

ELCO

ABSOLUTE ROTARY ENCODER

ETHERCAT



----User Manual



TIANJIN ELCO AUTOMATION CO., LTD.

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Version 1.0



Preface

1. Scope of application of this manual

It's for ELCO multi-turn encoder products with EtherCAT protocol.

From the information in the manual, you can connect the controller in EtherCAT mode to run multi-turn encoder products on the EtherCAT bus.

2. Basic knowledge required:

This manual assumes that you have a basic knowledge of electrical and automation engineering.

This manual describes each component based on valid data at the time of release. New components and parameter adjustments are updated in the new manual.

3. Guide:

This manual describes the hardware and use of multi-turn encoders under the EtherCAT protocol.

Coverage includes:

- Installation and wiring
- Technical characteristics
- Using examples
- Technical parameters

4. Technical support:

This manual describes the product characteristics and usage of multi-turn encoders as comprehensively as possible. If you have any questions or other questions regarding this product, please contact local ELCO office or call the service hotline 400-608-4005.

You can also visit the ELCO website to learn more about automation products.

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5. Liability exemption:

We have checked the consistency of the contents in the manual with the hardware and software. However, the possibility of deviation is not excluded, and the contents cannot be guaranteed to be completely consistent with the hardware and software. The data parameters have been tested as required, and the necessary modifications will be improved in the new version.

6. Copyright notice

EtherCAT® is a registered trademark and patented technology, authorized by Beckhoff Automation GmbH, Germany.

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1. Product overview

1.1 Introduction

The EtherCAT multi-turn encoder uses high-speed EtherCAT as the interface communication bus. The application of high-speed EtherCAT provides higher real-time performance than traditional field buses and implements the complete EtherCAT communication protocol, fully supporting EtherCAT master stations.

1.2 Product Introduction

The EtherCAT multi-turn encoder provides functions including real-time position, real-time speed, direction setting, single-turn resolution setting, total range setting, and preset value setting.

1.3 Features

- LED and screen status indicators, with online diagnostics and channel protection functions.
- Configurable parameters such as rotation direction, single-turn resolution, and total range.

1.4 Product Model







EAM58C10-BF6XTR-4096/8192ECND

2. Technical characteristics

2.1 Interface Description

This picture is a schematic diagram of EtherCAT multiturn encoder.

TERMINAL ASSIGNMENT

Function	M12 connector						
Bus Port 1	Signal	Transmit data+	Receive data+	Transmit data-	Receive data-		
	Abbreviation	TxD+	RxD+	TxD-	RxD-		
	Pin number	1	2	3	4		
Power Supply	Signal	Voltage+	-	Voltage-	-		
	Abbreviation	+V	-	0 V	-		
	Pin number	1	2	3	4		
Bus Port 2	Signal	Transmit data+	Receive data+	Transmit data-	Receive data-		
	Abbreviation	TxD+	RxD+	TxD-	RxD-		
	Pin number	1	2	3	4		

EtherCAT multi-turn encoder uses high-speed Ethernet as the interface communication bus, the application of high-speed Ethernet makes the encoder in the work to provide higher real-time than the traditional fieldbus, and implements the complete EtherCAT communication protocol, which can fully support the EtherCAT master station.

EtherCAT multi-turn encoder provides functions including DC clock, real-time position, real-time speed, direction setting, single-turn resolution setting, total resolution setting, and preset value setting.

2.2 Hardware parameters

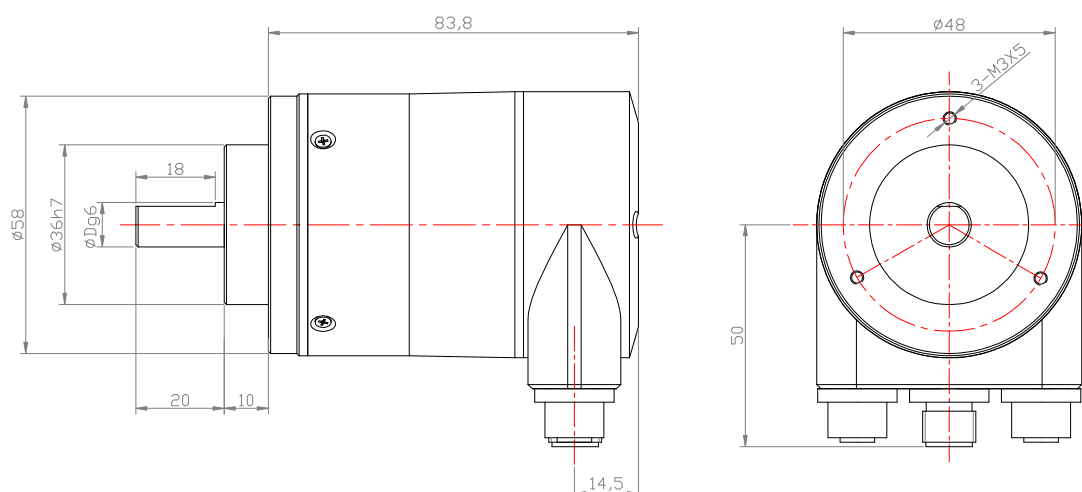
Power input	+24 V DC
Input voltage	10 ... 30 V DC
Operating temperature	-40 ... 80 °C
Storage temperature	-45 ... 85 °C
Vibration resistance	10 g, 10 ... 2000 Hz
Impact resistance	50 g, 11 ms
Shaft load	80 N Axial / 160 N Radial
Protection class	IP65
Bearing life	10 ⁹ turns

2.3 LED indication function

Indicator name	Indicator status	Indicator meaning	Fault analysis
L/A	Off	Not connected to the network	1. Network cable failure 2. Gateway damage
Power	Off	No power supply	1. Power supply cable failure 2. Gateway damage
	Green	Normal power supply	
ERR	Off	No communication error	
	Red	No communication connection established	1. Network cable failure 2. Configuration error
RUN	Off	EtherCAT-Init status	
	Flash	EtherCAT-Preop status	
	Flash slowly	EtherCAT-Safeop status	
	Light	EtherCAT-Op status	

3. Installation dimension

3.1 dimension drawing



4. 4. Using examples

4.1 Install the encoder ESI file

The EtherCAT encoder is configured using an ESI file (XML format), which is used to integrate the encoder into the system as a standard EtherCAT IO. You can visit the ELCO website to get the latest ESI documents or call the customer service hotline to contact the technicians.

