

# ZeroErr

# eRob Modbus RTU User Manual

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Version 1.6



**Build Robot Fast**

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## What's New

### 0.1 eRob Modbus RTU User Manual Version 1.6 Update

#### 0.1.1 Content Enhancement

- (1) Enhanced Parameter Description: `Position Feedback` redefined as `Actual Position` align with the description in eRob CANopen and EtherCAT User Manual.


#### 0.1.2 Added Content

- (1) Added NEW Parameter: `Position Offset` allow user to modify the eRob's zero point position offset, which enables the zero point calibration.
- (2) Added NEW Chapter: [Chapter 7 Zero Position Calibration Instruction](#), illustrated the procedure to calibrate zero point of the eRob.

## Content Modification Markings

### 0.2 New Content


Example:

 Thank you for choosing ZeroErr's eRob series rotary actuator module. We appreciate your trust and confidence in our product. To ensure your satisfaction and enhance your user experience, we have carefully designed this user manual to provide you with all the necessary information for operating and maintaining your eRob rotary actuator module.

### 0.3 Enhanced Content

The enhanced content in document of the current version is marked with a green strip and  $\Delta$  symbol.

Example:

  $\Delta$  If you have any questions or encounter any issues while using eRob rotary actuator module, please do not hesitate to reach out to our customer support team. We are here to assist you and provide timely assistance to ensure that you have a smooth and enjoyable experience.

## Record of Revisions

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Version	Iteration	Description	Date
1.5	1	Applied the new standard English format, Enhanced the images used in Chapter 2, Added parameter register addresses, Enhanced example steps for different operation mode.	December 19, 2023
1.6	2	Parameter Position Feedback redefined as Actual Position. Added NEW Position Offset Parameter. Added Chapter 7.	June 30, 2025

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## Symbols and Abbreviations

### 0.4 Abbreviations

Abbreviation	Definition
e.g.	for example
etc.	and so forth
CRC	cyclic redundancy check
DEC	decimal
FC	function code
HEX	hexadecimal
Hi	high
Lo	low
SWG	strain wave gear
RTU	remote terminal unit

# Chapter 1 Modbus Communication Protocol

## 1.1 Structure of Message Frame

The structure of message frame is as shown in [Table 1-1](#). The data exchange of “master-slave” or “slave-master” begins with the slave address, followed by the function code and the data. The structure of the data field depends on the used function code. Finally, the message frame transmits the Cyclic Redundancy Check (CRC) check code.

Table 1-1 Structure of Message Frame

Address	Function	Data	CRC Check
1 byte	1 byte	N byte (s)	2 bytes

- **Address:** Slave address of Modbus. The set range is 1 to 255.
- **Function:** Function code of Modbus.
- **Data:** Message frame data including the quantity of byte, the starting address of register, the quantity of register and the data of register.
- **CRC:** The check sum of message frame CRC16 is calculated using polynomial shown in [Formula 1.1](#). The low-byte are transmitted first, followed by the high-byte.

$$P(x) = x^{16} + x^{15} + x^2 + 1 \quad (1.1)$$

## 1.2 Function Code

The type of data exchange between Modbus systems is controlled by function codes (FC). The function code defines the meaning of message frame and the structure of message frame. The function codes supported by the eRob rotary actuators are shown in [Table 1-2](#).

Table 1-2 Function Code

Function Code	Function Conforming to Modbus Standard	Data Type	Access Type
0x03	Read Registers	16-bit Integer	Read Only
0x06	Write Single Register	16-bit Integer	Write Only
0x10	Write Multiple (successive) Registers	16-bit Integer	Write Only

### 1.2.1 Function Code 0x03 — Read Register Data

(1) Function

The master can read each register data of the slave by using this function.

(2) The Quantity of Register

Can read 1 to 127 register(s). (1 register = 2 bytes)

(3) The Structure of Modbus Master Request Frame

Field Name	Data Length	Data (HEX)
Address	1 Byte	Slave Address
Function Code	1 Byte	0x03
Starting Address of the Register	2 Bytes	0x0000 to 0xFFFF
Starting Quantity of the Registers	2 Bytes	1 to 127 (0x7F)
CRC Check	2 Bytes	Check Sum of CRC16

## (4) The Structure of Modbus Slave Response Frame

Field Name	Data Length	Data (HEX)
Address	1 Byte	Slave Address
Function Code	1 Byte	0x03
Byte Count	2 Bytes	2×N (Read Quantity of Registers)
Register Values	2×N Bytes	—
CRC Check	2 Bytes	Check Sum of CRC16

## (5) Example of Using FUNCTION CODE 0x03

Read the actual position register 0x0066 of Slave ID=0x02, the structure of master request frame:

Data (HEX)	Description
02H	Slave Address
03H	Function Code
00H	Starting Address of Register Hi
66H	Starting Address of Register Lo
00H	Quantity of Registers Hi
02H	Quantity of Registers Lo
27H	Check Sum of CRC16 Lo
24H	Check Sum of CRC16 Hi

The structure of slave response frame:

Data (HEX)	Description
02H	Slave Address
03H	Function Code
04H	Byte Count
00H	Register Address 66H Hi
07H	Register Address 66H Lo
A1H	Register Address 67H Hi
1FH	Register Address 67H Lo
AAH	Check Sum of CRC16 Lo
40H	Check Sum of CRC16 Hi

## 1.2.2 Function Code 0x06 — Write Single Register Data

## (1) Function

The master can overwrite 1 register data in the slave with a new value by using this function.

## (2) Register value

Any value can be used as a register value.

## (3) The Structure of Modbus Master Request Frame

Field Name	Data Length	Data (HEX)
Address	1 Byte	Slave Address
Function Code	1 Byte	0x06
Set Register Address	2 Bytes	0x0000 to 0xFFFF
Set Register Values	2 Bytes	0x0000 to 0xFFFF
CRC Check	2 Bytes	Check Sum of CRC16

(4) The structure of Modbus slave response frame

Field Name	Data Length	Data (HEX)
Address	1 Byte	Slave Address
Function Code	1 Byte	0x06
Set Register Address	2 Bytes	0x0000 to 0xFFFF
Set Register Values	2 Bytes	0x0000 to 0xFFFF
CRC Check	2 Bytes	Check Sum of CRC16

(5) Example of Using FUNCTION CODE 0x06

Read the actual position register 0x0040 of Slave ID=0x02, the structure of master request frame:

Data (HEX)	Description
02H	Slave Address
06H	Function Code
00H	Set Register Address Hi
40H	Set Register Address Lo
00H	Quantity of Registers Hi
03H	Quantity of Registers Lo
2CH	Check Sum of CRC16 Lo
C8H	Check Sum of CRC16 Hi

The structure of slave response frame:

Data (HEX)	Description
02H	Slave Address
06H	Function Code
00H	Set Register Address Hi
40H	Set Register Address Lo
00H	Register Values Hi
03H	Register Values Lo
2CH	Check Sum of CRC16 Lo
C8H	Check Sum of CRC16 Hi

## 1.2.3 Function Code 0x10 — Write Multiple Register Data

(1) Function

The master can use this command to overwrite the data of 127 registers in the slave through a request frame. The “Byte count” parameter in the request frame is generated according to the transmitted “Set the quantity of register”

(2) The Quantity of Register

Can set 1 to 127 register(s). ( 1 register = 2 bytes)

(3) The Structure of Modbus Master Request Frame

Field Name	Data Length	Data (HEX)
Address	1 Byte	Slave Address
Function Code	1 Byte	0x10
Set the Starting Address of Register	2 Bytes	0x0000 to 0xFFFF
Set the Quantity of Register	2 Bytes	1 to 127 (0x7F)
Byte Count	1 Byte	2×N (Set the Quantity of Registers)
Set Register Values	2×N Byte	—
CRC Check	2 Bytes	Check Sum of CRC16

## (4) The Structure of Modbus Slave Response Frame

Field Name	Data Length	Data (HEX)
Address	1 Byte	Slave Address
Function Code	1 Byte	0x10
Set the Starting Address of Register	2 Bytes	0x0000 to 0xFFFF
Set the Quantity of Register	2 Bytes	1 to 127 (0x7F)
CRC Check	2 Bytes	Check Sum of CRC16

