Register Map for GoodWe ModBus Protocol

Release Note

Ver.	Date	Modification	*Prepared by*	*Approved by*
1.0	20161115	The First draft of this document	ningzengkun	
1.1	20171019	Add register map for MT series	Frank	
1.2	20191031	Amend Data Format	Frank	
1.3	20191114	Add 0x0352 and 0x0353 registers	Lijun	
1.4	20200320	Add 0x0102 registers	Frank	
1.5	20200526	Modify 0x0100 register translation, delete register 102,106,120,121	ningzengkun	

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

1. *Byte Format*

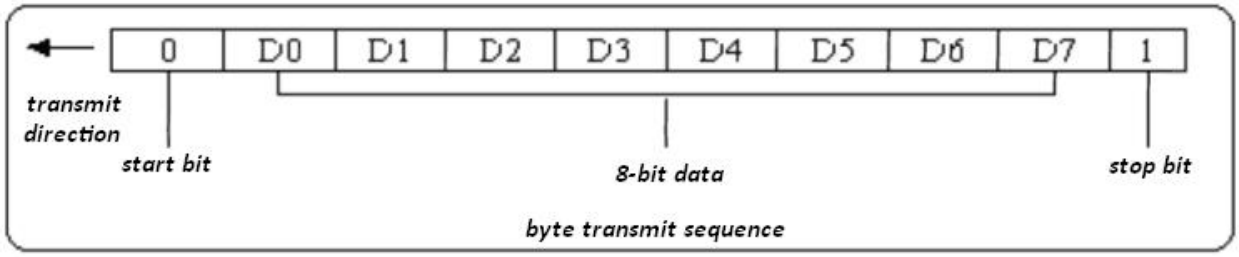

Figure 1

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			

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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	

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）

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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	

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：$X^{16}+X^{12}+X^{5}+1$

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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	INT16U	R/W	280v-600v	
0001	Reconnect Time		1s	INT16U	R/W	30s-300s	
0002	Low limit of Grid Voltage		0.1V	INT16U	R/W	110v-230v	
0003	High limit of Grid Voltage		0.1V	INT16U	R/W	230v-270v	
0004	Low limit of Grid Frequency		0.01Hz	INT16U	R/W	45hz-60hz	
0005	High limit of Grid Freqency		0.01Hz	INT16U	R/W	50hz-65hz	
0010 - 0012	RTC date&time	Year		INT8U	R/W	13-99	
		Month		INT8U	R/W	1-12	
		Date		INT8U	R/W	1-31	
		Hour		INT8U	R/W	0-23	
		Minute		INT8U	R/W	0-59	
		Second		INT8U	R/W	0-59	
0100	Range of active power adjust		1%	INT16U	W	0-100	0%~100% of rated active power
0101	Range of reactive power adjust			INT16U	W	1-10，90-100	1-10 as 0.99-0.9 lagging 90-100 as leading 0.90-1
0102	Reactive power adjust		Var	INT32S	R/W	0-0.6*Prated	
0106	Real power adjust base on current output power		1%	INT16U	W	High byte: 0-100，-100，0，128； Lowbyte: 0~256, ID command；	0-100,increase power; -100-0,decrease power; 128,recover to rated power.

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0120	Start		NA	INT16U	NA	0	allow connecting grid
0121	Stop		NA	INT16U	NA	0	Forbid connecting grid
0121	Reconnect		NA	INT16U	NA	0	
0200 - 0207	Serial Number Of Inverter			STR	R		ASCII code, 16 bytes
0210 - 0214	Model Name of Inverter			STR	R		ASCII Code, 10 Bytes
0220	Error Cdoe			INT32U	R		Refer to Error message table
0222	ETotal		0.1KW	INT32U	R		Total Energy Yield
0224	HTotal		1H	INT32U	R		Total Yield Time
0226	PV voltage of first tracker		0.1V	INT16U	R		
0227	PV voltage of second tracker		0.1V	INT16U	R		
0228	PV current of first tracker		0.1A	INT16U	R		
0229	PV current of second tracker		0.1A	INT16U	R		
022A	Grid voltage of Phase 1		0.1V	INT16U	R		
022B	Grid voltage of Phase 2		0.1V	INT16U	R		
022C	Grid voltage of Phase 3		0.1V	INT16U	R		
`022D	Grid Current of Phase 1		0.1A	INT16U	R		
022E	Grid Current of Phase 2		0.1A	INT16U	R		
022F	Grid Current of Phase 3		0.1A	INT16U	R		
0230	Grid Frequency of Phase 1		0.01Hz	INT16U	R		
0231	Grid Frequency of Phase 2		0.01Hz	INT16U	R		

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0232	Grid Frequency of Phase 3		0.01Hz	INT16U	R		
0233	Feeding power to grid		1W	INT16U	R		
0234	Running status			INT16U	R		0: cWaitMode 1: cNormalMode 2: cFaultMode
0235	Temperature of Heatsink		0.1 ℃	INT16S	R		
0236	EDay		0.1KW	INT16U	R		Energy yield in current day
Register map for MT Running Data Start							
0300	Vpv1		0.1V	INT16U	R		PV1 voltage
0301	Vpv2		0.1V	INT16U	R		PV2 voltage
0302	Ipv1		0.1A	INT16U	R		PV1 current
0303	Ipv2		0.1A	INT16U	R		PV2 current
0304	Vac1		0.1V	INT16U	R		Phase L1 voltage
0305	Vac2		0.1V	INT16U	R		Phase L2 voltage
0306	Vac3		0.1V	INT16U	R		Phase L3 voltage
0307	Iac1		0.1A	INT16U	R		Phase L1 current
0308	Iac2		0.1A	INT16U	R		Phase L2 current
0309	Iac3		0.1A	INT16U	R		Phase L3 current
030A	Fac1		0.01Hz	INT16U	R		Phase L1 frequency
030B	Fac2		0.01Hz	INT16U	R		Phase L2 frequency
030C	Fac3		0.01Hz	INT16U	R		Phase L3 frequency
030D	Pac L		1W	INT16U	R		low Byte of Feeding power
030E	Work Mode		NA	INT16U	R		Work Mode Table8-1
030F	Temperature		0.1 degree C	INT16S	R		Inverter internal temperature
0310	Error Message H		NA	INT16U	R		Failure description for status 'failure' Table8-2
0311	Error Message L		NA	INT16U	R		Failure description for status 'failure' Table8-2
0312	E-Total H		0.1KW.Hr	INT16U	R		Total Feed Energy to grid

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0313	E-Total L		0.1KW.Hr	INT16U	R		Total Feed Energy to grid
0314	h-Total H		Hr	INT16U	R		Total feeding hours
0315	h-Total L		Hr	INT16U	R		Total feeding hours
0316	Firmware Version		NA	INT16U	R		Firmware Version
0317	WarningCode		NA	INT16U	R		Warning Code
0318	PV2FaultValue		0.1V	INT16U	R		PV2 voltage fault value
0319	Functions Value		N/A	INT16U	R		Table 8-3
031A	Line2VfaultValue		0.1V	INT16U	R		Phase L2 voltage fault value
031B	Line3VfaultValue		0.1V	INT16U	R		Phase L3 voltage fault value
031C	BUSVoltage		0.1V	INT16U	R		BUSVoltage
031D	NBUSVoltage		0.1V	INT16U	R		NBUSVoltage
031E	Line3FfaultValue		0.01Hz	INT16U	R		Phase L3 frequency fault value
031F	Safety Country		1mA	INT16U	R		GFCI check value(/Safety Conutry)
0320	E-Day		0.1KW.Hr	INT16U	R		Feed Engery to grid in today
033B	Year :Month		NA	INT16U	R		High byte :Year; Low byte:Month
033C	Date :Hour		NA	INT16U	R		High byte :Date; Low byte:Hour
033D	Minute :Second		NA	INT16U	R		High byte :Minute; low byte:Second
033E	Manufacture ID		NA	INT16U	R		Manufacturer Identifier for Hanneng
033F	RSSI		%	INT16U	R		Strength of Signal（WiFi/GPRS 有效）
0340	PV mode		NA	INT16U	R		HighByte:PV2; LowByte:PV1 Refer to Table 8-4
0352	Pac H		1W	INT16U	R		High Byte of Feeding power
0353	Pac L		1W	INT16U	R		low Byte of Feeding power