The integration of ESI files into the system depends on the configuration

software used. Using Beckhoff's TwinCAT programming software for EtherCAT as an example, follow these steps to add ESI files:

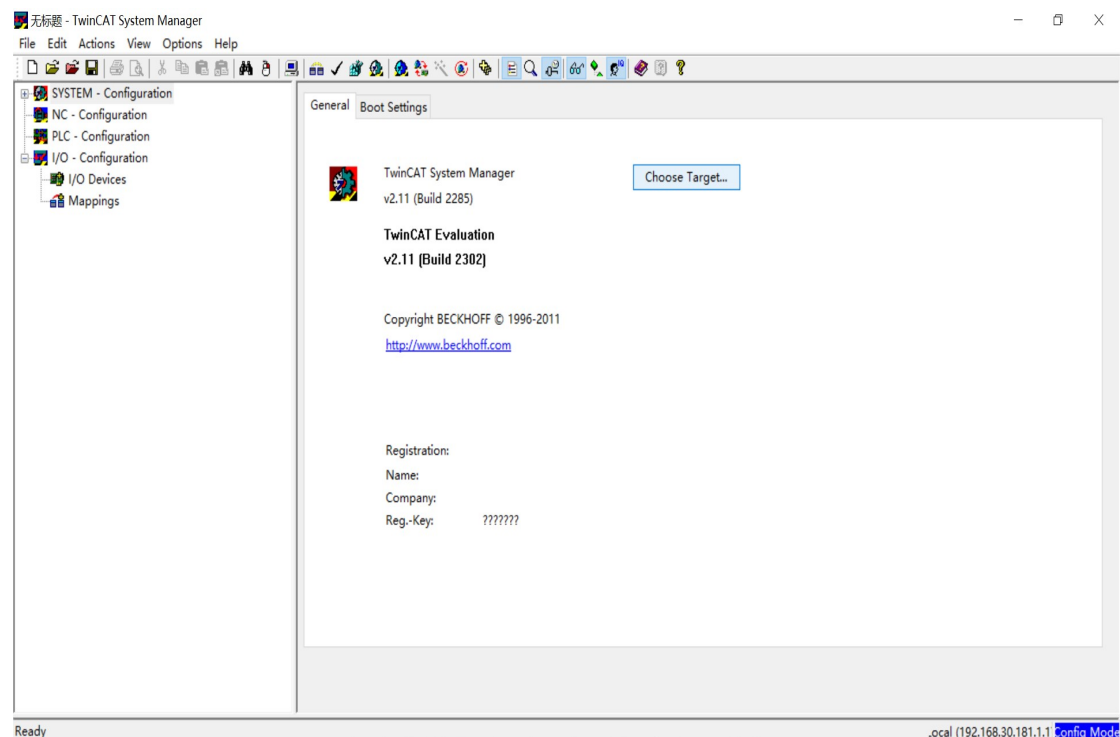
Install TwinCAT, and then copy the encoder xml file (later called xml file) into the following installation directory: C:\TwinCAT\Io\EtherCAT\

4.2 New project

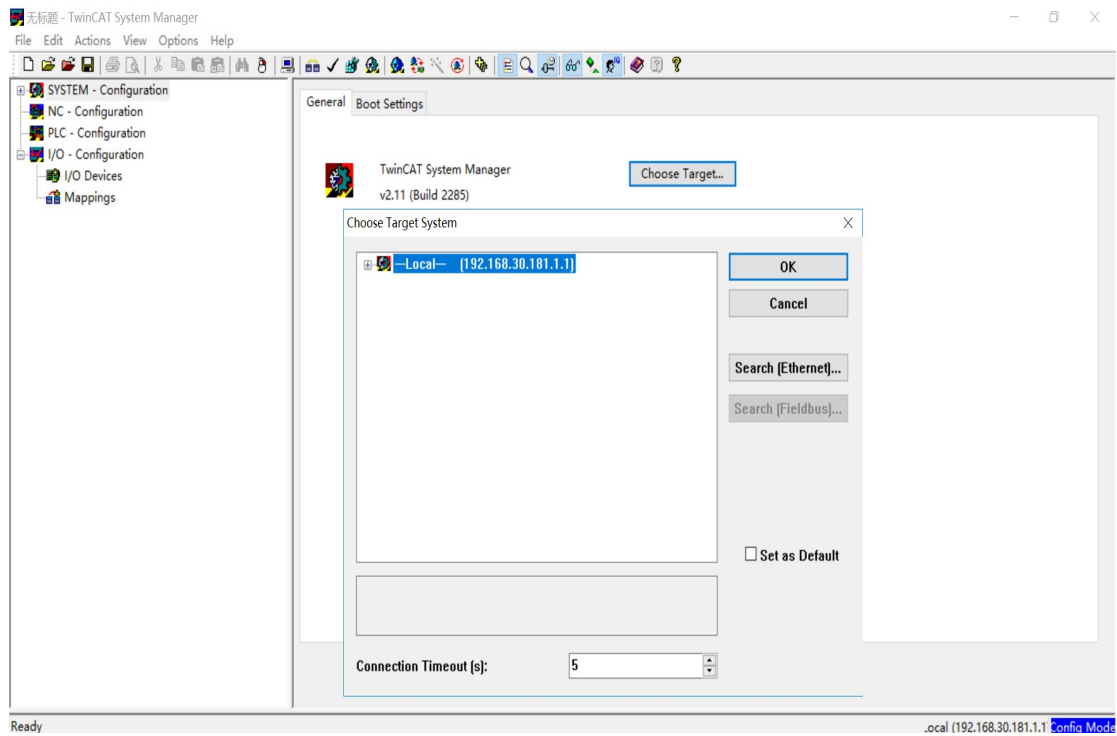
This section uses a new project to show the actual operation flow of the configuration connection, so that users can fully understand the actual use of EtherCAT encoder. This example uses ELCO's EtherCAT encoder as the EtherCAT slave station to connect Beckhoff's TwinCat. By default, TwinCAT has been installed, required network adapter information has been configured, ESI files have been installed, and all power supplies and bus connections have been completed. For details about the operation procedure, see the TwinCat user Guide and previous chapters.

We use pictures to show the specific software configuration debugging process.

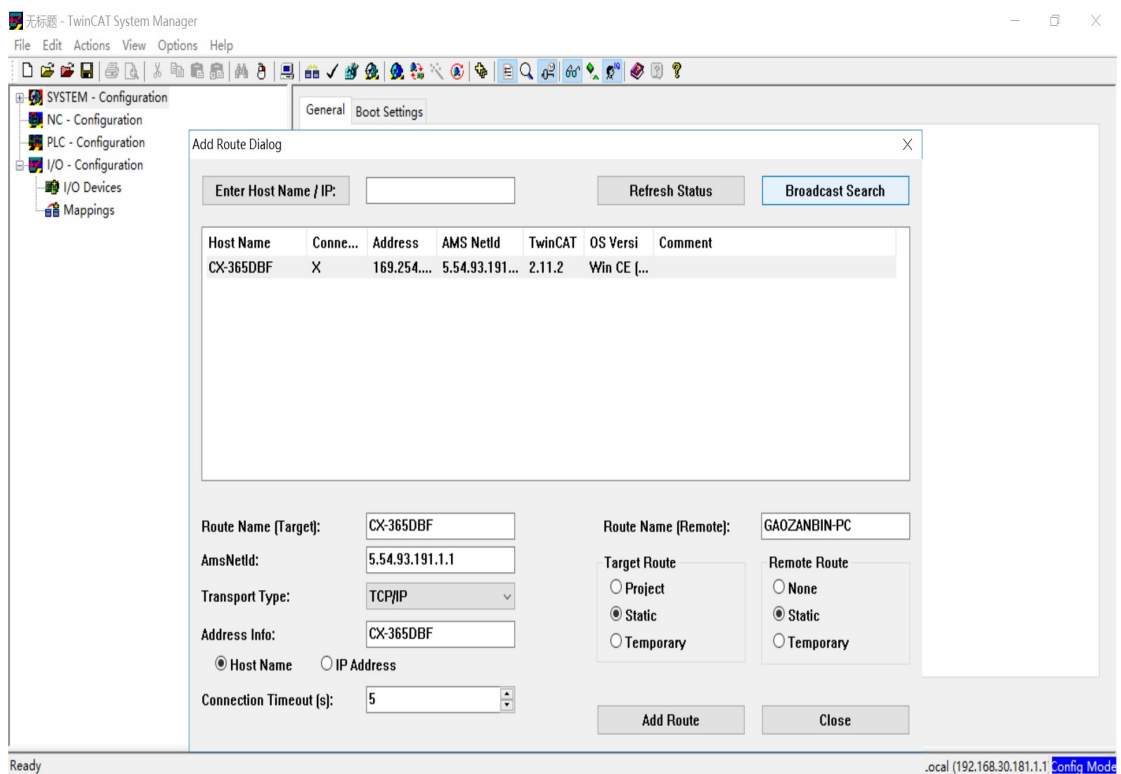
1) New project:



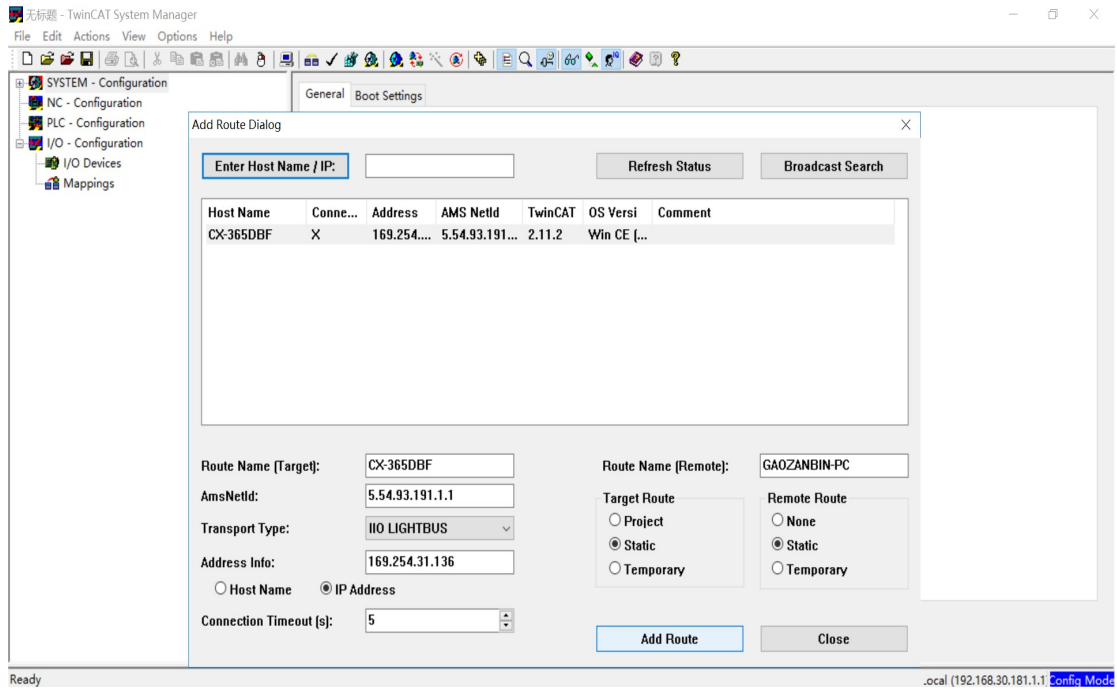
2) Click "Choose Target"



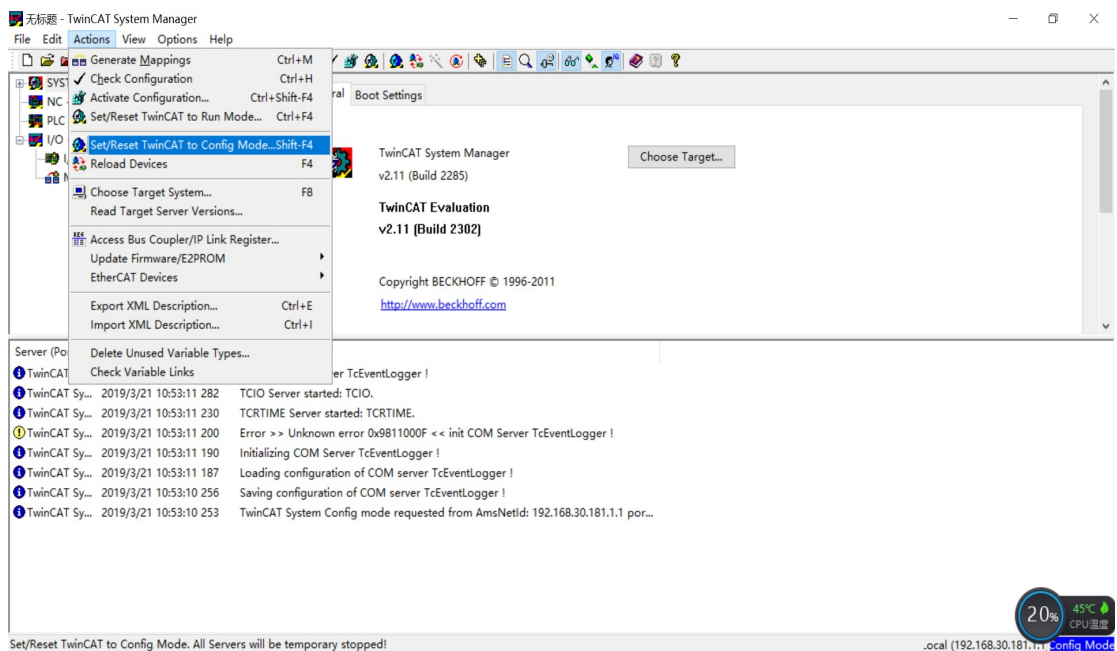
3) Click "Broadcast search"