## (5) Example of Using FUNCTION CODE 0x10

Set the target position register 0x0043(Hi) - 0x0044(Lo) of Slave ID=0x02, the master request frame

Data (HEX)	Description
02H	Slave address
10H	Function code
00H	Set the starting address of register Hi
43H	Set the starting address of register Lo
00H	Set the quantity of register Hi
02H	Set the quantity of register Lo
04H	Byte count
00H	Register address 43H value Hi
07H	Register address 43H value Lo
A1H	Register address 44H value Hi
20H	Register address 44H value Lo
47H	Check sum of CRC 16 Lo
71H	Check sum of CRC 16 Hi

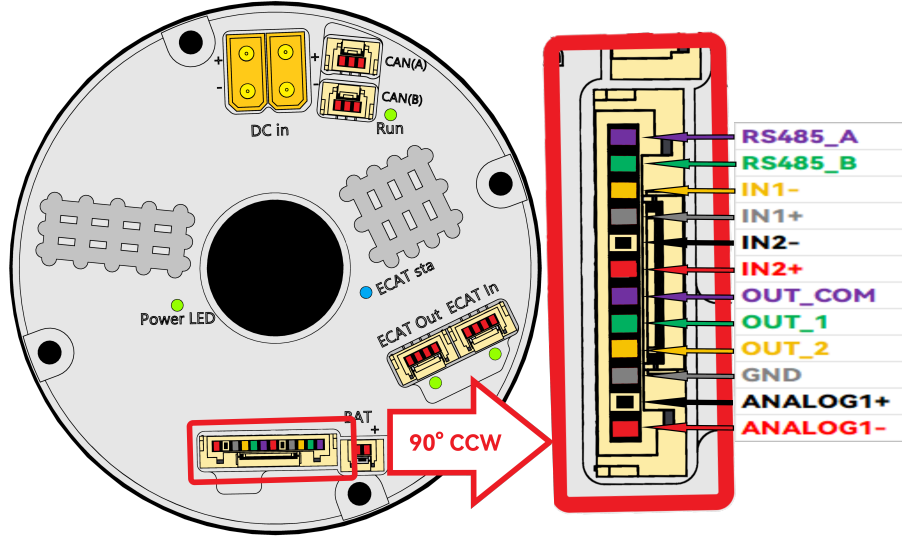

The structure of slave response frame:

Data (HEX)	Description
02H	Slave address
10H	Function code
00H	Set the starting address of register Hi
43H	Set the starting address of register Lo
00H	Set the quantity of register Hi
02H	Set the quantity of register Lo
2FH	Check sum of CRC 16 Lo
B0H	Check sum of CRC 16 Hi

## Chapter 2 Electrical Interface and Status Indicator LED

The Modbus wiring port definitions of the eRob rotary actuator are as shown below. Same as "eRob Rotary Actuator User Manual" Section 5.6.

Pin	Terminal Label	Terminal Function
1	RS485-A	RS485 COM Interface DATA+
2	RS485-B	RS485 COM Interface DATA-
3	IN1- / Pulse- /STOA-	Digital Input DIn1 / Pulse Command Signal / STOA
4	IN1+ / Pulse+ /STOA+	
5	IN2- /Dir- /STOB-	Digital Input DIn2 / Pulse Command Direction / STOB
6	IN2+ /Dir+ /STOB+	
7	OUT_COM	Programmable output signal ground
8	OUT_1	Programmable digital output 1
9	OUT_2	Programmable digital output 2
10	GND	Signal ground
11	ANALOG1+	Analog signal input + (input range -10V ~+10V)
12	ANALOG1-	Analog signal input- (input range -10V ~+10V)

Pin Layout	Connector
	
Header Information	Connector Information
<p>Model: BM12B-GHS-TBT</p> <p>Specification: JST Top Entry Single Row 12Pin 1.25mm Pitch Disconnectable Crimp Style Connector</p>	<p>Manufacturer: JST</p> <p>Housing Model: GHR-12V-S</p> <p>Contact Model: SSSL-002T-P0.2</p>

Note: CANopen version rotary actuators (model: eRobxxxxxxxx-xx-18Cx) do not have Pin3~Pin12 interfaces.

The Modbus master system and Modbus slave system can establish a multi-point connected bus network. Wiring diagram is shown below, For detailed wiring instructions, please refer to the "eRob Rotary Actuator User Manual" Section 6.4.

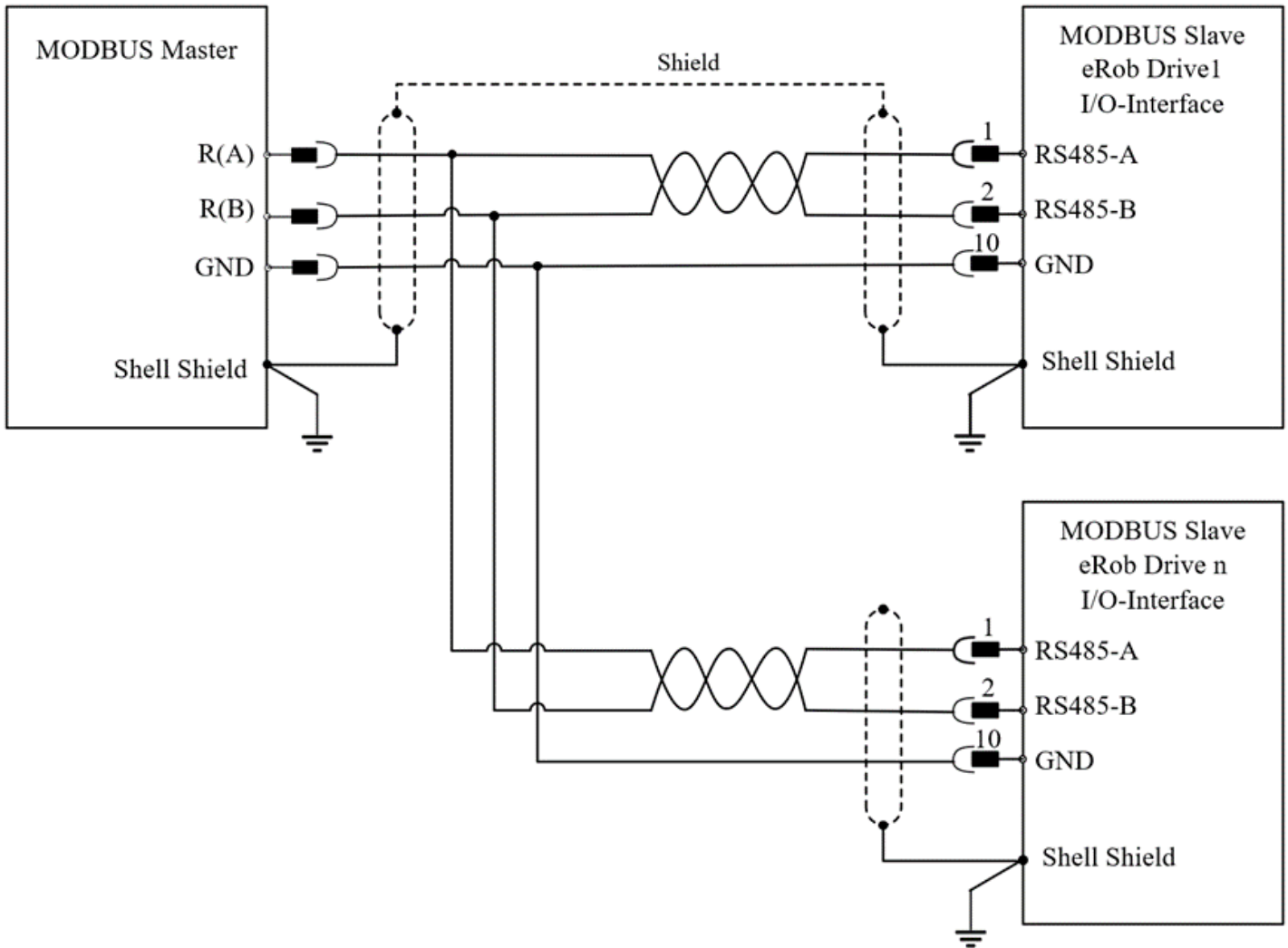


Figure 2-1 Modbus-RTU communication wiring diagram

**Notes:**

- (1) The Modbus-RTU communication lines use twisted pair cables with individual shielding.

