Modbus protocol

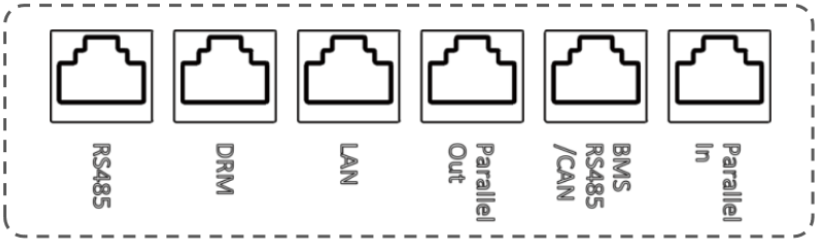
REV1.0

This document provides a method for reading inverter information(voltage, current, power, etc.) via the standard Modbus protocol.

1. Check support

	ID rules	Support
ELS-11.4	B040XXXXXXXX	√
ELT-12	B050XXXXXXXX	√

RS485 and TCP interfaces



8：NC
7：NC
6：NC
5：NC
4：NC
3：NC
2：RS485_MODBUS_A
1：RS485_MODBUS_B

3. MODBUS agreement

MODBUS-RTU

Read single or multiple registers

Transmission

Device Address	function code	Data header address	data size	CRC
1byte	1byte	2byte	2byte	2byte

Receive

Device Address	function code	Last Byte Count	Data 1	Data 2	…	Data n	CRC
1byte	1byte	1byte	2byte	2byte	…	2byte	2byte

Write single registers

Transmission

Device Address	function code	Data address	Data	CRC
1byte	1byte	2byte	2byte	2byte

Receive

Device Address	function code	Data address	Data	CRC
1byte	1byte	2byte	2byte	2byte

Write multiple registers

Transmission

Device Address	function code	Data address	register number	Last Byte Count	Data 1	…	Data n	CRC
1byte	1byte	2byte	2byte	1byte	2byte	…	2byte	2byte

Receive

Device Address	function code	Data address	register number	CRC
1byte	1byte	2byte	2byte	2byte

MODBUS-TCP

Read single or multiple registers

Transmission

order number	type	byte count	device address	function code	Data address	data size
2byte	2byte	2type	1byte	1byte	2byte	2byte

Receive

order number	type	byte count	device address	function code	Subsequent byte count	data1	data2	…	datan
2byte	2byte	2type	1byte	1byte	1byte	2byte	2byte	…	2byte

Write single registers

Transmission

order number	type	byte count	device address	function code	Data address	data
2byte	2byte	2type	1byte	1byte	2byte	2byte

Receive

order number	type	byte count	device address	function code	Data address	data
2byte	2byte	2type	1byte	1byte	2byte	2byte

