



Protocol for Goodwe Modbus

V1.3

Release Note

Ver.	Date	Modification	Prepared by	Approved by
1.0				
1.1	20171030	Add register 0x0560-0x059C	Xu	
1.2	20171103	Add register 0x0535-0x0543	Xu	
1.3	20171110	Adjust the order of address 0x561-0x577	Xu	

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

1. Byte Format

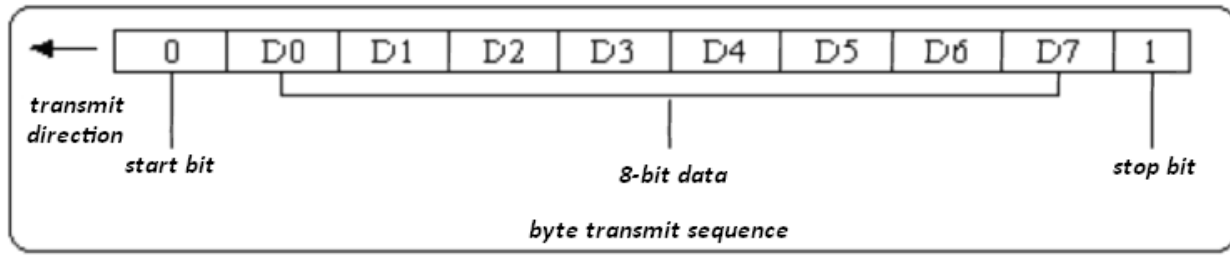


Figure 1

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	



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	

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: All data support single write, the same background color can be written continuously.)

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	INT16U	R/W	280v-600v	
0001	Reconnect Time		1s	INT16U	R/W	30s-300s	
0002	High limit of Grid Voltage		0.1V	INT16U	R/W	110v-230v	
0003	Low limit of Grid Voltage		0.1V	INT16U	R/W	230v-270v	
0004	High limit of Grid Frequency		0.01Hz	INT16U	R/W	45hz-60hz	
0005	Low limit of Grid Frequency		0.01Hz	INT16U	R/W	50hz-65hz	
0010	RTC date&time	Year / Month		INT16U	R/W	13-99/1-12	
0011		Date / Hour		INT16U	R/W	1-31/0-23	
0012		Minute / Second		INT16U	R/W	0-59/0-59	
0100	Range of real power adjust		1%	INT16U	W	0-100	0%~100% of rated real 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
0200 - 0207	Serial Number Of Inverter				R		ASCII code, 16 bytes
0210 - 0214	Model Name of Inverter				R		ASCII Code, 10 Bytes



Address	Name of Data	Content	Unit	Data Format	(R.W) Property	Range of Data	Remarks
Hybrid Inverter							
0500	Vpv1		0.1V	INT16U	R		PV1 voltage
0501	Ipv1		0.1A	INT16U	R		PV1 current
0502	PV1 Mode		NA	INT16U	R		PV1 Module work mode, refer to Table 8-4
0503	Vpv2		0.1V	INT16U	R		PV2 voltage
0504	Ipv2		0.1A	INT16U	R		PV2 current
0505	PV2 Mode		NA	INT16U	R		PV2 Module work mode, refer to Table 8-4
0506	Vbattery1		0.1V	INT16U	R		First group battery voltage
0507	TBD		NA	INT16U	R		
0508	BMS Status		NA	INT16U	R		BMS Work Status
0509	BMS Pack Temperature		0.1 degree	INT16U	R		
050A	Ibattery1		0.1A	INT16U	R		First group battery current
050B	BMS Charge I _{max}		1A	INT16U	R		
050C	BMS Discharge I _{max}		1A	INT16U	R		
050D	BMS Error Code		NA	INT16U	R		refer to Table 8-8
050E	SOC		1%	INT16U	R		First group battery capacity
050F	ES Warning		NA	INT16U	R		Warning Code
0510	TBD		NA	INT16U	R		
0511	BMS SOH		1%	INT16U	R		
0512	Battery1 Mode		NA	INT16U	R		First group battery work mode, refer to Table 8-9
0513	BMS Warning Code H		NA	INT16U	R		refer to Table 8-8
0514	BMS Warning Code L		NA	INT16U	R		refer to Table 8-8
0515	Meter Status		NA	INT16U	R		1: OK 0: NG
0516	Vgrid		0.1V	INT16U	R		Grid voltage