# Chapter 3 Communication Parameter Configuration

## 3.1 Communication Parameter Configuration via eTuner

Configuring Modbus-RTU communication parameters via eTuner is as shown in Figure 3-1.

- The “Serialport ID” is the slave address.
- Set “1-ModbusRTU” in “Serial communication”.
- The “RS485 Baudrate” can be selected from 9600 to 115200.
- Click “Save” in main interface after completing configuration.
- Wait for 3s, power off and restart to take effect after the save command is completed.

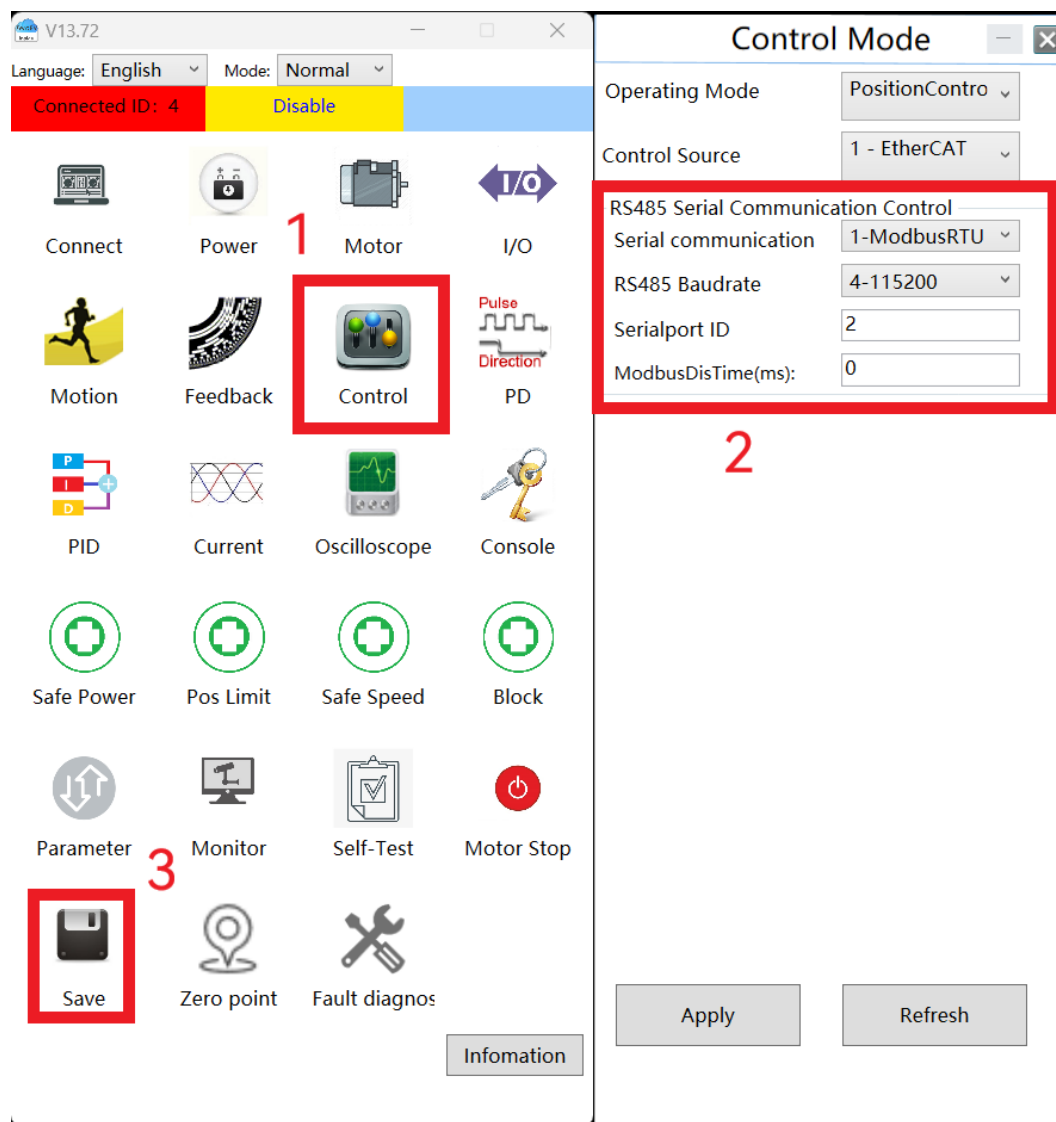


Figure 3-1 Configure Modbus-RTU Communication Parameters via PC

## 3.2 Serial Communication Parameter Configuration

Set the “Baud rate” (optional) to be consistent with the setting of the eTuner. That is, 8 “Data bits”, 1 “Stop bits”, and none “Parity”. The setting is as shown in Fig.3-2.

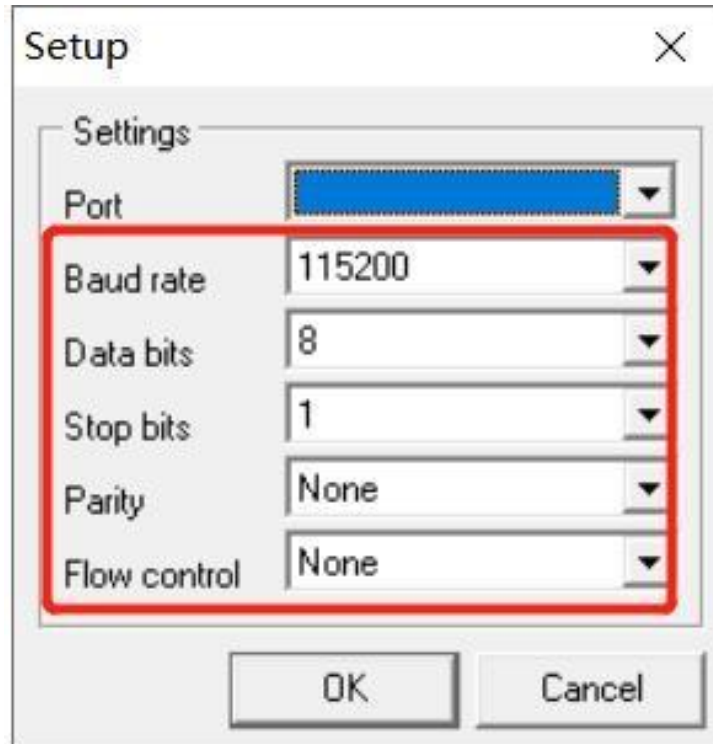


Figure 3-2 Serial Communication Setting

## Chapter 4 Parameter Register Address

Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
<b>Basic Parameters</b>					
0x0000	0	Modbus Address	R/W	—	Write and save. Power off and restart to take effect.
0x0001	1	Modbus Baud Rate	R/W	bps	Baud Rate Setting: 1: 9600 2: 19200 3: 38400 4: 115200
0x0002	2	Modbus Communication Timeout Duration.	R/W	ms	0: Disable this function (default); Modbus communication timeout time range: 1~4000ms; After the eRob Modbus slave establishes RS485 serial communication and receives the first frame of the message from the Modbus master using Modbus-RTU communication protocol, if it doesn't receive any further messages within the set "Modbus communication timeout duration," it will trigger an error called "RS485 communication timeout" with a error code of 0xFA2(4002).
<b>Performance Parameters</b>					
0x0030	48	Position Loop Gain	R/W	—	
0x0031	49	Speed Loop Gain	R/W	—	
0x0032	50	Speed Loop Integral	R/W	—	
<b>Control Parameters</b>					
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control

