

BASIC COMMUNICATION PARAMETERS

| | |
|-------------|---|
| Coding | 8-bit binary |
| Data bits | 8 bits |
| Parity bit | None |
| Stop bit | 1 bit |
| Error check | CRC (Redundant cyclic code) |
| Baud Rate | 2400bit/s, 4800bit/s, 9600bit/s can be set Factory standard is 4800bit/s |

DATA FRAME FORMAT DEFINITION

Modbus-RTU communication protocol is adopted, and the format is as follows:

Time of initial structure \geq 4 bytes

Address code=1 byte

Function code=1 byte

Data area=N bytes

Error check=16-bit CRC code

Time to end structure \geq 4 bytes

Address code: the address of the transmitter, which is unique in the communication network (factory standard 0x01)

Function code: the instruction function indication sent by the host.

This transmitter only uses function code 0x03 (read register data)

Data area: The data area is specific communication data.

Note that the high byte of 16bits data comes first

CRC code: two-byte check code.

Host query frame structure:

| Address code | Function code | Register start address | Register length | Check code low | Check code high |
|--------------|---------------|------------------------|-----------------|----------------|-----------------|
| 1 byte | 1 byte | 2 byte | 2 byte | 1 byte | 1 byte |

Slave response frame structure:

| Address code | Function code | Number of valid bytes | Data area 1 | Data area 2 | Data area N | Data area check code |
|--------------|---------------|-----------------------|-------------|-------------|-------------|----------------------|
| 1 byte | 1 byte | 1 byte | 2 byte | 2 byte | 2 byte | 2 byte |

Register address:

| Register address | PLC or configuration address | Content | Operation |
|------------------|------------------------------|-------------------------|----------------------------------|
| 0000H | 40001 | Humidity | R |
| 0001H | 40002 | Temperature | R |
| 0050H | 40081 | Temperature calibration | R/W |
| 0051H | 40082 | Humidity calibration | R/W |
| 07D0H | 42001 | Address register | R/W: 1-254 |
| 07D1H | 42001 | Baud rate register | R/W: 0: 2400/ 1: 4800/ 2:9600 |

COMMUNICATION PROTOCOL EXAMPLES & EXPLANATIONS

Example: Read the temperature and humidity value of the device address 0x01

Query frame (hexadecimal):

| Address code | Function code | Start Address | Data Length | Check Code Low | Check Code High |
|--------------|---------------|---------------|-------------|----------------|-----------------|
| 0x01 | 0x03 | 0x00 0x00 | 0x00 0x02 | 0xC4 | 0x0B |

Response frame (hexadecimal): (For example, when reading a temperature of - 10.1 °C and a humidity of 65.8% RH)

| Address code | Function code | Returns the number of valid bytes | Humidity Value | Temperature Value | Check Code Low | Check Code High |
|--------------|---------------|-----------------------------------|----------------|-------------------|----------------|-----------------|
| 0x01 | 0x03 | 0x04 | 0x02 0x92 | 0xFF 0x9B | 0x5A | 0x3D |

Temperature calculation:

When the temperature is lower than 0 °C, the temperature data is uploaded in the form of a complement code.

Temperature: FF9B H (hexadecimal)=- 101=>Temperature=- 10.1 °C

Humidity calculation:

Humidity: 292 H (hexadecimal)=658=>Humidity=65.8% RH

DEVICE ADDRESS SETTING METHOD

The device address supports two methods: software configuration and dial switch settings, Only one method can be selected to set the address.

When all four dial switches are turned to the "OFF" position, it is supported to use the configuration software to set the address, You can set the address through the "Configuration Software".

When one of the four dial switches is in the "ON" position, the device address can only be the address represented by the dial switch,

At this time, the address set by the software is invalid, and the address range set by the dial switch is 1 to 15.

