Introduction

The MODBUS communication is implemented by 2-wire (D+, D-) RS485 interface. The monitored inverters can extend to 255. The connecting diagram is shown in figure 1.

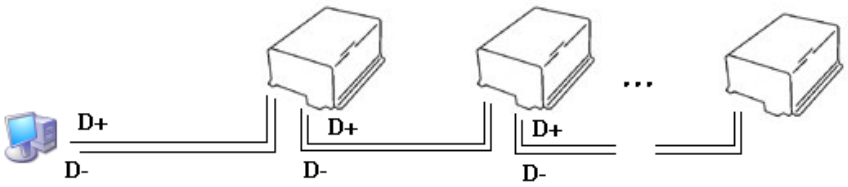

Figure 1

Usually, MODBUS uses 2 modes for data transmission. The first one is ASCII mode; the other one is RTU mode. Our product is using RTU Mode. The details are:

Table 1-1. Communication Parameter

Type	Note
Communication Mode	Half-Duplex
Baud Rate	9600bps
Start Bit	1
Data Bit	8
Parity Bit	None
Stop Bit	1

Before communication, each inverter must be assigned a unique address. The slave address range is from 1~255. And any of their addresses cannot be repeated.

Table 1-2. Technical Terms

Item	Description
Host	The one that initiates communication is called the host
Slave	The one that passive responses command called the slave
Broadcast address	0
Default address	1
U16	Unsigned integer of 16-bit
U32	Unsigned integer of 32-bit
S16	Signed integer of 16-bit
S32	Signed integer of 32-bit
ASCII	Char of 8-bit, the value range is 0x20~0x7F
CRC check	16 bit CRC check, low byte in front
Data format	High byte in front, example: 0x1234, byte 0=0x12, byte 1=0x34
R	Read only, only support 0x03 command
R/W	Read and write, support 0x03, 0x6, 0x10 command
PDU	Protocol Data Unit

MODBUS RTU MODE Introduction

Table 2-1: MODBUS Message Format

START OF FRAM	SLAVE ADDRESS FIELD	FUNCTION CODE	DATA FIELD	ERROR CHECK (CRC)	END OF FRAME
>60ms	1 BYTE	1 BYTE	1~255 BYTE	2 BYTE	>60ms

START OF FRAME: At least 60ms blank.
SLAVE ADDRESS FILED: 8-bit value representing the slave being addressed (1to 255), 0 is reserved for the broadcast address.
FUNCTION CODE: 8-bit value telling the addressed slave what action is to be performed.
DATA FIELD: Includes the address of register and the number of word to be read.
ERROR CHECK: 16 bit CRC.
END OF FRAME: At least 60ms blank.

- Proposal to terminate the connection time: 5000 (ms).

