Register Map for GoodWe ModBus Protocol

RTU mode is applied in this protocol. Baudrate of data transmitting is 9600bps.

1. Byte Format

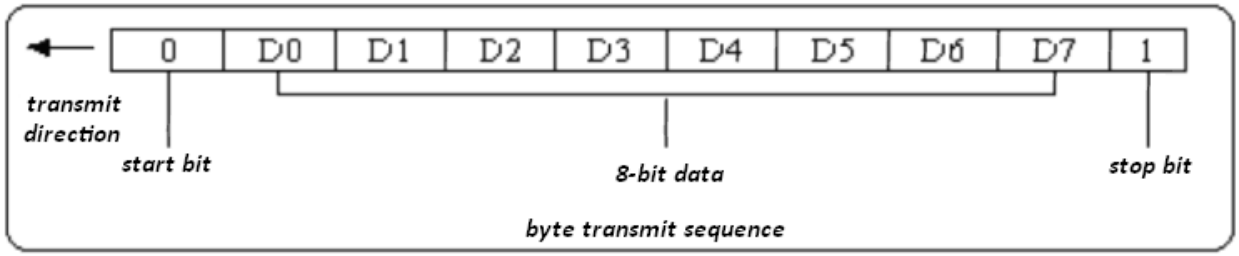

Figure 1

Every byte consists of one start bit, eight-bit data and one stop bit, 10 bit in total. The byte transmit sequence is described as in figure 1. D0 is the lowest bit of data and D7 is the highest bit of data.

2. Communication Data Format

Data is transmitted as word or double word format.

Data Type	Amount of Register	Amount of Byte	Description
Short integer	1	1	
Integer	1	2	High byte first, and low byte follow
Long integer	2	4	As 2 words, high word first and low word follow
Float			

3. Data Frame Format

3.1 Read Register（Function Code: 03H）

3.1.1 Data Frame Format from AP

Data NO	Content	Sample	Description
1	Inverter Address	1	Communication address（1-247）
2	03H	03H	Function code
3	High byte of first register	00H	Address of first register
4	Low byte of first register	01H	
5	High byte of amount	00H	Amount of register
6	Low byte of amount	02H	
7	High byte of CRC16 code	95H	CRC Code of verification
8	Low byte of CRC16 code	CBH	

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3.1.2 Data Frame Format from Inverter (When OK)

Data NO	Content	Description
1	Inverter Address	Communication address（1-247）
2	03H	Function code
3	Amount of byte of data（2N)	Amount of byte of data
4	High byte of data of first register	High byte of first register
5	Low byte of data of first register	Low byte of first register
…	…	。。。
2N+2	High byte of data of the Nth register	High byte of the Nth register
2N+3	Low byte of data of the Nth register	Low byte of the Nth register
2N+4	High byte of CRC16 verification code	High byte of CRC16 verification code
2N+5	Low byte of CRC16 verification code	Low byte of CRC16 verification code

3.1.3 Data Frame Format from Inverter（When NG）

Data NO	Content	Description
1	Inverter Address	Communication Address（1-247）
2	83H	Function code
3	02H	Fault Code
4	High byte of CRC16 verification code	High byte of CRC16 verification code
5	Low byte of CRC16 verification code	Low byte of CRC16 verification code

3.2 Set Register（Function code: 10H）

3.2.1 Data Frame Format from AP

Data NO	Content	Sample	Description
1	Inverter Address	1	Communication Address（1-247）
2	10H	10H	Function Code
3	High byte of data of first register	00H	Address of register: 0000H
4	Low byte of data of first register	00H	
5	High byte of amount of registers	00H	Amount of registers: 0001H
6	Low byte of amount of registers	01H	
7	Amount of bytes（N)	02H	Amount of bytes: 02H
8	High byte of data	0AH	Data: 0AF0H
9	Low byte of data	F0H	
10	High byte of CRC16 verification code	A0H	CRC verification
11	Low byte of CRC16 verification code	B4H	

3.2.2 Data Frame Format from Inverter (when OK)

Data NO	Content	Sample	Description
1	Inverter Address	1	Communication Address (1-247)
2	10H	10H	Function Code: 10H
3	High byte of data of first register	00H	Address of register: 0000H
4	Low byte of data of first register	00H	
5	High byte of amount of registers	00H	Amount of registers: 01H
6	Low byte of amount of registers	01H	
7	High byte of CRC16 verification code	01H	CRC verification
8	Low byte of CRC16 verification code	C9H	

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3.2.3 Data Frame Format from Inverter (when data is faulty)

Data NO	Content	Description
1	Inverter Address	Communication Address (1-247)
2	10H	Function Code: 10H
3	02H	Fault Code
4	High byte of CRC16 verification code	CRC Verification Code
5	Low byte of CRC16 verification code	