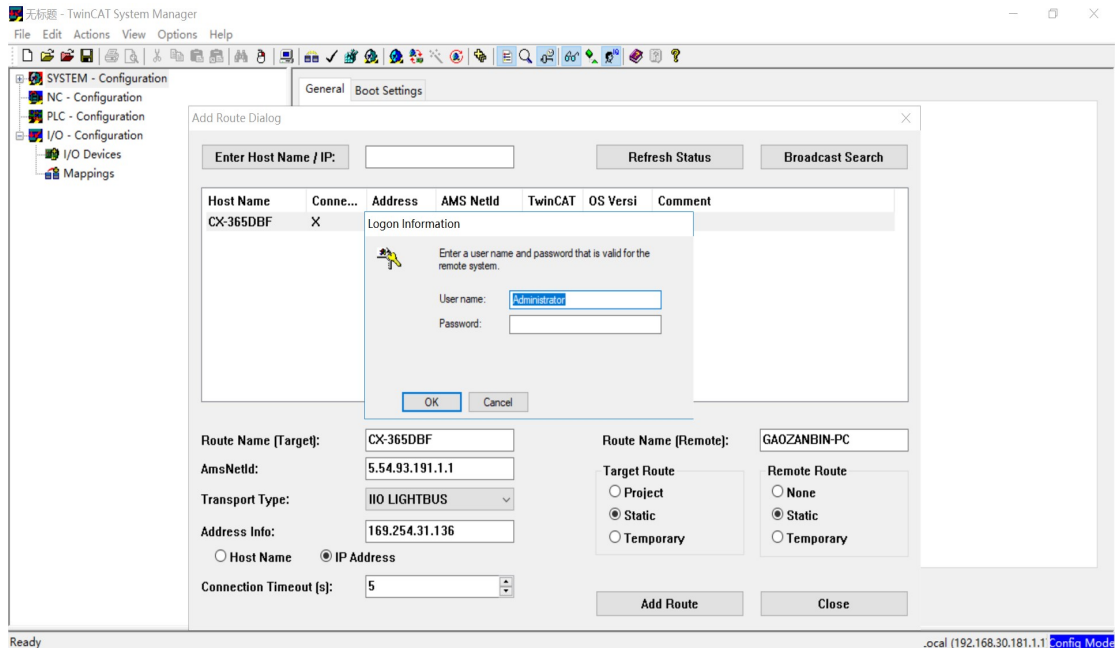
4) Click the scanned route and click "add route".



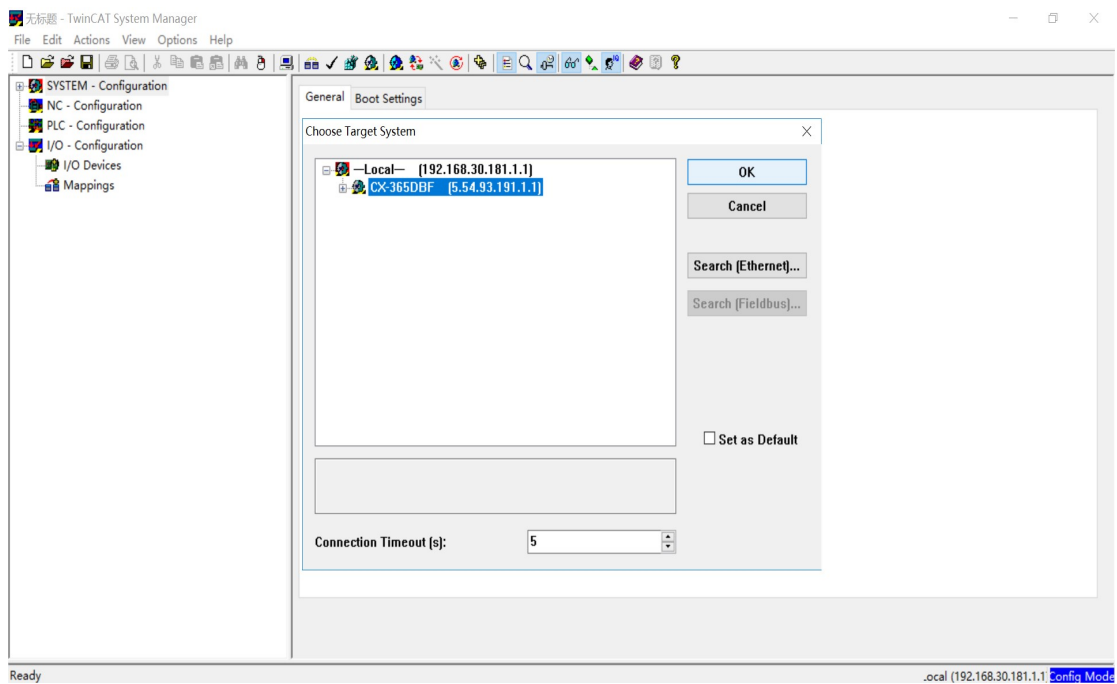
Note: If the PLC cannot be scanned by the above method, you can click the Actions menu (set/reset TwinCAT to Config Mode) and search again.



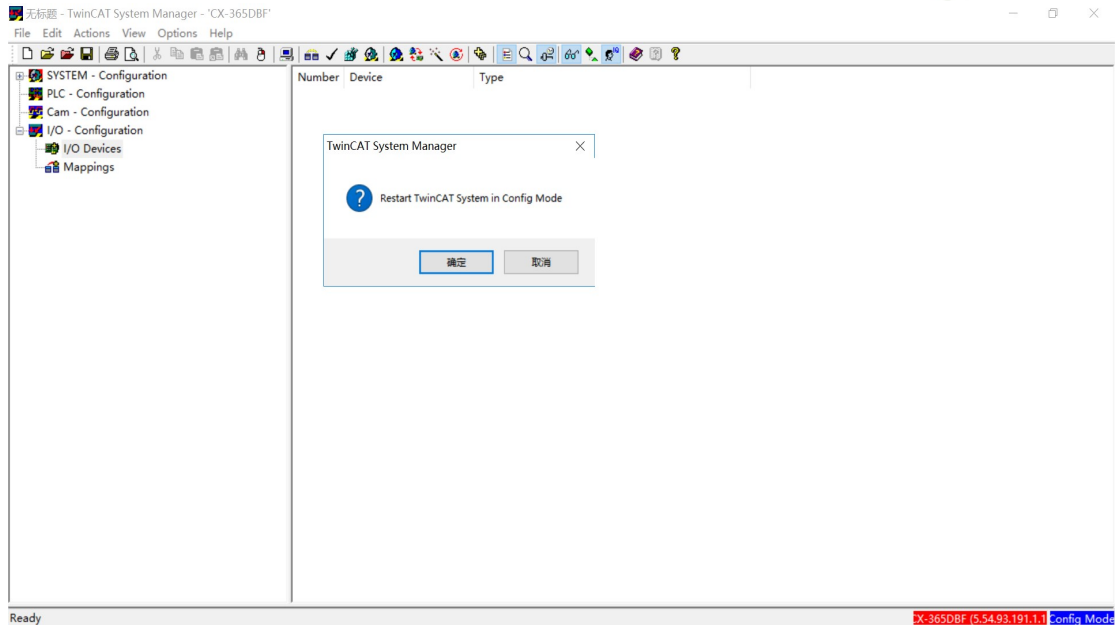
5) Click "OK" (no need to fill in the password)