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Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0041	65	Motion Mode	R/W	—	Motion Mode Setting: 0: Move Continuous 1: Move Absolute 2: Move Repetitive
0x0042	66	Control Source	R/W	—	Control Source Setting: 0: None 1: EtherCAT
0x0043	67	Target Absolute Position (Hi)	R/W	count	
0x0044	68	Target Absolute Position (Lo)	R/W	count	
0x0045	69	Target Relative Position (Hi)	R/W	count	
0x0046	70	Target Relative Position (Lo)	R/W	count	
0x0047	71	Profile Speed (Hi)	R/W	count/s	
0x0048	72	Profile Speed (Lo)	R/W	count/s	
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004D	77	Dwell Time (Hi)	R/W	0.05 ms	Time delay between repetitive motion direction change.
0x004E	78	Dwell Time (Lo)	R/W	0.05 ms	
0x004F	79	Target Current (Hi)	R/W	mA	Target Current in Torque Control Mode
0x0050	80	Target Current (Lo)	R/W	mA	
0x0051	81	Target Speed (Hi)	R/W	count/s	Target Speed in Speed Control Mode
0x0052	82	Target Speed (Lo)	R/W	count/s	
<b>Status Parameters</b>					
0x0060	96	Error Code	R	—	Please refer to <a href="#">Section 7.2</a> in <i>eRob CANopen and EtherCAT User Manual</i> for more details.
0x0061	97	Motion Status	R	—	Corresponding Values: 0: Stop Motion 1: During Motion 3: Stop Repetitive Motion

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Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0063	99	Status of Achieving Position	R	—	Corresponding Values: 0: Motor OFF (Module disabled and brake engaged) 1: Motor ON (Module enabled and brake disengaged) 2: Operation 3: Wait for Clearing the Defined Time 4: Achieve the Target
0x0064	100	Given Position (Hi)	R	count	
0x0065	101	Given Position (Lo)	R	count	
0x0066	102	Actual Position (Hi)	R	count	Output shaft actual position
0x0067	103	Actual Position (Lo)	R	count	
0x0068	104	Position Error (Hi)	R	count	
0x0069	105	Position Error (Lo)	R	count	
0x006C	108	Given Speed (Hi)	R	count/s	
0x006D	109	Given Speed (Lo)	R	count/s	
0x006E	110	Current Speed (Hi)	R	count/s	
0x006F	111	Current Speed (Lo)	R	count/s	
0x0070	112	Speed Error (Hi)	R	count/s	
0x0071	113	Speed Error (Lo)	R	count/s	
0x0072	114	Given Current (Hi)	R	mA	
0x0073	115	Given Current (Lo)	R	mA	
0x0074	116	Motor Current (Hi)	R	mA	
0x0075	117	Motor Current (Lo)	R	mA	
0x0076	118	Bus Voltage (Hi)	R	mV	
0x0077	119	Bus Voltage (Lo)	R	mV	
0x0078	120	Part of Power Temperature	R	°C	Sense Temperature Range: -20 ~ 150°C
0x0079	121	Position Reaches Set Precision	R/W	count	
0x007A	122	Time Setting of Achieving Position	R/W	0.05 ms	
0x007B	123	Torque Sensor Value (Hi)	R	mNm	This parameter address only supports modules with torque sensors.
0x007C	124	Torque Sensor Value (Lo)	R	mNm	

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Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x007D	125	Dual Encoder Difference Value (Hi)	R	count	The difference in encoder feedback position, converted from the load end to the motor end, can reflect the elastic deformation of the gearbox.
0x007E	126	Dual Encoder Difference Value (Lo)	R	count	
0x007F	127	Position Offset (Hi)	R/W	count	This defines the offset of the target position. Target position and actual position shift for the amount of position offset value when motor stop.
0x0080	128	Position Offset (Lo)	R/W	count	
<b>Protection Setting Parameters</b>					
0x00B0	176	Continuous Current (Hi)	R/W	mA	
0x00B1	177	Continuous Current (Lo)	R/W	mA	
0x00B2	178	Peak Current (Hi)	R/W	mA	
0x00B3	179	Peak Current (Lo)	R/W	mA	
0x00B4	180	Peak Current Time	R/W	ms	
0x00B5	181	Max. Speed (Hi)	R/W	count/s	
0x00B6	182	Max. Speed (Lo)	R/W	count/s	
0x00B7	183	Max. Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x00B8	184	Max. Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x00B9	185	Max. Position Error (Hi)	R/W	count	
0x00BA	186	Max. Position Error (Lo)	R/W	count	
0x00BB	187	Max. Speed Error (Hi)	R/W	count/s	
0x00BC	188	Max. Speed Error (Lo)	R/W	count/s	
0x00BD	189	Min. Position Limit Value (Hi)	R/W	count	
0x00BE	190	Min. Position Limit Value (Lo)	R/W	count	
0x00BF	191	Max. Position Limit Value (Hi)	R/W	count	
0x00C0	192	Max. Position Limit Value (Lo)	R/W	count	
0x00C1	193	Max. Phase Current (Hi)	R/W	mA	
0x00C2	194	Max. Phase Current (Lo)	R/W	mA	
0x00C3	195	Max. Motor Current (Hi)	R/W	mA	
0x00C4	196	Max. Motor Current (Lo)	R/W	mA	
0x00C5	197	Struck Current (Hi)	R/W	mA	

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Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x00C6	198	Struck Current (Lo)	R/W	mA	
0x00C7	199	Struck Speed (Hi)	R/W	count/s	
0x00C8	200	Struck Speed (Lo)	R/W	count/s	
0x00C9	201	Struck Time	R/W	0.05 ms	
0x00CA	202	Min. Permissible Bus Voltage (Hi)	R/W	mV	
0x00CB	203	Min. Permissible Bus Voltage (Lo)	R/W	mV	
0x00CC	204	Max. Permissible Bus Voltage (Hi)	R/W	mV	
0x00CD	205	Max. Permissible Bus Voltage (Lo)	R/W	mV	
0x00D1	209	Power Temperature Protection Value	R/W	°C	The recommended maximum setting for temperature protection is $\leq 85^{\circ}\text{C}$ . For detailed information, please refer to the “ <a href="#">SAFETY GUIDE</a> ” in the “eRob Rotary Actuator User Manual”
<b>Control Command</b>					
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F1	241	Start Operating	Command	—	Write the command will start operating.
0x00F2	242	Stop Operating	Command	—	Write the command will stop operating.

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Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x00F3	243	Emergency Stop	Command	—	The stop command for emergencies. The shutdown time is less than 50ms. So, this shutdown mode has a larger deceleration and may cause a larger impact on the motor, which will generate a larger sink current, thereby triggering a alarm of high bus voltage easily.
0x00F4	244	Stop Repetitive Motion	Command	—	Write the command will stop repetitive motion and return to the initial position or stop when achieving the target position.
0x00F6	246	Clear Errors	Command	—	Write non-zero value will clear errors
0x00F7	247	Save Parameters	Command	—	Write the command will save parameters. The save time is about 3s. Do not power off until the save command is completed. Or the parameters will be lost.

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Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x00F9	249	Reset Output Encoder	Command	—	Write the command will reset the load encoder. When the alarm related to the multiturn battery occurs (the singleturn rotary actuator does not have this alarm), reset the output encoder and clear the alarm after troubleshooting. <b>NOTE:</b> The multiturn value will be cleared if the alarm occurs under other condition.