0517	Igrid		0.1A	INT16U	R		Grid current
0518	Pgrid		1W	INT16S	R		Grid Power
0519	Fgrid		0.01Hz	INT16U	R		Grid Frequency
051A	Grid Mode		NA	INT16U	R		Grid mode, refer to Table 8-10
051B	Vload		0.1V	INT16U	R		Load voltage
051C	Iload		0.1A	INT16U	R		Load current
051D	Pload		1W	INT16U	R		Load Power
051E	Fload		0.01Hz	INT16U	R		Load Frequency
051F	Load Mode		NA	INT16U	R		Load work mode, refer to Table 8-11
0520	Work Mode		NA	INT16U	R		Storage Inverter work mode, refer to Table 8-12
0521	Temperature		0.1 degree C	INT16U	R		Inverter internal temperature
0522	Error Message H		NA	INT16U	R		Failure description for status 'failure' Table 8-2
0523	Error Message L		NA	INT16U	R		Failure description for status 'failure' Table 8-2
0524	E-Total H		0.1KW.Hr	INT16U	R		Total Feed Energy to grid
0525	E-Total L		0.1KW.Hr	INT16U	R		Total Feed Energy to grid
0526	h-Total H		Hr	INT16U	R		Total feeding hours
0527	h-Total L		Hr	INT16U	R		Total feeding hours
0528	E-Day		0.1KW.Hr	INT16U	R		Feed Engery to grid in today
0529	E-Load-Day		0.1KW.Hr	INT16U	R		Energy of load in day
052A	E-Total-Load H		0.1KW.Hr	INT16U	R		High Byte of total Energy of Load
052B	E-Total-Load L		0.1KW.Hr	INT16U	R		Low Byte of total Energy of Load
052C	TotalPower		1W	INT16S	R		Total Power of Inverter
052D	TBD		NA	INT16U	R		



052E	TBD		NA	INT16U	R		
052F	Grid in-out flag		NA	INT16U	R		It displays inverter send power to Grid or get power from Grid, refer to Table 8-13
0530	Back-Up Load		1w	INT16U	R		Load Power of Back-Up
0531	MeterPowerFactor		1%	INT16U	R		
0532	DiagStatusH		NA	INT16U	R		Refer Table 8-14
0533	DiagStatusL		NA	INT16U	R		Refer Table 8-14
0534	DRMStatus		NA	INT16U	R		Refer Table 8-15
0535	E-Total-Sell H		NA	float	R		
0536	E-Total-Sell L		NA	float	R		
0537	E-Total-Buy H		NA	float	R		
0538	E-Total-Buy L		NA	float	R		
0539	Vpv3		0.1V	INT16U	R		PV3 voltage
053A	Ipv3		0.1A	INT16U	R		PV3 current
053B	PV3 Mode		NA	INT16U	R		refer to Table 8-4
053C	VgridUo		0.1V	INT16U	R		Grid Uo voltage
053D	IgridUo		0.1A	INT16U	R		Grid Uo current
053E	VgridWo		0.1V	INT16U	R		Grid Wo voltage
053F	IgridWo		0.1A	INT16U	R		Grid Wo current
0540	E-BatteryCharge H		0.1Kwh	INT16U	R		Charge energy
0541	E-BatteryCharge L		0.1Kwh	INT16U	R		Charge energy
0542	E-BatteryDischarge H		0.1Kwh	INT16U	R		Discharge energy
0543	E-BatteryDischarge L		0.1Kwh	INT16U	R		Discharge energy
Setting register							
0550	ChargerTimeStart		HM	INT16U	R/W	(Hbyte :hour (0-23)Lbyte :minute(0-59))	Grid charge start time