Registers Address Table

Table 3-1: Register address table

Register Address	Function	Description	Format	Attribute	Unit
Measurement data					
0x1001	L1 phase voltage(AC)	Phase R grid voltage	U16	R	0.1V
0x1002	L1 phase current(AC)	Phase R grid current	U16	R	0.01A
0x1003	L1 power (High Word)	Phase R grid watt	U32	R	0.1Watt
0x1004	L1 power (Low Word)				
0x1005	L1 AC frequency	Phase R grid frequency	U16	R	0.01Hz
0x1006	L2 phase voltage(AC)	Phase S grid voltage	U16	R	0.1V
0x1007	L2 phase current(AC)	Phase S grid current	U16	R	0.01A
0x1008	L2 power (High Word)	Phase S grid watt	U32	R	0.1Watt
0x1009	L2 power (Low Word)				
0x100A	L2 AC frequency	Phase S grid frequency	U16	R	0.01Hz
0x100B	L3 phase voltage(AC)	Phase T grid voltage	U16	R	0.1V
0x100C	L3 phase current(AC)	Phase T grid current	U16	R	0.01A
0x100D	L3 power (High Word)	Phase T grid watt	U32	R	0.1Watt
0x100E	L3 power (Low Word)				
0x100F	L3 AC frequency	Phase T grid frequency	U16	R	0.01Hz
0x1010	1st input voltage(DC)	PV1 input DC voltage	U16	R	0.1V
0x1011	1st input current(DC)	PV1 input DC current	U16	R	0.01A
0x1012	1st input power (High Word)	PV1 input DC watt	U32	R	0.1Watt
0x1013	1st input power (Low Word)				
0x1014	2nd input voltage(DC)	PV2 input DC voltage	U16	R	0.1V
0x1015	2nd input current(DC)	PV2 input DC current	U16	R	0.01A
0x1016	2nd input power (High Word)	PV2 input DC watt	U16	R	0.1Watt
0x1017	2nd input power (Low Word)				
0x1018	3rd input voltage(DC)	PV3 input DC voltage	U16	R	0.1V
0x1019	3rd input current(DC)	PV3 input DC current	U16	R	0.01A
0x101A	3rd input power (High Word)	PV3 input DC watt	U16	R	0.1Watt
0x101B	3rd input power (Low Word)				
0x101C	Inverter internal temperature	Maximum heat sink temperature	S16	R	1°C
0x101D	Operation mode	Note [1] i	U16	R	
0x101E	Error message 1	Note [2] ii	U16	R	
0x101F	Error message 2	Note [3] iii	U16	R	
0x1020	Warning code	Note [4]	U16	R	
0x1021	Energy Total (High Word)	Accumulated Energy	U32	R	kwh
0x1022	Energy Total (Low Word)				
0x1023	Hour Total (High Word)	Total operation hours	U32	R	Hour
0x1024	Hour Total (Low Word)				
0x1025	Energy Today (High Word)	Daily generating energy	U32	R	kwh
0x1026	Energy Today (Low Word)				
0x1027	Energy Today (High Word)	Daily generating energy	U32	R	wh
0x1028	Energy Today (Low Word)				
0x1029	Phase R grid voltage failure	Phase R grid voltage failure value	U16	R	0.1V
0x102A	Phase S grid voltage failure	Phase S grid voltage failure value	U16	R	0.1V
0x102B	Phase T grid voltage failure	Phase T grid voltage failure value	U16	R	0.1V
0x102C	Phase R grid frequency failure	Phase R grid frequency failure value	U16	R	0.01Hz
0x102D	Phase S grid frequency failure	Phase S grid frequency failure value	U16	R	0.01Hz
0x102E	Phase T grid frequency failure	Phase T grid frequency failure value	U16	R	0.01Hz
0x102F	PV1 voltage failure	PV1 voltage failure value	U16	R	0.1V
0x1030	PV2 voltage failure	PV2 voltage failure value	U16	R	0.1V
0x1031	PV3 voltage failure	PV3 voltage failure value	U16	R	0.1V