# Chapter 5 Control Mode

## 5.1 Position Control

### 5.1.1 Move Absolute Mode

#### 5.1.1.1 Related Parameter Address

Related Parameter Address of “Move Absolute” Mode

Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control
0x0041	65	Motion Mode	R/W	—	Motion Mode Setting: 0: Move Continuous 1: Move Absolute 2: Move Repetitive
0x0043	67	Target Absolute Position (Hi)	R/W	count	
0x0044	68	Target Absolute Position (Lo)	R/W	count	
0x0047	71	Profile Speed (Hi)	R/W	count/s	
0x0048	72	Profile Speed (Lo)	R/W	count/s	
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F1	241	Start Operating	Command	—	Write the command will start operating.
0x00F2	242	Stop Operating	Command	—	Write the command will stop operating.
0x0066	102	Actual Position (Hi)	R	count	
0x0067	103	Actual Position (Lo)	R	count	
0x006E	110	Current Speed (Hi)	R	count/s	
0x006F	111	Current Speed (Lo)	R	count/s	

## 5.1.1.2 Steps for moving to target absolute position (take salve ID=2 as an example)

Steps	Direction	Message	Comment
1	Send→	02 06 00 40 00 03 C8 2C	Set Position Control Mode
	Receive←	02 06 00 40 00 03 C8 2C	
2	Send→	02 06 00 42 00 00 29 ED	Set Control Source Disabled
	Receive←	02 06 00 42 00 00 29 ED	
3	Send→	02 06 00 41 00 01 18 2D	Set Move Absolute Mode
	Receive←	02 06 00 41 00 01 18 2D	
4	Send→	02 10 00 49 00 02 04 00 00 27 10 22 8D	Set Acceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 49 00 02 90 2D	
5	Send→	02 10 00 4B 00 02 04 00 00 27 10 A3 54	Set Deceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 4B 00 02 31 ED	
6	Send→	02 10 00 47 00 02 04 00 00 27 10 A3 01	Set speed to 10000 count/s
	Receive←	02 10 00 47 00 02 F1 EE	
7	Send→	02 10 00 45 00 02 04 00 00 00 00 38 E4	Set move relative value to 0 (The default value is 0)
	Receive←	02 10 00 45 00 02 50 2E	
8	Send→	02 06 00 F0 00 01 48 0A	Enable Motor (After issuing the motor enable command, please wait for 500ms before issuing the start motion command. For detailed instructions on the control sequence, please refer to “5.1 Operation Sequence” of the “eRob CANopen and EtherCAT User Manual”)
	Receive←	02 06 00 F0 00 01 48 0A	
9	Send→	02 10 00 43 00 02 04 00 07 A1 20 71 47	Move to absolute position 500000 count
	Receive←	02 10 00 43 00 02 B0 2F	
10	Send→	02 06 00 F1 00 01 19 CA	Start to Move
	Receive←	02 06 00 F1 00 01 19 CA	
11	Send→	02 03 00 61 00 01 D5 E7	Read Motion Status
	Receive←	02 03 02 00 01 3D 84	
12	Send→	02 03 00 6E 00 02 A5 E5	Read Current Speed
	Receive←	02 03 04 00 00 27 05 12 C0	
13	Send→	02 03 00 66 00 02 24 27	Read Current Position
	Receive←	02 03 04 00 07 A1 1F 40 AA	
14	Send→	02 03 00 63 00 01 74 27	Read achieving position status
	Receive←	02 03 02 00 04 FD 87	
15	Send→	02 06 00 F0 00 00 89 CA	Disable the motor
	Receive←	02 06 00 F0 00 00 89 CA	

## 5.1.2 Move Relative Mode

### 5.1.2.1 Related Parameter Address

Related Parameter Address of “Move Relative” Mode					
Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control
0x0041	65	Motion Mode	R/W	—	Motion Mode Setting: 0: Move Continuous 1: Move Absolute 2: Move Repetitive
0x0045	69	Target Relative Position (Hi)	R/W	count	
0x0046	70	Target Relative Position (Lo)	R/W	count	
0x0047	71	Profile Speed (Hi)	R/W	count/s	
0x0048	72	Profile Speed (Lo)	R/W	count/s	
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F1	241	Start Operating	Command	—	Write the command will start operating.
0x00F2	242	Stop Operating	Command	—	Write the command will stop operating. Decelerate to stop with the profile deceleration.
0x0066	102	Actual Position (Hi)	R	count	
0x0067	103	Actual Position (Lo)	R	count	
0x006E	110	Current Speed (Hi)	R	count/s	
0x006F	111	Current Speed (Lo)	R	count/s	

## 5.1.2.2 Steps for moving forward from current position (take salve ID=2 as an example)

Steps	Direction	Message	Comment
1	Send→	02 06 00 40 00 03 C8 2C	Set Position Control Mode
	Receive←	02 06 00 40 00 03 C8 2C	
2	Send→	02 06 00 42 00 00 29 ED	Set Control Source Disabled
	Receive←	02 06 00 42 00 00 29 ED	
3	Send→	02 06 00 41 00 01 18 2D	Set Move Absolute Mode
	Receive←	02 06 00 41 00 01 18 2D	
4	Send→	02 10 00 49 00 02 04 00 00 27 10 22 8D	Set Acceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 49 00 02 90 2D	
5	Send→	02 10 00 4B 00 02 04 00 00 27 10 A3 54	Set deceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 4B 00 02 31 ED	
6	Send→	02 10 00 47 00 02 04 00 00 27 10 A3 01	Set speed to 10000 count/s
	Receive←	02 10 00 47 00 02 F1 EE	
7	Send→	02 06 00 F0 00 01 48 0A	Enable Motor (After issuing the motor enable command, please wait for 500ms before issuing the start motion command. For detailed instructions on the control sequence, please refer to “5.1 Operation Sequence” of the “eRob CANopen and EtherCAT User Manual”)
	Receive←	02 06 00 F0 00 01 48 0A	
8	Send→	02 10 00 45 00 02 04 00 01 86 A0 0B 3C	Move forward from current position 100000 count. (Move backward will get a negative value)
	Receive←	02 10 00 45 00 02 50 2E	
9	Send→	02 06 00 F1 00 01 19 CA	Start to move
	Receive←	02 06 00 F1 00 01 19 CA	
10	Send→	02 03 00 61 00 01 D5 E7	Read motion status
	Receive←	02 03 02 00 01 3D 84	
11	Send→	02 03 00 6E 00 02 A5 E5	Read current speed
	Receive←	02 03 04 00 00 27 05 12 C0	
12	Send→	02 03 00 66 00 02 24 27	Read current position
	Receive←	02 03 04 00 07 A1 1F 40 AA	
13	Send→	02 03 00 63 00 01 74 27	Read achieving position status
	Receive←	02 03 02 00 04 FD 87	
14	Send→	02 06 00 F0 00 00 89 CA	Disable the motor
	Receive←	02 06 00 F0 00 00 89 CA	

## 5.1.3 Move Continuous Mode

### 5.1.3.1 Related Parameter Address

Related Parameter Address of “Move Continuous” Mode					
Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control
0x0041	65	Motion Mode	R/W	—	Motion Mode Setting: 0: Move Continuous 1: Move Absolute 2: Move Repetitive
0x0047	71	Profile Speed (Hi)	R/W	count/s	
0x0048	72	Profile Speed (Lo)	R/W	count/s	
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F1	241	Start Operating	Command	—	Write the command will start operating.
0x00F2	242	Stop Operating	Command	—	Write the command will stop operating.
0x0066	102	Actual Position (Hi)	R	count	
0x0067	103	Actual Position (Lo)	R	count	
0x006E	110	Current Speed (Hi)	R	count/s	
0x006F	111	Current Speed (Lo)	R	count/s	

### 5.1.3.2 Steps for move forward continuously (take salve ID=2 as an example)

Steps	Direction	Message	Comment
1	Send→	02 06 00 40 00 03 C8 2C	Set Position Control Mode
	Receive←	02 06 00 40 00 03 C8 2C	
2	Send→	02 06 00 42 00 00 29 ED	Set Control Source Disabled
	Receive←	02 06 00 42 00 00 29 ED	
3	Send→	02 06 00 41 00 00 D9 ED	Set Move Continuous Mode
	Receive←	02 06 00 41 00 00 D9 ED	
4	Send→	02 10 00 49 00 02 04 00 00 27 10 22 8D	Set Acceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 49 00 02 90 2D	
5	Send→	02 10 00 4B 00 02 04 00 00 27 10 A3 54	Set deceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 4B 00 02 31 ED	
6	Send→	02 10 00 47 00 02 04 00 00 27 10 A3 01	Set speed to 10000 count/s (To move backward set a negative value)
	Receive←	02 10 00 47 00 02 F1 EE	
7	Send→	02 06 00 F0 00 01 48 0A	Enable Motor (After issuing the motor enable command, please wait for 500ms before issuing the start motion command. For detailed instructions on the control sequence, please refer to “5.1 Operation Sequence” of the “eRob CANopen and EtherCAT User Manual”)
	Receive←	02 06 00 F0 00 01 48 0A	
8	Send→	02 06 00 F1 00 01 19 CA	Start to move
	Receive←	02 06 00 F1 00 01 19 CA	
9	Send→	02 03 00 61 00 01 D5 E7	Read motion status
	Receive←	02 03 02 00 01 3D 84	
10	Send→	02 03 00 6E 00 02 A5 E5	Read current speed
	Receive←	02 03 04 00 00 27 05 12 C0	
11	Send→	02 03 00 66 00 02 24 27	Read current position
	Receive←	02 03 04 00 02 96 E5 C6 D8	
12	Send→	02 06 00 F2 00 00 28 0A	Stop motion
	Receive←	02 06 00 F2 00 00 28 0A	
13	Send→	02 06 00 F0 00 00 89 CA	Disable the motor
	Receive←	02 06 00 F0 00 00 89 CA	