0551	ChargerTimeEnd		HM	INT16U	R/W	(Hbyte :hour (0-23)Lbyte :minute(0-59))	Grid charge end time
0552	BatChargePowerMax		1%	INT16U	R/W	0-100	Grid charge power
0553	DisChargerTimeStart		HM	INT16U	R/W	(Hbyte :hour (0-23)Lbyte :minute(0-59))	Discharge start time
0554	DisChargerTimeEnd		HM	INT16U	R/W	(Hbyte :hour (0-23)Lbyte :minute(0-59))	Discharge end time
0555	BatDisPowerSet		1%	INT16U	R/W	0-100	Discharge power set
0556	BackUpEnable		NA	INT16U	R/W	0-1	Backup Output on(1 :on 0 :off)
0557	OffGridAutoCharge		NA	INT16U	R	0-1	PV Offgrid auto charge(1 :on 0 :off)
0558	EnableMPPT4Shadow		NA	INT16U	R/W	0-1	MPPT shadow scan enable(1 :on 0 :off)
0559	FeedPowerEnable		NA	INT16U	R/W	0-1	Feed power to grid (0 :yes 1 :no)
055A	ManufacturerCode		NA	INT16U	R		Meter protocol code
055B	LeadBatCapacity		Ah	INT16U	R/W	50-2000	Lead acid battery capacity(50-2000Ah)
055C	BattChargeVoltMax		0.1V	INT16U	R/W	500-600	Battery charge volt setting
055D	BattChargeCurrMax		0.1A	INT16U	R/W	0-1000	Battery charge curr setting
055E	BattDisChgCurrMax		0.1A	INT16U	R/W	0-1000	Battery discharge curr setting
055F	BattVoltUnderMin		0.1V	INT16U	R/W	400-480	Battery volt under setting
0560	BattSOCUnderMin		1%	INT16U	R/W	0-100	Battery SOC under setting
0561	BatActivePeriod		1 Min	INT16U	R/W	(0 :Off 1-1440min	Battery active(0 :Off 1-1440mins :on)



						s :on)	
0562	RPControlPara		NA	INT16U	R/W	-80-+80	Power Factor Setting Table 8-18
0563	BattFloatVolt		0.1V	INT16U	R/W	500-600	Battery float charge volt setting
0564	BattFloatCurr		0.1A	INT16U	R/W	0-1000	Battery float charge curr setting
0565	BattToFloatTime		1 min	INT16U	R/W	10-30	Battery CV charge Time
0566	BattTypeIndex		NA	INT16U	R	0-255	Battery manufactor index setting
0567	FeedPowerPara		1w	INT16U	R/W	0-5000	Feeding power limit
0568	AutoStartBackup		NA	INT16U	R/W	0-1	Offgrid Auto startup(1 :on 0 :off)
0569	StopSocProtect		NA	INT16U	R/W	0-1	No soc protect(1 :on 0 :off)
056A	DCVoltOutput/ KeepBattVoltOn		NA	INT16U	R/W	0-1	DC Ouput(1 :on 0 :off)No battery charge voltage on
056B	BattAvgChgVolt		0.1v	INT16U	R/W	500-600	Battery maintain charge voltage
056C	BatAvgChgHours		1 Hour	INT16U	R/W	1-5000	Battery maintain charge cycle
056D	AS477Parameters		NA	INT16U	R		Table 8-17
056E	WgPowerMode		NA	INT16U	R/W		Table 8-16
056F	WgPowerSet		1w	INT16U	R/W	0-4600	Table 8-16
0570	Reserved		NA	INT16U	R		BMS protocol config status
0571	NoGridChargeEnable		NA	INT16U	R	1-2	No grid charge enable (1: on 2: off)
0572	DisChgWithPVEnable		NA	INT16U	R	1-2	Discharge with PV enable (1: on 2: off)
0573	Reserved		NA	INT16U	R	0-1	
0574	AppModeIndex		NA	INT16U	R/W		
0575	GridWaveCheckLevel		NA	INT16U	R/W	0-2	0: High 1: low 2: close
0576	MeterCheckValue		1w	INT16U	R/W	0-60000	
0577	RapaidCutOff		NA	INT16U	R/W	0-1	0 :off 1 :on
0578	GridVoltQualit		0.1V	INT16U	R/W	2300-3000	Grid qualit volt mov avg in 9min



