10 Communication instruction

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Communication port protocol setting

PROTOCOL/communication port protocol setting

PROTOCOL(P)

Set (s) protocol for (N) communication port.

-[PROTOCOL (S) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S)	Protocol number to be set	-	Unsigned BIN 16 bit	ANY16
(N)	Which communication port to set, 0 means COM1, 1 means COM2 *1	0, 1	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
PROTOCOL	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●

Features

This instruction is mainly used to set the protocol during run, and can also be used in the first cycle of run.

The value of the protocol address (COM1 SD2542, COM2 SD2592) and the protocol modification flag (COM1 SD2543, COM2 SD2593) can be directly set according to the command parameters.

The specific calculation formula for setting the protocol modification flag (COM1 SD2543, COM2 SD2593) is: (parameter setting value + offset of the corresponding serial port's initial special soft component + 10)*2

For example, setting the protocol to 2 is (2 +2593-2590 +10)*2, which is (2+3+10) *2=30. At this time, SD2592 will be set to 1, and SD2593 will be set to 32.

#Note: Whether it is by self-calculation and then modifying the setting value of the identifier (COM1 SD2543, COM2 SD2593) to the protocol, or using this instruction to set, it is possible to modify the protocol when the PLC is in the RUN state.

Regarding the protocol modification flags (COM1 SD2543, COM2 SD2593): During the RUN process, the first cycle of setting the protocol and modifying the flags is correct (judging at END) to the correct first cycle. When the modification is completed, the protocol modification flags (COM1 SD2543, COM2 SD2593) is cleared, and then set the same value will not be processed. Mainly to avoid repeated settings multiple times.

Agreement Number

Agreement Number	Content
0 H	Wecon Modbus slave
2 H	ModbusRTU slave
3 H	ModbusASCII slave
10 H	User-defined protocol
20 H	ModbusRTU master station

30 H	ModbusASCII master

Related software components

Devices	Content
SD2542	COM1 protocol settings
SD2543	COM1 protocol modification sign
SD2592	COM2 protocol settings
SD2593	COM2 protocol modification sign

#Note:

The setting of communication parameters will affect the overall communication. The processing in the PLC is to modify it when there is no communication or after a round of communication is completed. This point needs attention.

If the set protocol does not match the provided protocol number, the protocol modification flag (COM1 SD2543, COM2 SD2593) will not be cleared after setting. At this time, the protocol will not be set successfully, and it will run according to the original protocol.
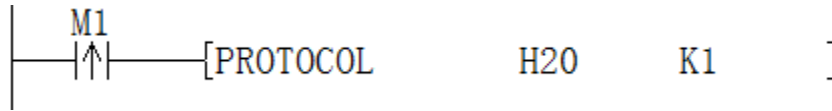
Error code

Error code	Content
4085H	The read address of (s) and (N) exceeds the device range
4084H	(N) is not 1

Example

Example above

M1 changes from OFF to ON during the run

SD2592 will be set to 32 (20H), SD2593 will be set to 90 and then it will be cleared. At this time, it means that the setting is successful.

| SD2592 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| SD2593 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

If you turn M1 from OFF to ON again

SD2592 will be set to 32 (20H), SD2593 will be set to 90 but will not be cleared.

| SD2592 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 |
| SD2593 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 90 |

Modbus serial port parameter setting

PORTPARA/Modbus serial port parameter setting

PORTPARA(P)

Set (s) serial port parameters for (N) communication port.

-[PORTPARA (s) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Serial port parameters to be set	-	Unsigned BIN 16 bit	ANY16
(N)	Which communication port to set, 0 means COM1, 1 means COM2	0, 1	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
ECAMCUP	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●

Features

This instruction is mainly used to set serial port parameters during run, and can also be used in the first cycle of run.

Can directly set the serial port parameter address (COM1 SD2540, COM2 SD2590) and the value of the serial parameter modification flag (COM1 SD2541, COM2 SD2591) according to the command parameters.

The specific calculation formula for setting the serial port parameter modification flags (COM1 SD2541, COM2 SD2591) is: (parameter setting value + offset of the corresponding serial port's initial special soft component + 10)*2

For example, setting the COM1 serial port parameter to 193 (HC1) is (193 +2541-2540 +10)*2 which is (193 +1+10) *2=408. At this time, 193 (HC1) will be set for SD2540 and 408 for SD2541.

#Note: Whether it is by self-calculation and then to the serial port parameter to modify the flag (COM1 SD2541, COM2 SD2591) setting value, or use this instruction to set, it is possible to modify the serial port parameter when the PLC is in the RUN state.

About serial port parameter modification flags (COM1 SD2541, COM2 SD2591): During RUN, when the serial port parameters are set and the modified flag is correct (judging at END) to the correct first cycle, the serial port parameter modification flag (COM1 SD2541, COM2, SD2591) are cleared, and then set the same value will not be processed. Mainly to avoid repeated settings multiple times.

Serial port parameter setting table

Bit number		B0	B1、B2	B3	B4、B5、B6、B7	B8、B9 B10	B11
Name		Data length	Parity	Stop Bit	Baud Rate (bps)	STX	ETX
Content	**0 off**	7bit	b2,b1 (0,0):None	1bit	4800　0111 9600　1000 19200　1001 38400　1010	Turn off STX function	Turn off ETX function
	1 on	8bit	(0,1):Odd parity(ODD) (1,1):Even parity(EVEN)	2bit	57600　1011 115200　1100 187500　1101 230400　1110 460800　1111 921600　10000	Enable STX function, the specific value is set by D8124	Turn on the ETX function, the specific value is set by D8125

Related software components

Devices	Content

SD2540	COM1 serial port parameter setting
SD2541	COM1 serial port parameter modification identification
SD2590	COM2 serial port parameter setting
SD2591	COM2 serial port parameter modification sign

#Note:

The setting of communication parameters will affect the overall communication. The processing in the PLC is to be modified when there is no communication or after a round of communication is completed. This point needs attention.

STX function and ETX function are only useful in the case of custom protocol.

If the set protocol does not match the provided protocol number, the serial port parameter modification flags (COM1 SD2541, COM2 SD2591) will not be cleared after setting. At this time, the protocol will not be set successfully, and it will run according to the original protocol.

Error code

Error code	Content
4085H	The read address of (s) and (N) exceeds the device range
4084H	(N) is not 0 or 1

Example
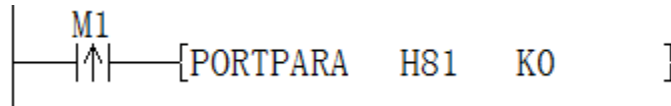
Example above

M1 changes from OFF->ON during run

SD2540 will be set to 129 (H81, baud rate: 9600, stop bit: 1, data bit: 8, parity bit: none), SD2541 will be set to 280 and then cleared. At this time it has been set successfully

SD2540	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	129
SD2541	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

If you turn M1 from OFF->ON again

SD2540 will be set to 129 (H81), SD2541 will be set to 280 but will be cleared.

SD2540	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	129
SD2541	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	280

Modbus station number setting

STATION/Modbus station number setting

STATION(P)

Under the Modbus slave station protocol. Set the station number (s) for the (N) communication port.

-[STATION (s) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Station number to be set	0 to 255	Unsigned BIN 16 bit	ANY16

| (N) | Which communication port to set 0 means COM1, 1 means COM2 | 0, 1 | Unsigned BIN 16 bit | ANY16 |

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
ECAMCUR	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	

Features

●This instruction is mainly used to set the station number during run, and it can also be used in the first cycle of run.

●The value of the station number address (COM1 SD2544, COM2 SD2594) and the station number modification flag (COM1 SD2545, COM2 SD2595) can be directly set according to the command parameters.

●The specific calculation formula for setting the station number modification flag (COM1 SD2545, COM2 SD2595) is: (parameter setting value + offset of the corresponding serial port's initial special device + 10)*2

●For example, setting the COM2 station number to 1 is (1 +2595-2590 +10)*2, which is (1 +5+10) *2=32. At this time, SD2594 will be set to 1, and SD2595 will be set to 32.

#Note: Whether it is by self-calculation and then modifying the ID (COM1 SD2545, COM2 SD2595) setting value to the station number, or setting with this instruction, the station number can be modified when the PLC is in the RUN state.

●Regarding station number modification identification (COM1 SD2545, COM2 SD2595): During RUN, when the station number is set and the modification identification is correct (judgment at END) to the correct first cycle, the station number will be modified when the modification is completed (COM1 SD2545, COM2 SD2595) are cleared, and then set the same value will not be processed. Mainly to avoid repeated settings multiple times.

Related software components

| Devices	Content
SD2544	COM1 station number setting
SD2545	COM1 station number modification sign
SD2594	COM2 station number setting
SD2595	COM2 station number modification sign

Error code

Error code	Content
4085H	The read address of (s) and (N) exceeds the device range
4084H	(s) not in the range of 0 to 255
	(N) is not 0 or 1

#Note:

The setting of communication parameters will affect the overall communication. The processing in the PLC is to modify it when there is no communication or after a round of communication is completed. This point needs attention.

Example
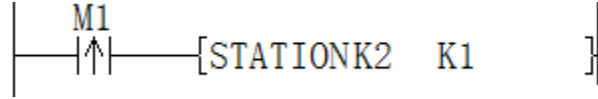
Example above

M1 changes from OFF->ON during run

SD2594 will be set to 2, SD2595 will be set to 34 and then it will be cleared. At this time it has been set successfully

If you turn M1 from OFF->ON again

SD2594 will be set to 2, SD2595 will be set to 34 but will not be cleared.

RS instruction

RS/External communication instruction

RS

In the case of Modbus master station protocol: This instruction is the setting interface for the master station to send protocol frames. The function code (s), slave address (m), length (d) of the station number set according to the instruction, and the function code determines whether the data of n is required to be automatically combined to send and receive protocol frames. If it is a read type function code, the data will be written into (N).

-[RS (s) (m) (d) (N)]

Content, range and data type

In the case of user-defined protocol:

Parameter	Content	Range	Data type	Data type (label)
(s)	The start address of register area that stores the data to be sent	-	Unsigned BIN 16 bit	ANY16
(m)	The length of data to be sent (bytes)	0 to 523	Unsigned BIN 16 bit	ANY16
(d)	The device start number that stores the written data	-	Unsigned BIN 16 it	ANY16
(N)	Number of data written (bytes)	0 to 523	Unsigned BIN 16 bit	ANY16

In the case of Modbus protocol:

Parameter	Content	Range	Data type	Data type (label)
(s)	The high byte stores the station number of slave station, and the low byte stores function code of Modbus	-	Unsigned BIN 16 bit	ANY16

(m)	Slave address. The address provided by the slave station will read or write data from this address of the slave station	-	Unsigned BIN 16 bit	ANY16
(d)	Length. The length of Modbus read or write. The unit is determined by function code.	-	Unsigned BIN 16 bit	ANY16
(N)	Start address for reading or writing data	-	Unsigned BIN 16 bit	ANY16

Device used

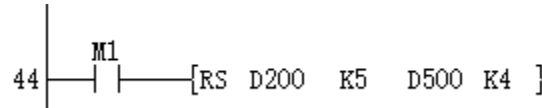| Instruction	Parameter	Devices						Offset modification	Pulse extension
		T	C	D	R	K	H	[D]	XXP
RS	Parameter 1	●	●	●	●	●	●		
	Parameter 2	●	●	●	●	●	●		
	Parameter 3	●	●	●	●	●	●		
	Parameter 4	●	●	●	●	●	●		

(1) Custom protocol

When the communication protocol is set as a [custom protocol]. When the contact in before RS instruction is turned on and SM2591 is also turned on at the same time, if the sending length (m) is not 0, the data of (s) will be sent (m) bytes out, and then it will be in the mode of waiting for reception. When the data is received, (N) bytes of data will be stored in (d). SM2593 will be turned ON after receiving (N) data.

In addition, when the sending length (m) is 0, it will be in the receive-only mode. When the receiving length (N) is 0, it will be in the send-only mode.
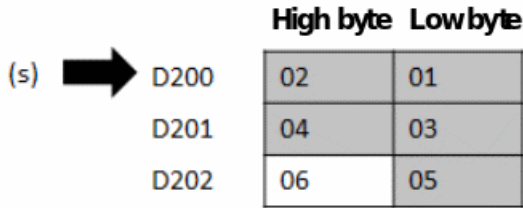
To enable the start character (STX) and the end character (ETX) modes of RS instruction, the status of the 10th and 11th bits of the special address SD2600 must be set. See the table below for detailed settings:

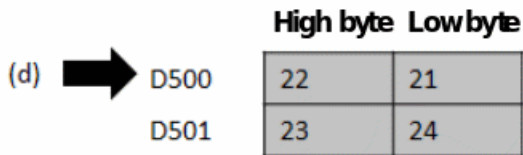| Bit number		B0	B1、B2	B3	B4、B5、B6、B7、B8、B9	B10	B11
Name		Data length	Parity	Stop Bit	Baud rate(bps)	STX	ETX
Content	0 off	7-bit	b2, b1 (0,0): None	1-bit	9600 001000 19200 001001 38400 001010 57600 001011	None	None
	1 on	8-bit	(0,1): Odd parity (ODD) (1,1): Even parity (EVEN)	2-bit	115200 001100 187500 001101 230400 001110 460800 001111 921600 010000	Turn on STX, the STX value is set in SD2600	Turn on ETX, the ETX value is set in SD2601

Example

```
        M1
44 ──┤ ├──────[RS  D200  K5   D500  K4 ]
```

When M1 is ON, the sending and receiving data of communication after executing instruction is stored as the following figure.

High byte Low byte

(s) ➡ D200

02	01
04	03	D201
06	05	D202

The data sent in the figure are:
01H、02H、03H、04H、05H

The amount used for the deep background is the length of sending(m)

High byte Low byte
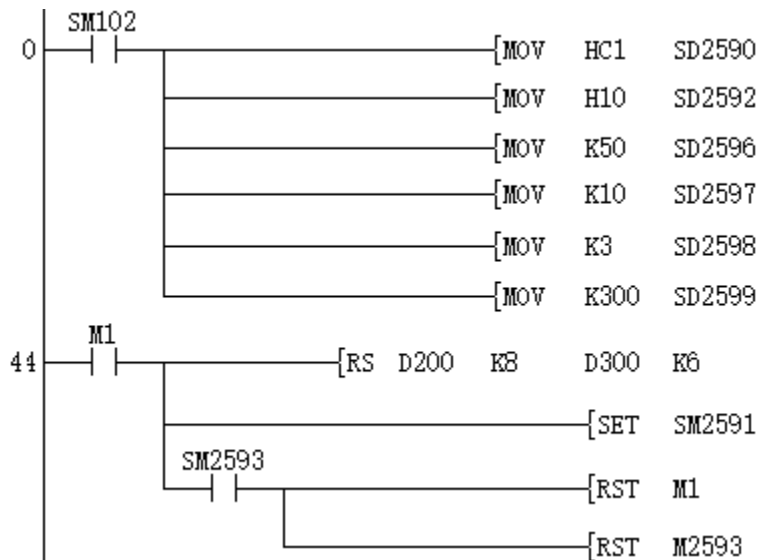
(d) ➡ D500

22	21
23	24	D501

The data sent in the figure are: 21H、22H、23H、24H

The amount used for the deep background is the length of receiving(n)

Some configuration and preparation of serial communication are needed for actual programming to communicate as expected, such as setting the transceiver mode of serial port, baud rate, number of bits, parity, software protocol settings, timeout judgment conditions, and data preparation for the transceiver buffer, send and receive flag processing, etc.,

A relatively complete RS communication setup program is shown as follows:

```
     SM102
0 ──┤ ├──────────────────────────[MOV   HC1    SD2590 ]
    │                             [MOV   H10    SD2592 ]
    │                             [MOV   K50    SD2596 ]
    │                             [MOV   K10    SD2597 ]
    │                             [MOV   K3     SD2598 ]
    │                             [MOV   K300   SD2599 ]

     M1
44 ──┤ ├──────────[RS   D200   K8   D300   K6 ]
    │                             [SET   SM2591 ]
    │ SM2593
    └─┤ ├─────────────────────────[RST   M1    ]
                                  [RST   M2593  ]
```

Serial port parameters settings:

Baud rate 112500, stop bit 1, data bit 8, parity bit none

Set the protocol as a custom protocol

Sending interval: 5ms

Receiving timeout: 100ms

Number of repetitions: 3 times

Timeout between characters: 30ms

Custom protocol, send start address D200, sending length 8, receive start address D300, receiving length 8,

Receive start address D300 Receive length 6

Send directly after trigger

After receiving, close the instruction directly and reset the instruction receiving flag
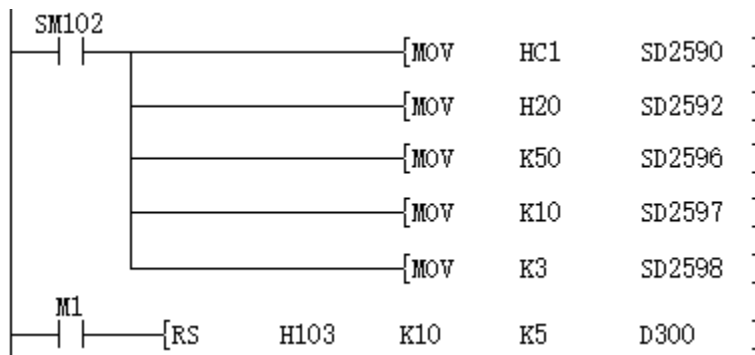
For detailed user-defined protocol instructions, please refer to "10.7.1 Custom protocol description"

(2) Modbus protocol

When the protocol is set to Modbus master protocol (whether it is RTU or ASCII). When the contact before RS instruction is turned ON, the RS instruction will send the combined data frame according to the station number function code (s), slave station address (m), length (d) and judge whether the data of (N) is needed according to the function code.

```
      M1
7 ────┤ ├────[RS   H103  K10  K5   D300 ]
```
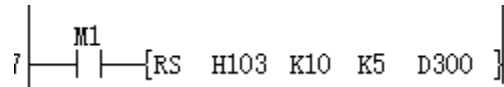
Parameter	Content
(s)	The high byte stores the station number of slave station, and the low byte stores the function code of Modbus
(m)	Slave address. The address provided by the slave station will read or write data from this address of the slave station
(d)	Length, the length of Modbus read or write. The unit is determined by the function code.
(N)	Start address for reading or writing data

```
 SM102
──┤ ├──────────────────────[MOV    HC1    SD2590 ]
          │
          ├───────────────[MOV    H20    SD2592 ]
          │
          ├───────────────[MOV    K50    SD2596 ]
          │
          ├───────────────[MOV    K10    SD2597 ]
          │
          └───────────────[MOV    K3     SD2598 ]
 M1
──┤ ├──────[RS     H103    K10    K5    D300 ]
```

Serial port parameter setting

Baud rate 115200, data bit 8, parity bit none, stop bit 1

Communication protocol setting: ModbusRTU master station protocol

Sending interval: 5ms

Receiving timeout: 100ms

Timeout retry times: 3 times

Station number 01H, function code 03H, slave address 10, length 05

As the ladder program shown above:

When M1 is turned ON, PLC will send data (hexadecimal) from COM2 of PLC: 01 03 00 0A 00 05 A5 C8

01: represents slave address, the upper 8 bits of (s);

03: Modbus instruction code, the lower 8 bits of (s), meaning to read the slave register;

00 0A: The address of slave register to be read, the value of (m);

00 05: The number of registers to be read, the value of (d),

A5 C8: CRC check code.

For detailed custom protocol instructions, please refer to "10.7.2 Modbus protocol description"

#Note:

Although the RS instruction currently allows all the parameters of the instruction to use constants such as K and H, there are different restrictions depending on the protocol.

When the protocol is a custom protocol, S and D cannot be constants, otherwise it will report (3189H) error.

When the protocol is Modbus protocol, n cannot be a constant, otherwise it will report (3189H) error.

The combination of RTU protocol and 7-bit data bits cannot be set.

If the serial port parameter settings are different, it may still be able to communicate. At present, it is normal to set one.

Currently, the RS instruction cannot be used in interrupts and events.

Error code

Error code	Content
4085H	The read address of (s), (m), (d) and (N) exceed the device range.
3180H	COM2 data reception error. There may be interference on the communication line, it is recommended to connect the grou
3181H	COM2 data reception timed out. "Check the wiring, check whether the serial port parameter settings are compatible with sending interval SD2546."
3182H	COM2 CRC check error. There may be interference on the communication line, it is recommended to connect the ground
3183H	COM2 LRC check error. There may be interference on the communication line, it is recommended to connect the ground
3184H	The COM2 station number is incorrectly configured. Check the slave station number setting, and check whether there is
3185H	COM2 send buffer overflow. Contact a technician if this error occurs
3186H	COM2 function code is wrong. Check whether the set function code is a function code supported by PLC
3187H	COM2 address is wrong. Check whether the slave station has this address (please refer to Modbus Abnormal 02)
3188H	The length of COM2 is wrong. Check whether the communication length exceeds the length range specified by the Modb
3189H	COM2 data error. "Check whether there are errors in the parameters of the instruction. Check whether the slave station s
318AH	COM2 slave station is busy. Slave station returns information: Slave station is busy (please refer to Modbus exception 06
318BH	COM2 slave station does not support function codes. Check whether the slave station supports this function code (pleas
318CH	COM2 slave station is faulty. Slave station returns information: Slave station is faulty, please check whether the slave sta
318DH	COM2 slave station confirmation. Slave station return information: slave station confirmation (please refer to Modbus abi
318EH	COM2 current protocol does not support this instruction or function. The related conmunication instruction of master stat corresponding instruction or diable the corresponding communication function.
318FH	COM2 sending timed out. Contact a technician if this error occurs
31A0H	COM2 is not available as a gateway. Slave station returns information: unavailable gateway (please refer to Modbus exc
31A1H	COM2 indicates that no response was obtained from the target device. Slave station returns information: the device is no

RS2 instruction

RS2/External communication instruction

RS2

In custom protocol: This instruction is a communication send and receive instruction. It takes out (M) of the initial data specified (s) and send it, and stores (N) of the data received through the serial port in (d) and sent by (n1) automatic communication port.