## 5.1.4 Move Repetitive Mode

### 5.1.4.1 Related Parameter Address

Related Parameter Address of “Move Repetitive” Mode					
Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control
0x0041	65	Motion Mode	R/W	—	Motion Mode Setting: 0: Move Continuous 1: Move Absolute 2: Move Repetitive
0x0043	67	Target Absolute Position (Hi)	R/W	count	
0x0044	68	Target Absolute Position (Lo)	R/W	count	
0x0047	71	Profile Speed (Hi)	R/W	count/s	
0x0048	72	Profile Speed (Lo)	R/W	count/s	
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004D	77	Dwell Time (Hi)	R/W	0.05 ms	Time delay between repetitive motion direction change.
0x004E	78	Dwell Time (Lo)	R/W	0.05 ms	
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F1	241	Start Operating	Command	—	Write the command will start operating.
0x00F4	244	Stop Repetitive Motion	Command	—	Write the command will stop repetitive motion and return to the initial position or stop when achieving the target position.
0x0066	102	Actual Position (Hi)	R	count	
0x0067	103	Actual Position (Lo)	R	count	

## 5.1.4.2 Steps for move repetitive (take salve ID=2 as an example)

Steps	Direction	Message	Comment
1	Send→	02 06 00 40 00 03 C8 2C	Set Position Control Mode
	Receive←	02 06 00 40 00 03 C8 2C	
2	Send→	02 06 00 42 00 00 29 ED	Set Control Source Disabled
	Receive←	02 06 00 42 00 00 29 ED	
3	Send→	02 06 00 41 00 02 58 2C	Set Move Repetitive Mode
	Receive←	02 06 00 41 00 02 58 2C	
4	Send→	02 10 00 49 00 02 04 00 00 27 10 22 8D	Set Acceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 49 00 02 90 2D	
5	Send→	02 10 00 4B 00 02 04 00 00 27 10 A3 54	Set deceleration to 10000 count/s <sup>2</sup>
	Receive←	02 10 00 4B 00 02 31 ED	
6	Send→	02 10 00 47 00 02 04 00 00 27 10 A3 01	Set speed to 10000 count/s
	Receive←	02 10 00 47 00 02 F1 EE	
7	Send→	02 10 00 4D 00 02 04 00 00 4E 20 0D 3A	Set stop time to 1000 ms
	Receive←	02 10 00 4D 00 02 D1 EC	
8	Send→	02 06 00 F0 00 01 48 0A	Enable Motor (After issuing the motor enable command, please wait for 500ms before issuing the start motion command. For detailed instructions on the control sequence, please refer to “ <a href="#">5.1 Operation Sequence</a> ” of the “eRob CANopen and EtherCAT User Manual”)
	Receive←	02 06 00 F0 00 01 48 0A	
9	Send→	02 10 00 43 00 02 04 00 03 0D 40 4D AE	Move to absolute position 200000 count
	Receive←	02 10 00 43 00 02 B0 2F	
10	Send→	02 06 00 F1 00 01 19 CA	Start to move
	Receive←	02 06 00 F1 00 01 19 CA	
11	Send→	02 03 00 61 00 01 D5 E7	Read motion status
	Receive←	02 03 02 00 01 3D 84	
12	Send→	02 03 00 6E 00 02 A5 E5	Read current speed
	Receive←	02 03 04 00 00 27 05 12 C0	
13	Send→	02 03 00 66 00 02 24 27	Read current position
	Receive←	02 03 04 00 03 43 BE 88 73	
14	Send→	02 06 00 F4 00 00 C8 0B	Stop repetitive motion (Return to the initial position or stop at target position)
	Receive←	02 06 00 F4 00 00 C8 0B	
15	Send→	02 06 00 F0 00 00 89 CA	Disable the motor
	Receive←	02 06 00 F0 00 00 89 CA	

## 5.2 Speed Control

### 5.2.1 Related Parameter Address

Related Parameter Address of “Speed Control” Mode					
Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x0051	81	Target Speed (Hi)	R/W	count/s	Target Speed in Speed Control Mode
0x0052	82	Target Speed (Lo)	R/W	count/s	
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F2	242	Stop Operating	Command	—	Write the command will stop operating.
0x0066	102	Actual Position (Hi)	R	count	
0x0067	103	Actual Position (Lo)	R	count	
0x006E	110	Current Speed (Hi)	R	count/s	
0x006F	111	Current Speed (Lo)	R	count/s	

## 5.2.2 Steps for speed control mode (take slave ID=1 as an example)

Steps	Direction	Message	Comment
1	Send→	01 06 00 40 00 02 09 DF	Set Speed Control Mode
	Receive←	01 06 00 40 00 02 09 DF	
2	Send→	02 06 00 42 00 00 29 ED	Set Control Source Disabled
	Receive←	02 06 00 42 00 00 29 ED	
3	Send→	01 10 00 49 00 02 04 00 00 27 10 2D C9	Set Acceleration to 10000 count/s <sup>2</sup>
	Receive←	01 10 00 49 00 02 90 1E	
4	Send→	01 10 00 4B 00 02 04 00 00 27 10 AC 10	Set deceleration to 10000 count/s <sup>2</sup>
	Receive←	01 10 00 4B 00 02 31 DE	
5	Send→	01 10 00 51 00 02 04 00 00 00 00 37 5F	Set initial speed to 0 count/s
	Receive←	01 10 00 51 00 02 10 19	
6	Send→	01 06 00 F0 00 01 48 39	Enable Motor (After issuing the motor enable command, please wait for 500ms before issuing the start motion command. For detailed instructions on the control sequence, please refer to “ <a href="#">5.1 Operation Sequence</a> ” of the “eRob CANopen and EtherCAT User Manual”)
	Receive←	01 06 00 F0 00 01 48 39	
7	Send→	01 10 00 51 00 02 04 00 00 27 10 2D 63	Set target speed 10000 count/s (To move backward, set a negative value)
	Receive←	01 10 00 51 00 02 10 19	
8	Send→	01 03 00 6E 00 02 A5 D6	Read Current Speed
	Receive←	01 03 04 00 00 26 46 61 A1	
9	Send→	01 03 00 66 00 02 24 14	Read Current Position
	Receive←	01 03 04 00 15 8A 06 0C 95	
10	Send→	01 10 00 51 00 02 04 00 00 00 00 37 5F	Set speed to 0 count/s Motion stop
	Receive←	01 10 00 51 00 02 10 19	
11	Send→	01 06 00 F0 00 00 89 F9	Disable the motor
	Receive←	01 06 00 F0 00 00 89 F9	

## 5.3 Torque Control

### 5.3.1 Related Parameter Address

Related Parameter Address of “Torque Control” Mode					
Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x0040	64	Operation Mode	R/W	—	Operation Mode Setting: 1: Torque Control 2: Speed Control 3: Position Control
0x0049	73	Profile Acceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004A	74	Profile Acceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004B	75	Profile Deceleration (Hi)	R/W	count/s <sup>2</sup>	
0x004C	76	Profile Deceleration (Lo)	R/W	count/s <sup>2</sup>	
0x004F	79	Target Current (Hi)	R/W	mA	Target Current in Torque Control Mode
0x0050	80	Target Current (Lo)	R/W	mA	
0x00F0	240	Enable the Motor	Command	—	Write the value: 0: Disable (The motor is disabled and the brake is engaged automatically) 1: Enable (The motor is enabled and the brake is released automatically)
0x00F2	242	Stop Operating	Command	—	Write the command will stop operating.
0x0066	102	Actual Position (Hi)	R	count	
0x0067	103	Actual Position (Lo)	R	count	
0x006E	110	Current Speed (Hi)	R	count/s	
0x006F	111	Current Speed (Lo)	R	count/s	

## 5.3.2 Steps for torque control mode (take salve ID=1 as an example)

Steps	Direction	Message	Comment
1	Send→	01 06 00 40 00 01 49 DE	Set Torque Control Mode
	Receive←	01 06 00 40 00 01 49 DE	
2	Send→	01 06 00 42 00 00 29 DE	Set Control Source Disabled
	Receive←	01 06 00 42 00 00 29 DE	
3	Send→	01 10 00 D8 00 02 04 00 00 00 FF 55	Set Torque Control Mode Max. Speed to 0 count/s
	Receive←	01 10 00 D8 00 02 C1 F3	
4	Send→	01 10 00 4F 00 02 04 00 00 00 B7 DF	Set initial current to 0 mA
	Receive←	01 10 00 4F 00 02 70 1F	
5	Send→	01 06 00 F0 00 01 48 39	Enable Motor (After issuing the motor enable command, please wait for 500ms before issuing the start motion command. For detailed instructions on the control sequence, please refer to “ <a href="#">5.1 Operation Sequence</a> ” of the “eRob CANopen and EtherCAT User Manual”)
	Receive←	01 06 00 F0 00 01 48 39	
6	Send→	01 10 00 4F 00 02 04 00 00 03 E8 B7 61	Set target current to 1000 mA (For safety, start with a no-load trial run and gradually increase the target values. Use negative values to output reverse torque.)
	Receive←	01 10 00 4F 00 02 70 1F	
7	Send→	01 03 00 74 00 02 84 11	Read Motor Current
	Receive←	01 03 04 00 00 04 08 F9 35	
8	Send→	01 03 00 6E 00 02 A5 D6	Read current speed
	Receive←	01 03 04 00 00 51 D6 46 3D	
9	Send→	01 03 00 66 00 02 24 14	Read current position
	Receive←	01 03 04 02 3B 3A 67 D9 0C	
10	Send→	01 06 00 F0 00 00 89 F9	Disable the motor
	Receive←	01 06 00 F0 00 00 89 F9	

## Chapter 6 Example of Communication Between RS485 Serial PC and eRob

- Step 1 Connect the RS485 serial debugger to the RS485 communication port and USB port of the computer.
- Step 2 As shown in [Figure 6-1](#), operate the RS485 serial PC (sscom5.10a.exe), select the PC port connected by USB in “ComNum”. Click “More Settings”. Set the “Baud rate” to “115200” (Corresponding to the PC setting), that is, 8 “Data bits”, 1 “Stop bits” and none “Parity”.

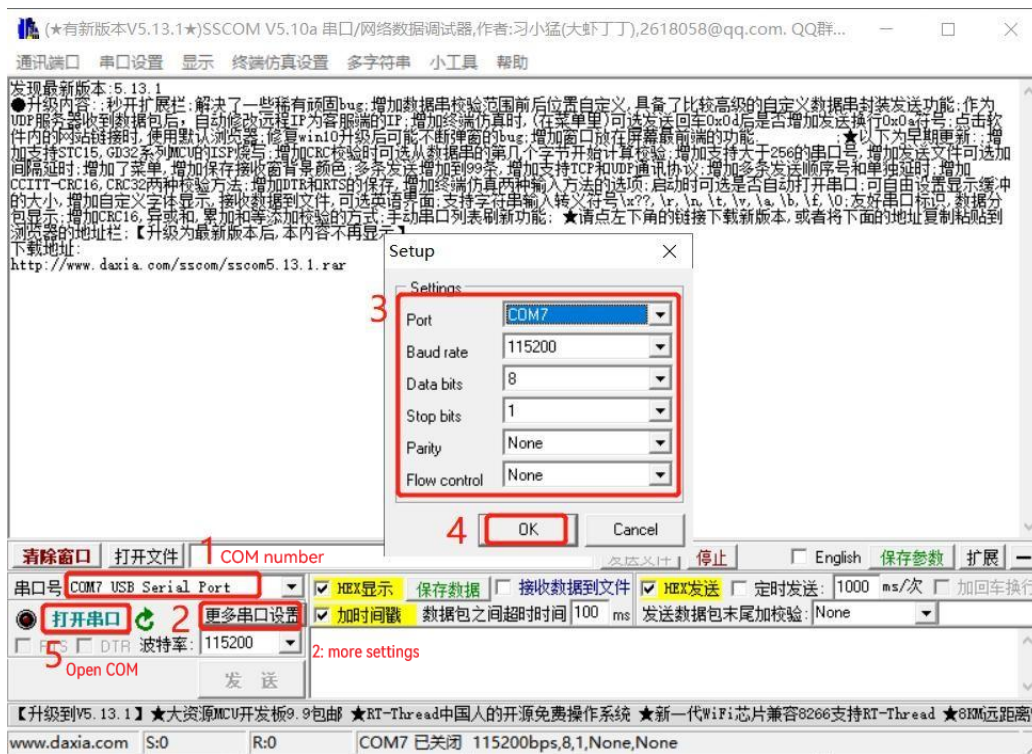


Figure 6-1 RS485 serial PC setting

- Step 3 As shown in [Figure 6-2](#), click “HEX Show”, “Send HEX”, and “Show Time and Packets”. Click “Multi\_Strings” the “Send (note)” interface pops up at the right. Click the commands successively, and the left window will display the sent messages, received messages and time stamp. Check the data of response messages and the motion status of eRob rotary actuator can judge whether the communication is normal.