0579	GridVoltHighS2		0.1V	INT16U	R/W	2300-3000	Grid over volt value in state 2
057A	GridVoltLowS2		0.1V	INT16U	R/W	1600-2300	Grid under volt value in state 2
057B	GridVoltHighS2Time		0.02S	INT16U	R/W	0-65535	Grid over volt time in state 2
057C	GridVoltLowS2Time		0.02S	INT16U	R/W	0-65535	Grid under volt time in state 2
057D	GridVoltHighS1		0.1V	INT16U	R/W	2300-3000	Grid over volt value in state 1
057E	GridVoltLowS1		0.1V	INT16U	R/W	1600-2300	Grid under volt value in state 1
057F	GridVoltHighS1Time		0.02S	INT16U	R/W	0-65535	Grid over volt time in state 1
0580	GridVoltLowS1Time		0.02S	INT16U	R/W	0-65535	Grid under volt time in state 1
0581	GridFreqHighS2		0.01Hz	INT16U	R/W	5000-5500	Grid over freq value in state 2
0582	GridFreqLowS2		0.01Hz	INT16U	R/W	4500-5000	Grid under freq value in state 2
0583	GridFreqHighS2Time		0.02S	INT16U	R/W	0-65535	Grid over freq time in state 2
0584	GridFreqLowS2Time		0.02S	INT16U	R/W	0-65535	Grid under freq time in state 2
0585	GridFreqHighS1		0.01Hz	INT16U	R/W	5000-5500	Grid over freq value in state 1
0586	GridFreqLowS1		0.01Hz	INT16U	R/W	4500-5000	Grid under freq value in state 1
0587	GridFreqHighS1Time		0.02S	INT16U	R/W	0-65535	Grid over freq time in state 1
0588	GridFreqLowS1Time		0.02S	INT16U	R/W	0-65535	Grid under freq time in state 1
0589	GridVoltRecoverHigh		0.1V	INT16U	R/W	2300-3000	Grid volt recover high value
058A	GridVoltRecoverLow		0.1V	INT16U	R/W	1600-2300	Grid volt recover low value
058B	GridVoltRecoverTime		0.02S	INT16U	R/W	0-65535	Grid volt recover time value
058C	GridFreqRecoverHigh		0.01Hz	INT16U	R/W	5000-5500	Grid freq recover high value
058D	GridFreqRecoverLow		0.01Hz	INT16U	R/W	4500-5000	Grid freq recover low



							value
058E	GridFreqRecoverTime		0.02S	INT16U	R/W	0-65535	Grid freq recover time value
058F	PointBValue		1%	INT16U	R/W	30-80	Reactive curve point B PF(30-80)
0590	PointCValue		0.01	INT16U	R/W	90-100	Reactive curve point C PF(90-100)
0591	GridLimitByVolStartVol		0.1V	INT16U	R/W		Grid limit start volt (JAPAN)
0592	GridLimitByVolStartPer		1%	INT16U	R/W		Grid limit start percent (JAPAN)
0593	GridLimitByVolSlope		1%/V	INT16U	R/W		Grid limit slope (JAPAN)
0594	ActiveCurveVolt		0.1v	INT16U	R/W	2300-2530	Voltage of start reactive curve (2300-2530)
0595	DesactiveCurveVolt		0.1v	INT16U	R/W	2070-2300	Voltage of stop reactive curve (2070-2300)
0596	EnableCurve			INT16U	R/W	1-2	Enable CEI voltage vs reactive curve 1.off ; 2,on
0597	BackupStartDly		1min	INT16U	R/W		Backup Start Delay
0598	RecoverTimeEE		1%/min	INT16U	R/W	5-100	Recover speed
0599	SafetyCountry			INT16U	R		0:Italy Table 8-19
059A	Iso Limit		10ko	INT16U	R	0-300	ISO Limit
059B	BatBMSCurrLmtCoff		%1	INT16U	R	1-100	BMS current limit coefficient
059C	wMeterConnectCheckFlag			INT16U	R/W	0-1	1 :Start Meter selfcheck, 0 :Stop check
059D	bMeterConnectStatus			INT16U	R	0-3	Meter Status :1 :OK 2 :Reverse, 3 : CT Error, 0 :NG
059E	MeterConnectStatus			INT16U	R	1-4	Meter Status :1 :OK 2 :Reverse, 3 : CT Error, 0 :NG



Table 8-1

Mode	Code	Description
Wait	0x00 0x00	Loss, inverter disconnects to Grid
Normal	0x00 0x01	OK, inverter connects to Grid
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	NA
Bit20	TBD	NA
Bit19	DC Injection High	The DC injection to grid is too high
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	Auto Test Failure	Auto test failure
Bit13	Over Temperature	Temperature is too high



Bit12	Internal Fan Failure(Back-Up Over Load for ES)	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	AC HCT check failure 3 times
Bit7	Relay Device Failure	Relay check failure 3 times
Bit6	GFCI Device Failure	GFCI check failure 3 times
Bit5	TBD	NA
Bit4	GFCI Consistency Failure	Different value between Master and Slave for GFCI
Bit3	DCI Consistency Failure	Different value between Master and Slave for output DC current
Bit2	TBD	NA
Bit1	AC HCT Check Failure	The output current sensor is abnormal
Bit0	GFCI Device Check Failure	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	Battery active	ON	OFF
Bit11	Feeding enable	ON	OFF
Bit10	EMS Mode	ON	OFF
Bit9	Auto Mode	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
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0x00	NO PV,inverter disconnects to PV
0x01	Standby,PV does not output power
0x02	Work, PV output power

Table 8-8

Bit NO	Error message	Description
Bit0	Battery Over Temperature	Charging: Stop charge, Discharging: reduce discharge current
Bit1	Battery Under Temperature	Charging: Stop charge, Discharging: reduce discharge current
Bit2	Battery Cell Voltage Differences	NA
Bit3	Battery Over Total Voltage	Stop charge
Bit4	Battery Discharge Over Current	Stop discharge
Bit5	Battery Charge Over Current	reduce charge current
Bit6	Battery Under SOC	Stop discharge
Bit7	Battery Under Total Voltage	Stop discharge
Bit8	Battery Communication Fail	Stop BMS Function,Inverter manage battery
Bit9	Battery Output Short	Inverter shutdown
Bit10	BMSOCTooHigh	
Bit11	BMSModuleFault	
Bit12	BMSSystemFault	
Bit13	BMSInternalFault	
Bit...		
Bit31		

Table 8-9

Mode Code	Description
0x00	NO Battery,inverter disconnects to Battery
0x01	Standby,no diacharging and no charging
0x02	Discharging
0x03	Charging
0x04	Waiting for charge
0x05	Waiting for discharge

Table 8-10

Mode Code	Description
0x00	Loss, inverter disconnects to Grid
0x01	OK, inverter connects to Grid
0x02	Fault,something is wrong

Table 8-11



Mode Code	Description
0x00	ON,inverter connects to Load
0x01	OFF, inverter disconnects to Load

Table 8-12

Mode Code	Description
0x01	cut off all the connection to Inverter(wait mode)
0x02	PV inputs to Inverter,Inverter outputs to Grid(online mode)
0x04	PV inputs to Inverter(First),Battery inputs to Inverter(Second),Inverter work as AC source(battery mode)
0x10	Fault,fault mode,something is in fault mode(fault mode)

Table 8-13

Code	Description
0x00	Inverter neither send power to Grid, nor get power from Grid.
0x01	Inverter sends power to Grid
0x02	Inverter gets power from Grid.

Table 8-14

Bit	Description
0	BatteryVoltLow
1	BatterySOCLow
2	BatterySOCInBack
3	BMSDischargeDisable
4	DischargeTimeOn
5	ChargeTimeOn
6	DischargeDriveOn
7	BMSDischgCurrentLow
8	DischargeCurrentLow
9	MeterCommLoss
10	MeterConnectReverse
11	SelfUseLoadLight
12	EMSDischargeIZero
13	DischargeBUSHigh
14	BatteryDisconnect
15	BatteryOvercharge



16	BMSOverTemperature
17	BMSOvercharge
18	BMSChargeDisable
19	SelfUseOff
20	SOCDeltaOverRange
21	BatterySelfDischarge
22	OffgridSOCLow
23	GridWaveUnstable
24	FeedPowerLimit
25	PFValueSet
26	RealPowerLimit
27	DCOutputOn
28	SOCProtectOff
29	Discharge mode for BP

Table 8-15

Bit NO	DRMx	Description
Bit0	DRM0	DRM0 Switch : 1 ON/0 OFF
Bit1	DRM1	DRM1 Switch : 1 ON/0 OFF
Bit2	DRM2	DRM2 Switch : 1 ON/0 OFF
Bit3	DRM3	DRM3 Switch : 1 ON/0 OFF
Bit4	DRM4	DRM4 Switch : 1 ON/0 OFF
Bit5	DRM5	DRM5 Switch : 1 ON/0 OFF
Bit6	DRM6	DRM6 Switch : 1 ON/0 OFF
Bit7	DRM7	DRM7 Switch : 1 ON/0 OFF
Bit8	DRM8	DRM8 Switch : 1 ON/0 OFF
Bit9		
Bit10		
Bit11		
Bit12		
Bit13		
Bit...		
Bit15	DRED Connect Status	DRED Status : 1 Connect / 0 Disconnect

Table 8-16



MODE	COMMAND	EFFECT
Auto	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x01 PowerLimitValue: 0 (2byte)	Battery power is automatically controlled by hybrid inverter, based on Meter Power
Stopped	Fcode: 0x03 Ccode: 0x3A ModeValue: 0xFF PowerLimitValue: 0 (2byte)	
Charge	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x02 PowerLimitValue: x w(2byte)	Charge mode: 1. x means the max power allowed to drain from grid. If Charge Power Limit set as 0W, means only PV is allowed to charge battery. 2. Battery charged by PV power in priority. 3. Charge Power fluctuates according to charge current.
Discharge	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x03 PowerLimitValue: x w(2byte)	Discharge mode, x means the max discharge power.
Import	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x04 PowerLimitValue: x w(2byte)	Power-Buy Mode: x means the power set to buy from grid. Grid power is used in priority, PV power will be limited when it goes high.
Export	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x05 PowerLimitValue: x w(2byte)	Power-selling Mode: x means the power set selling to grid, selling PV power in priority, then battery. The max PV power will be limited at x value.
Conserve	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x06 PowerLimitValue: x w(2byte)	x is invalid here. Battery will only charge when grid power is available. Battery will discharge when grid is not available.
Offgrid	Fcode: 0x03 Ccode: 0x3A ModeValue: 0x07	Off-Grid Mode: System will depart from grid compulsively, working without grid.