In Modbus master station protocol: This instruction is the setting interface for the master station to send protocol frames. According to the station number function code (s), slave address (m), length (d) set by the instruction, and the function code to determine whether n data is required to automatically combined sending and receiving protocol frames. If it is a read type function code, the data would be written to (N) and sent by (n1) custom communication port.

-[RS2 (s) (m) (d) (N) (n1)]

Content, range and data type

In custom protocol

Parameter	Content	Range	Data type	Data type (label)
(s)	The start address of register area that stores the data to be sent	-	Unsigned BIN 16 bit	ANY16
(m)	The length of data to be sent (bytes)	0 to 528	Unsigned BIN 16 bit	ANY16
(d)	The device start number that stores the written data	-	Unsigned BIN 16 bit	ANY16
(N)	Number of data written (bytes)	0 to 528	Unsigned BIN 16 bit	ANY16
(n1)	Specify the communication port		Unsigned BIN 16 bit	ANY16

In Modbus protocol

Parameter	Content	Range	Data type	Data type (label)
(s)	The high byte stores the station number of slave station, and the low byte stores function code of Modbus	-	Unsigned BIN 16 bit	ANY16
(m)	Slave address. The address provided by the slave station will read or write data from this address of the slave station	-	Unsigned BIN 16 bit	ANY16
(d)	Length. The length of Modbus read or write. The unit is determined by function code.	-	Unsigned BIN 16 bit	ANY16
(N)	The start address of the data to be read or written	-	Unsigned BIN 16 bit	ANY16
(n1)	Specify the communicatiom port		Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices							Offset modification	Pulse extension
		T	C	D	R	SD	K	H	[D]	XXP
RS2	(s)	●	●	●	●	●	●	●	-	-
	(m)	●	●	●	●	●	●	●	-	-
	(d)	●	●	●	●	●	●	●	-	-
	(N)	●	●	●	●	●	●	●	-	-
	(n1)						●	●		

Features

Parameter (n1) is the specified port. Curently, k0 indicates COM1, and k1 indicates COM2.
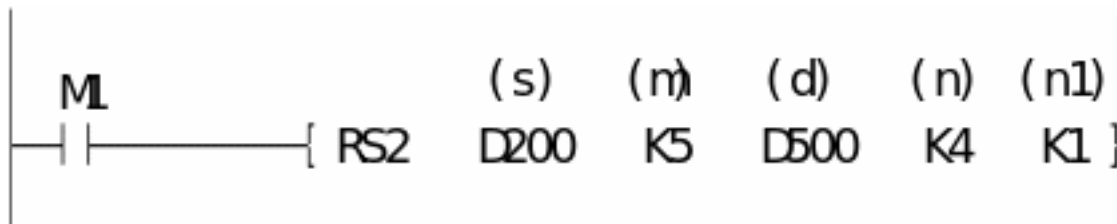
(1) Custom protocol

When the communication protocol is set as a custom protocol. When the contact in before RS2 instruction is turned on and "sending control enable" is also turned on at the same time, and the sending length (m) is not 0, the data of (s) will be sent (m) bytes out, and then it will be in the mode of waiting for reception. When the data is received, (N) bytes of data will be stored in (d). "reception control or reception notice" will be turned ON after receiving (N) data.

In addition, when the sending length (m) is 0, it will be in the receive-only mode. When the receiving length (N) is 0, it will be in the send-only mode.
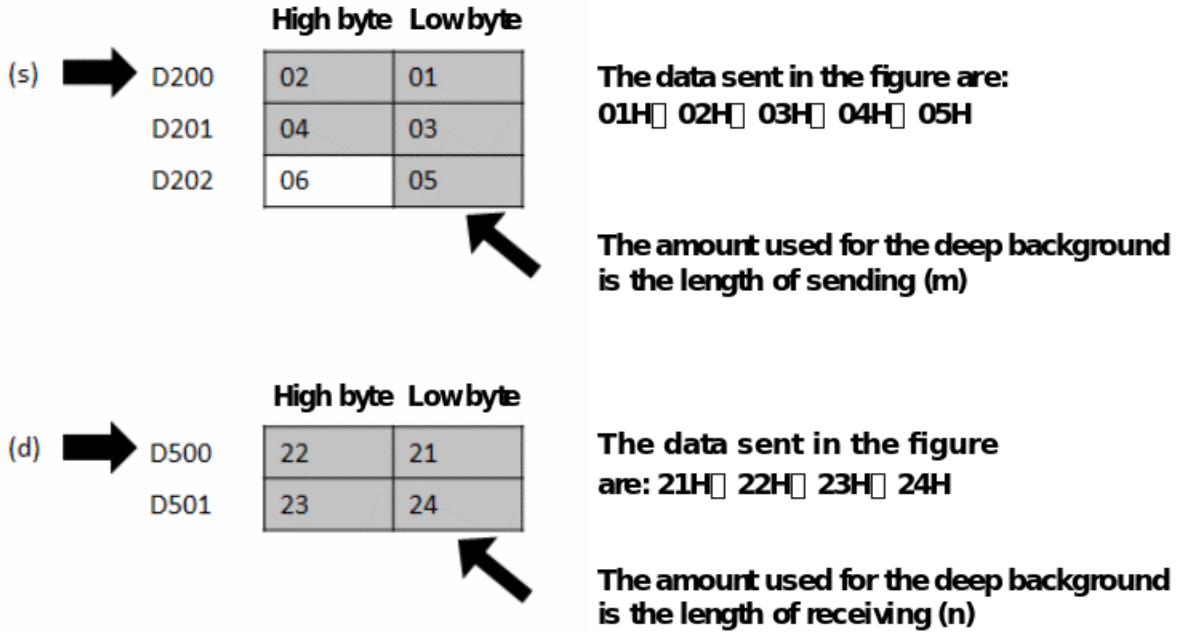
To enable the start character (STX) and the end character (ETX) modes of RS2 instruction, the status of the 10th and 11th bits of the special address "communication port setting" must be set. See the table below for detailed settings:

| Bit number		B0	B1、B2	B3	B4、B5、B6、B7、B8、B9		B10	B11
Name		Data length	Parity	Stop Bit	Baud rate(bps)		STX	ETX
Content	0 off	7-bit	b2, b1 (0,0): none	1-bit	9600	001000	None	None
					19200	001001		
	1 on	8-bit	(0,1): odd parity (ODD)	2-bit	38400	001010	Turn on STX, the STX value is set in the device of the corresponding communication	Turn on ETX, the ETX value is set in the device of the corresponding communication
					57600	001011		
			(1,1): even parity (EVEN)		115200	001100		
					187500	001101		
					230400	001110		
					460800	001111		
					921600	010000		

Example

When M1 is ON, the sending and receiving data of communication after executing instruction is stored as the following figure.

The data sent in the figure are:
01H、02H、03H、04H、05H

The amount used for the deep background is the length of sending (m)

The data sent in the figure are: 21H、22H、23H、24H

The amount used for the deep background is the length of receiving (n)

Some configuration and preparation of serial communication are needed for actual programming to communicate as expected, such as setting the transceiver mode of serial port, baud rate, number of bits, parity, software protocol settings, timeout judgment conditions, and data preparation for the transceiver buffer, send and receive flag processing, etc.,

A relatively complete RS communication setup program is shown as follows:
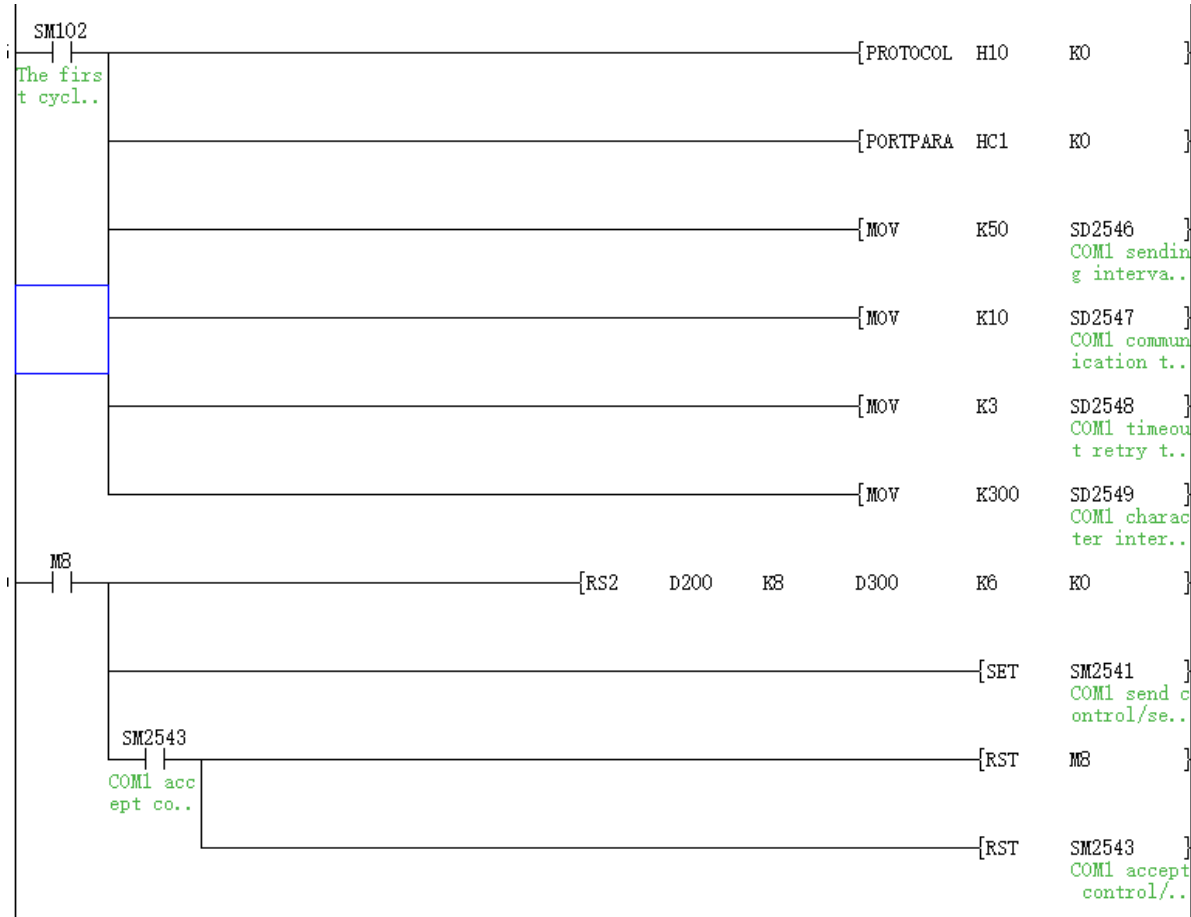
Set the protocol to a custom protocol.

Set serial port parameter: baud rate 115200 stop bit 1, data bit 8, no parity bit

For detailed custom protocol instructions, please refer to "10.7.1 Custom protocol description"

(2) Modbus protocol

When the protocol is set to Modbus master protocol (whether it is RTU or ASCII). When the contact before RS2 instruction is turned ON, the RS2 instruction will send the combined data frame according to the station number function code (s), slave station address (m), length (d) and judge whether the data of (N) is needed according to the function code.
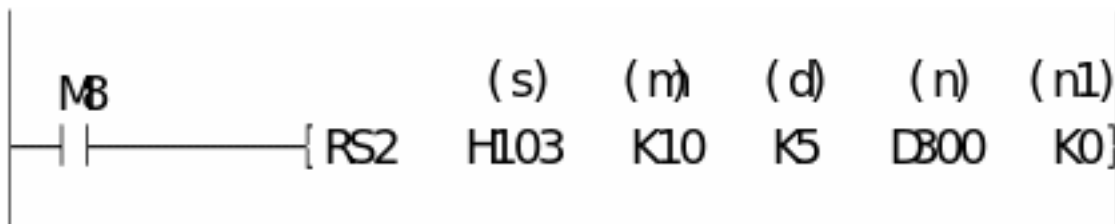

Parameter	Content
(s)	The high byte stores the station number of slave station, and the low byte stores function code of Modbus
(m)	Slave address. The address provided by the slave station will read or write data from this address of the slave station

(d)	Length. The length of Modbus read or write. The unit is determined by function code.
(N)	The start address of the data to be read or written
(n1)	Specify the communicatiom port
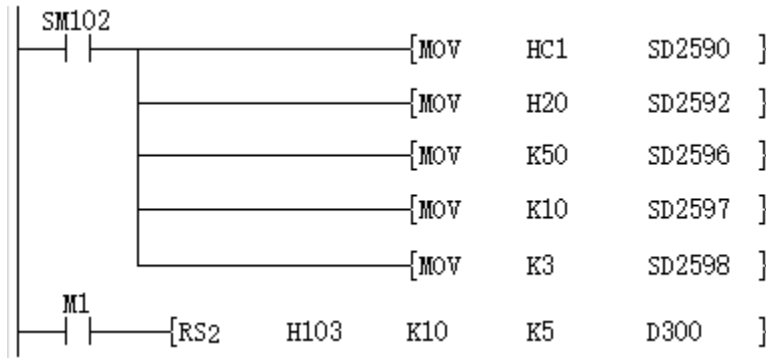
Serial port parameter setting

Baud rate 115200, data bit 8, no parity bit, stop bit 1

Communication protocol setting: ModbusRTU master station protocol

Sending interval: 5ms

Receiving timeout: 100ms

Timeout retry times: 3 times

Station number 01H, function code 03H, slave address 10, length 05

As the ladder program shown above:

When M1 is turned ON, PLC will send data (hexadecimal) from COM2 of PLC: 01 03 00 0A 00 05 A5 C8

01: represents slave address, the high 8 bits of (s);

03: Modbus command code, the low 8 bits of (s), which means to read the slave register;

00 0A: The address of slave register to be read, the value of (m);

00 05: The number of registers to be read, the value of (d),

A5 C8: CRC check code.

For detailed custom protocol instructions, please refer to "10.7.2 Modbus protocol description"

#Note:

Although the RS instruction currently allows all the parameters of the instruction to use constants such as K and H, there are different restrictions depending on the protocol.

When the protocol is a custom protocol, S and D cannot be constants, otherwise it will report (3189H) error.

When the protocol is Modbus protocol, n cannot be a constant, otherwise it will report (3189H) error.

The combination of RTU protocol and 7-bit data bits cannot be set.

If the serial port parameter settings are different, it may still be able to communicate. At present, it is normal to set one.

Currently, the RS2 instruction cannot be used in interrupts and events.

Error code

Error code	Content
4085H	The read address of (s), (m), (d) and (N) exceed the device range.
4084H	The parameter value exceed the specified range
3080H	COM1 data reception error. There may be interference on the communication line, it is recommended to connect the gro
3081H	COM1 data reception timed out. "Check the wiring, check whether the serial port parameter settings are compatible with sending interval".
3082H	COM1 CRC check error. There may be interference on the communication line, it is recommended to connect the ground
3083H	COM1 LRC check error. There may be interference on the communication line, it is recommended to connect the ground
3084H	The COM1 station number is incorrectly configured. Check the slave station number setting, and check whether there is
3085H	COM1 send buffer overflow. Contact a technician if this error occurs
3086H	COM1 function code is wrong. Check whether the set function code is a function code supported by PLC
3087H	COM1 address is wrong. Check whether the slave station has this address (please refer to Modbus Abnormal 02)
3088H	The length of COM1 is wrong. Check whether the communication length exceeds the length range specified by the Modl
3089H	COM1 data error. "Check whether there are errors in the parameters of the instruction. Check whether the slave station
308AH	COM1 slave station is busy. Slave station returns information: Slave station is busy (please refer to Modbus exception 0
308BH	COM1 slave station does not support function codes. Check whether the slave station supports this function code (pleas
308CH	COM1 slave station is faulty. Slave station returns information: Slave station is faulty, please check whether the slave st
308DH	COM1 slave station confirmation. Slave station return information: slave station confirmation (please refer to Modbus ab
308EH	COM1 current protocol does not support this instruction or function. The related conmunication instruction of master sta corresponding instruction or diable the corresponding communication function.
308FH	COM1 sending timed out. Contact a technician if this error occurs
30A0H	COM1 is not available as a gateway. Slave station returns information: unavailable gateway (please refer to Modbus exc
30A1H	COM1 indicates that no response was obtained from the target device. Slave station returns information: the device is n
3181H	COM2 data reception timed out. "Check the wiring, check whether the serial port parameter settings are compatible with "sending interval".
3182H	COM2 CRC check error. There may be interference on the communication line, it is recommended to connect the groun
3183H	COM2 LRC check error. There may be interference on the communication line, it is recommended to connect the groun
3184H	The COM2 station number is incorrectly configured. Check the slave station number setting, and check whether there is
3185H	COM2 send buffer overflow. Contact a technician if this error occurs
3186H	COM2 function code is wrong. Check whether the set function code is a function code supported by PLC
3187H	COM2 address is wrong. Check whether the slave station has this address (please refer to Modbus Abnormal 02)
3188H	The length of COM2 is wrong. Check whether the communication length exceeds the length range specified by the Modl
3189H	COM2 data error. "Check whether there are errors in the parameters of the instruction. Check whether the slave station
318AH	COM2 slave station is busy. Slave station returns information: Slave station is busy (please refer to Modbus exception 0
318BH	COM2 slave station does not support function codes. Check whether the slave station supports this function code (pleas
318CH	COM2 slave station is faulty. Slave station returns information: Slave station is faulty, please check whether the slave st
318DH	COM2 slave station confirmation. Slave station return information: slave station confirmation (please refer to Modbus ab
318EH	COM2 current protocol does not support this instruction or function. The related conmunication instruction of master sta corresponding instruction or diable the corresponding communication function.
318FH	COM2 sending timed out. Contact a technician if this error occurs
31A0H	COM2 is not available as a gateway. Slave station returns information: unavailable gateway (please refer to Modbus exc
31A1H	COM2 indicates that no response was obtained from the target device. Slave station returns information: the device is n

Expansion module communication

Single word data writing from TO/PLC to the module (16-bit specification)

TO(P)

Write the data at the start (N) point of the device specified in (s3) to the buffer memory in the intelligent function module specified in (s1) after the address specified in (s2).

-[TO (s1) (s2) (s3) (N)]
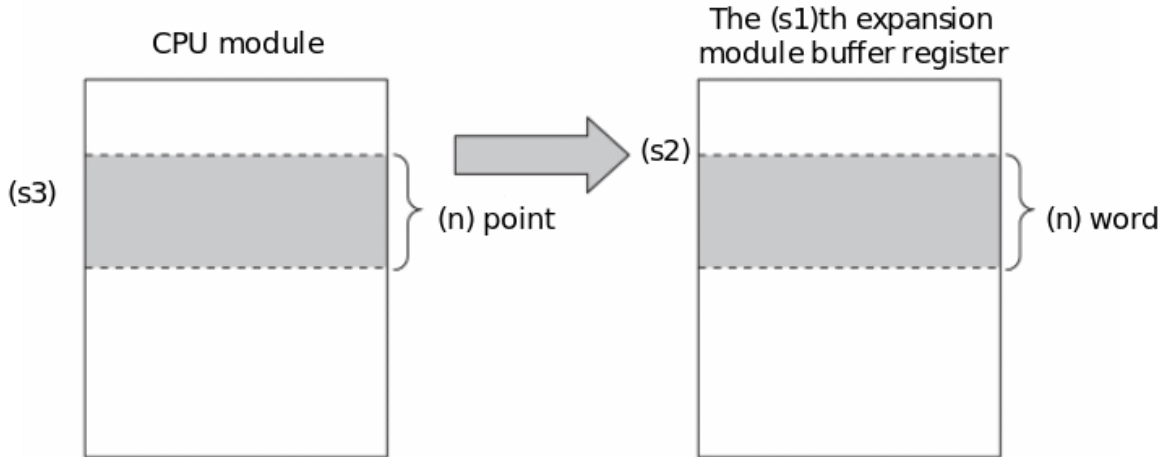
Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Module number, the first module is 0, the second module is 1, and so on	0 to 32767	Unsigned BIN 16 bit	ANY16
(s2)	Start writing from which BFM in the module	0 to 32767	Unsigned BIN 16 bit	ANY16
(s3)	Start number of the device storing the written data	-32768 to 32767	Signed BIN 16 bit	ANY16
(N)	Number of data written	0 to 512	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
TO	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 3	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 4	●	●	●	●	●	●	●	●	●	●	●	●

Features

Write the data at the start (N) point of the device specified in (s3) to the buffer memory in the intelligent function module specified in (s1) after the address specified in (s2).

As the following Circuit program

Indicates that when X1 is ON, write the data in the PLC's D220 register to the buffer register (BFM) #24 in the #1 (second) special module. When X1 is OFF, no operation is performed.

Currently LX5VPLC supports 16 special expansion modules at the same time.

The special devices used are as follows

Devices	Content
SD2081	Total number of modules
SD2082	Number of IO expansion modules
SD2083	Number of special expansion modules
SD2084	The first missing expansion module. When the value is -1, it means not lost

Error code

Error code	Content
4085H	The read addresses of (s1), (s2), (s3) and (N) exceed the device range
4084H	(s1) and (s2) is not in the range of 0 to 32767 or (N) is not in the range of 0 to 512
7080H	Check error when communicating between PLC and module
7081H	Expansion module communication message is abnormal
7082H	FROM/TO instruction error
7083H	The specified extension module was not found

Example
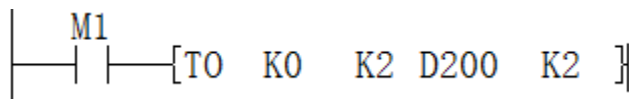
When M1 is turned on

The values of D200 and D201 will be passed to BFM2 and BFM3 of module #0 (the first)

| D200 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| D201 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 |

◉ Buffer memory   Module station `0`   Address `0`   Dec

| Monitor start | Monitor end | Set current value | Close |

Device	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0001	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
0002	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	30
0003	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	40
0004	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8

Double word data write from DTO/PLC to the module (32-bit specification)

DTO(P)

Write the data of (N)×2 points from the device specified in (s3) to the buffer memory in the intelligent function module specified in (s1) and beyond the address specified in (s2).

