AIN16-C-2

ANALOG INPUT MODULE

COMMUNICATION PROTOCOL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

Chinese trademark

SmartGen English trademark

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Table 1 – Software Version

Date	Version	Content
2021-09-01	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

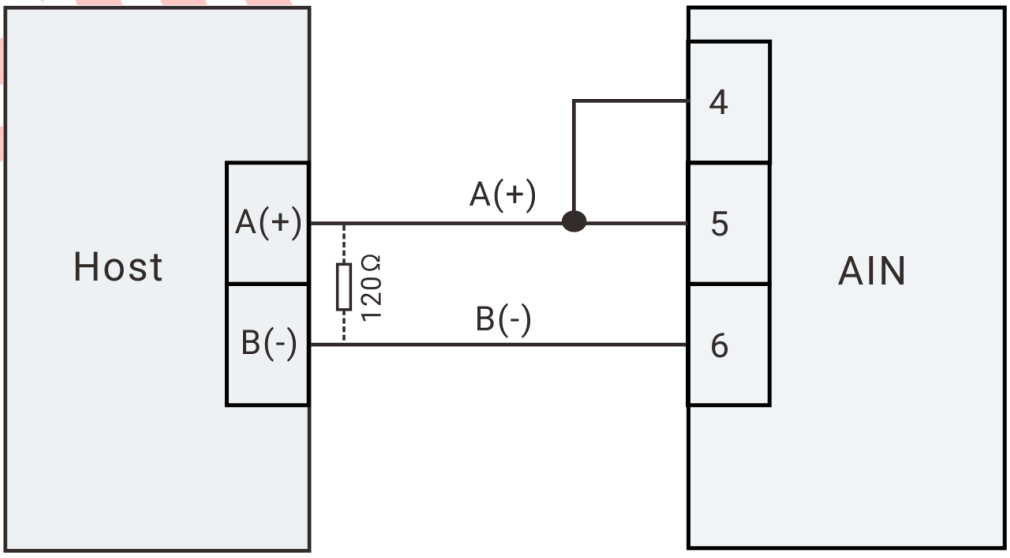

Fig.1 Single Unit Communication Wiring Diagram

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
1792	41793	Sensor 1 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1793	41794	Sensor 2 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1794	41795	Sensor 3 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1795	41796	Sensor 4 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1796	41797	Sensor 5 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1797	41798	Sensor 6 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1798	41799	Sensor 7 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1799	41800	Sensor 8 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1800	41801	Sensor 9 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1801	41802	Sensor 10 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1802	41803	Sensor 11 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1803	41804	Sensor 12 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1804	41805	Sensor 13 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1805	41806	Sensor 14 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1806	41807	Sensor 15 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1807	41808	Sensor 16 Sampling Value	0-40950	1		16-bit Unsigned	AD Value
1808	41809	/					
1809	41810	/					
1810	41811	/					
1811	41812	/					
1812	41813	/					
1813	41814	/					
1814	41815	/					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1815	41816	/					
1816	41817	/					
1817	41818	/					
1818	41819	/					
1819	41820	/					
1820	41821	/					
1821	41822	/					
1822	41823	/					
1823	41824	/					
1824	41825	Speed 1 Count Value	0-65535	1		16-bit Unsigned	200ms pulse count value
1825	41826	Speed 2 Count Value	0-65535	1		16-bit Unsigned	200ms pulse count value
1826	41827	Speed 3 Count Value	0-65535	1		16-bit Unsigned	200ms pulse count value
1827	41828	/					
1828	41829	/					
1829	41830	/					
1830	41831	/					
1831	41832	/					
1832	41833	/					
1833	41834	/					
1834	41835	/					
1835	41836	/					
1836	41837	/					
1837	41838	/					
1838	41839	/					
1839	41840	/					
1840	41841	Sensor 1 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1841	41842	Sensor 2 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1842	41843	Sensor 3 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1843	41844	Sensor 4 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1844	41845	Sensor 5 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1845	41846	Sensor 6 Current Value	0-65535	0.01	mA	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1846	41847	Sensor 7 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1847	41848	Sensor 8 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1848	41849	Sensor 9 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1849	41850	Sensor 10 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1850	41851	Sensor 11 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1851	41852	Sensor 12 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1852	41853	Sensor 13 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1853	41854	Sensor 14 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1854	41855	Sensor 15 Current Value	0-65535	0.01	mA	16-bit Unsigned	
1855	41856	Sensor 16 Current Value	0-65535	0.01	mA	16-bit Unsigned	

NOTE1: Actual value=received data*ratio. Take sensor current 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;

NOTE3: Current value can be obtained after calculating sensor sampling value. The formula is: sensor current value=sensor sampling value*275/4095.

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