

### ATO-LCTR-OAR-DY610 Modbus-RTU protocol

The Modbus-RTU protocol of the load cell amplifier (model number ATO-LCTR-OAR-DY610) supports three operation commands such as 03, 05, and 0x10. The total length of the transmitted and received data packets cannot exceed 60 bytes. The baud rate is from 2400 to 115200. The data format can also be set.

The detailed protocol of Modbus-RTU can refer to the standard text of Modbus. The parameter address corresponding to the 03 /0x10 commands is shown in table 1. The address corresponding to real-time data refers to table 2. Operation command 05 can complete the operations of injecting and clearing. See details in table 3.

**Example:** nn is the machine code, crc0 is the low bit of the CRC check, and crc1 is the high bit of the CRC check. Using Commix can calculate check code automatically.

The command data is hex data!

**Send:** nn 03 00 00 00 01 crc0 crc1 (Read the measured value)

**Return:** nn 03 04 d1 d2 crc0 crc1 (d1 d2 measurement data, the 2 bytes of signed data)

**Send:** nn 10 00 28 00 02 04 d1 d2 d3 d4 crc0 crc1 (Modify the first comparison value / upper limit value, d1-d4 are the 4 bytes of the fixed value, the high position is in front.)

**Return:** nn 10 00 28 00 02 crc0 crc1

**Send:** nn 05 00 00 ff 00 crc0 crc1 (clear)

**Return:** nn 05 00 00 ff 00 crc0 crc1

**Table 1: Load cell amplifier parameter table and corresponding communication address**

Minimum	Maximum	Initial value	Decimal places	Valid	Communication address (decimal)	Remarks
0	999999	5000	14	1	40	Upper limit value
0	999999	1000	14	1	42	Lower limit value
0	999	5	14	1	44	Hysteresis
1	40	10	0	1	46	Digital filtering
0	5000	10	0	1	48	Stability range
0	6	1	0	1	50	Zero tracking
0	5	2	0	1	52	Percentage of the range, 0: 0%; 1: 2%; 2: 5%; 3: 20%; 4: 50%; 5: 100%
0	50000	200	0	1	54	Manual set zero, range setting
0	7	4	0	1	56	Communication baud rate: 0: 0; 1: 2400; 2: 4800; 3: 9600; 4: 19200; 5: 38400; 6: 57600; 7: 115200
0	1	0	0	1	58	Communication mode. 0: Modbus;

						1: active upload
0	1	0	0	1	60	Data Format: 0: n81; 1: n82
1	8	1	0	1	62	Address
1	50000	100	3	1	64	Actively transmit interval and calibrate segment numbers
1	6	1	0	0	66	Division value
0	4	2	0	1	68	Decimal point
10	999999	50000	14	1	70	Transmitting range
10000	30000	20000	4	1	72	Sensitivity of load cell
10	999999	50000	14	1	74	Range of load cell
0	999999	0	0	1	76	Zero AD
0	9999999	100000	0	1	78	Corresponding weight of range coefficient
0	4	3	0	1	80	Collecting speed: 0: 5; 1: 10; 2: 20; 3: 40; 4: 80
0	1	0	0	1	82	Magnification times: 0: 64; 1: 128
0	4095	0	0	1	84	Transmitting zero calibration
0	4095	4000	0	1	86	Transmitting range calibration
0	5000	0	0	1	88	13 zero of load cell ad
5000	999999	260000	21	1	90	14 full range of load cell ad
0	5000	0	0	1	92	
0	65000	0	0	1	94	

Note: All parameters of the table support communication read and write operations, read operation using command 03, write operation using command 16.

**Table 2: Real-time data table and corresponding communication address command 03**

Communication address	Parameter	Range	Read and write
0	Net weight	Signed Long data	Read-only
2	Current inner code	Unsigned data	Read-only
4	Operating status		
6	Transmitting code value	0-4095	Read and write

8	Command code	According to write different data to the address to finish different operations: 1: Clear 2: Restore factory (excluding baud rate and machine code) 3: Restore factory completely 4: Hardware zero calibration 5: Hardware full range calibration 6: Digital calibration 7: Communication control transmission output is valid 8: Communication control is invalid	
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**Table 3: Operations of command 05**

Communication address	Function	Remarks
0	Clear	AD written to 1 is valid.
3	Restore factory (excluding baud rate and machine code)	AD written to 1 is valid.
4	Restore factory completely	AD written to 1 is valid.
5	Hardware zero calibration	AD written to 1 is valid.
6	Hardware full range calibration	AD written to 1 is valid.
7	Digital calibration	AD written to 1 is valid.
8	Communication control transmission output is valid	AD written to 1 is valid; written to 0, transmission output is invalid.

**The communication address 0-40 corresponds to the following data (read-only data). Multiply the following serial number by 2 is the communication address. Only serial number 11 (DA) is the read and write data.**

```
unsigned long xdata WorkData[20];
//0 Net weight
//1 Gross weight
//2 Current zero=Fad0
//3 Current filter
//4 10d corresponding ad code
//5 Operating status
    7:0 AD collecting and counting 0-19
```

15:8 Fault, 8-memory read error, 12-memory write error

16-stable, 17-zero, 24:25 DO1 DO2 status

//6 AD for full range in calibration

//7 Weight calibration

//8 Temporary parameter displays refresh record

//9 Temporary parameter calibration

//10 Judging stability and counting

//11 DA

### Active transmission protocol

The amplifier transmits data actively at regular intervals (parameter code 13), and the data format is 8 bytes ASC data and a carriage-return, such as 123.456 (carriage-return), the corresponding hexadecimal number is 2d 31 32 33 3e 34 35 36 0d. When using active transmission, the communication rate should not be too low, otherwise, it will block.

### Note:

1. The steps for using digital calibration. The load cell amplifier is calibrated for hardware zero and full range before leaving the factory. Before use, the customer only needs to set the load cell sensitivity and range, and then perform digital calibration. Note that the sensitivity must be an accurate value.
2. When the transmission control is valid (via the command 05 or the command 16), the analog output value can be modified by modifying the transmission code value. When the transmission output is invalid, the transmission output is controlled by the measured value.
3. Using the communication command to restore factory setting may cause communication interruption. The communication parameters should be set according to the recovered machine code baud rate.
4. The general RS485 protocol interface has no fixed standard. It may not be the same according to different pin order and pin functions of the manufacturer.
5. Users can check the RS485 pin diagram of the related product.
6. Each amplifier must be connected one by one, there must be no star connection or cross connection. If there is a star connection or cross connection, the interference will be very large, which will result in poor communication and even no communication.
7. It is best to use shielded twisted pair cable (grounding the shield), followed by twisted pair cable, do not use common cable. If you use common cable, the interference will be very large too, resulting in poor communication and even no communication. The length of the communication cable does not exceed 1200 meters.
8. If necessary, connect the terminating resistor to enhance the anti-interference of the system.
9. The standard version amplifier can connect up to 32 amplifiers at the same time. If large-scale networking is required, it can be customized.
10. The communication cable terminals must be securely connected, and there must be no looseness. Otherwise, the amplifier may be burned out.