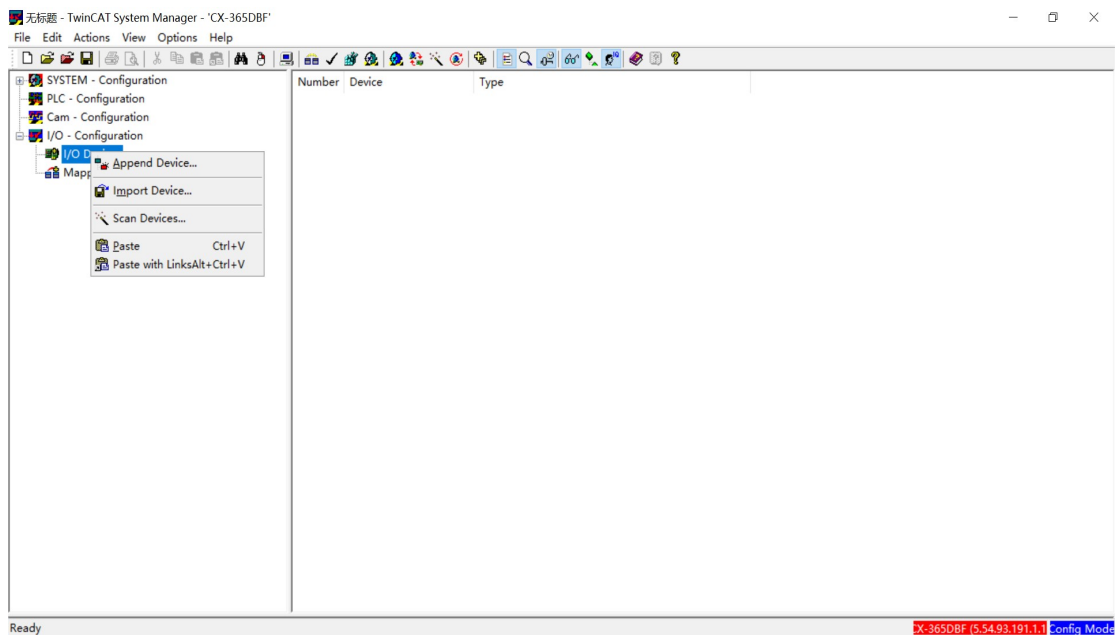
6) Click "OK"



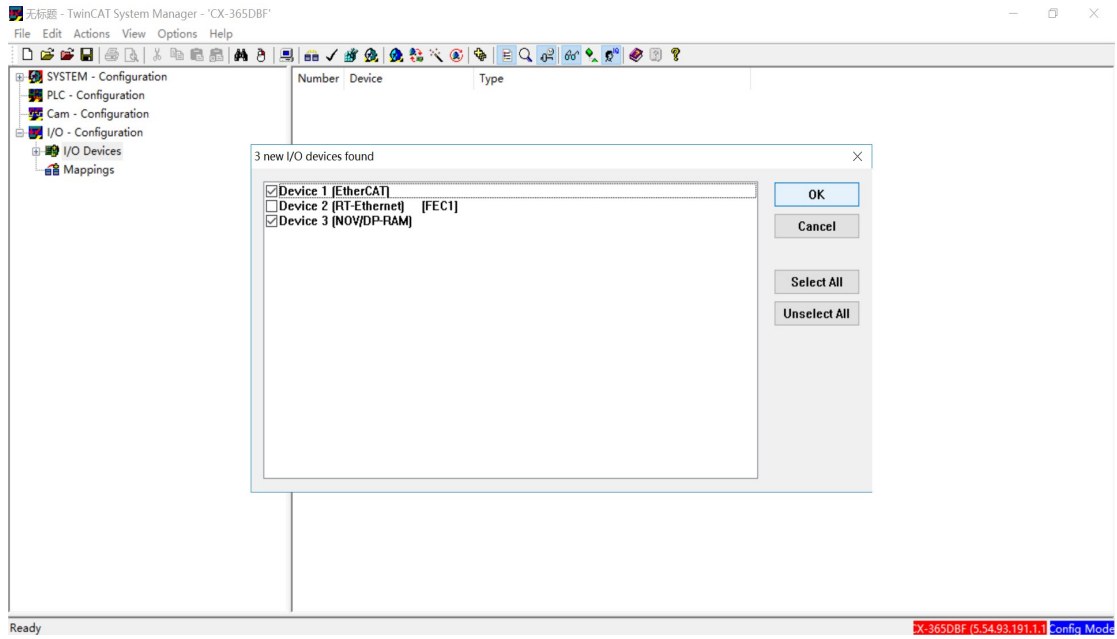
7) Select the tool "CONFIG MODE" and click OK