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0354	FM version of ARM		NA	INT16U	R		Firmware Version of ARM
0355	GPRS Burn-in Mode		NA	INT16U	R		0x00: normal mode 0x01: burn-in mode
0356	Pac H		1W	INT16U	R		High Byte of Feeding power
0357	Vpv3		0.1V	INT16U	R		PV3 voltage
0358	Vpv4		0.1V	INT16U	R		PV4 voltage
0359	Ipv3		0.1A	INT16U	R		PV3 current
035A	Ipv4		0.1A	INT16U	R		PV4 current
035B	Istr1		0.1A	INT16U	R		PV String1 Current
035C	Istr2		0.1A	INT16U	R		PV String2 Current
035D	Istr3		0.1A	INT16U	R		PV String3 Current
035E	Istr4		0.1A	INT16U	R		PV String4 Current
035F	Istr5		0.1A	INT16U	R		PV String5 Current
0360	Istr6		0.1A	INT16U	R		PV String6 Current
0361	Istr7		0.1A	INT16U	R		PV String7 Current
0362	Istr8		0.1A	INT16U	R		PV String8 Current
0363	Istr9		0.1A	INT16U	R		PV String9 Current
0364	Istr10		0.1A	INT16U	R		PV String10 Current
0365	Istr11		0.1A	INT16U	R		PV String11 Current
0366	Istr12		0.1A	INT16U	R		PV String12 Current
0367	Istr13		0.1A	INT16U	R		PV String13 Current
0368	Istr14		0.1A	INT16U	R		PV String14 Current
0369	Istr15		0.1A	INT16U	R		PV String15 Current
036A	Istr16		0.1A	INT16U	R		PV String16 Current
036B	Istring Status		0.1A	INT16U	R		Table 8-5
036C	Istr18		0.1A	INT16U	R		PV String18 Current
036D	Istr19		0.1A	INT16U	R		PV String19 Current
036E	Istr20		0.1A	INT16U	R		PV String20 Current
036F	PID&Wietap Status		NA	INT16U	R		Table 8-6
Register map for MT Running Data End							

Table 8-1

Mode	Code	Description
Wait	0x00 0x00	Loss, inverter disconnects to Grid
Normal	0x00 0x01	OK, inverter connects to Grid

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Fault	0x00 0x02	Fault,system is abnormal，inverter stop discharging
Permanent Fault	0x00 0x03	System is seriously abnormal. Inverter will restart after 20s.The conditions to enter this status are as follows 1.Grid current DC offset 2.Eeprom cannot be read or write in 3.Communication between CPU failure 4.Bus Voltage too high 5.Compare measured values from two CPU 6.relay check fail 7.GFCI Device check fail 8.HCT check fail

Table 8-2

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	Vac Consistency Failure	Different value between Master and Slave for grid voltage
Bit22	Fac Consistency Failure	Different value between Master and Slave for grid frequency
Bit21	TBD (String Current Over for MT)	NA(String Current Over 10.5A for MT)
Bit20	TBD(LCD Communication Failure for MT)	NA（Communication between LCD CPU and Master CPU is failure for MT ）
Bit19	DC Injection High	The DC injection to grid is too high
Bit18	Isolation Failure(LLc Bus High for HF)	Isolation resistance of PV-plant out of tolerable range(LLc bus is too high for HF)
Bit17	Vac Failure	Grid voltage out of tolerable range
Bit16	External Fan Failure(TBD for NS,DNS/FuseFlag for HF)	The external fan failure(Fuse is melt for HF)
Bit15	PV Over Voltage	Pv input voltage is over the tolerable maximum value
Bit14	Auto Test Failure(GFCI Check Timeout for MT)	Auto test failure(GFCI Check Timeout for MT)
Bit13	Over Temperature	Temperature is too high
Bit12	Internal Fan Failure(Back-Up Over Load for ES/TBD for NS,DNS)	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	AC HCT Failure（TBD for NS,DNS,HF）	AC HCT check failure 3 times

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Bit7	Relay Device Failure（TBD for NS,DNS,HF）	Relay check failure 3 times
Bit6	GFCI Device Failure（TBD for NS,DNS,HF）	GFCI check failure 3 times(GFCI check failure 20 times for MT)
Bit5	TBD	NA
Bit4	GFCI Consistency Failure（TBD for HF）	Different value between Master and Slave for GFCI
Bit3	DCI Consistency Failure	Different value between Master and Slave for output DC current
Bit2	TBD (Reference Voltage Check Failure for SDT,DT,MT)	NA(The reference voltage is abnormal for SDT,DT,MT)
Bit1	AC HCT Check Failure	The output current sensor is abnormal
Bit0	GFCI Device Check Failure（TBD for HF）	The GFCI detecting circuit is abnormal

Table 8-3

Bit No	Definition	Status	
		1	0
Bit15	High Impedance Flag	-	
Bit14			
Bit13	Ground Fault Flag	NG	OK
Bit12	电池激活功能（for ES）	ON	OFF
Bit11	防逆流(for ES)	ON	OFF
Bit10	EMS Mode(for ES)	ON	OFF
Bit9	电池自动管理模式(for ES)	ON	OFF
Bit8	Meter	OK	NG
Bit7	MPPT for Shadow	ON	OFF
Bit6	TBD	ON	OFF
Bit5	TBD	ON	OFF
Bit4	TBD	ON	OFF
Bit3	Power Limit Function	ON	OFF
Bit2	Burn-in Mode	ON	OFF
Bit1	LVRT	ON	OFF
Bit0	Anti-Islanding	ON	OFF

Table 8-4

Mode Code	Description
0x00	NO PV,inverter disconnects to PV
0x01	Standby,PV does not output power
0x02	Work, PV output power

Table 8-5

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Bit No	Definition	Status	
		1	0
Bit15	Istring16	Normal	Failure
Bit14	Istring15	Normal	Failure
Bit13	Istring14	Normal	Failure
Bit12	Istring13	Normal	Failure
Bit11	Istring12	Normal	Failure
Bit10	Istring11	Normal	Failure
Bit9	Istring10	Normal	Failure
Bit8	Istring9	Normal	Failure
Bit7	Istring8	Normal	Failure
Bit6	Istring7	Normal	Failure
Bit5	Istring6	Normal	Failure
Bit4	Istring5	Normal	Failure
Bit3	Istring4	Normal	Failure
Bit2	Istring3	Normal	Failure
Bit1	Istring2	Normal	Failure

Table 8-6

Bit No	Definition	Status	
		1	0
Bit15	TBD	-	-
Bit14	TBD	-	-
Bit13	TBD	-	-
Bit12	Wietap5	Normal	Failure
Bit11	Wietap4	Normal	Failure
Bit10	Wietap3	Normal	Failure
Bit9	Wietap2	Normal	Failure
Bit8	Wietap1	Normal	Failure
Bit7	TBD	-	-
Bit6	TBD	-	-
Bit5	TBD	-	-
Bit4	TBD	-	-
Bit3	TBD	-	-
Bit2	TBD	-	-
Bit1	PIDBox Status	Normal	Failure
Bit0	PIDBox	Connect	Disconnect

NOTE: R----Read Only
W----Write Only
R/W----Read and Write

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cWaitMode: Inverter waits to feed power

cNormalMode： Inverter is feeding power to grid

cFaultMode： Inverter is in faulty status

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

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

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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, 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, 0x41,0x01, 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, 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,

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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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