-[DTO (s1) (s2) (s3) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Module number, the first module is 0, the second module is 1, and so on	0 to 32767	Unsigned BIN 16 bit	ANY16
(s2)	Start writing from which BFM in the module	0 to 32767	Unsigned BIN 16 bit	ANY16
(s3)	Start number of the device storing the written data	-2147483648 to 2147483647	Signed BIN 32 bit	ANY32
(N)	Number of data written	0 to 256	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices												Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	LC	HSC	K	H	[D]	XXP
DTO	Parameter 1	●	●	●	●	●	●	●				●	●	●	●
	Parameter 2	●	●	●	●	●	●	●				●	●	●	●
	Parameter 3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 4	●	●	●	●	●	●	●				●	●	●	●

Features

Write the data of (N)×2 points from the device specified in (s3) to the buffer memory in the intelligent function module specified in (s1) and beyond the address specified in (s2).

As the following Circuit program

Indicates that when M1 is ON, write the data in the PLC's D200 and D201 registers to the buffer registers (BFM) #1 and #2 in the #0 (first) special module. When X1 is OFF, no operation is performed.

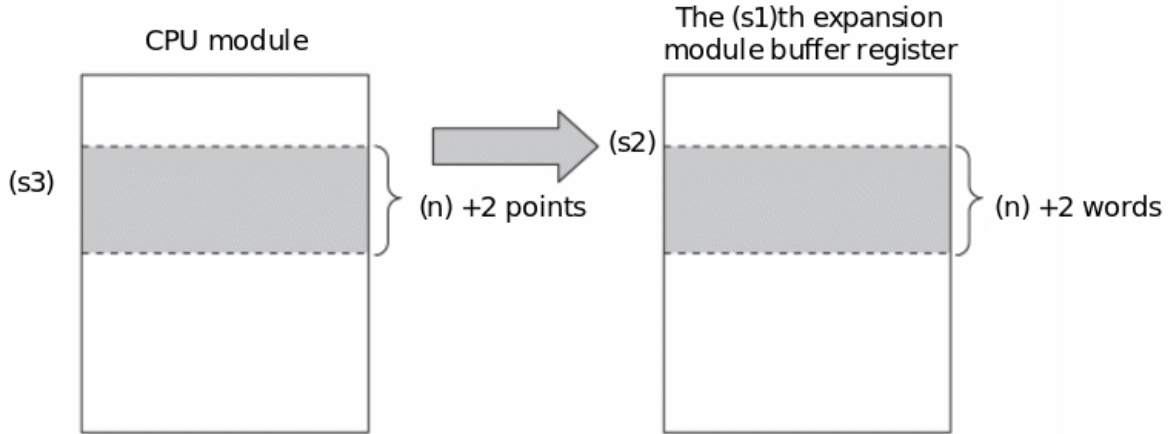Currently LX5VPLC supports 16 special expansion modules at the same time.

The special devices used are as follows

Devices	Content
SD2081	Total number of modules
SD2082	Number of IO expansion modules
SD2083	Number of special expansion modules
SD2084	The first missing expansion module. When the value is -1, it means not lost

Error code

Error code	Content
4085H	(s1) (s2) (s3) (N) The read address exceeds the device range
4084H	(s1) (s2) is not in the range of 0 to 32767 or (N) is not in the range of 0 to 256
7080H	Check error when communicating between PLC and module
7081H	Expansion module communication message is abnormal
7082H	FROM/TO instruction error
7083H	The specified extension module was not found

Example
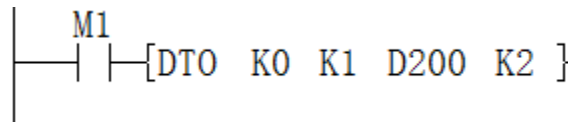
When M1 is turned on

The values from D200 to D203 will be transferred to BFM1 to BFM4 of module #0 (first)

		0	1	2	3	4	5	6	7	8	9	0	0	0	0	0	0	
D200		0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	30
D201		0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	40
D202		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D203		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

◉ Buffer memory   Module station 0   Address 0   Dec

[Monitor start]   [Monitor end]   [Set current value]   [Close]

Device	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0001	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	30
0002	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	40
0003	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0004	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

FROM/Read single word data from the module (16-bit specification)

FROM(P)

Read (N) word data from the buffer memory specified in (s2) in the module specified in (s1), and store it in the device specified in (d) and later.

Ladder

-[FROM (s1) (s2) (d) (N)]

Content, range and data type

| Parameter	Content	Range	Data type	Data type (label)
(s1)	Module number, the first module is 0, the second module is 1, and so on	0 to 32767	Unsigned BIN 16 bit	ANY16
(s2)	Start reading from which BFM in the module	0 to 32767	Unsigned BIN 16 bit	ANY16
(d)	Start number of the device storing the read data	-	Signed BIN 16 bit	ANY16
(N)	Number of read data	0 to 512	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices											Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
FROM	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 3	●	●	●	●	●	●	●				●	●
	Parameter 4	●	●	●	●	●	●	●	●	●	●	●	●

Features

Read (N) word data from the buffer memory specified in (s2) in the intelligent function module specified in (s1) and store it in the device specified in (d) and later.
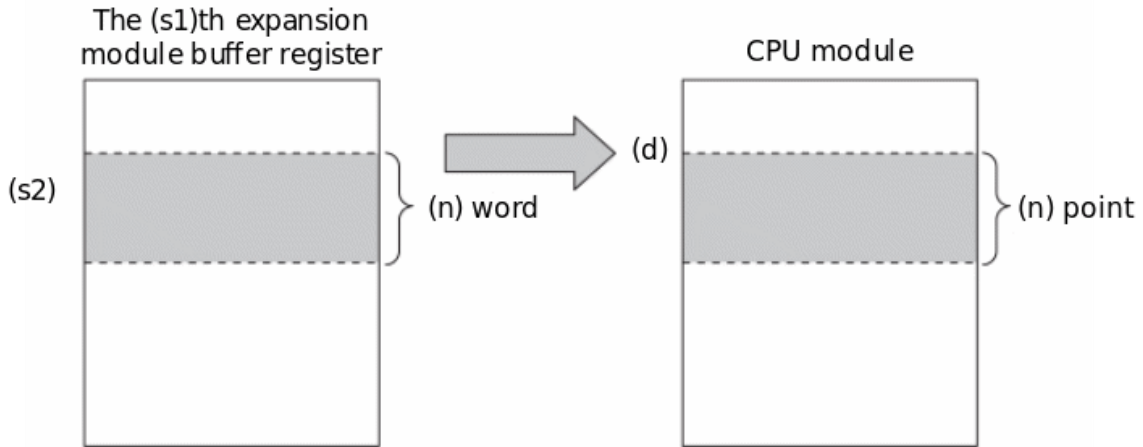
As the following Circuit program
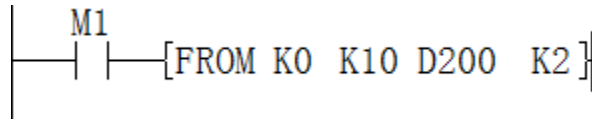
It means that when M1 is ON, the data in the buffer registers (BFM) #10 and #11 in the special module #0 (the first) will be written into the D200 and D201 registers of the PLC. When M1 is OFF, no operation is performed.

Currently LX5VPLC supports 16 special expansion modules at the same time.
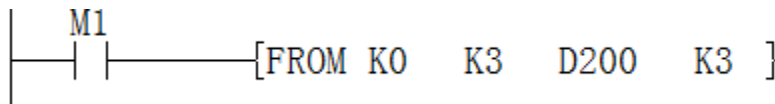
The special soft components used are as follows:

Devices	Content
SD2081	Total number of modules
SD2082	Number of IO expansion modules
SD2083	Number of special expansion modules
SD2084	The first missing expansion module. When the value is -1, it means not lost

Error code

Error code	Content
4085H	(s1) (s2) (N) The read address exceeds the device range
4086H	(d) The write address exceeds the device range
4084H	(s1) (s2) is not in the range of 0 to 32767 or (N) is not in the range of 0 to 512
7080H	Check error when communicating between PLC and module
7081H	Expansion module communication message is abnormal
7082H	FROM/TO instruction error
7083H	The specified extension module was not found

Example

When M1 is turned on

The values of BFM3, BFM4, and BFM5 of the #0 (first) module will be transferred to D200, D201, D202

DFROM/single word data read from the module (32-bit specification)

DFROM(P)

Read (N)*2 words of data from the buffer memory specified in (s2) in the module specified in (s1), and store it in the device specified in (d) and later.

-[DFROM (s1) (s2) (d) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	Module number, the first module is 0, the second module is 1, and so on	0 to 32767	Unsigned BIN 16 bit	ANY16
(s2)	Start reading from which BFM in the module	0 to 32767	Unsigned BIN 16 bit	ANY16
(d)	Start number of the device storing the read data	-	Signed BIN 32 bit	ANY32
(N)	Number of read data	0 to 256	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices												Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	LC	HSC	K	H	[D]	XXP
DFROM	Parameter 1	●	●	●	●	●	●	●	●			●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●			●	●	●	●
	Parameter 3	●	●	●	●	●	●	●	●	●	●			●	●

Parameter 4	●	●	●	●	●	●	●		●	●	●	●

Features

Read (N)×2 words of data from the buffer memory specified in (s2) in the intelligent function module specified in (s1), and store it in the device specified in (d) and later.
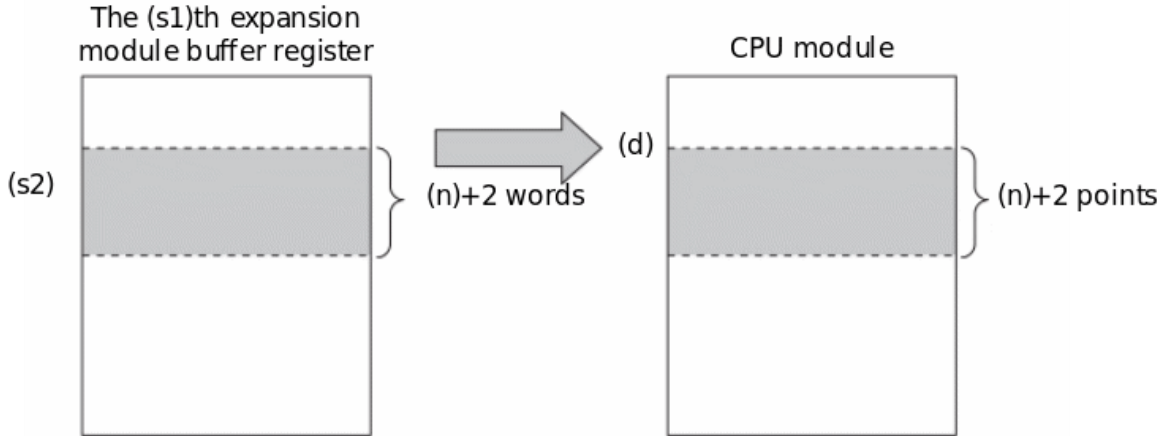
As the following Circuit program
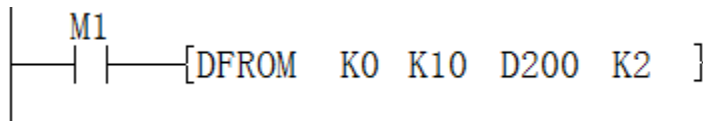

It means that when M1 is ON, the data in the buffer register (BFM) #10 to #13 in the special module #0 (the first) will be written to the D200 to D203 registers of the PLC. When M1 is OFF, no operation is performed.

Currently LX5VPLC supports 16 special expansion modules at the same time.

The special soft components used are as follows:

Devices	Content
SD2081	Total number of modules
SD2082	Number of IO expansion modules
SD2083	Number of special expansion modules
SD2084	The first missing expansion module. When the value is -1, it means not lost

Error code

Error code	Content
4085H	(s1) (s2) (N) The read address exceeds the device range
4086H	(d) The write address exceeds the device range
4084H	(s1) (s2) is not in the range of 0 to 32767 or (N) is not in the range of 0 to 256
7080H	Check error when communicating between PLC and module
7081H	Expansion module communication message is abnormal
7082H	FROM/TO instruction error
7083H	The specified extension module was not found

Example

```
        M1
   ┤├──┤├──────────[DFROM  K0  K3  D200  K3]
```

When M1 is turned on

The value of BFM3 to BFM8 of module #0 (first) will be transferred to D200 to D205

◉ Buffer memory	Module station 0	Address 0	Dec

Monitor start	Monitor end	Set current value	Close

0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0001	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
0002	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
0003	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
0004	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
0005	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
0006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
0007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
0008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
0009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
000A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
000B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
000C	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767

D200	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
D201	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
D202	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
D203	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
D204	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
D205	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	32767
D206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RS and RS2 instructions corresponding protocol description

Custom protocol description

Introduction

The function of custom protocol is that it can directly transmit data with the device without any processing or communicate with other devices with the corresponding protocol set by the customer.

At present, the custom protocol of 5V PLC is configured and sent by COM2, and the instruction used is RS instruction, and it need to configure the protocol and serial port parameters through the Devices.

The current custom protocol is generally close to 3V series.

Basic configuration

(1) Instructions

The RS instruction itself has the same usage as the previous RS instruction at 3V, and it can use R device.

-[RS (s) (m) (d) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The start address of the register area where the data to be sent is stored	-	Unsigned BIN 16 bit	ANY16
(m)	Is the length of the data to be sent (number of bytes)	0 to 528	Unsigned BIN 16 bit	ANY16
(d)	Start number of the device storing the written data	-	Unsigned BIN 16 bit	ANY16
(N)	Number of data written	0 to 528	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices						Offset modification	Pulse extension
		T	C	D	R	K	H	[D]	XXP
RS	Parameter 1	●	●	●	●	●	●		
	Parameter 2	●	●	●	●	●	●		
	Parameter 3	●	●	●	●	●	●		
	Parameter 4	●	●	●	●	●	●		

#Note: Although the RS instruction currently allows all the parameters of the instruction to use constants such as K and H, there are different restrictions according to the different protocol. When the protocol is a custom protocol, S and D cannot be constants, otherwise it will report an error.

(2) Special device settings

Special address table

COM2 special D device (SD)		COM2 special M Device (SM)	
2590	**Communication port setting**	2590	**Send control on**
2591	**Serial parameter modification identification**	2591	**Send control/send reminder**
2592	Protocol settings	2592	**Receive control on**
2593	Protocol modification logo	2593	**Accept control/receive prompt**
2594	Station number setting	2594	**8-bit mode (for custom protocol)**
2595	Station number modification logo	2595	
2596	**Sending interval (0.1ms) 0-32767** **It is 10 (1ms) when set to 0**	2596	
2597	**Communication timeout setting (10ms) 0-32767**	2597	

	It is 10(100ms) when set to 0		
2598	**Timeout retry times 0-32767**	2598	
2599	**Character interval timeout setting (for custom protocol) (0.1ms)**	2599	
	0-32767 . It is 10 (1ms) when set to 0		
2600	**STX value**	2600	
2601	**ETX value**	2601	
...		...	
2610	**The amount of data received**	2610	**Communication complete flag**
2611	**Last error**	2611	**Receiving flag**
2612	**Current error**	2612	**Retry occurred**
2613	**Error steps**	2613	**Communication error**
2614	**Error station number**	2614	**Communication timeout**
2615	**Cumulative number of errors**	2615	

The contents that the custom protocol will be used and set has been marked with underline and bold.

In addition, the devices to be used as judgment conditions have also been marked in bold in the table.

#Note: COM1 currently does not support custom protocols.

1) Communication port setting SD2590

Bit number		**B0**	B1 、B2	**B3**	B4 、B5 、B6 、 B7 、B8 、B9	**B10**	**B11**
Name		Data length	Parity	Stop Bit	Baud rate(bps)	STX	ETX
Content	**0 off**	7 bit	b2,b1	1 bit	4800 0111	None	None
	1 on	8 bit	(0,0): None	2 bit	9600 1000	Turn on ETX, the ETX value is set in SD2600	Turn on ETX, the ETX value is set in SD2601
			(0,1): Odd parity (ODD)		19200 1001		
			(1,1): Even parity (EVEN)		38400 1010		
					57600 1011		
					115200 1100		
					187500 1101		
					230400 1110		
					460800 1111		
					921600 10000		

Set the serial port parameters to SD2590 according to the bit settings provided in the table above. The setting is roughly the same as 3V. It is mainly because the baud rate can be set to a higher baud rate, the bit used need backward two bits when STX and ETX start.

For example: To set the serial port parameters: baud rate 115200, stop bit 1, data bit 8, no parity bit, turn on STX, you need to set the value H4C1 (K1217) on SD2590. The parameters directly set to SD2590 are only valid in the first cycle of PLC RUN.

If you need to modify it during RUN, you can use the PORTPARAM instruction to set it.

2) Protocol setting SD2592

Protocol settings	**Protocol settings**

0 H	Wecon Modbus slave station	10 H	Cunstom protocol
2 H	ModbusRTU slave station	20 H	ModbusRTU master station
3 H	ModbusASCII slave station	30 H	ModbusASCII master station

The corresponding protocol can be set by setting the corresponding value in SD2592.

The parameters directly set to SD2592 are only valid in the first cycle of PLC RUN.

If you need to modify it during RUN, you can use the PROTOCOL instruction to set it.

3) Sending interval SD2596

The main function of sending interval is: how long to wait for sending the next instruction after one instruction is completed. If the value is set to 0, there is basically no waiting for sending interval, but it will be affected by the scan cycle.

The unit of the sending interval is 0.1ms, that is, the interval time is 10ms when the setting is 100.

4) Communication timeout SD2597 and timeout retry SD2598
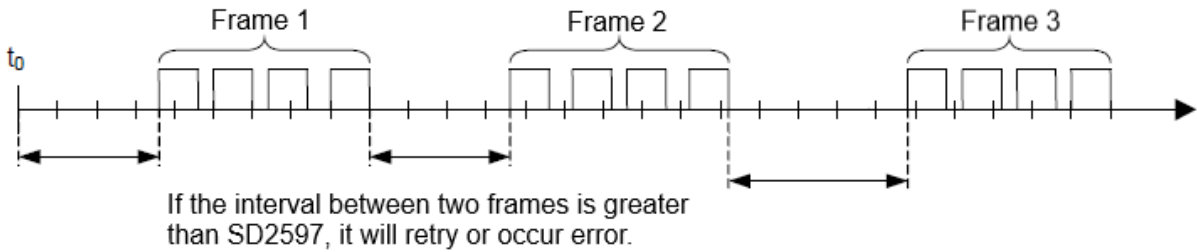
If the interval between two frames is greater than SD2597, it will retry or occur error.

The main function of communication timeout is: How long does it take to wait for no data to be received after the PLC sends retry or occurs an error. When 0 is set, the default is 100ms.

The unit of communication timeout is 10ms, that is, the timeout judgment time is 10ms when the setting is 100.

When a receiving timeout occurs, it will determine whether there are retry times and the current retry times. If the retry times are greater than or equal to SD2598, an error will be reported.

If SD2598 is set to 0, it will not try again.

If it is set to 1, send once again after sending a timeout.

5) Character interval timeout SD2599

Currently this setting is only available for custom protocols.

The main function of the character interval timeout is: after receiving at least one character before the communication timeout, judge whether the interval time between the following two characters has exceeded. if it is, report an error and end the communication.
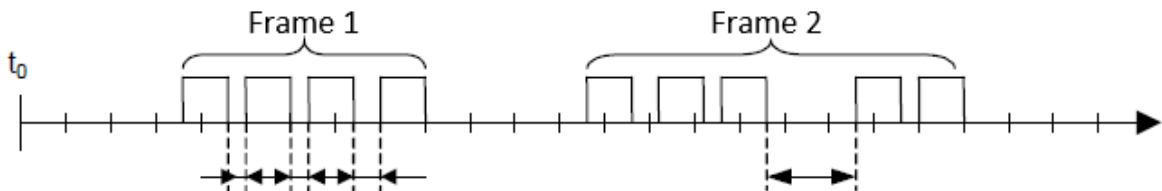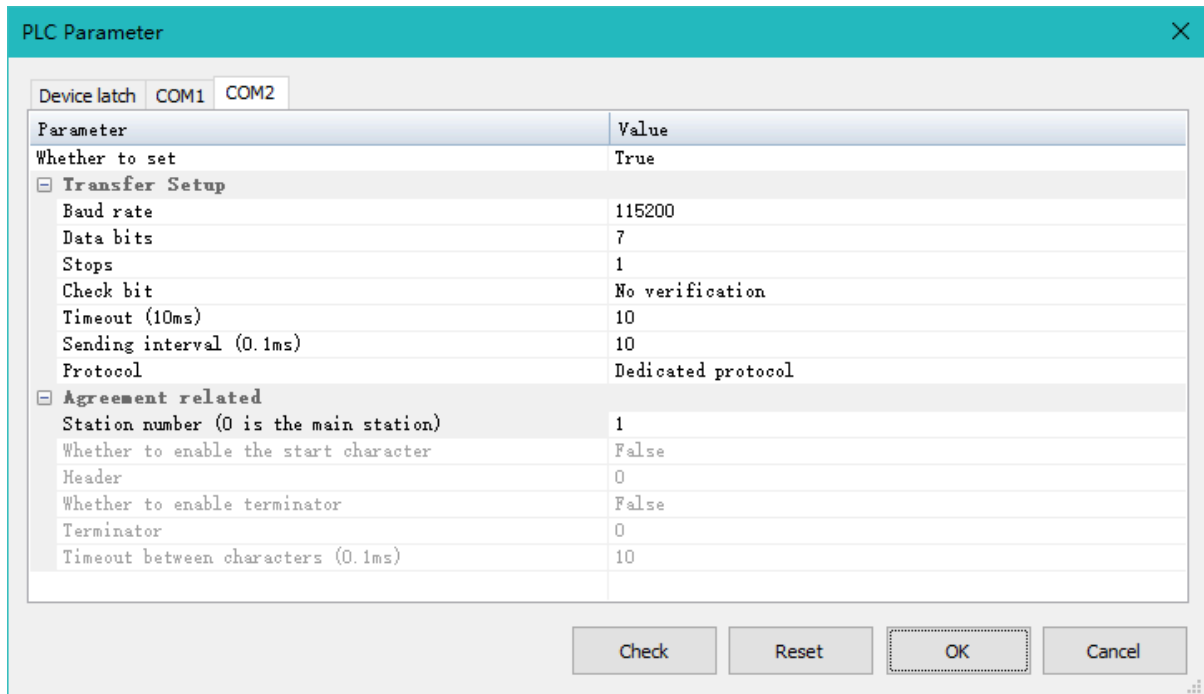

This setting is mainly designed considering that some devices may send slow or have other specific sending requirements.

The character interval timeout will not retry.

(3) Serial port parameter setting instructions

1) Host computer interface settings

Through the PLC parameter setting in the upper computer interface, If protocol is set to none, it is a custom protocol.

The serial port parameter content mainly sets the serial port parameters such as baud rate and data bit.

After the start character is enabled, the start/end character can be sent. The start/end character will also be distinguished when receiving. See the description in the sending and receiving process for details.

#Note: The characters here are decimal values.

2) PORTPARA instruction

-[PORTPARA (s) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Serial port parameters to be set	0 to 256	Unsigned BIN 16 bit	ANY16
(N)	Which communication port to set (0 means COM1, 1 means COM2)	0, 1	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
PROTPARA	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●

Function: To set communication parameters when running.

Please refer to "PORTPARA instruction description" for details.

3) PROTOCOL instruction

-[PROTOCOL (s) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Protocol number to be set	0 to 65535	Unsigned BIN 16 bit	ANY16
(N)	Which communication port to set (0 means COM1, 1 means COM2 *1)	1	Unsigned BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
PORTOCOL	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	

Features:

It is used to set the communication protocol when running. The above instruction actually sets a specific value for the parameter modification flag. The specific calculation formula is: (parameter setting value + the offset of the start special device corresponding to the serial port + 10)*2

For example, setting the protocol to Modbusrtu master station (H20) is (0x20 +2593-2590 +10)*2, that is (32 +3+10) *2=90. This is to prevent the serial port parameters from being modified at will.

The trigger of setting parameters in custom protocol will not change the value until an instruction is completed.

The trigger of setting parameters in Modbus master station protocol won't change the value until an instruction is completed.

The trigger of setting parameters in the Modbus slave protocol can be switched as long as it is not processing the received data. Please refer to "PROTOCOL instruction description" for details.

4) Priority description of serial port parameters

The priority of serial port parameter settings are listed as blow. The serial port parameters are saved by power failure currently.

Serial port parameter set instruction setting = Ladder program MOV instruction set the corresponding SD device > the download parameters of host computer > Previous power-off save data.

(4) Ladder program
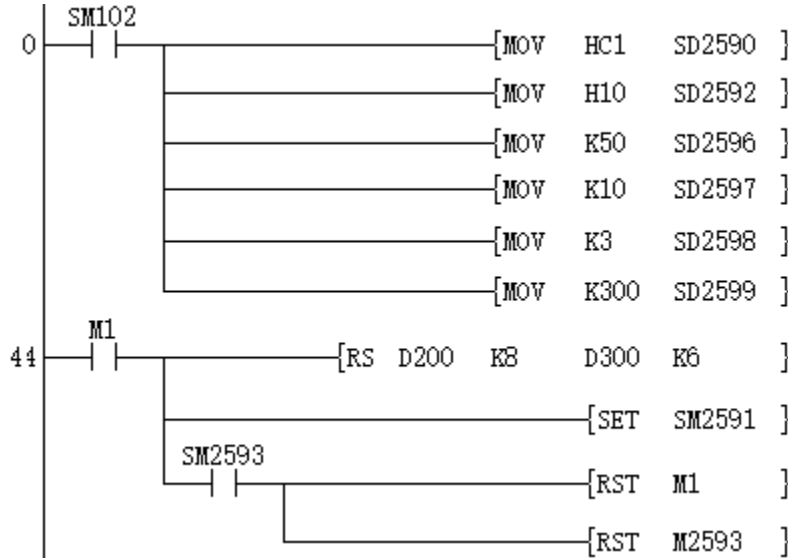
Set serial port parameters:

    Baud rate 112500, stop bit 1, data bit 8, no parity bit none

    Set protocol to custom protocol

    Sending interval: 5ms

    Receiving timeout: 100ms

    Number of repetitions: 3 times

    Characters interval timeout: 30ms

    Custom protocol sending start address D200, sending length 8.

    Receiving start address D300, receiving length 6

    Send directly after trigger

    After receiving is completed, close the instruction directly and reset the instruction receiving flag
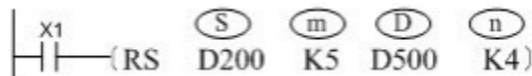
Sending and receiving process

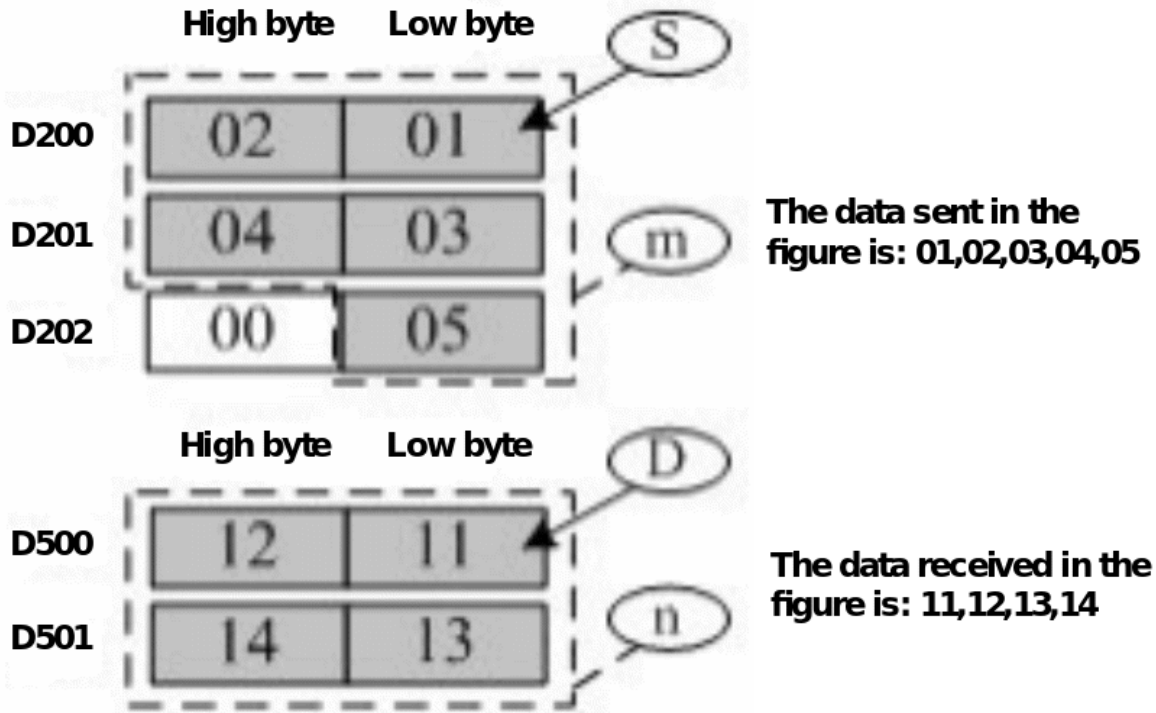**(1) Sending and receiving mechanism**

1) No start character (STX) and end character (ETX)

①16-bit (SM2594 is OFF)

    The devices will be divided into high and low directly, and send data from the low address first and then the high address in order.
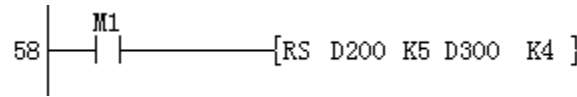
When M1 is ON, the sending and receiving data of communication after the instruction is executed is as the following figure

High byte   Low byte

	High byte	Low byte	
D200	02	01	S
D201	04	03	m
D202	00	05	

The data sent in the figure is: 01,02,03,04,05

	High byte	Low byte	
D500	12	11	D
D501	14	13	n

The data received in the figure is: 11,12,13,14

②8-bit (SM2594 is ON)

Get the value of the low address of device directly and send it

```
        M1
58 ┤ ├                    ─[RS  D200  K5  D300  K4 ]┤
```

软元件	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
D200	0	0	0	0	1	1	1	0	1	0	1	1	1	1	1	0	7D70
D201	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	00E1
D202	1	0	0	0	1	1	0	0	1	0	1	0	1	0	0	0	1531
D203	0	1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1862
D204	0	0	1	1	0	1	1	0	0	1	1	1	1	0	0	0	1E6C
D205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
D206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000

The data sent in the case of the ladder program and the data above should be 70 E1 31 62 6C.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
D300	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0002
D301	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0096
D302	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0042
D303	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0053
D304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000

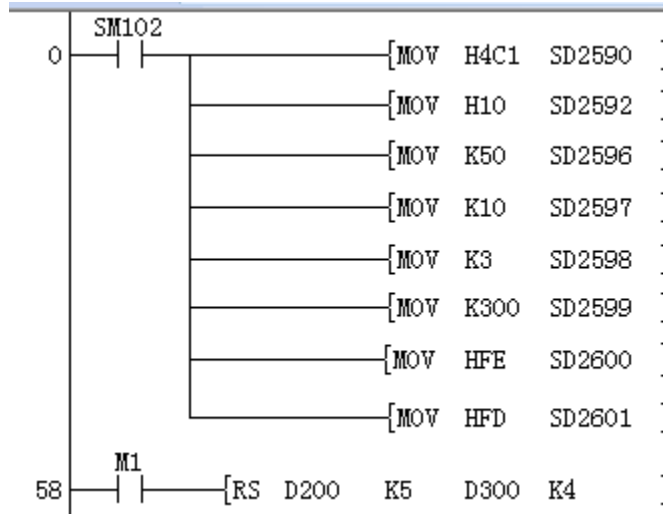Receiving will also be stored in the lower address

2) Open and set the start character STX

The value of the start character SD2600 is only valid in the low bit

When STX is enabled, the send will start with STX. When receiving, the send will start with STX, but STX will not be displayed.

If it receives the STX during the receiving, the receiving will restart.

If the first character is not received, the timeout period is judged by the first character timeout. When a character is received, no matter what data is received, the inter-character timeout will be counted from the last character received.

软元件	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
D200	0	0	0	0	1	1	1	0	1	0	1	1	1	1	1	0	7D70
D201	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	00E1
D202	1	0	0	0	1	1	0	0	1	0	1	0	1	0	0	0	1531
D203	0	1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1862
D204	0	0	1	1	0	1	1	0	0	1	1	1	1	0	0	0	1E6C
D205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
D206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000

For example, the result of the above ladder program and the above data sending is FE 70 7D E1 00 31.

Sending FE 51 26 34 15 to the PLC at this time will receive the following data. And if you send FE 25 63 FE 51 26 34 15 you will also receive the following data.
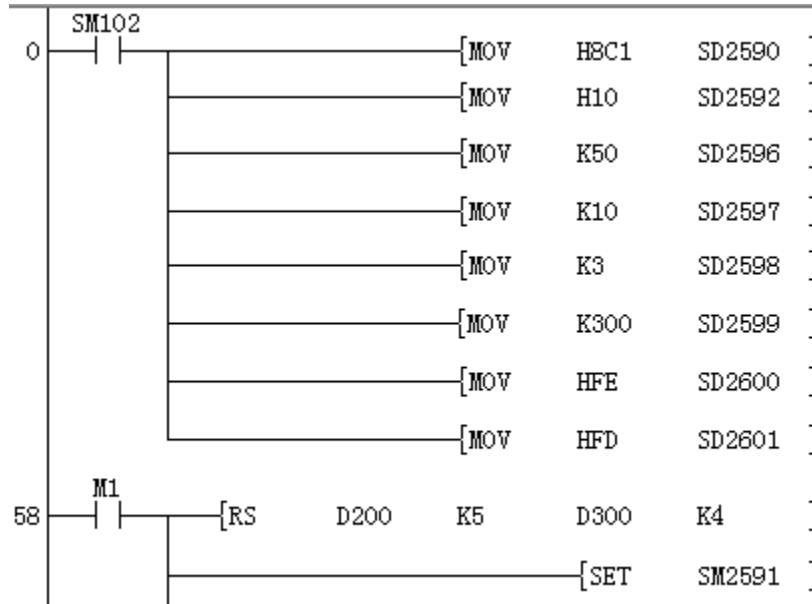
软元件	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
D300	1	0	0	0	1	0	1	0	0	1	1	0	0	1	0	0	2651
D301	0	0	1	0	1	1	0	0	1	0	1	0	1	0	0	0	1534

3) Open and set the end character ETX situation

The value of ending character SD2601 is only valid in the low bit.

When ETX is enabled, the send will end with ETX.

When ETX is received, SM2610 and SM2593 are immediately turned ON, regardless of whether sufficient length is received.

软元件	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
D200	0	0	0	0	1	1	1	0	1	0	1	1	1	1	1	0	7D70
D201	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	00E1
D202	1	0	0	0	1	1	0	0	1	0	1	0	1	0	0	0	1531
D203	0	1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1862
D204	0	0	1	1	0	1	1	0	0	1	1	1	1	0	0	0	1E6C
D205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
D206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000

For example, the result of the above Circuit program and the above data transmission is 70 7D E1 00 31 FD.

If the above Circuit program sends 01 06 FD to him, the following data will be received. If the FD is sent directly, it will be judged as the end directly.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
D300	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0601
D301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
D302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
D303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000

4) Both the start character STX and the end character ETX are turned on

When both are opened, it is basically a combination of the above single opened states. But if only ETX data is received when both start, it will not end immediately. It will judge the character interval time and does not start receiving data.

(2) Receiving after sending (similar to Modbus master station mechanism)

1) Send control switch (SM2590) and receive control switch (SM2592) OFF (default)

When the contact of RS instruction is on, turn SM2591 on and send it immediately. SM2591 will be automatically OFF immediately after sending.

After sending, SM2593 is ON, it will always stop at this instruction, and wait for it to be OFF and then receive data. If it is OFF, it will start to receive data.

After the first character timeout period (SD2597), if no character is received, it is judged as a timeout. If there are retry times, it will retry. But after retrying, the communication still does not report an error, and SM2593 and SM2614 are turned on.

After receiving the first character, it will judge whether that the interval between characters exceeds the time set by SD2599. If it it doesn't. it will report an error.(For the details, please refer to [the timeout of the interval character].)

When there are two or more instructions, the first RS instruction which is set ON will be sent after SM2591 is ON. Later, if this RS instruction is completed*1, then turn ON, SM2591 will switch to the next RS instruction*2 in the ladder sequence.

When there are two or more instructions, switch to another one during the data reception and it continue to stay back in the original instruction to until the reception is complete.

#Note:

#Completion refers to receiving data or reporting an error.

#If there is no other open RS instruction after the ladder sequence, it will return to the first RS instruction that was opened in the ladder sequence for execution.

2) The sending way when the sending control switch (SM2590) is ON

When the sending control switch (SM2590) is ON, there is no need to set SM2591 ON. At this time, as long as the contact of the RS instruction is triggered, it can be sent, and SM2591 is automatically turned ON.

3) The receiving way when the receiving control switch (SM2592) is ON

When the receiving control switch (SM2592) is ON, SM2593 will be OFF automatically when the instruction is executed. It will no longer judge the status of SM2593 when receiving, and SM2593 will still be turned ON after receiving.

4) Sending control switch (SM2590) and receiving control switch (SM2592) ON

In this case, you only need to trigger the contact before the RS instruction to send data, then it will automatically switch to the waiting status. When the reception is completed, it will turn to the next RS instruction that is turned on.

(3) Send-only

```
——[RS      D200     K5      D300     K0      }
```

When the sending length is set to a value other than 0, and the receiving length is set to 0, it is send-only mode.

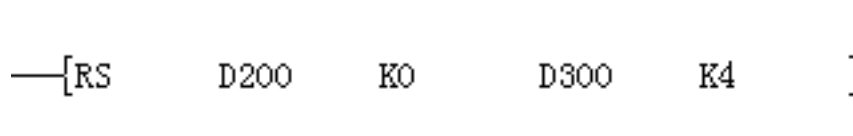### 1) The sending control switch (SM2590) is OFF

When SM2591 is turned ON, the data will be sent without receiving.

When there are two or more instructions, the first RS instruction which is turned ON will be sent after SM2591 is turned ON. After this RS instruction is completed, then turn ON SM2591 will switch to the next RS instruction in the ladder program.

2) The Sending control switch (SM2590) is ON

The RS instruction will be sent when triggered. Multiple instructions are triggered and sent in a loop. During the sending cycle, the interval will be sent according to the set sending interval.

(4) Receive-only

```
——[RS      D200     K0      D300     K4      }
```

When the sending length is 0 and the receiving length is not 0, it is only receiving.

1) SM2592 receiving control switch OFF

SM2593 will be turned ON when receiving, and the ladder program control must be turned OFF to continue receiving. SM2593 will not turn ON without receiving data.

When multiple instructions are enabled to receive only at the same time, it will start to receive from the smallest number of steps in the ladder diagram. Time out or received data will be forwarded to the second to continue receiving.

2) SM2592 receiving control switch ON

It can receive normally and will not be controlled by the flag bit. The SM2593 receiving identifier serves as the receiving prompt identifier,and SM2593 will not turn ON without receiving data.

If multiple RS receive only instructions are turned on at the same time, the receiving position is uncertain due to the timeout judgment and switching to the next one.

(5) Use receive-only and send-only methods to send after receiving (similar to Modbus slave mechanism)
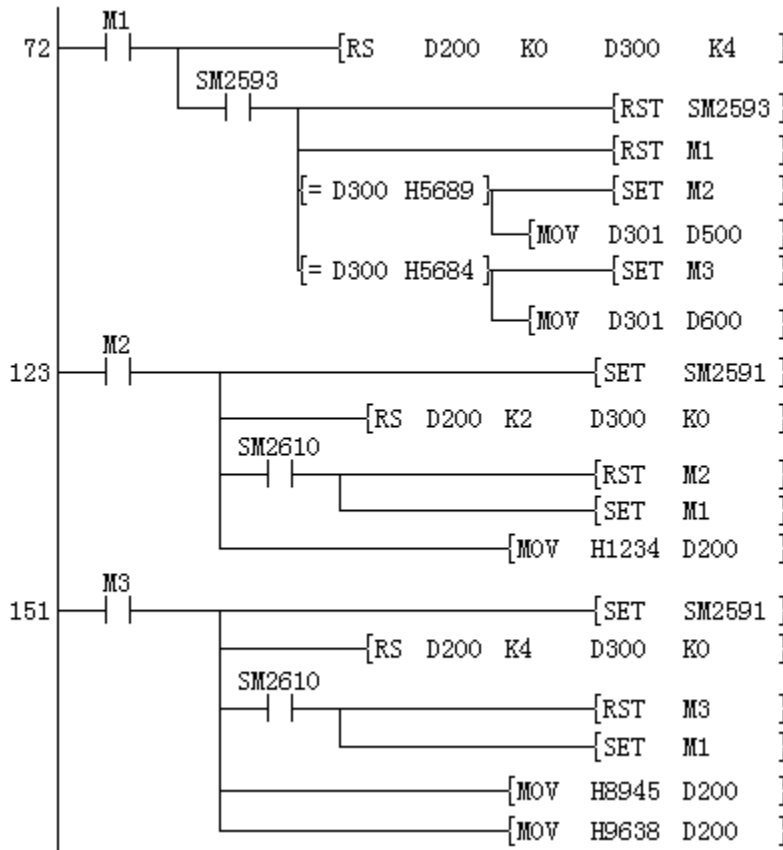
Receive-only: When it is determined that the reception is complete, it will determine the instruction to be triggered according to the received content, and save the received data at the same time.

Send-only: The content sent by triggered M2 is different from that of triggered M3. After the trigger is over, they will return to trigger the receive-only of M1.

10.7.1.4 Error message

Currently The Error code will be displayed on SD7, SD0, SD 2611 and SD2612.

The Error codes that will appear in the custom protocol are mainly as follows.

Error code	Content
3181H	Data receiving timeout

3188H	Wrong length
3189H	COM2 data error. "Check whether there are errors in the parameters of instruction. Check whether the slave station sup
318EH	Current protocol does not support this instruction
	(This error is only displayed on SD7 and SD0)
318FH	COM2 sending timed out. Contact a technician if this error occurs
3190H	COM2 receiving data exceeds the buffer limit.

After resetting the protocol or communication parameters, the error will be cleared.

In addition, the communication completion/communication error/communication timeout flag will be set after the executed instruction.

10.7.1.5 The difference with Mitsubishi

The current differences:

1. STX and ETX: Mitsubishi can set up to 4 bytes, we only have one byte.
2. Add sum check and CR, LF.
3. The instruction control of Mitsubishi is that the first instruction triggered is fixed to execute this instruction. It will not be switched to other instructions midway, unless the contact of this instruction is closed.

Modbus protocol description

10.7.2.1 Introduction

The Modbus master station protocol is generally close to LX3V. The address was modified in the slave station.

10.7.2.2 Basic configuration

(1) Introduction

The RS instruction has the same usage as the previous RS instruction of 3V, and can use R device.

-[RS (s) (m) (d) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The high byte stores the station number of slave station, and the low byte stores the Modbus function code.	-	Unsigned BIN 16 bit	ANY16
(m)	Slave address. The address provided by slave station will read or write data from this address of the slave station	-	Unsigned BIN 16 bit	ANY16
(d)	Length. The length of Modbus read or write. The unit is determined by function code.	-	Unsigned BIN 16 bit	ANY16
(N)	Start address for reading or writing data	-	Unsigned BIN 16 bit	ANY16

Device used

Instruction Parameter	Devices						Offset modification	Pulse extension
	T	C	D	R	K	H	[D]	XXP

RS	Parameter 1	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●
	Parameter 3	●	●	●	●	●	●
	Parameter 4	●	●	●	●		

#Note: Although the RS instruction currently allows all the parameters of the instruction to use constants such as K and H, there are different restrictions according to the different protocols. When the protocol is Modbus master station protocol, n cannot be a constant, otherwise an error will be reported.

(2) Special device setting

Special address table

COM 1 special D device (SD)

2540	**Communication port settings**
2541	**Serial parameter modification identification**
2542	
2543	
2544	**Station number setting**
2545	**Station number modification logo**

#Note: COM1 does not support modifying the protocol.

COM2 special D device (SD)		COM2 special M Device (SM)	
2590	**Communication port setting**	2590	Send control start
2591	**Serial parameter modification identifier**	2591	**Send control/send reminder**
2592	**Protocol setting**	2592	Receive control start
2593	**Protocol modification identifier**	2593	**Receive control/receive prompt**
2594	**Station number setting**	2594	8-bit mode (for custom protocol)
2595	**Station number modification identifier**	2595	
2596	**Sending interval (0.1ms) 0-32767.** **It is 10 when set to 0 (1ms)**	2596	
2597	**Communication timeout setting (10ms) 0-32767** **It is 10 when set to 0 (100ms)**	2597	
2598	**Timeout retry times 0-32767**	2598	
2599	Character interval timeout setting (for custom protocol) (0.1ms) 0-32767. It is 10 when set to 0 (1ms)	2599	
2600	STX value	2600	
2601	ETX value	2601	
...		...	

2610	The amount of data received	2610	Communication complete flag
2611	Last error	2611	Receiving flag
2612	Current error	2612	Retry occurred
2613	Error steps	2613	Communication error
2614	Error station number	2614	Communication timeout
2615	Cumulative number of errors	2615	

The contents that the custom protocol will be used and set has been marked with underline and bold. In addition, the devices to be used as judgment conditions have also been marked in bold in the table.

1) Communication port setting SD2590

Bit number		B0	B1、B2	B3	B4、B5、B6、B7、B8、B9	
Name		Data length	Parity	Stop Bit	Baud rate(bps)	
Content	0 off	7 bit	b2,b1	1 bit	4800	0111
	1 on	8 bit	(0,0): None	2 bit	9600	1000
			(0,1): Odd parity (ODD)		19200	1001
					38400	1010
			(1,1): Even parity (EVEN)		57600	1011
					115200	1100
					187500	1101
					230400	1110
					460800	1111
					921600	10000

Set the serial port parameters to SD2590 according to the bit settings provided in the table above. The setting is roughly the same as 3V. It is mainly because the baud rate can be set to a higher baud rate, the bit used need backward two bits when STX and ETX start.

For example: To set the serial port parameters: baud rate 115200, stop bit 1, data bit 8, no parity bit, you need to set the value H4C1 (K1217) on SD2590. The parameters directly set to SD2590 are only valid in the first cycle of PLC RUN. If you need to modify it during RUN, you can use the PORTPARAM instruction to set it.

2) Protocol setting SD2592

Protocol settings

0 H	Wecon Modbus slave station	10 H	Custom protocol
2 H	ModbusRTU slave station	20 H	ModbusRTU master station
3 H	ModbusASCII slave station	30 H	ModbusASCII master station

The corresponding protocol can be set by setting the corresponding value in SD2592. The parameters directly set to SD2592 are only valid in the first cycle of PLC RUN. If you need to modify it during RUN, you can use the PROTOCOL instruction to set it. COM1 cannot use protocols other than Wecon Modbus slave station Currently.

3) Sending interval SD2596

The main function of sending interval is: how long to wait for sending the next instruction after one instruction is completed. If it is set to 0, there is basically no waiting for interval sending, but it will be affected by the scan cycle. The unit of the sending interval is 0.1ms, that is, the interval is 10ms when set to 100.

4) Communication timeout SD2597 and timeout retry SD2598
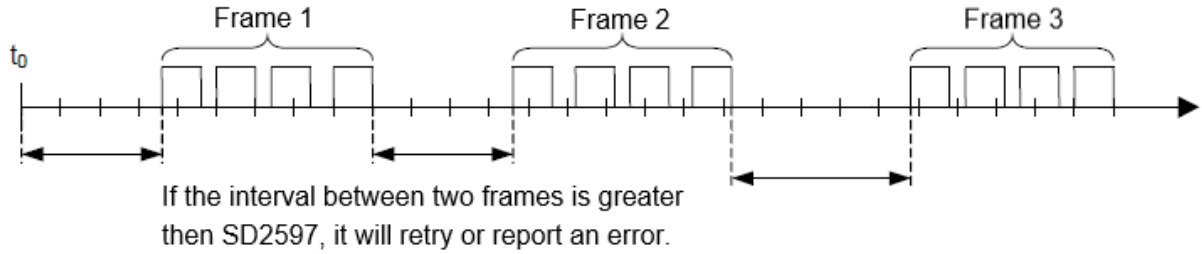
If the interval between two frames is greater then SD2597, it will retry or report an error.

The main function of communication timeout is: How long does it take to wait for no data to be received and then retry or report an error after the PLC sends. When it is set to 0, the default value is 100ms.

The unit of communication timeout is 10ms, that is, the timeout determine time is 100ms when set to 10.

When a receiving timeout occurs, it will determine whether there are retry times and the current retry times. If the retry times are greater than or equal to SD2598, an error will be reported.

If SD2598 is set to 0, it will not retry.

If it is set to 1, send once and then send once again after timeout.

Serial port parameter setting

PORTPARA instruction

-[PORTPARA (s) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s1)	The start number of the device that stores the number of digits of converted value	-	Signed BIN 16 bit	ANY16_S_ARRAY
(s2)	Converted BIN data	-2147483648 to 2147483647	Signed BIN 32 bit	ANY32_S

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
PORTPARA	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●

Features

Set communication parameters when used for run. Please refer to "PORTPARA instruction description" for details.

2) 2.3.2 PROTOCOL instruction

-[PROTOCOL (s) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)

| (s) | Protocol number to be set | 0 to 65535 | Unsigned BIN 16 bit | ANY16 |
| (N) | Which communication port to set (0 means COM1, 1 means COM2 *1) | 1 | Unsigned BIN 16 bit | ANY16 |

Device used

Instruction	Parameter	Devices										Offset modification	Pulse extension
		KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
PROTOCOL	Parameter 1	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●

Features

Set the communication protocol when used for run. The instruction above actually is to set a specific value for the parameter modification flag.

The calculation formula is: (parameter setting value + the offset of the start special device corresponding to the serial port + 10)*2

For example, setting the protocol to ModbusRTU master station (H20) is (0x20 +2593-2590 +10)*2, which is (32 +3+10) *2=90. This is to prevent the serial port parameters from being modified at will. .

In Modbus master protocol, the trigger of setting parameters is to change the value after an instruction is completed.

In Modbus slave protocol, the trigger of setting parameters is that to switch as long as it is not processing the received data.

For details, please refer to "PROTOCOL instruction description"

3) Host computer settings

The PLC parameter setting of host computer can set the corresponding serial port parameters.
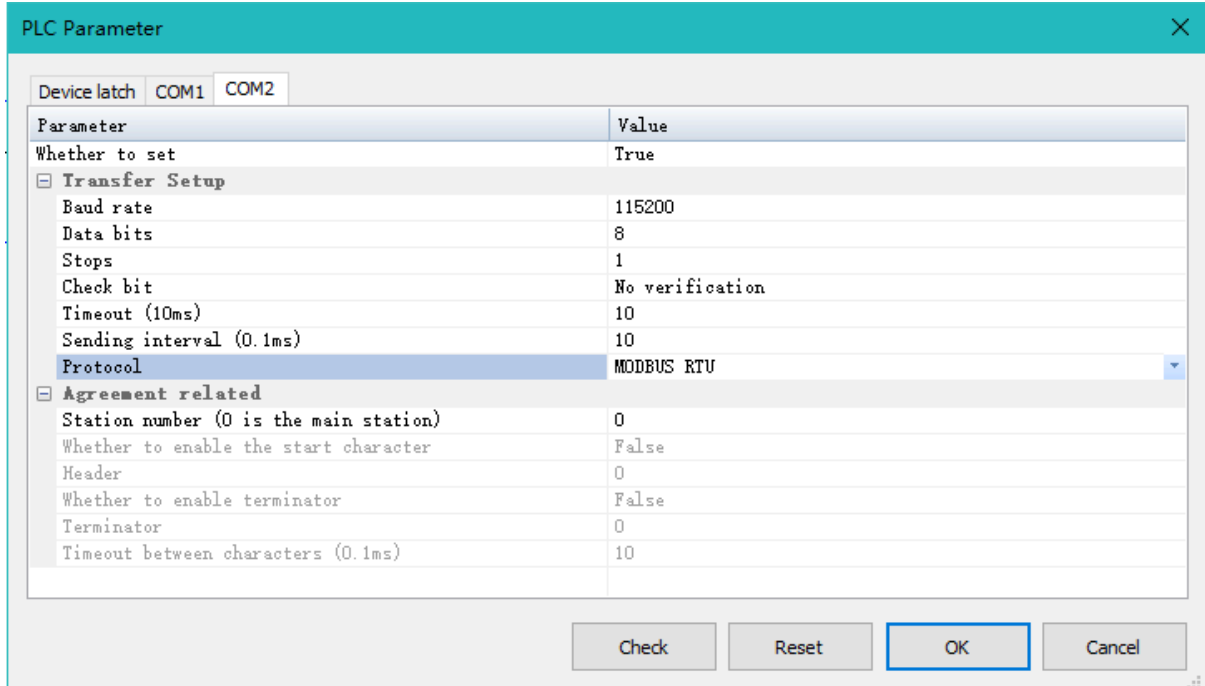
Specialized protocol station number cannot be 0.

The station number under ModbusRTU and ModbusASCII protocol is 0: the protocol sets the master station.

The station number under ModbusRTU and ModbusASCII protocol is not 0: the protocol sets the slave station.

The serial port parameters are filled in according to the content in the form.

#Note: RTU protocol cannot set data bit of 7-bit.

4)Priority description of serial port parameters

The priority of serial port parameter settings are listed as blow. The serial port parameters are saved by power failure currently.

Serial port parameter set instruction setting = Ladder program MOV instruction set the corresponding SD device > the download parameters of host computer > Previous power-off save data.

(4) Basic ladder program
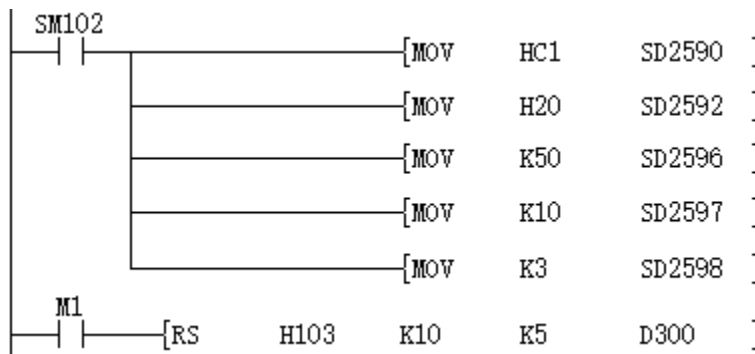
Serial port parameter setting

Baud rate 115200, data bit 8, parity bit none, stop bit 1

Communication protocol setting: ModbusRTU master station protocol

Sending interval: 5ms

Receiving timeout: 100ms

Timeout retry times: 3 times

Station number 01H, function code 03H, slave address 10, length 05

10.7.2.3 Send and receive process

(1) Modbus master station

When programming, before each RS (Modbus mode) instruction, the assignment of each operand unit, such as the communication operation object address, operation type, operation register address, data number, sending or receiving unit, etc., is completed, once the execution starts, the system program will automatically calculate the CRC check, organize the communication frame, and complete the operation of sending data and receiving response.

If you use Modbus-ASC protocol communication (set SD2592 as H30), the HEX-ASC format conversion of sending and receiving data is automatically completed by the PLC system program. The RS (Modbus mode) instruction method and the Modbus-RTU protocol method are exactly the same.

In the plc program, if multiple RS (Modbus mode) instructions are driven, the system program will still execute the "sending, waiting for answer, receiving, verification, analysis and storage" of an RS instruction, and then perform the same process for the next RS instruction until all RS instructions are executed and then restarted. You don not need to care about the timing and process of its execution, which simplifies the PLC programming design. This is the advantage of Modbus instruction.

Modbus master function list

Function code	Function name	Details
0x01	Coil readout	Coil readout (multiple points optional)
0x02	Input readout	Input and read (multiple points optional)
0x03	Holding register readout	Holding register readout(multiple points optional)
0x04	Input register readout	Input register readout (multiple points optional)
0x05	1 coil write	Coil writing (only 1 point)
0x06	1 register write	Holding register write (only 1 point)
0x0F	Batch coil write	Multi-point coil writing
0x10	Batch register write	Multi-point holding register write

Serial port parameter setting

Baud rate 115200, data bit 8, no parity bit, stop bit 1

Example:
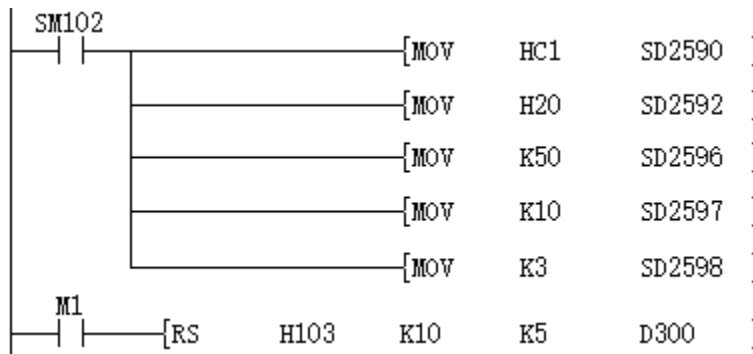
Communication protocol setting: ModbusRTU master station protocol

Sending interval: 5ms

Receiving timeout: 100ms

Timeout retry times: 3 times

Station number 01H, function code 03H, slave address 10, length 05

As shown in the ladder program shown:

When M1 is turned ON, PLC will send data (hexadecimal) from COM2 of PLC: 01 03 00 0A 00 05 A5 C8

01: Slave address, the high 8 bits of (s);

03: Modbus instruction code, the lower 8 bits of (s). It is to read the slave register;

00 0A: The address of the slave register to be read, the value of (m);

00 05: The number of registers to be read, the value of (d),

A5 C8: CRC check code.

#Note:

When using 1 coil to write (0x05), the value used for writing 1 is 0xFF00, and the value used for writing 0 is 0x0000.

When using batch coil write (0x0F), pay attention to the high and low byte exchange. For example, when writing 1 length, the fourth parameter value is 1 (0x0001), which means 0 is sent. You need to write 256 (0x0100) to write 1 to the target address.

(2) Modbus slave

When the PLC series is used as a Modbus slave, it supports Modbus communication operation instructions such as 0x01, 0x03, 0x05, 0x06, 0x 0f, 0x10. The coils of the PLC that can be read and written include M, S, T, C, X (only Read) SM, Y, LC, HSC and other variables through these instructions. Register variables include D, T, C, R, SD, LC, HSC.

When the Modbus communication master accesses (reads or rewrites) the internal variables of the PLC slave, it must follow the following communication instruction frame definition and the variable address index method in order to carry out normal communication operations.

1) instruction code 0x01 (01): read coil

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x01 (instruction code)	1 byte	Read coil
3	Coil start address	2 bytes	High bit in front, low bit in back, see coil addressing
4	Number of coils	2 bytes	High bit in front, low bit in back (N)
5	CRC check	2 bytes	Low bit in front, high bit in back

Response frame format: slave address + 0x01 + number of bytes + coil status + CRC check

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x01 (instruction code)	1 byte	Read coil
3	Number of bytes	1 byte	Value: [(N+7)/8]

Serial number	Data (byte) meaning	Number of bytes	Instruction
4	Coil state	[(N+7)/8] bytes	Every 8 coils are combined into one byte. If the last one is less than 8 bits, fill in 0 in the undefined part. The first 8 coils are in the first byte, and the coil with the smallest address is in the lowest bit. And so on
5	CRC check	2 bytes	High bit first, then low bit

Error response: refer to error response frame.

2) instruction code 0x03 (03): read register

Request frame format: slave address + 0x03 + register start address + number of registers + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x03 (instruction code)	1 byte	Read register
3	Register start address	2 bytes	High bit in front, low bit in back, see register addressing
4	Number of registers	2 bytes	High bit in front, low bit in back (N)
5	CRC check	2 bytes	High bit in front, low bit in back

Response frame format: slave address + 0x03 + number of bytes + register value + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x03 (instruction code)	1 byte	Read register
3	Number of bytes	1 byte	Value: N*2
4	Register value	N*2 bytes	Every two bytes represent a register value, with high bit in front, low bit in back. The smallest register address comes first
5	CRC check	2 bytes	High bit in front, low bit in back

Error response: See error response frame.

3) instruction code 0x05 (05): write single coil

Request frame format: slave address + 0x05 + coil address + coil status + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x05 (instruction code)	1 byte	Write single coil
3	Coil address	2 bytes	High bit in front, low bit in back, see coil addressing
4	Coil state	2 bytes	High bit in front, low bit in back. Non-zero is valid
5	CRC check	2 bytes	High bit in front, low bit in back

Response frame format: slave address + 0x05 + coil address + coil status + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction

1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x05 (instruction code)	1 byte	Write single coil
3	Coil address	2 bytes	High bit in front, low bit in back, see coil addressing
4	Coil state	2 bytes	High bit in front, low bit in back. Non-zero is valid
5	CRC check	2 bytes	High bit in front, low bit in back

Error response: see error response frame. The coil status 0xFF00 means ON, and 0x0000 means OFF.

4) instruction code 0x06 (06): write a single register

Request frame format: slave address + 0x06 + register address + register value + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x06 (instruction code)	1 byte	Write single coil
3	Register	2 bytes	High bit in front, low bit in back, see coil addressing
4	Register value	2 bytes	High bit in front, low bit in back. Non-zero is valid
5	CRC check	2 bytes	High bit in front, low bit in back

Response frame format: slave address + 0x06 + register address + register value + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x06 (instruction code)	1 byte	Write single coil
3	Register	2 bytes	High bit in front, low bit in back, see coil addressing
4	Register value	2 bytes	High bit in front, low bit in back. Non-zero is valid
5	CRC check	2 bytes	High bit in front, low bit in back

Error response: See error response frame.

5) instruction code 0x 0f (15): write multiple coils

Request frame format: slave address + 0x 0f + coil start address + coil number + byte number + coil status + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x 0f (instruction code)	1 byte	Write multiple single coils
3	Coil start address	2 bytes	High bit in front, low bit in back, see coil addressing
4	Number of coils	2 bytes	High bit in front, low bit in back. The maximum of N is 1968
5	Number of bytes	1 byte	Value: $[(N+7)/8]$
6	Coil state	$[(N+7)/8]$ bytes	Every 8 coils are combined into one byte. If the last one is less than 8 bits, fill in 0 in the undefined part. The first 8 coils

			are in the first byte, and the coil with the smallest address is in the lowest bit. And so on
7	CRC check	2 bytes	High bit in front, low bit in back

Response frame format: slave address + 0x 0f + coil start address + coil number + CRC check

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x 0f (instruction code)	1 byte	Write multiple single coils
3	Coil start address	2 bytes	High bit in front, low bit in back, see coil addressing
4	Number of coils	2 bytes	High bit in front, low bit in back
5	CRC check	2 bytes	High bit in front, low bit in back

Error response: See error response frame.

6) 3.2.6 instruction code 0x10 (16): write multiple registers

Request frame format: slave address + 0x10 + register start address + register number + byte number + register value + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x10(instruction code)	1 byte	Write multiple registers
3	Register start address	2 bytes	High bit in front, low bit in back, see register addressing
4	Number of registers	2 bytes	High bit in front, low bit in back. The maximum of N is 120
5	Number of bytes	1 byte	Value: N*2
6	Register value	N*2 (N*4)	
7	CRC check	2 bytes	High bit in front, low bit in back

Response frame format: slave address + 0x10 + register start address + register number + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594
2	0x10 (instruction code)	1 byte	Write multiple registers
3	Register start address	2 bytes	High bit in front, low bit in back, see register addressing
4	Number of registers	2 bytes	High bit in front, low bit in back. The maximum of N is 120
5	CRC check	2 bytes	High bit in front, low bit in back

Error response: See error response frame.

7) Error response frame

Error response: slave address + (instruction code + 0x80) + Error code + CRC check.

Serial number	Data (byte) meaning	Number of bytes	Instruction
1	Slave address	1 byte	Value 1 to 247, set by SD2544, SD2594

2	Instruction code+0x80	1 byte	Error instruction code
3	Code	1 byte	1 to 4
4	CRC check	2 bytes	High bit in front, low bit in back

Serial number	Error code	Instruction
1	01	Unsupported function code
2	02	Wrong address or function code
3	03	Wrong length
4	04	Imperfect instruction
5	05	Address not allowed

8) Slave address table

Word address

Address type	Occupy	Address range	Decimal address	Total reserved address size
T0 to T511	512 WORD	0x0000-0x01ff	0	1536
C0 to C255	256 WORD	0x0600-0x06ff	1536	1024
LC0 to LC255	512 WORD	0x0A00-0x0BFF	2560	1024
HSC0 to HSC15	128 WORD	0x0E00-0x0E1F	3584	512
D0 to D7999	8000 WORD	0x1000-0x2F3F	4096	16384
SD0 to SD4095	4096 WORD	0x5000-0x5FFF	20480	12288
R0 to R30000	30000 WORD	0x8000-0xF52F	32768	30000

Bit address

Address type	Occupy	Address range	Decimal address	Total reserved address size
T0 to T511	512 bit	0x0000-0x01ff		1536
C0 to C255	256 bit	0x0600-0x06ff	1536	1024
LC0 to LC255	256 bit	0x0A00-0x0AFF	2560	1024
HSC0 to HSC15	64 bit	0x0E00-0x0E0F	3584	512
M0 to M8000	8192bit	0x1000-0x2F3F	4096	16384
SM0 to SM4095	4096bit	0x5000-0x5FFF	20480	12288
Reserved		0x8000-0xBFFF		16383
S0 to S4095	4096bit	0xC000-0xCFFF	49152	8192
X0 to X1023	1024bit	0xE000-0xE3FF	57344	4096
Y0 to Y1023	1024bit	0xF000-0xF3FF	61440	4096

10.7.2.4 Error message

Currently the Error code will be displayed on SD7 and SD0 and SD2611 and SD2612.

The Error codes that appear in the Modbus protocol are mainly as follows.

Error code	Content
4085H	(s)(m)(d)(N) The read address is out of the device range (this error is only displayed on SD7 and SD0)
3180H	COM2 data reception error. There may be interference on the communication line, it is recommended to connect the grou
3181H	COM2 data reception timed out. "Check the wiring, check whether the serial port parameter settings are compatible with sending interval SD2546."
3182H	COM2 CRC check error. There may be interference on the communication line, it is recommended to connect the ground
3183H	COM2 LRC check error. There may be interference on the communication line, it is recommended to connect the ground
3184H	The COM2 station number is incorrectly configured. Check the slave station number setting. And check whether there is
3185H	COM2 send buffer overflow. Contact a technician if this error occurs

3186H	COM2 function code is wrong. Check whether the set function code is a function code supported by PLC
3187H	COM2 address is wrong. Check whether the slave station has this address (please refer to Modbus Abnormal 02)
3188H	The length of COM2 is wrong. Check whether the communication length exceeds the length range specified by the Modb
3189H	COM2 data error. "Check whether there are errors in the parameters of the instruction. Check whether the slave station s
318AH	COM2 slave is busy. Slave station returns information: Slave station is busy (please refer to Modbus exception 06)
318BH	The COM2 slave station does not support function codes. Check whether the slave station supports this function code (p
318CH	The COM2 slave is faulty. Slave station returns information: Slave station is faulty, please check whether the slave statio
318DH	COM2 slave confirms. Slave station return information: slave station confirmation (please refer to Modbus abnormal 05)
318EH	COM2 current protocol does not support this instruction. RS instruction cannot be used when it is set to slave station prot
318FH	COM2 sending timed out. Contact a technician if this error occurs
3190H	COM2 receiving data exceeds the buffer limit.
31A0H	COM2 is not available as a gateway. Returned information from the station: unavailable gateway (please refer to Modbus
31A1H	COM2 indicates that no response was obtained from the target device. Slave station returns information: the device is no

After resetting the protocol or communication parameters, the error will be cleared.

In addition, the communication completion/communication error/communication timeout flag will be set after the executed instruction.

PLCLINK/Fast interconnect

PLCLINK function is used to simplify the fast connection between PLCs. The fast communication of the LX5V series PLC could be achieved only using the configuration parameters without using the communication instruction(RS).

The topological diagram is shown in the figure below.
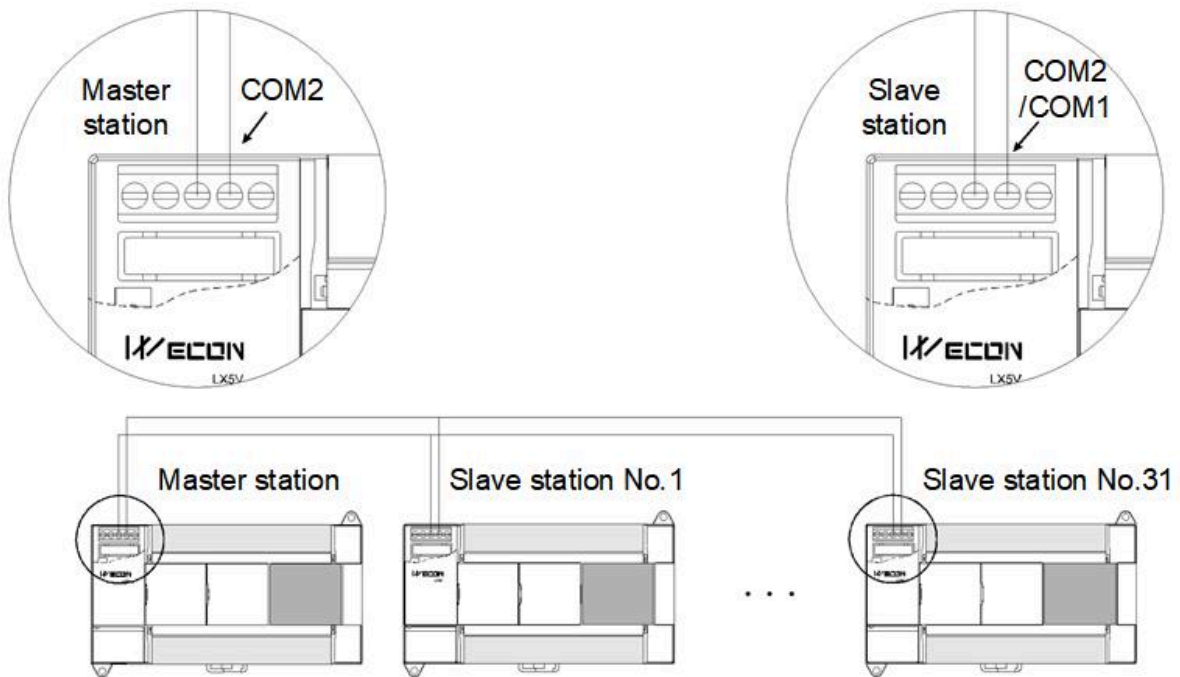
When using the PLCLINK function:

- Master station configuration: Select COM2 port and set the protocol to PLCLINK protocol.
- Slave configuration: Select COM1 or COM2 and set the protocol to dedicated protocol.

(1) Create a table

In [Project manager]-[Extended function]-[PLCLINK], right click [PLCLINK], and click it to create a table.
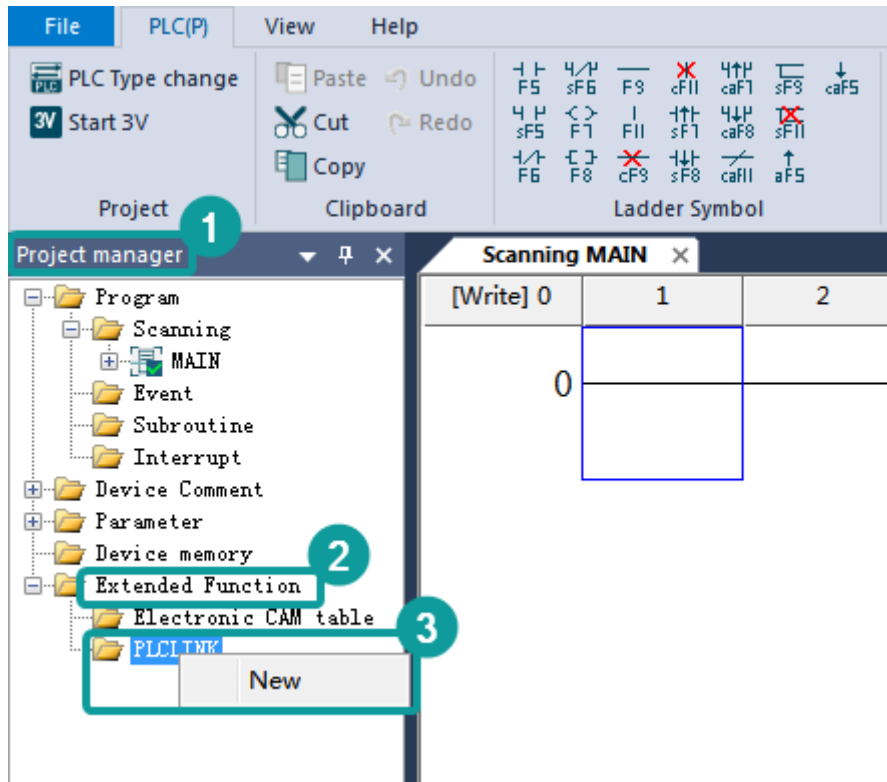
Click it and a prompt box as below would pop up.
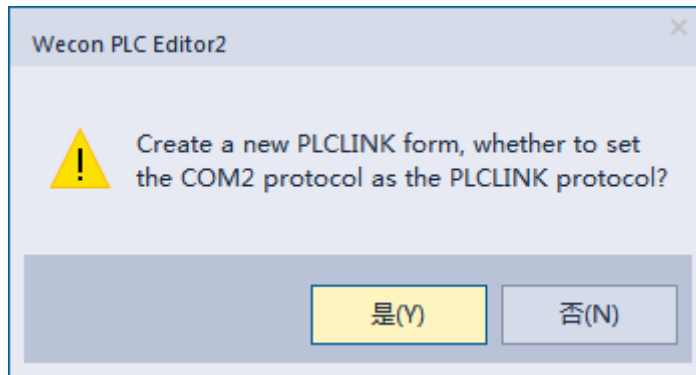
Click "Yes" will automatically change the protocol to PLCLINK, click "No" will not change the protocol.
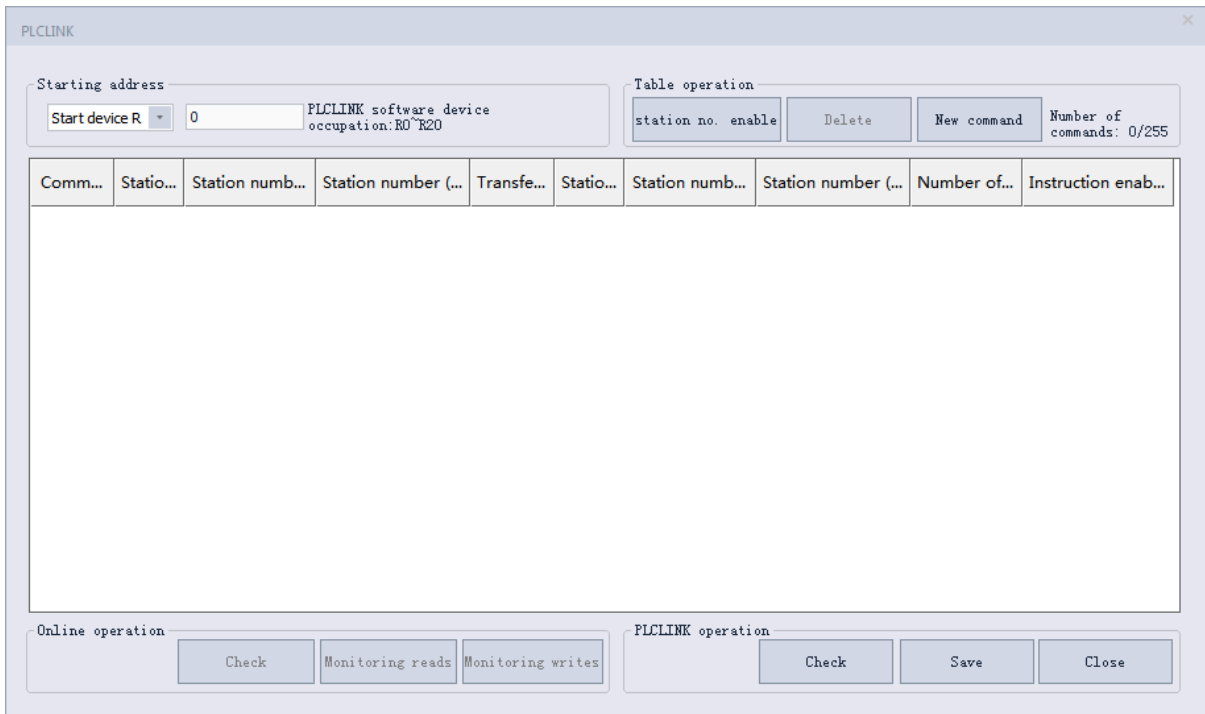
The number of PLCLINK protocol is H60.

0H	Wecon Modbus slave station
2H	ModbusRTU slave station
3H	ModbusASCII slave station
10H	user-defined protocol
20H	ModbusRTU main station
30H	ModbusASCII main station
60H	PLCLINK protocol

Click "Yes" will generate an empty table MAIN.
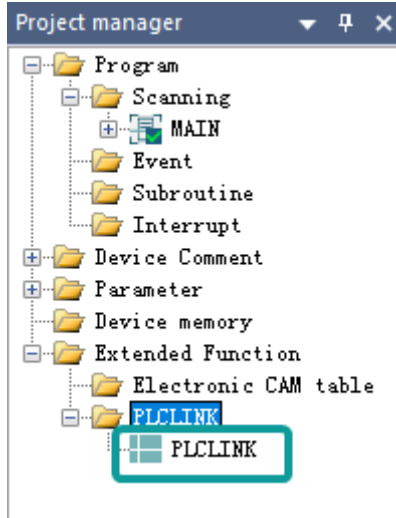
Double click MAIN will pop up the POLCLINK table as below.

Currently only one PLCLINK table can be created. Creating a new table after creating one is disallowed.
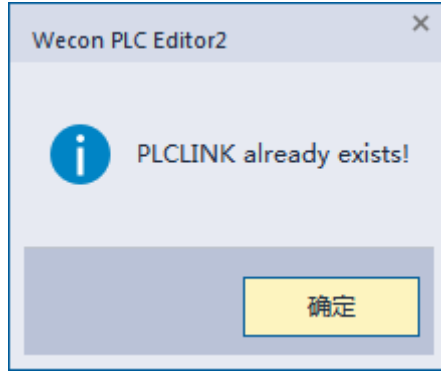
(2) Write the table

Write station number in

After writing the station number in the new instruction station number in the table, click the new instruction to add the communication instruction.

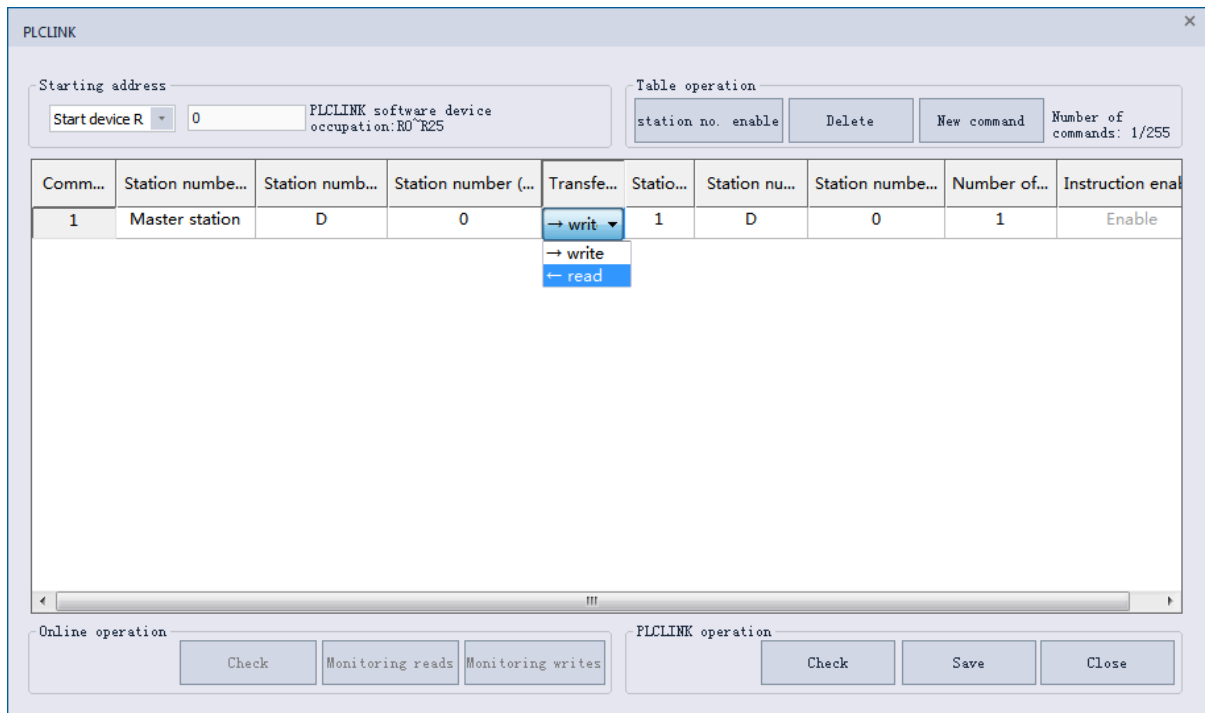The range of station number is 1 to 31. The maximum number of communication instruction is 255.
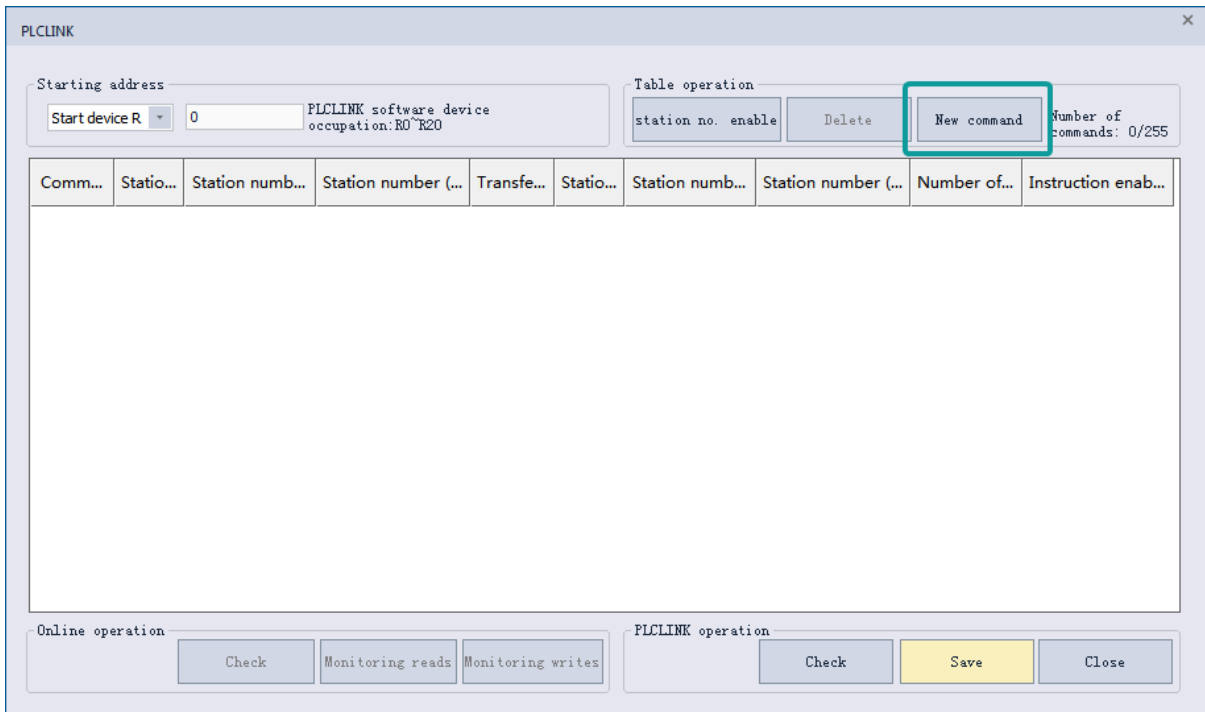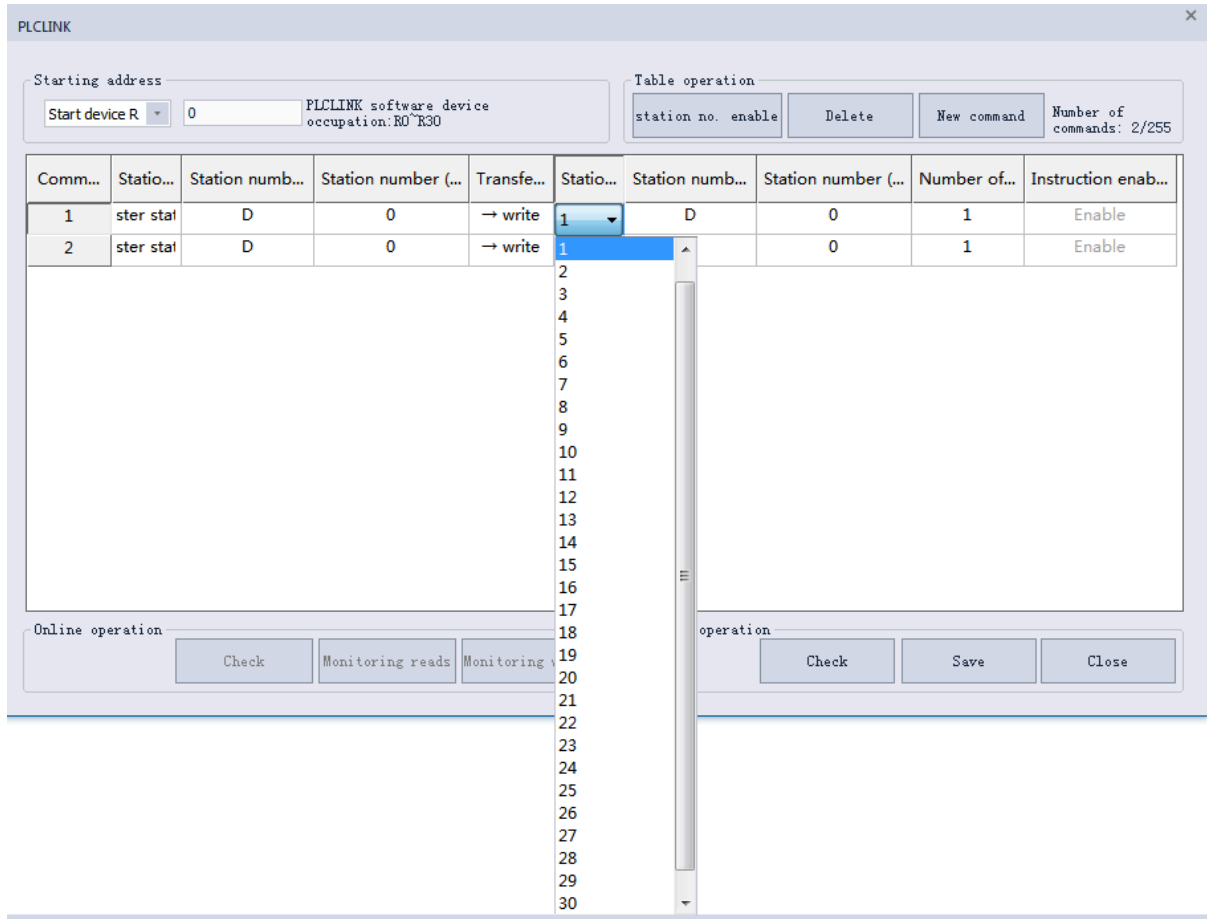
Currently the station number is only selected by drop-down box.
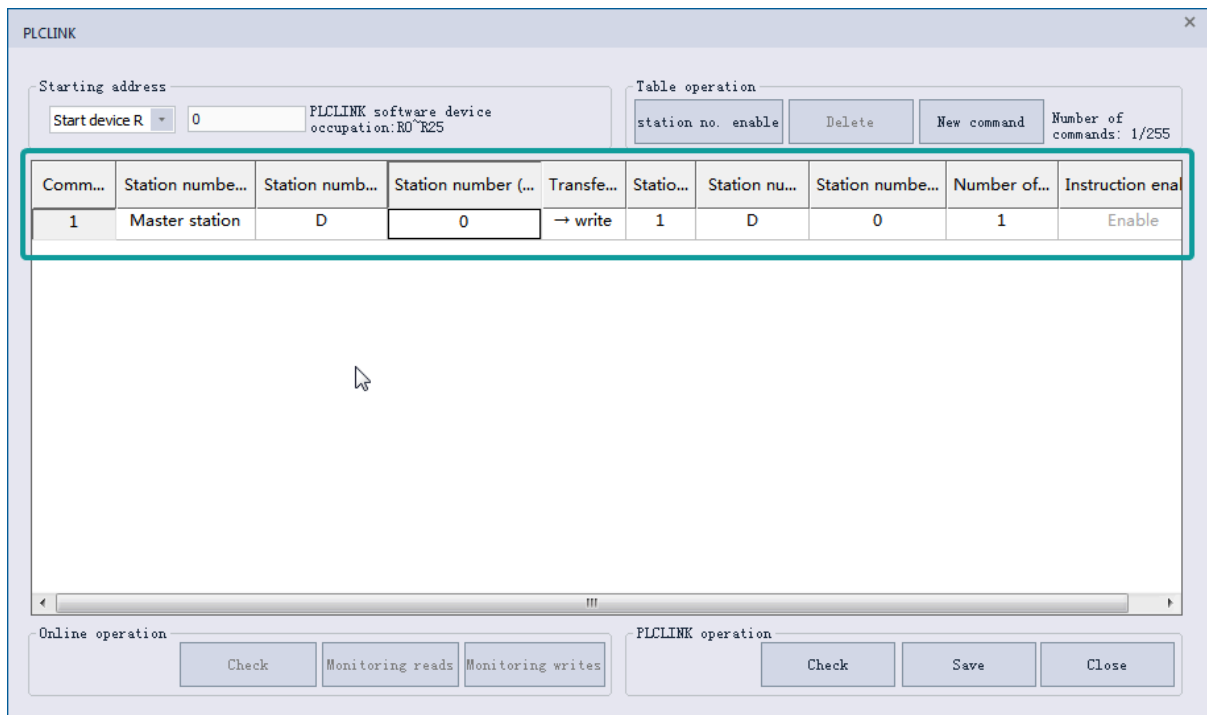
The devices of main station and slave station are selected by drop-down box.
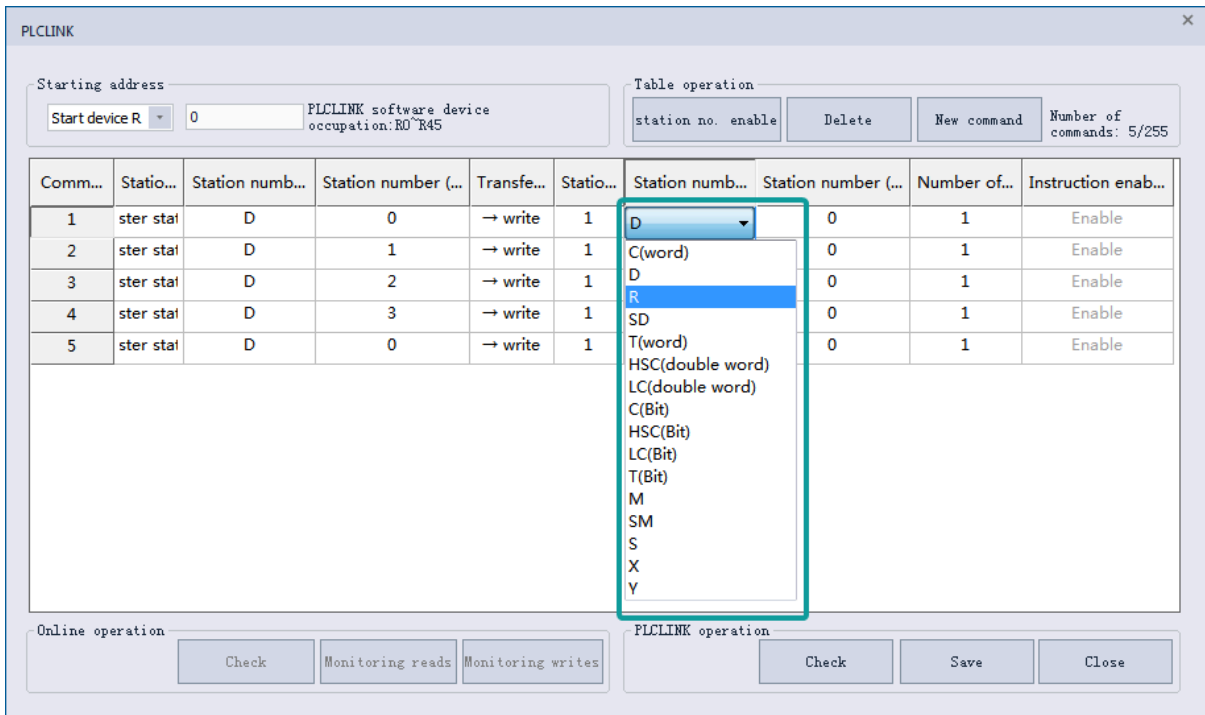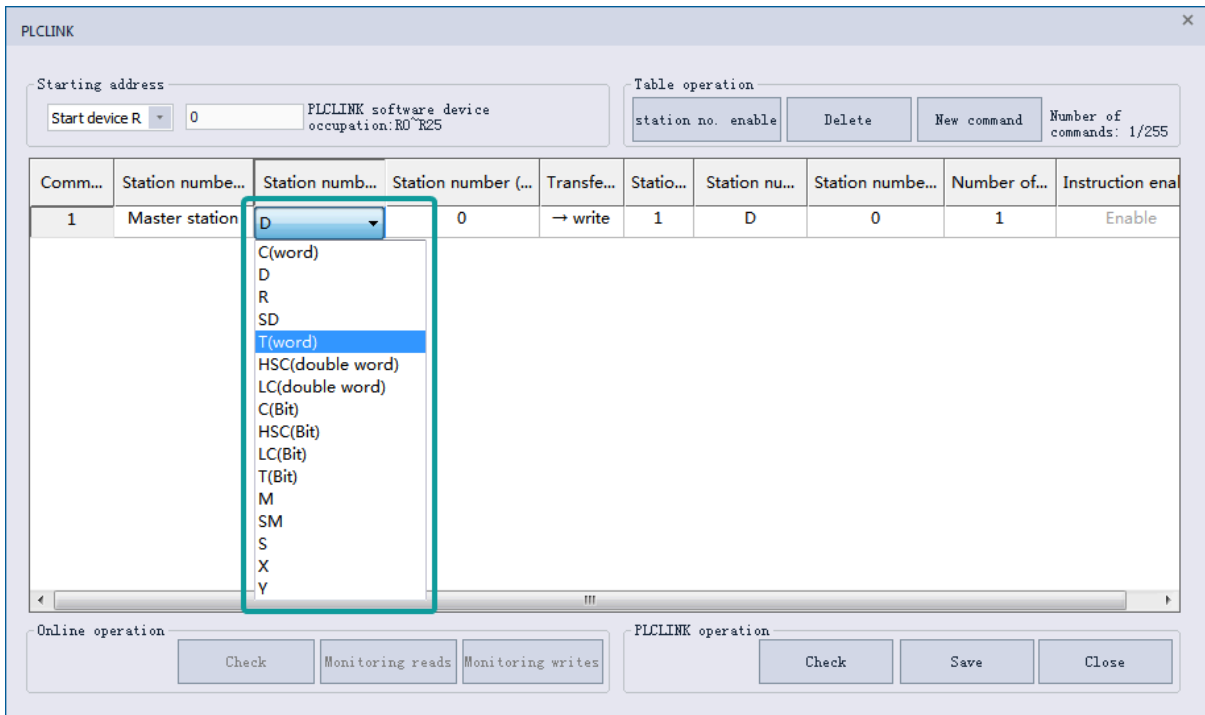
The transfer direction are read and write, and also selected by drop-down box.