	PowerLimitValue: x (2byte)	
--	----------------------------	--

Table 8-17

Bit No	Definition	Status	
		1	0
Bit15	PF Null	-	-
Bit14	PQ Curve	-	-
Bit13	Fixed PF	-	-
Bit12	FixedQ	-	-
Bit11	TBD	-	-
Bit10	TBD	-	-
Bit9	TBD	-	-
Bit8	TBD	-	-
Bit7	TBD	-	-
Bit6	TBD	-	-
Bit5	TBD	-	-
Bit4	TBD	-	-
Bit3	TBD	-	-
Bit2	PFreq Curve	ON	OFF
Bit1	PU Curve	ON	OFF
Bit0	QU Curve	ON	OFF

Table 8-18

Data	Description	Data	Description
1	0.99 lagging	80	0.80 leading
2	0.98 lagging	81	0.81 leading
3	0.97 lagging	82	0.82 leading
4	0.96 lagging	83	0.83 leading
5	0.95 lagging	84	0.84 leading
6	0.94 lagging	85	0.85 leading
7	0.93 lagging	86	0.86 leading
8	0.92 lagging	87	0.87 leading
9	0.91 lagging	88	0.88 leading
10	0.90 lagging	89	0.89 leading
11	0.89 lagging	90	0.90 leading
12	0.88 lagging	91	0.91 leading



13	0.87 lagging	92	0.92 leading
14	0.86 lagging	93	0.93 leading
15	0.85 lagging	94	0.94 leading
16	0.84 lagging	95	0.95 leading
17	0.83 lagging	96	0.96 leading
18	0.82 lagging	97	0.97 leading
19	0.81 lagging	98	0.98 leading
20	0.80 lagging	99	0.99 leading
		100	1

Table 8-19

Code	Description	Grid connection standards
0x00	Italy	ENEL (Un: 230Vac)
0x01	Czech	EN50438(CZ) (Un: 230Vac)
0x02	Germany	VDE-AR-N 4105(Un: 230Vac)
0x03	Spain	RD1699(Un: 230Vac)
0x04	GreeceMainland	EN50438(GR) (Un: 230Vac)
0x05	Danmark	EN50438(DK)
0x06	Belgium	C10/C11(Un: 230Vac)
0x07	Romania	(Un: 230Vac)
0x08	G83 or G59, according to model	G83/2 G59/3 (Un: 230Vac)
0x09	Australia	AS/NZS 4777.2
0x0A	France	VDE0126
0x0B	China	NB-T
0x0C	60Hz Grid Default	CSA
0x0D	Poland	EN50438
0x0E	South Africa	(Un: 230Vac)
0x0F	AustraliaL	AS/NZS 4777.2
0x10	Brazil	(Un: 220Vac)
0x11	Thailand MEA	MEA
0x12	Thailand PEA	PEA
0x13	Mauritius	(Un: 230Vac)
0x14	Holland	EN50438
0x15	Northern Ireland	Northern Ireland
0x16	中国标准较高压	NB-T
0x17	French 50Hz	(Un: 230Vac)
0x18	French 60Hz	(Un: 230Vac)
0x19	Australia Ergon	AS/NZS 4777.2
0x1A	Australia Energex	AS/NZS 4777.2
0x1B	Holland 16/20A	EN50438



0x1C	Korea	(Un: 220Vac)
0x1D	China Station	NB-T
0x1E	Austria	(Un: 230Vac)
0x1F	India	IEC61727
0x20	50Hz Grid Default	Default
0x21	Warehouse	Warehouse
0x22	Philippines	Philippines
0x23	Ireland	EN50438 Ireland
0x24	Taiwan	(Un: 230Vac)
0x25	Bulgaria	EN50438
0x26	Barbados	(Un: 230Vac)
0x27	中国标准最高压	NB-T

Note: INT16U, Unsigned Integer
 INT16S, Signed Integer
 INT32U, Long Integer
 INT8U, Byte
 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. For Example

9.1 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

9.2 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.

9.3 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 AAAAAAABBBBBBBB (Just as a sample)

9.4 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	

9.5 Set Lowest PV voltage for feeding power
AP sends:

01H	10H	00H	00H	00H,01H	02H	0AH	FOH	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		Amount of	CRC Code	



Address	Code	register	registers	
---------	------	----------	-----------	--

10. 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, 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, 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, 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, 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);
}
```