

# RS-485 Communication Function(V1.0)

## 1.1 Hardware Screen of Communication

Servo Driver: With RS485 serial communication function, using MODBUS protocol can realize multiple functions such as servo system parameter change and servo system status monitoring.

## 1.2 Communication Parameter

Para.	Name	Range	Default Value
PA-71	ID number of Servo Driver	1~254	1

When using RS485 communication, ID number (station number) needs to be set different value for every one servo drivers by this parameter, its range is 1~254, default value is 1, it is absolute address during RS485 communication, if same ID number, which will affect communication wrong.

Para.	Name	Range	Default Value
PA-72	Baud Rate of MODBUS Communication	48~1152*100	96

This parameter is set for baud rate of RS485 Modbus communication, set to same baud rate with upper control unit.

Example: set to 96\*100, baud rate is 9600.

And also we need to set protocol of RS485 communication same to upper control unit. Detailed Setting value as following:

8, N, 2 (MODBUS, RTU)

8, means transferring data is 8 bits; N, means don't use parity bit; 2, means end bit is 2.

Para.	Name	Range	Default Value
PA-73	Protocol of MODBUS Communication	0~2	0

This parameter is set for communication protocol of RS485 MODBUS, which must keep same protocol to upper control units. Detailed setting value as following,

0: 8, N, 2 (MODBUS, RTU)

1: 8, E, 1 (MODBUS, RTU)

2: 8, 0, 1 (MODBUS, RTU)

8, means transferring data is 8 bits; N, E, 0, means parity bit, N, means don't use parity bit, E, means 1 even bit, 0, means 1 odd bit; 2, means end bit is 2, 1, means end bit is 1.

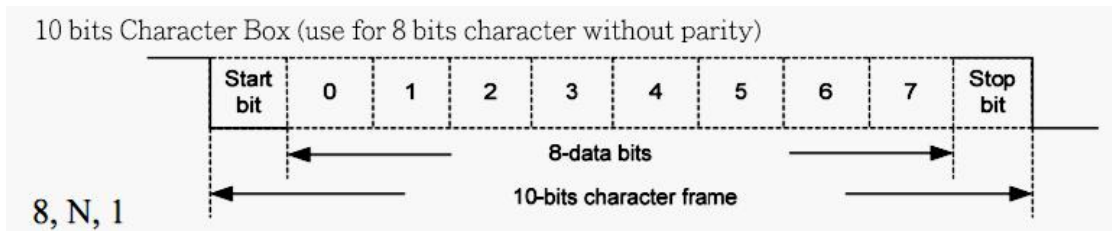
## 1.3 Communication Protocol

When using RS485 series port communication, it must to set ID number of each one servo driver, where communication of upper control unit is base. And baud rate also keep same at servo driver & upper control unit. Modbus adopts RTU (Remote Terminal Unit) mode.

Mean of Encoder

Everyone 8 bits data is composed by two pcs of 4 bits Hexadecimal character. Example: 1bytes 64H.

## Structure of Character



## Structure of Communication Data

STX	Min interval time to last one is the time of 3.5 characters.
ADR	Communication Address: 1 byte
CMD	Command Code: 1 byte
DATA(0)	Data: Nword= 2N byte, N<=100
.....	
DATA(n-1)	
CRC	Check Code: 2 byte
End1	Min interval time to next one is the time of 3.5 characters.

Explanation:

### 1. STX (Start of Communication)

Min interval time to last one frame is 3.5 character's time

### 2.ADR (Communication Address)

Legal communication address is 1~254, show as following: communication with servo driver ,whose ID number is 16 (Hex. Is 10H) , ADR=10H.

### 3. CMD(command code) & DATA ( data character)

Format of data character is decided by command code.

Common command codes are as following

#### (1) Command code 03H, read out N bits (16bits)

Example: Read out two parameters of No.5 parameter from servo driver. (ID number is 01H )

Command Messages:

ADR	01H
CMD	03H
STX	00H(High byte)
	05H(Low byte)
DATA	00H(High byte)
	02H(Low byte)
CRC LOW	D4H(High byte)
CRC HIGH	0AH(Low byte)

Responding Messages:

ADR	01H
CMD	03H
DATA Number (figured by byte)	04H
Value of No.5 Parameter	00H(High byte)
	05H(Low byte)
Value of No.6 Parameter	00H(High byte)
	02H(Low byte)
CRC LOW	D4H(High byte)
CRC HIGH	0AH(Low byte)

#### (2) Command code 06H, write in one value to one parameter

Example: Write 100 in No.5 parameter of servo driver(ID number is 01H).

