AIN24 -2
ANALOG INPUT MODULE

COMMUNICATION PROTOCOL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

Chinese trademark

English trademark

SmartGen — make your generator *smart*

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Table 1 − Software Version

Date	Version	Content
2021-11-01	V1.0	Original release.

CONTENT

1. DESCRIPTION

This protocol describes read and write command format of RS485 half-duplex serial port communication and definition of internal information data for the third-party to develop and use.

The controller is used as a slave, using Modbus-RTU protocol, and does not support other protocols such as Modbus-ASCII.

Communication address: 1~2
Baud rate: 9600/19200bps can be set
Start bit: 1-bit
Data bit: 8-bit
Parity bit: No/Odd/Even Parity (default: no parity)
Stop bit: 2-bit

Supported function code: 03H. Function code 03H is used for reading controller data.
Data check mode: CRC16.
Internal registers of controller are in the unit of "word (double bytes)".
Communication timeout period: over 200ms.
Communication distance: 9600 baud rate, the longest distance can reach 1,000m when using 120Ω shielding twisted pair.
Once maximum 120 data of word register can be read.
When RS485 is connected, 120Ω twisted pair with shielding layer shall be used, and the shielding layer shall be grounded at one end.

2. WIRING DIAGRAM
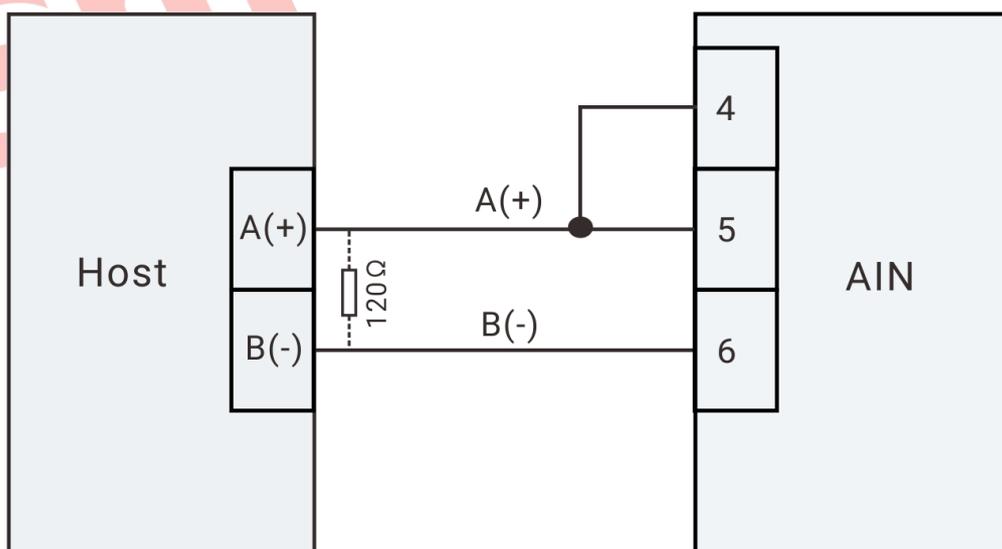
Fig.1 Single Unit Communication Wiring Diagram

NOTE1: 120Ω impedance resistor of master unit can be connected automatically according to site situation, 120Ω resistor of analog input module can be connected by shorting terminal 4 and 5.

NOTE2: This figure is RS485 wiring diagram.

3. CONTROLLER INTERNAL REGISTER ADDRESS AND DATA

Table 2 − Function Code 03H Mapping Data Field

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
500	40501	Sensor 1 Temp Value	0-9999	0.1	°C	16-bit Signed	
501	40502	Sensor 2 Temp Value	0-9999	0.1	°C	16-bit Signed	
502	40503	Sensor 3 Temp Value	0-9999	0.1	°C	16-bit Signed	
503	40504	Sensor 4 Temp Value	0-9999	0.1	°C	16-bit Signed	
504	40505	Sensor 5 Temp Value	0-9999	0.1	°C	16-bit Signed	
505	40506	Sensor 6 Temp Value	0-9999	0.1	°C	16-bit Signed	
506	40507	Sensor 7 Temp Value	0-9999	0.1	°C	16-bit Signed	
507	40508	Sensor 8 Temp Value	0-9999	0.1	°C	16-bit Signed	
508	40509	Sensor 9 Temp Value	0-9999	0.1	°C	16-bit Signed	
509	40510	Sensor 10 Temp Value	0-9999	0.1	°C	16-bit Signed	
510	40511	Sensor 11 Temp Value	0-9999	0.1	°C	16-bit Signed	
511	40512	Sensor 12 Temp Value	0-9999	0.1	°C	16-bit Signed	
512	40513	Sensor 13 Temp Value	0-9999	0.1	°C	16-bit Signed	
513	40514	Sensor 14 Temp Value	0-9999	0.1	°C	16-bit Signed	
514	40515	Sensor 15 Resist. Value	0-9999	0.1	Ω	16-bit Unsigned	
515	40516	Sensor 16 Resist. Value	0-9999	0.1	Ω	16-bit Unsigned	
516	40517	Sensor 17 Resist. Value	0-9999	0.1	Ω	16-bit Unsigned	
517	40518	Sensor 18 Resist. Value	0-9999	0.1	Ω	16-bit Unsigned	
518	40519	Sensor 19 Resist. Value	0-9999	0.1	Ω	16-bit Unsigned	
519	40520	Sensor 20 Current Value	0-2200	0.01	mA	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
520	40521	Sensor 21 Current Value	0-2200	0.01	mA	16-bit Unsigned	
521	40522	Sensor 22 Current Value	0-2200	0.01	mA	16-bit Unsigned	
522	40523	Sensor 23 Current Value	0-2200	0.01	mA	16-bit Unsigned	
523	40524	Sensor 24 Current Value	0-2200	0.01	mA	16-bit Unsigned	

NOTE1: Actual value=received data*ratio. Take sensor current value as the example, received data is 1000 (3E8H), ratio is 0.01mA, so the actual current value is 10.00mA(1000*0.01mA);

NOTE2: Definition of signed number. Take received data 8000H as the example, transfer it to binary 1000 0000 0000 0000b, the MSB is 1, which is a negative number. One's complement is obtained by subtracting 1 from it, which is inverted to obtain the absolute value of the negative number. Then transfer it to -32768 in decimal.

 Example:

Read "Sensor 1 Current Value (current is 10.00mA)", firstly get its address is 1840 by checking the table, then it is known that you need to read 1 byte's data.

Assume the slave address is 01, the master request command is as following:

Table 3 – Master Request Command

Slave Address	Function Code	Starting Address (1840)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	03	07	30	00	01	85	71

Slave response command is as following:

Table 4 – Slave Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data		CRC 16 Calibration	
			Data MSB of Address 1840	Data MSB of Address 1840	LSB	MSB
01	03	02	03	E8	B8	FA

Fill the received data into the corresponding address, as shown in the table below:

Table 5 – Data Analysis

Address	Received Data (Hex)	Combination (Hex)	Sensor 1 Current Value (Decimal)
1840	03E8	03E8	10.00mA

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