0x1032	Temperature failure	Temperature failure value	U16	R	0.1C
0x1033	GFCI failure	GFCI failure value	U16	R	1mA
0x1034	Isolation failure	Isolation failure value	U16	R	1KΩ
0x1035	Other failure	Others failure	U16	R	
0x1036	Load de-rating message	Load de-rating condition Note[5]	U16	R	
0x1037	Totally active power(High Word)	Totally of three phases active power	U32	R	0.1W
0x1038	Totally active power(Low Word)				
0x1039	Totally reactive power(High Word)	Totally of three phases reactive power	U32	R	0.1Var
0x103A	Totally reactive power(Low Word)				
0x103B	Daily peak power(High Word)	Daily peak power	U32	R	0.1W
0x103C	Daily peak power(Low Word)				
0x103D	Power factor	Totally of three phases power factor	S16	R	0.001
0x103E	4th input voltage(DC)	PV4 input DC voltage	U16	R	0.1V
0x103F	4th input current(DC)	PV4 input DC current	U16	R	0.01A
0x1040	4th input power (High Word)	PV4 input DC watt	U32	R	0.1W
0x1041	4th input power (Low Word)				
0x1042	Totally reactive energy(High Word)	Accumulated reactive energy	U32	R	kVARh
0x1043	Totally reactive energy(Low Word)				
0x1044 ~0x104F	Reserved	Reserve			
0x1050	String1 input voltage	String 1 input voltage	U16	R	0.1V
0x1051	String1 input current	String 1 input current	U16	R	0.01A
0x1052	String2 input voltage	String 2 input voltage	U16	R	0.1V
0x1053	String2 input current	String 2 input current	U16	R	0.01A
0x1054	String3 input voltage	String 3 input voltage	U16	R	0.1V
0x1055	String3 input current	String 3 input current	U16	R	0.01A
0x1056	String4 input voltage	String 4 input voltage	U16	R	0.1V
0x1057	String4 input current	String 4 input current	U16	R	0.01A
0x1058	String5 input voltage	String 5 input voltage	U16	R	0.1V
0x1059	String5 input current	String 5 input current	U16	R	0.01A
0x105A	String6 input voltage	String 6 input voltage	U16	R	0.1V
0x105B	String6 input current	String 6 input current	U16	R	0.01A
0x105C	String7 input voltage	String 7 input voltage	U16	R	0.1V
0x105D	String7 input current	String 7 input current	U16	R	0.01A
0x105E	String8 input voltage	String 8 input voltage	U16	R	0.1V
0x105F	String8 input current	String 8 input current	U16	R	0.01A
0x1060	String9 input voltage	String 9 input voltage	U16	R	0.1V
0x1061	String9 input current	String 9 input current	U16	R	0.01A
0x1062	String10 input voltage	String 10 input voltage	U16	R	0.1V
0x1063	String10 input current	String 10 input current	U16	R	0.01A
0x1064	String11 input voltage	String 11 input voltage	U16	R	0.1V
0x1065	String11 input current	String 11 input current	U16	R	0.01A
0x1066	String12 input voltage	String 12 input voltage	U16	R	0.1V
0x1067	String12 input current	String 12 input current	U16	R	0.01A
0x1068	String13 input voltage	String 13 input voltage	U16	R	0.1V
0x1069	String13 input current	String 13 input current	U16	R	0.01A
0x106A	String14 input voltage	String 14 input voltage	U16	R	0.1V
0x106B	String14 input current	String 14 input current	U16	R	0.01A
0x106C	String15 input voltage	String 15 input voltage	U16	R	0.1V
0x106D	String15 input current	String 15 input current	U16	R	0.01A
0x106E	String16 input voltage	String 16 input voltage	U16	R	0.1V
0x106F	String16 input current	String 16 input current	U16	R	0.01A
0x1070	String17 input voltage	String 17 input voltage	U16	R	0.1V
0x1071	String17 input current	String 17 input current	U16	R	0.01A
0x1072	String18 input voltage	String 18 input voltage	U16	R	0.1V
0x1073	String18 input current	String 18 input current	U16	R	0.01A

0x1074	String19 input voltage	String 19 input voltage	U16	R	0.1V
0x1075	String19 input current	String 19 input current	U16	R	0.01A
0x1076	String20 input voltage	String 20 input voltage	U16	R	0.1V
0x1077	String20 input current	String 20 input current	U16	R	0.01A
Reserved					
0x1400	Channel 1 current	Channel 1 current	U16	R	mA
0x1401	Channel 2 current	Channel 2 current	U16	R	mA
0x1402	Channel 3 current	Channel 3 current	U16	R	mA
0x1403	Channel 4 current	Channel 4 current	U16	R	mA
0x1404	Channel 5 current	Channel 5 current	U16	R	mA
0x1405	Channel 6 current	Channel 6 current	U16	R	mA
0x1406	Channel 7 current	Channel 7 current	U16	R	mA
0x1407	Channel 8 current	Channel 8 current	U16	R	mA
0x1408	Channel 9 current	Channel 9 current	U16	R	mA
0x1409	Channel 10 current	Channel 10 current	U16	R	mA
0x140A	Channel 11 current	Channel 11 current	U16	R	mA
0x140B	Channel 12 current	Channel 12 current	U16	R	mA
0x140C	Channel 13 current	Channel 13 current	U16	R	mA
0x140D	Channel 14 current	Channel 14 current	U16	R	mA
0x140E	Channel 15 current	Channel 15 current	U16	R	mA
0x140F	Channel 16 current	Channel 16 current	U16	R	mA
0x1410	Reserved	Reserve		R	
0x1411	Reserved	Reserve		R	
0x1412	Reserved	Reserve		R	
0x1413	Reserved	Reserve		R	
0x1414	Reserved	Reserve		R	
0x1415	Reserved	Reserve		R	
0x1416	Reserved	Reserve		R	
0x1417	Reserved	Reserve		R	
0x1418	Reserved	Reserve		R	
0x1419	Reserved	Reserve		R	
0x141A	Reserved	Reserve		R	
0x141B	Reserved	Reserve		R	
0x141C	Reserved	Reserve		R	
0x141D	Reserved	Reserve		R	
0x141E	Reserved	Reserve		R	
0x141F	Reserved	Reserve		R	
0x1420	Reserved	Reserve		R	
0x1421	Reserved	Reserve		R	
0x1422	Reserved	Reserve		R	
0x1423	Reserved	Reserve		R	
0x1424	Reserved	Reserve		R	
0x1425	Reserved	Reserve		R	
0x1426	Reserved	Reserve		R	
0x1427	Reserved	Reserve		R	
0x1428	Reserved	Reserve		R	
0x1429	Reserved	Reserve		R	
0x142A	Reserved	Reserve		R	
0x142B	Reserved	Reserve		R	
0x142C	Reserved	Reserve		R	
0x142D	Reserved	Reserve		R	
0x142E	Reserved	Reserve		R	
0x142F	Reserved	Reserve		R	
0x1430	Reserved	Reserve		R	
0x1431	Reserved	Reserve		R	
0x1432	Reserved	Reserve		R	

0x1433	Reserved	Reserve		R	
0x1434	Reserved	Reserve		R	
Reserved					
Basic PVI information					
0x1A00 ~0x1A07	Model name	ASCII code, ex. “PV4000”	ASCII	R	
0x1A08 ~0x1A0F	Reserved			R	
0x1A10 ~0x1A17	Serial No.	ASCII code, ex. “11100011”	ASCII	R	
0x1A18	Modbus Protocol Type	Major Version : High Byte Minor Version : Low Byte Example : 0x0101 : Means Version V01.01 517 : Means Version V02.05 (517 / 256 = 2, 517 % 256 = 5)	U16	R	
0x1A19 ~0x1A1B	External firmware version	ASCII code, ex. “TA0101”	ASCII	R	
0x1A1C ~0x1A1E	Master firmware version	ASCII code, ex. “DE0100”	ASCII	R	
0x1A1F ~0x1A22	Master firmware part number	ASCII code, ex. “123456-0”	ASCII	R	
0x1A23 ~0x1A25	Master firmware build date	ASCII code, ex. “209080”	ASCII	R	
0x1A26 ~0x1A28	Slave firmware version	ASCII code, ex. “DE0200”	ASCII	R	
0x1A29 ~0x1A2C	Slave firmware part number	ASCII code, ex. “123456-0”	ASCII	R	
0x1A2D ~0x1A2F	Slave firmware build date	ASCII code, ex. “209080”	ASCII	R	
0x1A30	Max. PV open voltage	Maximum PV open voltage	U16	R	0.1V
0x1A31	Nominal DC voltage	Nominal PV DC voltage	U16	R	0.1V
0x1A32	System start-up voltage	System start-up PV voltage	U16	R	0.1V
0x1A33	Control power shutdown voltage	System shutdown PV voltage	U16	R	0.1V
0x1A34	Initial feeding voltage	Initial feeding PV voltage	U16	R	0.1V
0x1A35	Max. feeding limit voltage	Maximum feeding PV limit voltage	U16	R	0.1V
0x1A36	Min. working voltage range	Minimum working PV voltage range	U16	R	0.1V
0x1A37	Max. working voltage range	Maximum working PV voltage range	U16	R	0.1V
0x1A38	Min. MPPT voltage range (full rating range)	Minimum MPPT PV voltage range	U16	R	0.1V
0x1A39	Max. MPPT voltage range (full rating range)	Maximum MPPT PV voltage range	U16	R	0.1V
0x1A3A	MPPT efficiency	MPPT efficiency	U16	R	0.001%
0x1A3B	Number of MPP tracker(s)	Number of MPP tracker(s)	U16	R	
0x1A3C	Min. DC insulation resistance	Minimum DC insulation resistance	U16	R	1kOhm
0x1A3D	Total max. DC power limit	Total maximum DC power limit	U16	R	1W
0x1A3E	Tracker 1 DC current limit	Maximum DC current of tracker 1	U16	R	0.01A
0x1A3F	Tracker 2 DC current limit	Maximum DC current of tracker 2	U16	R	0.01A
0x1A40	Tracker 3 DC current limit	Maximum DC current of tracker 3	U16	R	0.01A
0x1A41	Tracker 1 power limit	The power limit of tracker 1	U16	R	1W
0x1A42	Tracker 2 power limit	The power limit of tracker 2	U16	R	1W
0x1A43	Tracker 3 power limit	The power limit of tracker 3	U16	R	1W
0x1A44	Nominal voltage	Nominal voltage	U16	R	0.1V
0x1A45	Nominal frequency	Nominal frequency	U16	R	0.01Hz
0x1A46	Nominal AC active power	Nominal AC active power	U16	R	1W
0x1A47	Nominal AC apparent power	Nominal AC apparent power	U16	R	1VA
0x1A48	AC wiring system	AC wiring system(1 : single phase 2 :Split	U16	R	

		phase 3 : three phases)			
0x1A49	Nominal AC current	Nominal AC current	U16	R	0.01A
0x1A4A	Max. AC current	Maximum AC current	U16	R	0.01A
0x1A4B	Min. power factor	Minimum power factor	U16	R	0.001%
0x1A4C	Max. conversion efficiency	Maximum conversion efficiency	U16	R	0.001%
0x1A4D	European efficiency	European efficiency	U16	R	0.001%
0x1A4E	Reserved	Reserve		R	
0x1A4F	Reserved	Reserve		R	
0x1A50	Reserved	Reserve		R	
0x1A51	Reserved	Reserve		R	
0x1A52	Reserved	Reserve		R	
0x1A53	Reserved	Reserve		R	
0x1A54	Reserved	Reserve		R	
0x1A55	Reserved	Reserve		R	
0x1A56	Reserved	Reserve		R	
0x1A57	Reserved	Reserve		R	
0x1A58 ~0x1A5F	Reserved	Reserve		R	
0x1A60 ~0x1A62	Logger firmware version	ASCII code, ex. “TA0000”	ASCII	R	
0x1A63 ~0x1A66	Logger firmware part number	ASCII code, ex. “123456-0”	ASCII	R	
0x1A67 ~0x1A6D	Logger firmware build date	ASCII code, ex. “20131105100530” (YYYYMMDDhhmmss)	ASCII	R	
0x1A6E	Logger database version	ASCII code, ex. “02”	ASCII	R	
Reserved					
Brand information					
0x1B00 ~0x1B0F	Brand name	Fixed marker for identification	ASCII	R	
	Ex: PrimeVOLT	0x50,0x72,0x69,0x6d,0x65,0x56,0x4f,0x4c,0x54 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00			
Reserved					
Power limit parameter					
0x3000	Logger RTC time 1	Year / Year	U16	R/W	
0x3001	Logger RTC time 2	Month / Day	U16	R/W	
0x3002	Logger RTC time 3	Hour / Minute	U16	R/W	
0x3003	Logger RTC time 4	sec / none	U16	R/W	
0x3004	Limit Power Mode	0x00 : none 0x01 : Modbus control 0x02 : 70% Panel limit 0x03 : RCR (Ripple Control Receiver)	U16	R/W	
0x3005	Power de-rating percent by Modbus	Power de-rating percent	U16	R/W	%
0x3006	Total panel power	Ex. Total panel power = 5000W Limit panel power input = 3500W	U16	R/W	
0x3007	RCR signal time	Read signals interval time	U16	R/W	s
0x3008	RCR fallback flag	0x00 : Disable 0x01 : Enable	U16	R/W	
0x3009	RCR fallback time	Interval time when no signal enters fallback	U16	R/W	
0x300A	RCR fallback power	Fallback’s power	U16	R/W	W
0x300B	RCR enable flag bit	Ripple control receiver enable bit Ex. 0x0000(RCR0) ~ 0x4000(RCR15)	U16	R/W	
0x300C	RCR0 power setting	Ripple control receiver power setting 0	U16	R/W	%
0x300D	RCR1 power setting	Ripple control receiver power setting 1	U16	R/W	%
0x300E	RCR2 power setting	Ripple control receiver power setting 2	U16	R/W	%
0x300F	RCR3 power setting	Ripple control receiver power setting 3	U16	R/W	%
0x3010	RCR4 power setting	Ripple control receiver power setting 4	U16	R/W	%
0x3011	RCR5 power setting	Ripple control receiver power setting 5	U16	R/W	%
0x3012	RCR6 power setting	Ripple control receiver power setting 6	U16	R/W	%