Write multiple registers

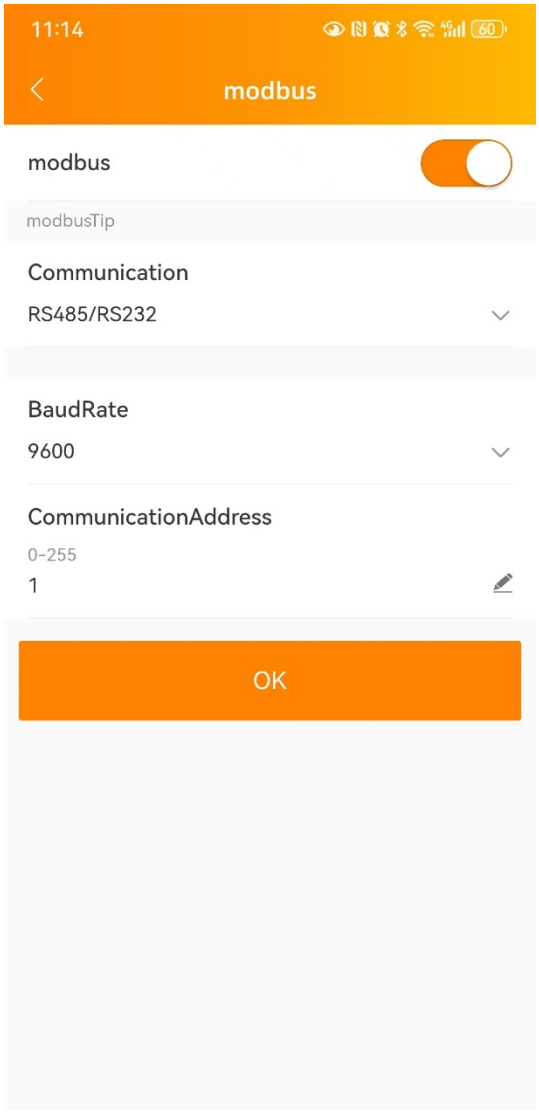
Transmission

order number	type	byte count	device address	function code	Data address	Data size	Subsequent byte count	data1	…	datan
2byte	2byte	2type	1byte	1byte	2byte	2byte	1byte	2byte	…	2byte

Receive

order number	type	byte count	device address	function code	Data address	Data size
2byte	2byte	2type	1byte	1byte	2byte	2byte

3. Software configuration



4. Point table

Address	Name	Value	Type	Size	Scale Factor	Units	RW	Description
40002	ID	1	uint16	1			R	Model identifier
40003	Model Length	66	uint16	1			R	Model length
40004	Manufacturer		string	16			R	Well known value registered with SunSpec for compliance
40020	Model		string	16			R	Manufacturer specific value (32 chars)
40036	Options		string	8			R	Manufacturer specific value (16 chars)
40044	Version		string	8			R	Manufacturer specific value (16 chars)
40052	Serial Number		string	16			R	Manufacturer specific value (32 chars)
40068	Device Address		uint16	1			RW	Modbus device address
40070	ID	802	uint16	1			R	Model identifier
40071	Model Length	128	uint16	1			R	Model length
40073	WHRtg		uint16	1	**WHRtg_SF(*0.01)**	kWh	R	Energy Capacity
40074	Max Charge Rate		uint16	1	W_SF(*1)	W	R	Maximum rate of energy transfer into the storage device in DC watts.
40075	Max Disharge Rate		uint16	1	W_SF(*1)	W	R	Maximum rate of energy transfer out of the storage device in DC watts

40077	SoCMax	1000	uint16	1	SoC_SF(*0.1)	%	R	Manufacturer maximum state of charge, expressed as a percentage.
40078	SoCMin	0	uint16	1	SoC_SF(*0.1)	%	R	Manufacturer minimum state of charge, expressed as a percentage.
40079	SoCRsvMax		uint16	1	SoC_SF(*0.1)	%	RW	Setpoint for maximum reserve for storage as a percentage of the nominal maximum storage.
40080	SoCRsvMin		uint16	1	SoC_SF(*0.1)	%	RW	Setpoint for minimum reserve for storage as a percentage of the nominal maximum storage.
40081	SoC		uint16	1	SoC_SF(*0.1)	%	R	State of charge, expressed as a percentage.
40083	SoH		uint16	1	SoH_SF(*1)	%	R	Percentage of battery life remaining.
40086	Charge Status		enum16	1			R	Charge status of storage device. Enumeration.
	OFF	1						
	EMPTY	2						
	DISCHARGING	3						
	CHARGING	4						
	FULL	5						
	HOLDING	6						
	TESTING	7						
40089	Controller Heartbeat		uint16	1			R	Value is incremented every second with periodic resets to zero.
40096	Battery Event 1 Bitfield		bitfield32	2			R	Alarms and warnings. Bit flags.
	COMMUNICATION_ERROR	0						

	OVER_TEMP_ALARM	1						
		2						reserve
	UNDER_TEMP_ALARM	3						
		4						reserve
	OVER_CHARGE_CURRENT_ ALARM	5						
		6						reserve
	OVER_DISCHARGE_CURRENT_ ALARM	7						
		8						reserve
	OVER_VOLT_ALARM	9						
		10						reserve
	UNDER_VOLT_ALARM	11						
		12						reserve
		13						reserve
		14						reserve
		15						reserve
		16						reserve
		17						reserve
		18						reserve
		19						reserve
		20						reserve
		21						reserve
	GROUND_FAULT	22						