The address mode for setting the dial switch is as follows: 1 represents ON, 0 represents OFF.

| Modbus Address | 1 | 2 | 3 | |
|----------------------------|-------|-------|-------|-------|
| Address set using software | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 2 | 0 | 0 | 0 | 0 |
| | | | | |
| 15 | 1 | 1 | 1 | 1 |

SDCO COMMUNICATION PARAMETERS

- RS-485 interface, Hardware named D+, D-
- Slave Address: 1~247
- Baud rate: 9600, 19200, 38400, 57600, 115200
- Parity: None, Even, Odd
- Data length: 8 bit
- Stop bit: 1 or 2 bit
- Default Address = 1, Data format= 9600, N81

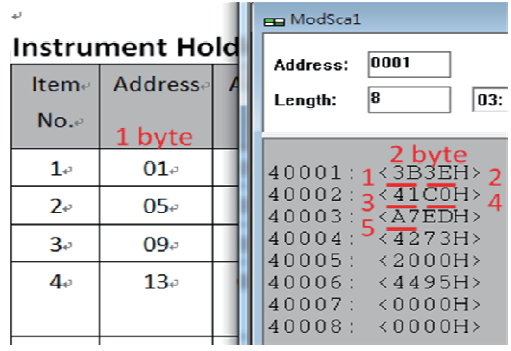
Modbus (ref PI-MBUS-300)

- Support RTU mode
- Broadcast support (Address 0)
- Bit addressable items (i.e. Coils and Discrete inputs) will not be implemented
- Measurement Values are represented in IEEE 754 single-precision 32-bit floating point type
http://en.wikipedia.org/wiki/IEEE_754
- Modbus protocol structure:
 - ▣ 1st byte: Address (1~247)
 - ▣ 2nd byte: Function code (1 byte)
 - ▣ 3~Nth bytes: Data bytes
 - ▣ N+1th~N+2th byte: CRC (16 bits), LSB first

SDCO RS-485 PROTOCOL (Application) ex:ModScan

| Item No. | Add. | Add. HEX | Parameter | Point Type | Data Type | Value |
|----------|------|----------|----------------------------|------------------|--------------|-------|
| 1 | 1025 | 0401H | Temperature | HOLDING REGISTER | Floating Pt. | °C |
| 2 | 1029 | 0405H | Relative Humidity | HOLDING REGISTER | Floating Pt. | % |
| 3 | 1033 | 0409H | Dew Point Temperature | HOLDING REGISTER | Floating Pt. | °C |
| 4 | 1037 | 040DH | Forst Point Temperature | HOLDING REGISTER | Floating Pt. | °C |
| 5 | 1041 | 0411H | Wet Bulb Temperature | HOLDING REGISTER | Floating Pt. | °C |
| 6 | 1045 | 0415H | Saturation Vapour Pressure | HOLDING REGISTER | Floating Pt. | mbar |
| 7 | 1049 | 0419H | Vapour Pressure | HOLDING REGISTER | Floating Pt. | mbar |
| 8 | 1053 | 041DH | Mixture Ratio | HOLDING REGISTER | Floating Pt. | g/kg |
| 9 | 1057 | 0421H | Absolute Humidity | HOLDING REGISTER | Floating Pt. | g/m³ |
| 10 | 1061 | 0425H | Specific Enthalpy | HOLDING REGISTER | Floating Pt. | kJ/kg |

- The base address is 1 rather than 0 in ModScan application.
- The register shown on the table is 1 byte whereas the ModScan 2 bytes.
- So the corresponding value against address 1029 of the "table" would be address 1027 of the Modscan
(e.g. 05 of the table equals to 40003 of the ModScan)



SDCO RS-485 PROTOCOL(Software)

| Item No. | Add. | Add. HEX | Parameter | Data Bytes | Data type | Value |
|--|-------|-------------|------------------|------------|------------------|-----------|
| Information | | | | | | |
| 1 | 17-26 | 0011H-001AH | Firmware version | 10 bytes | ASCII | |
| 2 | 33-48 | 0021H-0030H | Serial Number | 16 bytes | ASCII | |
| RS-485 Slave Address, Baud rate, Data format | | | | | | |
| 3 | 49 | 0031H | Slave Address | 1 byte | unsigned Integer | 1-247 |
| 4 | 51 | 0033H | Baud rate | 1 byte | unsigned Integer | 0: 9600 |
| | | | | | | 1: 19200 |
| | | | | | | 2: 38400 |
| | | | | | | 3: 57600 |
| | | | | | | 4: 115200 |
| 5 | 53 | 0035H | Data type | 1 byte | unsigned Integer | 0: N81 |
| | | | | | | 1: N82 |
| | | | | | | 2: E81 |
| | | | | | | 3: E82 |
| | | | | | | 4: O81 |
| | | | | | | 5: O82 |

| Item No. | Add. | Add. HEX | Parameter | Data Bytes | Data type | Value |
|---------------------|------|----------|-----------|------------|-----------|------------------------|
| Physical Quantities | | | | | | |
| 6 | 1 | 001H | OUT1 | 4 bytes | IEEE 754 | Relate to OUT1 setting |
| 7 | 5 | 005H | OUT2 | 4 bytes | IEEE 754 | Relate to OUT2 setting |