0x3013	RCR7 power setting	Ripple control receiver power setting 7	U16	R/W	%
0x3014	RCR8 power setting	Ripple control receiver power setting 8	U16	R/W	%
0x3015	RCR9 power setting	Ripple control receiver power setting 9	U16	R/W	%
0x3016	RCR10 power setting	Ripple control receiver power setting 10	U16	R/W	%
0x3017	RCR11 power setting	Ripple control receiver power setting 11	U16	R/W	%
0x3018	RCR12 power setting	Ripple control receiver power setting 12	U16	R/W	%
0x3019	RCR13 power setting	Ripple control receiver power setting 13	U16	R/W	%
0x301A	RCR14 power setting	Ripple control receiver power setting 14	U16	R/W	%
0x301B	RCR15 power setting	Ripple control receiver power setting 15	U16	R/W	%
Reserved					
Regulation Parameter					
0x5000	First start delay time	First time connect with grid delay time	U16	R/W	s
0x5001	Reconnect delay time	Reconnect with grid delay time	U16	R/W	s
0x5002	Grid frequency high level 1 limit	Maximum frequency operation level 1 range	U16	R/W	0.01Hz
0x5003	Grid frequency low level 1 limit	Minimum frequency operation level 1 range	U16	R/W	0.01Hz
0x5004	Grid voltage high level 1 limit	Maximum voltage operation level 1 range	U16	R/W	0.1V
0x5005	Grid voltage low level 1 limit	Minimum voltage operation level 1 range	U16	R/W	0.1V
0x5006	Grid Frequency High Level 1 trip time	Maximum frequency operation level 1 trip time	U16	R/W	ms
0x5007	Grid Frequency Low Level 1 trip time	Minimum frequency operation level 1 trip time	U16	R/W	ms
0x5008	Grid Voltage High Level 1 trip time	Maximum voltage operation level 1trip time	U16	R/W	ms
0x5009	Grid Voltage Low Level 1 trip time	Minimum voltage operation level 1 trip time	U16	R/W	ms
0x500A	Grid Frequency High Level 2 Limit	Maximum frequency operation level 2 range	U16	R/W	0.01Hz
0x500B	Grid Frequency Low Level 2 Limit	Minimum frequency operation level 2 range	U16	R/W	0.01Hz
0x500C	Grid Voltage High Level 2 Limit	Maximum voltage operation level 2 range	U16	R/W	0.1V
0x500D	Grid Voltage Low Level 2 Limit	Minimum voltage operation level 2 range	U16	R/W	0.1V
0x500E	Grid Frequency High Level 2 trip time	Maximum frequency operation level 2 trip time	U16	R/W	ms
0x500F	Grid Frequency Low Level 2 trip time	Minimum frequency operation level 2 trip time	U16	R/W	ms
0x5010	Grid Voltage High Level 2 trip time	Maximum voltage operation level 2 trip time	U16	R/W	ms
0x5011	Grid Voltage Low Level 2 trip time	Minimum voltage operation level 2 trip time	U16	R/W	ms
0x5012	Grid Frequency High Level 1 back	Maximum grid frequency back to normal point	U16	R/W	0.01Hz
0x5013	Grid Frequency Low Level 1 back	Minimum grid frequency back to normal point	U16	R/W	0.01Hz
0x5014	De-rating Grid Frequency High back	Maximum grid frequency back to de-rating stop point	U16	R/W	0.01Hz
0x5015	De-rating Grid Frequency Low back	Minimum grid frequency back to de-rating stop point	U16	R/W	0.01Hz
0x5016	Frequency Level 1 Function	Frequency loss level 1 function enable/disable	U16	R/W	
0x5017	Frequency De-rating Function	Frequency de-rating function enable/disable	U16	R/W	
0x5018	Grid Voltage High Moving Average Limit	Maximum operational grid voltage of 10 minutes moving average	U16	R/W	0.1V
0x5019	Soft output power percent	Soft output power percentage each minute	U16	R/W	%
0x501A	Power reduction base on frequency	Power reduction percentage base on frequency	U16	R/W	0.1%
0x501B	Insulation resistance active value	Insulation resistance active value	U16	R/W	1KΩ
0x501C	DC current offset active value	DC current offset active value	U16	R/W	mA
0x501D	DC current offset active time	DC current offset active time	U16	R/W	ms
0x501E	Grid over voltage de-rating point	Grid over voltage de-rating point setting	U16	R/W	0.1V
Reserved					
0x5030	Output reactive power mode	Output reactive power mode	U16	R/W	
		Function index / Relation with register address			