ADR	01H	ADR	01H
CMD	06H	CMD	03H

STX	00H(High byte)		DATA Number (figured by byte)	00H(High byte)
	05H(Low byte)			05H(Low byte)
DATA	00H(High byte)		Value of No.5 Parameter	00H(High byte)
	64H(Low byte)			64H(Low byte)
CRC LOW	98H(High byte)		CRC LOW	98H(High byte)
CRC HIGH	20H(Low byte)		CRC HIGH	20H(Low byte)

#### 4. Verify & Figure of CRC Frame

##### Steps of Verify&Figure

- 1) Initial one 16bits register,whose value is FFFFH, which calls CRC Register.
- 2) Do XOR operation between 1<sup>st</sup> character of Command code & Low byte of 16-bits CRC register, and save result as CRC register.
- 3) Check lowest bit of CRC Register, if 0, Shift one bit to the right; if 1, shift one bit to the right & then do XOR operation with A001H.
- 4) Return to Step 3, until Step 3 is finished by 8times,and then execute Step 5
- 5) Repeat Step2 to Step4 for next character of command code, until all characters finished above steps, value of current CRC register is the frame check of CRC.

Remark: After figure out frame check if CRC,at command message, must fill low byte in firstly,and then high byte.

Example: Read out two parameters of No.5 parameter from servo driver. (ID number is 01H ). Final value of CRC register , figure out from ADR to last bit of DATA, is 0AD4H, and its command messages is shown as following, and note that send D4H firstly,and then 0AH.

ADR	01H
CMD	03H
STX	00H(High byte)
	05H(Low byte)
DATA	00H(High byte)
	02H(Low byte)
CRC LOW	D4H(High byte)
CRC HIGH	0AH(Low byte)

#### 5. End1 (End of communication)

Min interval time to next one is the time of 3.5 characters.

## 1.4 Write-in & Read-Out of Parameter

### 1)Write-in of PA group Parameter

All PA group parameter of SD series servo driver,please check Chapter 7 of user manual. Everyone parameter is specified by 16bits data, communication address of everyone parameter is confirmed by its sequence number. Example: No.1 Parameter, (PA-0), specified by 0X0000 , No.2 Parameter(PA-1) ,specified by 0X0001, Other parameters are analogous in turn.

### 2) Write-in of P3 Group Parameter

All P3 group parameter of SD series servo driver,please check related Chapter of user manual. Everyone parameter is specified by 16bits data, communication address

of everyone parameter is confirmed by its sequence number. Example: No.1 Parameter, (P3-0), specified by 0X0100H , No.16 Parameter(P3-15) ,specified by 0X010FH.

### 3) Write-in of P4 Group Parameter

All P4 group parameter of SD series servo driver,please check related Chapter of user manual. Everyone parameter is specified by 16bits data, communication address of everyone parameter is confirmed by its sequence number. Example: No.1 Parameter, (P4-0), specified by 0X0200H , No.16 Parameter(P4-15) ,specified by 0X020FH.

### 4) Format Explanation of Write-in & Read-Out Parameter

Explanation for format of write-in & read-out parameter by communication, please take reference of Charter 1.5. The parameters read and written must be decimal integer numbers, which are marked with a decimal point in the drive display panel and manual. They are enlarged by the corresponding multiple during the reading and writing operations. Becomes a decimal integer number. The display format is a binary parameter, which is the equivalent of the decimal integer number used during the read and write operations.

PA Para. No.	Value on User manual	Communication Value	Convert Mode
1	315	315	Not change
63	1.00	100	Expand 100 times
57	0100(Binary)	4(Decimal)	Binary to Decimal

All parameters that description on Parameter part of User manual can be write-in & read-out by communication.