3.2.4 Data Frame Format from Inverter (when address or amount of register is faulty)

Data NO	Content	Description
1	Inverter Address	Communication Address (1-247)
2	90H	Function Code
3	02H	Fault Code
4	High byte of CRC16 verification code	CRC Verification Code
5	Low byte of CRC16 verification code	

4. Inverter Address: Can be assigned from 1~247. 247 is factory default assignment.

5. Communication baudrate: 9600bps

6. Function Code:

03H: Read Operation (NOTE: can read more than one registers at once)

10H: Write Operation (NOTE: Only support write single register at once)

7. CRC Code Verification

7.1 CRC multinomial：$X^{16}+X^{12}+X^5+1$

7.2 CRC verification covers first byte to the last byte before CRC data.

7.3 Refer to chapter 11 to implement CRC verification

8. Address and Property of Register

Address	Name of Data	Content	Unit	Data Format	(R.W) Property	Range of Data	Remarks
0000	Lowest Feeding Voltage of PV		0.1V	Integer	R/W	280v-600v	
0001	Reconnect Time		1s	Integer	R/W	30s-300s	
0002	High limit of Grid Voltage		0.1V	Integer	R/W	110v-230v	
0003	Low limit of Grid Voltage		0.1V	Integer	R/W	230v-270v	
0004	High limit of Grid Frequency		0.01Hz	Integer	R/W	45hz-60hz	
0005	Low limit of Grid Freqency		0.01Hz	Integer	R/W	50hz-65hz	

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0010 - 0012	RTC date&time	Year		Byte	R/W	13-99	
		Month		Byte	R/W	1-12	
		Date		Byte	R/W	1-31	
		Hour		Byte	R/W	0-23	
		Minute		Byte	R/W	0-59	
		Second		Byte	R/W	0-59	
0100	Range of real power adjust		1%	Integer	W	0-100	0%~100% of rated real power
0101	Range of reactive power adjust			Integer	W	1-10，90-100	1-10 as 0.99-0.9 lagging 90-100 as leading 0.90-1
0200 - 0207	Serial Number Of Inverter				R		ASCII code, 16 bytes
0210 - 0214	Model Name of Inverter				R		ASCII Code, 10 Bytes
0220	Error Cdoe			Long Integer	R		Refer to Error message table
0222	ETotal		0.1KW	Long Integer	R		Total Energy Yield
0224	HTotal		1H	Long Integer	R		Total Yield Time
0226	PV voltage of first tracker		0.1V	Integer	R		
0227	PV voltage of second tracker		0.1V	Integer	R		
0228	PV current of first tracker		0.1A	Integer	R		
0229	PV current of second tracker		0.1A	Integer	R		
022A	Grid voltage of Phase 1		0.1V	Integer	R		
022B	Grid voltage of Phase 2		0.1V	Integer	R		
022C	Grid voltage of Phase 3		0.1V	Integer	R		
`022D	Grid Current of		0.1A	Integer	R		

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	Phase 1						
022E	Grid Current of Phase 2		0.1A	Integer	R		
022F	Grid Current of Phase 3		0.1A	Integer	R		
0230	Grid Frequency of Phase 1		0.01Hz	Integer	R		
0231	Grid Frequency of Phase 2		0.01Hz	Integer	R		
0232	Grid Frequency of Phase 3		0.01Hz	Integer	R		
0233	Feeding power to grid		1W	Integer	R		
0234	Running status			Integer	R		0: cWaitMode 1: cNormalMode 2: cFaultMode
0235	Temperature of Heatsink		0.1 ℃	Integer	R		
0236	EDay		0.1KW	Integer	R		Energy yield in current day

NOTE: R----Read Only
W----Write Only
R/W----Read and Write
cWaitMode: Inverter waits to feed power
cNormalMode： Inverter is feeding power to grid
cFaultMode： Inverter is in faulty status

9. Error Code Description

NOTE: Bit31 is the lowest bit of Error code and Bit0 is the highest bit of Error code.

Bit NO	Error message	Description
Bit31	Internal Communication Failure	Communication between microcontrollers is failure
Bit30	EEPROM R/W Failure	EEPROM cannot be read or written
Bit29	Fac Failure	The grid frequency is out of tolerable range
Bit28	TBD	NA
Bit27	TBD	NA
Bit26	TBD	NA
Bit25	Relay Check Failure	Relay check is Failure
Bit24	TBD	NA
Bit23	TBD	NA
Bit22	TBD	NA
Bit21	TBD	NA
Bit20	TBD	NA
Bit19	DC Injection High	The DC injection to grid is too high

