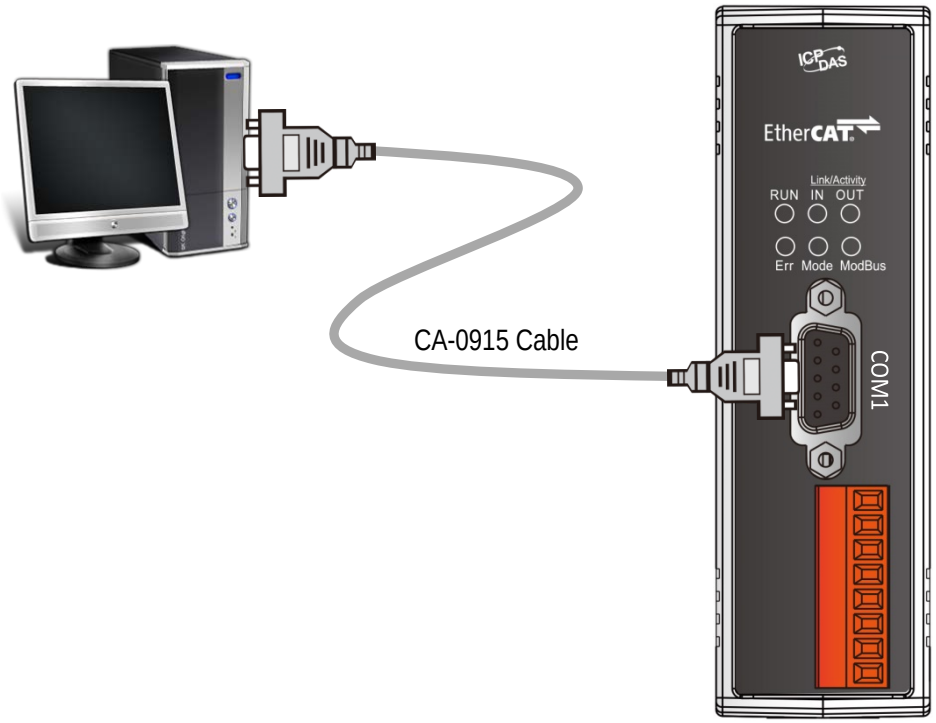

Figure 4-2.1

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Step 2 Download the ECAT-2610_Utl_xxxxxx.zip.

❶ The **"ECAT-2610_Utl_xxxxxx.zip"** can be downloaded from the ICP DAS web site at:
http://ftp.icpdas.com/pub/cd/fieldbus_cd/ethercat/slave/ecat-2000/software/

❷ Decompressing the "**ECAT-2610_Utl_xxxxxx.zip"** and then you can find the "**7188ECAT folder"**.
❸ Copy the **7188ECAT folder** to a drive on the PC host (e.g., E :\), the 7188ECAT folder should contain the following:

more commands_2610	This folder contains additional configuration and reference files for DI, DO, AD and DA commands, etc. Refer to Appendix A2. "Configuration Files Reference for ECAT-2610" for more details.
more commands_3133	This folder contains additional configuration and reference files for PM-3133 Power Meter.
7188ECAT.exe	This is the application file. Refer to A3. "Manually Configure and Upload for ECAT-2610" for more details.
7188XW.CF4	This is the Control file for the 7188ECAT application.
commands.txt	This is the configuration file for the Modbus RTU slave devices. The ECAT-2610 will use this file to communicate with the Modbus RTU slave device.
execOM1.bat	Using this file to upload the configuration data (commands.txt) to the ECAT-2610 module when it is connected to COM1 on the Host PC. Refer to A3. "Manually Configure and Upload for ECAT-2610" for more details.
execOM2.bat	Using this file to upload the configuration data (commands.txt) to the ECAT-2610 module when it is connected to COM2 on the Host PC. Refer to A3. "Manually Configure and Upload for ECAT-2610" for more details.
ECAT-2610 Configurator.exe	ECAT-2610 Configuration Tool.exe

Step 3 Launch the ECAT-2610 Configurator.exe.

Double-click the **"ECAT-2610 Configurator.exe"** to open configuration toolkit.

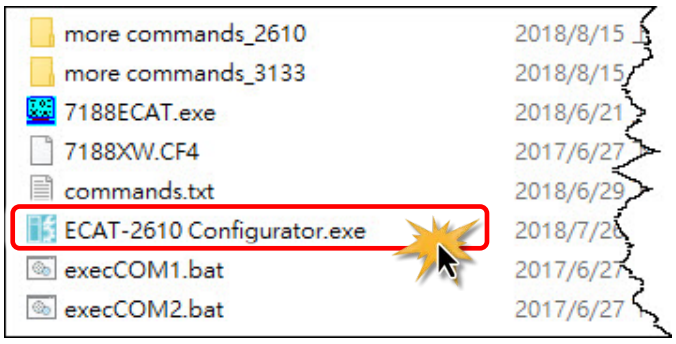

Figure 4-2.2

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➢ In the left-hand pane is used to set and upload a configuration file to ECAT-2610 module.

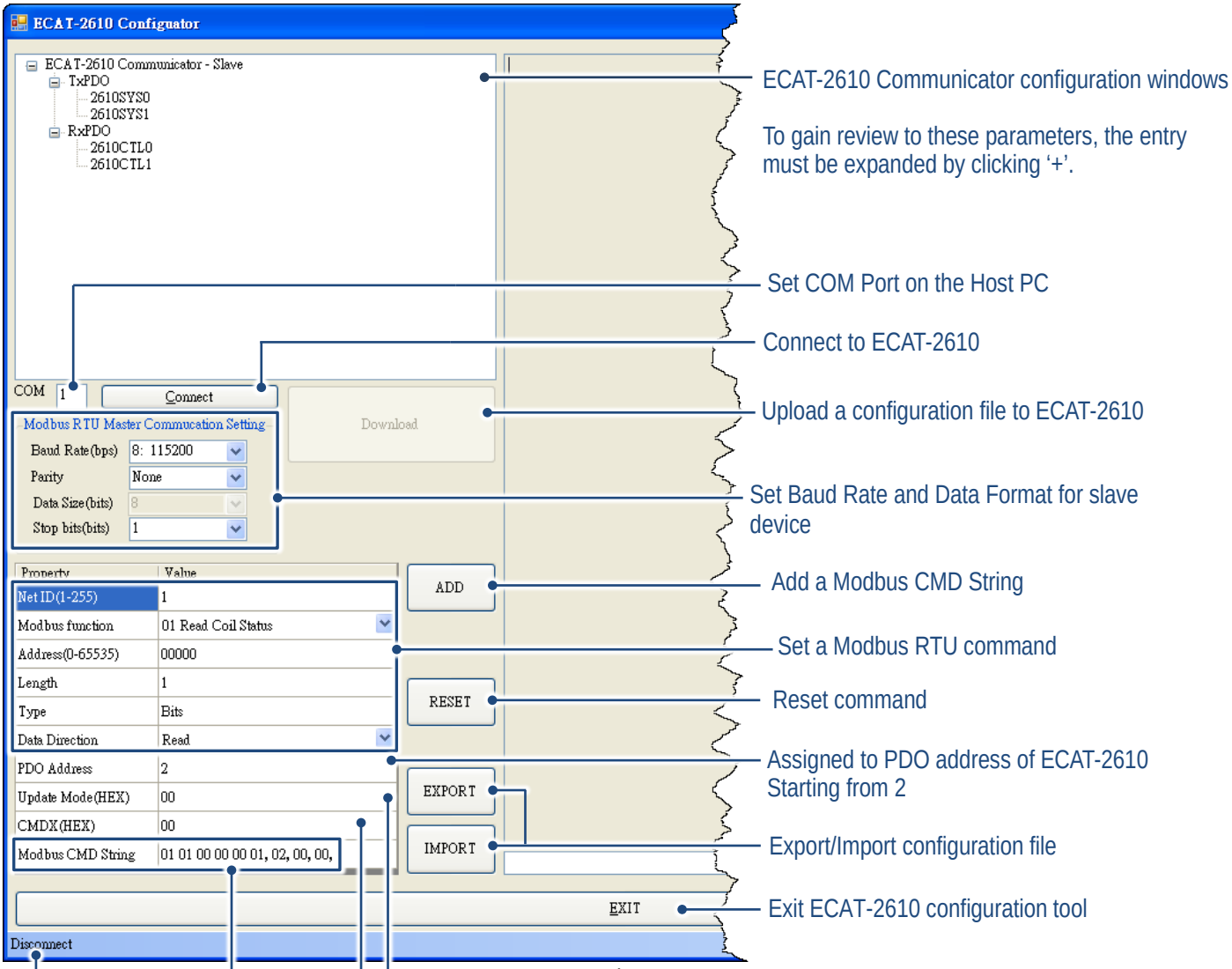

Figure 4-2.3

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➢ In the right-hand pane is used to factory debug operations.

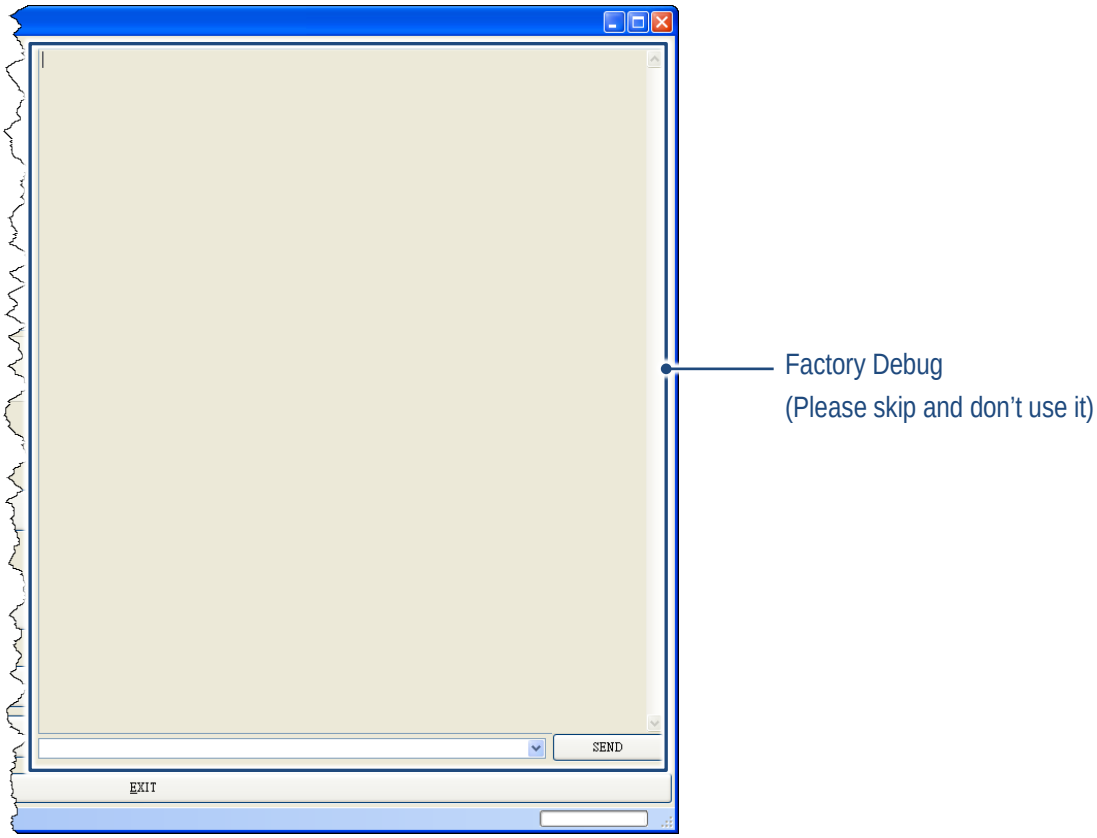

Figure 4-2.4

Step 4 Modify COM Port number, Baud Rate and Data Format.

❶ Modify COM Port number in the **"COM"** field that depends on the Host PC COM Port (e.g., COM4) that connects to ECAT-2610.

❷ Select the appropriate **Baud Rate and Data Format** settings from the relevant drop down options. Note that the exact values for these parameters will depend on the Modbus RTU slave device being used, e.g., the M-7050D.

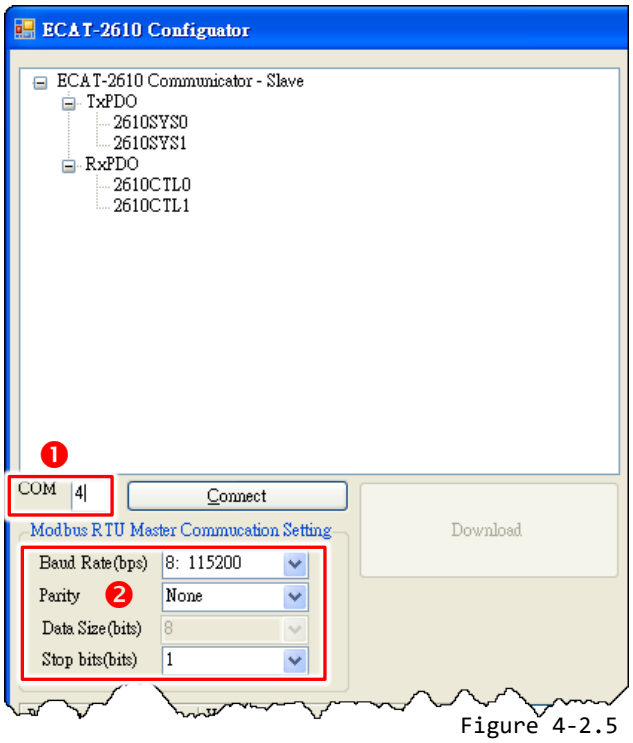

Figure 4-2.5

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Step 5 Modify the Modbus RTU command and relevant property.

Here, the M-7050 module is used as an example, as it provides 7-channel Digital Input and 8-channel Digital Output.

Type the Modbus RTU command of write Digital Output channels 0 to 7 (see Figure 4-2.6), as follows:

❶ Set the appropriate **"Net ID(1-255)"**, **"Modbus Function"**, **"Address (0-65535)"** and **"Length"** settings from the relevant field depends on the Modbus RTU device.
❷ Set the RxPDO address from the **"PDO Address"** filed.
❸ Set the update mode from the **"Update Mode(HEX)"** filed.
❹ Set the special code from the **"CMDX(HEX)"** filed.
❺ Click the **"ADD"** button to add the "**OUTWORD02**" item.

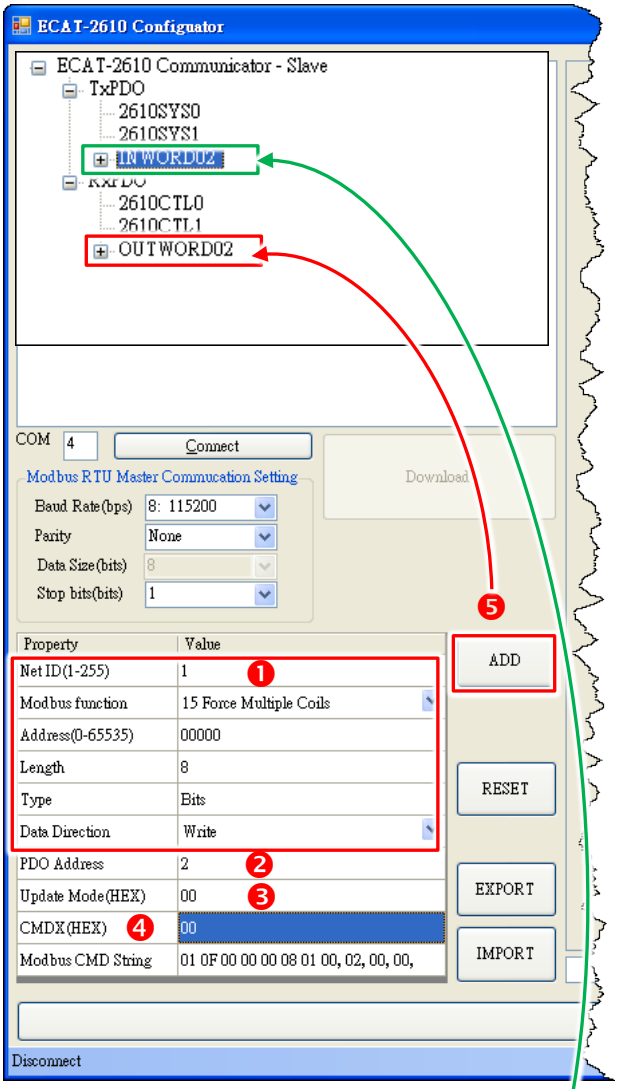

Figure 4-2.6

Type the Modbus RTU command of Read Digital Input channels 0 to 6 (see Figure 4-2.7), as follows:

❶ Set the appropriate **"Net ID(1-255)"**, **"Modbus Function"**, **"Address (0-65535)"** and **"Length"** settings from the relevant field depends on the Modbus RTU slave device.
❷ Set the TxPDO address from the **"PDO Address"** filed.
❸ Set the update mode from the **"Update Mode(HEX)"** filed.
❹ Set the special code from the **"CMDX(HEX)"** filed.
❺ Click the **"ADD"** button to add the "**INWORD02**" item.

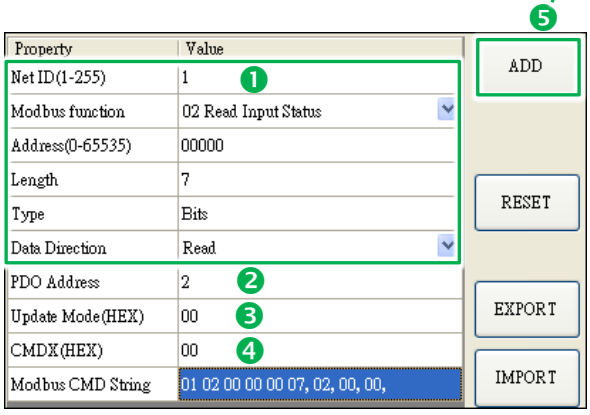

Figure 4-2.7

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Step 6 Click the “Connect” to connect the ECAT-2610 module

Verify that status column shows **“Connect”** and **“Download”** button is unlocked.

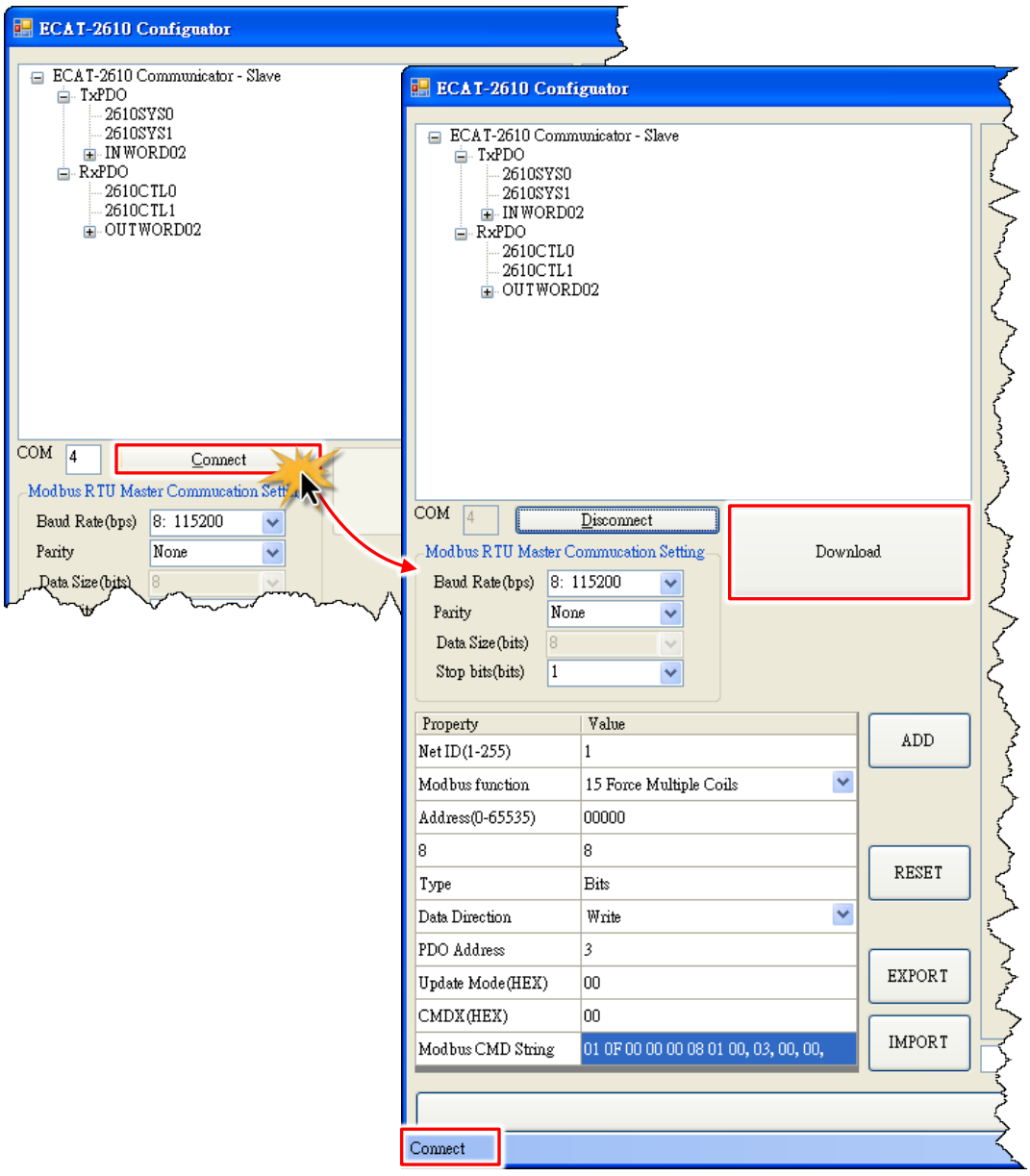

Figure 4-2.8

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Step 7 Starting upload

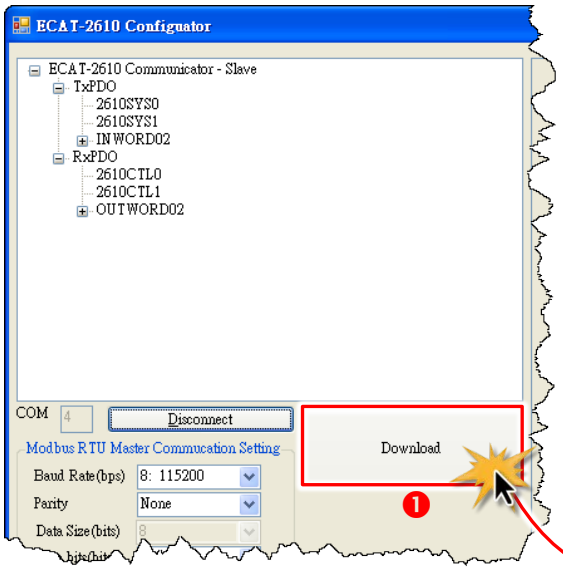
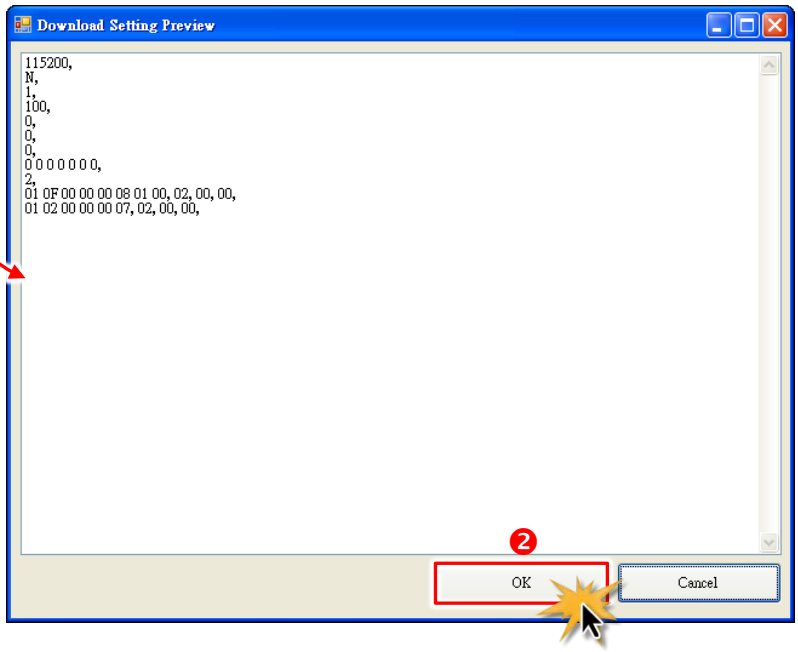


Figure 4-2.9

❶ Click the **"Download"** button to open the "Download Setting Preview" window.

❷ Verify that the configuration data is correct (refer to commands.txt file for more detailed information about configuration data format) and click the **"OK"** button to continue next step.



❸ The **"ECAT-2610 Configurator"** dialog box will be displayed asking you to reboot the ECAT-2610 module. Therefore, **switch off** the power to the ECAT-2610 module and then switch it back on again to reboot the module, and click the **"OK"** button to continue.

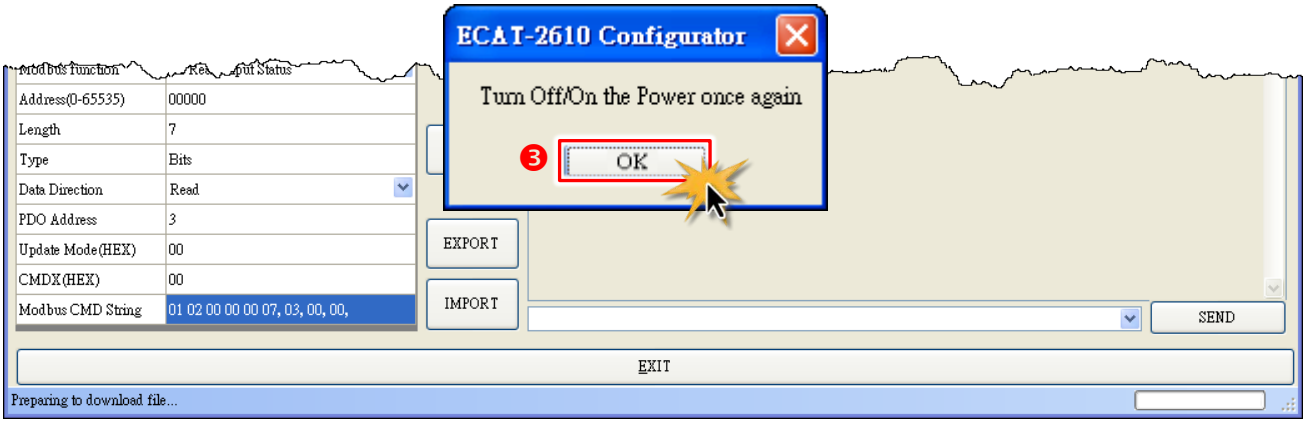


Figure 4-2.10

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❹ The status column will be displayed the progress of the upload.

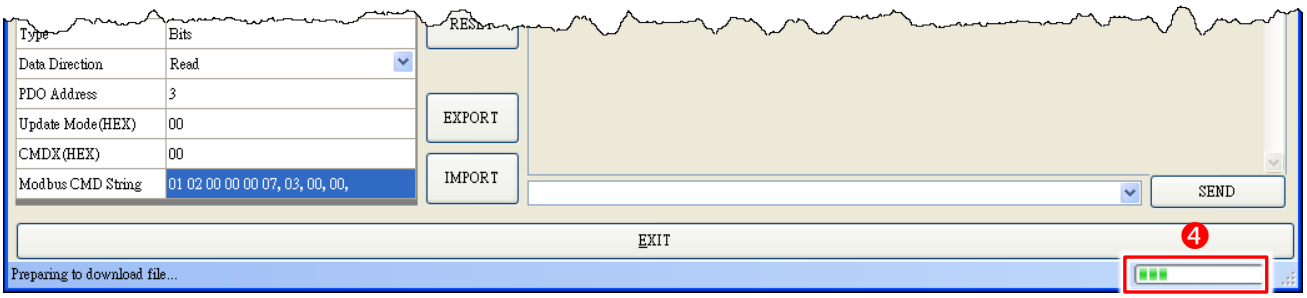

Figure 4-2.11

❺ The **"ECAT-2610 Configurator"** dialog box is displayed again asking you to reboot the ECAT-2610 module when the upload is successful. Therefore, **switch off** the power to the ECAT-2610 module and then switch it back on again to reboot the module, and click the **"OK"** button to complete the upload.

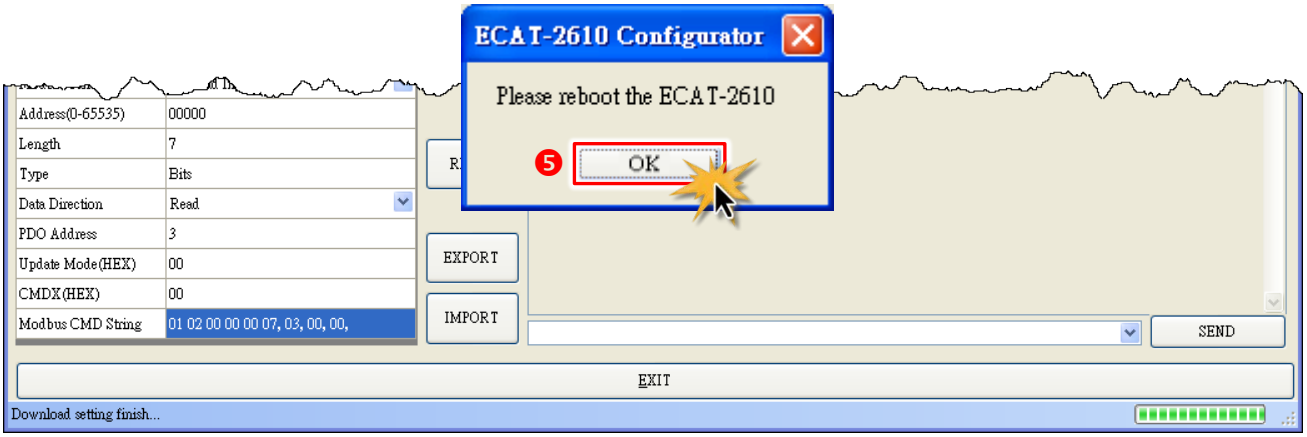

Figure 4-2.12

⚠Note:

If the upload configuration via ECAT-2610 Configurator.exe is failed, then the manually configuration data file and upload is required to make the module working again, refer to A3. "Manually Configure and upload for ECAT-2610" for more details.

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4.2.1 Restore to Factory Defaults Settings

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

❶ Connect the COM1 port on the ECAT-2610 module to the COM Port on the Host PC using the CA-0915 cable, as illustrated in the diagram below.

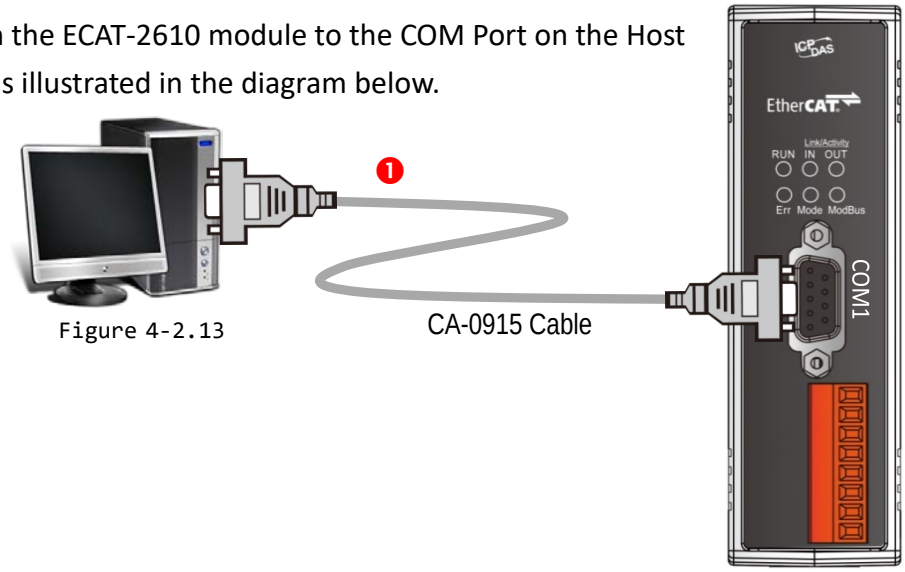

Figure 4-2.13

❷ In the **7188ECAT** folder, double-click the **"ECAT-2610 Configurator.exe"** to open configuration toolkit. Note the if the 7188ECAT folder does not exist, refer to Section 4.2 "Configuring and Uploading" for details of how to download the 7188ECAT folder.

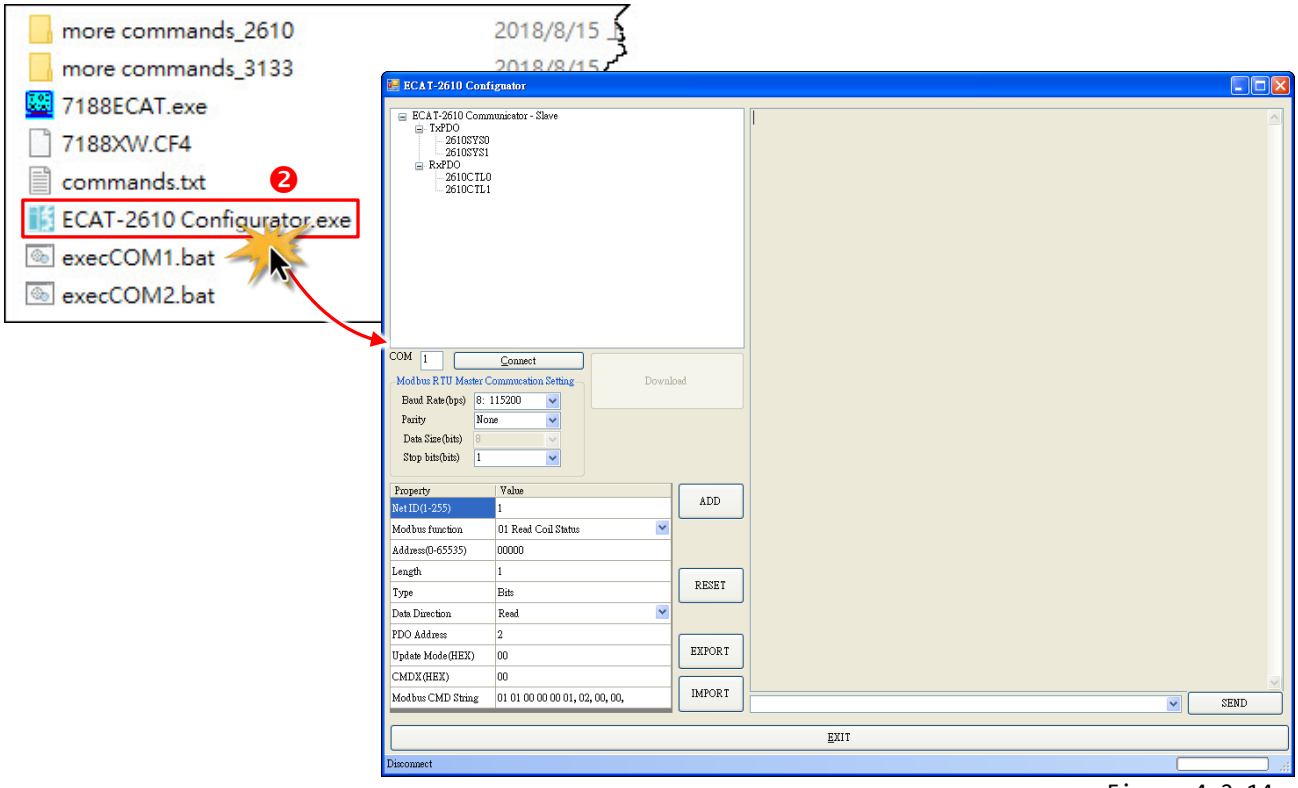

Figure 4-2.14

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❸ Modify COM Port number in the **"COM"** field that depends on the Host PC COM Port (e.g., COM4) that connects to ECAT-2610.
❹ Click the **"Connect"** button to connect the ECAT-2610 module.

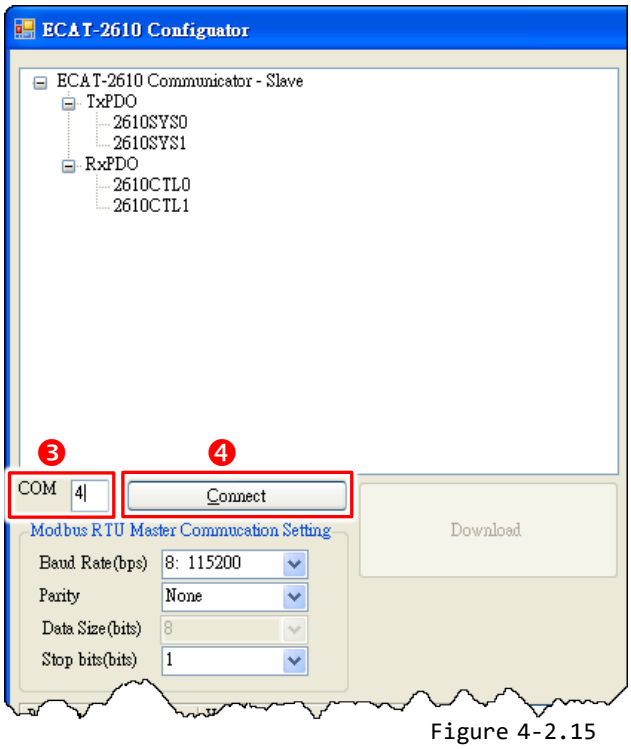

Figure 4-2.15

❺ Verify that status column shows **"Connect"** and **"Download"** button is unlocked.
❻ Click the **"Download"** button to open the **"ECAT-2610 Configurator"** dialog box asking you to download the default setting, and click the **"OK"** button to continue.

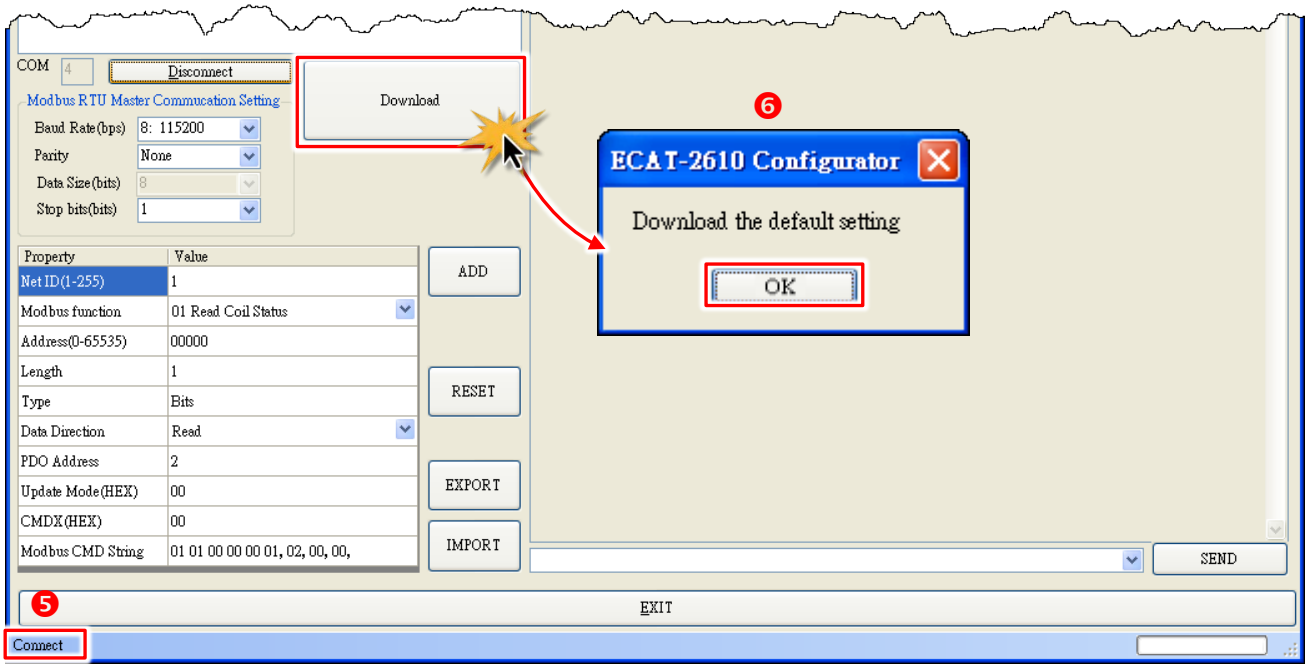

Figure 4-2.16

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❼ The **"ECAT-2610 Configurator"** dialog box will be displayed asking you to reboot the ECAT-2610 module. Therefore, **switch off** the power to the ECAT-2610 module and then switch it back on again to reboot the module, and click the **"OK"** button to continue.

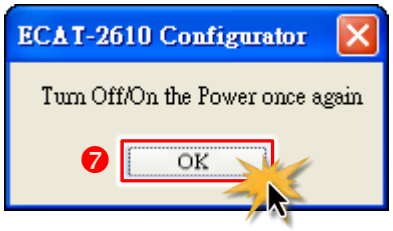

Figure 4-2.17

❽ The status column will be displayed the progress of the upload.

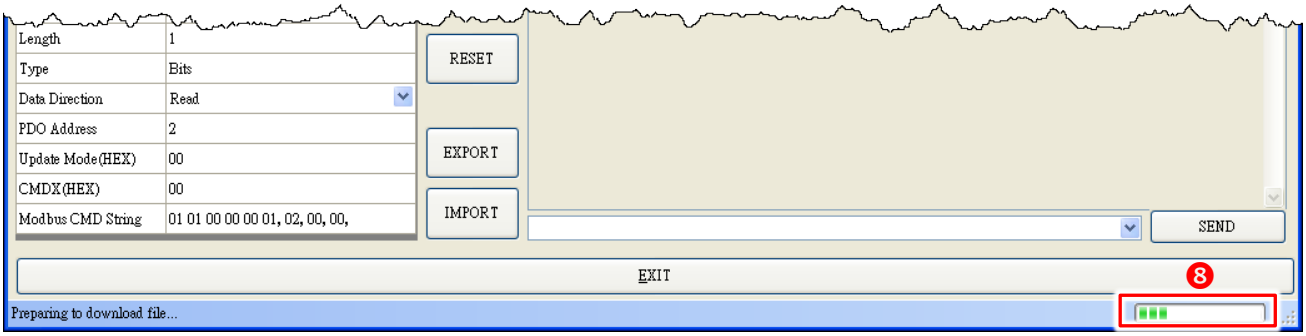

Figure 4-2.18

❾ The **"ECAT-2610 Configurator"** dialog box is displayed again asking you to reboot the ECAT-2610 module when the upload is successful. Therefore, **switch off** the power to the ECAT-2610 module and then switch it back on again to reboot the module, and click the **"OK"** button to complete the upload.

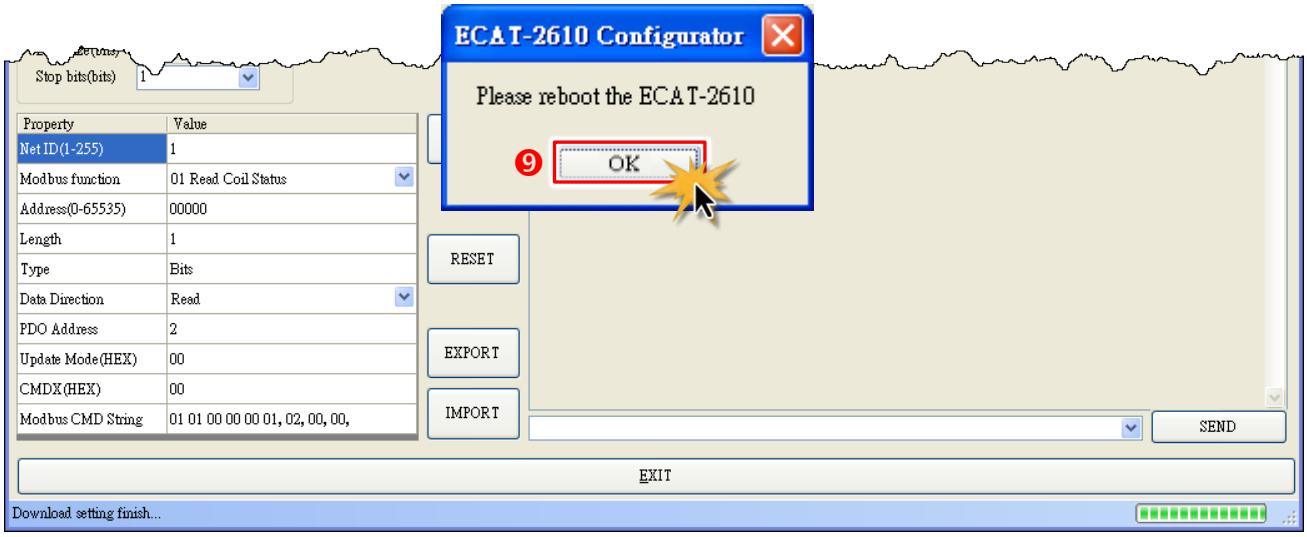

Figure 4-2.19

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4.3 Testing the Modbus RTU Slave

Before beginning the **"Test Modbus RTU Slave"** process, the configuration data must be correctly formatted and upload to the ECAT-2610 module. Refer to Section 4.2 "Configuring and Uploading" for more details.