		23						reserve
		24						reserve
		25						reserve
		26						reserve
		27						reserve
		28						reserve
		29						reserve
		30						reserve
		31						reserve
40100	EvtVnd1		bitfield32	2			R	PCS alarm
	PCS_ COMMUNICATION_ERROR	0						
	AC_A_Voltage_stage1_Exceeding _Range	1						
	AC_A_Voltage_stage1_Under _Range	2						
	AC_B_Voltage_stage1_Exceeding _Range	3						
	AC_B_Voltage_stage1_Under _Range	4						
	AC_C_Voltage_stage1_Exceeding _Range	5						
	AC_C_Voltage_stage1_Under _Range	6						
	AC_A_Voltage_stage2_Exceeding _Range	7						
	AC_A_Voltage_stage2_Under	8						

	_Range							
	AC_B_Voltage_stage2_Exceeding _Range	9						
	AC_B_Voltage_stage2_Under _Range	10						
	AC_C_Voltage_stage2_Exceeding _Range	11						
	AC_C_Voltage_stage2_Under _Range	12						
	AC_A_Voltage_stage3_Exceeding _Range	13						
	AC_A_Voltage_stage3_Under _Range	14						
	AC_B_Voltage_stage3_Exceeding _Range	15						
	AC_B_Voltage_stage3_Under _Range	16						
	AC_C_Voltage_stage3_Exceeding _Range	17						
	AC_C_Voltage_stage3_Under _Range	18						
	AC_A_Voltage_stage4_Exceeding _Range	19						
	AC_A_Voltage_stage4_Under _Range	20						
	AC_B_Voltage_stage4_Exceeding	21						

	_Range							
	AC_B_Voltage_stage4_Under _Range	22						
	AC_C_Voltage_stage4_Exceeding _Range	23						
	AC_C_Voltage_stage4_Under _Range	24						
		25						reserve
		26						reserve
		27						reserve
		28						reserve
		29						reserve
		30						reserve
		31						reserve
40104	DC_Bus_Voltage(Battery)		uint16	1	V_SF(*0.1)	V	R	DC Bus Voltage.
40114	DC_current		int16	1	A_SF(*0.1)	A	R	Total DC current flowing to/from the battery bank.(+:in. -out)
40117	Battery Power		int16	1	W_SF(*1)	W	R	Total power flowing to/from the battery bank.(+:discharge. -:charge)
40123	WHRtg_SF	-2	sunssf	1			R	Scale factor for energy capacity.
40124	WChaDisChaMax_SF	0	sunssf	1			R	Scale factor for maximum charge and discharge rate.
40125	DisChaRte_SF	0	sunssf	1			R	Scale factor for self discharge rate.
40126	SoC_SF	-1	sunssf	1			R	Scale factor for state of charge values.
40128	SoH_SF	0	sunssf	1			R	Scale factor for state of health.

40129	V_SF	-1	sunssf	1			R	Scale factor for DC bus voltage.
40131	A_SF	-1	sunssf	1			R	Scale factor for DC current.
40132	AMax_SF	-1	sunssf	1			R	Scale factor for instantaneous DC charge/discharge current.
40133	W_SF	0	sunssf	1			R	Scale factor for AC power request.
40134	Battery_ Voltage		uint16	1	V_SF(*0.1)	V	R	Battery Voltage
40135	Active_Power_A		int16	1	W_SF(*1)	W	R	A-phase active power (+:discharge. -:charge)
40136	Active_Power_B		int16	1	W_SF(*1)	W	R	B-phase active power (+:discharge. -:charge)
40137	Active_Power_C		int16	1	W_SF(*1)	W	R	C-phase active power (+:discharge. -:charge)
40138	Reactive_Power_A		uint16	1	W_SF(*1)	Var	R	A-phase reactive power
40139	Reactive_Power_B		uint16	1	W_SF(*1)	Var	R	B-phase reactive power
40140	Reactive_Power_C		uint16	1	W_SF(*1)	Var	R	C-phase reactive power
40146	Daily_Charge_Energy		uint16	1	Energy_SF(*0.01)	kWh	R	
40147	Daily_Disharge_Energy		uint16	1	Energy_SF(*0.01)	kWh	R	
40148	Charge_Energy		uint32	2	Energy_SF(*0.01)	kWh	R	
40150	Disharge_Energy		uint32	2	Energy_SF(*0.01)	kWh	R	
40152	Energy_SF	-2	sunssf	1				
40153	Grid_Power_A		int16	1	W_SF(*1)	W	R	A-phase grid side power (+:Grid discharge. -:Grid countercurrent)
40154	Grid_Power_B		int16	1	W_SF(*1)	W	R	B-phase grid side powe
40155	Grid_Power_C		int16	1	W_SF(*1)	W	R	C-phase grid side powe
40156	Battery_temp		int16	1	Temp_SF(*0.1)	℃	R	

40157	PCS_temp		int16	1	Temp_SF(*0.1)	℃	R	
40158	Temp_SF	-1	sunssf	1			R	
40159	Chip1_Version		string	8			R	
40167	Chip2_Version		string	8			R	
40175	Chip3_Version		string	8			R	
40183	Set_Power		int16	1	W_SF(*1)	W	RW	Set the battery charging(-) or discharging(+) power. 0 represents standby
Address	Name	Value	Type	Size	Scale Factor	Units	RW	Description
40002	ID	1	uint16	1			R	Model identifier
40003	Model Length	66	uint16	1			R	Model length
40004	Manufacturer		string	16			R	Well known value registered with SunSpec for compliance
40020	Model		string	16			R	Manufacturer specific value (32 chars)

7. Table illustration

If SoC equals 856 and SoC_SF equals -1, the actual SoC is $856 \times 10^{-1} = 85.6(\%)$

Read data

Read single or multiple registers

If device address = 0x01, and you want to get SoH, you need to send:

0x01 0x03 0x9C 0x93 0x00 0x01 0x5A 0x77

0x01: device address;

0x03: function code;

0x9C 0x93: starting register address for query;

0x00 0x01: query the number of registers;

0x5A 0x77: cyclic redundancy check

And you would receive:

0x01 0x03 0x02 0x00 0x64 0xB9 0xAF

0x01: device address;

0x03: function code;

0x02: number of bytes of subsequent data;

0x00 0x64: The value of register 0x9C93;

0xB9 0xAF: cyclic redundancy check

It means that the SoH is 0x0064 = 100. The SoH_SF = 0, so SoH = $100 \times 10^{-0} = 100$

Write data

Write single register

If you want to set SoCRsvMin to 30%, and the SoC_SF is -1, you need to set the value of register 40080 to 300. You need to send:

0x01 0x06 0x9C 0x90 0x01 0x2C 0xA7 0xFA

0x01: device address;

0x06: function code;

0x9C 0x90: register address written;

0x01 0x2C: The value of the written register;

0xA7 0xFA: cyclic redundancy check

And you would receive:

0x01 0x06 0x9C 0x90 0x01 0x2C 0xA7 0xFA

0x01: device address;

0x06: function code;

0x9C 0x90: register address written;

0x01 0x2C: The value of the written register;

0xA7 0xFA: cyclic redundancy check

Write multiple registers

If you want to set the SoCRsvMin to 30% and set SoCRsvMax to 90%, you need send
0x01 0x10 0x9C 0x8F 0x00 0x02 0x04 0x03 0x84 0x01 0x2C 0x02 0xA9

0x01: device address;
0x10: function code;
0x9C 0x8F: register address written;
0x00 0x02: the number of registers to be written;
0x04: the number of bytes written to the data afterwards
0x03 0x84 0x01 0x2C: the value of the written register;
0x02 0xA9: cyclic redundancy check

And you would receive:
0x01 0x10 0x9C 0x8F 0x00 0x02 0x5E 0x73

0x01: device address;
0x10: function code;
0x9C 0x8F: register address written;
0x00 0x02: the number of registers to be written;
0x5E 0x73: cyclic redundancy check

Type	Range	NotImplemented
int32 Range	-2147483647~2147483647	0x80000000
uint32 Range	0~4294967294	0xFFFFFFFF
enum32	0~4294967294	0xFFFFFFFF
bitfield32	0~4294967294	0xFFFFFFFF
int16 Range	-32767~32767	0x8000
uint16 Range	0~65534	0xFFFF
enum16	0~65534	0xFFFF
bitfield16	0~65534	0xFFFF