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Bit18	Isolation Failure	Isolation resistance of PV-plant out of tolerable range
Bit17	Vac Failure	Grid voltage out of tolerable range
Bit16	External Fan Failure	The external fan failure
Bit15	PV Over Voltage	Pv input voltage is over the tolerable maximum value
Bit14	TBD	NA
Bit13	Over Temperature	Temperature is too high
Bit12	Internal Fan Failure	The fan in case failure
Bit11	DC Bus High	Dc bus is too high
Bit10	Gournd I Failure	Ground current is too high
Bit9	Utility Loss	Utility is unavailable
Bit8	HCT Device Failure	HCT Device is Failure
Bit7	Relay Device Failure	Relay Device is Failure
Bit6	GFCI Device Failure	GFCI Device is Failure
Bit5	TBD	NA
Bit4	TBD	NA
Bit3	TBD	NA
Bit2	RefVoltage Failure	1.5V REF is Failure
Bit1	AC HCT Check Failure	The output current sensor is abnormal
Bit0	GFCI Check Failure	The GFCI detecting circuit is abnormal

10. For Example

10.1 Read lowest PV voltage for feeding power (Single register at once)

AP sends:

01H	03H	00H	00H	00H,01H	84H	0AH
Inverter Address	Read Function	First Address of register		Amount of registers	CRC Verification Code	

Inverter Response:

01H	03H	02H	0AH	FOH	BEH	A0H
Inverter Address	Read Function	Amount of Bytes	High byte of Data	Low Byte of Data	CRC Verification Code	

Data is 2800, and the unit for the data is 0.1v, So actual value is 280.0v

10.2 Read lowest PV voltage for feeding power and reconnect time (multiply registers at once)

AP sends:

01H	03H	00H	00H	00H,02H	C4H	0BH
Inverter Address	Read Function	First Address of register		Amount of registers	CRC Verification Code	

Inverter Response:

01H	03H	04H	0AH	FOH	00H	1EH	79H	D0H
Inverter Address	Read Function	Amount of Bytes	High byte of Data1	Low Byte of Data1	High byte of Data2	Low Byte of Data2	CRC Verification Code	

Data1 is 2800, and the unit for the data is 0.1v, so actual value is 280.0v

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Data 2 is 30, and the unit for the data is 1s, so actual value is 30s.

10.3 Read Serial Number

AP sends:

01H	03H	02H	00H	00H,08H	45H	B4H
Inverter Address	Read Function	First Address of register		Amount of registers	CRC Verification Code	

Inverter response:

01H	03H	10H	41H,41H,41H,41H,41H,41H,41H,41H,42H,42H,42H,42H,42H,42H,42H,42H	7EH	B7H
Inverter Address	Read Function	Amount of Bytes	Data	CRC Code	

Serial Number is AAAAAAAABBBBBBBB (Just as a sample)

10.4 Set Reconnect Time

AP sends:

01H	10H	00H	01H	00H,01H	02H	00H	3CH	A7H	90H
Inverter Address	Function Code	First Address of register		Amount of registers	Amount of data	Data		CRC Code	

Data is 60 and unit is 1s, so actual setting is 60s.

Inverter response:

01H	10H	00H	01H	00H,01H	50H	09H
Inverter Address	Function Code	First Address of register		Amount of registers	CRC Code	

10.5 Set Lowest PV voltage for feeding power

AP sends:

01H	10H	00H	00H	00H,01H	02H	0AH	F0H	A0H	B4H
Inverter Address	Function Code	First Address of register		Amount of registers	Amount of data	Data		CRC Code	

Data is 2800 and unit is 0.1v, so actual setting is 280.0v.

Inverter response:

01H	10H	00H	00H	00H,01H	01H	C9H
Inverter Address	Function Code	First Address of register		Amount of registers	CRC Code	

11. CRC16 Method:

const INT8U auchCRCHi[] = { 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,

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0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00,
0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41,0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00,
0xC1, 0x81, 0x40,0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40,0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,0x00,
0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,0x01, 0xC0, 0x80,
0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,0x01, 0xC0, 0x80, 0x41, 0x00,
0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,
0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40};

const INT8U auchCRCLo[] = { 0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05,
0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8,0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C,
0xDC,0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3, 0x11, 0xD1, 0xD0,
0x10,0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C,
0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A, 0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9,
0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C,0xE4, 0x24, 0x25, 0xE5, 0x27,
0xE7, 0xE6, 0x26, 0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0,0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2,
0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4,   0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE,
0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68,0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE,
0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C,0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3,
0x73, 0xB1, 0x71, 0x70, 0xB0,0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55,
0x95, 0x94, 0x54,0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58,
0x98,0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,0x44,
0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40};

INT16U sCRC16(INT8U *puchMsg, INT16U usDataLen)
{
    INT8U uchCRCHi = 0xFF ; // Initialization
    INT8U uchCRCLo = 0xFF ; // Initialization
    INT8U uIndex;
    while (usDataLen--)
    {
        uIndex = uchCRCHi ^ *puchMsg++ ; //Calculate CRC
        uchCRCHi = uchCRCLo ^ auchCRCHi[uIndex] ;
        uchCRCLo = auchCRCLo[uIndex] ;
    }
    return ((INT16U)uchCRCHi << 8 | uchCRCLo) ;
}
```


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