Instruction Manual

Supplementary Manual for SYL-53X2P (RS-485/Modbus_RTU)

Version 1.2 (Sep, 2020)

CAUTION!

This controller is intended to control equipment under normal operating conditions. If failure or malfunction of it could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of or protect against failure or malfunction of the controller must be incorporated into and maintained as part of the control system.

1. Introductory

This controller is using RS485 Modebus_RTU (Remote Terminal Unit) mode for the data transfer. Up to 255 meters can be connected at same time. The format for each byte in RTU mode is:

Coding system:
8-bit binary, hexadecimal 0-9, A-F
Two hexadecimal characters contained in each 8-bit field of the message

Bits per Bytes:
Baud rate (bps): 1200, 2400, 4800 and 9600
Stop bit: 1 bit
Data length: 8 bits
Parity check: None
Error Check Field: Cyclical Redundancy Check (CRC-16)

Other spec when use third party PLC/comm software
Timeout interval: 300ms.
Retries: >2 times

2. RTU Message Frame:

A typical message frame is shown below.

Table 2.1 RTU data frame.

Target Address	Function	Data	CRC-16
8 Bits	8 Bits	n x Bits	16 Bit

Target address field: This field contains 8-bit data (RTU). Its range is 0 - 255 decimal. Address 0 is for broadcasting data to all receiving devices. To contact a PID controller, the sender unit/computer/PLC will put the address of that PID controller in the address field of the message. When that PID controller replies, it will put its address in the address field of the message as well.

Function field: This field contains 8-bit data. Its range is 1 - 64 decimal. This function field will tell what operations are requested for this data frame. For example, updating the value for set temperature, fetching the current reading temperature, etc.

Data field: This field contains multiple 8-bit data. It contains all the additional information, which is needed to complete the requested function. Such as the target parameter address, or the new set temperature.

CRC: 16-bit or two 8-bit bytes for error checking. Cyclical Redundancy Check (CRC) value is appended to the end of this data frame. Low-order byte will be sent in prior to the high-order byte. For example, if the data frame is 010310010001, and its CRC16 is D10A. So its complete data frame is 010310010001**D10A**.

Note: RTU message is in hexadecimal format.

3. Parameter set

Table 3.1 System Parameters

Code	Description	Setting Range	Initial Setting	Data Type*	Register Absolute Address	Holding Register Address
SP	Set Point (Single Step mode only)	PuL ~ PuH	100	Decimal	0x00	40001
AL1	Alarm 1 Setting	-1999 ~ +9999	200	Decimal	0x01	40002
AL2	Alarm 2 Setting	0 ~ 200	10	Decimal	0x02	40003
Pb	Input offset	±20.0	0	Integral	0x03	40004
P	Proportional Constant	0 ~ 5000	0	Integral	0x04	40005
I	Integral Time	0 ~ 3000	500	Integral	0x05	40006
d	Derivative Time	0 ~ 2000	100	Integral	0x06	40007
t	Cycle Time	2 ~ 120	10	Integral	0x07	40008
FILt	Digital Filter	0 ~ 50	20	Integral	0x08	40009
HY	Hysteresis Band	0.1 ~ 50.0	0.5	Decimal	0x09	40010
dP	Decimal Point Position	0 ~ 1	1	Integral	0x0A	40011
outH	Output High Limit	outL ~ 200%	200%	Integral	0x0B	40012
outL	Output Low Limit	0 ~ outH	0	Integral	0x0C	40013
At	Auto Tuning	0 ~ 1	0	Integral	0x0D	40014
LoCK	Configuration Privilege	0 ~ 50	0	Integral	0x0E	40015
Sn	**Input Sensor Type****		K	Integral	0x0F	40016
oP-A	Reserved				0x10	40017
CF	Display Temp Unit	C, F	C/0	Integral	0x11	40018
ALP	Alarm Output Definition	0 ~ 10	1	Integral	0x12	40019
CooL	System Function Selection	0 ~ 1	0	Integral	0x13	40020
PuH	Display High Limit	PuL ~ 9999	1300	Decimal	0x14	40021
PuL	Display Low Limit	-1999 ~ PuH	0	Decimal	0x15	40022
Addr	Communication address	0 ~ 255	1	Integral	0x16	40023
bAud	Communication baud rate		3 for 9600	Integral	0x17	40024

Table 3.2 Ramp Soak Profile Parameters

Code	Description	Setting Range	Initial Setting	Data Type*	Register Absolute Address	Holding Register Address
SEC	Timer Unit	0 ~ 1	0 for min.	Integral	0x19	40026
LooP	Program Cycling	0 ~ 1	1	Integral	0x1A	40027
PdE	Power Outage Mode	0 ~ 3	2	Integral	0x1B	40028
SSb	Safety Start Band	0 ~ 100.0	100	Decimal	0x1C	40029
run	Program Control	0 ~ 3	0	Integral	0x1D	40030
Pro	Program Step Jump	0 ~ 64	0	Integral	0x1E	40031
tE	Run Time			Integral	0x1F	40032
r01	Ramp Time 1	0 ~ 2000	0	Integral	0x20	40033
t01	Soak Time 1	0 ~ 9999	0	Integral	0x21	40034
C01	Set Temp 1	PuL ~ PuH	0	Decimal	0x22	40035
…						
r32	Ramp Time 32		0	Integral	0x7D	40126
t32	Soak Time 32		0	Integral	0x7E	40127
C32	Set Temp 32		0	Decimal	0x7F	40128

Table 3.3 Status parameters (read only)

Description	Data Type*	Register Absolute Address	Holding Register Address
Reading Temp	Decimal	1001	44098
Current Set Temp	Decimal	1002	44099
Main Output (0-200%)	Integral	1101	44354
Alarm Status* **	Integral	1201	44610

Note*: Parameter Data Type

Some parameters in this controller may display in decimal number (number with one decimal digit) rather than integral number. For example, your display temperature can be 20.1 degree (decimal number) and your step 2 ramp timer is 10 minutes (integral number). For decimal number, its actual stored value in controller's memory will be 10 times larger than its display value. For example, if your display temperature is 20.1, it will be stored as 201 (Decimal) or C9 (Hex) in its register. For integral number, its actual stored value in the controller's memory will be the same as its display value.

This controller uses signed 16-bit number and it cannot read floating point numbers.

Note: Input Sensor Type**

This PID controller can read the following 9 different temperature sensor types. Please find the table below. Sn code is the Sn value used in its software. Sn symbol is the display value on the PID controller.

Table 3.4 Value table for input sensor type

Sn Code	Sn Symbol	Definition
0	Cu50	Cu50 (RTD)
1	Pt1	Pt100 (RTD), -200~200C
2	Pt2	Pt100 (RTD), -200~600C
3	K	K (thermocouple)
4	E	E (thermocouple)
5	J	J (thermocouple)
6	t	T (thermocouple)
7	S	S (thermocouple)
8	r	R (thermocouple)

Note*: Alarm Status**

This parameter shows the status of both AL1 and AL2 relay outputs. See table below:

Table 3.5 Value table for alarm status

Value	Alarm status
0	AL1 OFF, AL2 OFF
1	AL1 ON, AL2 OFF
2	AL1 OFF, AL2 ON
3	AL1 ON, AL2 ON

4. Function code examples

Note: Two function codes are available for this controller: 03 (0x03) and 06 (0x06). Function code 03 (read holding registers) and 06 (present single register/write register). For details, please check ModBus Protocol.

4.1. Function code 03: Read parameter value from the controller

Function code 03 is used to read the parameter value from the controller. Please note, the query message (sent by host) has a length of 8-byte and the response message (sent by PID) has a length of 7-byte.

Example: Read the current PV value from the controller:
Data sent by host (query): 01 03 10 01 00 01 D1 0A
Data received from PID (response): 01 03 02 03 7A 39 57

Table 4.1 Example for function code 03

Query Message				
Target Address	Function	Parameter Address	Number of words	CRC16
01	03	1001	0001	D10A
Response Message				
Target Address	Function	Data Length	Data	CRC16
01	03	02	037A	3957

By the response message, the current stored PV value was 037A (hex) or 890 (decimal). PV is in decimal format, so the actual display temperature is 89.0 degree.

4.2. Function code 06: Write new parameter value to the controller

Function code 06 is used to write new parameter value to the controller. The query message (sent by host) and the response message (sent by PID) both have a length of 8-byte. After the controller received the query message correctly, controller will reply the exact same message to the host.

Example #1: Write 550.5 degree as new alarm 1 temperature (AL1) value to the controller. AL1 parameter is in decimal format, so the stored value is 5505 (decimal) or 1581 (hex). The replied data will be the same as sent data.

Data sent by host (query): 01 06 00 01 15 81 16 FA
Data received from PID (response): 01 06 00 01 15 81 16 FA

Table 4.2.1 Example 1 for function code 06

Query Message				
Target Address	Function	Parameter Address	Number of words	CRC16
01	06	0001	1581	16FA
Response Message				
Target Address	Function	Parameter Address	Number of words	CRC16
01	06	0001	1581	16FA

Example #2: Change the display temperature unit from Celsius to Fahrenheit. The address for parameter CF is 0011. Change it to 0 for Celsius display and change it to 1 for Fahrenheit display.
Data sent by host (query): 01 06 00 11 00 01 18 0F
Data received from PID (response): 01 06 00 11 00 01 18 0F

Table 4.2.2 Example 2 for function code 06

Query Message				
Target Address	Function	Parameter Address	Number of words	CRC16
01	06	0011	0001	180F
Response Message				
Target Address	Function	Parameter Address	Number of words	CRC16
01	06	0011	0001	180F

5. Common Error

Q: Why I get no response from this controller?

A: 1). Please check the controller's address in the query message is correct, CRC code for message is correct and data frame format is correct.

2). Every command can only read one resistor at one time. User cannot read multiple registers at same time.

3). Please check the time interval between query messages is over 300ms.

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