The device address range limitations are as below.

1. The device address could not exceed the current device range
2. In the device of bit written, the mantissa of points of X and Y must be zero, such as X0, X10, X20, Y0, Y10, Y20 and so on. The software PLC Editor 2 will adjust automatically.
3. The Points of bit device other than X and Y must be a multiple of 8,such as M0, M8, N16, T(bit) 16, C(bit) 24 and so on. The software PLC Editor 2 will adjust automatically.
4. Bit device must communicate with bit device , and word device must communicate with word device. Double word device can only communicate with double word device. This is to avoid length perception differences.

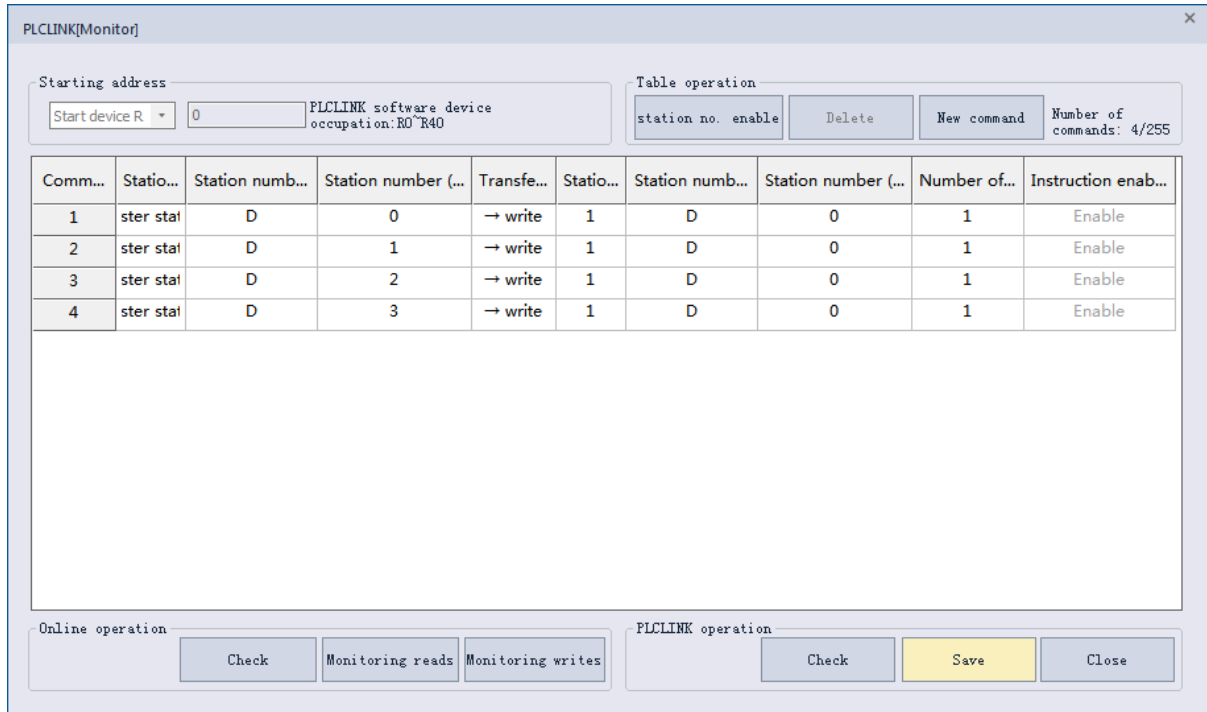The number limitations of slave station device are as below.

1. The number of bit device ranges from 8 to 2,032.
2. The number of word device ranges from 1 to 126.
3. The number of double word device ranges from 1 to 63. HSC can only use a maximum of 16 due to the number limitation.
4. The number of bit device must be a multiple of 8, such as 8, 16, 24, 32 and so on. The software PLC Editor 2 will adjust automatically.display the corresponding device address and range.

(3) Download

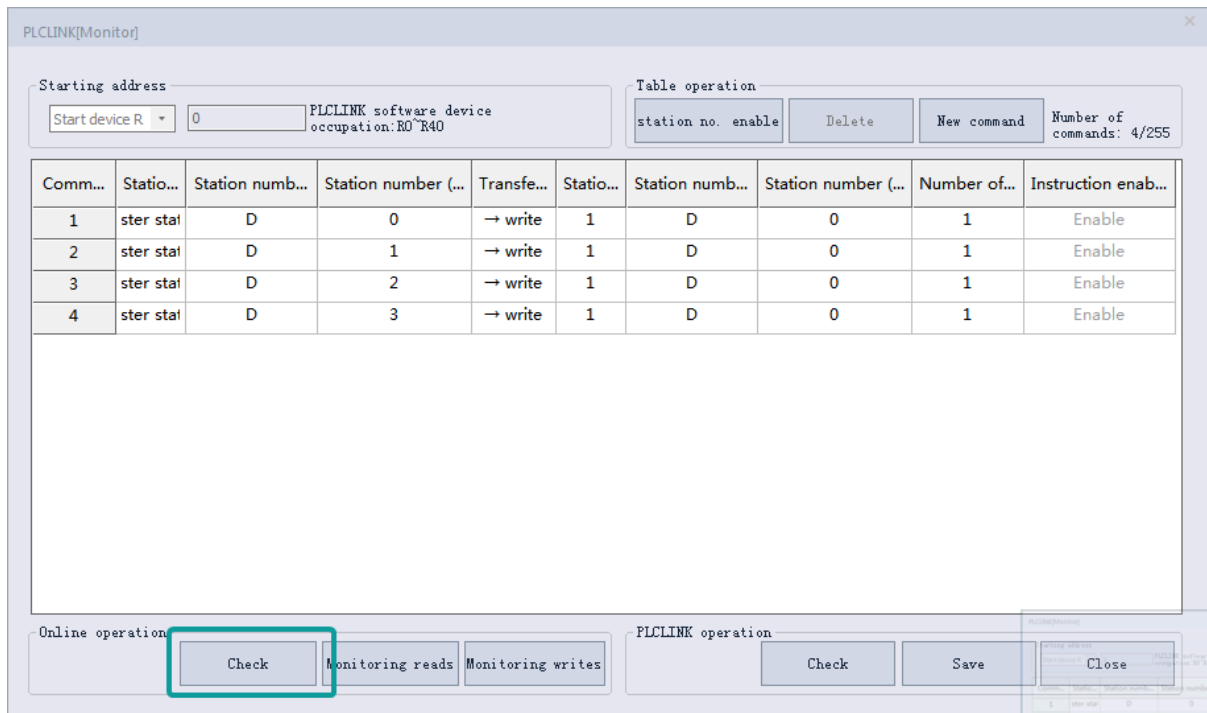Currently PLCLINK could only be downloaded with the program and could not downloaded separately.
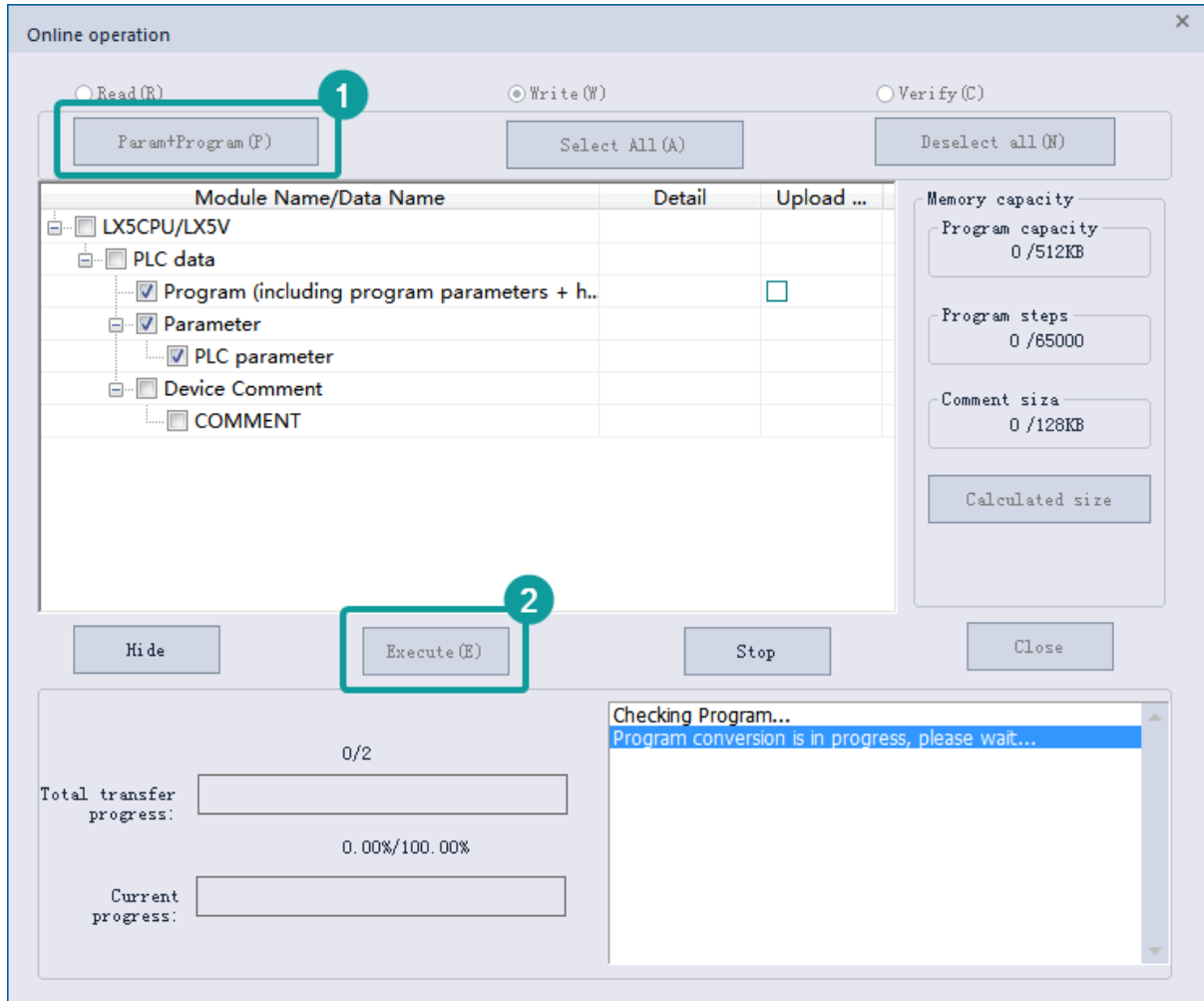
Click on PLCLINK in monitoring mode to re-write part of the table into PLC, but the start device could not be modified.

PLCLINK[Monitor]									

Starting address — Start device R ▼ 0 — PLCLINK software device occupation:R0~R40

Table operation — station no. enable | Delete | New command | Number of commands: 4/255

Comm...	Statio...	Station numb...	Station number (...	Transfe...	Statio...	Station numb...	Station number (...	Number of...	Instruction enab...
1	ster stat	D	0	→ write	1	D	0	1	Enable
2	ster stat	D	1	→ write	1	D	0	1	Enable
3	ster stat	D	2	→ write	1	D	0	1	Enable
4	ster stat	D	3	→ write	1	D	0	1	Enable

Online operation — Check | Monitoring reads | Monitoring writes

PLCLINK operation — Check | Save | Close

In monitoring mode, monitoring read and monitoring write could not be executed if the ladder program comparison is incorrect.

(4) Automatic check

Click "Check" in monitoring mode, the PLC that can communicate will be automatically searched and enabled. Stations that could not communicate will be closed. The Stations without instructions will not be checked. The PLCLINK table will be updated after the automatic check of the upper computer is finished.

PLCLINK[Monitor]									

Starting address — Start device R ▼ 0 — PLCLINK software device occupation:R0~R40

Table operation — station no. enable | Delete | New command | Number of commands: 4/255

Comm...	Statio...	Station numb...	Station number (...	Transfe...	Statio...	Station numb...	Station number (...	Number of...	Instruction enab...
1	ster stat	D	0	→ write	1	D	0	1	Enable
2	ster stat	D	1	→ write	1	D	0	1	Enable
3	ster stat	D	2	→ write	1	D	0	1	Enable
4	ster stat	D	3	→ write	1	D	0	1	Enable

Online operation — Check | Monitoring reads | Monitoring writes

PLCLINK operation — Check | Save | Close

Write 1 to in the table for addresses whose start address is offset 12 (for example, R200 is R212). The corresponding function is as below.

S1+12	Auto check mode	0: No check; 1: Automatic check mode; 2: Automatic check in progress.
	(Reserved)	When enabled, all the station numbers will send data to determine whether the station number exists. The corresponding communication switch will be turned on if it exists. If not, the corresponding communication switch will be turned off.

No error will be reported during auto check after the auto check is enabled. After the check is complete, the corresponding station number will be automatically enabled and disabled.

S1+13	Corresponding station number communication switch 1	The switch control of station 1 to 15
		Bit0: ON: Station number 0 (broadcast) normal communication
		OFF: Station number 0 (broadcast) communication prohibited (broadcast prohibited)
		Bit1: ON: Station number 1 normal communication; OFF: Station 1 communication prohibited
		Bit2: ON: Station number 2 normal communication; OFF: Station 2 communication prohibited
S1+14	Corresponding station number communication switch 2	The switch control of station 16 to 31

Click [station number enable] to set the station enable according to the corresponding situations.

#Note: When in the automatic check state, forcibly turn off the automatic check state (write 0 in S1+12), an error may occur.
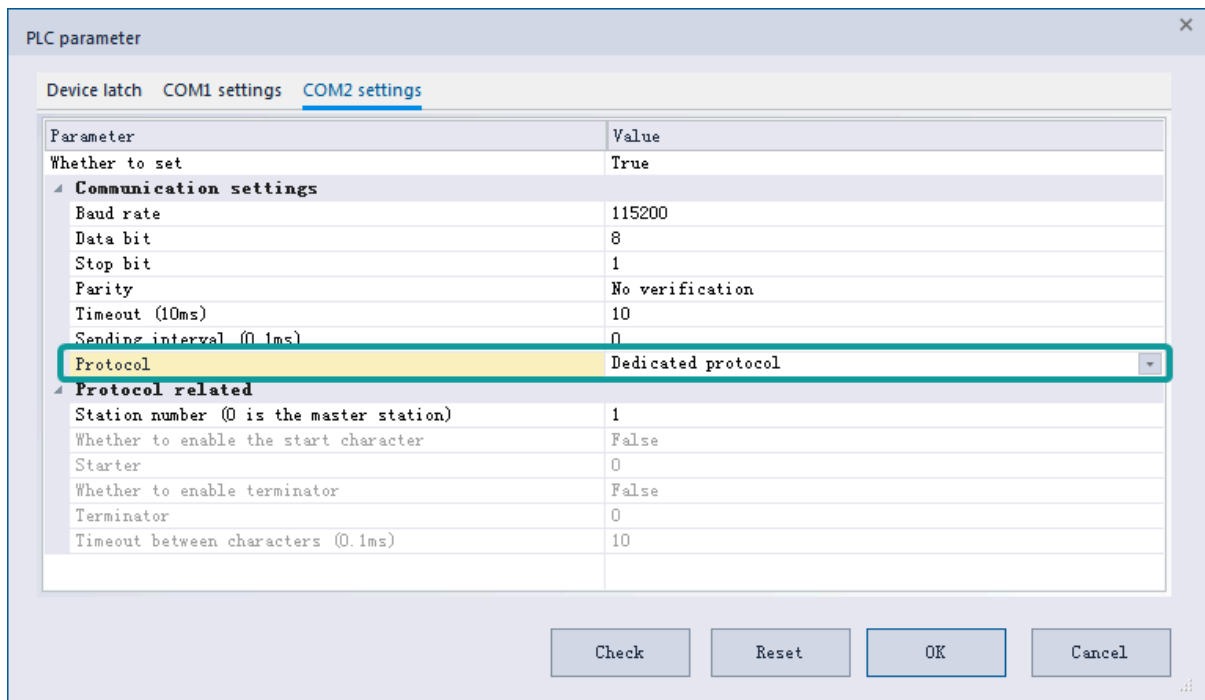
(5) Main station parameter configuration
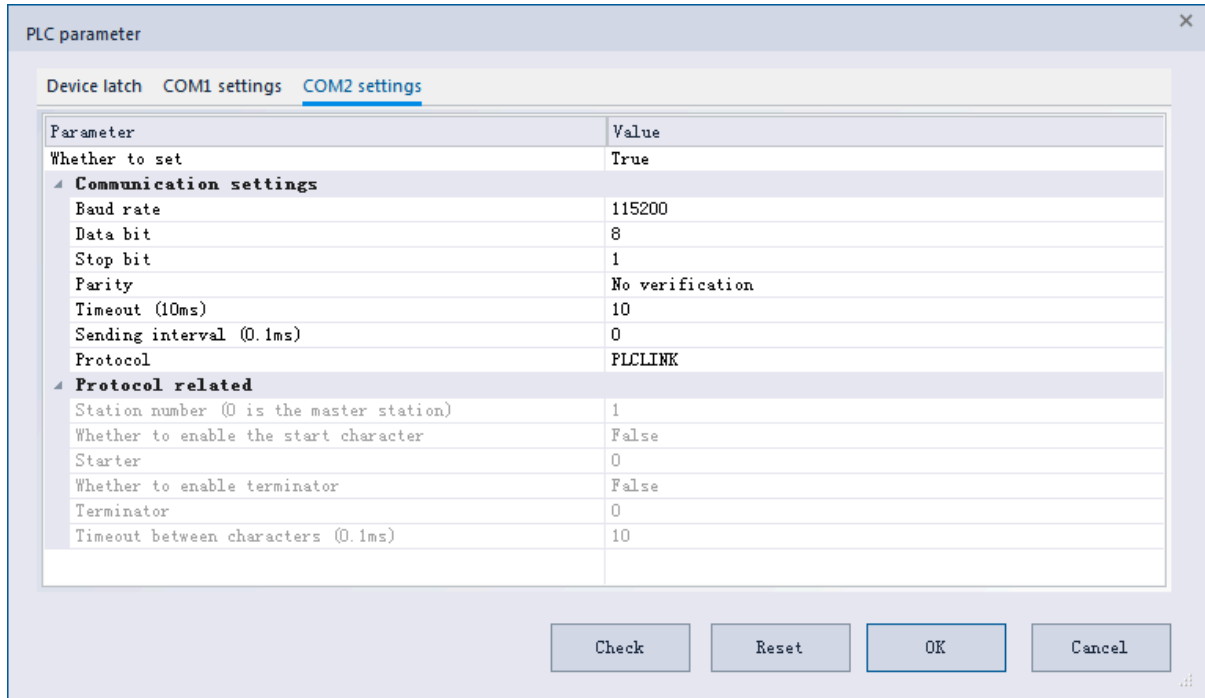
The protocol must be PLCLINK protocol, and the data bit can not be 7-bit data bit. Other parameters can be selected as required.

(6) Slave station configuration

For PLCLINK communication ports, select the dedicated protocol from the station protocol.

The settings of Baud rate, data bit, stop bit, parity bit must be consistent with main station. The parameters above are consistent if not modified. The station number needs to be configured separately. The slave station number ranges from 1 to 31.

(7) Close PLCLINK

In S1+11, The pause and start of PLCLINK are controlled by bit 8. If bit 8 is ON, PLCLINK would be closed. No error is reported when switching protocol after this function is disabled.

S1+11	Operation state	`Bit0=1, Port` is occupied. This function obtains the right of data transaction transmission.
		`Bit2=1, One` cycle has been executed.
		`Bit4, Communication` transmission output indication
		`Bit5, Communication` error output indication (Exceeds the number of retry times)
		`Bit6, Communication` completion output indication
		`Bit8, PLCLINK` suspension (0: Normal operation, 1: Operation paused)

(8) Table contents

Currently the communication table is downloaded to the device to operate. The details of the table are as follows.

Address offset	Brief description		Detailed description
	High byte	**Low byte**	
S1+0	Header		Header =70h, correct PLCLINK table. (modification prohibited)
S1+1	Number of communication instructions		1 to 255 (modification prohibited)
S1+2	Version		V1.100 (modification prohibited)
S1+3	The start address of communication table		modification prohibited
S1+4	Check bit of the number of header and communication		Simple check calculation for table header, number of communication instructions, version, and the start address of communication table ((modification prohibited))
S1+5	Which instruction currently is running		Display the current running command (read only)
S1+6	Station NO.1	Read/write direction	The instruction content of current communication
S1+7	The data start address of station NO.1		
S1+8	Station NO.2	Address type distinction	
S1+9	The data start address of station NO.2		
S1+10	Data length		
S1+11	Operation state		Bit0=1,Port is occupied. This function obtains the right of data transaction transmission.
			Bit2=1, One cycle has been executed.
			Bit4, Communication transmission output indication
			Bit5, Communication error output indication (Exceeds the number of retry times)

			Bit6, Communication completion output indication
			Bit8, PLCLINK suspension (0: Normal operation, 1: Operation paused)
S1+12	Auto check mode (Reserved)		0: No check; 1: Automatic check mode; 2: Automatic check in progress.
			When enabled, all the station numbers will send data to determine whether the station number exists. The corresponding communication switch will be turned on if it exists. If not, the corresponding communication switch will be turned off.
S1+13	Corresponding station number communication switch 1		The switch control of station 1 to 15
			Bit0: ON: Station NO. 0 (broadcast) normal communication
			OFF: Station NO.0 (broadcast) communication prohibited (broadcast prohibited)
			Bit1: ON: Station NO.1 normal communication;
			OFF: Station NO.1 communication prohibited
			Bit2: ON: Station NO.2 normal communication;
			OFF: Station NO.2 communication prohibited
S1+14	Corresponding station number communication switch 2		The switch control of station 16 to 31
S1+15	Reserved		
S1+16	Reserved		
S1+17	Reserved		
S1+18	Reserved		
S1+19	Reserved		
S1+20	Reserved		
S1+21	Station NO.1	Read/write direction	• Station NO. 1 to 32, FF(FF represents main station)
			• Function code:
			=01H, read
			=02H, write
S1+22	The data start address of station NO.1		• Valid word. Define operating the start address of slave station data
S1+23	Station NO.2	Address type distinction	•Station NO.0 to 32 (If it is 0, broadcast to all the slave stations on behalf of master

			station, and slave stations do not respond
			•Distinguish the type of the starting device for storing data in the main station.
			Main station address type distinction. 0: word address; 1: bit address
S1+24	The data start address of station NO.2		• Valid word. Define operating the start device of slave station data. Define the corresponding address by MUDBUS address of 5V.
S1+25	Data length		• Valid word. Range 1 to 126(bit data), 1 to 2,032(bit data)
S1+26	Station NO.1	Read/write direction	The second data transmission description.
S1+27	The data start address of station NO.1		
S1+28	Station NO.2	Address type distinction	Main station address type distinction.
S1+29	The data start address of station NO.2		
S1+30	Data length		
•			
•			
S1+20+ n×5	Reserved		• n is the total number of data transmission commands.

#Note:

1. It is forbidden to modify S0 to S4.
2. It is not recommended to change the value except the function enable or station number enable. Otherwise, the operation or upload may be abnormal.

Error code

| Error code	Contents
31C0H	Abnormal PLCLINK header. Re-download the program.
31C1H	PLCLINK function is not supported by COM port currently.
31C2H	PLCLINK table version is incompatible. Re-download the program.
31C3H	The number of PLCLINK command exceeds the range. The value ranges from 1 to 255 Currently.
31C4H	The station number of PLCLINK table exceeds the range. Check the station number in the table.
31C5H	PLCLINK table exceeds the range of device. Check the corresponding device range of table.
31C6H	The device used by PLCLINK table command exceeds the range. Check the device used for each command in the table
3180H	COM2 data reception error. There may be interference on the communication line. It is recommended to connect the gr
3181H	COM2 data reception time. Check wiring, whether the parameters of the serial port setting is master-slave corresponde
3182H	COM2 CRC check error. There may be interference on the communication line. It is recommended to connect the groun
3184H	COM2 station number error. Check the setting of slave station number. Check whether there is a problem with the slave
3186H	COM2 function code error. Check whether the function code is supported by PLC.
3187H	COM2 address error.
3188H	COM2 length error. Check whether the communication length exceeds the length range specified by Modbus or user-de
3189H	COM2 data error. Check whether the parameter of instruction is wrong. Check whether the setting of the value is suppo
318AH	COM2 slave station is busy. Slave station returns message: Slave station is busy. (Please refer to Modbus abnormal 06
318BH	COM2 slave station does not support function codes. Check whether the function code is supported by slave station. (P
318CH	COM2 slave station fault. Slave station returns message: Slave station is fault. Check whether the slave station is faulty

|	
318DH	COM2 slave station confirmation. Slave station returns message: Slave station confirmation.(Please refer to Modbus ab
318EH	COM2 does not support this instruction or function. When slave station protocol is set, the corresponding communicatio corresponding communication function.
3190H	The data received by COM2 exceeds the cache limit.

Example

Create a PLCLINK table and automatically switch the Com2 protocol to PLCLINK.
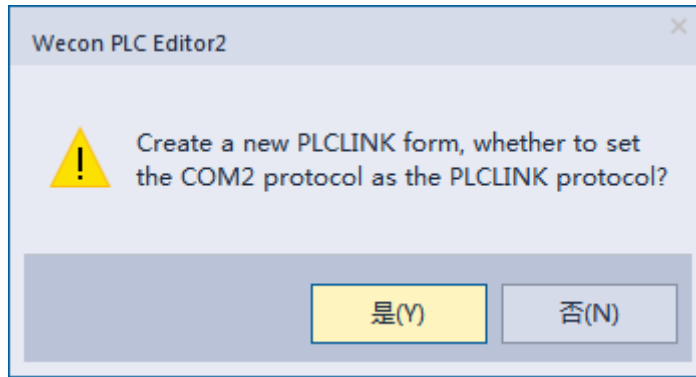
Open PLCLINK table, write the master station D10 to the slave station D10 device number 10, and read the slave station D10 to the master station D20 device number 10.
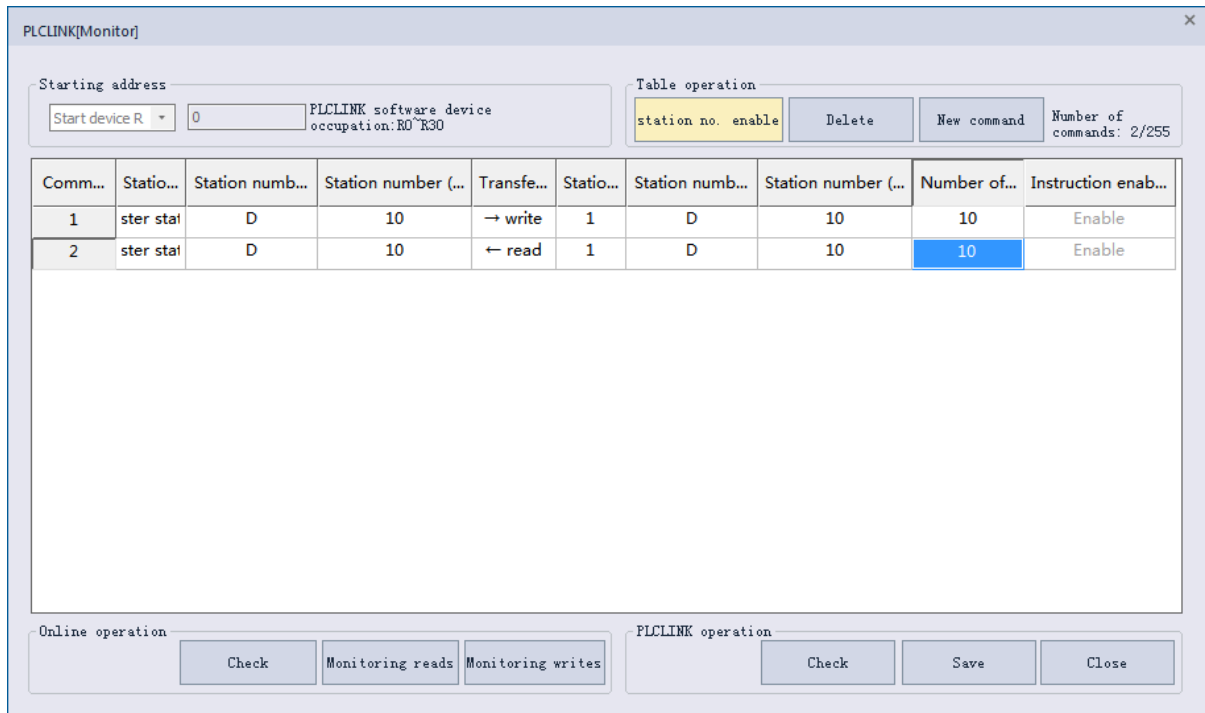

Connect Com2 of master station PLC to COM1 of slave station, and set the slave station number to 1. After downloading, set the value of main station D10 to 1 and D11 to 8192 . Then, D20 will change to 1 and and D21 will change to 8192.
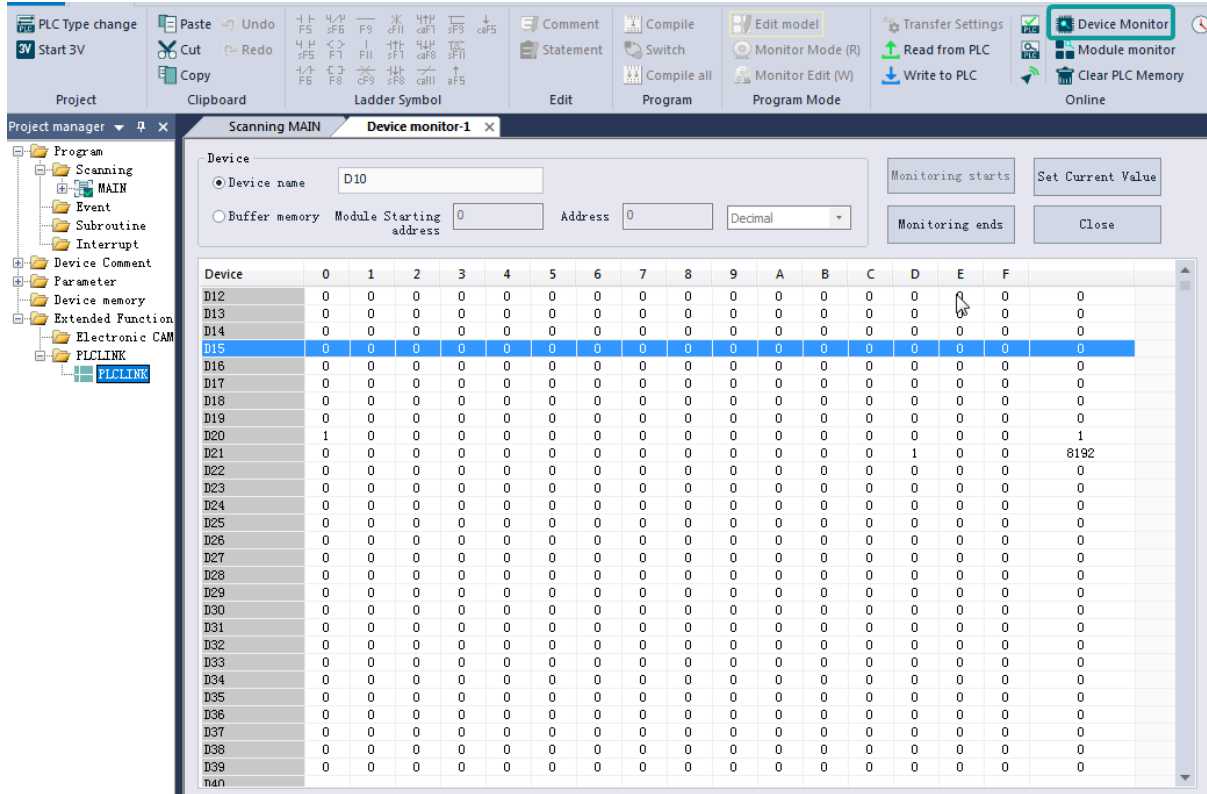
The situation of connecting more than one

When adding commands, the station number that corresponding more slave station number can add more station number communication connections
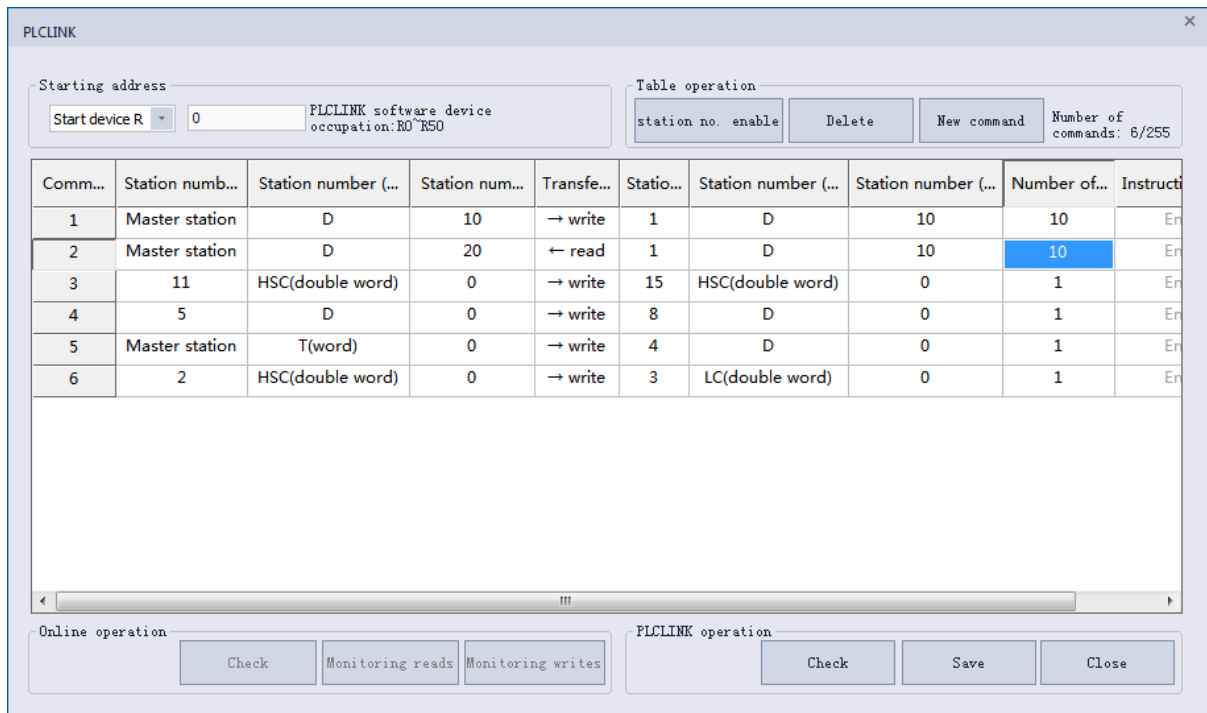
Wecon Modbus protocol description

The current Wecon Modbus protocol description (special protocol) is modified based on the ModbusRTU protocol.

Therefore, 7-bit data bits cannot be used in the serial port parameter part.

The protocol of COM0 and COM1 can only use WECON Modbus protocol at present and cannot be changed.

This protocol is fully compatible with Modbus RTU protocol, and the address is also the same as the default address of LX5VPLC's Modbus RTU protocol.

The extended function is mainly used to communicate with PLCEDITOR.