ASCII format, Item No. 1-2

| 1st Word | | 2nd Word | | 3rd Word | | 4th Word | | 5th Word | | 6th Word | | 7th Word | | 8th Word | |
|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|
| Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte |
| | | | | | | | | | | | | | | | |

"ABCDEF0123456789" is represented in byte of hexadecimal as

<41><42><43><44><45><46><30><31><32><33><34><35><36><37><38><39>

IEEE754 format, Item No. 6-7

| Data Hi Word, Hi Byte | Data Hi Word, Lo Byte | Data Lo Word, Hi Byte | Data Lo Word, Lo Byte |
|-----------------------|-----------------------|-----------------------|-----------------------|
| SEEE EEEE | EMMM MMMM | MMMM MMMM | MMMM MMMM |

Where

S represents the sign bit where 1 is negative and 0 is positive

E is the two's complement exponent with an offset of 127 i.e. an exponent of zero is represented by 127, an exponent of 1 by 128 etc.

M is the 23-bit normal mantissa. The highest bit is always 1 and, therefore, is not stored.

Using the above format the floating point number 23.83 is represented in byte of hexadecimal as <41><BE><A3><D7>:

| Data Hi Word, Hi Byte | Data Hi Word, Lo Byte | Data Lo Word, Hi Byte | Data Lo Word, Lo Byte |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 0x41 | 0xBE | 0xA3 | 0xD7 |

COMMUNICATION EXAMPLES

Read Temperature Measurement Value

| Request the host (PC or PLC) to polling the data of SDCO | | | |
|--|--------|------|------|
| Field Name | Value | Type | Byte |
| Slave Address | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 04 | Byte | 1 |
| Starting Address Lo | 00 | Byte | 1 |
| No. of registers Hi | 00 | Byte | 1 |
| No. of registers Lo | 02 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Registers of Temperature are 0x0400 ~ 0x0403

| Response SDCO response data to the host (PC or PLC) | | | |
|---|--------|------|------|
| Field Name | Value | Type | Byte |
| Slave Address | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 04 | Byte | 1 |
| IEEE 754 Data Lo Word, Hi Byte | 0xA3 | Byte | 1 |
| IEEE 754 Data Lo Word, Lo Byte | 0xD7 | Byte | 1 |
| IEEE 754 Data Hi Word, Hi Byte | 0x41 | Byte | 1 |
| IEEE 754 Data Hi Word, Lo Byte | 0xBE | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*the floating point number 23.83 is represented in byte of hexadecimal as <41><BE><A3><D7>

Read Relativity Humidity Measurement Value

| Request the host (PC or PLC) to polling the data of SDCO | | | |
|--|--------|------|------|
| Field Name | Value | Type | Byte |
| Slave Address | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 04 | Byte | 1 |
| Starting Address Lo | 04 | Byte | 1 |
| No. of registers Hi | 00 | Byte | 1 |
| No. of registers Lo | 02 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Registers of Relativity Humidity are 0x0404 ~ 0x0407

| Response SDCO response data to the host (PC or PLC) | | | |
|---|--------|------|------|
| Field Name | Value | Type | Byte |
| Slave Address | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 04 | Byte | 1 |
| IEEE 754 Data Lo Word, Hi Byte | 0x77 | Byte | 1 |
| IEEE 754 Data Lo Word, Lo Byte | 0xCF | Byte | 1 |
| IEEE 754 Data Hi Word, Hi Byte | 0x42 | Byte | 1 |
| IEEE 754 Data Hi Word, Lo Byte | 0x13 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

* the floating point number 36.87 is represented in byte of hexadecimal as <42><13><77><CF>: