Sigenergy

Modbus Protocol

Version: V1.7

Release date: 2024-04-09

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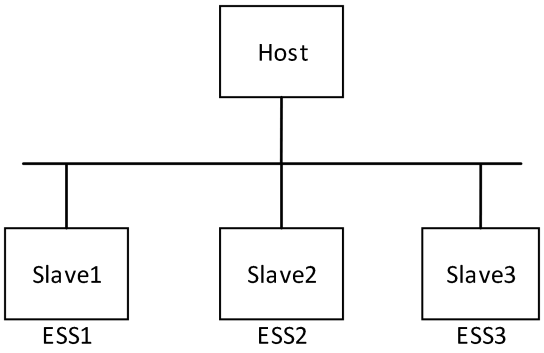
Contents

Version	Date	Change Description
V1.0	2023-08-15	Initial release.
V1.1	2023-09-06	Added description for interaction timeout. Changed a few register setting address.
V1.2	2023-09-22	Added models of three phase products.
V1.3	2023-11-22	Supporting grid-wide power control
V1.4	2023-11-30	Added a few power related registers, added definition for alarm severity.
V1.5	2024-01-30	Added a few phase power related registers and mode controlling registers, modified a few registers' value range.
V1.6	2024-03-08	Added a few DC Charger related registers
V1.7	2024-04-09	Modified and added a few remote EMS and ESS control related registers.

1. Introduction

The Modbus protocol of Sigenergy complies the standard Modbus Application protocol specification. The physical media is multiple, such as RS485, Fast Ethernet, WLAN, Optical fiber and 4G. The figure below shows a simple host-slave mode in Modbus protocol.



2. Applicable Model

Table 1-1 Applicable models and firmware versions

Model	Firmware versions	Note
SigenStor EC 3.0 SP	/	/
SigenStor EC 3.6 SP	/	/
SigenStor EC 4.0 SP	/	/
SigenStor EC 4.6 SP	/	/
SigenStor EC 5.0 SP	/	/
SigenStor EC 6.0 SP	/	/
Sigen Hybrid 3.0 SP	/	/
Sigen Hybrid 3.6 SP	/	/
Sigen Hybrid 4.0 SP	/	/
Sigen Hybrid 4.6 SP	/	/
Sigen Hybrid 5.0 SP	/	/
Sigen Hybrid 6.0 SP	/	/
Sigen PV Max 3.0 SP	/	/
Sigen PV Max 3.6 SP	/	/

Sigen PV Max 4.0 SP	/	/
Sigen PV Max 4.6 SP	/	/
Sigen PV Max 5.0 SP	/	/
Sigen PV Max 6.0 SP	/	/
Sigen Hybrid 5.0 TP	/	/
Sigen Hybrid 6.0 TP	/	/
Sigen Hybrid 8.0 TP	/	/
Sigen Hybrid 10.0 TP	/	/
Sigen Hybrid 12.0 TP	/	/
Sigen Hybrid 15.0 TP	/	/
Sigen Hybrid 17.0 TP	/	/
Sigen Hybrid 20.0 TP	/	/
Sigen Hybrid 25.0 TP	/	/
Sigen PV Max 5.0 TP	/	/
Sigen PV Max 6.0 TP	/	/
Sigen PV Max 8.0 TP	/	/
Sigen PV Max 10.0 TP	/	/
Sigen PV Max 12.0 TP	/	/
Sigen PV Max 15.0 TP	/	/
Sigen PV Max 17.0 TP	/	/
Sigen PV Max 20.0 TP	/	/
Sigen PV Max 25.0 TP	/	/
SigenStor EC 5.0 TP	/	/
SigenStor EC 6.0 TP	/	/
SigenStor EC 8.0 TP	/	/
SigenStor EC 10.0 TP	/	/
SigenStor EC 12.0 TP	/	/
SigenStor EC 15.0 TP	/	/
SigenStor EC 17.0 TP	/	/
SigenStor EC 20.0 TP	/	/
SigenStor EC 25.0 TP	/	/

3. Communication Interface

3.1 RS485

Parameter	Description
Transfer mode	RTU mode
Communication mode	Half duplex
Baud rate	9600bps(default)
Start bit	1
Data bit	8
Check bit	None
Stop bit	1

3.2 Fast Ethernet/WLAN/Optical fiber/4G

Parameter	Description
Transfer mode	TCP mode
Communication mode	Full duplex
Link layer Mode	TCP Server
Application layer Mode	Slave
Port	502

3.3 Fast Ethernet/WLAN/Optical fiber/4G*

Parameter	Description
Transfer mode	TCP mode
Communication mode	Full duplex
Link layer Mode	TCP Client
Application layer Mode	Slave
Port	custom

*Note :To be specific, if 4G is the only physical communication media, the protocol then only supports one SigenStor to connect the third party cloud as a client.

4. Technical Terms

4.1 Technical item name specification:

Item	Description
Host	The one that initiates an application request is referred to the host
Slave	The one that responds to an application request is referred to the slave
Access plant address	247
Slave address range	1-246
U16	Unsigned integer of 16-bit
U32	Unsigned integer of 32-bit
U64	Unsigned integer of 64-bit
S16	Signed integer of 16-bit
S32	Signed integer of 32-bit
STRING	Character string in ASCII

RO	Read only, only support 0x04 command
WO	Write only, only support 0x06 command
RW	Read and write, support 0x04、0x06、0x10 command

4.2 Interaction timeout

A communication process following the Modbus protocol should always be stared by a host. In Modbus RTU Mode :

Minimum Request period (RS485 Time out): 1000 ms

After sending an unicast request, before receiving a respond from the salve device, the host should wait for up to 1000ms to send a new unicast request to slave device. If no respond is received from the slave device after waiting for 1000 ms, the host should regard this request as a timeout.

4.3 Alarm severity level definition

There are only two levels of alarms, and their definitions are as follows:

Critical Alarm: The external environment does not meet the operating conditions for the device, or a serious device fault has occurred. The device will enter fault mode and stop operating. The alarm can be automatically cleared once the external conditions or the device fault is resolved.

General Alarm: Due to minor faults either in the external environment or within the device, the device can still operate normally or

at a reduced capacity. The alarm can be automatically cleared once the

external conditions or the device fault is resolved.

5. Register Address Definition

5.1 Plant running information address definition (read-only register)

The registers below can only be accessed by slave address 247. To obtain power plant data, inquiries should be send to address 247.

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Comment
1	System time	30000	2	RO	U32	1	s	Epoch seconds
2	System time zone	30002	1	RO	U16	1	min	
3	EMS work mode	30003	1	RO	U16	N/A	N/A	0: Max self consumption; 1: Sigen AI Mode; 2: TOU 7: Remote EMS mode
4	Grid Sensor Status	30004	1	RO	U16	N/A	N/A	(gateway or meter connection status) 0: not connected 1: connected
5	[Grid sensor] Active power	30005	2	RO	S32	1000	kW	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
6	[Grid sensor] reactive power	30007	2	RO	S32	1000	kVar	Data collected from grid sensor at grid to system checkpoint;
7	On/Off Grid status	30009	1	RO	U16	N/A	N/A	0: on grid 1: off grid (auto) 2: off grid (manual)
8	Max active power	30010	2	RO	U32	1000	kW	This is should be the base value of all active power

								adjustment actions
9	Max apparent power	30012	2	RO	U32	1000	kVar	This is should be the base value of all reactive power adjustment actions
10	Energy storage system SOC	30014	1	RO	U16	10	%	
11	Plant phase A active power	30015	2	RO	S32	1000	kW	
12	Plant phase B active power	30017	2	RO	S32	1000	kW	
13	Plant phase C active power	30019	2	RO	S32	1000	kW	
14	Plant phase A reactive power	30021	2	RO	S32	1000	kVar	
15	Plant phase B reactive power	30023	2	RO	S32	1000	kVar	
16	Plant phase C reactive power	30025	2	RO	S32	1000	kVar	
17	General Alarm1	30027	1	RO	U16	N/A	N/A	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 2
18	General Alarm2	30028	1	RO	U16	N/A	N/A	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 3
19	General Alarm3	30029	1	RO	U16	N/A	N/A	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 4
20	General Alarm4	30030	1	RO	U16	N/A	N/A	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 5

21	Plant active power	30031	2	RO	S32	1000	kW	
22	Plant reactive power	30033	2	RO	S32	1000	kVar	
23	Photovoltaic power	30035	2	RO	S32	1000	kW	
24	ESS power	30037	2	RO	S32	1000	kW	<0: discharging >0: charging
25	Available max active power	30039	2	RO	U32	1000	kW	Feed to the ac terminal. Count only the running inverters
26	Available min active power	30041	2	RO	U32	1000	kW	Absorb from the ac terminal. Count only the running inverters
27	Available max reactive power	30043	2	RO	U32	1000	kVar	Feed to the ac terminal. Count only the running inverters
28	Available min reactive power	30045	2	RO	U32	1000	kVar	Absorb from the ac terminal. Count only the running inverters
29	Available max charging power	30047	2	RO	U32	1000	kW	Count only the running inverters
30	Available max discharging power	30049	2	RO	U32	1000	kW	Count only the running inverters
31	Plant running state	30051	1	RO	U16	N/A	N/A	Refer to Appendix 1
32	[Grid sensor] Phase A active power	30052	2	RO	S32	1000	kW	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
33	[Grid sensor] Phase B active power	30054	2	RO	S32	1000	kW	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid

34	[Grid sensor] Phase C active power	30056	2	RO	S32	1000	kW	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
35	[Grid sensor] Phase A reactive power	30058	2	RO	S32	1000	kVar	Data collected from grid sensor at grid to system checkpoint;
36	[Grid sensor] Phase B reactive power	30060	2	RO	S32	1000	kVar	Data collected from grid sensor at grid to system checkpoint;
37	[Grid sensor] Phase C reactive power	30062	2	RO	S32	1000	kVar	Data collected from grid sensor at grid to system checkpoint;
38	Available max charging capacity	30064	2	RO	U32	100	kWh	Count only the running inverters
39	Available max discharging capacity	30066	2	RO	U32	100	kWh	Count only the running inverters
40	Rated ESS charging power	30068	2	RO	U32	1000	kW	
41	Rated ESS discharging power	30070	2	RO	U32	1000	kW	

5.2 Plant parameter setting address definition (holding register)

The registers below can only be accessed by slave address 247. To modify plant-level registers, send commands to address 247.

Note: Power control related registers not explicitly mentioned in the "Comment" will take effect only when the remote EMS control mode value is 0.

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Comment
1	Start/Stop	40000	1	WO	U16	N/A	N/A	0: Stop

								1: Start
2	Active power fixed adjustment target value	40001	2	RW	S32	1000	kW	
3	Reactive power fixed adjustment target value	40003	2	RW	S32	1000	kVar	
4	Active power percentage adjustment target value	40005	1	RW	S16	100	%	Range: [-100.00,100.00]
5	Q/S adjustment target value	40006	1	RW	S16	100	%	Range: [-60.00,60.00]
6	Power factor adjustment target value	40007	1	RW	S16	1000	N/A	Range: (-1, -0.8] U [0.8, 1]
7	Phase A active power fixed adjustment target value	40008	2	RW	S32	1000	kW	Valid only when output type is L1/L2/L3/N
8	Phase B active power fixed adjustment target value	40010	2	RW	S32	1000	kW	Valid only when output type is L1/L2/L3/N
9	Phase C active power fixed adjustment target value	40012	2	RW	S32	1000	kW	Valid only when output type is L1/L2/L3/N
10	Phase A reactive power fixed adjustment target value	40014	2	RW	S32	1000	kVar	Valid only when output type is L1/L2/L3/N
11	Phase B reactive power fixed adjustment target value	40016	2	RW	S32	1000	kVar	Valid only when output type is L1/L2/L3/N

12	Phase C reactive power fixed adjustment target value	40018	2	RW	S32	1000	kVar	Valid only when output type is L1/L2/L3/N
13	Phase A Active power percentage adjustment target value	40020	1	RW	S16	100	%	Valid only when output type is L1/L2/L3/N. Range: [-100.00,100.00]
14	Phase B Active power percentage adjustment target value	40021	1	RW	S16	100	%	Valid only when output type is L1/L2/L3/N. Range: [-100.00,100.00]
15	Phase C Active power percentage adjustment target value	40022	1	RW	S16	100	%	Valid only when output type is L1/L2/L3/N. Range: [-100.00,100.00]
16	Phase A Q/S fixed adjustment target value	40023	1	RW	S16	100	%	Valid only when output type is L1/L2/L3/N. Range: [-60.00,60.00]
17	Phase B Q/S fixed adjustment target value	40024	1	RW	S16	100	%	Valid only when output type is L1/L2/L3/N. Range: [-60.00,60.00]
18	Phase C Q/S fixed adjustment target value	40025	1	RW	S16	100	%	Valid only when output type is L1/L2/L3/N. Range: [-60.00,60.00]
19	Active power fixed adjustment upper limit	40026	2	RW	S32	1000	kW	The actual power adjustment value will be the lesser of this register and register 40001.
20	Active power percentage adjustment upper limit	40028	1	RW	S16	100	%	The actual power adjustment value will be the lesser of this register and

								register 40005.
21	Remote EMS enable	40029	1	RW	U16	N/A	N/A	0: disabled 1: enabled When needed to control EMS remotely, this register needs to be enabled. When enabled, the plant's EMS work mode (30003) will switch to remote EMS.
22	Independent phase power control enable	40030	1	RW	U16	N/A	N/A	Valid only when output type is L1/L2/L3/N. To enable independent phase control, this parameter must be enabled. 0: disabled 1: enabled
23	Remote EMS control mode	40031	1	RW	U16	N/A	N/A	Mode values' definition refer to Appendix 6
24	ESS max charging limit	40032	2	RW	U32	1000	kW	[0, Rated ESS charging power]. This register will take effect when Remote EMS control mode (40031) is 3 or 4.
25	ESS max discharging limit	40034	2	RW	U32	1000	kW	[0, Rated ESS discharging power]. This register will take effect when Remote EMS control mode (40031) is 5 or 6.
26	PV max power limit	40036	2	RW	U32	1000	kW	This register will take effect when Remote EMS control mode (40031) is 3, 4, 5 or 6.

5.3 Hybrid inverter running information address definition (read-only register)

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Comment
1	Model type	30500	15	RO	STRING	N/A	N/A	
2	Serial number	30515	10	RO	STRING	N/A	N/A	
3	Machine firmware version	30525	15	RO	STRING	N/A	N/A	
4	Rated active power	30540	2	RO	U32	1000	kW	
5	Max. apparent power	30542	2	RO	U32	1000	kVA	
6	Max. active power	30544	2	RO	U32	1000	kW	
7	Max. absorption power	30546	2	RO	U32	1000	kW	
8	Rated battery capacity	30548	2	RO	U32	100	kWh	
9	[ESS]Rated charge power	30550	2	RO	U32	1000	kW	
10	[ESS]Rated discharge power	30552	2	RO	U32	1000	kW	
11	Daily export energy	30554	2	RO	U32	100	kWh	
12	Accumulated export energy	30556	4	RO	U64	100	kWh	
13	Daily import energy	30560	2	RO	U32	100	kWh	
14	Accumulated import energy	30562	4	RO	U64	100	kWh	
15	Battery daily charge energy	30566	2	RO	U32	100	kWh	

16	Battery accumulated charge energy	30568	4	RO	U64	100	kWh	
17	Battery daily discharge energy	30572	2	RO	U32	100	kWh	
18	Battery accumulated discharge energy	30574	4	RO	U64	100	kWh	
19	Running state	30578	1	RO	U16	N/A	N/A	Refer to Appendix 1
20	Max.active power adjustment value	30579	2	RO	S32	1000	kW	
21	Min. active power adjustment value	30581	2	RO	S32	1000	kW	
22	Max. reactive power adjustment value fed to the ac terminal	30583	2	RO	U32	1000	kVar	
23	Max. reactive power adjustment value absorbed from the ac terminal	30585	2	RO	U32	1000	kVar	
24	Active power	30587	2	RO	S32	1000	kW	
25	Reactive power	30589	2	RO	S32	1000	kVar	
26	[ESS]Max. battery charge power	30591	2	RO	U32	1000	kW	
27	[ESS]Max. battery	30593	2	RO	U32	1000	kW	

	discharge power							
28	[ESS]Available battery charge Energy	30595	2	RO	U32	100	kWh	
29	[ESS]Available battery discharge Energy	30597	2	RO	U32	100	kWh	
30	[ESS] charge / discharge power	30599	2	RO	S32	1000	kW	
31	[ESS]Battery SOC	30601	1	RO	U16	10	%	
32	[ESS]Battery SOH	30602	1	RO	U16	10	%	
33	[ESS]average cell temperature	30603	1	RO	S16	10	℃	
34	[ESS] average cell voltage	30604	1	RO	U16	1000	V	
35	Alarm1	30605	1	RO	U16	N/A	N/A	Refer to Appendix 2
36	Alarm2	30606	1	RO	U16	N/A	N/A	Refer to Appendix 3
37	Alarm3	30607	1	RO	U16	N/A	N/A	Refer to Appendix 4
38	Alarm4	30608	1	RO	U16	N/A	N/A	Refer to Appendix 5
39	Rated grid voltage	31000	1	RO	U16	10	V	
40	Rated grid frequency	31001	1	RO	U16	100	Hz	
41	Grid frequency	31002	1	RO	U16	100	Hz	
42	[PCS] Internal temperature	31003	1	RO	S16	10	℃	
43	Output type	31004	1	RO	U16	N/A	N/A	0: L/N 1: L1/L2/L3 2: L1/L2/L3/N 3: L1/L2/N

44	A-B line voltage	31005	2	RO	U32	100	V	Invalid when output type is L/N, L1/L2/N, or L1/L2/N
45	B-C line voltage	31007	2	RO	U32	100	V	
46	C-A line voltage	31009	2	RO	U32	100	V	
47	Phase A voltage	31011	2	RO	U32	100	V	When output type is L/N, refers to "Phase voltage"
48	Phase B voltage	31013	2	RO	U32	100	V	Invalid when output type is L/N, L1/L2/N, or L1/L2/N
49	Phase C voltage	31015	2	RO	U32	100	V	
50	Phase A current	31017	2	RO	S32	100	A	When output type is L/N, refers to "Phase current"
51	Phase B current	31019	2	RO	S32	100	A	Invalid when output type is L/N, L1/L2/N, or L1/L2/N
52	Phase C current	31021	2	RO	S32	100	A	
53	Power factor	31023	1	RO	U16	1000	N/A	
54	PACK count	31024	1	RO	U16	1	N/A	
55	PV string count	31025	1	RO	U16	1	N/A	
56	MPPT count	31026	1	RO	U16	1	N/A	
57	PV1 voltage	31027	1	RO	S16	10	V	
58	PV1 current	31028	1	RO	S16	100	A	
59	PV2 voltage	31029	1	RO	S16	10	V	
60	PV2 current	31030	1	RO	S16	100	A	
61	PV3 voltage	31031	1	RO	S16	10	V	
62	PV3 current	31032	1	RO	S16	100	A	
63	PV4 voltage	31033	1	RO	S16	10	V	
64	PV4 current	31034	1	RO	S16	100	A	

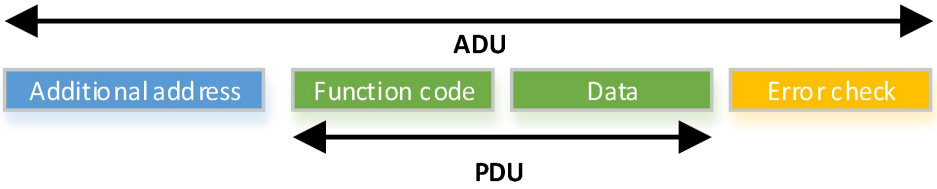
65	PV power	31035	2	RO	S32	1000	kW	
66	Insulation resistance	31037	1	RO	U16	1000	MΩ	
67	Startup time	31038	2	RO	U32	1	s	
68	Shutdown time	31040	2	RO	U32	1	s	
69	[DC Charger] Vehicle battery voltage	31500	1	RO	U16	10	V	
70	[DC Charger] Charging current	31501	1	RO	U16	10	A	
71	[DC Charger] Output power	31502	2	RO	S32	1000	kW	
72	[DC Charger] Vehicle SOC	31504	1	RO	U16	10	%	
73	[DC Charger] Current charging capacity	31505	2	RO	U32	100	kWh	Single time
74	[DC Charger] Current charging duration	31507	2	RO	U32	1	s	Single time

5.4 Hybrid inverter Parameter setting address definition (holding register)

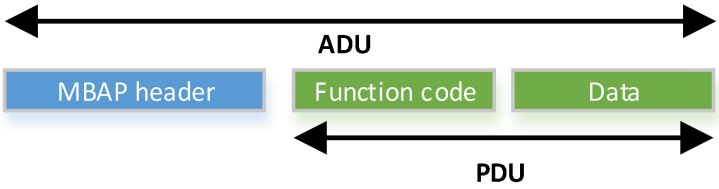
No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Comment
1	Start/Stop	40500	1	WO	U16	N/A	N/A	0: Stop 1: Start
2	Grid code	40501	1	RW	U16	N/A	N/A	
3	[DC Charger] Start/Stop	41000	1	WO	U16	N/A	N/A	0: Start 1: Stop

6. Modbus Protocol Command Overview

(1) MODBUS-RTU frame format



(2) MODBUS-TCP frame format



Filed	Length(Bytes)	Description
Transmission identifier	2	Matching identifier between a request frame and a response frame
Protocol type	2	0 = Modbus protocol
Data length	2	Follow-up data length
Slave Address	1	Customized by user (1~247)

MODBUS PDU for serial line communication = 256 - Slave address (1 byte) - CRC (2 bytes) = 253 bytes.

Consequently:

RS232 / RS485 ADU = 253 bytes + Slave address (1 byte) + CRC (2 bytes) = 256 bytes.

TCP MODBUS ADU = 253 bytes + MBAP (7 bytes) = 260 bytes.

6.1 Function code

Index	Function code	Description
1	0x03	Read Read-only Register(RO)
2	0x04	Read Holding Register(RW/WO)
3	0x06	Write a single Register
4	0x10	Write multiple Registers

6.1.1 Read Read-only Register

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x03
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~124

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x03
Byte count	1 Byte	2 x N
Register value	2 x N Bytes	N=Quantity of Registers

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x83
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU

Host query command: 01 03 0E 30 00 01

Slave normal respond: 01 03 02 00 64

Slave abnormal respond: 01 83 02

6.1.2 Read Holding Register

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x04
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~124

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x04
Byte count	1 Byte	2 x N
Register value	2 x N Bytes	N=Quantity of Registers

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x84
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU

Host query command: 01 04 0F A1 00 01

Slave normal respond: 01 04 02 00 02

Slave abnormal respond: 01 84 02

6.1.3 Write a single Register

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x06
Register address	2 Bytes	0x0000~0xFFFF
Register value	2 Bytes	0x0000~0xFFFF

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x06
Register address	2 Bytes	0x0000~0xFFFF
Register value	2 Bytes	0x0000~0xFFFF

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x86
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU

Host query command: 01 06 0F A1 00 01

Slave normal respond: 01 06 0F A1 00 01

Slave abnormal respond: 01 86 04

6.1.4 Write multiple Registers

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x10
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~123
Byte count	1 Byte	2 x N
Registers value	2 x N Bytes	N=Quantity of Registers

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x10
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~123

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x90
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU

Host query command: 01 10 0F A2 00 02 04 03 E8 00 64
Slave normal respond: 01 10 0F A2 00 02
Slave abnormal respond: 01 90 02

6.2 Exception code

Code	Name	Meaning
0x01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.
0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the server (or slave). More specifically, the combination of reference number and transfer length is invalid.
0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server (or slave). This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does NOT mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the MODBUS protocol is unaware of the significance of any particular value of any particular register.
0x04	SLAVE DEVICE FAILURE	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.

Appendix 1

Running State	Value
Standby	0x00
Running	0x01
Fault	0x02
Shutdown	0x03

Appendix 2

Alarm Code	Alarm Description	Bit	Severity Level
1001	Software version mismatch	0	Critical
1002	Low insulation resistance	1	Critical
1003	The temperature is too high	2	Critical
1004	Equipment failure	3	Critical
1005	The system grounding is abnormal	4	General
1006	PV string voltage is high	5	Critical
1007	PV string reverse connection	6	Critical
1008	PV string back-filling	7	Critical
1009	AFCI fault	8	Critical
1010	Grid outage	9	Critical

1011	Grid overvoltage	10	Critical
1012	Grid undervoltage	11	Critical
1013	Grid overfrequency	12	Critical
1014	Grid underfrequency	13	Critical
1015	Grid voltage imbalance	14	Critical
1016	The DC component of the output current exceeds the limits	15	Critical

Appendix 3

Alarm Code	Alarm Description	Bit	Severity Level
1017	The leakage electricity exceeds the limits	0	Critical
1018	Communication abnormal	1	General
1019	System internal protection	2	Critical
1020	AFCI self-test circuit fault	3	Critical
1021	Off-grid protection	4	Critical
Not defined	Not defined	Not defined	

Appendix 4

Alarm Code	Alarm Description	Bit	Severity Level
2001	Software version mismatch	0	Critical
2002	The energy storage module has low insulation resistance to ground	1	General
2003	The temperature is too high	2	Critical
2004	Equipment failure	3	Critical
2005	Below desired temperature	4	Critical
2008	System internal protection	5	Critical
Not defined	Not defined	Not defined	

Appendix 5

Alarm Code	Alarm Description	Bit	Severity Level
3001	Software version mismatch	0	Critical
3002	The temperature is too high	1	Critical
3003	Equipment failure	2	Critical
3004	Excessive leakage current in off-grid output	3	Critical
3005	N line grounding fault	4	Critical

Not defined	Not defined	Not defined	

Appendix 6

Remote EMS control mode	Value
PCS remote control	0x00
Standby	0x01
Maximum self-consumption	0x02
Command charging (consume grid power first)	0x03
Command charging (consume PV power first)	0x04
Command discharging (output from PV first)	0x05
Command discharging (output from ESS first)	0x06