# DS6 series MODBUS communication protocol

## 1、Protocol overview

### 1.1、Modbus RTU Protocol

The protocol applies to PAN-GLOBE DS6 series communication instrument .

The protocol provides for instrument and master computer data exchange mode .

It adopts asynchronism master and slave semiduplex communication mode by Upper computer as master , instrument as slave , and request message from master computer , instrument response accordingly .

### 1.2、Component

Data port : RS 485

Communication Add : 1~255 （Hang up a network of 128 stations ）

Wire : Shielded twisted pair

### 1.3、 Data linking

Request 8-bit binary, each code is expressed by two hexadecimal characters. Frame format is: 1 start bit, 8 data bits, 2 stop bits.

**Message Configuration**

| Slave address | Function Code | Data | CRC |
|---|---|---|---|
| 8bits | 8bits | n*8bits | 16bits |

**Function Code**

| Code | Contents |
|---|---|
| 03H | Reading one or multiple registers value |
| 10H | Setting multiple registers value |
| 06H | Setting 1 register value |

Note : 1 register value with 2 bits .

### 1.4、Error Check CRC

CRC generation step is as below:

①. CRC is initialized as 0FFFFH from 16bits register.

②. Calculate XOR with 1st 8-bit data and the low byte of CRC. And return to CRC register.

③. Shift CRC one bit to the right. Top bit as "0" , and lowest bit shift and test .

④.Repeat step 3 , when shift bit as "0" . If "1" , then calculate CRC register with "0A001H",

⑤. Repeat step 3 and 4, shifting right 8 times. Until last data is finished on 8-bit .

⑥. Repeat step 2~5, deal with next 8-bit data , until last data is processed.

Finally ,CRC value = CRC register .

## 2、Application function

The purpose of the application functions command is to define specific common format.

Software programmers can use the following methods to establish protocol of special application .

**Message configuration**

| Slave Add | Function code | Add top byte | Add low byte | Data top byte | Data low byte | CRC top byte | CRC low byte |
|---|---|---|---|---|---|---|---|
| 01 | 03 | 00 | BA | 00 | 01 | A5 | DC |

### 2..1、PC reading data（function code 03H）

This function allows the master to read collected or recorded data from slave station and system parameters from instrument.

request message from Master format as follow examples .

| Slave Add | Function code | Add top byte | Add low byte | Data top byte | Data low byte | CRC top byte | CRC low byte |
|---|---|---|---|---|---|---|---|
| 02 | 03 | 00 | BA | 00 | 01 | A5 | DC |

**Response data from slave instrument**

| Slave Add | Function code | Data whole byte number | Data top byte | Data low byte | CRC top byte | CRC low byte |
|---|---|---|---|---|---|---|
| 02 | 03 | 02 | xx | xx | xx | xx |

### 2.2、preset multiple registors ( function code : 10H)

This function allows Master instrument to revise 4-byte variable value and from top bit to low bit as : DATA4,DATA3,DATA2,DATA1, but send order as : DATA2,DATA1,DATA4,DATA3, It means just send low register , then send top register , as following :

| Slave Add | Function code | Add top byte | Add low byte | ariable value whol e byte | ariable value top byte | ariable value whole byte |
|---|---|---|---|---|---|---|
| 02 | 10 | 00 | B0 | 00 | 02 | 04 |

| DATA 2 | DATA 1 | DATA4 | DATA3 | CRC top byte | CRC low byte |
|---|---|---|---|---|---|
| 34 | 56 | 00 | 12 | 99 | B2 |

**Response data from slave instrument**

| Slave Add | Function code | Add top byte | Add low byte | ariable value top byte | ariable value low byte | CRC top byte | CRC low byte |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 02 | 10 | 00 | B0 | 00 | 02 | 40 | 1C |

2.3 Master write 1 register to Slave ( function code : 06H)

This function allows Master instrument to revise a single byte variable values from Slave . since every time sending by double-byte register, so the top bit should fill 0.