## 1.5 Status Monitor

Status value on servo driver only could be read-out,cannot be write-in operation by RS485 communication. Status parameters are stored with 16bits data. The value that is accurate to the decimal place is 10 times and 100 times amplified when read through the communication port. This situation is the same as the parameter reading section, and the assembly order of the related state quantities is as follows:

- 1000H: Speed of Motor
- 1001H: Low 5 bits of current position
- 1002H: High 5 bits of current position
- 1003H: Low 5 Bits of Position command(Command pulse accumulation)
- 1004H: High 5 Bits of Position command(Command pulse accumulation)
- 1005H: Low 5 Bits of Position deviation
- 1006H: High 5Bits of Position deviation
- 1007H: Torque of Servo Motor
- 1008H: Current of Servo Motor
- 1009H: Current Control Mode
- 100AH: Current Temperature
- 100BH: Speed Command
- 100CH: Torque Command
- 100DH: Low 5 Bits of Absolute position at one revolution

- 100EH: High 5 Bits of Absolute position at one revolution
- 100FH: Status of Input port
- 1010H: Status of Output port
- 1011H: Encoder Input Signal
- 1012H: Voltage of Main circuit
- 1013H: Alarm Code
- 1014H: Version No. Of Logic chips
- 1015H: Status of Relays ON/OFF
- 1016H: Running Status
- 1017H: Status of External Voltage
- 1018H: 15bit~0bit of Absolute Position Value
- 1019H: 31bit~16bit of Absolute Position Value
- 101AH: 47bit~32bit of Absolute Position Value
- 101BH: 63bit~48bit of Absolute Position Value

### 1.6 Temporary Address

During real using & demands of customers, maybe we often need to refresh parameters' values of servo driver, in order to save using life of EPROM & running efficiency, so we add temporary address functions. When we use related temporary address, values of this address will can be altered, but without save, after rebooting, which will recovery to initial value.

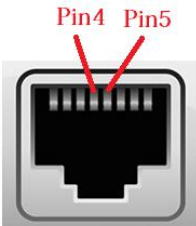
Communication temporary address of PA group parameters is current address offset 0x80.

Example: PA23; saving address: 0x17; temporary address: 0x97

PA35; saving address: 0x23; temporary address: 0xA3.

Example: Address of PA34 (Inner CCW Limit Torque) is 0x0022, set it to 200, it will save to EPROM, after power off, PA34=200 will not be lost; if use its temporary address, 0xA2, it will set & work, after power off, it will lost and recovery to 300.

### 1.7 Pinout Define of RS485 Communication

RS485 Communication Signal		
Pin	Define	Explanation
4	RS485-	
5	RS485+	

Note: It is ok that only needs to connect Pin4 & Pin5.

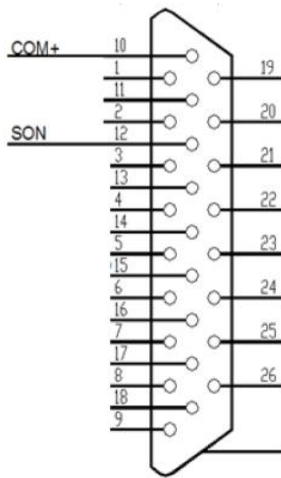
## 1.8 Define & Usage of Enable Signal

Enable signal is an “allowable” signal, which decides if normal servo driver can start working. When Enable is valid, servo driver can work with servo motor normally.

There are 3 kinds of solutions that can activate Enable signal, 1<sup>st</sup> solution is by external input switch, 2<sup>nd</sup> solution is by setting PA-53 parameter, 3<sup>rd</sup> solution is by setting P3-15 . Only one solution that activate enable, which is enough okay.

### 1) External Switch

When use external switch to control enable signal, just connected to P10 & P12 on CN1 plug. Shown as picture:



Pin	Define	Remark
10	COM+	Join with +24VDC
12	SON	Join with external switch, another port of switch is connected to -24VDC(0V).

### 2) PA Group Parameter Set

PA-53 on PA group parameter is set for control enable of servo driver, shown as following table:

Parameter No.	Name	Range	Default
PA-53	Force Enable	0 or 1	1

If using inner force enable, set PA-53 to 1, if using external switch for enable, set PA-53 to 0.

### 3) P3 Group Parameter set

P3-15 on P3 group parameter also could be set for control enable of servo driver, related function of P3-15 , display with 8 bits binary , is as following:

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Function	CZERO	ZCLAMP	TCW	TCCW	CWL	CCWL	ARST	SON

Related setting as following:

Value of P3-15	Enable Signal	Status
00000000	OFF	Enable invalid
00000001	ON	Enable Valid