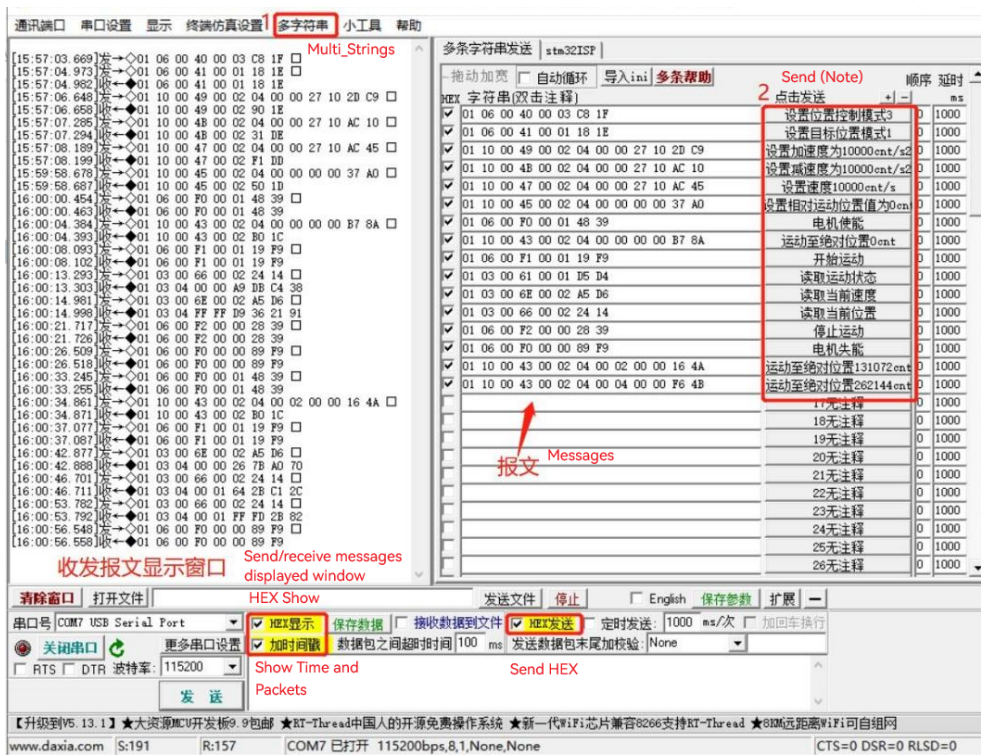


Figure 6-2 Send/receive messages of RS485 serial PC

# Chapter 7 Zero Position Calibration Instruction

## 7.1 Related Parameter Address

Related Parameter Address of “Zero Position Calibration” Function					
Address (HEX)	Address (DEC)	Definition	Attribute	Unit	Description
0x007F	127	Position Offset (Hi)	R/W	count	This defines the offset of the target position. Target position and actual position shift for the amount of position offset value when motor stop.
0x0080	128	Position Offset (Lo)	R/W	count	
0x00F9	249	Reset Output Encoder	Command	—	Write the command will reset the load encoder. When the alarm related to the multiturn battery occurs (the singleturn rotary actuator does not have this alarm), reset the output encoder and clear the alarm after troubleshooting.  NOTE: The multiturn value will be cleared if the alarm occurs under other condition.
0x0066	102	Actual Position (Hi)	R	count	Output shaft actual position
0x0067	103	Actual Position (Lo)	R	count	
0x00F7	247	Save Parameters	Command	—	Write the command will save parameters. The save time is about 3s. Do not power off until the save command is completed. Or the parameters will be lost.

## 7.2 Single-Turn eRob Zero Position Calibration

### 7.2.1 Single-Turn eRob Zero Postion Calibration Instruction

- (1) Start the procedure.
- (2) Move the eRob to the desired mechanical zero position.
- (3) Disable the eRob.
- (4) Write 0 to the Position Offset.
- (5) Read back the Position Offset value; it should be 0 to confirm the write was successful.
- (6) Read the actual position value (should be within the range 0 to 524,287).
- (7) Calculate the Position Offset using the formula:  $262,144 - \text{Actual Position Value}$ .
- (8) Write the calculated Position Offset.
- (9) Read back the Position Offset value; it should match the calculated value to confirm the write was successful.
- ★ (10) Issue the save command, and wait at least 3 seconds before powering off.
- (11) Power on and restart the eRob.
- (12) Read the actual position; it should now be 262,144, confirming that the zero position calibration is complete.

**EXAMPLE** Suppose you want to define the eRob’s mechanical zero point at a position value of 10,000 counts.

**SOLUTION** To calculate the required Position Offset, subtract the actual position value from the base value 262,144:

$$\begin{aligned} \text{Position Offset} &= 262,144 - \text{Actual Position Value} \\ \text{Position Offset} &= 262,144 - 10,000 \\ \text{Position Offset} &= 252,144 \end{aligned}$$

#### 7.2.1.1 Steps for Single-Turn eRob Zero Position Calibration (take salve ID=2 as an example)

Steps	Direction	Message	Comment
1		Move to the desired mechanical zero position	Please refer to the example in <a href="#">Section 5.1</a>
2	Send→	02 06 00 F0 00 00 89 CA	Disabled the eRob
	Receive←	02 06 00 F0 00 00 29 ED	
3	Send→	02 10 00 7F 00 02 04 00 00 00 00 BB 8F	Set Position Offset = 0
	Receive←	02 10 00 7F 00 02 70 23	
4	Send→	02 03 00 7F 00 02 F5 E0	Read the Position Offset = 0
	Receive←	02 03 04 00 00 00 00 C9 33	
5	Send→	02 03 00 60 00 02 24 27	Read the actual position value = 10,000
	Receive←	02 03 02 00 00 27 10 5B 0F	
6	Send→	02 10 00 7F 00 02 04 00 03 D8 F0 11 CB	Write the position offset = 252,144
	Receive←	02 10 00 7F 00 02 70 23	
7	Send→	02 03 00 66 00 02 24 27	Read the actual position value = 252,144

Continued on next page

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Steps	Direction	Message	Comment
	Receive←	02 03 02 00 04 00 00 00 F2	
8	Send→	02 06 00 F7 00 02 B9 CA	Issue the save command
	Receive←	02 06 00 F7 00 02 B9 CA	Wait at least 3 seconds before powering off
9	Power cycle the eRob		
10	Send→	02 03 00 66 00 02 24 27	Read the actual position value = 262,144
	Receive←	02 03 02 00 04 00 00 00 F2	Zero Point Calibration Success

## 7.3 Multi-Turn eRob Zero Position Calibration

### 7.3.1 Multi-Turn eRob Zero Postion Calibration Instruction

- (1) Start the procedure.
- (2) Move the eRob to the desired mechanical zero position.
- (3) Disable the eRob.
- (4) Reset output encoder;
- (5) Write 0 to the `Position Offset`.
- (6) Read back the `Position Offset` value; it should be 0 to confirm the write was successful.
- (7) Read the actual position value (should be within the range 0 to 524,287).
- (8) Calculate the `Position Offset` using the formula:  $262,144 - \text{Actual Position Value}$ .
- (9) Write the calculated `Position Offset`.
- (10) Read back the `Position Offset` value; it should match the calculated value to confirm the write was successful.
- (11) Issue the save command, and wait at least 3 seconds before powering off.
- (12) Power on and restart the eRob.
- (13) Read the actual position; it should now be 262,144, confirming that the zero position calibration is complete.

**EXAMPLE** Suppose you want to define the eRob's mechanical zero point at a position value of 10,000 counts.

**SOLUTION** To calculate the required `Position Offset`, subtract the actual position value from the base value 262,144:

$$\text{Position Offset} = 262,144 - \text{Actual Position Value}$$

$$\text{Position Offset} = 262,144 - 10,000$$

$$\text{Position Offset} = 252,144$$

#### 7.3.1.1 Steps for Multi-Turn eRob Zero Position Calibration (take salve ID=2 as an example)

Steps	Direction	Message	Comment
1	Move to the desired mechanical zero position		Please refer to the example in <a href="#">Section 5.1</a>

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Steps	Direction	Message	Comment
2	Send→	02 06 00 F0 00 00 89 CA	Disabled the eRob
	Receive←	02 06 00 F0 00 00 29 ED	
3	Send→	02 06 00 F9 00 02 D8 09	Reset output encoder
	Receive←	02 06 00 F9 00 02 D8 09	
4	Send→	02 10 00 7F 00 02 04 00 00 00 00 BB 8F	Set Position Offset = 0
	Receive←	02 10 00 7F 00 02 70 23	
5	Send→	02 03 00 7F 00 02 F5 E0	Read the Position Offset = 0
	Receive←	02 03 04 00 00 00 00 C9 33	
6	Send→	02 03 00 60 00 02 24 27	Read the actual position value = 10,000
	Receive←	02 03 02 00 00 27 10 5B 0F	
7	Send→	02 10 00 7F 00 02 04 00 03 D8 F0 11 CB	Write the position offset = 252,144
	Receive←	02 10 00 7F 00 02 70 23	
8	Send→	02 03 00 66 00 02 24 27	Read the actual position value = 252,144
	Receive←	02 03 02 00 04 00 00 00 F2	
9	Send→	02 06 00 F7 00 02 B9 CA	Issue the save command
	Receive←	02 06 00 F7 00 02 B9 CA	Wait at least 3 seconds before powering off
10	Power cycle the eRob		
11	Send→	02 03 00 66 00 02 24 27	Read the actual position value = 262,144
	Receive←	02 03 02 00 04 00 00 00 F2	Zero Point Calibration Success

## Declaration

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ZEROERR CONTROL CO.,LTD

## About Us



ZeroErr was founded in December 2016 in ShenZhen, China. ZeroErr stands for Zero Error Motion Control. We design, develop and manufacture rotary actuators and encoders which are widely used in automation industry, collaborative robots, surgical robots and bionic robots. More than thousands of customer groups in the global use simple combinations with our products makes wide range of applications. ZeroErr is committed to providing reliable quality standard production, cost-effective products and quick response technical support, enabling our customers to accelerate innovation, improve productivity and achieve extraordinary application performance.

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