⚠NOTE

The testing method used depends on your Modbus RTU slave device. Here, the M-7050D module is used as an example. For other Modbus RTU slave device, refer to the Quick Start Guide or User Manual for that specific Modbus RTU slave device.

Step 1 Connect the Modbus RTU Slave Device.

❶ Maintain the network connection status for your ECAT-2610 module. Refer to Section 3.2 "Connecting the Power and the Host PC" for more details.

❷ Connect the ECAT-2610 module to a Modbus RTU slave device via the RS-485 bus, e.g., the M-7050D module illustrated in the diagram below.

❸ Connect a power supply to the Modbus RTU slave device, e.g., the +10 to +30 VDC power supply used for the M-7050D module illustrated in the diagram below.

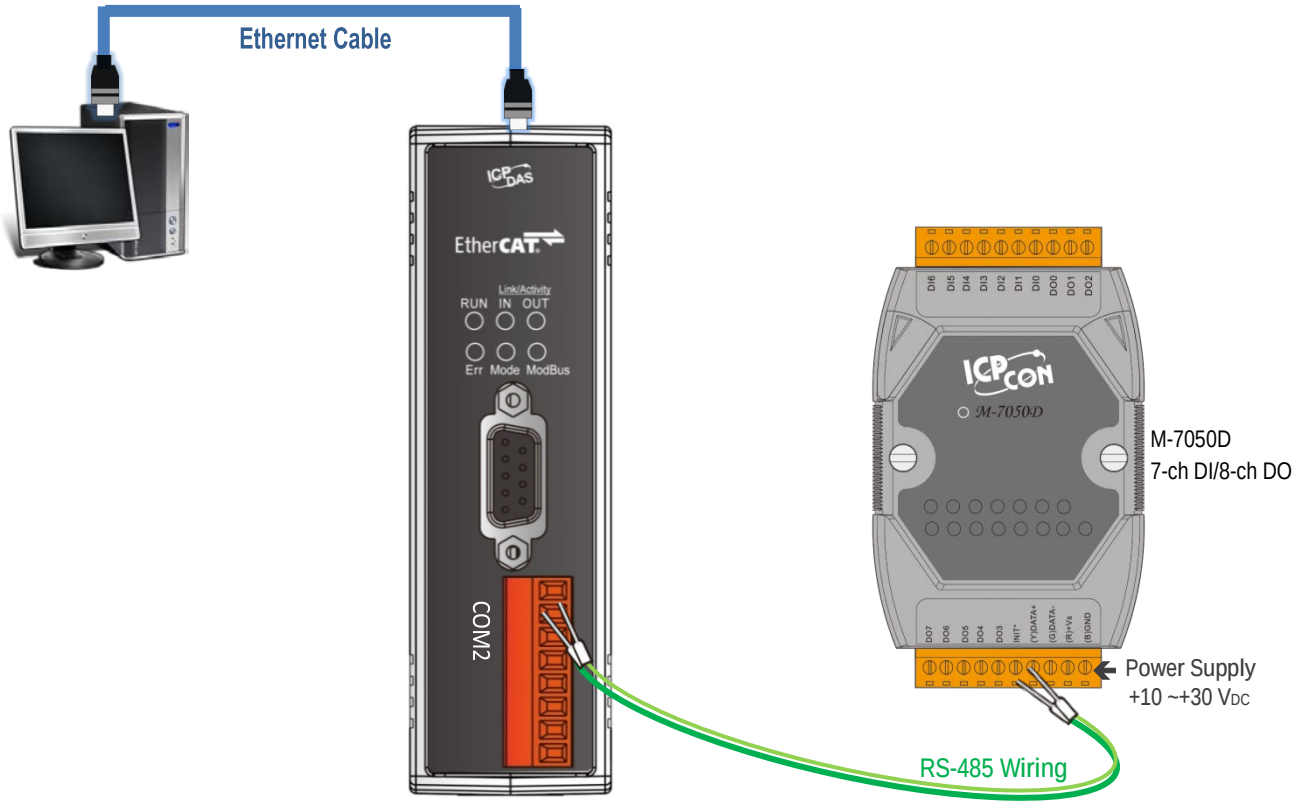

Figure 4-3.1

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Step 2 Launch the TwinCAT Master software

❶ You must first install the EtherCAT Master software (e.g., Beckhoff TwinCAT). In this example, we will use **Beckhoff TwinCAT 2.x** to configuring and operating the ECAT-2610 module, refer to Section 3.3 "Configuration and Operation" for more details.

❷ Automatically scan for connected devices

Switch on the power supply, launch the TwinCAT System Manager in **Config mode**, and scan for connected devices (see Figure 4-3.2 below). Acknowledge all dialogs by clicking the **OK** button, so that the configuration is operating in **"FreeRun"** mode.

For more detailed information related to launch the TwinCAT Master Software (e.g., Beckhoff TwinCAT 2.X). Refer to Section 3.3 "Configuration and Operation" or ECAT-2610 Quick Start for more details.

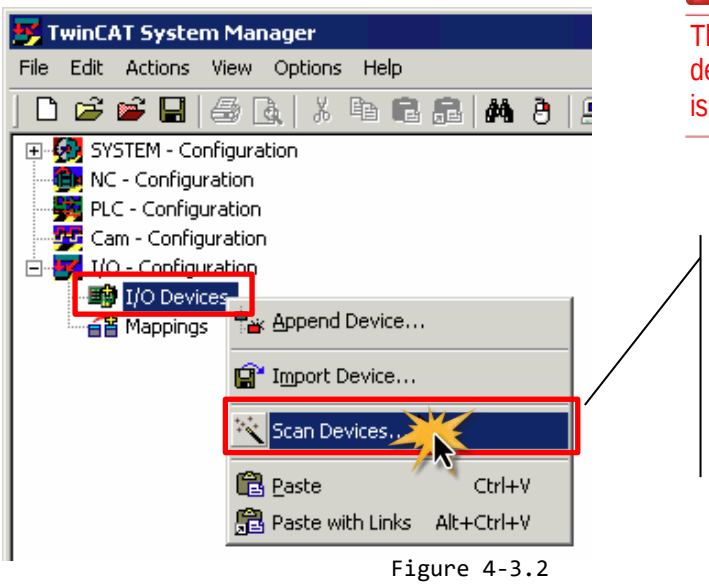

Figure 4-3.2

NOTE

The EtherCAT system must be in a safe, de-energized state before the ECAT-2610 module is connected to the EtherCAT network.

Scan the device configuration by right-clicking the **I/O Devices** item in the navigation pane, and the selecting the **Scan Devices…** option form the menu.

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Step 3 Configuration via TwinCAT

In the left-hand pane of the TwinCAT System Manager, expand on the branch for the EtherCAT Box that you wish to configure (i.e., ECAT-2610 in this case). Expand the entries for both **TxPDO** and **RxPDO** and click the relevant **Inxx and Outxx** items to access the properties window and then configure the state, as described in the procedure below.

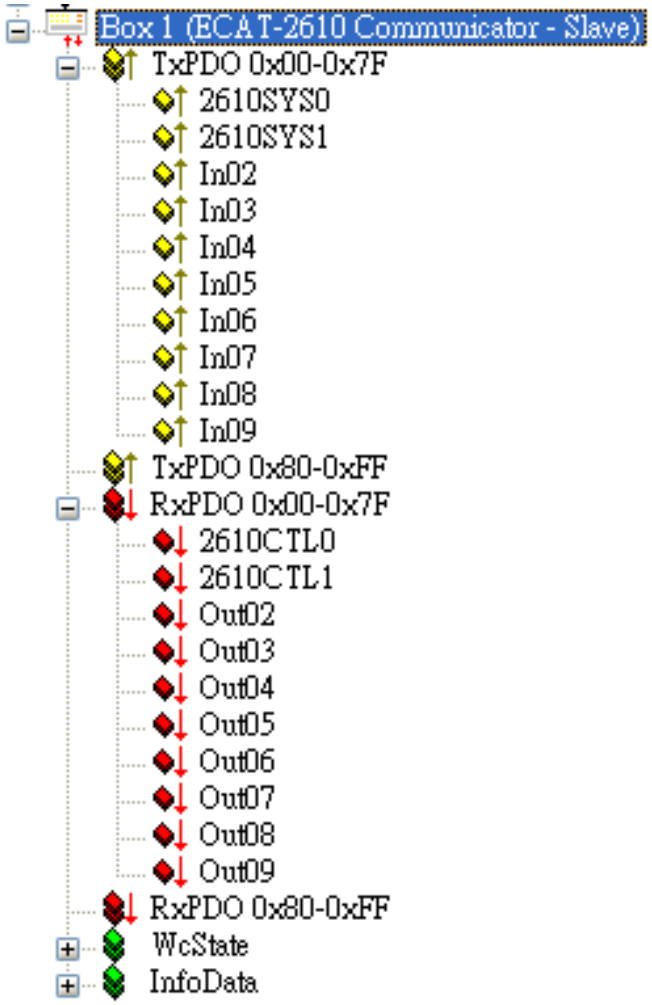

Figure 4-3.3

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➢ Verify the test results of the DO functions for M-7050D module in the following manner.

❶ In the left-hand pane of the TwinCAT System Manager window, click the **Out02** item.
❷ In the right-hand pane, click the **Online** tab.
❸ Click the **Write** button to open the **"Set Value Dialog"** dialog box.
❹ In the **"Set Value Dialog"** dialog box, enter the value **"0x00ff"** in the **"Hex:"** field, which enables configuration for all DO channels, and then click the **OK** button.

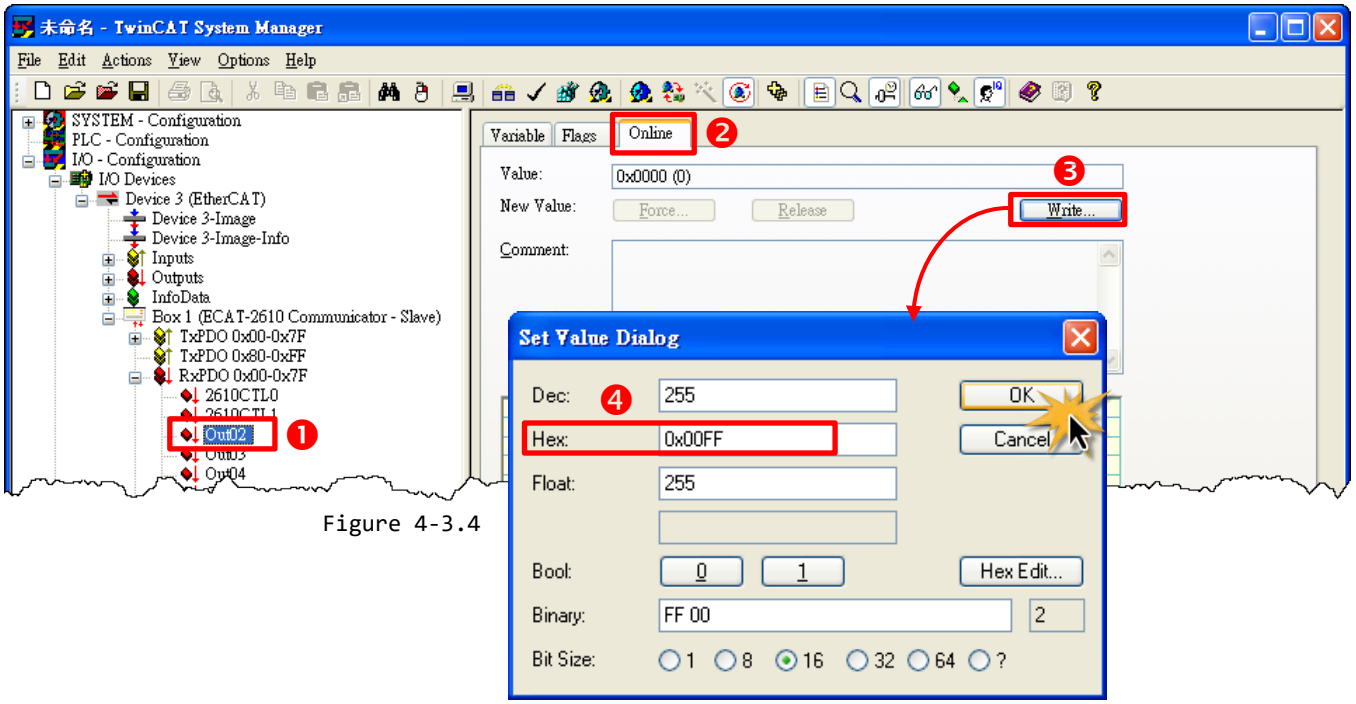

Figure 4-3.4

❺ Check that the LEDs for all DO channels on the M-7050D module are illuminated.



Figure 4-3.5

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5. Modbus RTU Master Setup

NOTE

Before beginning the **"Modbus RTU Master Setup"** process, ensure that your **ECAT-2611 module** is operating correctly, refer to Chapter 3 "Getting Started" for more detailed information.

Here, the PC to be a Modbus RTU Master for example. For other Modbus RTU Master, refer to the Quick Start Guide or User Manual for that specific Modbus RTU Master.

This chapter provides a simple overview of how to configure the basic settings for an ECAT-2611 module, including the Net ID, the Baud Rate and the Data Format, etc., and how to make Modbus RTU Master communicate with ECAT-2611.

5.1 Configuring and Uploading

Step 1 Connect the ECAT-2611 module to the Host PC.

Follow the procedure described below to connect the CA-0915 cable from the ECAT-2611 module to the Host PC.

❶ **Power off** the ECAT-2611 module.

❷ Connect the COM1 port on the ECAT-2611 module to the COM Port on the Host PC using the CA-0915 cable, as illustrated in the diagram below.

❸ **Power on** the ECAT-2611 module.

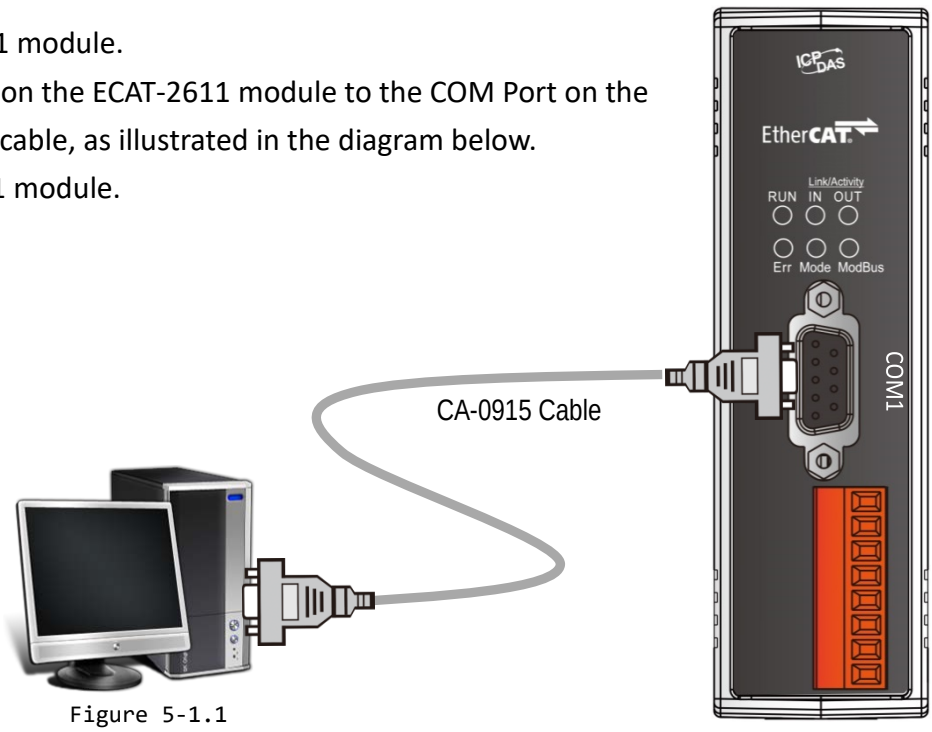

Figure 5-1.1

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Step 2 Download the ECAT-2611_Utl_xxxxxx.zip.

❶ The **"ECAT-2611_Utl_xxxxxx.zip"** can be downloaded from the ICP DAS web site at:
http://ftp.icpdas.com/pub/cd/fieldbus_cd/ethercat/slave/ecat-2000/software/

❷ Decompressing the "**ECAT-2611_Utl_xxxxxx.zip"** and then you can find the "**7188ECAT folder"**.
❸ Copy the **7188ECAT folder** to a drive on the PC host (e.g., E :\), the 7188ECAT folder should contain the following:

7188ECAT.exe	This is the application file. Refer to A4. "Manually Configure and Upload for ECAT-2611" for more details.
7188XW.CF4	This is the Control file for the 7188ECAT application.
commands.txt	This is the configuration file for the Modbus RTU slave devices. The ECAT-2611 will use this file to communicate with the Modbus RTU slave device.
execOM1.bat	Using this file to upload the configuration data (commands.txt) to the ECAT-2611 module when it is connected to COM1 on the Host PC. Refer to A4. "Manually Configure and Upload for ECAT-2611" for more details.
execOM2.bat	Using this file to upload the configuration data (commands.txt) to the ECAT-2611 module when it is connected to COM2 on the Host PC. Refer to A4. "Manually Configure and Upload for ECAT-2611" for more details.
ECAT-2611 Configurator.exe	ECAT-2611 Configuration Tool.exe

Step 3 Launch the ECAT-2611 Configurator.exe.

Double-click the **"ECAT-2611 Configurator.exe"** to open configuration toolkit.

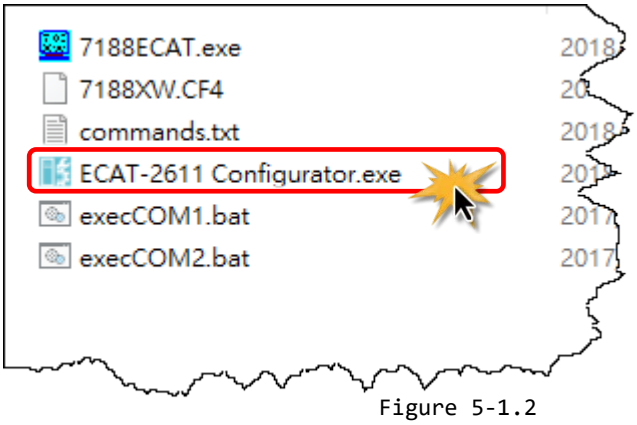

Figure 5-1.2

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The ECAT-2611 configuration toolkit is used to set and upload a configuration file to ECAT-2611 module.

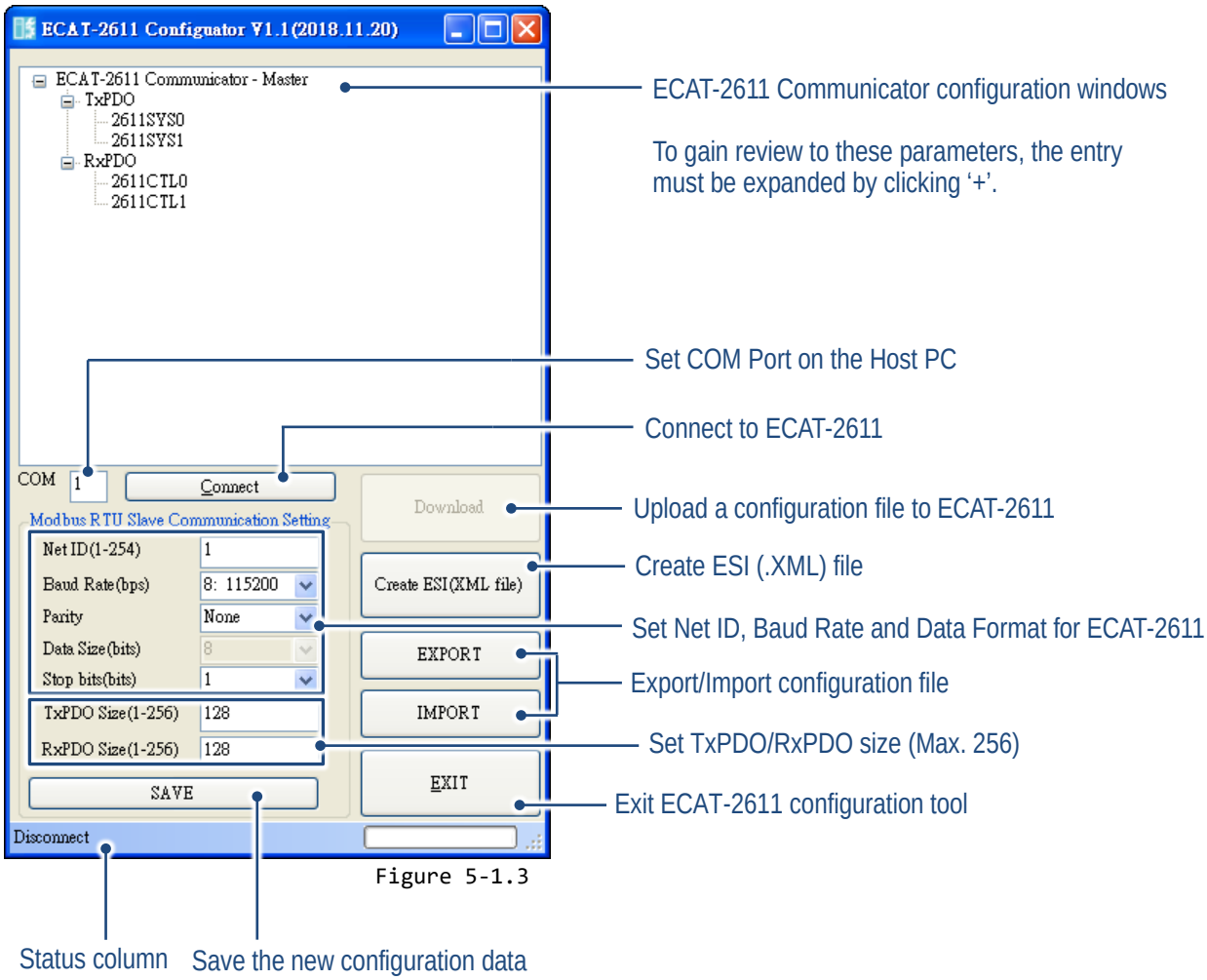

Figure 5-1.3

Step 4 Modify COM Port number, Net ID, Baud Rate and Data Format, etc.

❶ Modify COM Port number in the **"COM"** field that depends on the Host PC COM Port (e.g., COM8) that connects to ECAT-2611, see figure 5-1.4.

❷ Select the appropriate **Net ID, Baud Rate, Data Format and TxPDO/RxPDO size** settings from the field and relevant drop down options, see figure 5-1.4. (e.g., modify the Net ID to 2)

The factory default settings of ECAT-2611 as shown in the table below:

COM	1	Data Size (bits)	8
Net ID	1	Stop bits (bits)	1
Baud Rate (bps)	115200	TxPDO size	128
Parity	None	RxPDO size	128

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❸ Click the **"Connect"** to connect the ECAT-2611 module.

❹ Verify that status column shows **"Connect"** and **"Download"** button is unlocked.

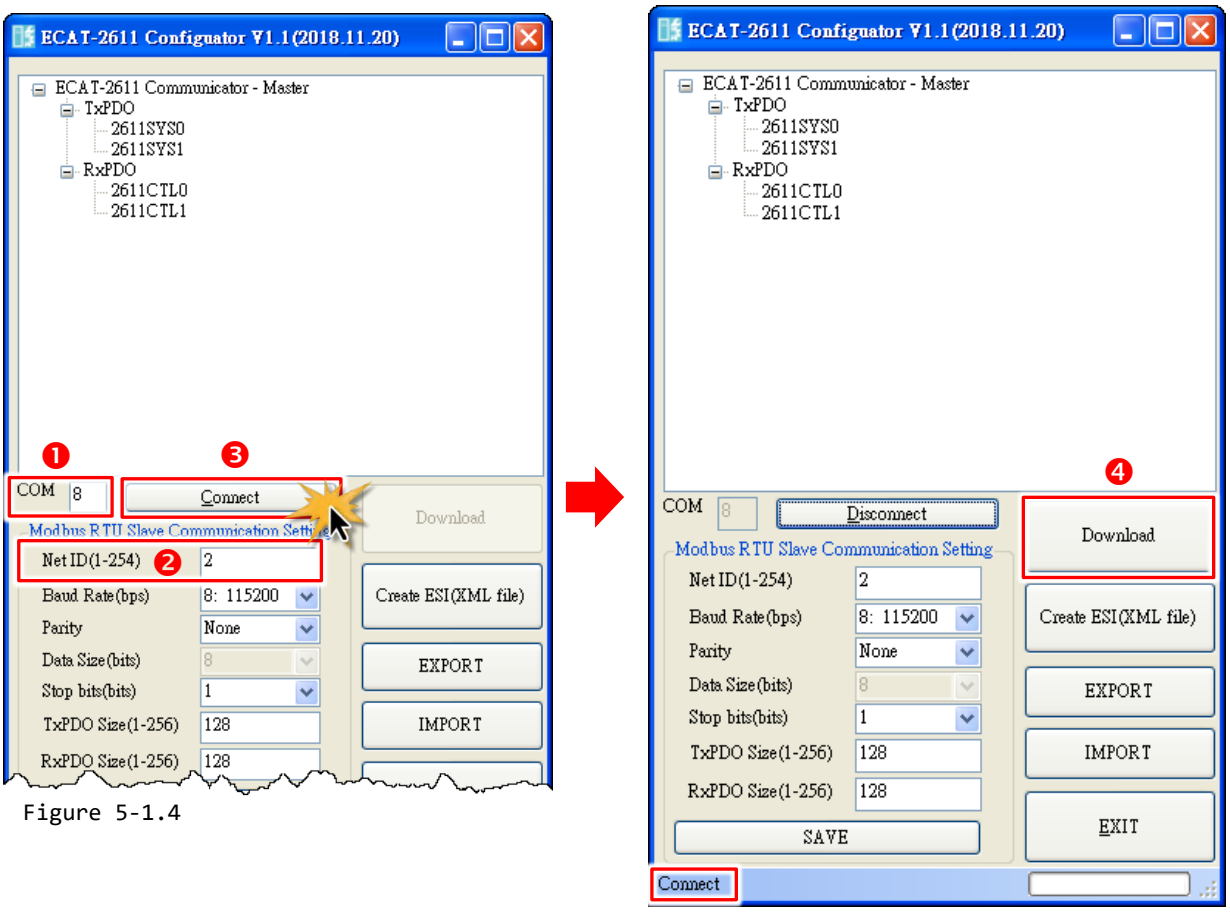

Figure 5-1.4

Figure 5-1.5

Step 5 Starting upload

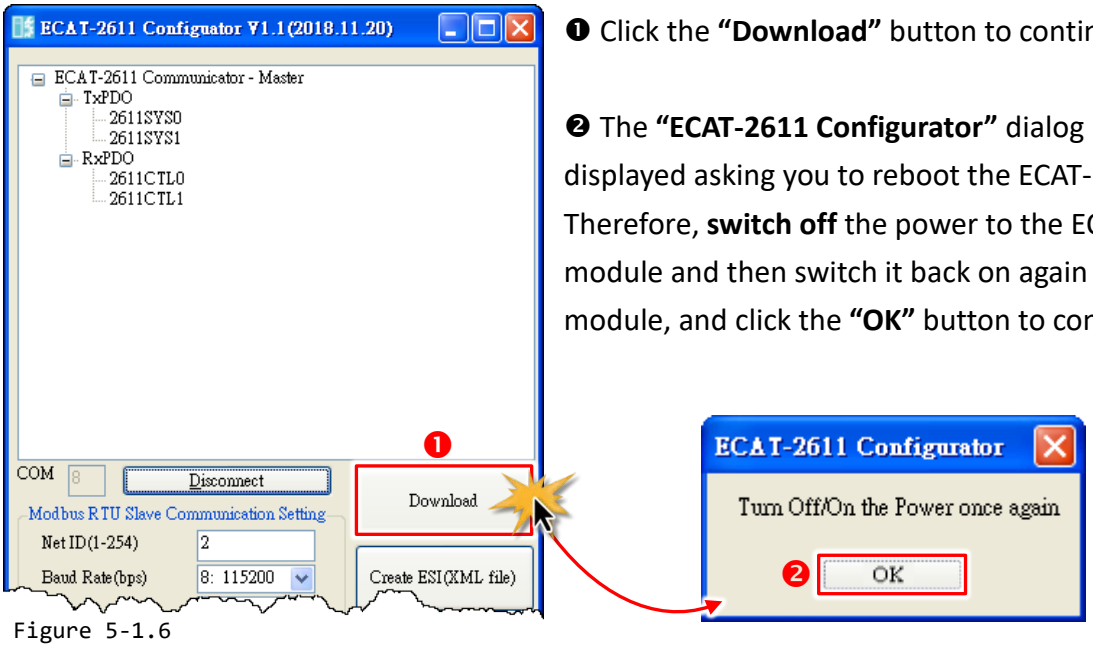

Figure 5-1.6

❶ Click the **"Download"** button to continue next step.

❷ The **"ECAT-2611 Configurator"** dialog box will be displayed asking you to reboot the ECAT-2611 module. Therefore, **switch off** the power to the ECAT-2611 module and then switch it back on again to reboot the module, and click the **"OK"** button to continue.

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❸ The status column will be displayed the progress of the upload.

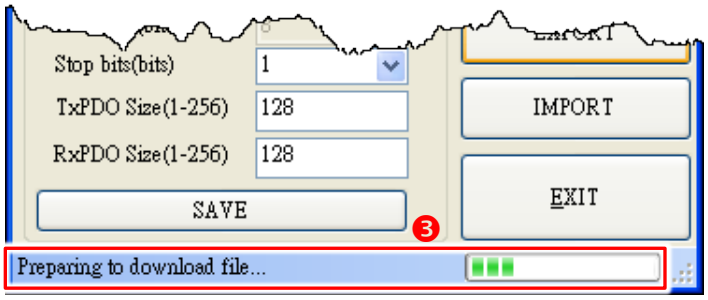

Figure 5-1.7

❹ The **"ECAT-2611 Configurator"** dialog box is displayed again asking you to reboot the ECAT-2611 module when the upload is successful. Therefore, **switch off** the power to the ECAT-2611 module and then switch it back on again to reboot the module, and click the **"OK"** button to complete the upload.

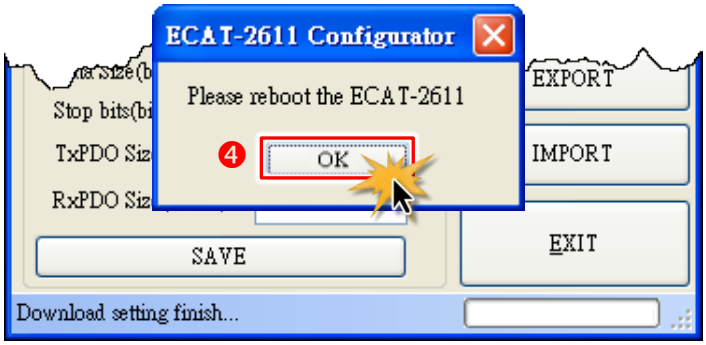

Figure 5-1.8

⚠Note:

If the upload configuration via ECAT-2611 Configurator.exe is failed, then the manually configuration data file and upload is required to make the module working again, refer to A4. "Manually Configure and upload for ECAT-2611" for more details.

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5.2 Connecting the Modbus RTU Master

In this example, we use PC as Modbus RTU Master, which will be described in more detail below.

Step 1 Connect the Modbus Master device (e.g., PC) to COM2 (RS-485) on the ECAT-2611.

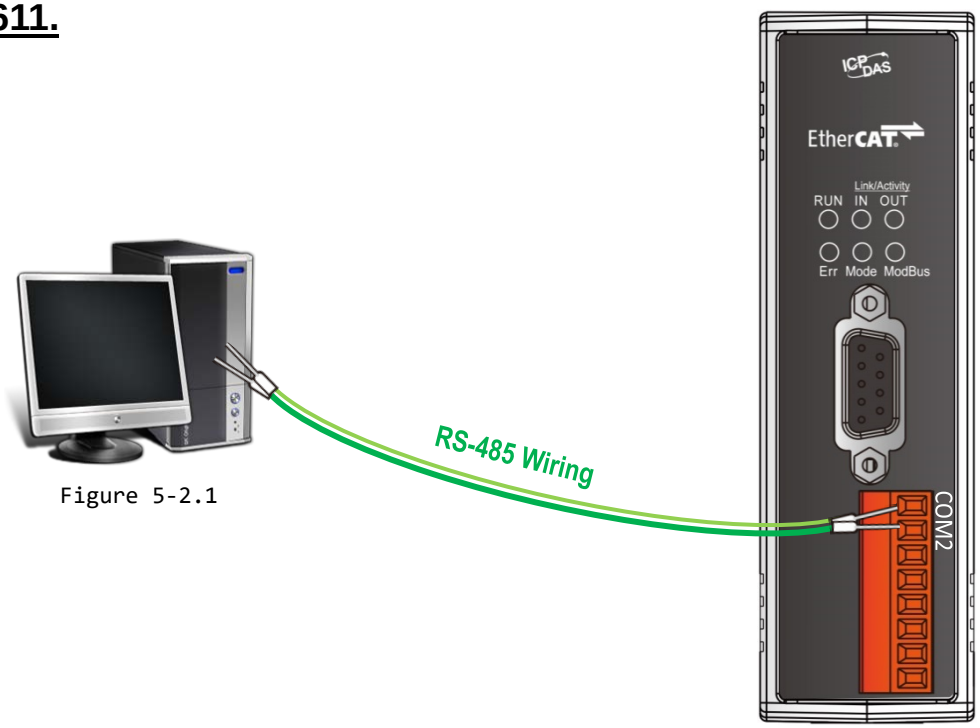

Figure 5-2.1

Step 2 Configure your computer to be a Modbus Master

❶ Install Modbus Master Tools (e.g., Modbus Poll, it is a Modbus Master simulator) on your PC. The location of the download addresses are shown below:

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

❷ Launch the **Modbus Poll.exe** program. Click the **"Read/Write Definition F8"** option from the **"Setup"** menu to open the "Read/Write Definition" dialog.

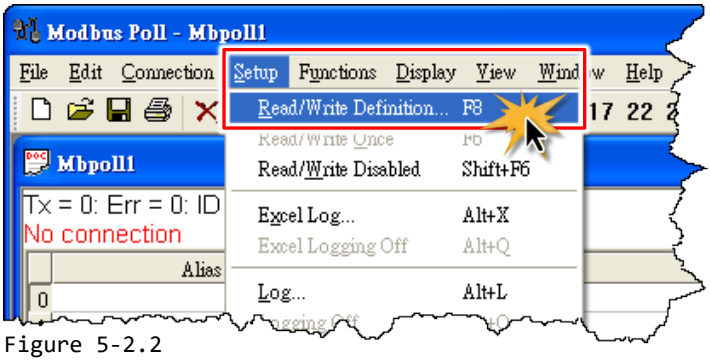

Figure 5-2.2

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❸ In the “Read/Write Definition” dialog, set the Slave ID, Function code, Start Address and Quantity, etc. values depends on your ECAT-2611 module and click the **“OK”** button.

For example, we use function 03 to read **“20”** registers from ECAT-2611 address **“2”** from Slave ID **“2”** every 1000 ms.

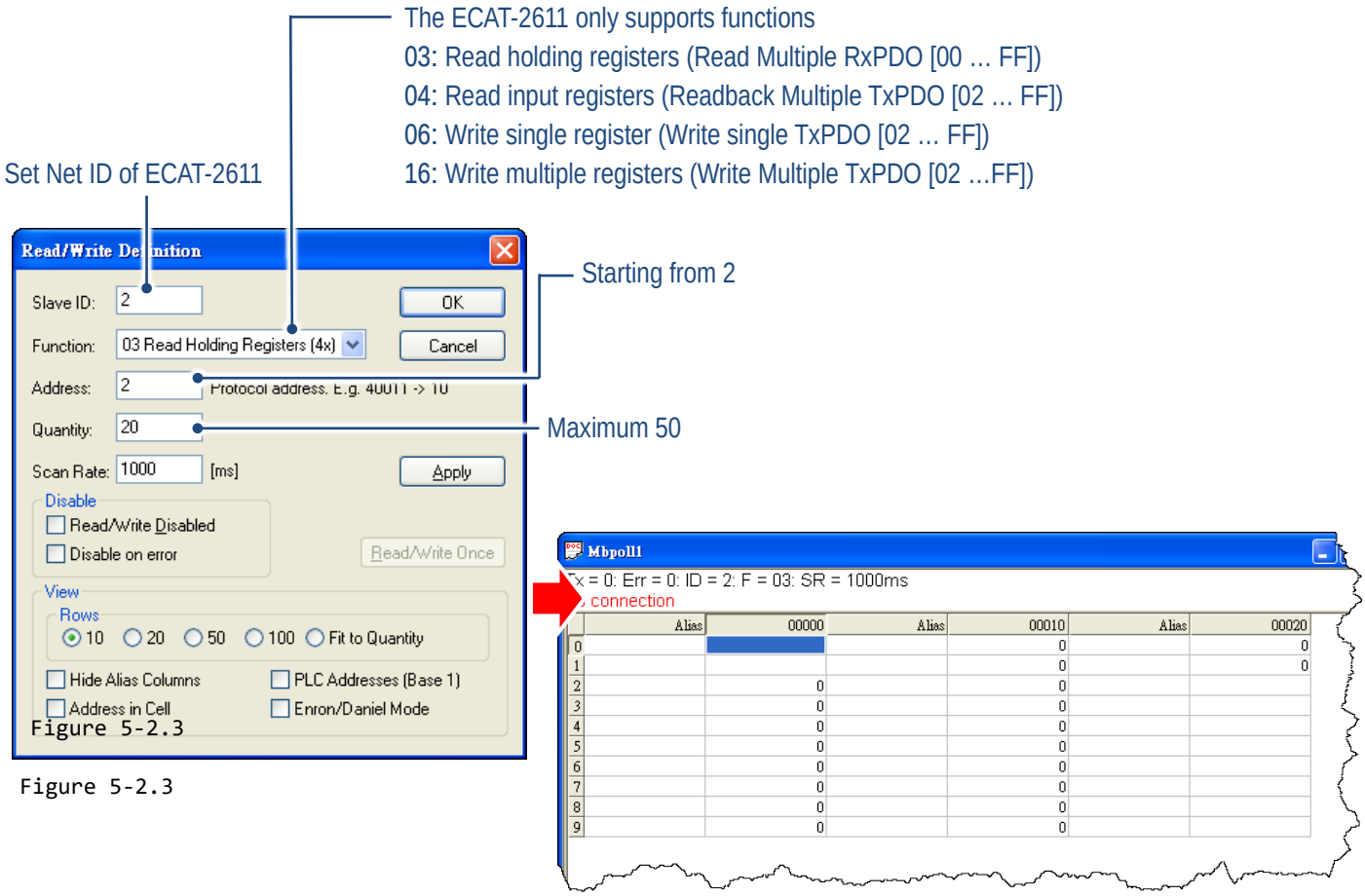

Figure 5-2.3

❹ Click the **“Connect… F3”** option from the **“Connection”** menu to open the “Connection Setup” dialog.

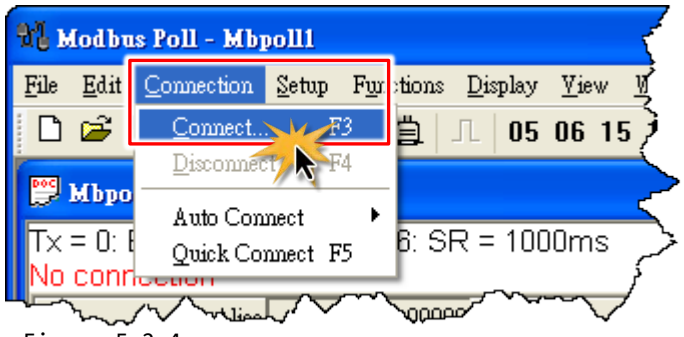

Figure 5-2.4

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❺ In the “Connection Setup” dialog, select the **“Serial Port”** from the “**Connection”** drop down options and set the appropriate **serial port settings** from the relevant drop down options, and then click the **“OK”** button.

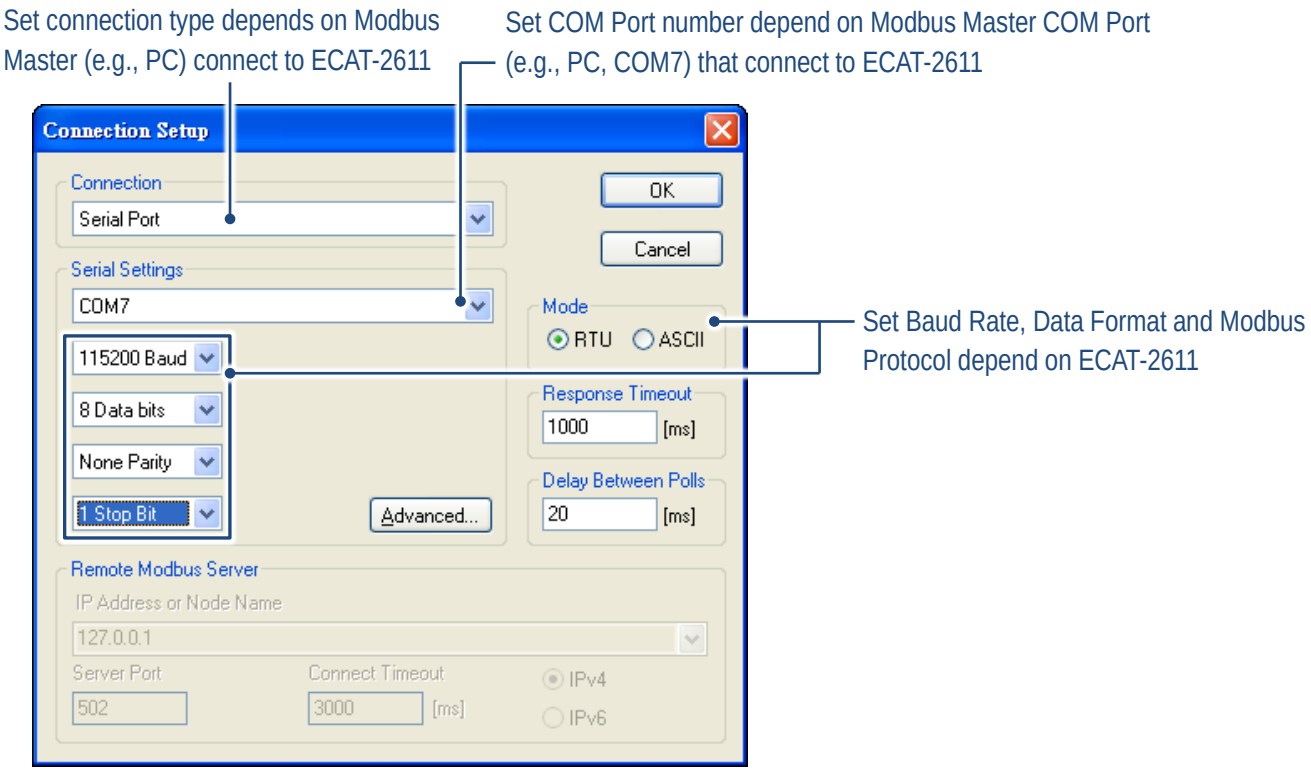

Figure 5-2.5

❻ In the “Mbpoll1” window, verify that connection is successful (ERR = 0).