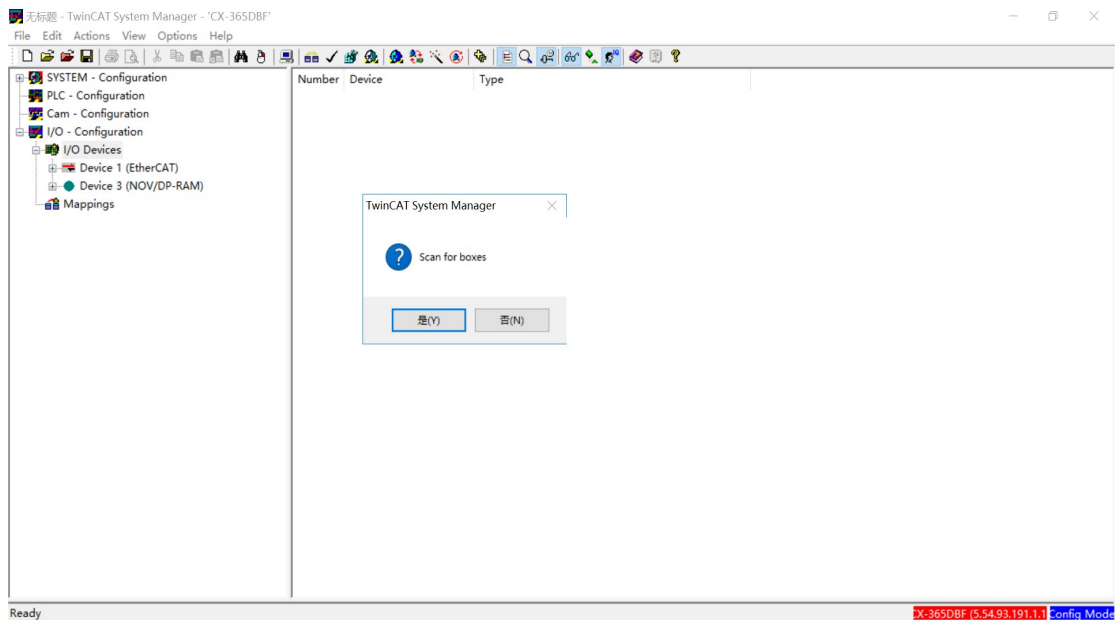
8) In I/O device, select SCAN DEVICES



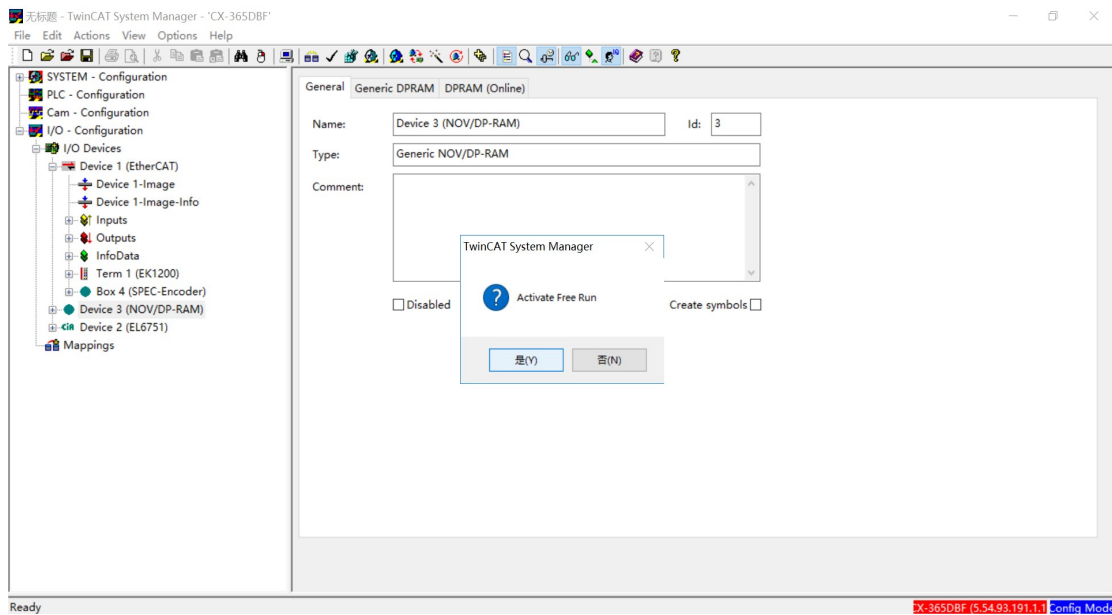
9) Click "OK"



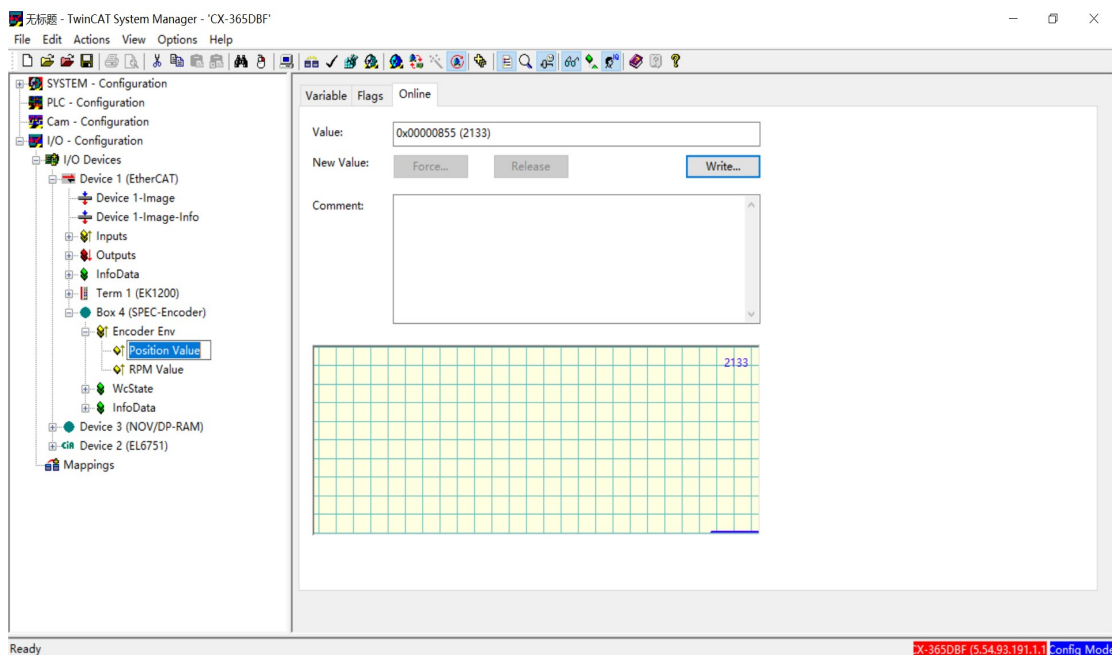
10) Click (Y)



11) Click (Y)



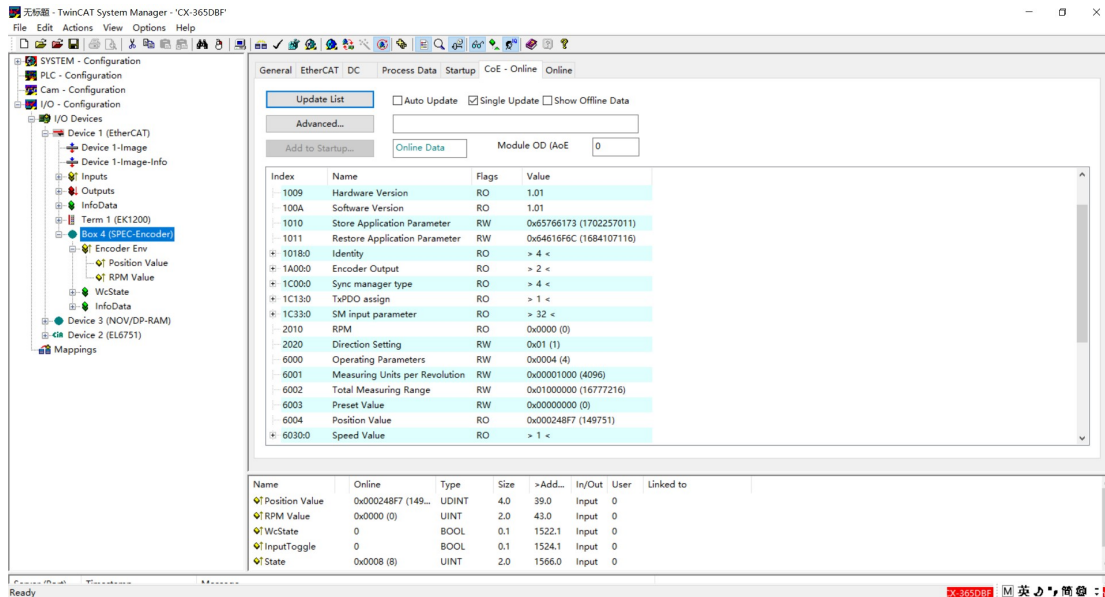
12) Position Value can be displayed normally (real-time encoder data)



4.3 Encoder real time value, parameter setting

The encoder provides several parameters including DC clock, rotation direction, resolution per turn, total measurement range, save Settings, restore default Settings, preset value Settings, etc. All parameters except the DC clock are sent to the slave station in CoE mode.

1) Select BOX4(SPEC-Encoder) to configure the encoder parameters (CoE-Online option) :



The command functions are as follows:

Read and write commands (RW) :

1010 Save the command

2020 Direction changes

6000 Operating parameters: No manual setting is required (after the 2020 direction parameters are set, the 6000 Operating parameters will automatically modify the corresponding parameters)

6001 Single turn resolution

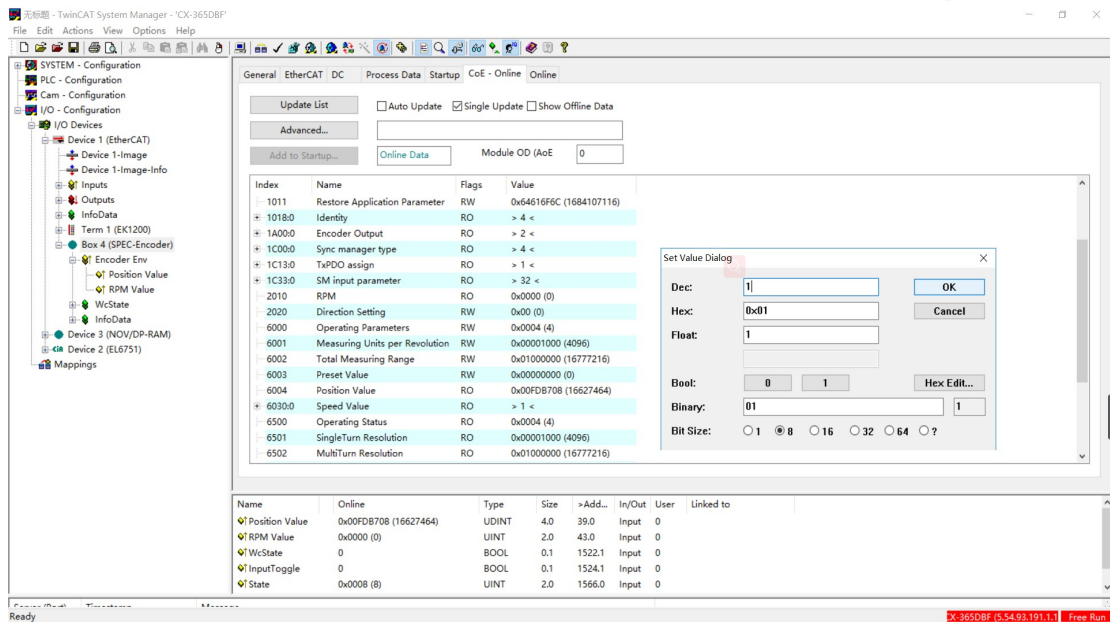
6002 Total resolution

6003 The default value

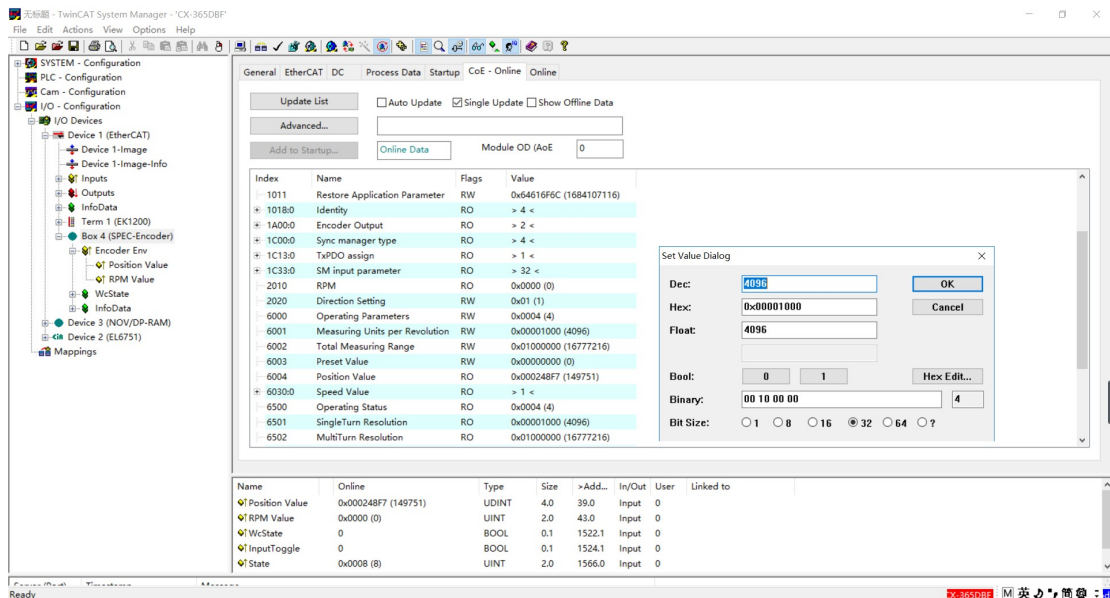
Read command (RO) :

6004 Current position of the encoder

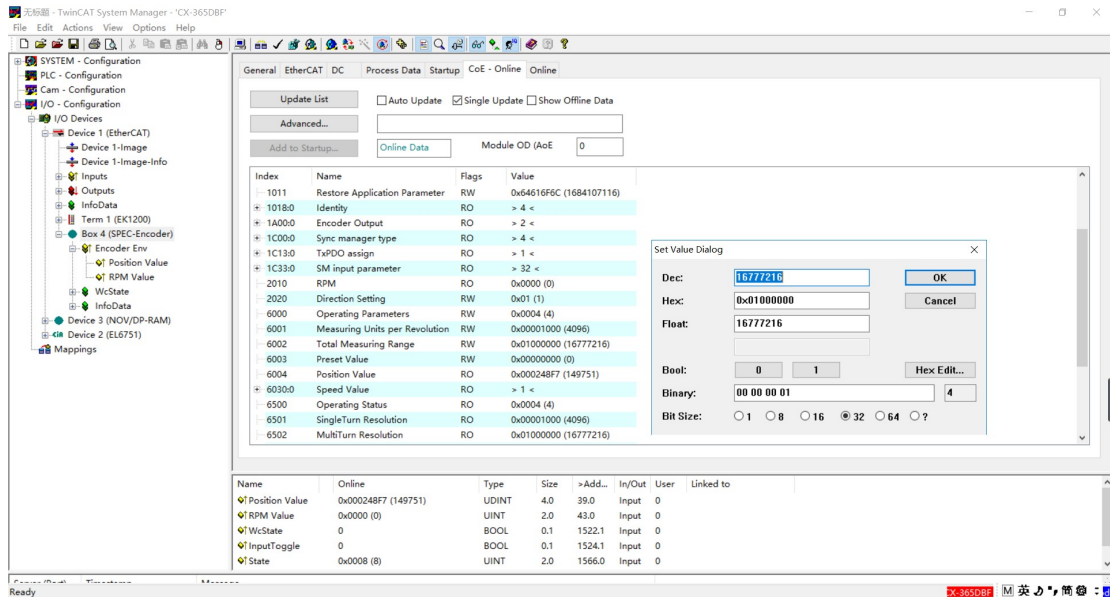
2) Double click 2020 direction setting (0 for CCW, 1 for CW)



3) Double click 6001 Measuring Units Per Revolution



4) Double-click 6002 total Measuring Range



5) Double-click 6003 Preset Value(Encoder Reset and encoder Preset Value Setting)

Explanation:

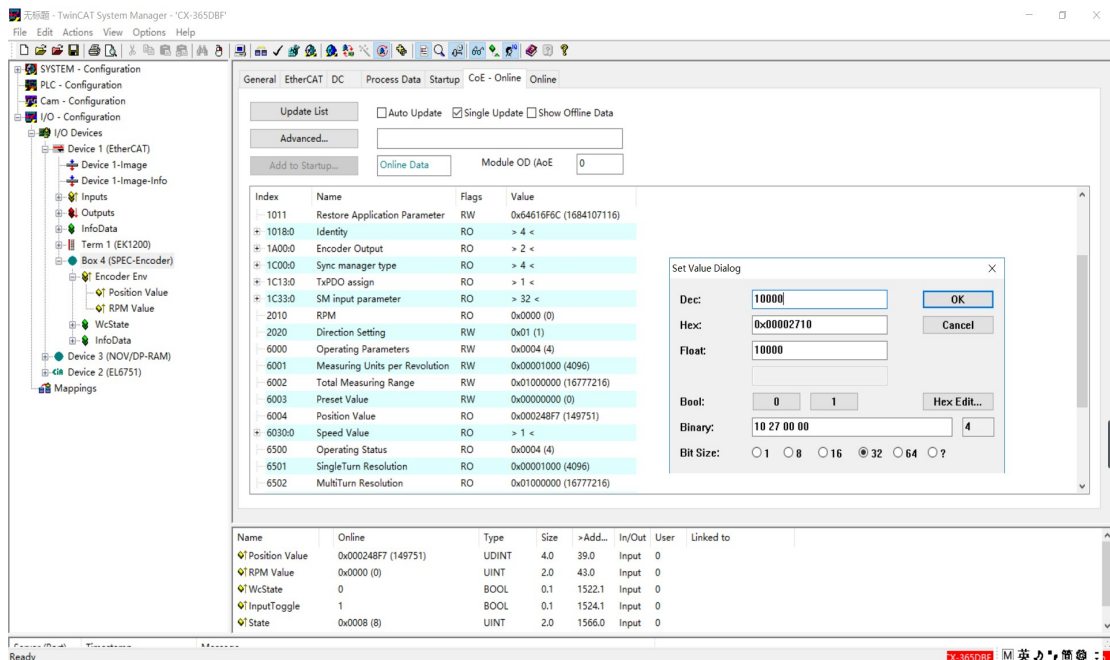
CW Direction, When the data increments, the preset value "6003" parameter is set to the actual required value.

If the preset value is 1000, just set it to 1000.

CW Direction, When the data decreases, the preset value "6003" parameter is set to the total value - the preset

value; If the preset value required is 1000 and the total resolution is 33554432, then the parameter

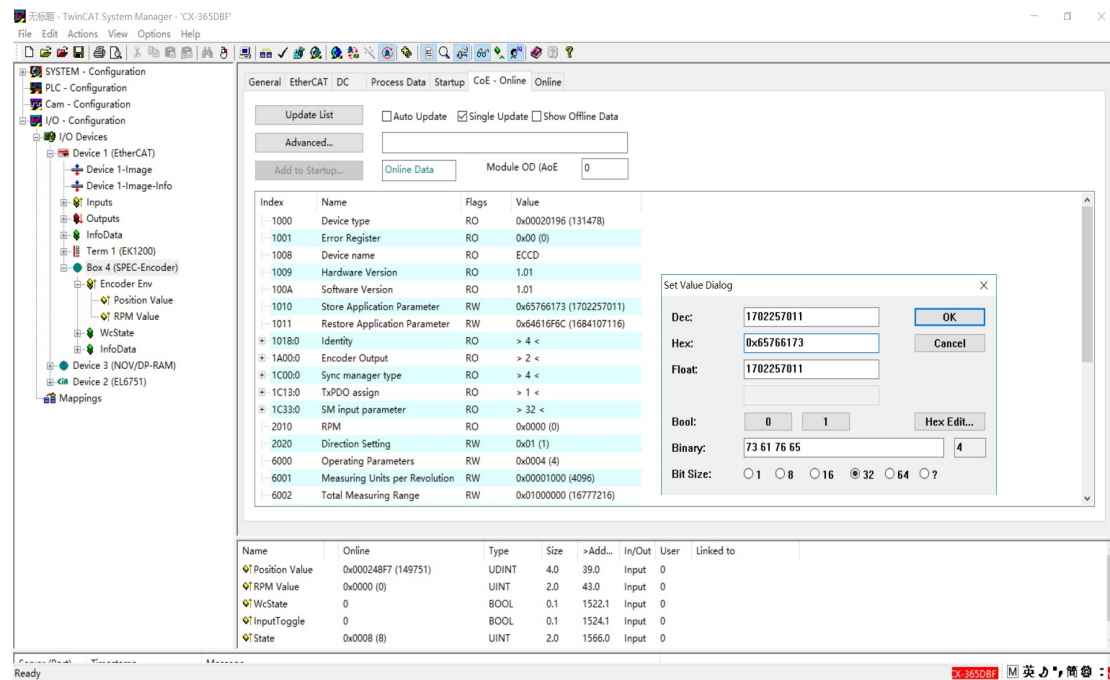
33553432(i.e., 33554432-1000) needs to be set.



6) Double-click 1010 Store Application Parameter , save the parameter setting

Note: After parameter modification, use instruction 1010 to save, otherwise the modified data will not take effect.

If the device is powered off and then powered on, the parameter Settings are restored to the previous state.



The screenshot shows the TwinCAT System Manager interface for 'CX-365DBF'. The left sidebar displays the project structure, including 'SYSTEM - Configuration', 'PLC - Configuration', 'Cam - Configuration', 'I/O - Configuration', and 'I/O Devices'. Under 'I/O Devices', 'Device 1 (EtherCAT)' is selected, showing its configuration tree with 'Inputs', 'Outputs', 'InfoData', 'Term 1 (EK1200)', 'Box 4 (SPEC-Encoder)', 'Encoder Env', 'Position Value', 'WcState', 'InfoData', 'Device 3 (NOV/DP-RAM)', 'Device 2 (EL6751)', and 'Mappings'.

The main window shows the 'Online' tab for 'Device 1 (EtherCAT)'. It contains a table of parameters with their online values and a 'Set Value Dialog' for editing.

Index	Name	Flags	Value
1000	Device type	RO	0x00020196 (131478)
1001	Error Register	RO	0x00 (0)
1008	Device name	RO	ECCD
1009	Hardware Version	RO	1.01
100A	Software Version	RO	1.01
1010	Store Application Parameter	RW	0x65766173 (1702257011)
1011	Restore Application Parameter	RW	0x64616F6C (1684107116)
1018:0	Identity	RO	> 4 <
1A00:0	Encoder Output	RO	> 2 <
1C00:0	Sync manager type	RO	> 4 <
1C13:0	TxPDO assign	RO	> 1 <
1C33:0	SM input parameter	RO	> 32 <
2010	RPM	RO	0x0000 (0)
2020	Direction Setting	RW	0x01 (1)
6000	Operating Parameters	RW	0x0004 (4)
6001	Measuring Units per Revolution	RW	0x00001000 (4096)
6002	Total Measuring Range	RW	0x01000000 (16777216)

The 'Set Value Dialog' is open, showing the following fields:

- Dec: 1702257011
- Hex: 0x65766173
- Float: 1702257011
- Bool: 0
- Binary: 73 61 76 65
- Bit Size: 32

The bottom status bar shows 'Ready' and 'X-365DBF'.