| Slave Add | Function code | Add top byte | Add low byte | ariable value top byte | ariable value low byte | CRC top byte | CRC low byte |
|---|---|---|---|---|---|---|---|
| 02 | 06 | 00 | B0 | 00 | 02 | 09 | DF |

**Response data from slave instrument :**

| Slave Add | Function code | Add top byte | Add low byte | ariable value top byte | ariable value low byte | CRC top byte | CRC low byte |
|---|---|---|---|---|---|---|---|
| 02 | 06 | 00 | B0 | 00 | 02 | A9 | C4 |

**Parameters address configuration**

| Parameters ADD | Parameters Type( can read and write) | Data length | Data type | Data range | Remark |
|---|---|---|---|---|---|
| BFH-C0H | T4 | 2 | HEX | 0-FFH | AL4 (time delay) |
| BDH-BEH | T3 | 2 | HEX | 0-FFH | AL3 (time delay) |
| BBH-BCH | T2 | 2 | HEX | 0-FFH | AL2 (time delay) |
| B9H-BAH | T1 | 2 | HEX | 0-FFH | AL1 (time delay) |
| A3H-A4H | HSP | 2 | HEX | 0000-07D0H | Measurement top point set value |
| A1H-A2H | LSP | 2 | HEX | 0000-07D0H | Measurement low point set value |
| A5H-A6H | P | 2 | HEX | 0000-07D0H | Proportional coefficient set value |
| A7H-A8H | SVP | 2 | HEX | 01/01/04/08/10 | PV decimal set up |
| A9H-AAH | FIL | 2 | HEX | 01-10 | Measurement equal number |
| ABH-ACH | ALMOD | 2 | HEX | 01/01/04/08 | Alarm mode set up |
| ADH=AEH | HY | 2 | HEX | 0000-07D0H | Alarm error set up value |
| AFH-B0H | AL1 | 2 | HEX | 0000-07D0H | SV1 alarm setup |
| B1H-B2H | AL2 | 2 | HEX | 0000-07D0H | SV2 alarm setup |
| B3H-B4H | AL3 | 2 | HEX | 0000-07D0H | SV3 alarm setup |
| B5H-B6H | AL4 | 2 | HEX | 0000-07D0H | SV4 alarm setup |
| B7H-B8H | LCK | 2 | HEX | 0000-07D0H | Keypad code set up |
| C1H-C2H | PV | 2 | HEX | 0000-07D0H | Measurement value |
| C3H-C4H | FLAG1 | 2 | HEX | | State remark |

| | | | | | |
|---|---|---|---|---|---|
| C5H-C6H | PS | 2 | HEX | 0000-07D0H | Measurement low point set up . |

FLAG1(BDH) Status remark as :

| Data position | Position (1) function | Re-set (0) function |
|---|---|---|
| D0 | AL1 on | AL1 off |
| D1 | AL2 on | AL2 off |
| D2 | AL3 on | AL3 off |
| D3 | AL4 on | AL4 off |
| D4 | N/A | N/A |
| D5 | N/A | N/A |
| D6 | N/A | N/A |
| D7 | N/A | N/A |

ALMOD (ADH) Alarm mode as :

| Data position | Position (1) function | Re-set (0) function |
|---|---|---|
| D0 | AL1 hi on | AL1 lo on |
| D1 | AL2 hi on | AL2 lo on |
| D2 | AL3 hi on | AL3 lo on |
| D3 | AL4 hi on | AL4 lo on |
| D4 | N/A | N/A |
| D5 | N/A | N/A |
| D6 | N/A | N/A |
| D7 | N/A | N/A |

SVP (A9H) PV decimal as :

| Number | Definition |
|---|---|
| 01 | Alarm no decimal |
| 02 | Alarm 1 bit decimal |
| 04 | Alarm 2 bits decimal |
| 08 | Alarm 3 bits decimal |
| 10 | Alarm 4 bits decimal |