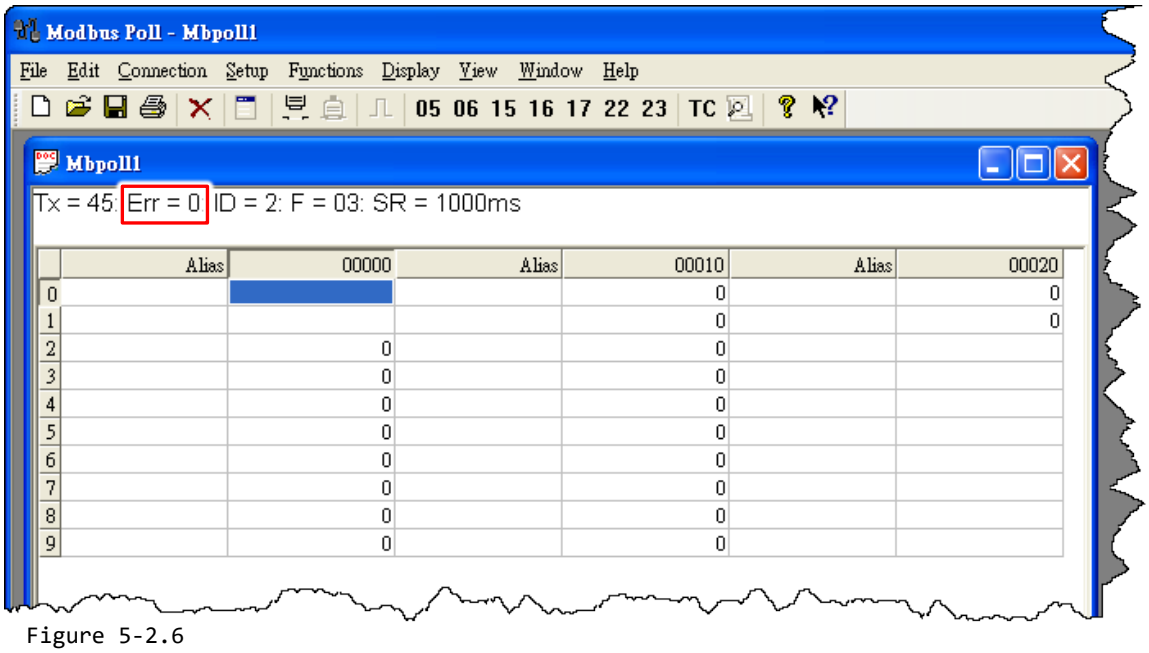

Figure 5-2.6

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5.3 Testing the Modbus RTU Master

Before beginning the **"Test Modbus RTU Master"** process, confirm that Sections 5.1 and 5.2 have been completed.

Step 1 Launch the TwinCAT Master software

❶ You must first install the EtherCAT Master software (e.g., Beckhoff TwinCAT). In this example, we will use **Beckhoff TwinCAT 2.x** to configuring and operating the ECAT-2611 module, refer to Section 3.3 "Configuration and Operation" for more details.

❷ Automatically scan for connected devices

Switch on the power supply, launch the TwinCAT System Manager in **Config mode**, and scan for connected devices (see Figure 5-3.1 below). Acknowledge all dialogs by clicking the **OK** button, so that the configuration is operating in **"FreeRun"** mode.

For more detailed information related to launch the TwinCAT Master Software (e.g., Beckhoff TwinCAT 2.X). Refer to Section 3.3 "Configuration and Operation" or ECAT-2611 Quick Start for more details.

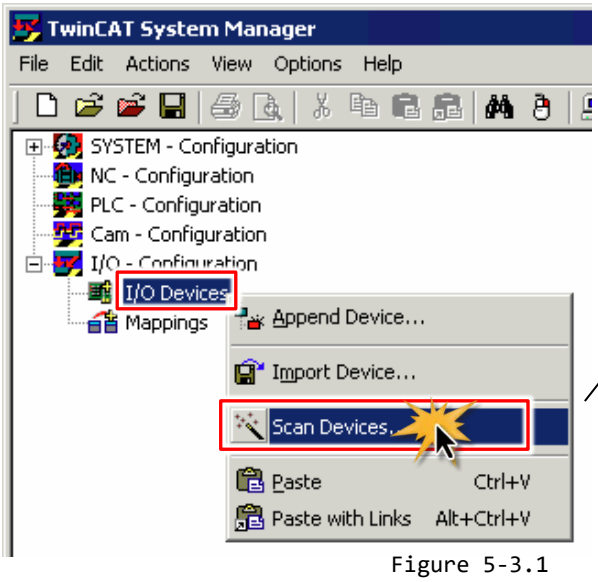

Figure 5-3.1

NOTE

The EtherCAT system must be in a safe, de-energized state before the ECAT-2611 module is connected to the EtherCAT network.

Scan the device configuration by right-clicking the **I/O Devices** item in the navigation pane, and the selecting the **Scan Devices...** option form the menu.

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Step 2 Configuration via TwinCAT

In the left-hand pane of the TwinCAT System Manager, expand on the branch for the EtherCAT Box that you wish to configure (i.e., ECAT-2611 in this case). Expand the entries for both **TxPDO** and **RxPDO** and click the relevant **Inxx and Outxx** items to access the properties window and then configure the state, as described in the procedure below.

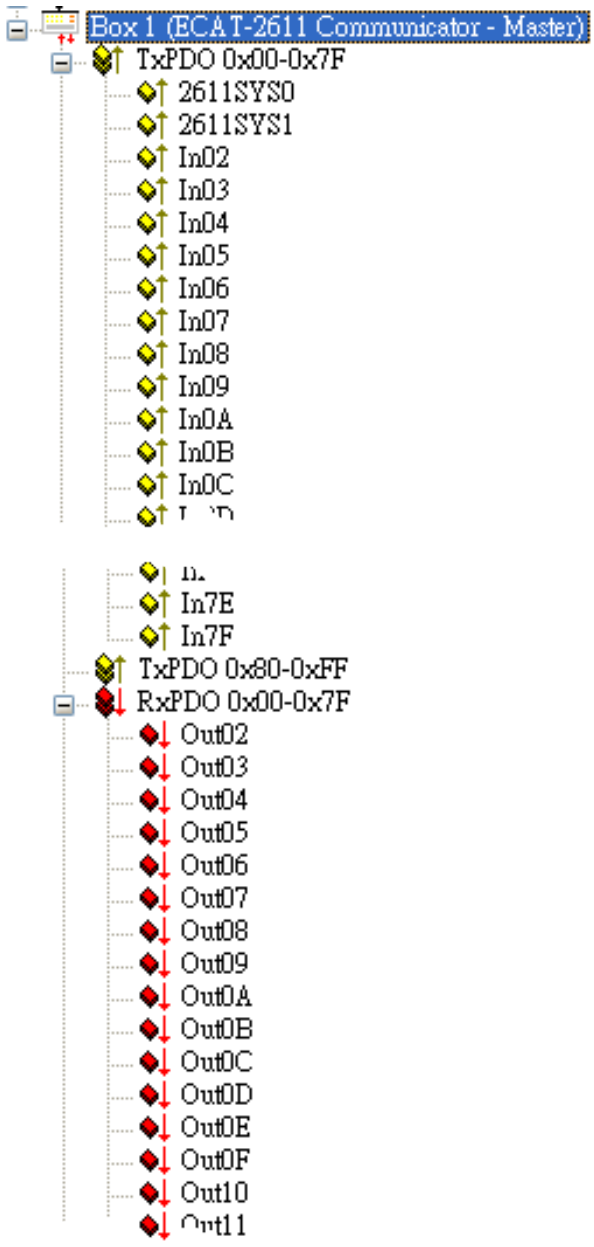

Figure 5-3.2

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➢ Verify the test results of the function 03 “Read holding registers” in the following manner.

❶ In the “Modbus Poll” program, set the function 03 and relevant property, refer to Section 5.2 “Connecting the Modbus RTU Master” for more details.

❷ In the left-hand pane of the TwinCAT System Manager window, click the **Out02** item.

❸ In the right-hand pane, click the **Online** tab.

❹ Click the **Write** button to open the “Set Value Dialog” dialog.

❺ In the “Set Value Dialog” dialog, enter the value **“10”** in the **“Dec:”** field and click the **OK** button.

❻Repeat **Steps 2 to 5** above to **set the value “10” for Out03 to Out0A** items.

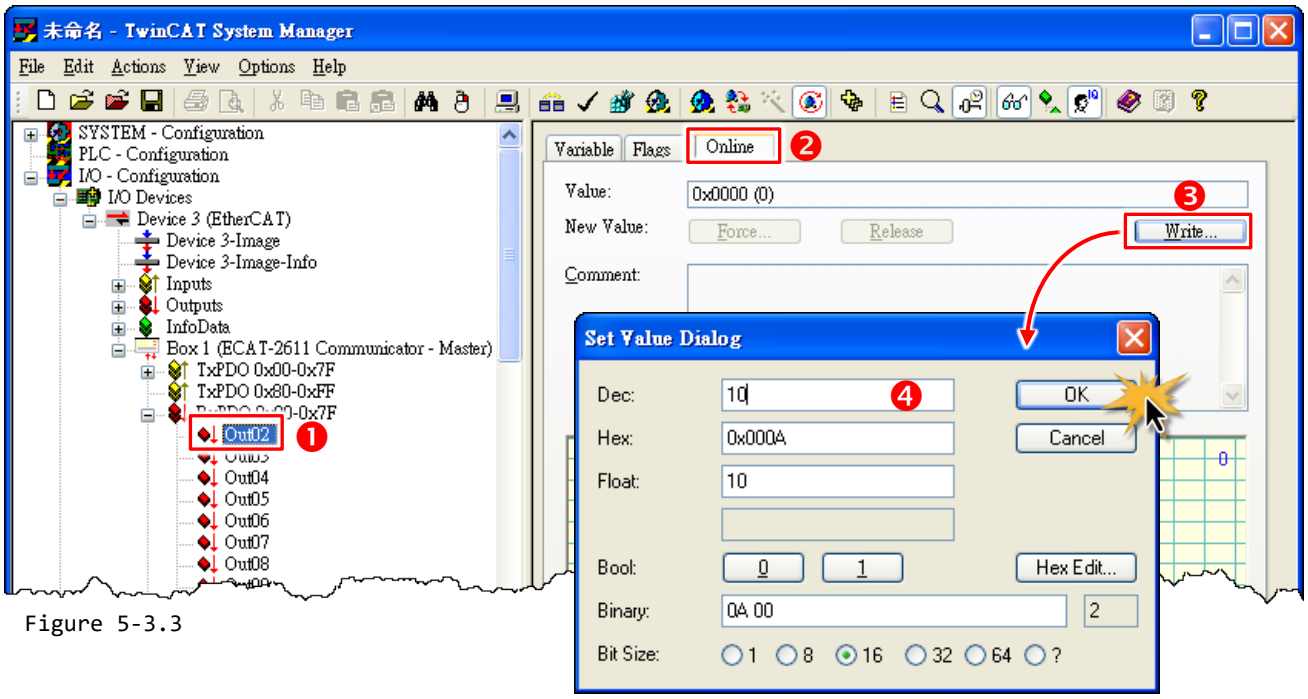

Figure 5-3.3

❼ In the “Modbus Poll” program, verify that the **addresses 2 to 10 are shown “10”** in the value cell.

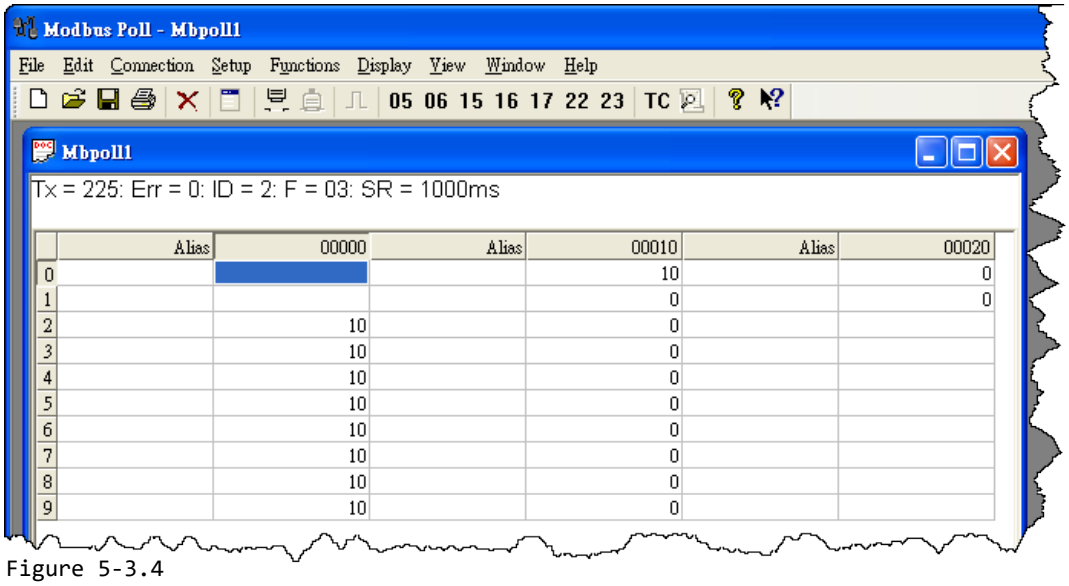

Figure 5-3.4

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➢ Verify the test results of the function 16 “Write multiple registers” in the following manner.

❶ In the “Modbus Poll” program, set the function 16 and relevant property, as Figure below. Refer to Section 5.2 “Connecting the Modbus RTU Master” for more details.

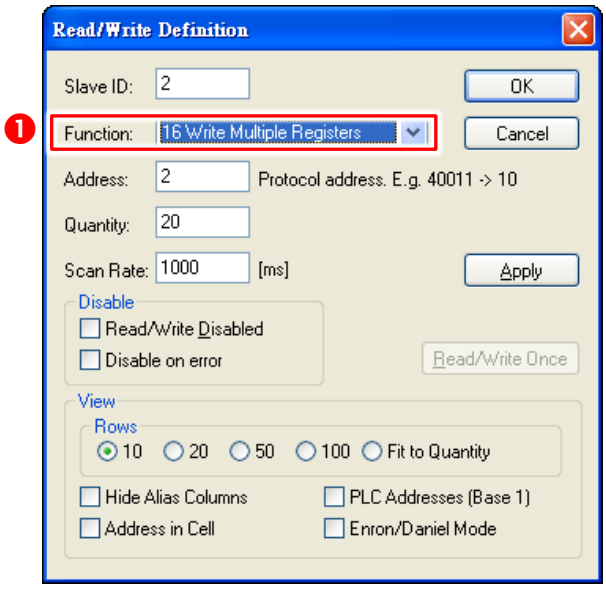

Figure 5-3.5

❷ In the “Modbus Poll” program, **double-click the value cell of address 2** to open the “Enter signed int 16” dialog.

❸ In the “Enter signed int 16” dialog, enter **“20”** in the **“Value”** filed and click the **OK** button.

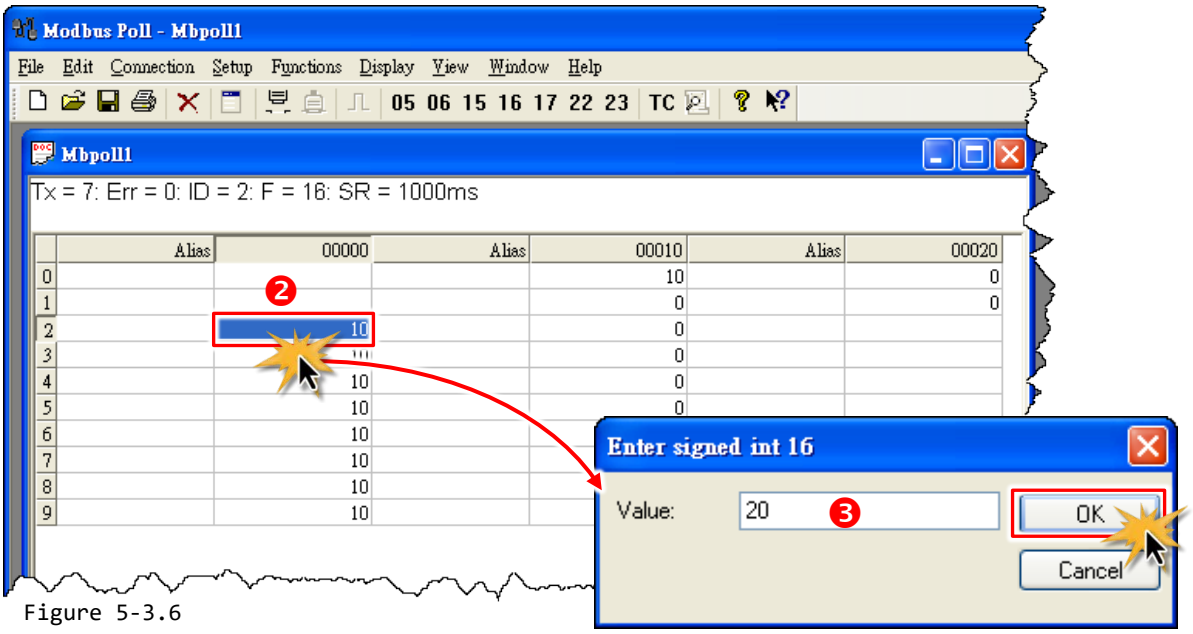

Figure 5-3.6

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❹ Repeat **Steps 2 to 3** above to **set the value "20" for addresses 3 to 10**.

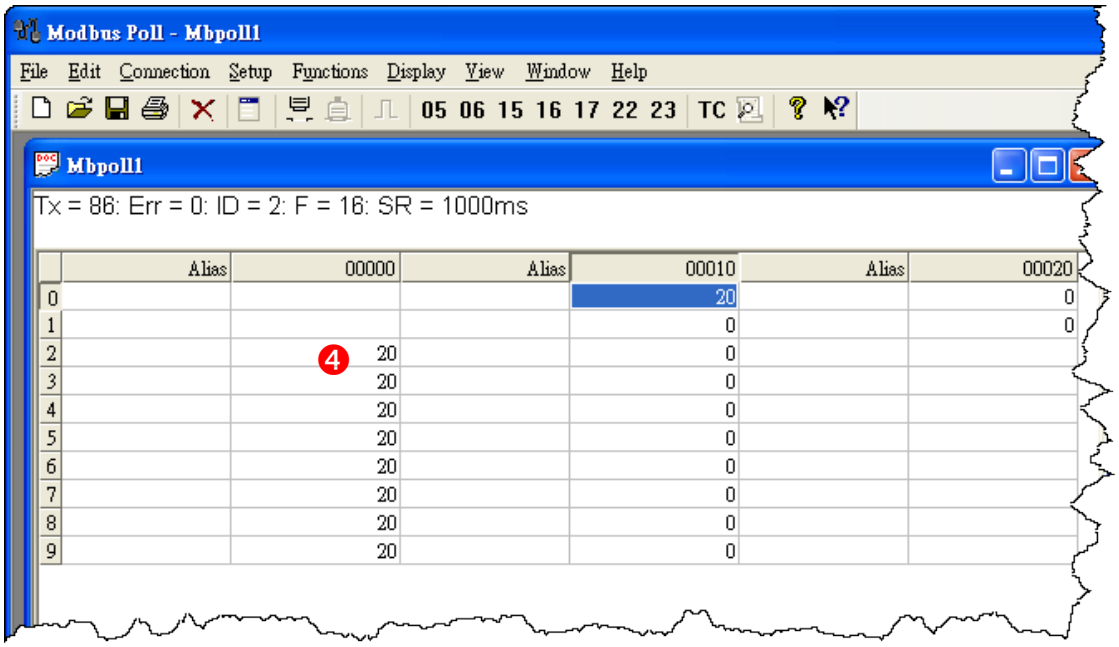

Figure 5-3.7

❺ In the left-hand pane of the TwinCAT System Manager window, click the **TxPDO 0x00-0x7F** item.

❻ In the right-hand pane, check the **In02 to In0A items is 0x0014 (20)**.

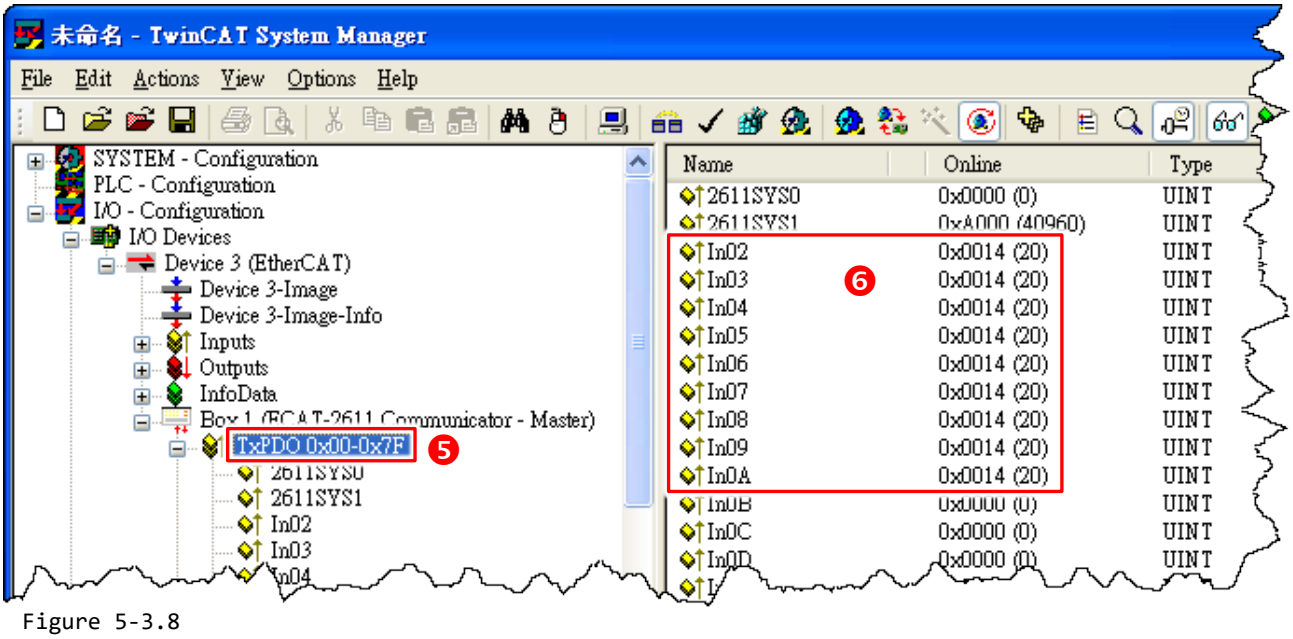

Figure 5-3.8

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6. Modbus Information

Modbus is a communication protocol that was developed by Modicon in 1979. Detailed information regarding the Modbus protocol can be found at: http://www.modbus.org.

The different versions of Modbus used today include Modbus RTU, which is based on serial communication interfaces such as RS-485 and RS-232, as well as Modbus ASCII and Modbus TCP, which uses the Modbus RTU protocol embedded into TCP packets.

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, 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 RTU Data Structure

<table>
<tr><th>Byte 00</th><th>Byte 01</th><th>Byte 02-03</th><th>Byte 04-05</th></tr>
<tr><td rowspan="2">Net ID
(Station number)</td><td rowspan="2">Function Code</td><td colspan="2">Data Field</td></tr>
<tr><td>Reference Number
(Address Mapping)</td><td>Number of Points</td></tr>
</table>

- **Net ID:** Specifies the address of the receiver (i.e., the Modbus RTU slave).
- **Function Code:** Specifies the message type.
- **Data Field:** The data block.

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Net ID (Station Number)

The first byte in the message structure of a Modbus RTU query is the address of the receiver. A valid address is in the range from 0 to 247. Address 0 is used for broadcast purposes, while addresses 1 to 247 are assigned to individual Modbus devices.

Function Code

The second byte in the message structure of a Modbus RTU query is the function code, which describes what the slave device is required to do. Valid function codes range between 1 and 255. To answer the query, the slave device uses the same function code as contained in the request. The highest bit in the function code will only be set to '1' if an error occurs in the system. In this way, the master device will know whether or not the message has been correctly transmitted.

Code	Function	Reference (Address)
01 (0x01)	Read Multiple Coils Status for DO	0xxxx
02 (0x02)	Read Multiple Input Discrete for DI	1xxxx
03 (0x03)	Read Multiple Registers for AO	4xxxx
04 (0x04)	Read Multiple Input Registers for AI	3xxxx
05 (0x05)	Write Single Coil for DO	0xxxx
06 (0x06)	Write Single Register for AO	4xxxx
15 (0x0F)	Force Multiple Coils for DO	0xxxx
16 (0x10)	Write Multiple Registers for AO	4xxxx

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Data Field

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 will be transmitted as 0x0A, 0x0B. The data for 32-bit registers is transmitted as two 16-bit registers, and is low-word first. For example: 0x0A0B0C0D will be transmitted as 0x0C, 0x0D, 0x0A, 0x0B.

The data field for messages sent between a master device and a slave device 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	**Read/Write Discrete Outputs or Coils.** An 0x reference address is used to output device data to a Digital Output channel.
1xxxx	**Read Discrete Inputs.** The ON/OFF status of a 1x reference address is controlled by the corresponding Digital Input channel.
3xxxx	**Read Input Registers.** A 3x reference register contains a 16-bit value received from an external source, e.g. an analog signal.
4xxxx	**Read/Write Output or Holding Registers.** A 4x register is used to store 16bits of numerical data (binary or decimal), or to send data from the CPU to an output channel.

⚠NOTE

The details regarding the address mapping (Reference Number) depends on which Modbus RTU slave device in installed.

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FC1(0x01) Read Multiple Coils (0xxxx) for DO

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	Depends on the Modbus address of the slave device. 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

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FC2(0x02) Read Multiple Input Discrete (1xxxx) for DI

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	Depends on the Modbus address of the slave device. 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 =(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

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FC3(0x03) Read Multiple Registers (4xxxx) for AO

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	Depends on the Modbus address of the slave device. 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

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FC4(0x04) Read Multiple Input Registers (3xxxx) for AI

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	Depends on the Modbus address of the slave device. 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.

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FC5(0x05) Write Single Coil (0xxxx) for 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	Depends on the Modbus address of the slave device. 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.

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FC6(0x06) Write Single Register (4xxxx) for 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	Depends on the Modbus address of the slave device. 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.

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FC15(0x0F) Force Multiple Coils (0xxxx) for DO

This function code is used to set the status of multiple coils or to 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	Depends on the Modbus address of the slave device. 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 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	1to 247
01	Function Code	1 Byte	0x8F
02	Exception Code	1 Byte	Refer to the Modbus Standard Specifications for more details.

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FC16(0x10) Write Multiple Registers (4xxxx) for AO

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	Depends on the Modbus address of the slave device. 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.

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FC255(0xFF) Special Commands

This function code is special command that applies only to the ECAT-2610 module.

Commands	Description	Reference
FF 03 00 00 00 02	Read system status (2610Sys0 + 2610Sys1)	Refer to Section 3.3.1 "Module Status and Error Mode" for more details.
FF 03 00 01 00 01	Save the RS-485 cycle time, unit = 0.1 ms	Refer to 16. RS485_Cycle_Time for more details.
FF 06 00 00 00 nn	Delay 100 ms x **nn**	Refer to 11.Delay_Command for more details.
FF 06 00 01 00 nn	Delay 1 ms x **nn**	

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7. Upload Commands.txt Operations

If the ECAT-2610/2611 module is not functioning correctly, e.g., if there is no response from the module, or if the LED is continuously displayed as either ON or OFF, you can use Debug Mode to diagnose the problem. To begin, **short the TxD and RxD pins** on the module, as illustrated in Figure 7-1.1, the ECAT-2610/2611 module will then enter the "**Init"** (Debug Mode). In the Debug Mode, the module will bypass the EEPROM and stop executing commands, and then you can erase the EEPROM and upload new configuration data file (commands.txt) to the EEPROM, as described below:

Step 1 Switch to Init Mode

Follow the procedure described below to switch the ECAT-2610/2611 module to **Init** mode.

❶ **Power off** the ECAT-2610/2611 module.

❷ Connect the COM1 (Console Port) on the ECAT-2610/2611 module to the COM Port on the Host PC using the CA-0915 cable, as illustrated in the diagram below.

❸ **Connect the TxD pin to RxD pin** on the COM3 terminal block on the ECAT-2610/2611 module, as illustrated in the diagram below.

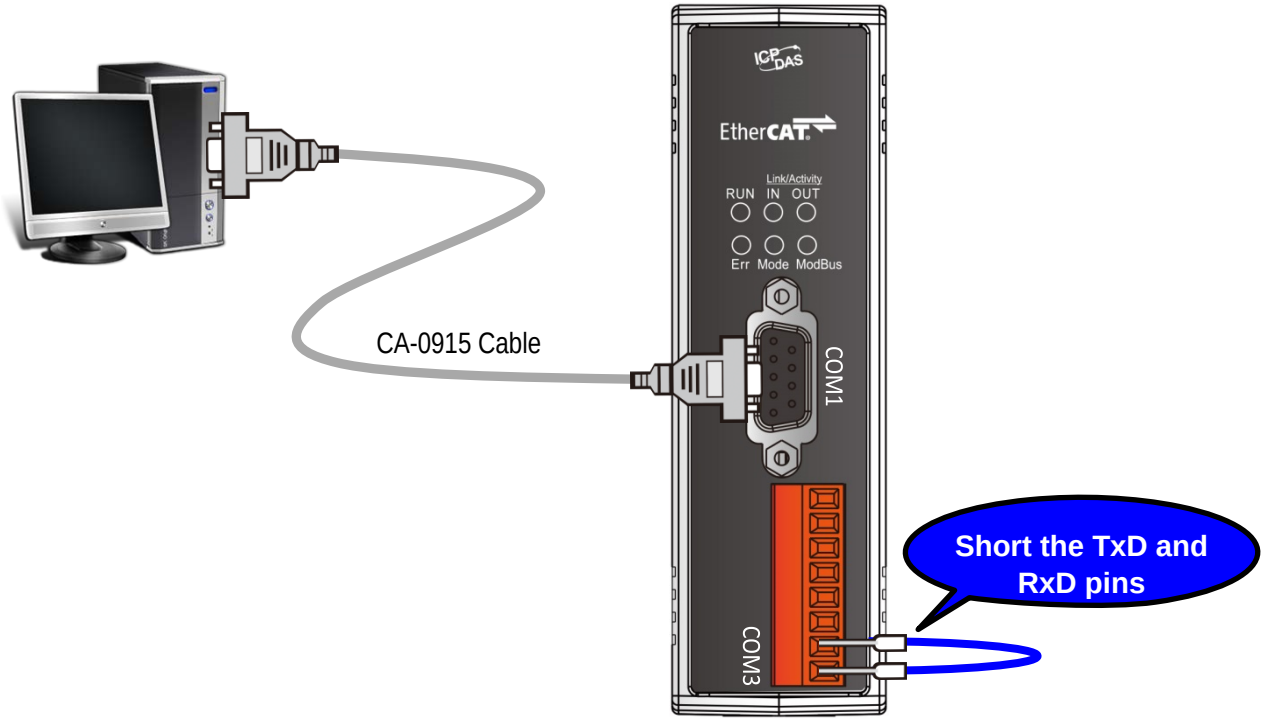

Figure 7.1.1

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Step 2 Launch the Configuration/Diagnostic Utility (7188ECAT.exe)

❶ Here, the Windows XP is used as an example, type **"cmd"** in the **Open** field and the press **Enter** to open the Command Prompt window.

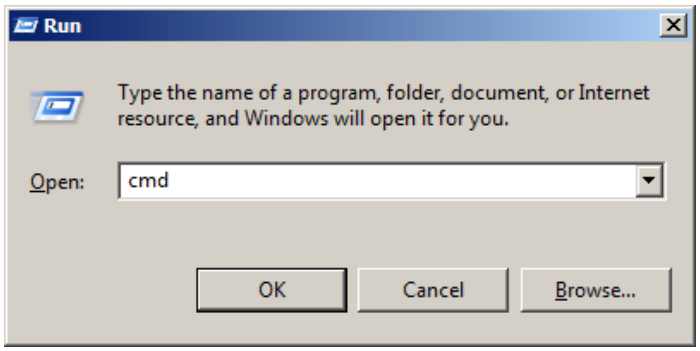

Figure 7-1.2

NOTE

Open a Command Prompt window method depends on the version of Windows being used.

❷ In the Command Prompt window, type **"e:"** (7188ECAT folder location on your hard drive) and then press **Enter**.

❸ Type **cd 7188ecat** and then press **Enter**.

❹ Type **execcom4** and then press **Enter** to automatically launch the **7188ECAT.exe** Configuration/Diagnostic Utility. **Note** that the **execcom4** is used COM Port 4 on the Host PC to download data, refer to Figure A3-9 of A3. Manually Configure and Upload for more details.

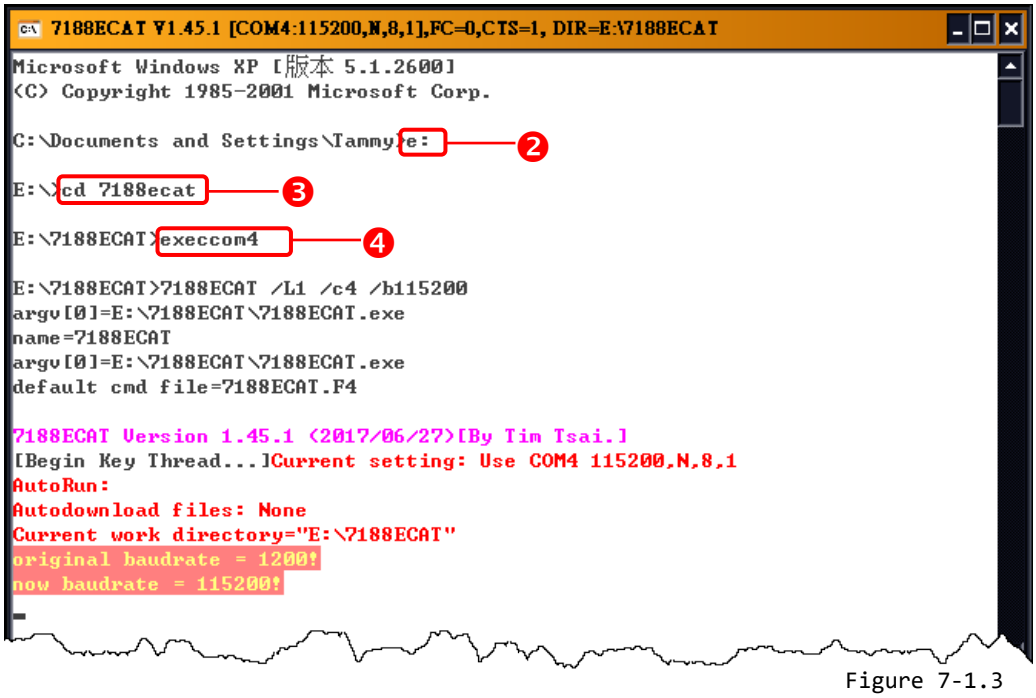

Figure 7-1.3

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Step 3 Power on the ECAT-2610/2611 module in Init Mode

When you power on the ECAT-2610/2611 module, it will automatically enter the **"INIT"** (Debug Mode), as illustrated in the diagram below.

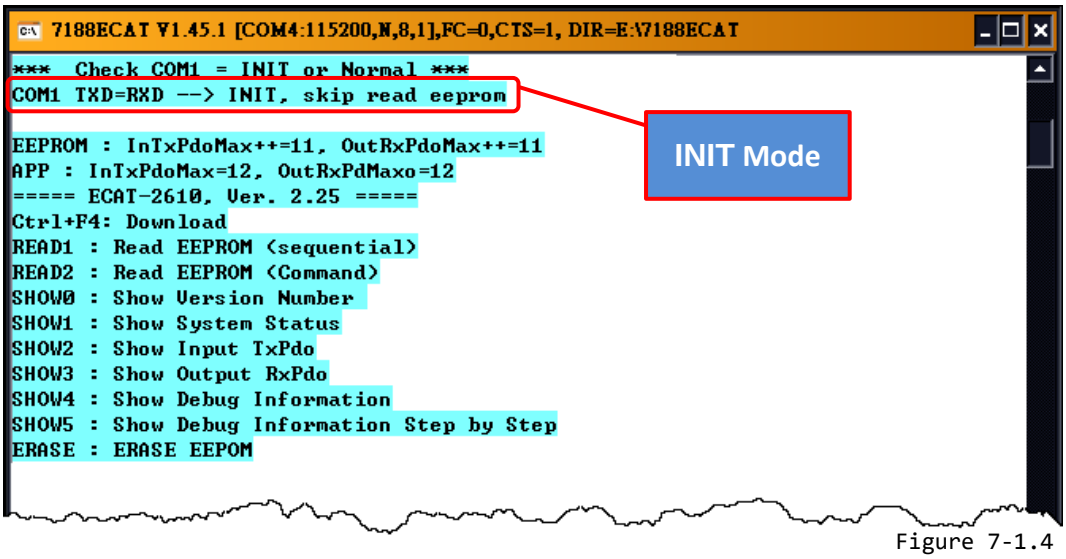

Figure 7-1.4

- There are ten commands applicable to uploading and diagnostic operations, as described below:

Command	Description	Operations
CTRL+F4	Upload the **commands.txt** file to the EEPROM	**Upload**
READ1	Read data from the EEPROM	Factory Debug
READ2	Read data from the EEPROM	Factory Debug
SHOW0	Show the Version Number	Factory Debug
SHOW1	Show the status	Factory Debug
SHOW2	Show InTxPDO[00] to InTxPDO[FF]	Factory Debug
SHOW3	Show OutRxPDO[00] to OutRxPDO[FF]	Factory Debug
SHOW4	Show the Debug Information	Factory Debug
SHOW5	Show the Debug Information Step by Step (Slow Speed)	Factory Debug
ERASE	Erase all data from the EEPROM	**Upload**

Only the **CTRL+F4** and **ERASE** commands are applicable to uploading new configuration file (commands.txt) to the EEPROM. The other commands are applicable for factory debug operations.

NOTE

The EEPROM is designed to store data that is not changed frequently. It is not suitable for frequent access a large amount of data, and the erase/write cycle is limited, so it should not be changed frequently when testing that it will easily cause damage to the module.

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Step 4 Disconnect the TxD and RxD pins

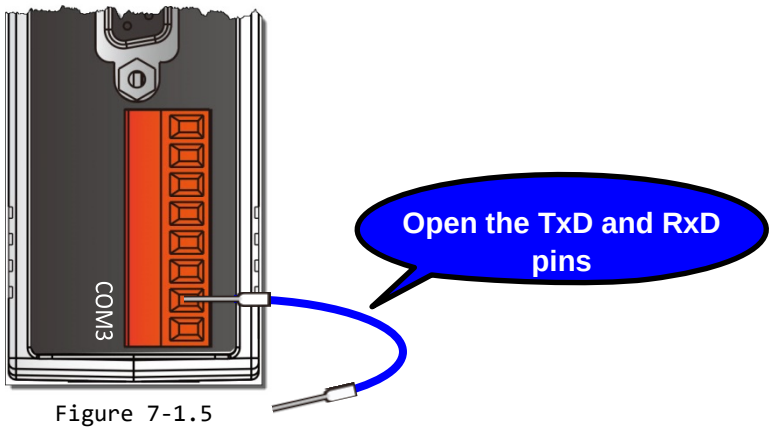

Figure 7-1.5

Step 5 Upload the new configuration file to the EEPROM

Since the configuration has been changed, the new configuration data must be uploaded to the EEPROM using the Configuration/Diagnostic Utility. To do this, follow the procedure described below.

❶ Type **erase** in the Command Prompt window and then press **Enter** to erase all currently existing data from the EEPROM.

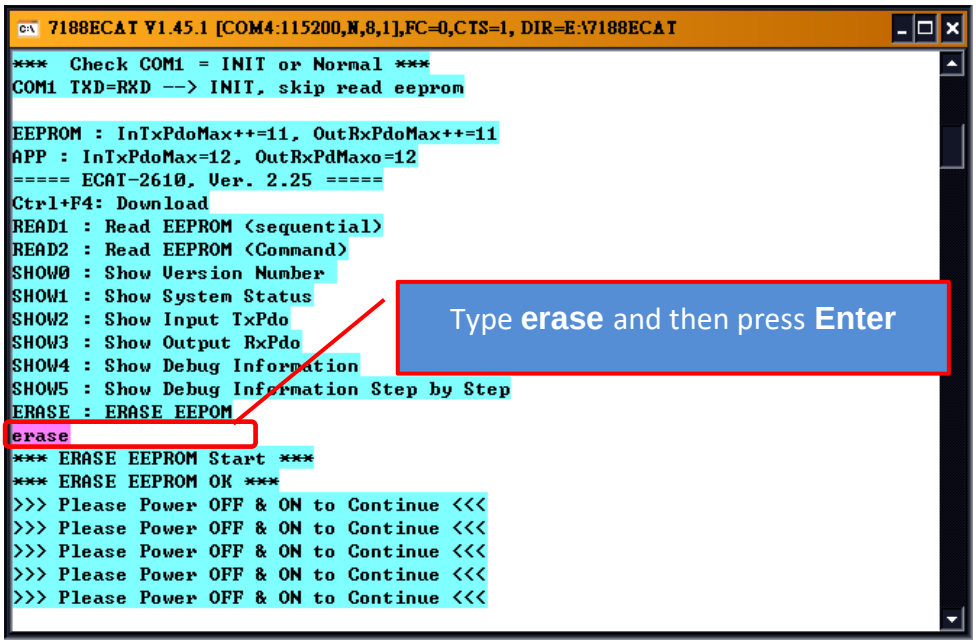

Figure 7-1.6

❷ **Switch off** the power to the ECAT-2610/2611 module and then switch it back on again to reboot the module.

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❸ Press **[Ctrl]+[F4]** on the keyboard to upload the **new configuration file (commands.txt)** to the ECAT-2610/2611 module.

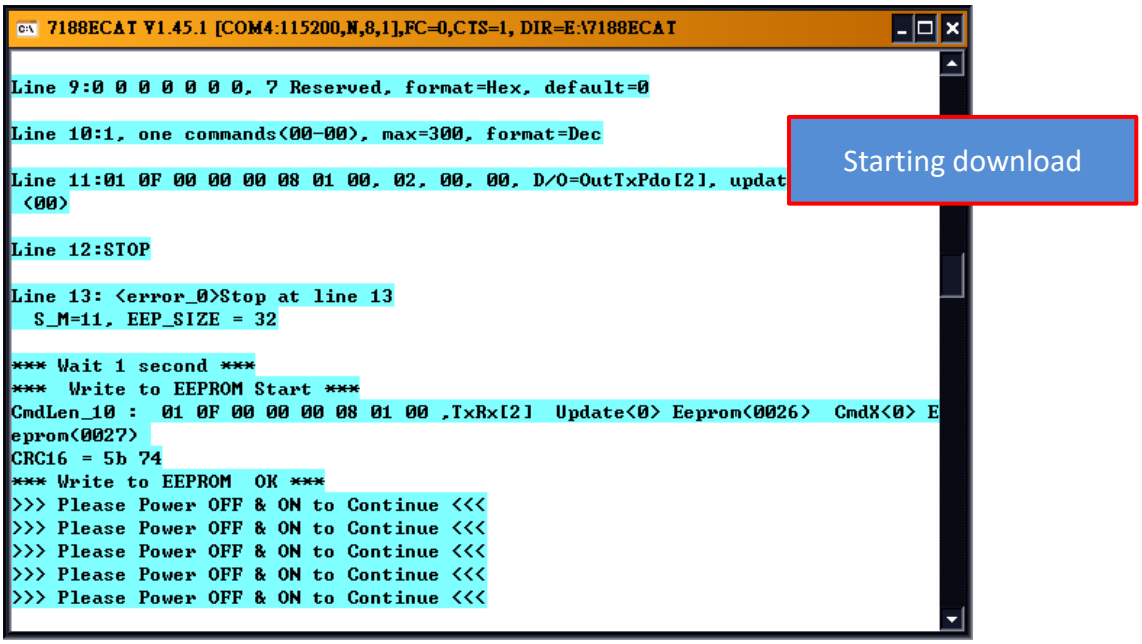

Figure 7-1.7

❹ **Switch off** the power to the ECAT-2610/2611 module and then switch it back on again to reboot the module.

❺ Click the ☒ icon on the right-top corner of the Command Prompt Utility window to close it.

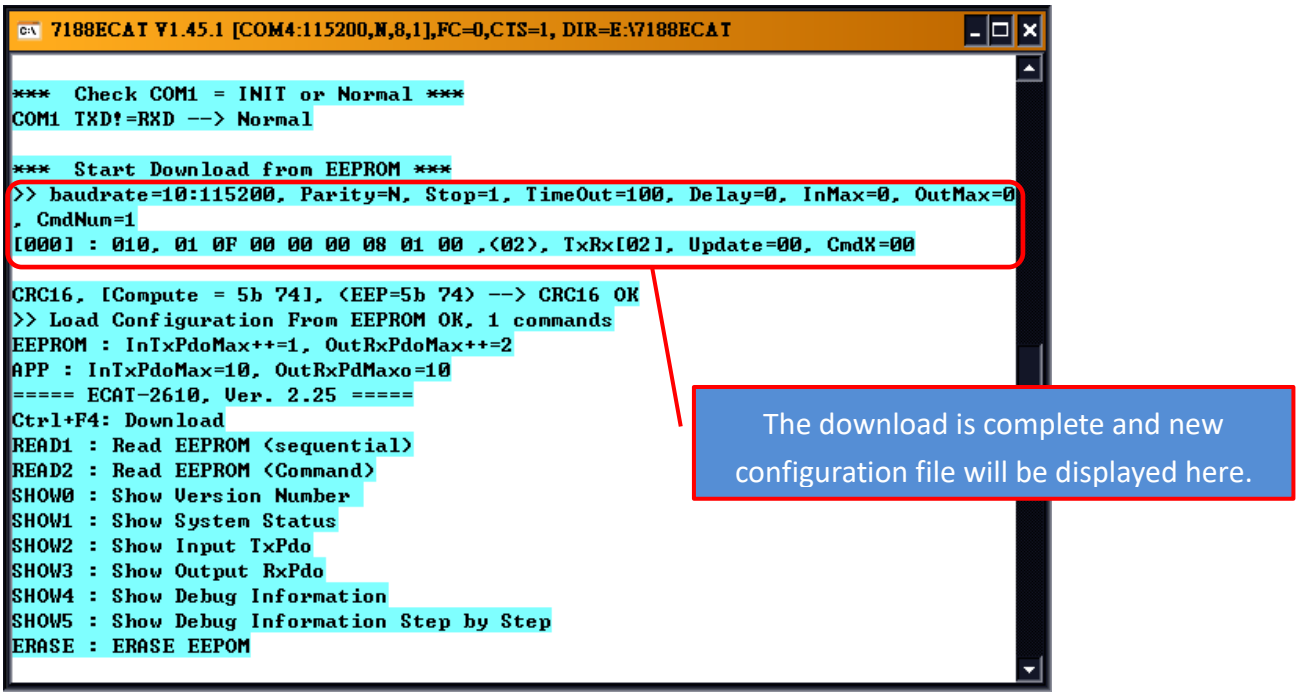

Figure 7-1.8

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8. Distributed Clocks for ECAT-2610

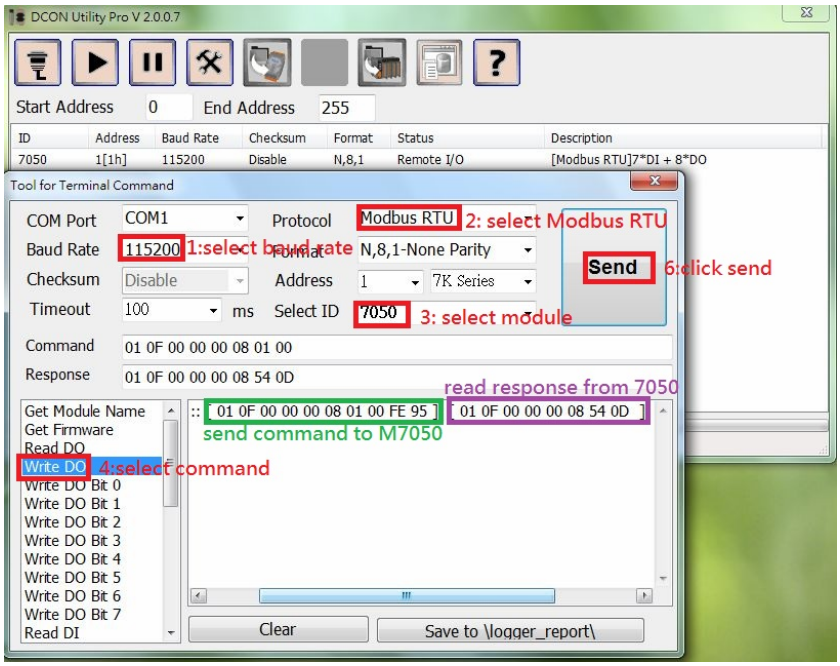
The term “Distributed Clocks” (DC) refers to a logical network of synchronized, distributed local clocks in an EtherCAT fieldbus system. By using distributed clocks, EtherCAT, the real-time Ethernet protocol, is able to synchronize the time in all local bus devices within a very narrow tolerance range. Additional and more detailed information about EtherCAT in general and Distributed Clocks in particular, can be found at http://www.ethercat.org/.

8.1 Modbus RTU Timing

In this example, we use the ECAT-2610 module to control an M-7050 module (Modbus RTU I/O device), the 7-channel Digital Input and 8-channel Digital Output of ICP DAS. The following four example for measure the hardware timing for send command, read response and DC cycle time, as described below:

Sending a single Modbus Command, i.e., Write DO

❶ Use the DCON Utility to easily and quickly get the correct **Write DO command** and **read response data**. Refer to A1 “How do I retrieve the Modbus command via DCON Utility” for details of how to send commands to an M-7050 module as described below:



1. Select Baud Rate
2. Select Modbus RTU
3. Select Module
4. Select Command
5. Click “**Send**” button

Send Write DO Command String
= 01 0F 00 00 00 08 01 00 FE 95

Receive Response String
= 01 0F 00 00 00 08 54 0D
NOTE: The FE 95 and 54 0D items are check sum bytes.

Figure 8-1.1

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❷ Edit the configuration data (commands.txt) by modifying the relevant information, including the Baud Rate, Data Format and Write DO command (Paste the command obtained in Step1), refer to Section 4.2 "Configuring and Uploading" or A3. "Manually configure and Upload for ECAT-2610" for details of how to upload the configuration data (see Figure 8-1.2) to the ECAT-2610 module.

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, one commands(00-00), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure 8-1.2

❸ The ECAT-2610 module will first send the Write DO command **01 0F 00 00 00 08 01 00 FE 95** to the M-7050 module, then read the response **01 0F 00 00 00 08 54 0D** from the M-7050 module. The **send_then_read** operation will not stop and will continue to repeat in sequence.

❹ Measure hardware timing result for a single send Write DO command/read response cycle is as follows:

- To Send the command **01 0F 00 00 00 08 01 00 FE 95** take approximately 1 ms.
- To Read the response **01 0F 00 00 00 08 54** take approximately 1 ms.
- The **send_then_read** process takes approximately 5 ms
- The **read_N** to **send_N+1** process takes approximately 2 ms
- A single **send_read_cycle** is approximately 5+2=7 ms

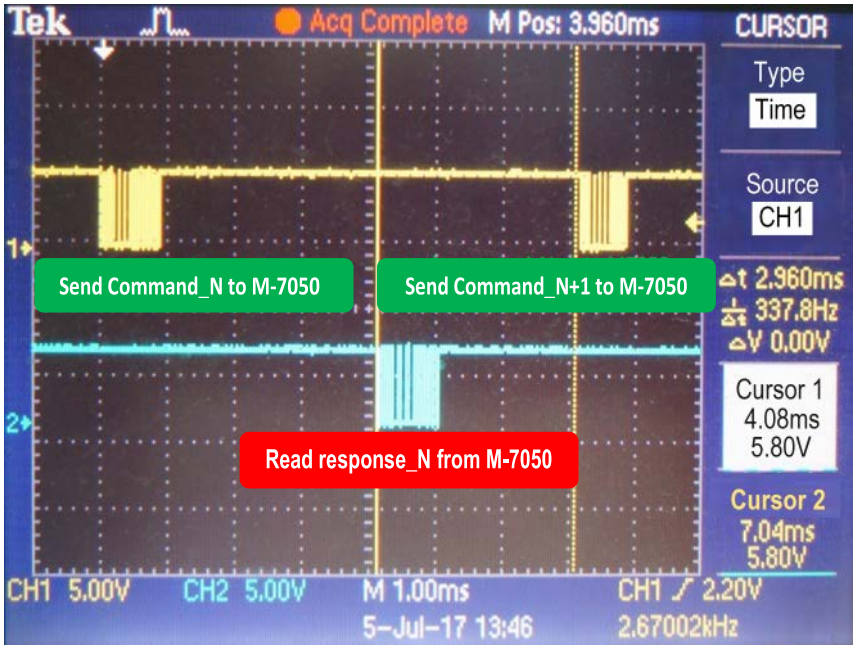

Figure 8-1.3

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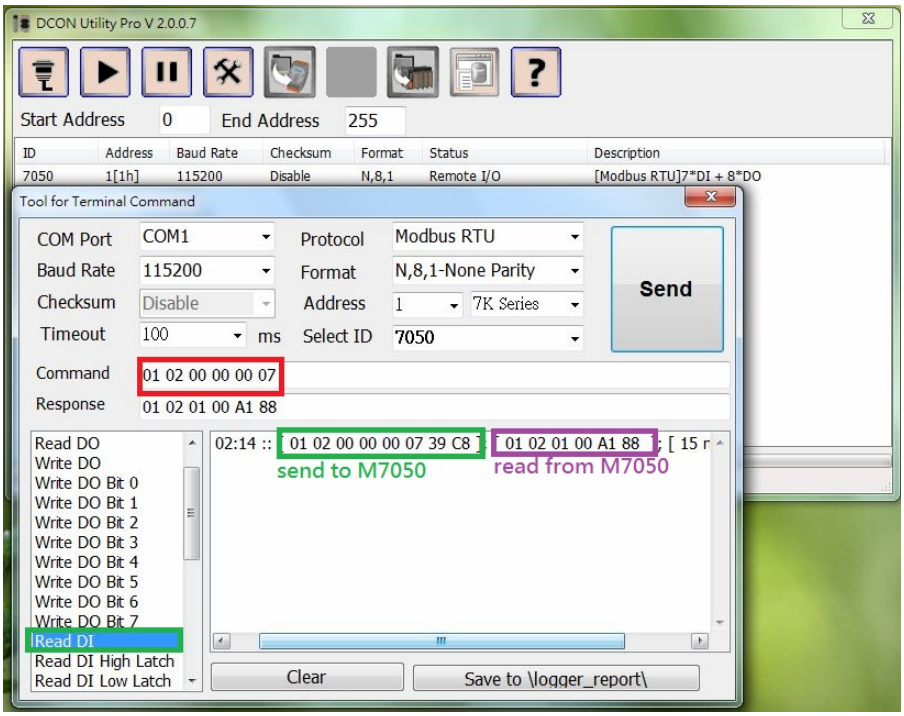
Sending a single Modbus Command, i.e., Read DI

❶ Back to DCON Utility to easily and quickly get the correct **Read DI command** and **read response data**. Refer to A1 "How do I retrieve the Modbus command via DCON Utility" for details of how to send commands to an M-7050 module as described below:



Send Read DI command string
= 01 02 00 00 00 07 39 C8

Receive response string
= 01 02 01 00 A1 88

NOTE: The 39 C8 and A1 88 items are check sum bytes.

Figure 8-1.4

❷ Edit the configuration data (commands.txt) by modifying the relevant information, including the Baud Rate, Data Format and Read DI command (Paste the command obtained in Step1) , refer to Section 4.2 "Configuring and Uploading" or A3. "Manually configure and Upload for ECAT-2610" for details of how to upload the configuration data (see Figure 8-1.5) to the ECAT-2610 module.

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, one commands(00-00), max=300, format=Dec
01 02 00 00 00 07, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure 8-1.5

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❸ The ECAT-2610 will first send the Read DI command **01 02 00 00 00 07 39 C8** to the M-7050, then read the response **01 02 01 00 A1 88** from the M-7050 module. The **send_ then_read** operation will not stop and will continue to repeat in sequence.

❹ Measure hardware timing result for a single send Read DI command/read response cycle is as follows:

- To Send the command **01 02 00 00 00 07 39 C8** takes approximately 0.8 ms
- To Read the response **01 02 01 00 A1 88** takes approximately 0.7 ms
- The **send_then_read** process takes approximately 4 ms
- The **read_N** to **send_N+1** process takes approximately 2 ms
- A single **send_read_cycle** takes approximately 4+2=6 ms

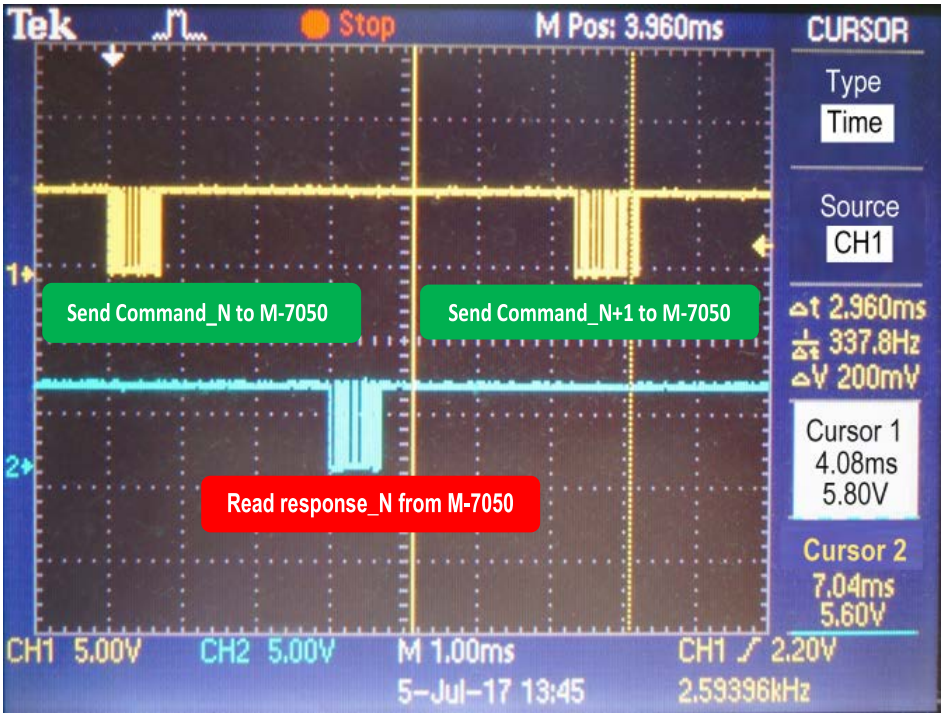

Figure 8-1.6

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Sending two Modbus Commands, i.e., Write DO and Raead DI

❶ Edit the configuration data (commands.txt) by modifying the relevant information, including the Baud Rate, Data Format and Write DO + Read DI commands, refer to Section 4.2 "Configuring and Uploading" or A3. "Manually configure and Upload for ECAT-2610" for details of how to upload the configuration data (see Figure 8-1.7) to the ECAT-2610 module.

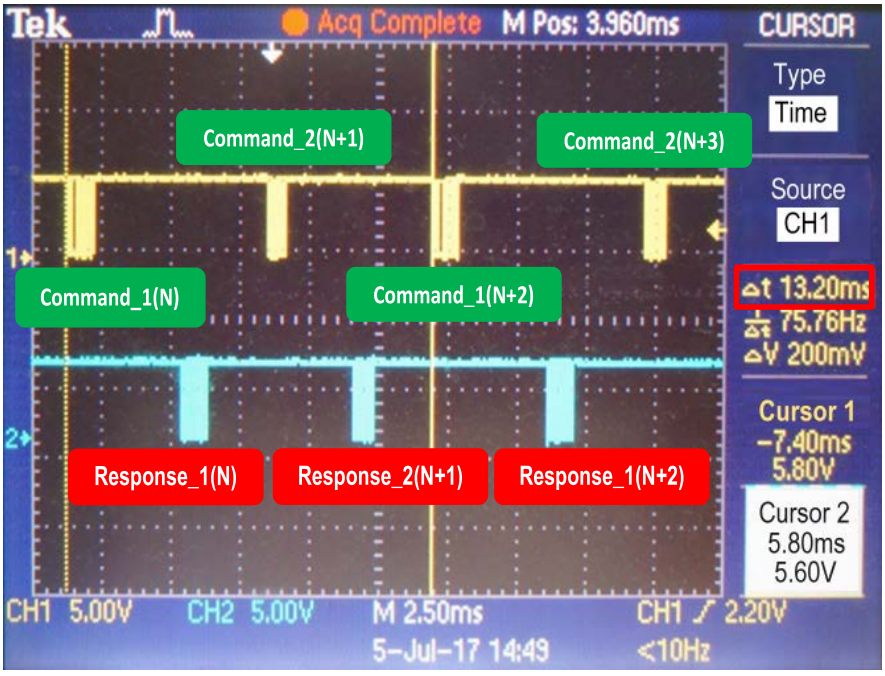
```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 07, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
STOP
=============================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================
```

Figure 8-1.7

❷ The ECAT-2610 module will first send the Write DO command **01 0F 00 00 00 08 01 00 FE 95** to the M-7050 module, then read the response **01 0F 00 00 00 08 54 0D** from the M-7050 module, the second send the Read DI command **01 02 00 00 00 07 39 C8** to the M-7050, then read the response **01 02 01 00 A1 88** from the M-7050 module.

The Write DO Command_01 = (send) 01 0F 00 00 00 08 01 00 FE 95 + (read) 01 0F 00 00 00 08 54 0D
The Read DI Command_02 = (send) 01 02 00 00 00 07 39 C8 + (read) 01 02 01 00 A1 88

❸ Measure hardware timing result for the Write DO Command_01 + Read DI Command_02 cycle is as follows:



- A single Write DO Command_1 + Read DI Command_02 cycle takes approximately 13.2 ms

Figure 8-1.8

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DC Cycle Time

The ECAT-2610 module will automatically detect and synchronize to the DC signal each time the first command is executed. The cycle time for the **Write DO command** is about 7 ms, and the cycle time for the **Write DO + Read DI commands** is about 13.2 ms.

- If the DC signal is set to 20 ms, the cycle time for the **Write DO command** will be as follows:

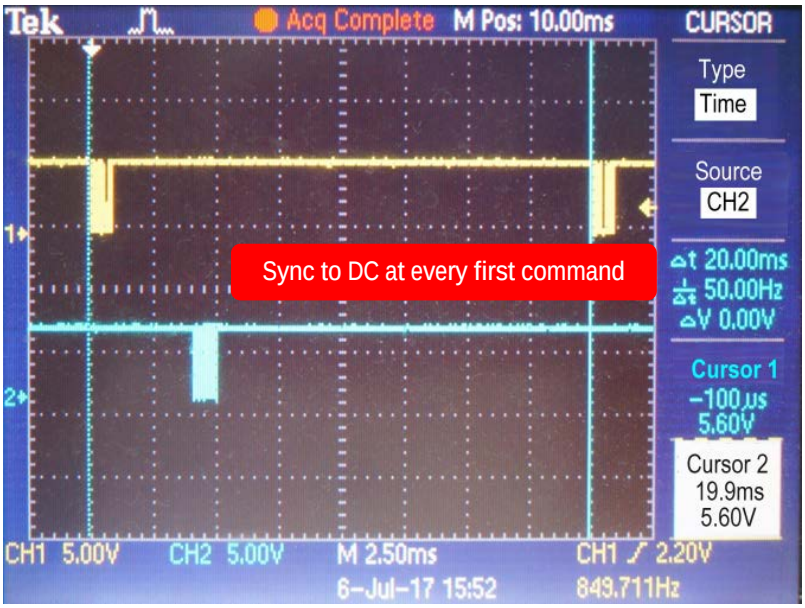

Figure 8-1.9

- If the DC signal is set to 20 ms, the cycle time for the **Write DO + Read DI commands** will be as illustrated in the following diagram:

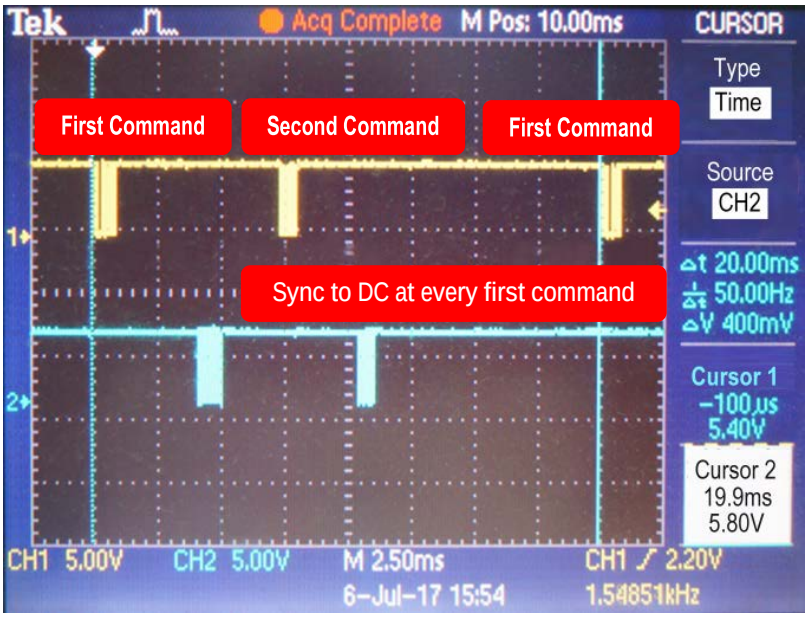

Figure 8-1.10

A single command_1 + command_02 cycle takes approximately 13.2ms.

If the DC Cycle Time is set to 10 ms < 13.2 ms, the ECAT-2610 will synchronize to the DC at every first command. So the timing diagram for when the DC=10 ms is as same as for when the DC=20 ms and above. The total command cycle time can be greater than the DC Cycle Time without causing any significant problems.

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8.2 DC Configuration and Operation

This Section provides a simple overview of how to configure the Distributed Clocks (DC), follow the procedure described below.

The image below shows an example of the setup for Distributed Clocks (DC) test:

- DC is active
- DI = ECAT-2052
- DO1=M-7055 slave1, DO2=M-7055 slave2
- DO1=DI, DO2=DI

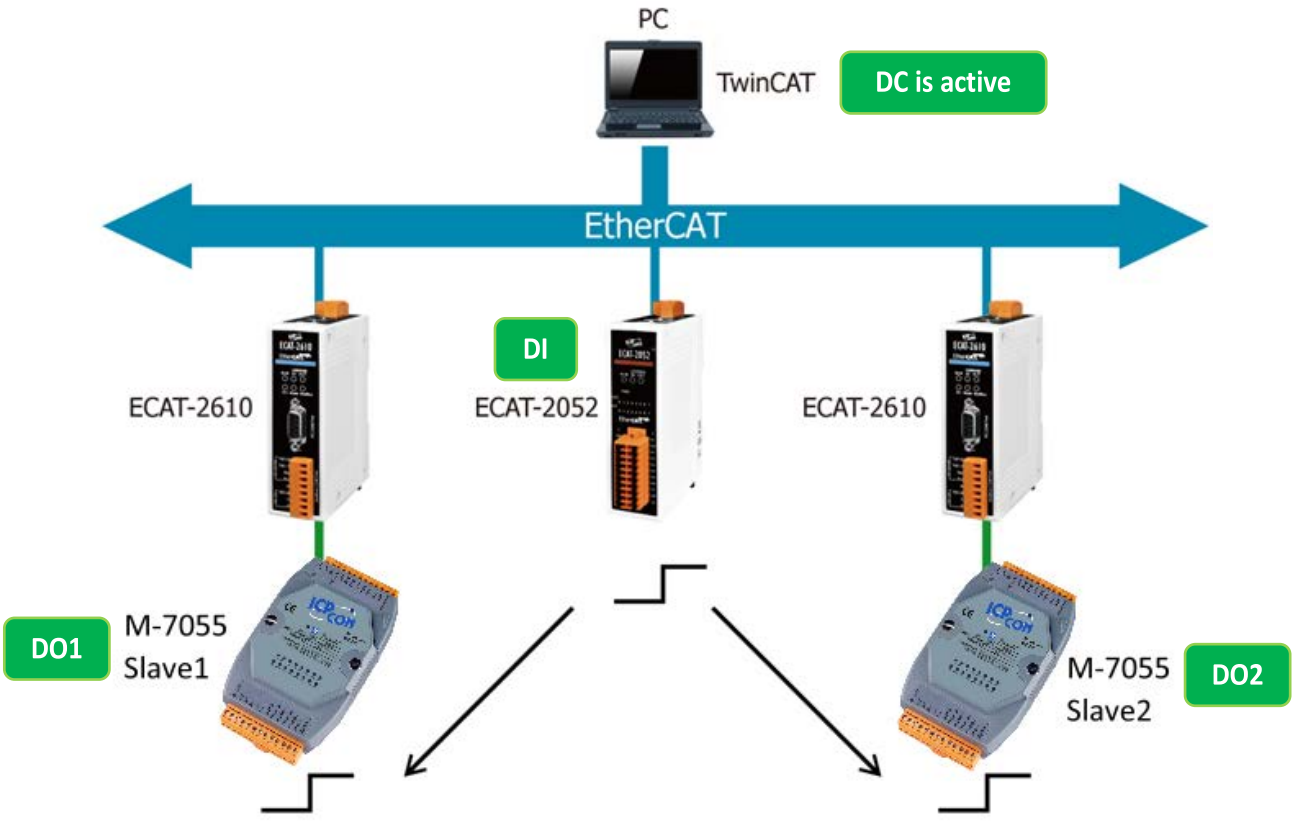

Figure 8-2.1: The setup for a Distributed Clocks (DC) test

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Launch the TwinCAT3.0 application and then follow the procedure described below to set the Distributed Clocks (DC) operation:

Step 1 Scan for devices

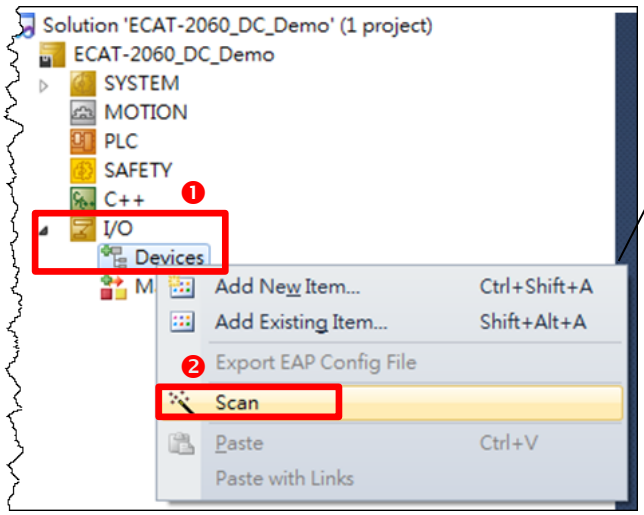

Figure 8-2.2

Scan the configuration by first expanding the **I/O** entry in the left-hand pane of the TwinCAT System Manager and then right-clicking the **Devices** item.

Select the **Scan** option from the menu to access the configuration panel.

Step 2 Configure the DC mode settings for the ECAT-2610 module

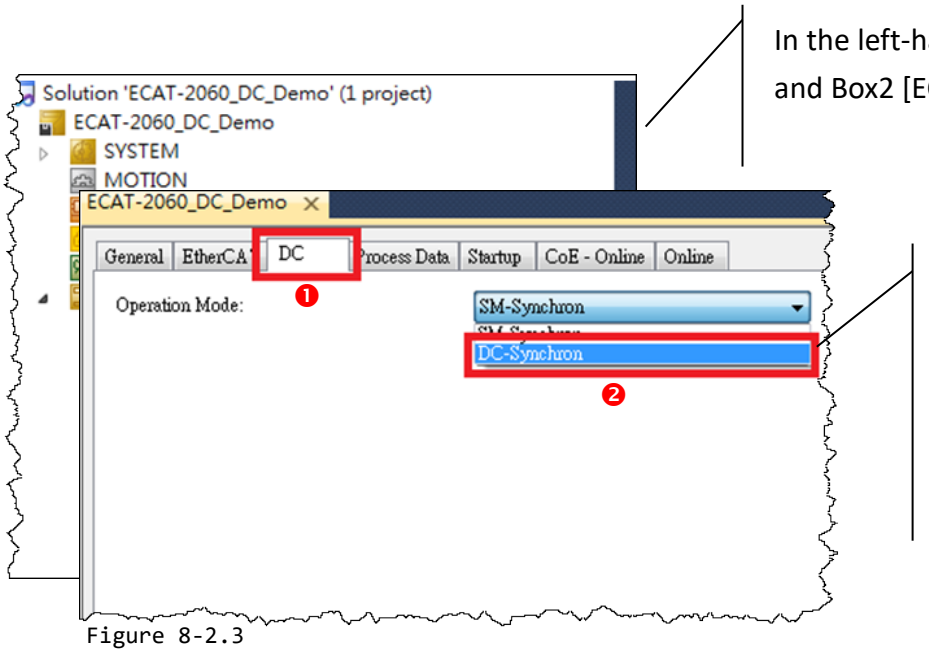

Figure 8-2.3

In the left-hand pane click the Box1 and Box2 [ECAT-2610]

In the right-hand pane click the **DC** tab, and then select the **DC-Synchron** Option from the operation Mode drop-down menu.

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Step 3 Activate the PLC

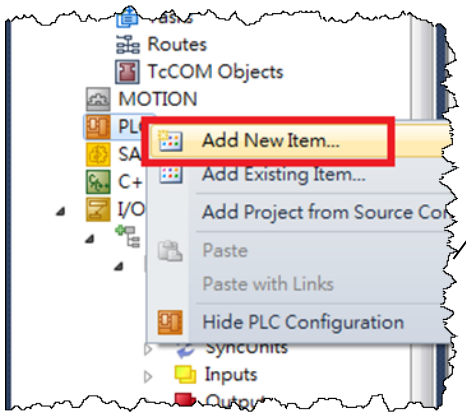

Figure 8-2.4

Activate the **PLC** by right-clicking the **PLC** item in the left-hand pane of the TwinCAT system Manager and then selecting the **Add New Item…** option from the menu to open the **Add New Item** dialog.

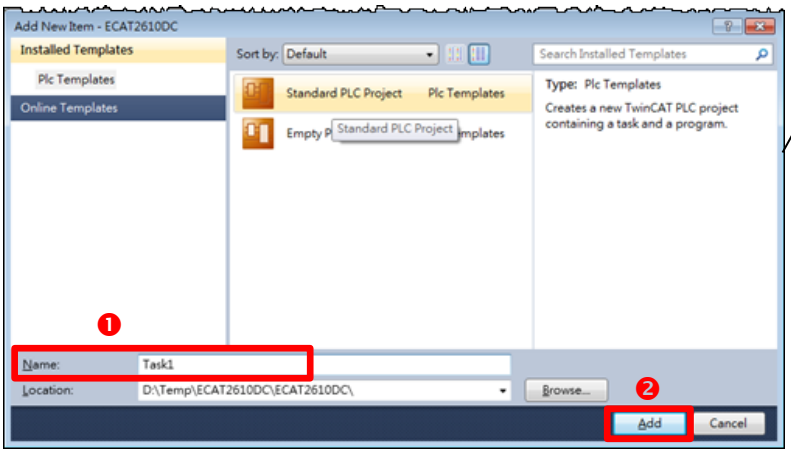

Figure 8-2.5

In the **Add New Item** dialog, enter a name for the project in the **Name** field **(e.g., Task1)**, and then click the **Add** button.

The new item will then be listed in the left-hand pane of the TwinCAT System Manager application.

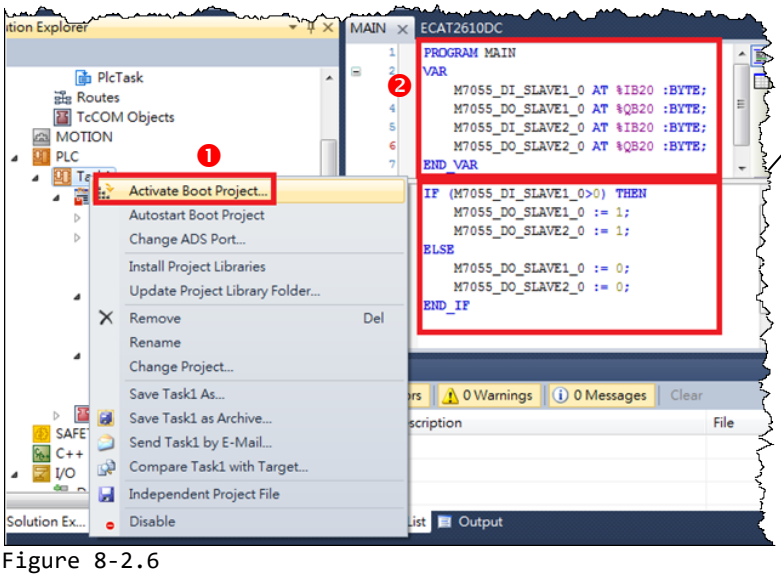

Figure 8-2.6

Right-click the **Task1** item in the left-hand pane of the TwinCAT System Manager and then select the **Activate Boot Project…** item from the menu.

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Step 4 Map the M-7055 Output Variables

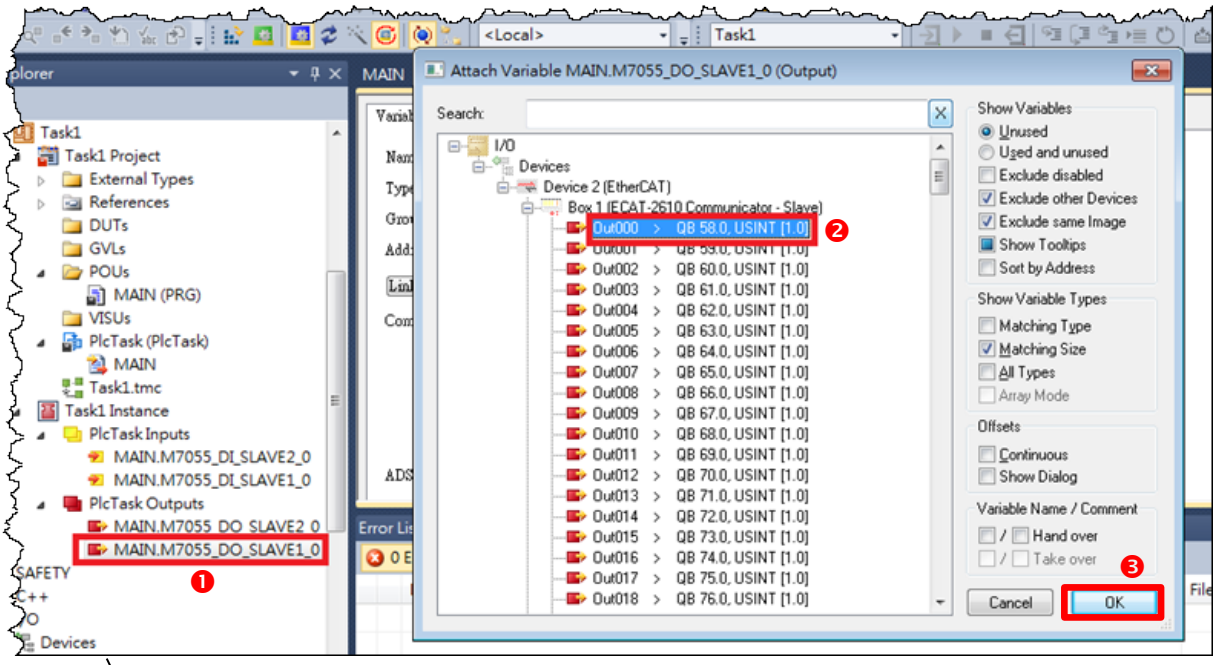

Figure 8-2.7

Expand the **PLC Task Outputs** item in the left-hand panel of the TwinCAT System Manager and then double click the entry for **MAIN.M7055_DO_SLAVE1_0** to open the **Attach Variable** dialog box.

Expand the Devices item in the Attach Variable dialog box and select the **Out000** item from the Box1 [ECAT-2610] list.

Click the **OK** button to continue.

Step 5 Cycle time settings

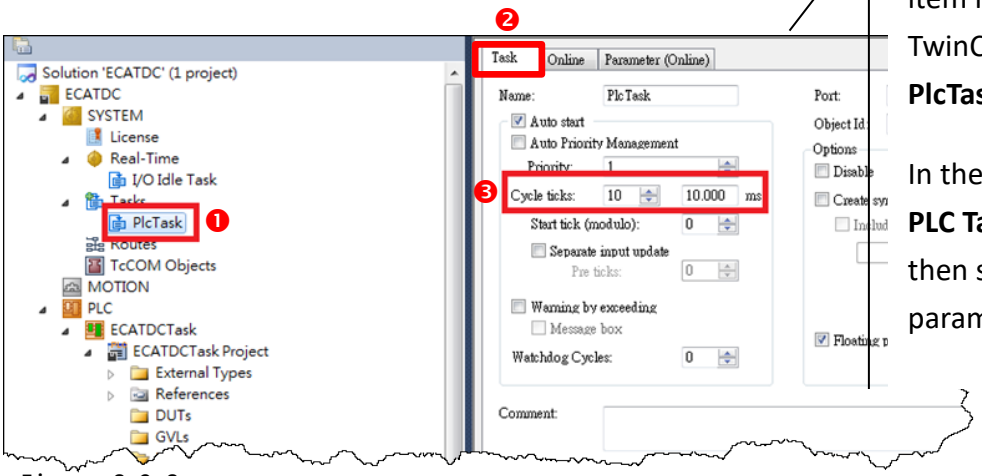

Figure 8-2.8

To configure the Cycle Time settings, first expand the Tasks item in the left-hand panel of the TwinCAT System and click the **PlcTask** item.

In the Properties window for the **PLC Task,** click the **Task** tab, and then set the **Cycle Time** parameter to **10 ms**.

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Step 6 Run the PLC

Click the **Activate Configuration** button to run the **PLC**.

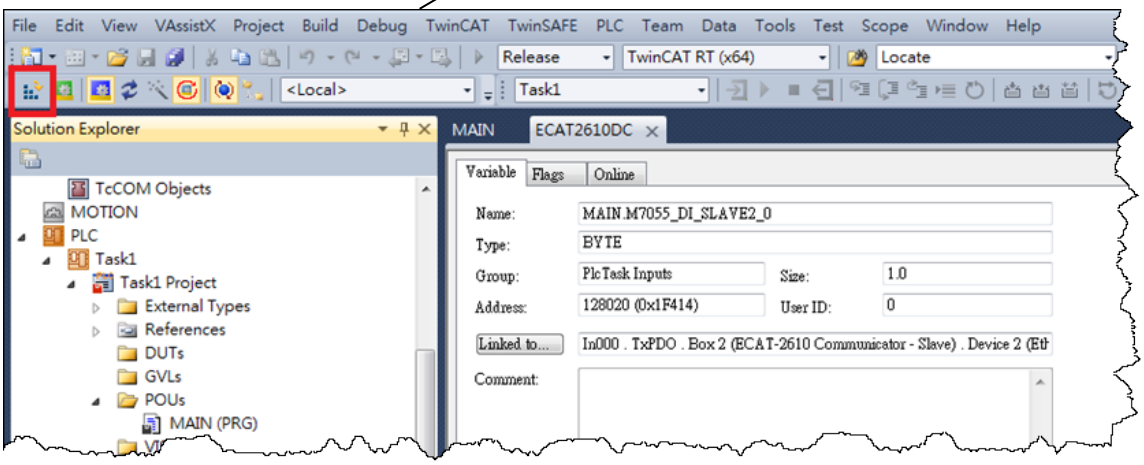
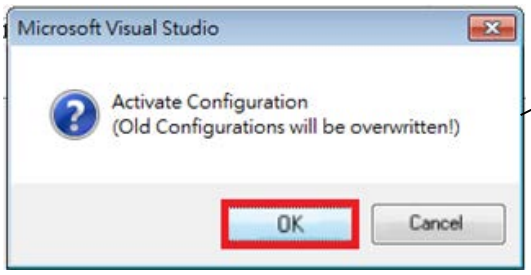
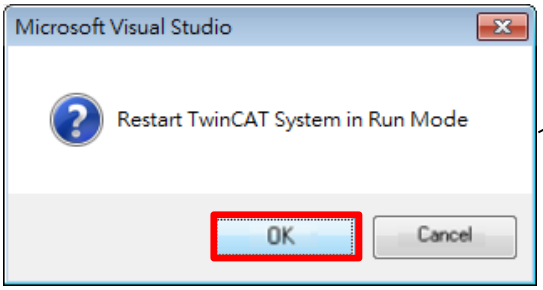


Figure 8-2.9



Click the **OK** button to activate the new configuration.

Figure 8-2.10



Click the **OK** button to restart the TwinCAT System in Run Mode.

Figure 8-2.11

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Once the TwinCAT System has restarted, click the **Login** button.

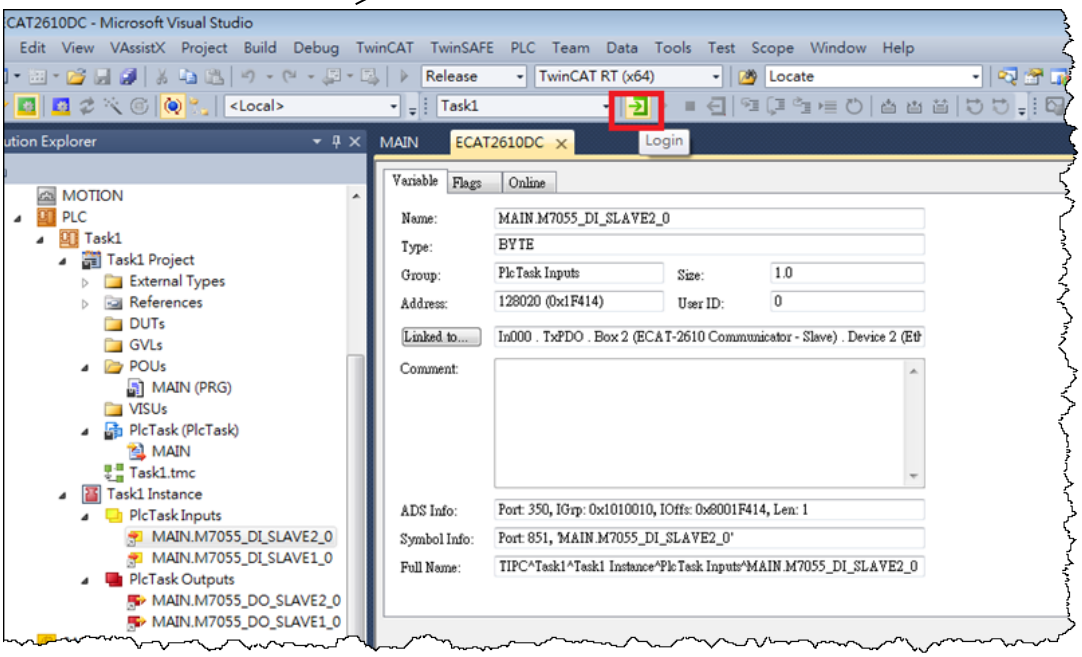

Figure 8-2.12

Click the **Start** button to start the PLC operation.

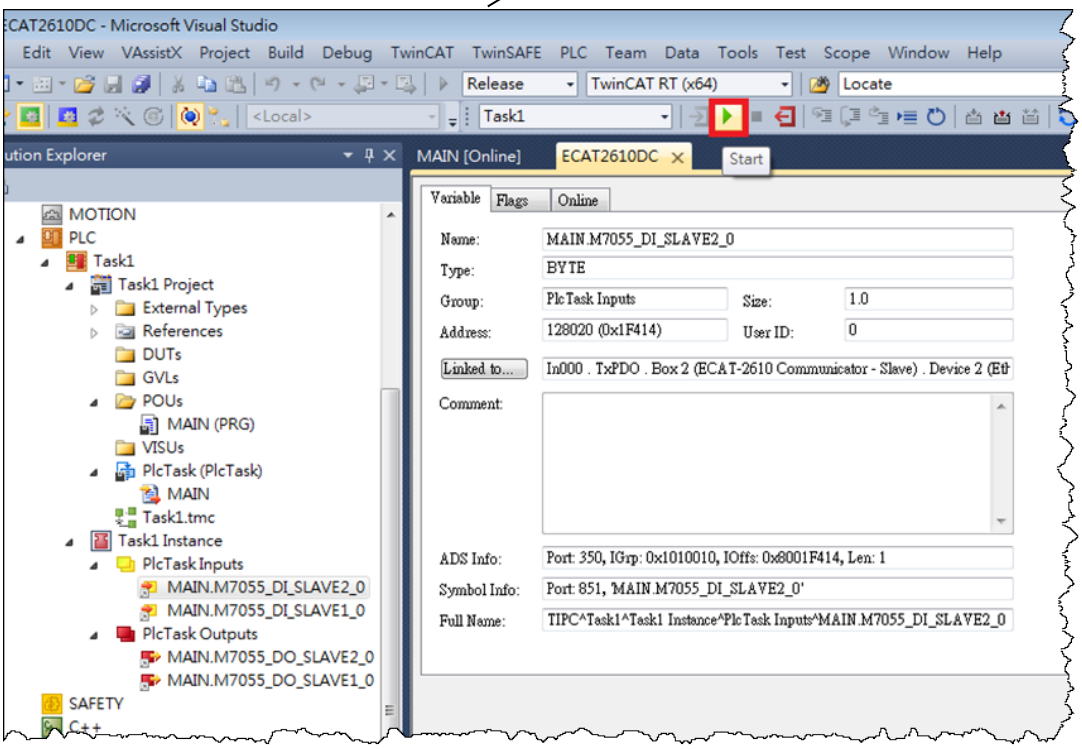

Figure 8-2.13

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If the **DC-Synchrony** option has been set to **disabled**, the DO1 and DO2 channels will operate independently, below are some examples of the typical timing diagram is about some ms:

- DO1 to DO2 = 2 ms

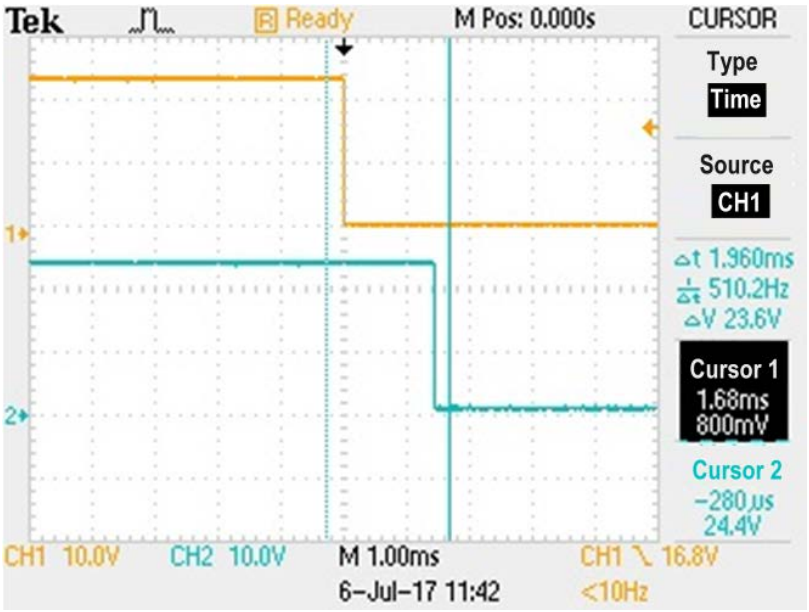

Figure 8-2.14

- DO1 to DO2 = 5 ms

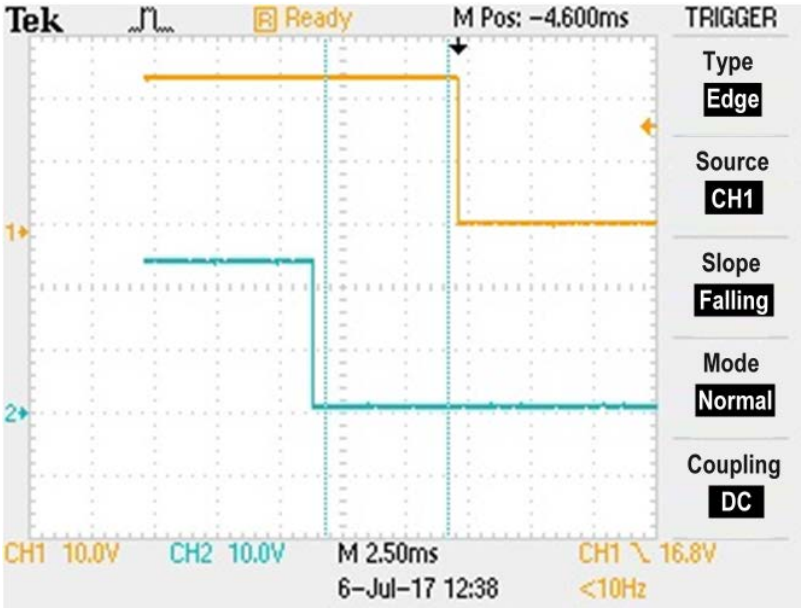

Figure 8-2.15

- The worst case for DO1 to DO2 is about 7 ms, refer to Section 8.1 "Modbus RTU Timing" for more information.

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If the **DC-Synchrony** option has been set to **active**, the DO1 and DO2 channels will be synchronized to the DC output. Below are some examples of the typical timing diagram is about some µs:

- DO1 to DO2 = 6 µs

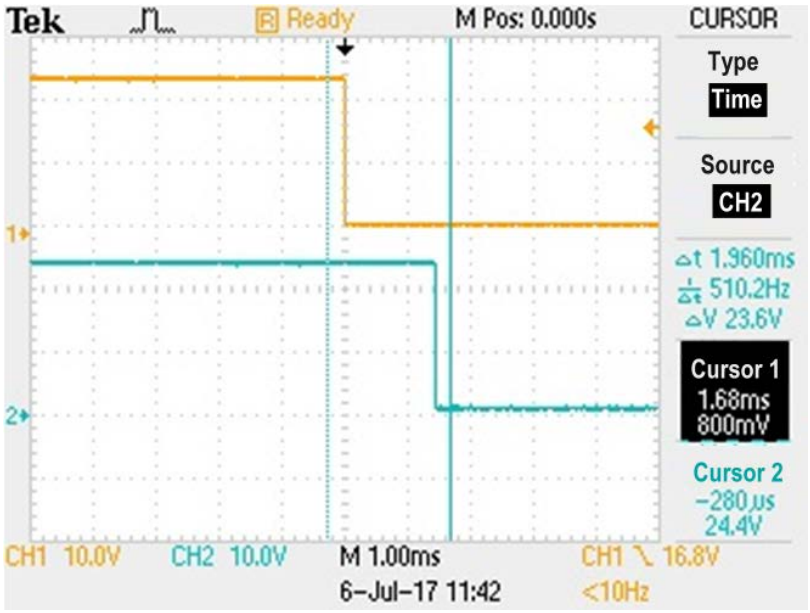

Figure 8-2.16

- DO1 to DO2 = 100 µs

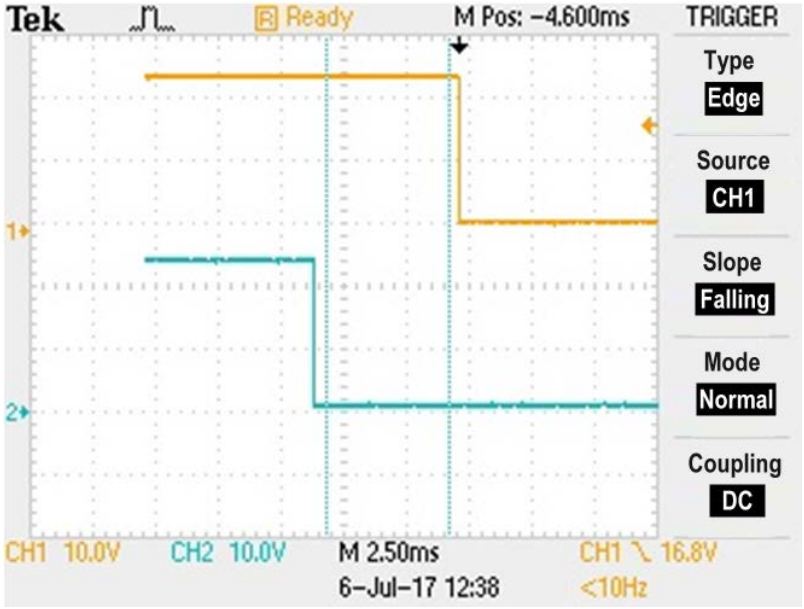

Figure 8-2.17

- In general, the timing difference between DO1 and DO2 is about some µs.

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9. Object Description and Parameterization

The following is a summary of the standard and specific objects that can be used with the ECAT-2610/2611.

9.1 Standard Objects

Index	Name	Sub-Index	Definition	Data Type	Flags	Notes
1000h	Device type	00h	Device type	UINT32	RO	0x0000 0192(No profile)
1001 h	Error Register	00h	Error Register	UINT16	RO	0x00
1008h	Device name	00h	ECAT-2610/2611 Communicator	Visible String	RO	-
1009h	Hardware Version	00h	Hardware Version	UINT16	RO	-
100Ah	Software Version	00h	Software Version	UINT16	RO	-
1018h	Identity object	00h	Number of Entries	UINT16	RO	04h
		01h	Vendor ID	UINT32	RO	-
		02h	Product Code	UINT32	RO	-
		03h	Revision Number	UINT32	RO	-
		04h	Serial Number	UINT32	RO	-
1600h	Receive PDO	00h	RxPDO 0x00-0x7F	UINT16	RO	Refer to Table 8-1 below
1601h	mapping	00h	RxPDO 0x80-0xFF	UINT16	RO	
1A00h	Transmit PDO	00h	TxPDO 0x00-0x7F	UINT16	RO	Refer to Table 8-1 below
1A01h	mapping	00h	TxPDO 0x80-0xFF	UINT16	RO	
1C00h	Sync Manager	00h	Sync Manger Type	UINT16	RO	04h
	Communication	01h	Write to Mailbox	UINT16	RO	01h
	Type	02h	Read from Mailbox	UINT16	RO	02h
		03h	Process Data Out	UINT16	RO	03h
		04h	Process Data In	UINT16	RO	04h
1C12h	Sync Manager Rx	00h	SyncManager 2 Assignment	UINT16	RO	No. of assigned RxPDO(0-1)
	PDO Assign	01h	Assigned RxPDO	UINT16	RO	Assigned to RxPDO 1600h
		02h	Assigned RxPDO	UINT16	RO	Assigned to RxPDO 1601h
1C13h	Sync Manager Tx	00h	SyncManager 3 Assignment	UINT16	RO	No. of assigned TxPDO(0-1)
	PDO Assign	01h	Assigned TxPDO	UINT16	RO	Assigned to TxPDO 1A00h
		02h	Assigned TxPDO	UINT16	RO	Assigned to TxPDO 1A01h

Table 8-1: The PDO mapping for the ECAT-2610/2611 module is static and is as follows:

PDO	Corresponding Object	Internal Memory
TxPDO 1A00h	Index 2000h, sub-index 1 to 128	Input Data, bytes 0 to 127
TxPDO 1A01h	Index 2010h, sub-index 1 to 128	Input Data, bytes 128 to 255
RxPDO 1600h	Index 2100h, sub-index 1 to 128	Output Data, bytes 0 to 127
RxPDO 1601h	Index 2110h, sub-index 1 to 128	Output Data, bytes 128 to 255

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9.2 Specific Objects

Input Buffer

Index	Object Name	Sub-Index	Definition	Data Type	Flags
2000h	Inputs	00h	No. of Entries	UINT16	RO
		01h	Input Byte 0000	UINT16	RO
		02h	Input Byte 0001	UINT16	RO
		---	---	---	---
		80h	Input Byte 0127	UINT16	RO
2010h	Inputs	00h	No. of Entries	UINT16	RO
		01h	Input Byte 0128	UINT16	RO
		02h	Input Byte 0129	UINT16	RO
		---	---	---	---
		80h	Input Byte 0255	UINT16	RO

NOTE

The Gateway will only create the actual number of objects needed to store the configuration information for the sub-network.

Output Buffer

Index	Object Name	Sub-Index	Definition	Data Type	Flags
2100h	Outputs	00h	No. of Entries	UINT16	RO
		01h	Output Byte 0000	UINT16	R(W)
		02h	Output Byte 0001	UINT16	R(W)
		---	---	---	---
		80h	Output Byte 0127	UINT16	R(W)
2110h	Outputs	00h	No. of Entries	UINT16	RO
		01h	Output Byte 0128	UINT16	R(W)
		02h	Output Byte 0129	UINT16	R(W)
		---	---	---	---
		80h	Output Byte 0255	UINT16	R(W)

NOTES

1: For consistency, any data declared as I/O data will be designated as read-only.

2: The Gateway will only create the actual number of objects needed to store the configuration information for the sub-network.

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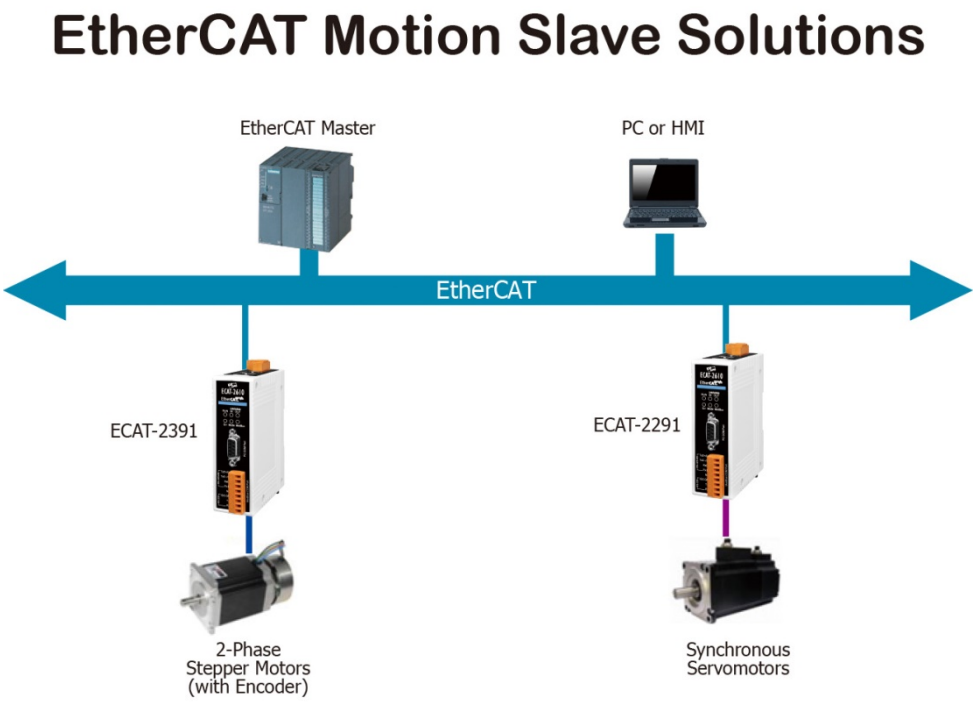
10. Applications

10.1 The ICPDAS Family of ECAT Products

ICPDAS provides a range of products designed to operate in an EtherCAT network, including DC Digital I/O Modules, Analog Output modules and Analog Input modules, etc. For more information related to the available devices, check the EtherCAT Selection Guide web site.



➢ The following diagram provides an example of a solution for an ECAT Motion Slave system:



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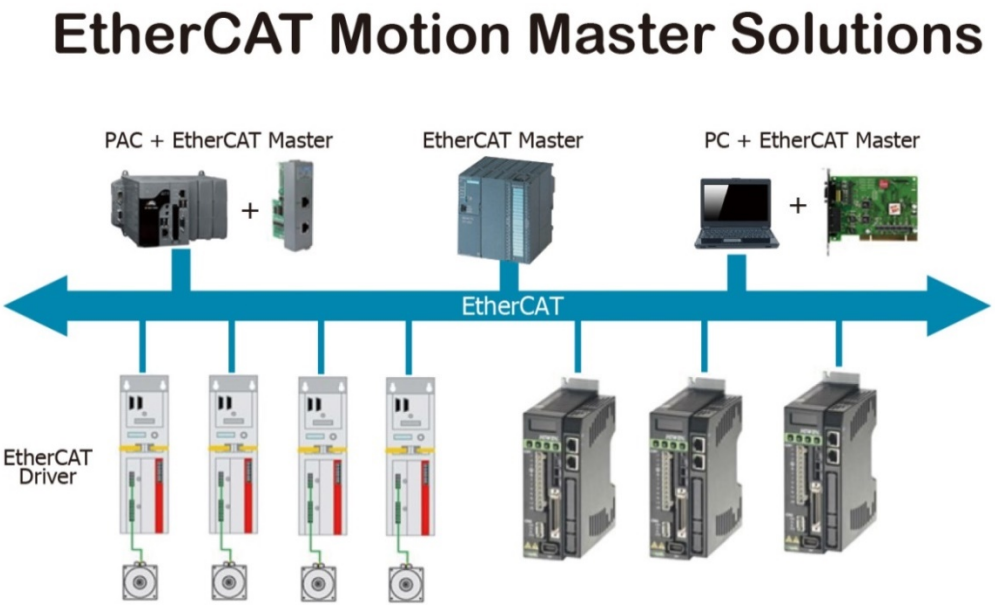
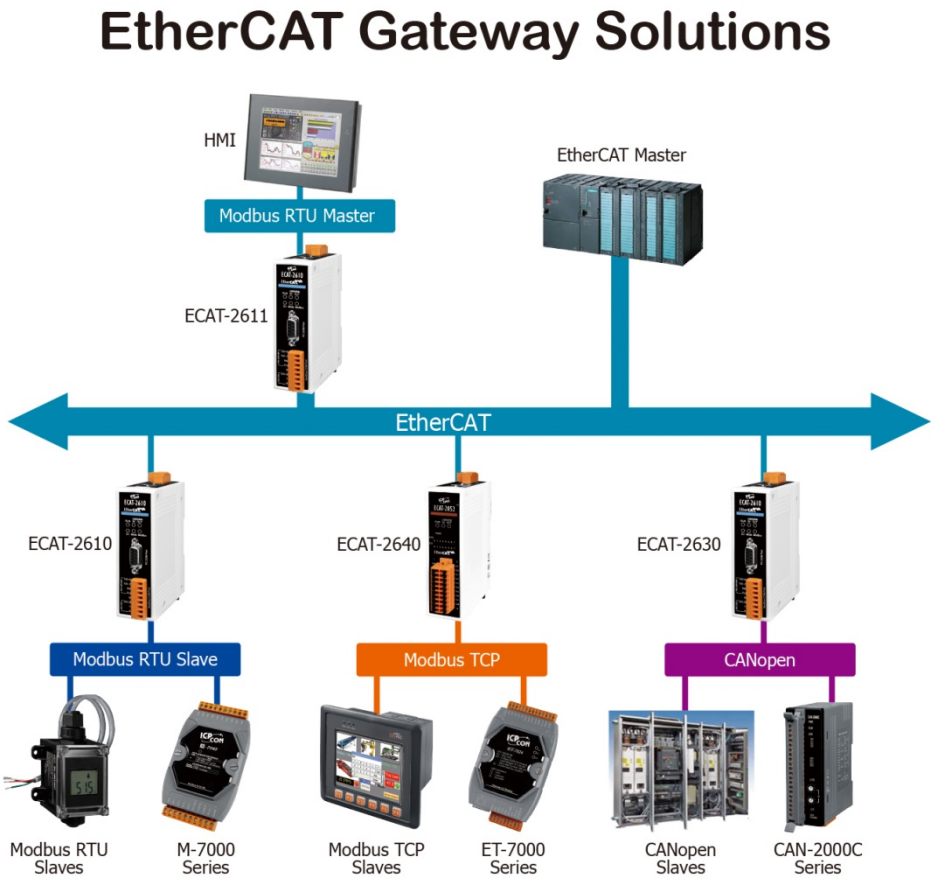
➢ The following diagram provides an example of a solution for an ECAT Motion Master system:



➢ The following diagram provides an example of a solution for an ECAT Gateway:



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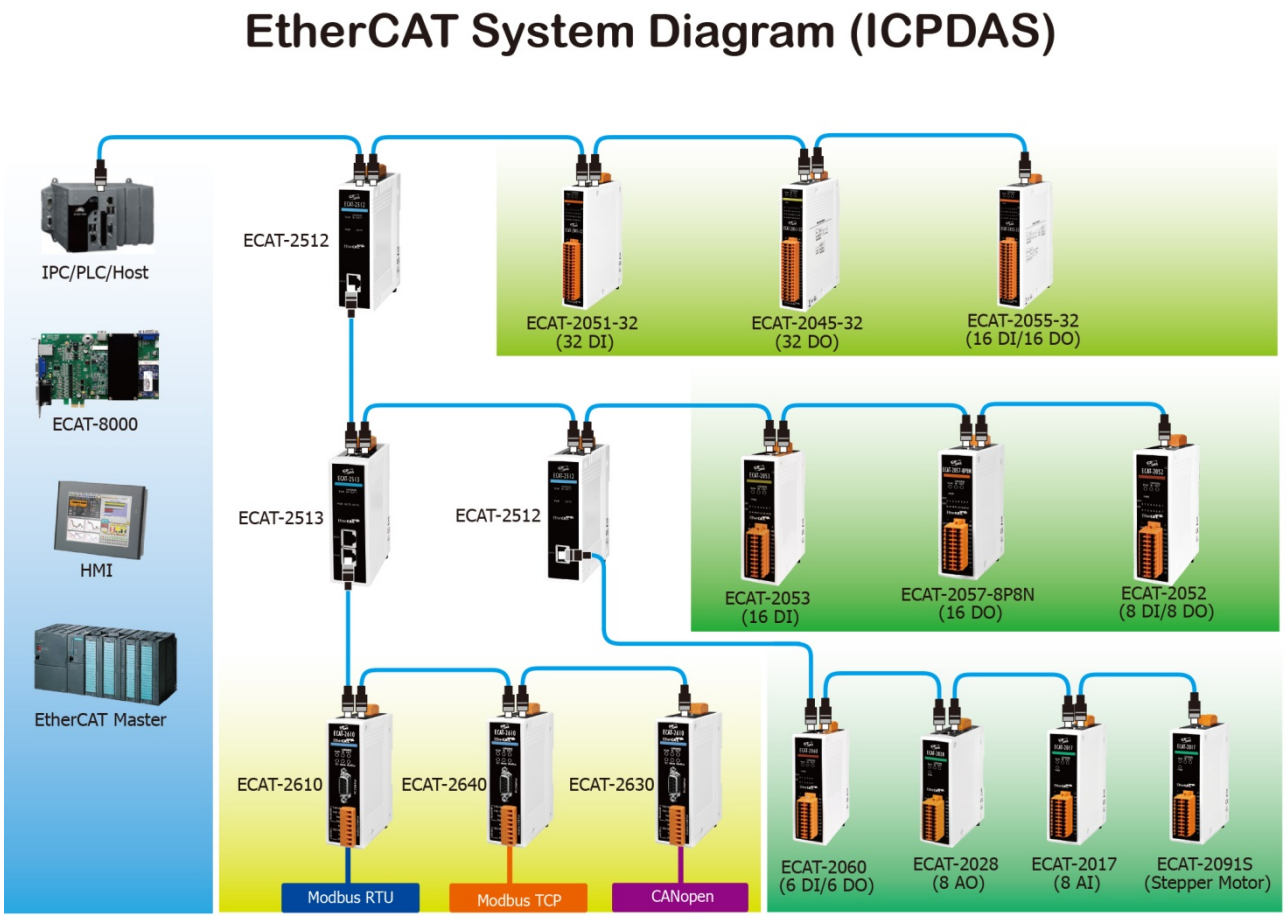
➢ The following diagram provides an example of a solution that can be implemented using a number of modules that can be selected from the ICP DAS family of ECAT products:



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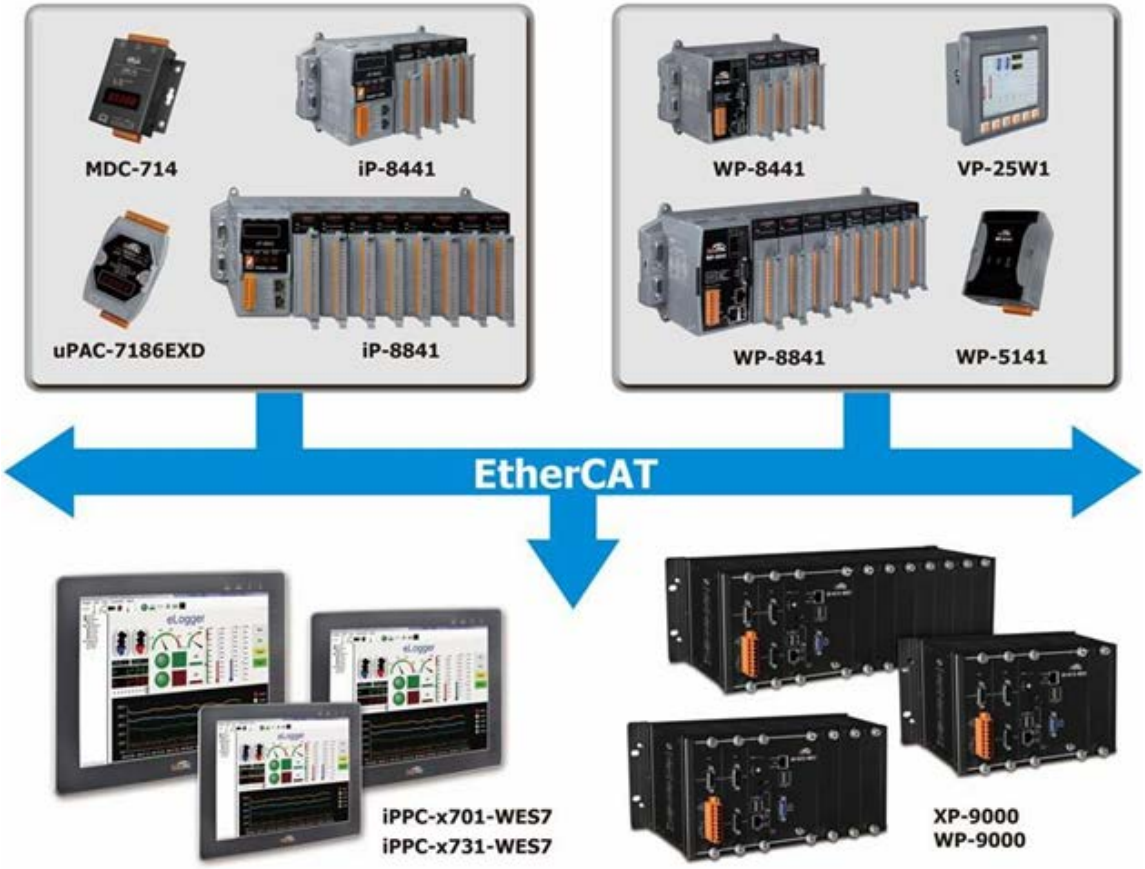
10.2 ODMs are Welcome

ICP DAS has been focused on Fieldbus products for several years and has accumulated a rich development experience on Fieldbus applications, and have recently announced a variety of new Fieldbus projects for different applications. Whether it is software or hardware, ICP DAS always provides the best product for customers.

This Section will introduce integrated applications for ECAT with various Fieldbus projects. Whatever your requirements, ICP DAS offers the complete solution.

- ICPDAS provides a rich platform for ECAT Solutions that can be used to variety of modules are integrated into an EtherCAT network, an example of which is illustrated below.



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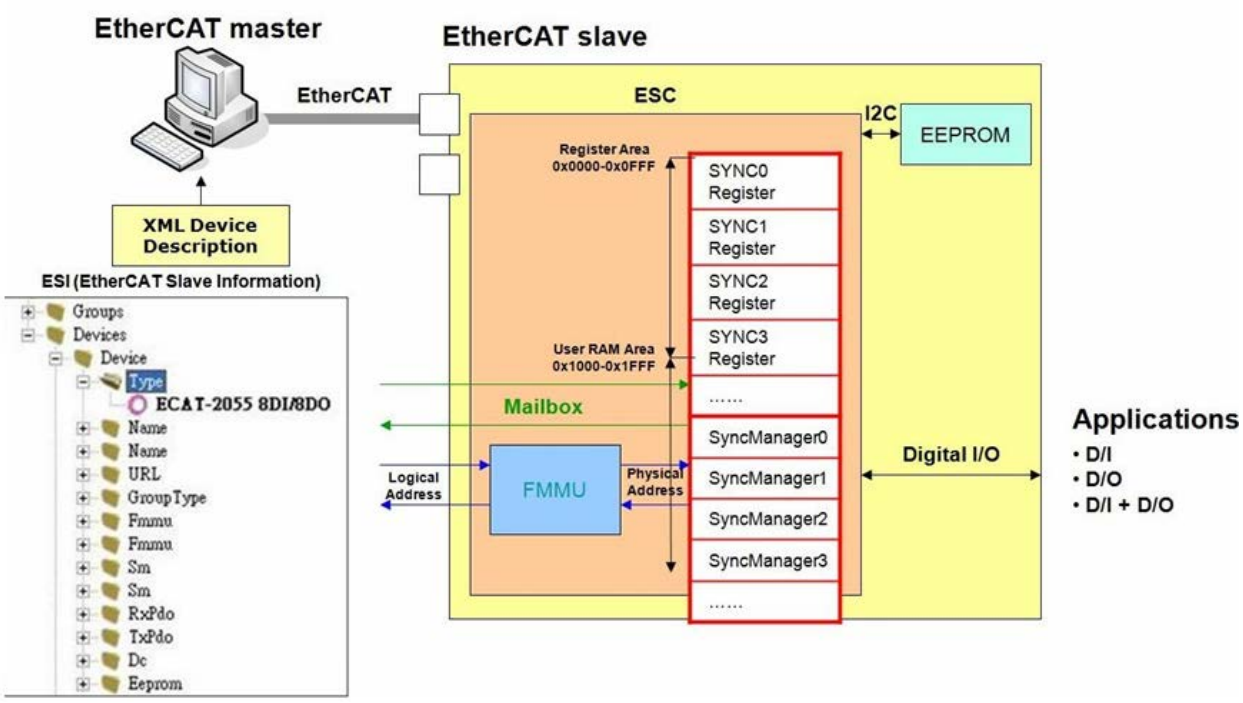
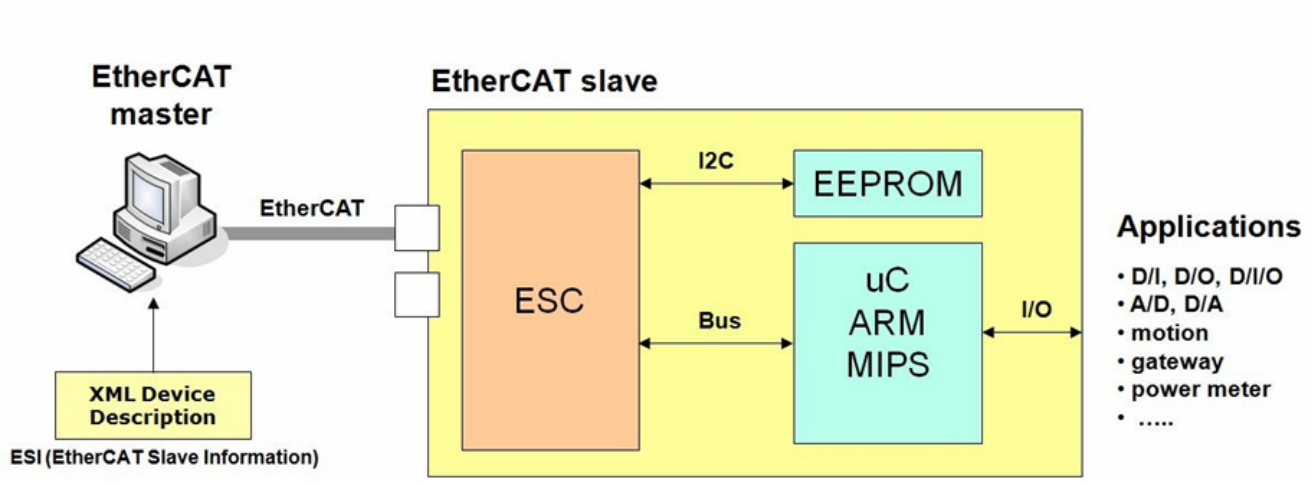
- ICPDAS provides variety IO slave (e.g., Digital I/O and Analog I/O) solution, an example of which is illustrated below:



- ICPDAS provides a Complex_IO slave (ESC+uC: ARM or MIPS, 32-bit) solution, an example of which is illustrated below:



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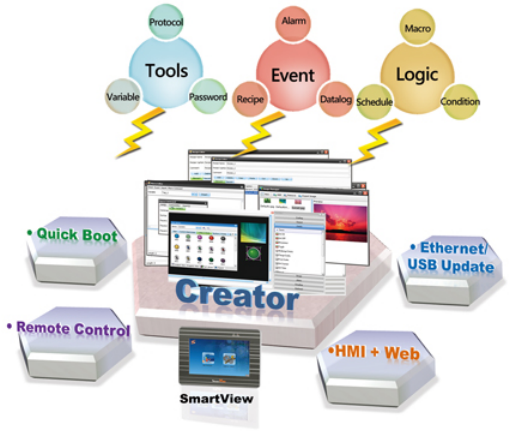
- ICPDAS provides a rich software package that combines a variety of applications, an example of which is illustrated below:

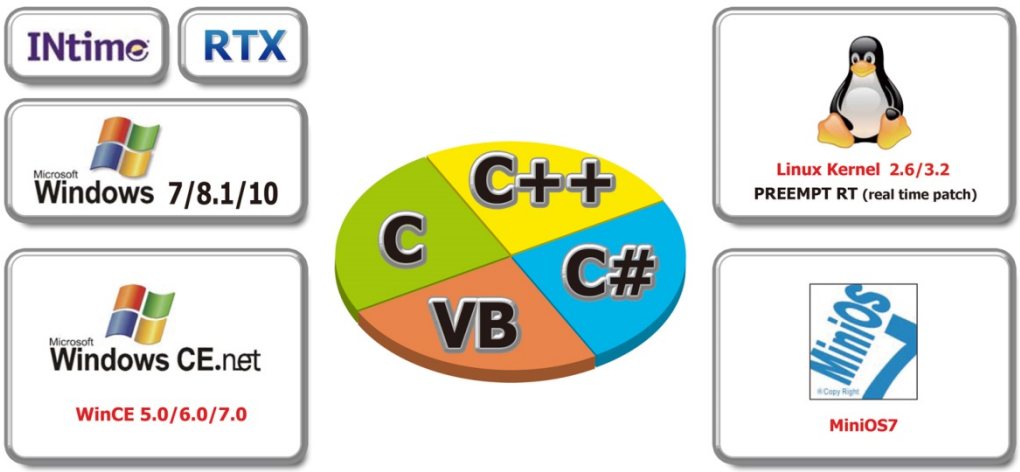








- ICPDAS provides the ability to integrate devices into a wide range of operating system environments, such as Windows 7/8/10/CE.net, Linux and MiniOS7, etc., using a variety of programming languages, including C, C++, C# and VB, as illustrated below:



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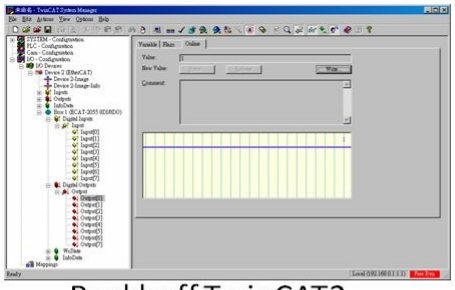
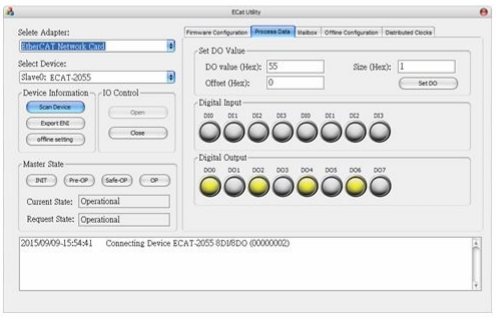
- The ECAT Utility is a powerful software tool that is provided free by ICP ADS, as illustrated below:



Beckhoff TwinCAT2



ICP DAS ECAT Utility

ECAT Utility Feature:

- Export **EtherCAT Network Information** file
- ICP DAS Slave I/O Module Diagnostic
- Firmware Configuration/Download

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Appendices

A1. How do I retrieve the Modbus Command via DCON Utility?

The configure procedure described below relates to ICP DAS Modbus RTU devices. Connect the Modbus RTU device (e.g., an M-7050) to the Host PC and supply power to the Modbus RTU device. Refer to Section 4.1 "Configure the Modbus RTU Device" for more details.

❶ In the DCON Utility Pro tool (see Section 4.1 "Configure the Modbus RTU Device" for more details), click the **"Command Line"** button to open the "Tool for Terminal Command" dialog box.
❷ Select the appropriate **COM Port, Baud Rate, Format and Address** settings from the relevant drop down options, as shown in Figure A1-1 below.
❸ Select the **name of the module** from the **"Select ID"** drop down options. Once selected, all the commands relevant to the module will be displayed in the Command Panel on the left of the dialog box.
❹ Click the desired **command** in the panel to select it, and the Modbus RTU code (without checksum) will be given in the Command test field.
❺ Copy the Modbus RTU command to the configuration data file (commands.txt).
❻ Click the **"Send"** button.
❼ The Modbus RTU command together with the response will be displayed in the Output Panel.

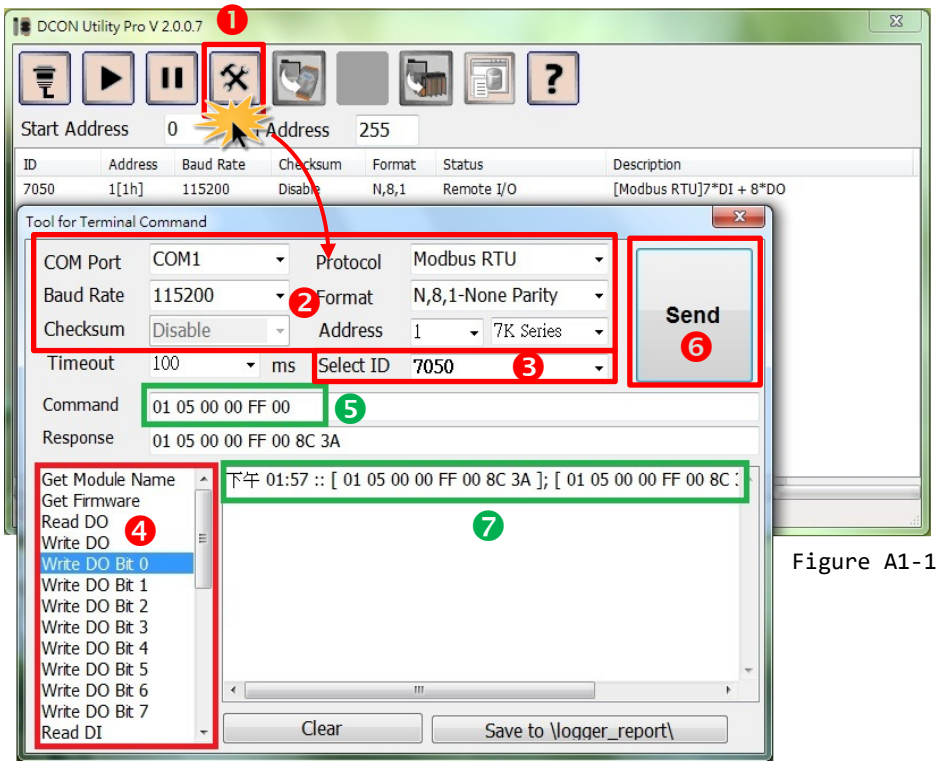

Figure A1-1

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A2. Configuration File Reference for ECAT-2610

The **more commands folder** that can be found in the 7188ECAT folder provides many examples of configuration data commands (commands.txt) for the DI, DO, AD and DA … etc., each of which will be described in more detail below. You can refer to these configurations file examples to effectively create your own custom configuration data (commands.txt) files.

NOTE

This Chapter is used the ICP DAS Modbus RTU device (M-7000 series) as an example. If your device is a third party Modbus RTU device, refer to the Quick Start Guide or User Manual for that specific Modbus RTU device to settings Modbus command.

- Based on the default installation, the content of the more commands folder should be as follows:

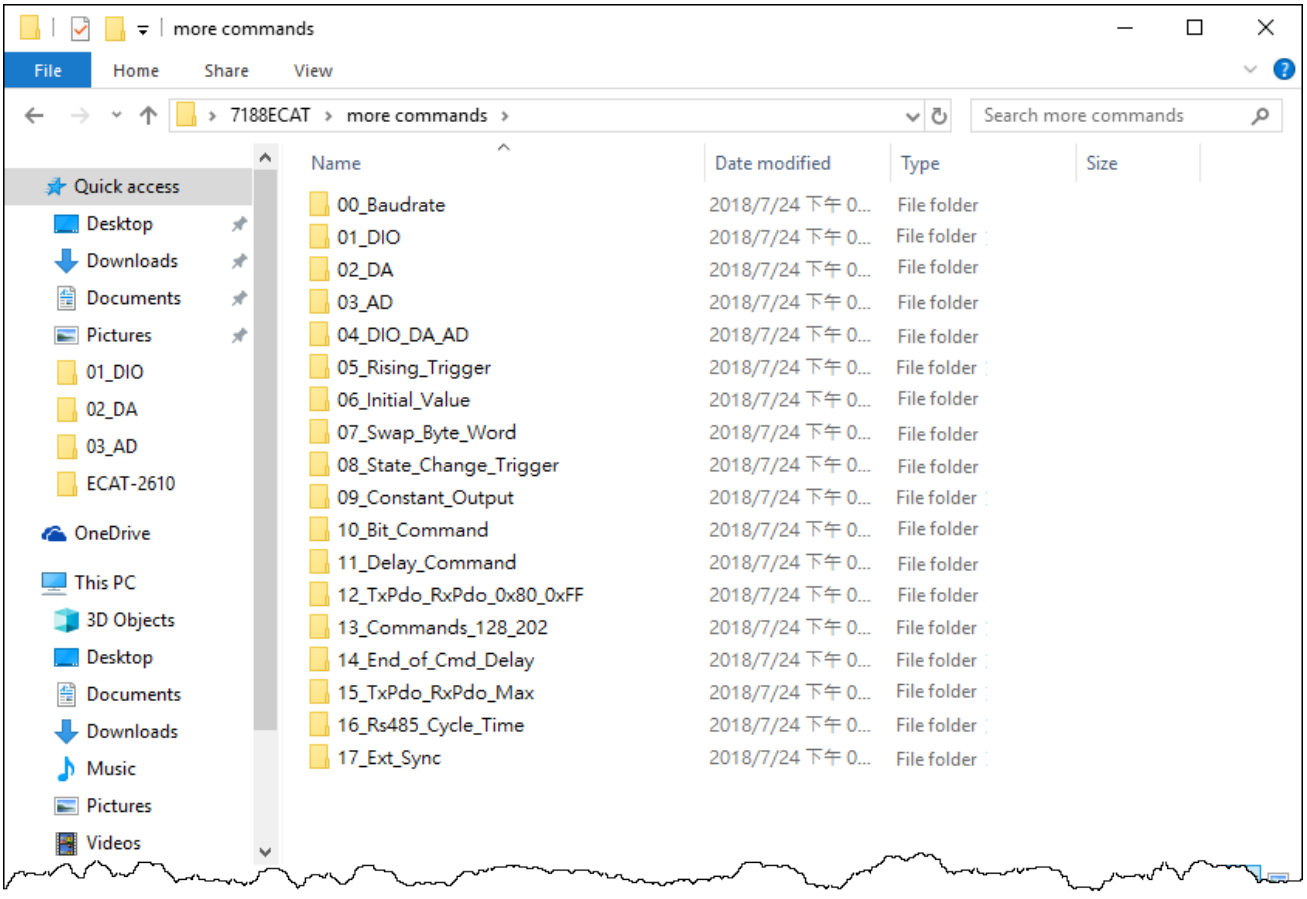

Figure A2-1

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The following is a detailed description of each of the files contained in the more commands folder.

00.Baudrate

The **00_Baudrate** folder provides configure sample for set the Baud Rate, Parity Bit and Stop Bit, each of which will be described in more detail below. Note that the ECAT-2610 only supports 16 data bits.

115200_N81_Init.txt

The **115200_N81_Init.txt** command file contains the default settings for the commands.txt file:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
FF 03 00 00 00 02, 02, 00, 00, InTxPdo[2]=InTxPdo[0]=Sys_Lo, InTxPdo[3]=InTxPdo[1]=Sys_Hi (00)
FF 06 00 00 00 64, 02, 00, 00, 0x64=100, delay 100X0.01 sec = 1 sec, (01)
FF 06 00 01 00 64, 02, 00, 00, 0x64=100, delay 100X1ms  = 0.1 sec, (02)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-2

For Example:

Baud Rate = **115200**, Parity = **N** (None), Stop Bits = **1**, TimeOut = **100**, Number of commands = **3**,

(00) **Modbus Command, PDO[Addr], Update Mode, Special Code** = **FF 03 00 00 00 02, 02, 00, 00,**

This command will read the system status for the ECAT-2610 module, refer to Section 3.3.1 "Module Status and Error Mode" for more details.

(01) **Modbus Command, PDO[Addr], Update Mode, Special Code** = **FF 06 00 00 00 64, 02, 00, 00,**

(02) **Modbus Command, PDO[Addr], Update Mode, Special Code** = **FF 06 00 01 00 64, 02, 00, 00,**

These command will delay the Modbus command scan, refer to 11.Delay Command for more details.

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9600_N81.txt

The **9600_N81.txt** command file is very similar to the 115200_N81_init.txt command file described above, except for the Baud Rate value (e.g., 9600):

```
START
9600, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
FF 03 00 00 00 02, 02, 00, 00, InTxPdo[2]=InTxPdo[0]=Sys_Lo, InTxPdo[3]=InTxPdo[1]=Sys_Hi (00)
FF 06 00 00 00 64, 02, 00, 00, 0x64=100, delay 100X0.01 sec = 1 sec, (01)
FF 06 00 01 00 64, 02, 00, 00, 0x64=100, delay 100X1ms  = 0.1 sec, (02)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-3

19200_N82.txt

The **19200_N82.txt** command file is very similar to the 115200_N81_init.txt command file described above, except for the Baud Rate and Stop Bit values (e.g., 19200 and 2):

```
START
19200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
2, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
FF 03 00 00 00 02, 02, 00, 00, InTxPdo[2]=InTxPdo[0]=Sys_Lo, InTxPdo[3]=InTxPdo[1]=Sys_Hi (00)
FF 06 00 00 00 64, 02, 00, 00, 0x64=100, delay 100X0.01 sec = 1 sec, (01)
FF 06 00 01 00 64, 02, 00, 00, 0x64=100, delay 100X1ms  = 0.1 sec, (02)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-4

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38400_E81.txt

The **38400_E81.txt** command file is very similar to the 115200_N81_init.txt command file described above, except for the Baud Rate and Parity values (e.g., 38400 and EVEN):

```
START
38400, baud rate, from 1200,2400 ~ 57600,115200
E, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
FF 03 00 00 00 02, 02, 00, 00, InTxPdo[2]=InTxPdo[0]=Sys_Lo, InTxPdo[3]=InTxPdo[1]=Sys_Hi (00)
FF 06 00 00 00 64, 02, 00, 00, 0x64=100, delay 100X0.01 sec = 1 sec, (01)
FF 06 00 01 00 64, 02, 00, 00, 0x64=100, delay 100X1ms  = 0.1 sec, (02)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-5

57600_O81.txt

The **57600_O81.txt** command file is very similar to the 115200_N81_init.txt command file described above, except for the Baud Rate and Parity values (e.g., 57600 and ODD):

```
START
57600, baud rate, from 1200,2400 ~ 57600,115200
O, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
FF 03 00 00 00 02, 02, 00, 00, InTxPdo[2]=InTxPdo[0]=Sys_Lo, InTxPdo[3]=InTxPdo[1]=Sys_Hi (00)
FF 06 00 00 00 64, 02, 00, 00, 0x64=100, delay 100X0.01 sec = 1 sec, (01)
FF 06 00 01 00 64, 02, 00, 00, 0x64=100, delay 100X1ms  = 0.1 sec, (02)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-6

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01.DIO

The **01_DIO** folder provides configure sample for set the Digital Input (DI) and Digital Output (DO), each of which will be described in more detail below.

DIO_Addr01_1.txt

The **DIO_Addr01_1.txt** command file contains a single typical Modbus RTU command, i.e., Write DO, as illustrate below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, one commands(00-00), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-7

The M-7050 module is used as an example:

Number of commands = **1**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → This command will first read data from the OutRxPDO[02] and then send the Modbus command to the DO module.

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DIO_Addr01_2.txt

The **DIO_Addr01_2.txt** command file contains two typical Modbus RTU commands, i.e., Write DO and Read DI, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
STOP
================================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
================================================================================
```

Figure A2-8

The M-7050 module is used as an example:

Number of commands = **2**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → Read data from the OutRxPDO[02] and then send the Modbus command to the DO module.

(01) **01 02 00 00 00 08, 02, 00, 00,** → Read the DI data from the module, and then write the value that was read to the InTxPDO[02].

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DIO_Addr01_3.txt

The **DIO_Addr01_3.txt** command file is very similar to DIO_Addr01_2.txt command file described above, except for the read DI latch, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
01 01 00 40 00 07, 03, 00, 00, InTxPdo[03]=D/I latch, update cyclically, (02)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-9

The M-7050 module is used as an example:

Number of commands = **3**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → Read data from the OutRxPDO[02] and then send the Modbus command to the DO module.

(01) **01 01 00 00 00 08, 02, 00, 00,** → Read the DO readback value from the module, and then write the value that was read to the InTxPDO[02].

(02) **01 01 00 40 00 07, 03, 00, 00,** → Read the DI Latch high value from the module, and then write the value that was read to the InTxPDO[03].

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DIO_Addr01_4.txt

The **DIO_Addr01_4.txt** command file contains four typical Modbus RTU commands, i.e., Write DO and Read DI, DO Readback and DI Latch, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
4, four commands(00-03), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 01 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/O read back, update cyclically, (01)
01 02 00 00 00 08, 03, 00, 00, InTxPdo[03]=D/I, update cyclically, (02)
01 01 00 40 00 07, 04, 00, 00, InTxPdo[04]=D/I_Latch_High, update cyclically, (03)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-10

The M-7050 module is used as an example:

Number of commands = **4**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → Read data from the OutRxPDO[02] and then send the Modbus command to the DO module.

(01) **01 01 00 00 00 08, 02, 00, 00,** → Read the DO readback value from the module, and then write the value that was read to the InTxPDO[02].

(02) **01 02 00 00 00 08, 03, 00, 00,** → Read the DI data from the module, and then write the value that was read to the InTxPDO[03].

(03) **01 01 00 40 00 07, 04, 00, 00,** → Read the DI Latch high value from the module, and then write the value that was read to the InTxPDO[04].

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02.DA

The **02_DA** folder provides configure sample for set the Analog Output (DA), each of which will be described in more detail below.

DA_Addr02_1.txt

The **DIO_Addr02_1.txt** command file contains four typical Modbus RTU commands, i.e., Write Analog Output channels 0 to 3, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
4, four commands(00-03), max=300, format=Dec
02 06 00 00 00 00, 02, 00, 00, D/A_0=OutRxPdo[02],  update cyclically, (00)
02 06 00 01 00 00, 03, 00, 00, D/A_1=OutRxPdo[03],  update cyclically, (01)
02 06 00 02 00 00, 04, 00, 00, D/A_2=OutRxPdo[04],  update cyclically, (02)
02 06 00 03 00 00, 05, 00, 00, D/A_3=OutRxPdo[05],  update cyclically, (03)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-11

Number of commands = 4,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 06 00 00 00 00, 02, 00, 00,** → Read data from the OutRxPDO[02] and then send the Modbus command to the DA0.

(01) **02 06 00 01 00 00, 03, 00, 00,** → Read data from the OutRxPDO[03] and then send the Modbus command to the DA1.

(02) **02 06 00 02 00 00, 04, 00, 00,** → Read data from the OutRxPDO[04] and then send the Modbus command to the DA2.

(03) **02 06 00 03 00 00, 05, 00, 00,** → Read data from the OutRxPDO[05] and then send the Modbus command to the DA3.

Here, the M-7024 module is used as an example, as it provides four 16-bit DA channels. The address mapping is as follows:

DA Channel	PDO[Addr]
0	OutRxPDO[02]
1	OutRxPDO[03]
2	OutRxPDO[04]
3	OutRxPDO[05]

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DA_Addr02_2.txt

The **DA_Addr02_2.txt** command file contains a single typical Modbus RTU command, i.e., write all Analog Output channels, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, one commands(00-00), max=300, format=Dec
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 00, DA_0/1/2/3=OutRxPdo[2/3/4/5], update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-12

Number of commands = **1**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 00,**

→ Read data from the OutRxPDO[02/03/04/05] and then send the Modbus command to the DA0/1/2/3.

Here, the M-7024 module is used as an example, as it provides four 16-bit DA channels. The address mapping is as follows:

DA channel	PDO[Addr]
0	OutRxPDO[02]
1	OutRxPDO[03]
2	OutRxPDO[04]
3	OutRxPDO[05]

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DA_Addr02_3.txt

The **DA_Addr02_3.txt** command file is very similar to DA_Addr02_1.txt command file described above, except for the read Analog Output channels 0 to 3 Readback, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
8, eight commands(00-07), max=300, format=Dec
02 06 00 00 00 00, 02, 00, 00, D/A_0=OutRxPdo[02], update cyclically, (00)
02 06 00 01 00 00, 03, 00, 00, D/A_1=OutRxPdo[03], update cyclically, (01)
02 06 00 02 00 00, 04, 00, 00, D/A_2=OutRxPdo[04], update cyclically, (02)
02 06 00 03 00 00, 05, 00, 00, D/A_3=OutRxPdo[05], update cyclically, (03)
02 03 00 40 00 01, 02, 00, 00, InTxPdo[02]=D/A_0 read back, update cyclically, (04)
02 03 00 41 00 01, 03, 00, 00, InTxPdo[03]=D/A_1 read back, update cyclically, (05)
02 03 00 42 00 01, 04, 00, 00, InTxPdo[04]=D/A_2 read back, update cyclically, (06)
02 03 00 43 00 01, 05, 00, 00, InTxPdo[05]=D/A_3 read back, update cyclically, (07)
STOP
================================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
================================================================================
```

Figure A2-13

The M-7024 module is used as an example:

Modbus Command, PDO[Addr], Update Mode, Special Code =

(04) **02 03 00 40 00 01, 02, 00, 00,** → Read the DA0 readback value from the module, and then write the value that was read to the InTxPDO[02].

(05) **02 03 00 41 00 01, 03, 00, 00,** → Read the DA1 readback value from the module, and then write the value that was read to the InTxPDO[03].

(06) **02 03 00 42 00 01, 04, 00, 00,** → Read the DA2 readback value from the module, and then write the value that was read to the InTxPDO[04].

(07) **02 03 00 43 00 01, 05, 00, 00,** → Read the DA3 readback value from the module, and then write the value that was read to the InTxPDO[05].

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DA_Addr02_4.txt

The **DA_Addr02_4.txt** command file is very similar to DA_Addr02_2.txt command file described above, except for the read all Analog Output channels Readback, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 00, DA_0/1/2/3=OutRxPdo[2/3/4/5], update cyclically, (00)
02 03 00 40 00 04, 02, 00, 00, InTxPdo[2/3/4/5]=DA_0/1/2/3 read back, update cyclically, (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-14

The M-7024 module is used as an example:

Modbus Command, PDO[Addr], Update Mode, Special Code =

(01) **02 03 00 40 00 04, 02, 00, 00,** → Read the DA0/1/2/3 readback value from the module, and then write the value that was read to the InTxPDO[02/03/04/05].

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DA_Addr02_5.txt

The **DA_Addr02_5.txt** command file contains five typical Modbus RTU commands, i.e., Write AO0 to AO3 and Read Analog Output channels 0 to 3 readback, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
5, four commands(00-04), max=300, format=Dec
02 03 00 40 00 02, 02, 00, 00, InTxPdo[2/3]=DA_0/1 read back, update cyclically, (00)
02 03 00 42 00 02, 04, 00, 00, InTxPdo[4/5]=DA_2/3 read back, update cyclically, (01)
02 10 00 00 00 02 04 12 34 12 34, 02, 00, 00, DA_0/1=OutTxPdo[2/3], update cyclically, (02)
02 06 00 02 00 00, 04, 00, 00, DA_2=OutTxPdo[4], update cyclically, (03)
02 06 00 03 00 00, 05, 00, 00, DA_3=OutTxPdo[5], update cyclically, (04)
STOP
================================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
================================================================================
```

Figure A2-15

The M-7024 module is used as an example:

Number of commands = **5**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 03 00 40 00 02, 02, 00, 00,** → Read the DA0/1 readback value from the module, and then write the value that was read to the InTxPDO[02/03].

(01) **02 03 00 42 00 02, 04, 00, 00,** → Read the DA2/3 readback value from the module, and then write the value that was read to the InTxPDO[04/05].

(02) **02 10 00 00 00 00 02 04 12 34 12 34, 02, 00, 00,** → Read data from the OutRxPDO[02/03] and then send the Modbus command to the DA0/1.

(03) **02 06 00 02 00 00, 04, 00, 00,** → Read data from the OutRxPDO[04] and then send the Modbus command to the DA2.

(04) **02 06 00 03 00 00, 05, 00, 00,** → Read data from the OutRxPDO[05] and then send the Modbus command to the DA3.

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03.AD

The **03_AD** folder provides configure sample for set the Analog Input (AD), each of which will be described in more detail below.

AD_Addr03_1.txt

The **AD_Addr03_1.txt** command file contains eight typical Modbus RTU commands, i.e., Read Analog Input channels 0 to 7, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
8, 8 commands(00-07), max=300, format=Dec
03 04 00 00 00 01, 02, 00, 00, InTxPdo[2]=A/I_0, update cyclically, (00)
03 04 00 01 00 01, 03, 00, 00, InTxPdo[3]=A/I_1, update cyclically, (01)
03 04 00 02 00 01, 04, 00, 00, InTxPdo[4]=A/I_2, update cyclically, (02)
03 04 00 03 00 01, 05, 00, 00, InTxPdo[5]=A/I_3, update cyclically, (03)
03 04 00 04 00 01, 06, 00, 00, InTxPdo[6]=A/I_4, update cyclically, (04)
03 04 00 05 00 01, 07, 00, 00, InTxPdo[7]=A/I_5, update cyclically, (05)
03 04 00 06 00 01, 08, 00, 00, InTxPdo[8]=A/I_6, update cyclically, (06)
03 04 00 07 00 01, 09, 00, 00, InTxPdo[9]=A/I_7, update cyclically, (07)
STOP
═══════════════════════════════════════════════════════════════════════
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
═══════════════════════════════════════════════════════════════════════
```

Figure A2-16

Number of command = **8**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **03 04 00 00 00 01, 02, 00, 00,** → Read the AI0 value from the module, and then write the value that was read to the InTxPDO[02].

(01) **03 04 00 01 00 01, 03, 00, 00,** → Read the AI1 value from the module, and then write the value that was read to the InTxPDO[03].

(02) **03 04 00 02 00 01, 04, 00, 00,** → Read the AI2 value from the module, and then write the value that was read to the InTxPDO[04].

(03) **03 04 00 03 00 01, 05, 00, 00,** → Read the AI3 value from the module, and then write the value that was read to the InTxPDO[05].

(04) **03 04 00 04 00 01, 06, 00, 00,** → Read the AI4 value from the module, and then write the value that was read to the InTxPDO[06].

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(05) **03 04 00 05 00 01, 07, 00, 00,** → Read the AI5 value from the module, and then write the value that was read to the InTxPDO[07].

(06) **03 04 00 06 00 01, 08, 00, 00,** → Read the AI6 value from the module, and then write the value that was read to the InTxPDO[08].

(07) **03 04 00 07 00 01, 09, 00, 00,** → Read the AI7 value from the module, and then write the value that was read to the InTxPDO[09].

Here, the M-7017 module is used as an example, as it provides seven 16-bit AD channels. The address mapping is as follows:

AD channel	PDO[Addr]
0	InTxPDO[02]
1	InTxPDO[03]
2	InTxPDO[04]
3	InTxPDO[05]
4	InTxPDO[06]
5	InTxPDO[07]
6	InTxPDO[08]
7	InTxPDO[09]

AD_Addr03_2.txt

The **AD_Addr03_2.txt** command file contains a single typical Modbus RTU command, i.e., read all Analog Input channels, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, 1 commands(00-00), max=300, format=Dec
03 04 00 00 00 08, 02, 00, 00, InTxPdo[2/9]=A/I_0~7, update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-17

The M-7017 module is used as an example:

Modbus Command, PDO[Addr], Update Mode, Special Code =

(01) **02 03 00 40 00 04, 02, 00, 00,** → Read the AI0/1/2/3/4/5/6/7 value from the module, and then write the value that was read to the InTxPDO[02/03/04/05/06/07/08/09].

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04.DIO_DA_AD

The **04_DIO_DA_AD** folder provides configure sample for set the Digital Input (DI), Digital Output (DO), Analog Input (AD), Analog Output (DA) and delay the Modbus command, each of which will be described in more detail below.

DIO_DA_AD_1.txt

The **DIO_DA_AD_1.txt** command file contains five typical Modbus RTU commands, i.e., Read DI/AI, Write DO/AO and Set the delay 2 ms, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
5, five commands(00-04), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 03, 00, 00, DA_0/1/2/3=OutRxPdo[3/4/5/6], update cyclically, (02)
FF 06 00 01 00 02, 02, 00, 00, delay 1ms x 2=2ms, A/D need more delay @ 115.2K (03)
03 04 00 00 00 08, 03, 00, 00, InTxPdo[3/0A]=A/I_0~7, update cyclically, (04)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
DIO Address = 0x01
D/A Address = 0x02
A/D Address = 0x03
```

Figure A2-18

For Example:

Number of command = **5**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → Read data from the OutRxPDO[02] and then send the Modbus command to DO module.

(01) **01 02 00 00 00 08, 02, 00, 00,** → Read the DI data from the module, and then write the read value that was read to InTxPDO[02].

(02) **02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 03, 00, 00,** → Read data from the OutRxPDO[03/04/05/06] and then send the Modbus command to AO0/1/2/3.

(03) **FF 06 00 01 00 02, 02, 00, 00,** → Set the delay 2 ms.

(04) **03 04 00 00 00 08, 03, 00, 00,** → Read the AI0/1/2/3/4/5/6/7 value from the module, and then write the value that was read to the InTxPDO[03/04/05/06/07/08/09/0A].

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05.Rising_Trigger

The **05_Rising_Trigger** folder provides configure sample for set the read/clear Counter and high/low_Latch of Digital Input, each of which will be described in more detail below.

RisingTrigger _1.txt

The **RisingTrigger_1.txt** command file is very similar to DIO_Addr01_2.txt command file described above, except for the Read/Clear DI Counter 0, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
4, four commands(00-03), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutRxPdo[02], update cyclically, (00)
01 02 00 00 00 07, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
01 04 00 00 00 01, 03, 00, 00, InTxPdo[03]=Cnt_0, update cyclically, (02)
01 05 02 00 FF 00, 03, 01, 00, Clear Cnt_0, update OutRxPdo[03].bit0 rising, (03)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-19

Here, the M-7050 module is used as an example, where the DI can be used as a 16-bit event counter.

Modbus Command, PDO[Addr], Update Mode, Special Code =

(02) **01 04 00 00 00 01, 03, 00, 00,** → This command is used to cyclically read the DI Counter_0 data from the module, and then write the read value that was read to InTxPDO[03].

(03) **01 05 02 00 FF 00, 03, 01, 00,** → This command will clear DI Counter_0. Since the update mode is not set to 00, Command will not be executed cyclically. If bit0 of the OutRxPDO[03] is changed from 0 to 1 (rising), Command (03) will be executed once and DI Counter_0 will be cleared to zero.

The address mapping as follows:

DO/DI/Event Counter	PDO[Addr]	Clear Counter
DO	OutRxPDO[02]	-
DI	InTxPDO[02]	-
Cnt_0	InTxPDO[03]	OutRxPDO[03].bit0

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RisingTrigger _2.txt

The **RisingTrigger_2.txt** command file is very similar to RisingTrigger_1.txt command file described above, except for the Read/Clear DI Counters 0 to 16, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
16, 16 commands(00-15), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutRxPdo[02], update cyclically, (00)
01 02 00 00 00 07, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
01 04 00 00 00 01, 03, 00, 00, InTxPdo[03]=Cnt_0, update cyclically, (02)
01 04 00 01 00 01, 04, 00, 00, InTxPdo[04]=Cnt_1, update cyclically, (03)
01 04 00 02 00 01, 05, 00, 00, InTxPdo[05]=Cnt_2, update cyclically, (04)
01 04 00 03 00 01, 06, 00, 00, InTxPdo[06]=Cnt_3, update cyclically, (05)
01 04 00 03 00 01, 07, 00, 00, InTxPdo[07]=Cnt_4, update cyclically, (06)
01 04 00 03 00 01, 08, 00, 00, InTxPdo[08]=Cnt_5, update cyclically, (07)
01 04 00 03 00 01, 09, 00, 00, InTxPdo[09]=Cnt_6, update cyclically, (08)
01 05 02 00 FF 00, 03, 01, 00, Clear Cnt_0, update OutRxPdo[03].bit0 rising, (09)
01 05 02 01 FF 00, 03, 02, 00, Clear Cnt_1, update OutRxPdo[03].bit1 rising, (10)
01 05 02 02 FF 00, 03, 04, 00, Clear Cnt_2, update OutRxPdo[03].bit2 rising, (11)
01 05 02 03 FF 00, 03, 08, 00, Clear Cnt_3, update OutRxPdo[03].bit3 rising, (12)
01 05 02 04 FF 00, 03, 10, 00, Clear Cnt_4, update OutRxPdo[03].bit4 rising, (13)
01 05 02 05 FF 00, 03, 20, 00, Clear Cnt_5, update OutRxPdo[03].bit5 rising, (14)
01 05 02 06 FF 00, 03, 40, 00, Clear Cnt_6, update OutRxPdo[03].bit6 rising, (15)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-20

Here, the M-7050 module is used as an example as it provides support for seven event counters. Commands (02) to (15) are used to cyclically read the seven event counters. If bits 0 to 6 for the OutRxPDO[03] are rising, the related event counters will be cleared to zero.

The address mapping for the seven event counters is as follows:

Event Counter	InTxPDO[Addr]	Clear Counter
0	InTxPDO[03]	OutRxPDO[03].bit0
1	InTxPDO[04]	OutRxPDO[03].bit1
2	InTxPDO[05]	OutRxPDO[03].bit2
3	InTxPDO[06]	OutRxPDO[03].bit3
4	InTxPDO[07]	OutRxPDO[03].bit4
5	InTxPDO[08]	OutRxPDO[03].bit5
6	InTxPDO[09]	OutRxPDO[03].bit6

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RisingTrigger _3.txt

The **RisingTrigger_3.txt** command file is very similar to RisingTrigger_2.txt command file described above, except for the Read/Clear DI Latch, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
19, 19 commands(00-18), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutRxPdo[02], update cyclically, (00)
01 02 00 00 00 07, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
01 04 00 00 00 01, 03, 00, 00, InTxPdo[03]=Cnt_0, update cyclically, (02)
01 04 00 01 00 01, 04, 00, 00, InTxPdo[04]=Cnt_1, update cyclically, (03)
01 04 00 02 00 01, 05, 00, 00, InTxPdo[05]=Cnt_2, update cyclically, (04)
01 04 00 03 00 01, 06, 00, 00, InTxPdo[06]=Cnt_3, update cyclically, (05)
01 04 00 03 00 01, 07, 00, 00, InTxPdo[07]=Cnt_4, update cyclically, (06)
01 04 00 03 00 01, 08, 00, 00, InTxPdo[08]=Cnt_5, update cyclically, (07)
01 04 00 03 00 01, 09, 00, 00, InTxPdo[09]=Cnt_6, update cyclically, (08)
01 05 02 00 FF 00, 03, 01, 00, Clear Cnt_0, update OutRxPdo[03].bit0 rising, (09)
01 05 02 01 FF 00, 03, 02, 00, Clear Cnt_1, update OutRxPdo[03].bit1 rising, (10)
01 05 02 02 FF 00, 03, 04, 00, Clear Cnt_2, update OutRxPdo[03].bit2 rising, (11)
01 05 02 03 FF 00, 03, 08, 00, Clear Cnt_3, update OutRxPdo[03].bit3 rising, (12)
01 05 02 04 FF 00, 03, 10, 00, Clear Cnt_4, update OutRxPdo[03].bit4 rising, (13)
01 05 02 05 FF 00, 03, 20, 00, Clear Cnt_5, update OutRxPdo[03].bit5 rising, (14)
01 05 02 06 FF 00, 03, 40, 00, Clear Cnt_6, update OutRxPdo[03].bit6 rising, (15)
01 01 00 40 00 07, 10, 00, 00, InTxPdo[10]=D/I_Latch_High,update cyclically,     (16)
01 01 00 60 00 07, 11, 00, 00, InTxPdo[11]=D/I_Latch_Low,update cyclically,      (17)
01 05 01 00 FF 00, 04, 01, 00, Clear D/I Latch, update OutRxPdo[04].bit0 rising, (18)
STOP
================================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
================================================================================
```

Figure A2-21

Here, the M-7050 module is used as an example, as the DI can be latched using either the High_pulse or the Low_pulse. The address mapping is as follows:

DI Latch	PDO[Addr]	Clear Latch
High_Latch	InTxPDO[10]	OutRxPDO[04].bit0
Low_Latch	InTxPDO[11]	

Modbus Command, PDO[Addr], Update Mode, Special Code =

(16) **01 01 00 40 00 07, 10, 00, 00,** → This command is used to cyclically read the DI High_Latch.

(17) **01 01 00 60 00 07, 11, 00, 00,** → This command is used to cyclically read the DI Low_Latch.

(18) **01 05 01 00 FF 00, 04, 01, 00,** → This command is used to clear the DI Latch. If bit0 for the OutRxPDO[04] are rising, the related DI Latch will be cleared to zero.

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06.Initial_Value

The **06_Initial_Value** folder provides configure sample for set the Power-on value function when special code is **"01"**, each of which will be described in more detail below.

Init_Value _1.txt

The **Init_Value_1.txt** command file contains eight typical Modbus RTU commands, i.e., set the Power-on value, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
8, eight commands(00-07), max=300, format=Dec
02 06 00 00 01 23, 02, 00, 01, D/A_0=OutRxPdo[02]+initial=0x0123, (00)
02 06 00 01 02 34, 03, 00, 01, D/A_1=OutRxPdo[03]+initial=0x0234, (01)
02 06 00 02 03 45, 04, 00, 01, D/A_2=OutRxPdo[04]+initial=0x0325, (02)
02 06 00 03 04 56, 05, 00, 01, D/A_3=OutRxPdo[05]+initial=0x0456, (03)
02 03 00 40 00 01, 02, 00, 00, InTxPdo[02]=D/A_0 read back, update cyclically, (04)
02 03 00 41 00 01, 03, 00, 00, InTxPdo[03]=D/A_1 read back, update cyclically, (05)
02 03 00 42 00 01, 04, 00, 00, InTxPdo[04]=D/A_2 read back, update cyclically, (06)
02 03 00 43 00 01, 05, 00, 00, InTxPdo[05]=D/A_3 read back, update cyclically, (07)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
if (OutRxPdo[0].bit0=0) then D/A=initial value
if (OutRxPdo[0].bit0=1) DA_0/1/2/3=OutRxPdo[02/03/04/05]
```

Figure A2-22

Number of commands = **8**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 06 00 00 01 23, 02, 00, 01,** → Set the DA0 initial value = 123 and read data from the OutRxPDO[02] then send the data to the DA0.

(01) **02 06 00 01 02 34, 03, 00, 01,** → Set the DA1 initial value = 234 and read data from the OutRxPDO[03] then send the data to the DA1.

(02) **02 06 00 02 03 45, 04, 00, 01,** → Set the DA2 initial value = 345 and read data from the OutRxPDO[04] then send the data to the DA2.

(03) **02 06 00 03 04 56, 05, 00, 01,** → Set the DA3 initial value = 456 and read data from the OutRxPDO[05] then send the data to the DA3.

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(04) **02 03 00 40 00 01, 02, 00, 00,** → This command is used to cyclically read the DA0 readback value.
(05) **02 03 00 41 00 01, 03, 00, 00,** → This command is used to cyclically read the DA1 readback value.
(06) **02 03 00 42 00 01, 04, 00, 00,** → This command is used to cyclically read the DA2 readback value.
(07) **02 03 00 43 00 01, 05, 00, 00,** → This command is used to cyclically read the DA3 readback value.

If bit0 of the OutRxPDO[00] is 0, the DA 0 to 3 will be set to initial value.
If bit0 of the OutRxPDO[00] is 1, read data from the OutRxPDO[02/03/04/05] and sent the data to the DA 0 to 3.

NOTE

For detailed information about the OutRxPDO[00].bit0 (2610CTL0), refer to Section 3.3.1 "Module Status and Error Mode".

The address mapping is as follows:

DA channel	**OutRxPDO[00].bit0 = 0**	**OutRxPDO[00].bit0 = 1**	**Readback**
	Initial Value	OutRxPDO[Addr]	InTxPDO[Addr]
0	0x0123	OutRxPDO[02]	InTxPDO[02]
1	0x0234	OutRxPDO[03]	InTxPDO[03]
2	0x0345	OutRxPDO[04]	nTxPDO[04]
3	0x0456	OutRxPDO[05]	nTxPDO[05]

When the ECAT-2610 is power-on, the **OutRxPDO[00]=2610CTRL0.bit0 is reset to 0**.
So the output of DA0/1/2/3 is set to the initial value as follows:
DA0 = 0x0123
DA1 = 0x0234
DA2 = 0x0345
DA3 = 0x0456

The OutRxPDO[02/03/04/05] is set to new value.
Then the **OutRxPDO[00]=2610CTRL0.bit0** is set to **1** to update DA0/1/2/3 as follows:
DA0 = OutRxPDO[02]
DA1 = OutRxPDO[03]
DA2 = OutRxPDO[04]
DA3 = OutRxPDO[05]

If the **OutRxPDO[00]=2610CTRL0.bit0** is set to **0**, the DA0/1/2/3 will be set to the initial value again.

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07.Swap_Byte_Word

The **07_Swap_Byte_Word** folder provides configure sample for set the swap function, each of which will be described in more detail below.

Both_Swap _1.txt

The **Both_Swap_1.txt** command file contains two typical Modbus RTU commands, i.e., the both-swap function when set the special code is **"06"**, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 06, DA_0/1/2/3=OutRxPdo[2/3/4/5], both swap, (00)
02 03 00 40 00 04, 02, 00, 06, InTxPdo[2/3/4/5]=DA_0/1/2/3 read back, both swap , (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
input=ABCD,  both swap=DCBA
```

Figure A2-23

Number of commands = **2**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 06,** → Read data from the OutRxPDO[02/03/04/05] and send data to the DA0/1/2/3 then both swap.

(01) **02 03 00 40 00 04, 02, 00, 06,** → Read the DA0/1/2/3 readback value from the module, and write the read value that was read to InTxPDO[02/03/04/05] then both swap.

If the input 4 bytes are **ABCD**, after both swap, the four bytes are **DCBA**.
Assume the **OutRxPDO[02]=0xAB** and **OutRxPDO[03]=0xCD**,
after they are both swap,
The result are **DA0 = 0xDC** and **DA1 = 0xBA**.

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Byte_Swap _1.txt

The **Byte_Swap_1.txt** command file contains two typical Modbus RTU commands, i.e., the byte-swap function when set the special code is **"02"**, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
8, eight commands(00-07), max=300, format=Dec
02 06 00 00 00 00, 02, 00, 02, D/A_0=OutRxPdo[02], byte swap, (00)
02 06 00 01 00 00, 03, 00, 02, D/A_1=OutRxPdo[03], byte swap, (01)
02 06 00 02 00 00, 04, 00, 02, D/A_2=OutRxPdo[04], byte swap, (02)
02 06 00 03 00 00, 05, 00, 02, D/A_3=OutRxPdo[05], byte swap, (03)
02 03 00 40 00 01, 02, 00, 02, InTxPdo[02]=D/A_0 read back, byte swap, (04)
02 03 00 41 00 01, 03, 00, 02, InTxPdo[03]=D/A_1 read back, byte swap, (05)
02 03 00 42 00 01, 04, 00, 02, InTxPdo[04]=D/A_2 read back, byte swap, (06)
02 03 00 43 00 01, 05, 00, 02, InTxPdo[05]=D/A_3 read back, byte swap, (07)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
input=ABCD,  byte swap=BADC
```

Figure A2-24

Number of commands = **8**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 06 00 00 00 00, 02, 00, 02,** → Read data from the OutRxPDO[02] and send data to the DA0 then byte swap.

(01) **02 06 00 01 00 00, 03, 00, 02,** → Read data from the OutRxPDO[03] and send data to the DA1 then byte swap.

(02) **02 06 00 02 00 00, 04, 00, 02,** → Read data from the OutRxPDO[04] and send data to the DA2 then byte swap.

(03) **02 06 00 03 00 00, 05, 00, 02,** → Read data from the OutRxPDO[05] and send data to the DA3 then byte swap.

(04) **02 03 00 40 00 01, 02, 00, 02,** → Read the DA0 readback value from the module, and write the read value that was read to InTxPDO[02] then byte swap.

(05) **02 03 00 41 00 01, 03, 00, 02,** → Read the DA1 readback value from the module, and write the read value that was read to InTxPDO[03] then byte swap.

(06) **02 03 00 42 00 01, 04, 00, 02,** → Read the DA2 readback value from the module, and write the read value that was read to InTxPDO[04] then byte swap.

(07) **02 03 00 43 00 01, 05, 00, 02,** → Read the DA3 readback value from the module, and write the read value that was read to InTxPDO[05] then byte swap.

If the input 4 bytes are **ABCD**, after byte swap, the four bytes are **BADC**.

Assume the **OutRxPDO[02]=0xAB** and **OutRxPDO[03]=0xCD**,

after they are byte swap,

The result are **DA0 = 0xBA** and **DA1 = 0xDC**.

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Word_Swap _1.txt

The **Word_Swap_1.txt** command file contains two typical Modbus RTU commands, i.e., the word-swap function when set the special code is **"04"**, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 04, DA_0/1/2/3=OutRxPdo[2/3/4/5], word swap, (00)
02 03 00 40 00 04, 02, 00, 04, InTxPdo[2/3/4/5]=DA_0/1/2/3 read back, word swap , (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
input=ABCD,  word swap=CDAB
```

Figure A2-25

Number of commands = **2**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 04,** → Read data from the OutRxPDO[02/03/04/05] and send data to the DA0/1/2/3 then word swap.

(01) **02 03 00 40 00 04, 02, 00, 04,** → Read the DA0/1/2/3 readback value from the module, and write the read value that was read to InTxPDO[02/03/04/05] then word swap.

If the input 4 bytes are **ABCD**, after word swap, the four bytes are **CDAB**.

Assume the **OutRxPDO[02]=0xAB** and **OutRxPDO[03]=0xCD**,

after they are word swap,

The result are **DA0 = 0xCD** and **DA1 = 0xAB**.

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08.State_Change_Trigger

The **08_State_Change_Trigger** folder provides configure sample for set the state change trigger function when special code is **"08"**, each of which will be described in more detail below.

State_Change _1.txt

The **State_Change_1.txt** command file contains four typical Modbus RTU commands that are used to set the state change trigger function for Analog Output channels 0 to 3, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
4, four commands(00-03), max=300, format=Dec
02 06 00 00 00 00, 02, 00, 08, D/A_0=OutRxPdo[02]+state change update, (00)
02 06 00 01 00 00, 03, 00, 08, D/A_1=OutRxPdo[03]+state change update, (01)
02 06 00 02 00 00, 04, 00, 08, D/A_2=OutRxPdo[04]+state change update, (02)
02 06 00 03 00 00, 05, 00, 08, D/A_3=OutRxPdo[05]+state change update, (03)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
D/A_0/1/2/3 will update when OutRxPdo[02/03/04/05] change
```

Figure A2-26

Number of commands = **4**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 06 00 00 00 00, 02, 00, 08,** → The DA0 = OutRxPDO[02].

If OutRxPDO[02] is changed, the **"02 06 00 00 00 00"** command will be sent to module.

If OutRxPDO[02] is same, the **"02 06 00 00 00 00"** command will be bypass.

(01) **02 06 00 01 00 00, 03, 00, 08,** → The DA1 = OutRxPDO[03].

If OutRxPDO[03] is changed, the **"02 06 00 01 00 00"** command will be sent to module.

If OutRxPDO[03] is same, the **"02 06 00 01 00 00"** command will be bypass.

(02) **02 06 00 02 00 00, 04, 00, 08,** → The DA2 = OutRxPDO[04].

If OutRxPDO[04] is changed, the **"02 06 00 02 00 00"** command will be sent to module.

If OutRxPDO[04] is same, the **"02 06 00 02 00 00"** command will be bypass.

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(03) **02 06 00 03 00 00, 05, 00, 08,** → The DA3 = OutRxPDO[05].

If OutRxPDO[05] is changed, the **"02 06 00 03 00 00"** command will be sent to module.

If OutRxPDO[05] is same, the **"02 06 00 03 00 00"** command will be bypass.

The address mapping is as follows:

DA channel	PDO[Addr]
0	OutRxPDO[02]
1	OutRxPDO[03]
2	OutRxPDO[04]
3	OutRxPDO[05]

State_Change _2.txt

The **State_Change_2.txt** command file contains four typical Modbus RTU commands that are used to set the state change trigger function for all Analog Output channels, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, eight commands(00-01), max=300, format=Dec
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 08, DA_0/1/2/3=OutRxPdo[2/3/4/5]+state change update, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
D/A_0/1/2/3 will update when OutRxPdo[02/03/04/05] change
```

Figure A2-27

Number of commands = **1**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 02, 00, 08,** → The DA0/1/2/3 = OutRxPDO[02/03/04/05].

If one of OutRxPDO[02/03/04/05] is changed, the **"02 10 00 00 00 04 08 12 34 12 34 12 34 12 34"** command will be sent to module.

else the **"02 10 00 00 00 04 08 12 34 12 34 12 34 12 34"** command will be bypass.

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09.Constant_Output

The **09_Constant_Output** folder provides configure sample for set the constant output function when special code is **"10"**, each of which will be described in more detail below.

Constant _1.txt

The **Constant_1.txt** command file contains four typical Modbus RTU commands that are used to output of the Analog Output channels 0 to 3 is constant value, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
4, four commands(00-03), max=300, format=Dec
02 06 00 00 01 23, 02, 00, 10, D/A_0=constant 0x0123,  update cyclically, (00)
02 06 00 01 02 34, 03, 00, 10, D/A_1=constant 0x0234,  update cyclically, (01)
02 06 00 02 03 45, 04, 00, 10, D/A_2=constant 0x0345,  update cyclically, (02)
02 06 00 03 04 56, 05, 00, 10, D/A_3=constant 0x0456,  update cyclically, (03)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-28

Number of commands = **4**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

(00) **02 06 00 00 01 23, 02, 00, 10,** → This command is used to cyclically constant output "123" using DA0.

(01) **02 06 00 01 02 34, 03, 00, 10,** → This command is used to cyclically constant output "234" using DA1.

(02) **02 06 00 02 03 45, 04, 00, 10,** → This command is used to cyclically constant output "345" using DA2.

(03) **02 06 00 03 04 56, 05, 00, 10,** → This command is used to cyclically constant output "456" using DA3.

The address mapping is as follows:

DA channel	PDO[Addr]	Constant output
0	OutRxPDO[02]	0x0123
1	OutRxPDO[03]	0x0234
2	OutRxPDO[04]	0x0345
3	OutRxPDO[05]	0x0456

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10.Bit_Command

The **10_Bit_Command** folder provides configure sample for set the Bit command, each of which will be described in more detail below.

Bit _Cmd_1.txt

The **Bit_Cmd_1.txt** command file contains eight typical Modbus RTU commands that are used to write to DO Bits 0 to 7, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
8, 8 commands(00-07), max=300, format=Dec
01 05 00 00 FF 00, 02, 00, 00, D/O.bit0=OutRxPdo[02].bit0, update cyclically, (00)
01 05 00 01 FF 00, 02, 00, 00, D/O.bit1=OutRxPdo[02].bit1, update cyclically, (01)
01 05 00 02 FF 00, 02, 00, 00, D/O.bit2=OutRxPdo[02].bit2, update cyclically, (02)
01 05 00 03 FF 00, 02, 00, 00, D/O.bit3=OutRxPdo[02].bit3, update cyclically, (03)
01 05 00 04 FF 00, 02, 00, 00, D/O.bit4=OutRxPdo[02].bit4, update cyclically, (04)
01 05 00 05 FF 00, 02, 00, 00, D/O.bit5=OutRxPdo[02].bit5, update cyclically, (05)
01 05 00 06 FF 00, 02, 00, 00, D/O.bit6=OutRxPdo[02].bit6, update cyclically, (06)
01 05 00 07 FF 00, 02, 00, 00, D/O.bit7=OutRxPdo[02].bit7, update cyclically, (07)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-29

The M-7050 module is used as an example. The address mapping is as follows:

DO	PDO[Addr]
Bit0	OutRxPDO[02].bit0
Bit1	OutRxPDO[02].bit1
Bit2	OutRxPDO[02].bit2
Bit3	OutRxPDO[02].bit3
Bit4	OutRxPDO[02].bit4
Bit5	OutRxPDO[02].bit5
Bit6	OutRxPDO[02].bit6
Bit7	OutRxPDO[02].bit7

NOTE

Using bit commands is not recommended.

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11.Delay_Command

The **11_Dealy_Command** folder provides configure sample for set the delay time, each of which will be described in more detail below.

Delay_Cmd_1.txt

The **Delay_Cmd_1.txt** command file is very similar to DIO_DA_AD_1.txt command file described above, except for the delay time, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
6, six commands(00-05), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
FF 06 00 01 00 01, 02, 00, 00, delay 1ms x 1=1ms, D/A need more delay @ 115.2K (02)
02 10 00 00 00 04 08 12 34 12 34 12 34 12 34, 03, 00, 00, DA_0/1/2/3=OutRxPdo[3/4/5/6], update cyclically, (03)
FF 06 00 01 00 02, 02, 00, 00, delay 1ms x 2=2ms, A/D need more delay @ 115.2K (04)
03 04 00 00 00 08, 03, 00, 00, InTxPdo[3/0A]=A/I_0~7, update cyclically, (05)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
DIO Address = 0x01
D/A Address = 0x02
A/D Address = 0x03
```

For Example: Figure A2-30

Modbus Command, PDO[Addr], Update Mode, Special Code =

(02) **FF 06 00 01 00 01, 02, 00, 00,** → Set the delay 1 ms = 1 ms x 1

(04) **FF 06 00 01 00 02, 02, 00, 00,** → Set the delay 2 ms = 1 ms x 2

If the module needs more delay time, the delay command can be used as follows:

FF 06 00 00 00 XX: unit = 0.01 sec = 10 ms, max. = 255 x 0.01 sec = 2.55 sec

FF 06 00 01 00 XX: unit = 1 ms, max. = 255 x 1 ms = 0.255 sec

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12.TxPdo_RxPdo_0x80_0xFF

The **12_TxPdo_RxPdo_0x80_0xFF** folder provides configure sample for set the address is 0x80 to 0xFF for the InTxPDO and OutRxPDO, each of which will be described in more detail below.

TxPdo_RxPdo_0x80.txt

The **TxPdo_RxPdo_0x80.txt** command file contains two typical Modbus RTU commands that are used to set the InTxPDO[Addr] and OutRxPDO[addr] is 0x80 for the Digital Input and Digital Output, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 80, 00, 00, D/O=OutTxPdo[80], update cyclically, (00)
01 02 00 00 00 08, 80, 00, 00, InTxPdo[80]=D/I, update cyclically, (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-31

TxPdo_RxPdo_0xFF.txt

The **TxPdo_RxPdo_0xFF.txt** command file contains two typical Modbus RTU commands that are used to set the InTxPDO[Addr] and OutRxPDO[Addr] is 0xFF for the Digital Input and Digital Output, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, FF, 00, 00, D/O=OutTxPdo[FF], update cyclically, (00)
01 02 00 00 00 08, FF, 00, 00, InTxPdo[FF]=D/I, update cyclically, (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-32

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TxPdo_RxPdo_AD_0x80.txt

The **TxPdo_RxPdo_AD_0x80.txt** command file contains eight typical Modbus RTU commands that are used to set the InTxPDO[Addr] is 0x80 to 0x87 for the Analog Input channels 0 to 7, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
8, 8 commands(00-07), max=300, format=Dec
03 04 00 00 00 01, 80, 00, 00, InTxPdo[80]=A/I_0, update cyclically, (00)
03 04 00 01 00 01, 81, 00, 00, InTxPdo[81]=A/I_1, update cyclically, (01)
03 04 00 02 00 01, 82, 00, 00, InTxPdo[82]=A/I_2, update cyclically, (02)
03 04 00 03 00 01, 83, 00, 00, InTxPdo[83]=A/I_3, update cyclically, (03)
03 04 00 04 00 01, 84, 00, 00, InTxPdo[84]=A/I_4, update cyclically, (04)
03 04 00 05 00 01, 85, 00, 00, InTxPdo[85]=A/I_5, update cyclically, (05)
03 04 00 06 00 01, 86, 00, 00, InTxPdo[86]=A/I_6, update cyclically, (06)
03 04 00 07 00 01, 87, 00, 00, InTxPdo[87]=A/I_7, update cyclically, (07)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-33

TxPdo_RxPdo_AD_0xFF.txt

The **TxPdo_RxPdo_AD_0xFF.txt** command file contains eight typical Modbus RTU commands that are used to set the InTxPDO[Addr] is 0x8F to 0xFF for the Analog Input channels 0 to 7, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, 1 commands(00-00), max=300, format=Dec
03 04 00 00 00 08, F8, 00, 00, InTxPdo[F8/FF]=A/I_0~7, update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-34

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TxPdo_RxPdo_DA_0x80_0xFF.txt

The **TxPdo_RxPdo_AD_0xFF.txt** command file contains eight typical Modbus RTU commands that are used to set the InTxPDO[Addr] and OutTxPDO[Addr] is 0x80 to 0xFF for the Analog Output channels 0 to 3, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
5, four commands(00-04), max=300, format=Dec
02 03 00 40 00 02, 80, 00, 00, InTxPdo[80/81]=DA_0/1 read back, update cyclically, (00)
02 03 00 42 00 02, FE, 00, 00, InTxPdo[FE/FF]=DA_2/3 read back, update cyclically, (01)
02 10 00 00 00 02 04 12 34 12 34, 80, 00, 00, DA_0/1=OutTxPdo[80/81], update cyclically, (02)
02 06 00 02 00 00, FE, 00, 00, DA_2=OutTxPdo[FE], update cyclically, (03)
02 06 00 03 00 00, FF, 00, 00, DA_3=OutTxPdo[FF], update cyclically, (04)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A2-35

13.Commands_128_202

The **Commands_128_202** folder provides configure sample (commands_128.txt and commands_202.txt) contains 128 and 202 typical Modbus RTU commands.

NOTE

The maximum command line is 300, but the maximum EEPROM is 2047.

In the configure sample (commands_202.txt), the maximum commands is 202.

The EEPROM will be FULL, if the command 203 is added.

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14.End_of_Cmd_Dealy

The **14_End_of_Cmd_Dealy** folder provides configure sample for set delay time in the end of Modbus command, each of which will be described in more detail below.

End_Delay_1.txt

The **End_Dealy_1.txt** command file contains set the end_delay 2 seconds, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
200, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, delay=200x0.01=2 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
STOP
═══════════════════════════════════════════════════════════════════════
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
═══════════════════════════════════════════════════════════════════════
```

Figure A2-36

For Example:

Set the end_delay to 200, unit = 0.01 sec, so 200 x 0.01 sec = 2 sec for slow speed debug.
ECAT-2610 will delay extra 2 seconds in the end of every command.
This will make the scan speed is down to slow for debug.

NOTE

It is recommended to set this value to 0 for normal application.

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15.TxPdo_RxPdo_Max

The **15_TxPdo_RxPdo_Max** folder provides configure sample for set the InTxPdoMax/2 and OutRxPdoMax/2, each of which will be described in more detail below.

NOTE

The InTxPdoMax/2 and OutRxPdoMax/2 can be set to special value for debug.

It is recommended to set these 2 values to 0 (Automatic settings).

TxRxPdo_Max_1.txt

The **TxRxPdo_Max_1.txt** command file contains set the IntxPdoMax/2 to 8 and OutRxPdoMax/2 to 10, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
8, InTxPdoMax/2, format=Dec, InTxPdoMax=8X2=16=Sys0 ~ In0F
10, OutRxPdoMax/2, format=Dec, OutRxPdoMax=10X2=20=Ctrl0 ~ Out13
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
min InTxPdoMax = 10
min OutRxPdoMax = 10
```

For Example: Figure A2-37

Set the InTxPdoMax/2 to 8, so InTxPdoMax = 8 x 2 =16 that means InTxPDO[00] to InTxPDO[0F].
Set the OutRxPdoMax/2 to 10, so OutRxPdoMax = 10 x 2 =20 that means OutRxPDO[00] to OutRxPDO[13].

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TxRxPdo_Max_2.txt

The **TxRxPdo_Max_2.txt** command file contains set the IntxPdoMax/2 and OutRxPdoMax/2 to 64, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
64, InTxPdoMax/2, format=Dec, InTxPdoMax=64X2=128=Sys0 ~ In7F
64, OutRxPdoMax/2, format=Dec, OutRxPdoMax=64x2=128=Ctrl0 ~ Out7F
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
min InTxPdoMax = 10
min OutRxPdoMax = 10
```

Figure A2-38

For Example:

Set the InTxPdoMax/2 to 64, so InTxPdoMax = 64 x 2 =128 that means InTxPDO[00] to InTxPDO[7F].

Set the OutRxPdoMax/2 to 64, so OutRxPdoMax = 64 x 2 =128 that means OutRxPDO[00] to OutRxPDO[7F].

TxRxPdo_Max_3.txt

The **TxRxPdo_Max_3.txt** command file contains set the IntxPdoMax/2 and OutRxPdoMax/2 to 128, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
128, InTxPdoMax/2, format=Dec, InTxPdoMax=128X2=256=Sys0 ~ InFF
128, OutRxPdoMax/2, format=Dec, OutRxPdoMax=128x2=256=Ctrl0 ~ OutFF
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
min InTxPdoMax = 10
min OutRxPdoMax = 10
```

Figure A2-39

For Example:

Set the InTxPdoMax/2 to 128, so InTxPdoMax = 128 x 2 =256 that means InTxPDO[00] to InTxPDO[FF].

Set the OutRxPdoMax/2 to 128, so OutRxPdoMax = 128 x 2 =256 that means OutRxPDO[00] to OutRxPDO[FF].

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16.Rs485_Cycle_Time

The **16_Rs485_Cycle_Time** folder provides configure sample that are used to set the **"FF 03 00 01 00 01"** command is designed to save the RS-485 cycle time, each of which will be described in more detail below.

Rs485_Cycle_Time_1.txt

The **Rs485_Cycle_Time_1.txt** command file is very similar to DIO_Addr01_1.txt command file described above, except for save the RS-485 cycle time, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, delay=200x0.01=2 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
2, two commands(00-01), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
FF 03 00 01 00 01, 02, 00, 00, InTxPdo[2]=Rs485_Cycle_Time, unit=0.1ms (01)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=In[02..FF]
=============================================================================
```

Figure A2-40

Number of commands = **2**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

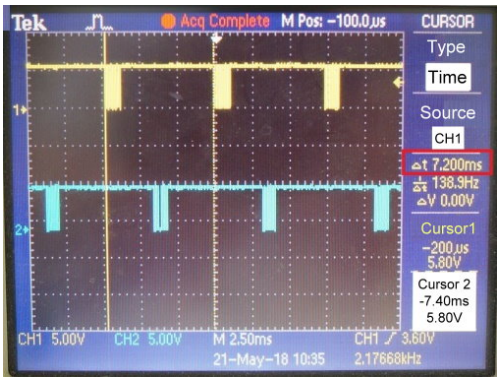
(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → This command is used to cyclically write DO.

(01) **FF 03 00 01 00 01, 02, 00, 00,** → This command is used to save the RS-485 cycle time, unit = 0.1 ms.

The following example will show the measured value by TwinCAT and oscilloscope.

TwinCAT Project1 ADS Symbol Watch

Name	Online	Type	Size	>Addr...	In/Out	User ...
2610SYS0	0x0000	UINT	2.0	26.0	Input	0
2610SYS1	0xa000	UINT	2.0	28.0	Input	0
In02	72	UINT	2.0	30.0	Input	0
In03	0	UINT	2.0	32.0	Input	0
In04	0	UINT	2.0	34.0	Input	0
In05	0	UINT	2.0	36.0	Input	0
In06	0	UINT	2.0	38.0	Input	0
In07	0	UINT	2.0	40.0	Input	0
In08	0	UINT	2.0	42.0	Input	0
In09	0	UINT	2.0	44.0	Input	0



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Rs485_Cycle_Time_2.txt

The **Rs485_Cycle_Time_2.txt** command file is very similar to DIO_Addr01_2.txt command file described above, except for save the RS-485 cycle time, as illustrated below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, delay=200x0.01=2 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
3, three commands(00-02), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[02], update cyclically, (00)
01 02 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/I, update cyclically, (01)
FF 03 00 01 00 01, 03, 00, 00, InTxPdo[03]=Rs485_Cycle_Time, unit=0.1ms (02)
STOP
================================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=In[02..FF]
================================================================================
```

Figure A2-41

Number of commands = **3**,

Modbus Command, PDO[Addr], Update Mode, Special Code =

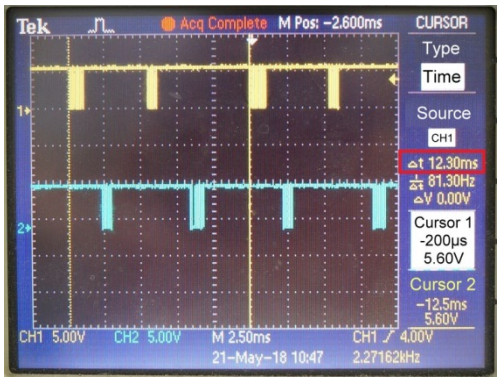
(00) **01 0F 00 00 00 08 01 00, 02, 00, 00,** → This command is used to cyclically write DO.

(01) **01 02 00 00 00 08, 02, 00, 00,** → This command is used to cyclically read DI.

(02) **FF 03 00 01 00 01, 03, 00, 00,** → This command is used to save the RS-485 cycle time, unit = 0.1 ms.

The following example will show the measured value by TwinCAT and oscilloscope.

Name	Online	Type	Size	>Addr...	In/Out	User ...
2610SYS0	0x0000	UINT	2.0	26.0	Input	0
2610SYS1	0xa000	UINT	2.0	28.0	Input	0
In02	0	UINT	2.0	30.0	Input	0
In03	122	UINT	2.0	32.0	Input	0
In04	0	UINT	2.0	34.0	Input	0
In05	0	UINT	2.0	36.0	Input	0
In06	0	UINT	2.0	38.0	Input	0
In07	0	UINT	2.0	40.0	Input	0
In08	0	UINT	2.0	42.0	Input	0
In09	0	UINT	2.0	44.0	Input	0



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17.Ext_Sync

The **17_Ext_Sync** folder provides configure sample for how to use the Ext_Sync mechanism.

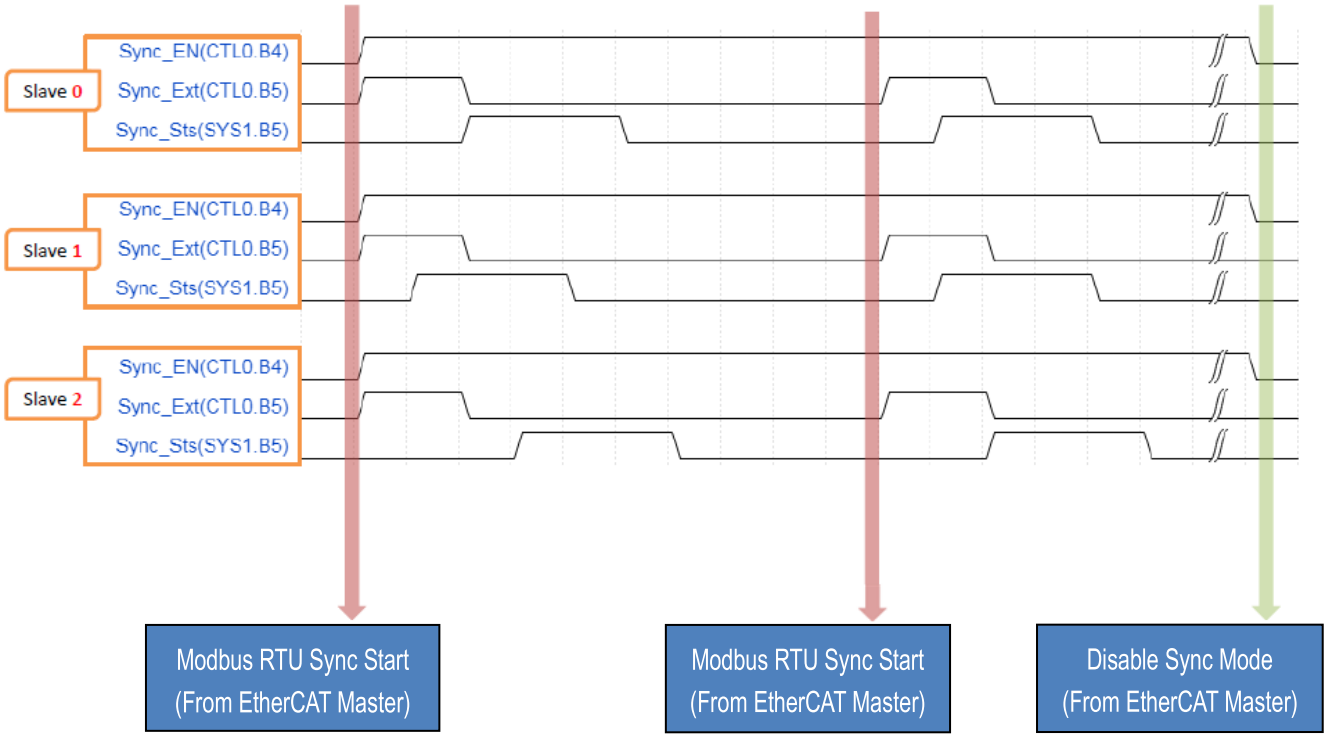
The Ext_Sync mechanism is designed to synchronize multiple ECAT-2610 modules, define as follows:

- Host use **2610CTL0.Bit4 = High** to Enable the Ext_Sync mechanism
- Host use **2601CTL0.Bit5 = High** to indicate Ext_Sync Ready
- ECTA-2610 use **2610SYS1.Bit5 = High** to indicate the **Ext_Sync_commands** are executed
- ECAT-2610 use **2610SYS1.Bit5 = Low** to indicate the **Ext_Sync_commands** are end
- User use **CtrlX[0]** to indicate the starting **Ext_Sync_commands**.

NOTE

For detailed information about the 2610CTL0.Bit4, 2610CTL0.Bit5 and 2610SYS1.Bit5, refer to Section 3.3.1 "Module Status and Error Mode".

The image below shows an example of the Ext_Sync operation for three slave devices:



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ext_sync.txt

The **Ext_Sync.txt** command file contains five typical Modbus RTU commands. Here, set the **CtrlX[0] = 3** that means used to indicate the starting **Ext_Sync_command** is **03**. Therefore, commands (00) to (02) are **normal_commands** that will be always scan as normal, while commands (03) to (04) are **Ext_Sync_commands** that will be scan when the Ext_Sync is High, else (Ex_Sync is Low), the commands (03) to (04) will not be scan, as illustrate below:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
3 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0,CtrlX[0]=03=Ext_Sync_Start
5, five commands(00-04), max=300, format=Dec
01 01 00 00 00 08, 02, 00, 00, InTxPdo[02]=D/O read back, update cyclically, (00)
01 02 00 00 00 08, 03, 00, 00, InTxPdo[03]=D/I, update cyclically, (01)
01 01 00 40 00 07, 04, 00, 00, InTxPdo[04]=D/I_Latch_High, update cyclically, (02)
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (03)
01 01 00 00 00 08, 05, 00, 00, InTxPdo[05]=D/O read back, update cyclically, (04)
STOP
;=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610SYS1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=In[02..FF]
;=============================================================================
```

CtrlX[0]

Normal_commands

Ext_Sync_commands

Figure A2-42

When the **2610CTL0.Bit5 = Low**, the scan sequence will be given as follows:
Commands (00) → (01) → (02) →(00) →(01)→(02)→……. →(00) → (01) → (02)→ …..

When the **2610CTL0.Bit5 = High**, the scan sequence will be given as follows:
Commands (00) →(01)→(02)→(03) →(04) →……. →(00)→(01)→(02)→(03)→(04)→…….

➢ The steps to configure the **Ext_Sync mechanism** are given as follows:

Step 1: write all **normal_commands** in the leading part.

Step 2: write all **Ext_Sync_commands** in the last part.

Step 3: use **CtrlX[0]** to indicate the starting of **Ext_Sync_commands**.

Step 4: upload the commands.txt to ECAT-2610 module.

➢ The steps to control the **Ext_Sync Operation** are given as follows:

Step 1: Host set **2610CTL0.Bit4 = High** to enable the Ext_Sync mechanism.

Step 2: Host set **2610CTL0.Bit5 = High** to START the Ext_Sync operation.

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Step 3: Host waits the **2610SYS1.Bit5 = High**

(ECAT-2610 set **2610SYS1.Bit5 = High** to indicate **Ext_Sync_commands** are executed)

Step 4: Host set **2610CTL0.Bit5 = Low** to STOP this Ext_Sync operation

(ECAT-2610 set **2610SYS1.Bit5 = Low** to indicate **Ext_Sync_commands** are end)

Step 5: Host waits the **2610SYS1.Bit5 = Low**

Step 6: ……..

Step 7: Return **Step 2** for next Ext_Sync operation.

Step 8: Host set **2610CTL0.Bit4 = Low** to disable the Ext_Sync mechanism.

Step 9: End

In addition, the **Ext_Sync.txt** command file also contains the definitions of 2610CTL0.Bit4, 2610CTL0.Bit5, 2610SYS1.Bit5 and CtrlX[0]:

```
OutRxPdo[00]=2610CTL0
Host set 2610CTL0.bit4=High to Enable the Ext_Sync mechanism
Host set 2601CTL0.bit5=High to Start one Ext_Sync operation
Host set 2601CTL0.bit5=Low to Stop this Ext_Sync operation

InTxPdo[01]=2610SYS1
2610 set 2610SYS1.bit5=High to indicate Ext_Sync_commands are executed
2610 set 2610SYS1.bit5=Low  to indicate Ext_Sync_commands are end



======== assume CtrlX[0]=Sync_Start=03 ========
CtrlX[0]=Sync_Start=3   --> normal scan = 00,01,02,00,01,02,....,00,01,02,...
CtrlX[0]=Sync_Start=3   --> Ext_Sync scan = 00,01,02,03,04,00,01,02,03,04....,00,01,02,03,04...
[00,01,02] = normal_commands = always scan
[03,04] = Ext_Sync_commands = scan when 2610CTRL0.bit5 is High
when [03,04] are executed, 2610 will set 2610SYS1.bit5 to High
when [03,04] are end, 2610 will set 2610SYS1.bit5 to Low



======== assume CtrlX[0]=Sync_Start=04 ========

CtrlX[0]=Sync_Start=4--> normal scan = 00,01,02,03,00,01,02,03,....,00,01,02,03,...
CtrlX[0]=Sync_Start=4--> Ext_Sync scan = 00,01,02,03,04,00,01,02,03,04....,00,01,02,03,04...
[00,01,02,03] = normal_commands = always scan
[04] = Ext_Sync_command = scan when 2610CTRL0.bit5 is High
when [04] are executed, 2610 will set 2610SYS1.bit5 to High
when [04] are end, 2610 will set 2610SYS1.bit5 to Low
```

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A3. Manually Configure and Upload for ECAT-2610

This chapter provides a simple overview of default configuration data file (commands.txt) format, and use the following procedure to modify the configuration data (commands.txt) then use the configuration/Diagnostic Utility (7188ECAT.exe) to upload configuration data (commands.txt) to ECAT-2610 module:

Step 1 Edit the configuration data.

❶ Double-click the **"commands.txt"** configuration file to open it.

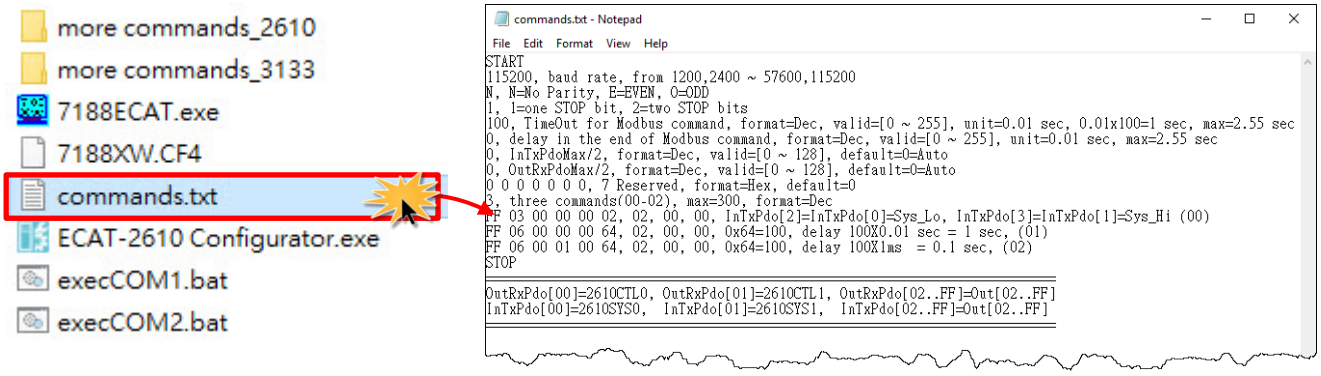

Figure A3-1

The "**commands.txt"** file provides a simple command setting that can be used to control a Modbus RTU device. A syntax rule consists of a left to right sequence of instructions, separated by a comma **","**. The data format of the **commands.txt** file, will be described in more detail below.

➢ The settings contained in the **default commands.txt file** are illustrated below:

Red Block: The parameter settings area.

Green Block: The parameter description area.

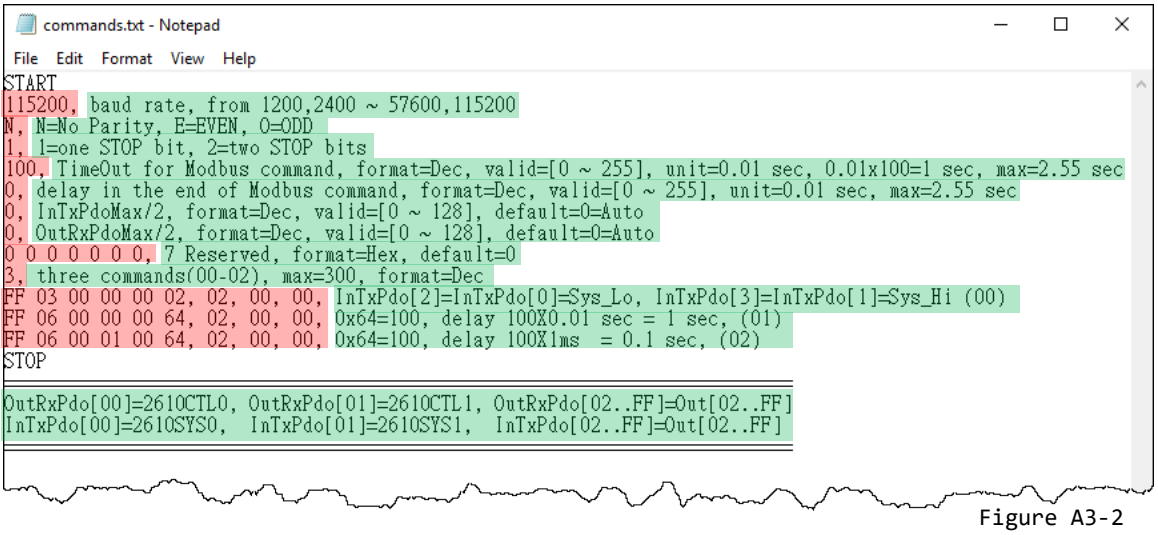

Figure A3-2

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❷ Set the **Baud Rate, Parity and Stop Bit** values depending on the requirements of the Modbus RTU device being used.

Parameter	Description
Baud Rate	Valid values: 1200/2400/4800/9600/19200/38400/57600/115200 bps. (Default: 115200)
Parity	Valid values: N (None), E (EVEN), O (ODD). (Default: N)
Stop Bits	Valid values: 1, 2. (Default: 1)

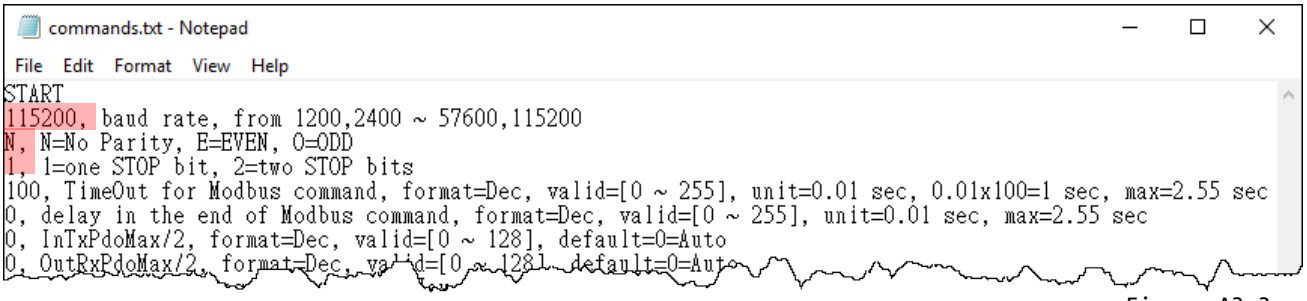

Figure A3-3

❸ Set the **timeout, delay time, InTxPdoMax/2 and OutRxPdoMax/2** values.

Parameter	Description
Timeout	Set the timeout of the Modbus command (Default: 100). Valid Range: 0 to 255. Unit = 0.01 second, 0.01 x 100 = 1 second, Max. = 2.55 second.
End_delay Time	Set the delay time at the end of the command (Default: 0). Refer to End_Delay_1.txt for more details. Valid Range: 0 to 255. Unit = 0.01 second, Max. = 2.55 second.
IntxPdoMax/2	The InTxPdoMax/2 is used for debug (Default: 0). It is recommended set to 0 (Automatic settings). Refer to 15.TxPdo_RxPdo_Max for more details.
OutRxPdoMax/2	The OutRxPdoMax/2 is used for debug (Default: 0). It is recommended set 0 (Automatic settings). Refer to 15.TxPdo_RxPdo_Max for more details.
7 Reserved	The first parameter (CtrlX[0]=Ext_Sync_Start) is used to set indicate the starting Ext_Sync_command, and the other six parameters are reserved and have no function. Refer to 17.Ext_Sync for more details. (Default: 0 0 0 0 0 0 0)

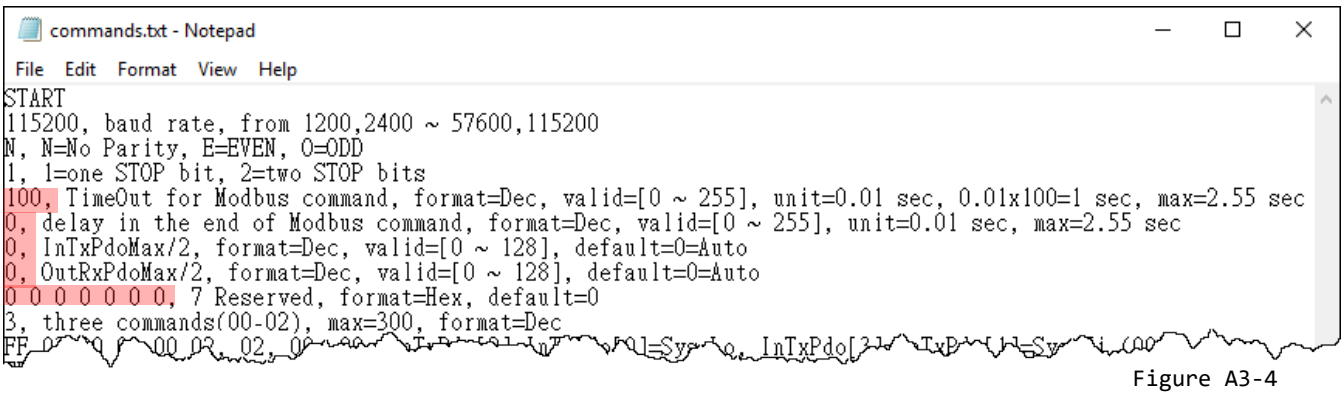

Figure A3-4

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❹ Set the **Number of Modbus Commands**.

Parameter	Description
Number of Modbus Commands	Valid Range: 0 to 300 (Max.). (Default: 3)

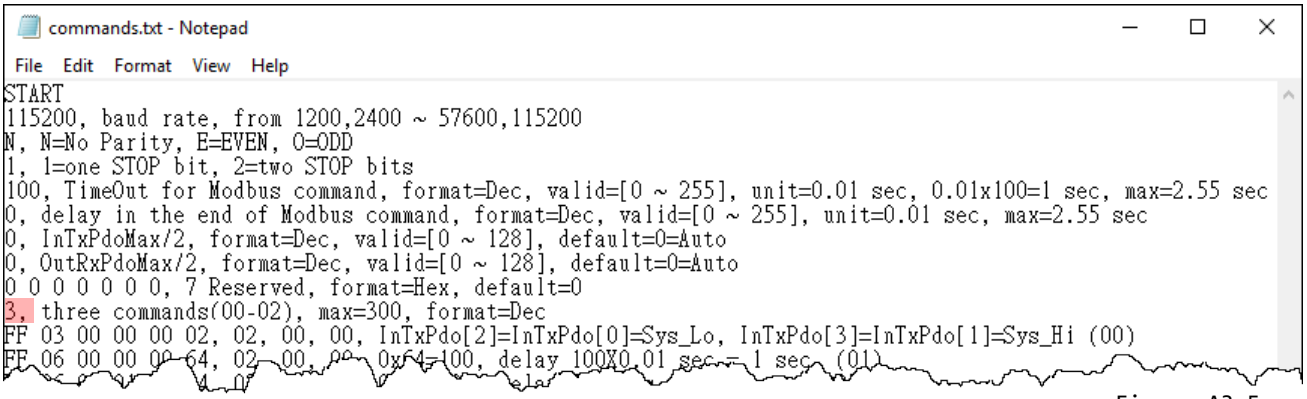

Figure A3-5

❺ Set the **Modbus commands** depending on the Modbus RTU device being used, and then save the amended configuration

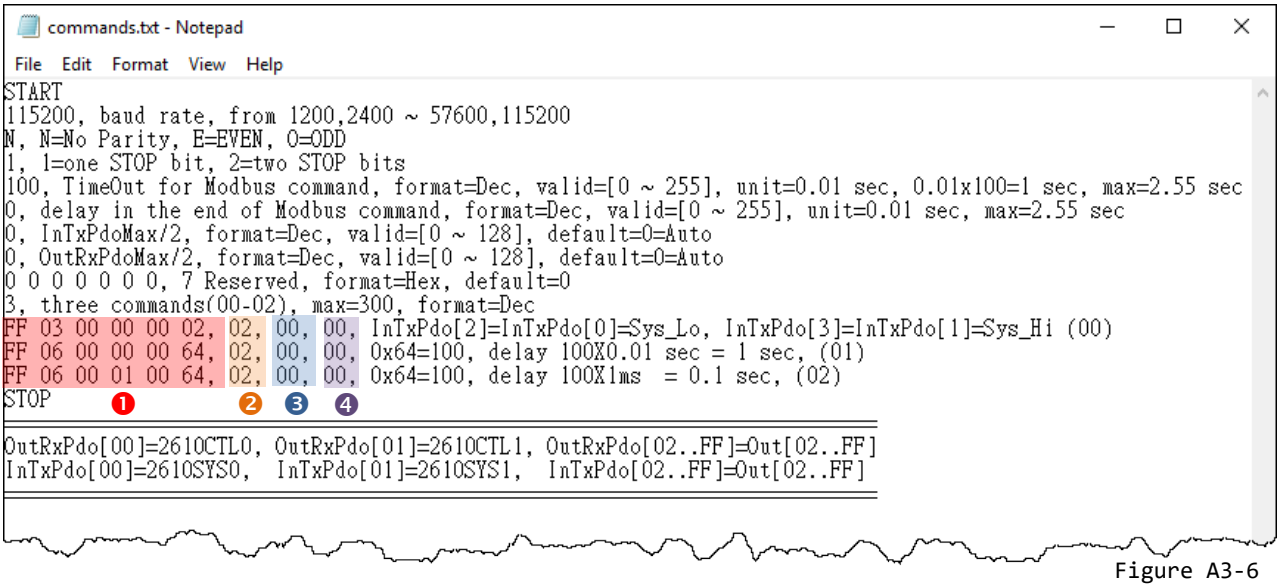

Figure A3-6

No.	Modbus Commands (HEX)	Description
❶	FF 03 00 00 00 02	The factory default command is used to read the status settings for the ECAT-2610 module. Refer to Section 3.3.1 "Module Status and Error Mode" for more details.
	FF 06 00 00 00 64	The factory default command is used to delay the Modbus command scan. This command is used to slow down the Modbus command for debug, refer to 11. Delay Command for more details.
	FF 06 00 01 00 64	Unit = 0.01 sec, delay 0x64 (HEX) = 100 (DEC), 100 (DEC) x 0.01 sec = 1 sec Unit = 1 ms = 0.01 sec, delay 0x64 (HEX) = 100 (DEC), 100 (DEC) x 0.001 sec = 0.1 sec

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	PDO [Addr] (HEX)	Description
❷	02	The [Addr] attribute is mapped to InTxPDO[Addr] or OutRxPDO[Addr] parameters. Valid Range: 0x02 to 0xFF. Note that OutRxPDO[00], OutRxPDO[01], InTxPDO[00] and InTxPDO[01] are used by the system of the ECAT-2610 module.

	Update Mode (HEX)	Description
❸	00	The data update mode is an 8-bit control. Refer to the 05.Rising_Trigger for more details. **00:** This command will update cyclically. **≠00:** This command will update at the rising edge of InTxPDO[Addr].

	Special Code (HEX)	Description
❹	00	Set the special code contain power-on value, swap, state change update and constant output functions, refer to 06 Initial Value, 07_Swap_Byte_Word, 08_State_Change_Trigger and 09_Constant_Output for more details. Valid values (HEX): **00** (None, default), **01** (Power-On value), **02** (byte-swap), **04** (word-swap), **06** (both-swap), **08** (state change trigger), **10** (constant output).

➢ Here, the M-7050 module is used as an example, type a single Modbus RTU command, i.e., write Digital Output channels 0 to 7 and save the amended configuration, as follows:

```
START
115200, baud rate, from 1200,2400 ~ 57600,115200
N, N=No Parity, E=EVEN, O=ODD
1, 1=one STOP bit, 2=two STOP bits
100, TimeOut for Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, 0.01x100=1 sec, max=2.55 sec
0, delay in the end of Modbus command, format=Dec, valid=[0 ~ 255], unit=0.01 sec, max=2.55 sec
0, InTxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0, OutRxPdoMax/2, format=Dec, valid=[0 ~ 128], default=0=Auto
0 0 0 0 0 0 0, 7 Reserved, format=Hex, default=0
1, one commands(00-00), max=300, format=Dec
01 0F 00 00 00 08 01 00, 02, 00, 00, D/O=OutTxPdo[2], update cyclically, (00)
STOP
=============================================================================
OutRxPdo[00]=2610CTL0, OutRxPdo[01]=2610CTL1, OutRxPdo[02..FF]=Out[02..FF]
InTxPdo[00]=2610SYS0,  InTxPdo[01]=2610SYS1,  InTxPdo[02..FF]=Out[02..FF]
=============================================================================
```

Figure A3-7

Parameter	Description
Number of Modbus commands	Valid Range= 0 to 300 (Max.) (Default: 1)

Modbus Command (HEX)	PDO[Addr] (HEX)	Update Mode (HEX)	Special Code (HEX)	Description
01 0F 00 00 00 08 01 00	02	00	00	For more detailed information about the Modbus command, refer to Chapter 5 "Modbus Information" .

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Step 2 Connect the ECAT-2610 module to the Host PC.

❶ **Switch off** the power to the ECAT-2610 module.
❷ Connect the COM1 port on the ECAT-2610 module to the COM Port on the Host PC using the CA-0915 cable, as illustrated in the diagram below.

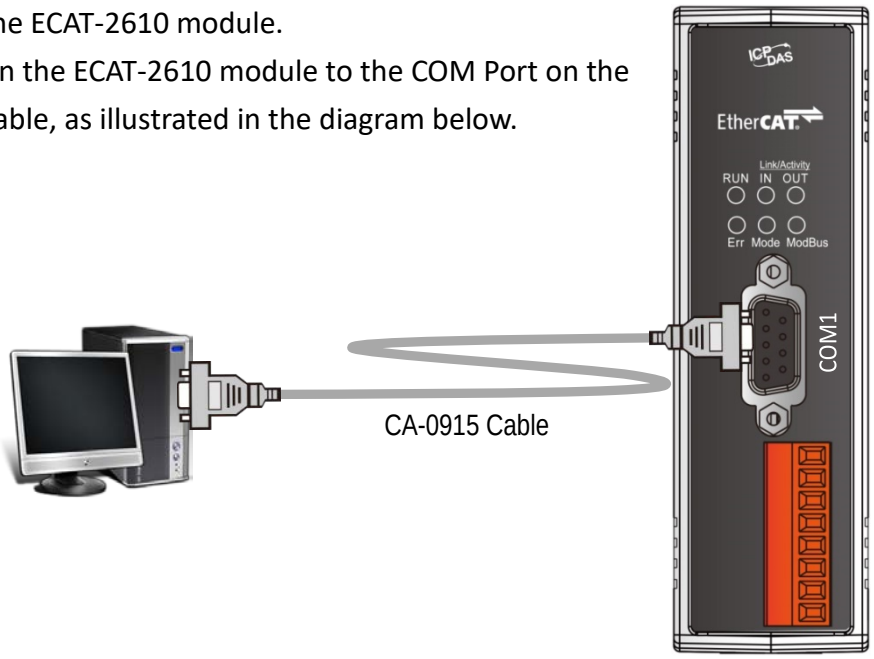

Figure A3-8

Step 3 Modify the COM Port number in execCOM1.bat file

Right-click the name of the **execCOM1.bat** file and select the **Edit** option from the context menu. Change the COM Port value and save the file under a new name. The exact value will depend on COM Port (e.g., COM4) on your Host PC that is used to connect to the ECAT-2610 module.

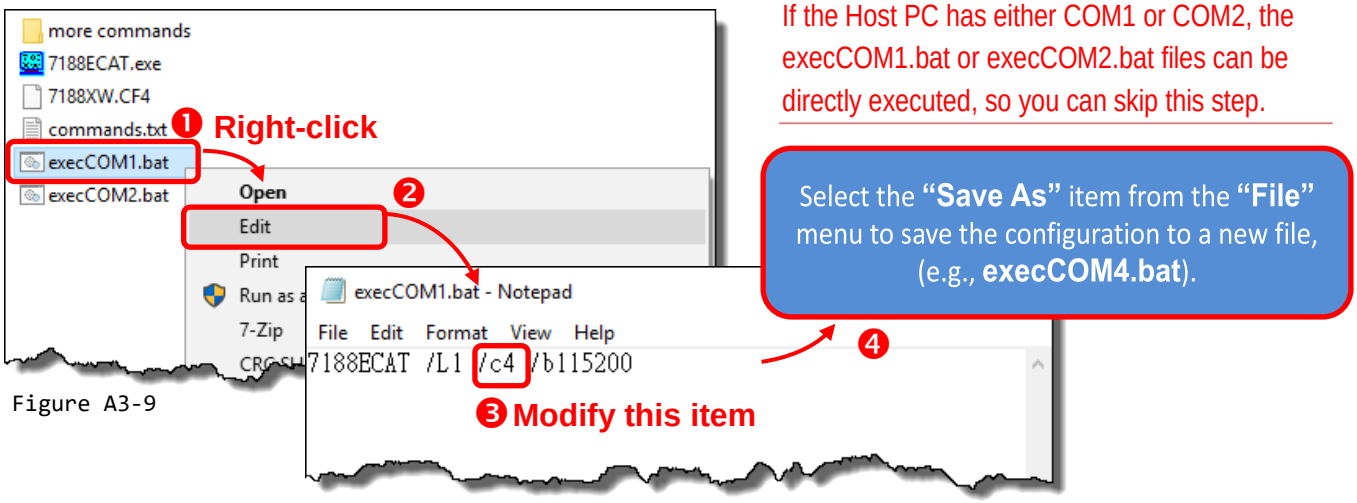

Figure A3-9

NOTE

If the Host PC has either COM1 or COM2, the execCOM1.bat or execCOM2.bat files can be directly executed, so you can skip this step.

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Step 4 Upload the Configuration Data (commands.txt) to the ECAT-2610 module.

❶ Here, the Windows XP is used as an example. Launch a Command Prompt window by clicking the Windows **Start** button and opening a Run dialog. Type **"cmd"** in the **Open** field and then press **Enter**.

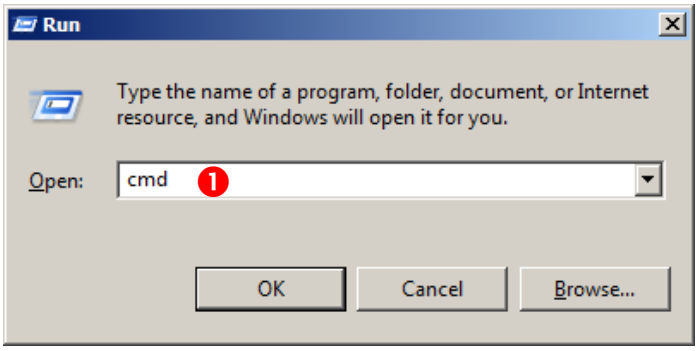

Figure A3-10

NOTE

Open a Command Prompt window method depends on the version of Windows being used.

❷ In the Command Prompt window, type **E:** (7188ECAT folder location on your hard drive, e.g., E) and then press **Enter**.

❸ Type **cd 7188ecat** and then press **Enter**.

❹ Type **execcom4** and then press **Enter** to automatically launch the **7188ECAT.exe** program.

NOTE

The execCOM1.bat and execCOM2.bat files are designed to use COM ports 1 and 2 on the Host PC when downloading data. If the default COM Ports on the PC is not set to 1 or 2, refer to **Figure A3-9** in Step 3 for details of how to modify the COM Port number.

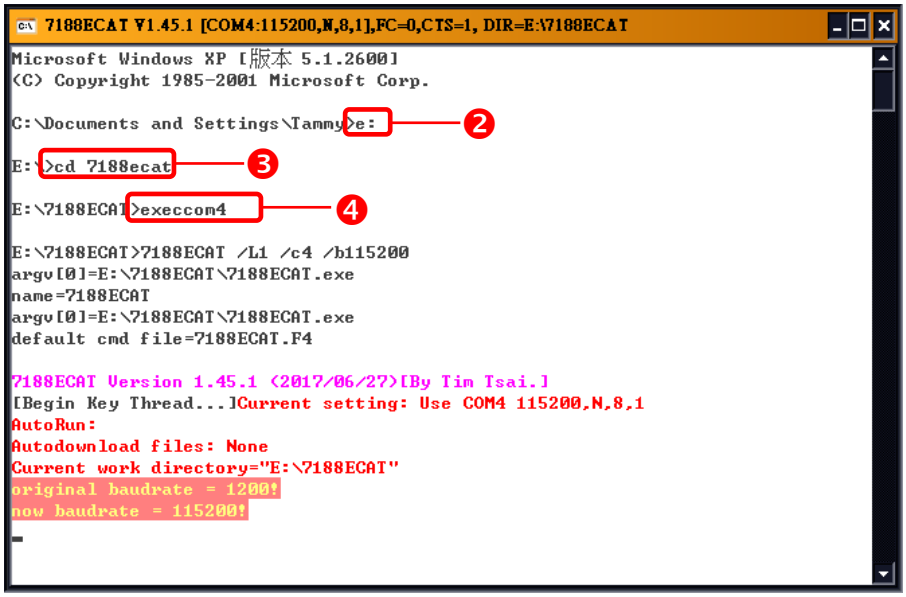

Figure A3-11

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❺ **Switch on** the power to the ECAT-2610 module.

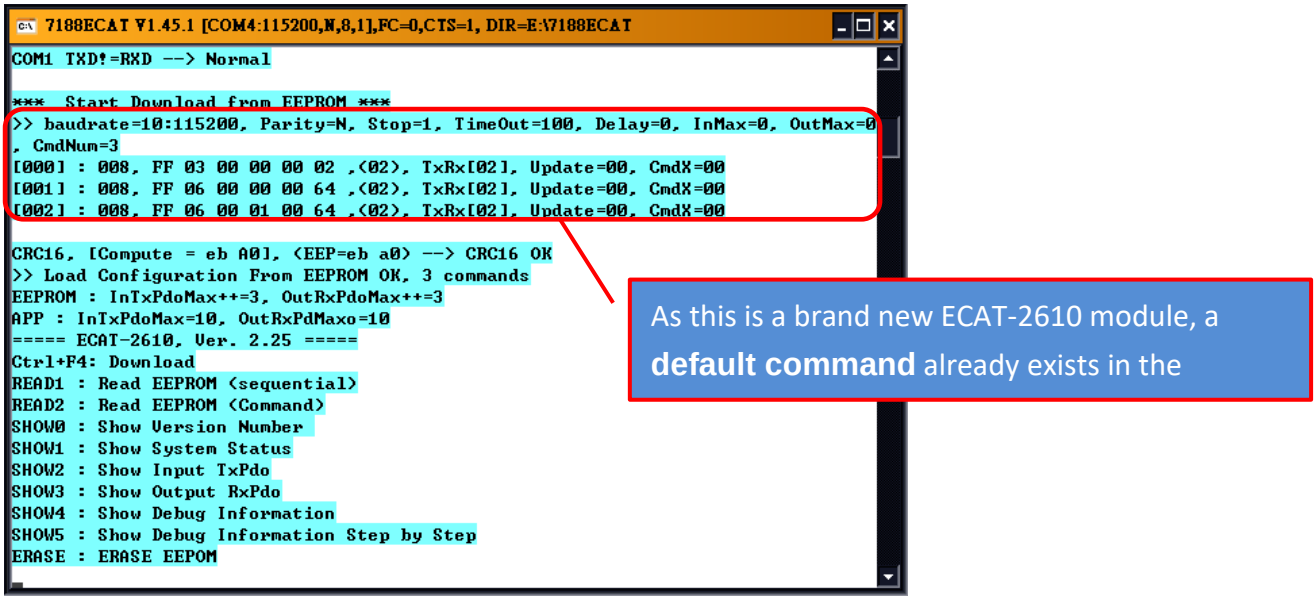

Figure A3-12

❻ Type **erase** and the press **Enter** to erase any files that currently exist in the EEPROM.

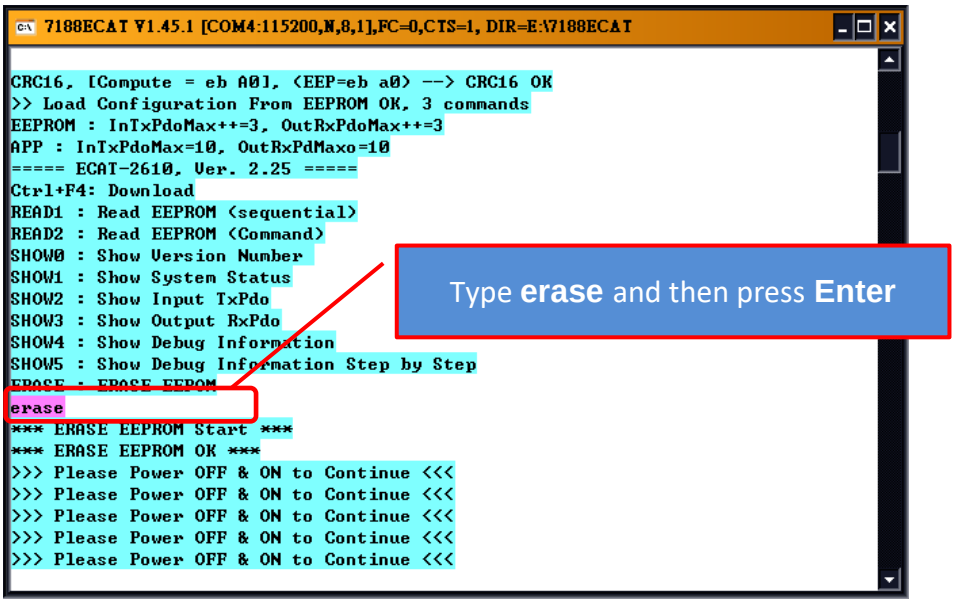

Figure A3-13

❼ **Switch off** the power to the ECAT-2610 module and then switch it back on again to reboot the module.

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❽ Simultaneously press **[Ctrl] and [F4] keys on the keyboard** to upload the **commands.txt** file to the ECAT-2610 module.

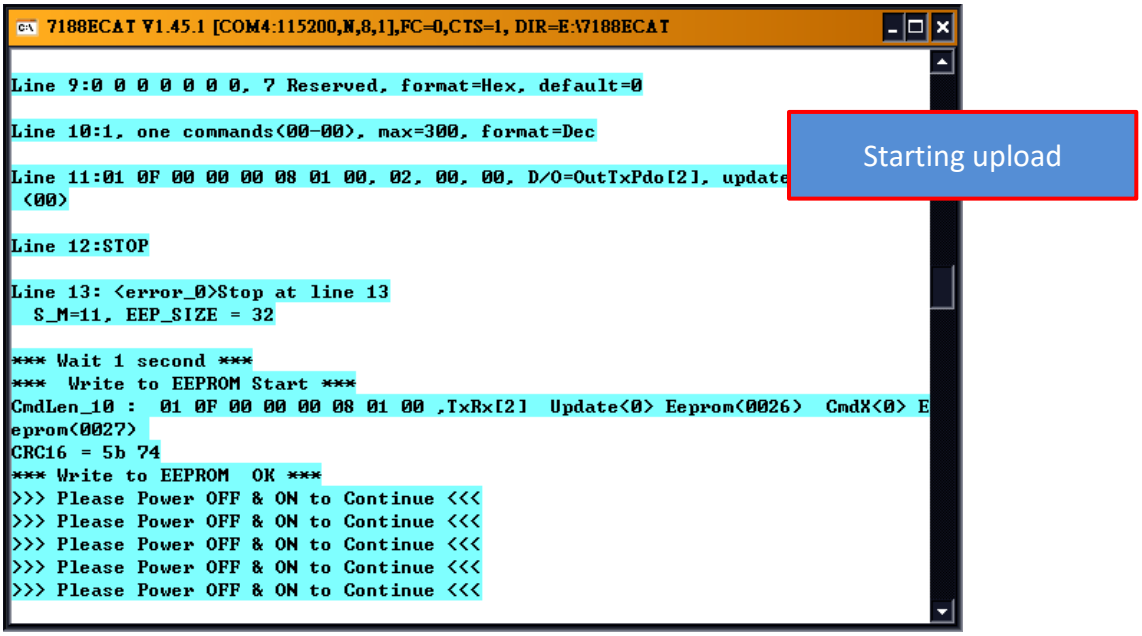

Figure A3-14

❾ **Switch off** the power to the ECAT-2610 module and then switch it back on again to reboot the module.

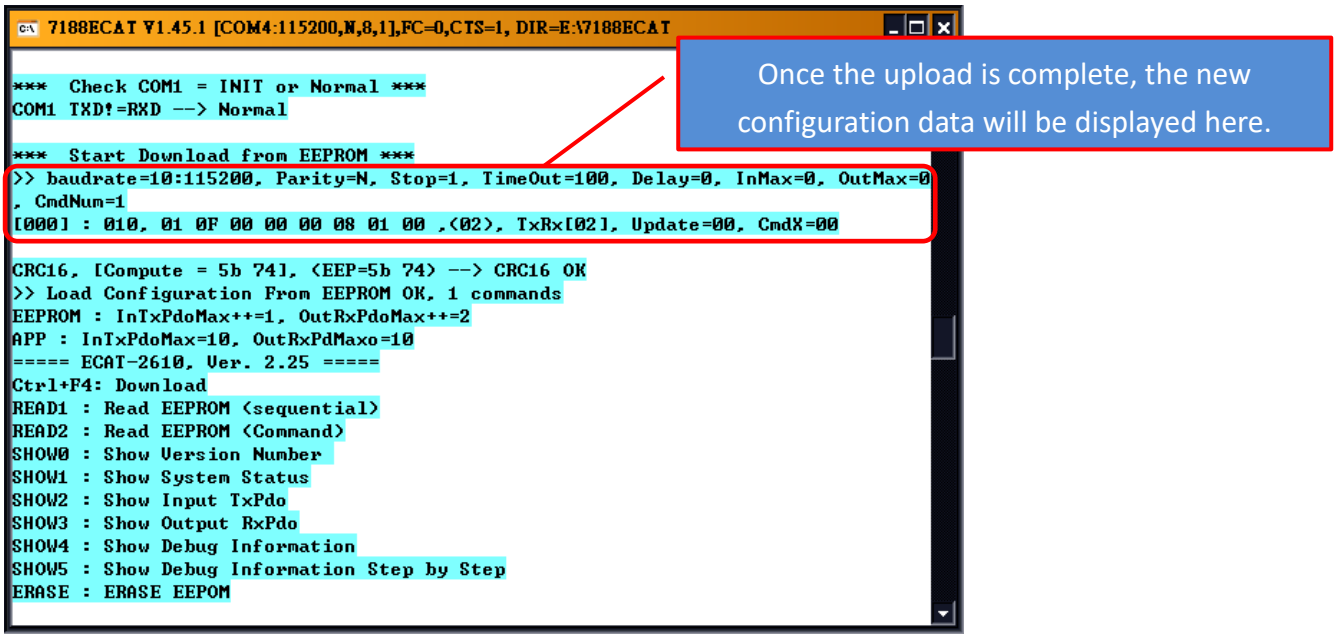

Figure A3-15

❿ Once the upload has been completed, click the ☒ icon in the right-top corner of the window to close it.

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NOTES

1. If there are any errors in the configuration data (commands.txt), the ECAT-2610 module will stop and wait until you reboot it (i.e., switch the power OFF and ON) before continuing, as illustrated in Figure A3-16.
Please check the configuration data (commands.txt) to correctly configure the parameters, and then upload the configuration data (commands.txt) to the ECAT-2610 module again.

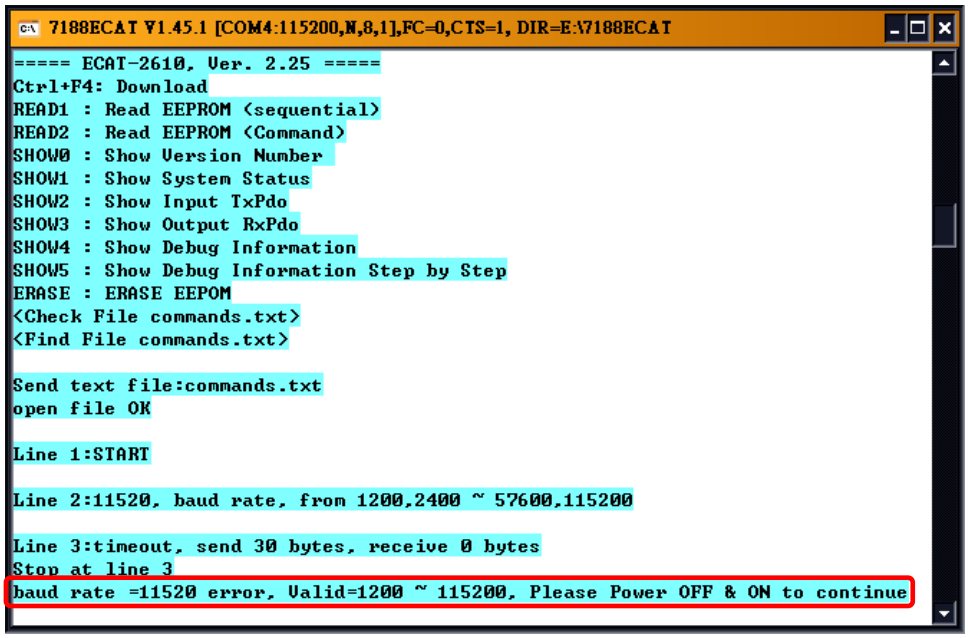

Figure A3-16

2. The EEPROM is designed to store data that is not changed frequently. It is not suitable for frequent access a large amount of data, and the erase/write cycle is limited, so it should not be changed frequently when testing that it will easily cause damage to the module.

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A4. Manually Configure and Upload for ECAT-2611

This chapter provides a simple overview of default configuration data file (commands.txt) format, and use the following procedure to modify the configuration data (commands.txt) then use the configuration/Diagnostic Utility (7188ECAT.exe) to upload configuration data (commands.txt) to ECAT-2611 module:

Step 1 Edit the configuration data.

❶ Double-click the **"commands.txt"** configuration file to open it.

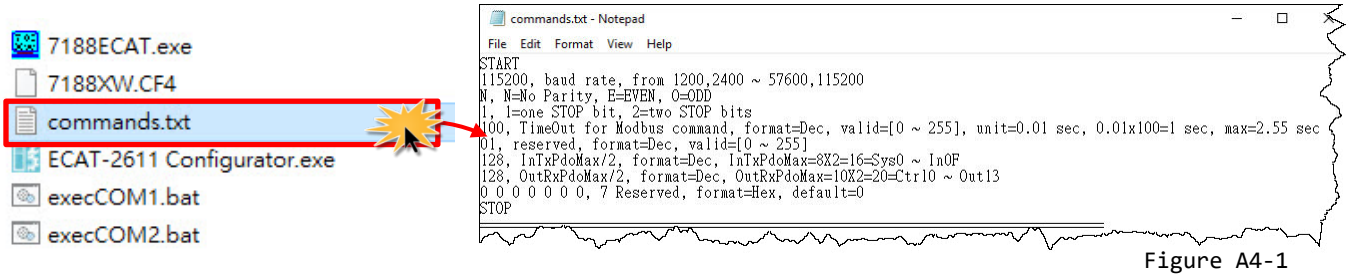

Figure A4-1

The "**commands.txt**" file provides a simple command setting of ECAT-2611, including the Net ID, the Baud Rate and the Data Format, etc. A syntax rule consists of a left to right sequence of instructions, separated by a comma **","**. The data format of the **commands.txt** file, will be described in more detail below.

➢ The settings contained in the **default commands.txt file** are illustrated below:

Red Block: The parameter settings area.

Green Block: The parameter description area.

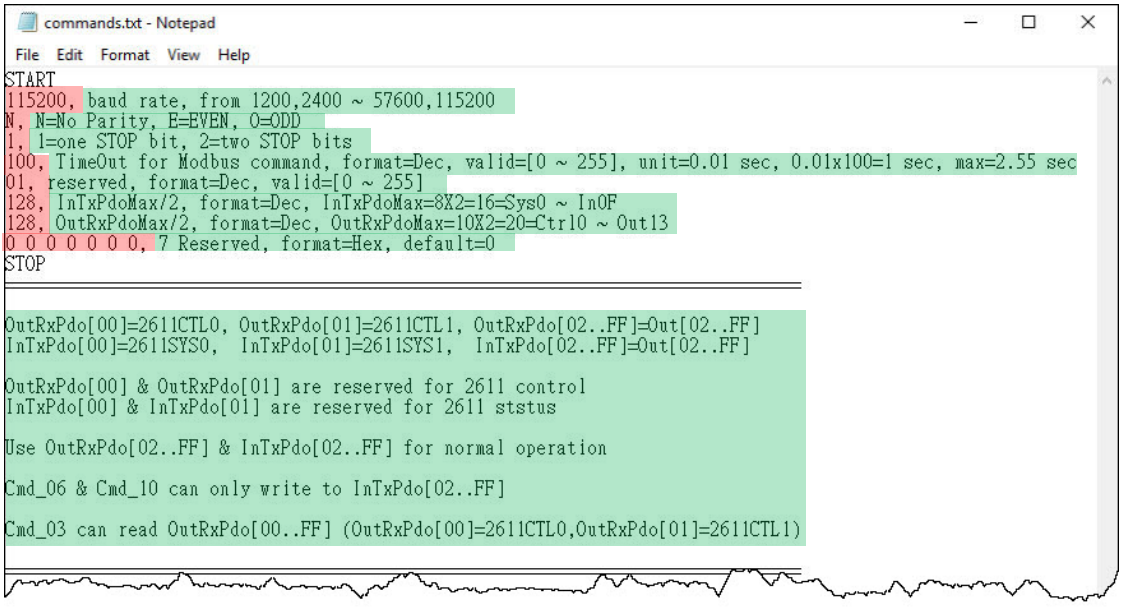

Figure A4-2

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❷ Set the **Baud Rate, Parity and Stop Bit** values.

Parameter	Description
Baud Rate	Valid values: 1200/2400/4800/9600/19200/38400/57600/115200 bps. (Default: 115200)
Parity	Valid values: N (None), E (EVEN), O (ODD). (Default: N)
Stop Bits	Valid values: 1, 2. (Default: 1)

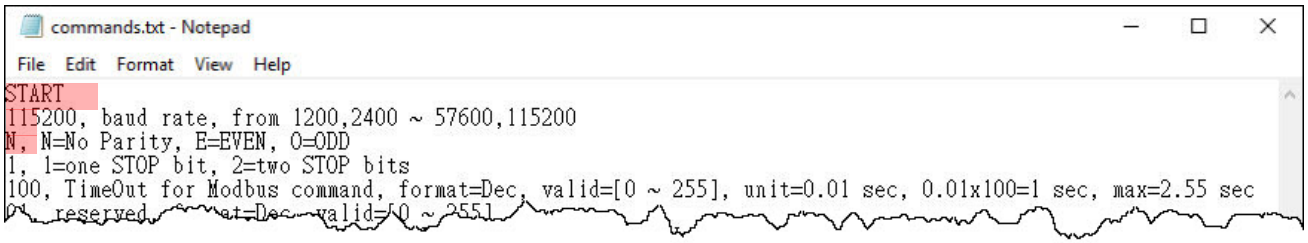

Figure A4-3

❸ Set the **timeout, Net ID, InTxPdoMax/2 and OutRxPdoMax/2** values.

Parameter	Description
Timeout	Set the timeout of the Modbus command (Default [DEC]: 100). Valid Range [DEC]: 0 to 255. Unit = 0.01 second, 0.01 x 100 = 1 second, Max. = 2.55 second.
Net ID	Set the Net ID (Default [DEC]: 1). Valid Range [DEC]: 0 to 255.
IntxPdoMax/2	InTxPdoMax = 8 X 2 = 16 = Sys0 ~ In0F (Default [DEC]: 128).
OutRxPdoMax/2	OutRxPdoMax = 10 X 2 = 20 =Ctrl0 ~ Out13 (Default [DEC]: 128).
7 Reserved	These parameters are reserved and have no function. (Default[Hex]: 0 0 0 0 0 0 0)

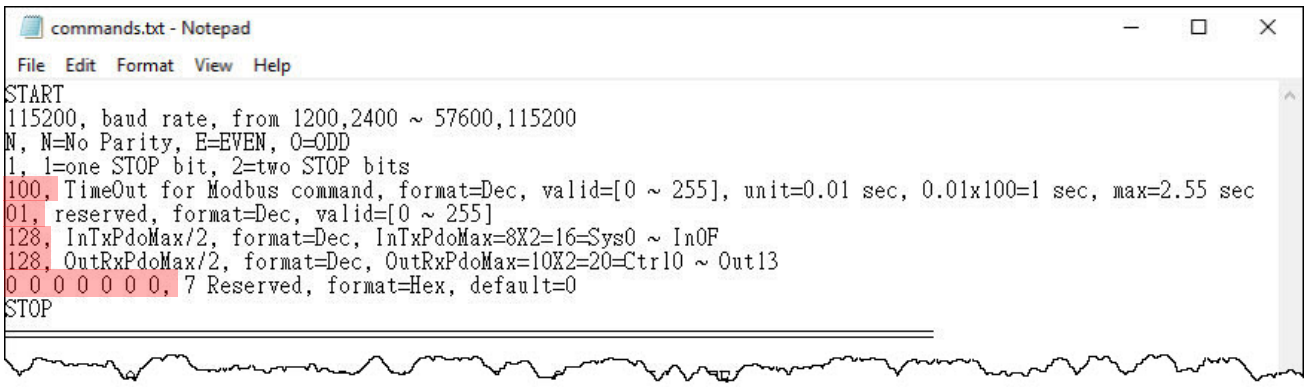

Figure A4-4

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Step 2 Connect the ECAT-2611 module to the Host PC.

❶ **Switch off** the power to the ECAT-2611 module.
❷ Connect the COM1 port on the ECAT-2611 module to the COM Port on the Host PC using the CA-0915 cable, as illustrated in the diagram below.

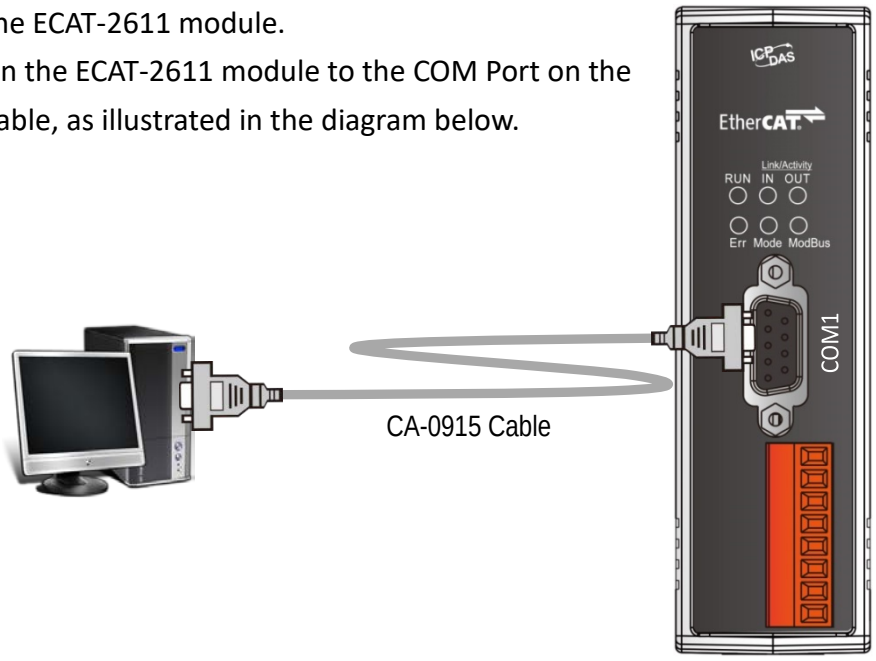

Figure A4-5

Step 3 Modify the COM Port number in execCOM1.bat file

Right-click the name of the **execCOM1.bat** file and select the **Edit** option from the context menu. Change the COM Port value and save the file under a new name. The exact value will depend on COM Port (e.g., COM4) on your Host PC that is used to connect to the ECAT-2611 module.

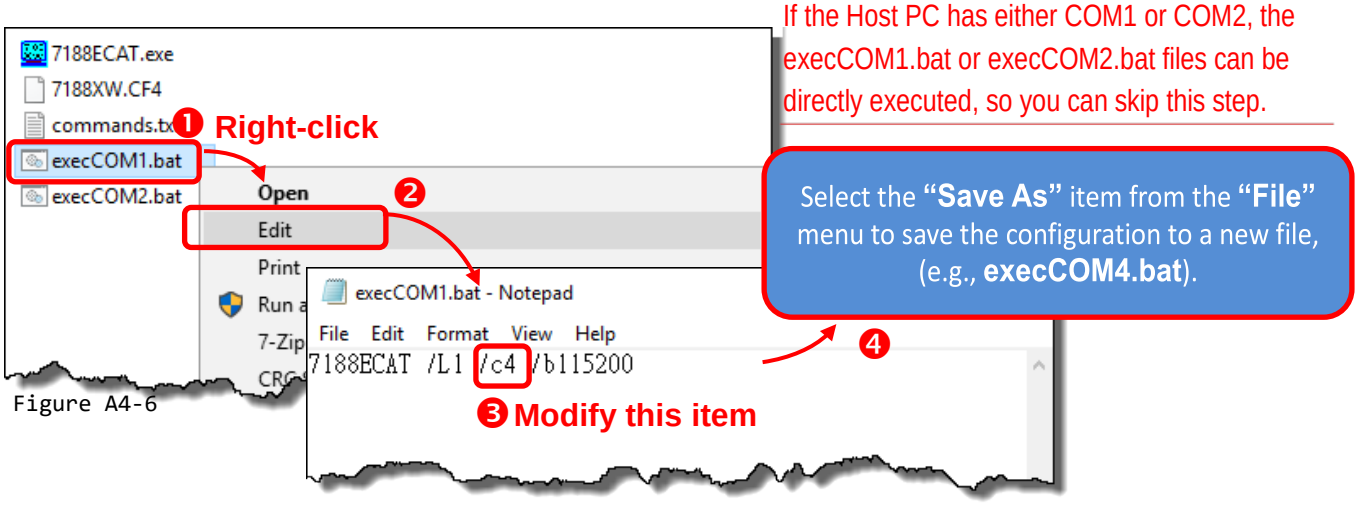

Figure A4-6

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Step 4 Upload the Configuration Data (commands.txt) to the ECAT-2611 module.

❶ Here, the Windows XP is used as an example. Launch a Command Prompt window by clicking the Windows **Start** button and opening a Run dialog. Type **"cmd"** in the **Open** field and then press **Enter**.

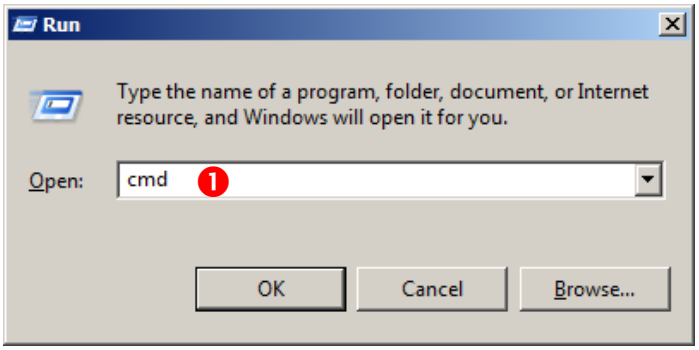

Figure A4-7

NOTE

Open a Command Prompt window method depends on the version of Windows being used.

❷ In the Command Prompt window, type **E:** (7188ECAT folder location on your hard drive, e.g., E) and then press **Enter**.

❸ Type **cd 7188ecat** and then press **Enter**.

❹ Type **execcom4** and then press **Enter** to automatically launch the **7188ECAT.exe** program.

NOTE

The execCOM1.bat and execCOM2.bat files are designed to use COM ports 1 and 2 on the Host PC when downloading data. If the default COM Ports on the PC is not set to 1 or 2, refer to **Figure A4-6** in Step 3 for details of how to modify the COM Port number.

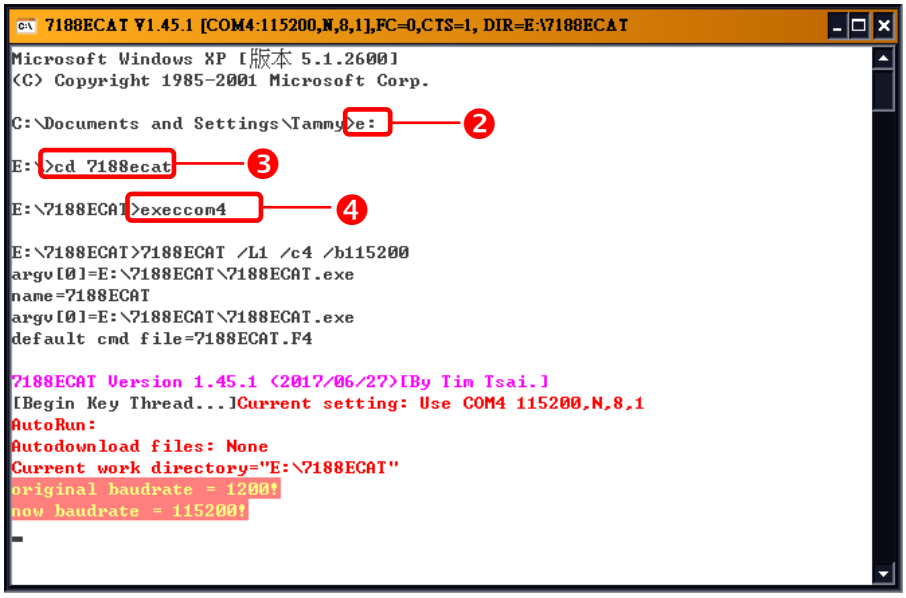

Figure A4-8

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❺ **Switch on** the power to the ECAT-2611 module.

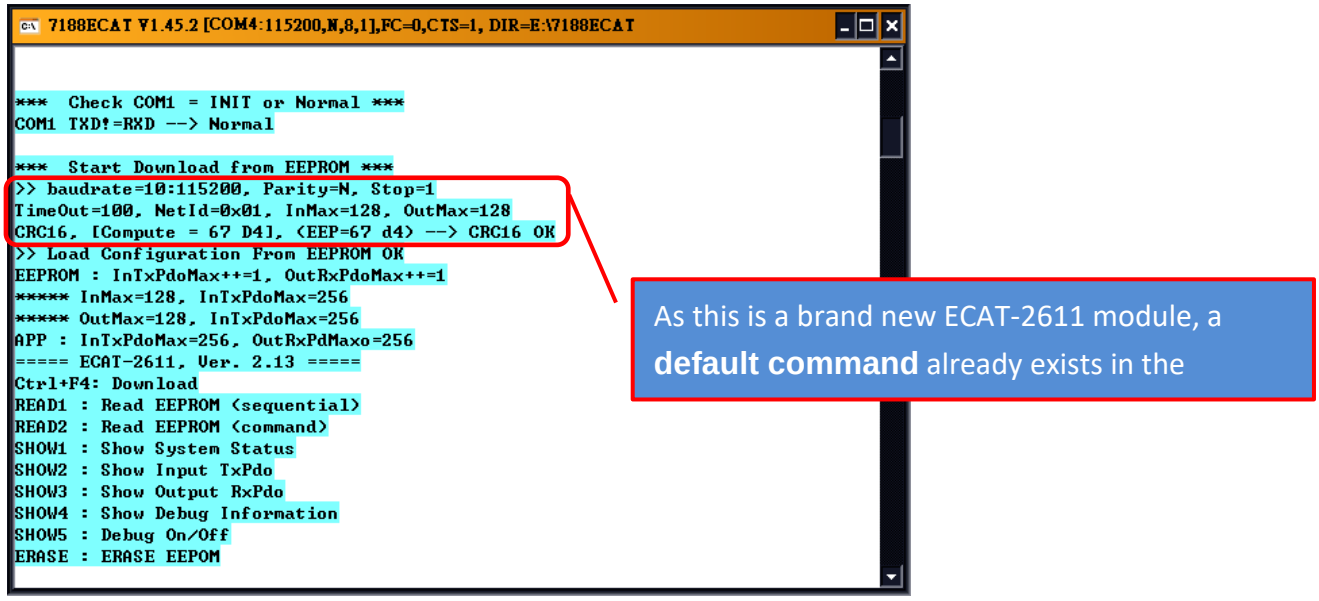

Figure A4-9

❻ Type **erase** and the press **Enter** to erase any files that currently exist in the EEPROM.

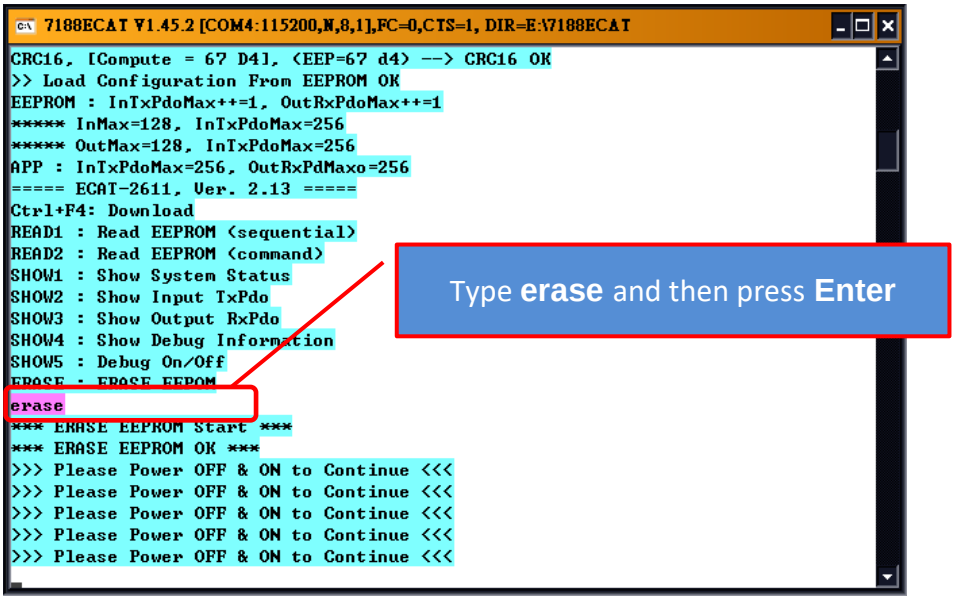

Figure A4-10

❼ **Switch off** the power to the ECAT-2611 module and then switch it back on again to reboot the module.

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❽ Simultaneously press **[Ctrl] and [F4] keys on the keyboard** to upload the **commands.txt** file to the ECAT-2611 module.

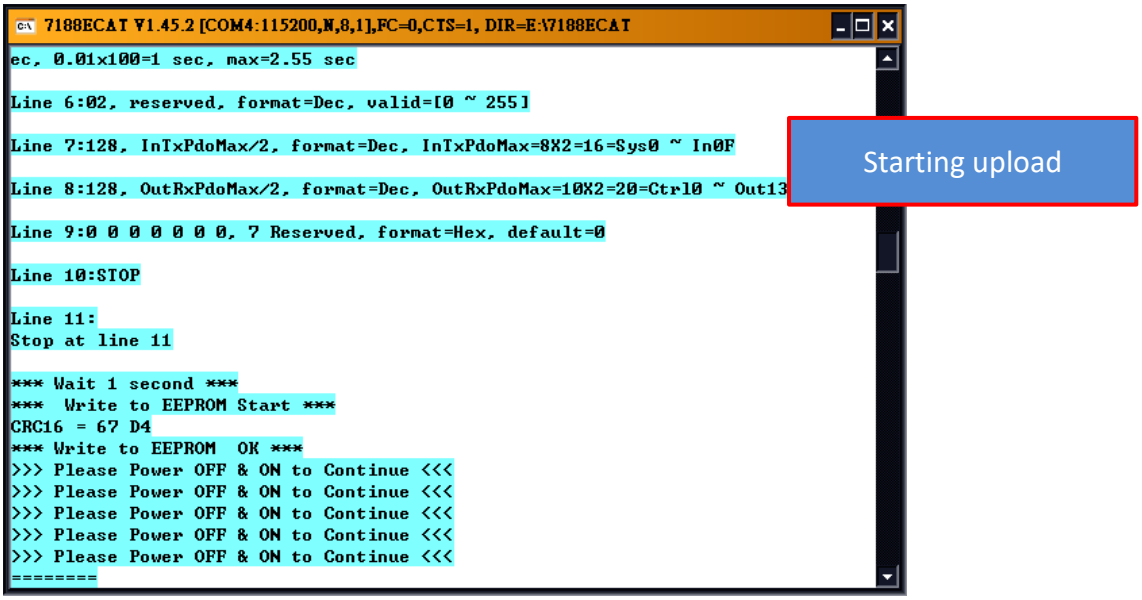

Figure A4-11

❾ **Switch off** the power to the ECAT-2611 module and then switch it back on again to reboot the module.

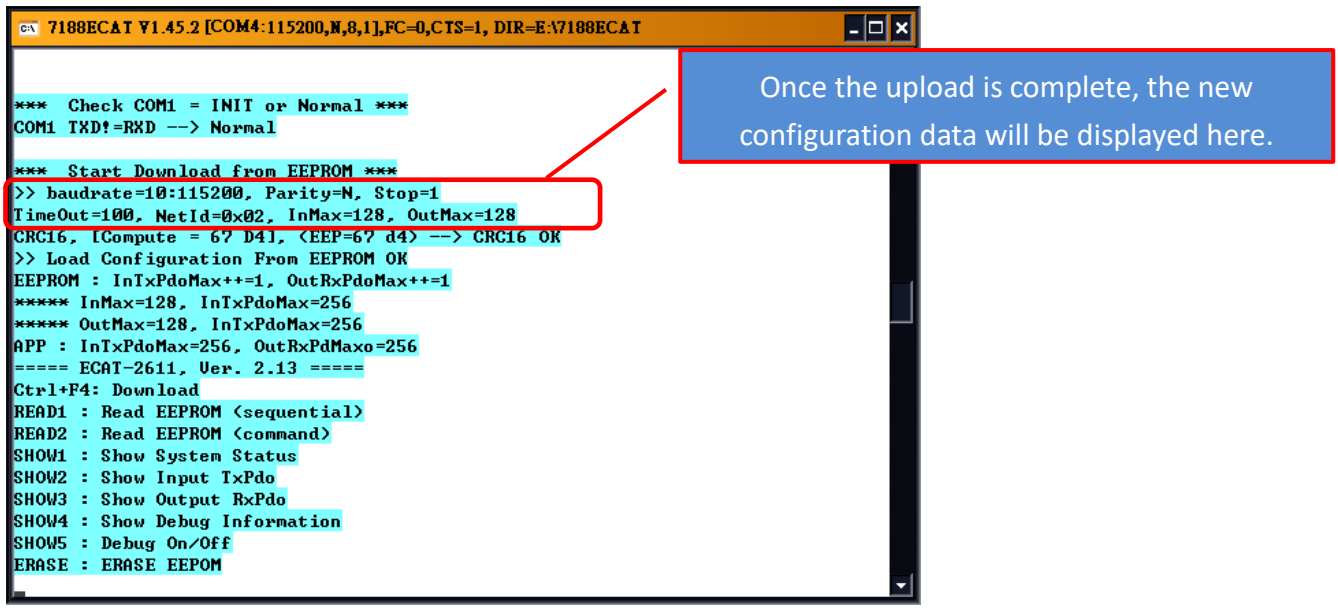

Figure A4-12

❿ Once the upload has been completed, click the ☒ icon in the right-top corner of the window to close it.

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NOTES

1. If there are any errors in the configuration data (commands.txt), the ECAT-2611 module will stop and wait until you reboot it (i.e., switch the power OFF and ON) before continuing, as illustrated in Figure A4-13.
Please check the configuration data (commands.txt) to correctly configure the parameters, and then upload the configuration data (commands.txt) to the ECAT-2611 module again.

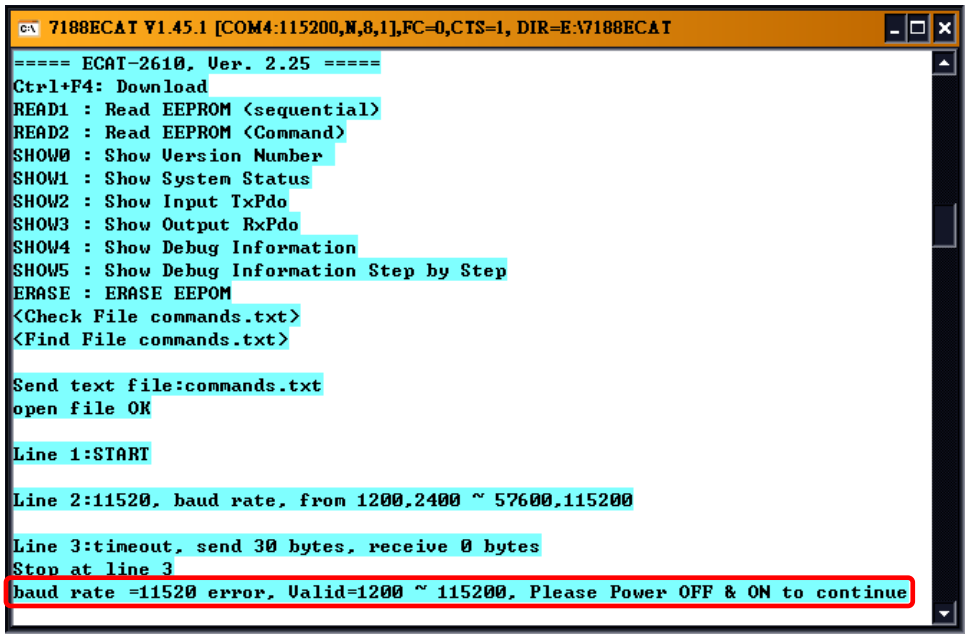

Figure A4-13

2. The EEPROM is designed to store data that is not changed frequently. It is not suitable for frequent access a large amount of data, and the erase/write cycle is limited, so it should not be changed frequently when testing that it will easily cause damage to the module.

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A5. Integration with ICP DAS Modbus RTU Products

The following is a summary of the ICP DAS Modbus RTU slave devices that can be used in conjunction with the ECAT-2610 module.

Model	Description
 M-7000 Series	RS-485 Remote I/O Modules Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/i-7000_m-7000/i-7000_m-7000_selection.html
 M-2000 Series	RS-485 Remote I/O Modules Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/m-2000/m-2000_selection.html
 tM Series	RS-485 Remote I/O Modules Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/tm-series/tm-series_selection.html
 LC Series	Lighting Control Modules Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/lighting_control/lighting_control_selection.html
 SC Series	Lighting/Smart Control Modules Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/smart_control/smart_control_selection.html
 DL Series	Temperature and Humidity Data Logger Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/dl_series/dl_selection.html
 CL Series	PM2.5/CO/CO2/Temperature/Humidity/Dew Point Data Logger Website:http://www.icpdas.com/root/product/solutions/remote_io/rs-485/cl_series/cl_selection.html
 ZT Series	ZigBee I/O Module Website:http://www.icpdas.com/root/product/solutions/industrial_wireless_communication/wireless_solutions/wireless_selection.html#e

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A.6. Revision History

The following information relates to the revision history of this document.

Revision	Date	Description
B1.0	Oct. 2017	First Version: 8-bit version
B1.0	Mar. 2018	Second version: 16-bit version
1.1	May 2018	Initial release
1.2	Aug.2018	1. Modify the Section 4.2 use the ECAT-2610 Configuator.exe to set and upload a configuration file to ECAT-2610. 2. Added the Section 4.2.1 Restore to Factory Defaults Settings 3. Added the examples for 16.Rs485_Cycle_Time and 17.Ext_Sync
1.3	Nov. 2018	Modify the value of 2610SYS1 in the Section 3.3 Configuration and Operation.
1.4	Jan. 2019	Added the product information of ECAT-2611.

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