		0x0000 : Pure active power				
		0x0001 : cosϕ = const.	[0x5031]			
		0x0002 : Q = const.	[0x5032]			
		0x0003 : cosϕ(P)	[0x5034~0x503B], [0x5045,0x5046 CEI-021 only]			
		0x0004 : Q(U)	[0x503C~0x5044] , [0x5047,0x5048 CEI-021 & PEA only]			
		0x0005 : AUTO P(U)				
		0x0006 : Watt(U) AS4777, Pure active power	[0x5049~0x5050]			
		0x0007 : Q(U) AS4777	[0x5051~0x5058]			
		0x0008 : Q = const. (P priority)	[0x5114]			
0x5031	Output power factor (P.F.)	Output power factor (+) Positive : over-excited (lag, inductive) (-) Negative : under-excited (lead, capacitive)		S16	R/W	0.001pf
0x5032	Q	Output reactive power (+) Positive : over-excited (lag, inductive) (-) Negative : under-excited (lead, capacitive)		S16	R/W	1VAR
0x5033	Q(U) control response time	Q(U) control response time		U16	R/W	s
0x5034	Cosϕ (P) curve node1 percent	Cos(P) curve node1 percentage setting (P/Pn)		U16	R/W	%
0x5035	Cosϕ (P) curve node2 percent	Cos(P) curve node2 percentage setting (P/Pn)		U16	R/W	%
0x5036	Cosϕ (P) curve node3 percent	Cos(P) curve node3 percentage setting (P/Pn)		U16	R/W	%
0x5037	Cosϕ (P) curve node4 percent	Cos(P) curve node4 percentage setting (P/Pn)		U16	R/W	%
0x5038	Cosϕ (P) curve node1 value	Cos(P) curve node1 value setting (cosϕ = Pf)		S16	R/W	0.001pf
0x5039	Cosϕ (P) curve node2 value	Cos(P) curve node2 value setting (cosϕ = Pf)		S16	R/W	0.001pf
0x503A	Cosϕ (P) curve node3 value	Cos(P) curve node3 value setting (cosϕ = Pf)		S16	R/W	0.001pf
0x503B	Cosϕ (P) curve node4 value	Cos(P) curve node4 value setting (cosϕ = Pf)		S16	R/W	0.001pf
0x503C	Q(U) curve node1 percent	Q(U) curve node1 percentage setting (U/Un)		U16	R/W	%
0x503D	Q(U) curve node2 percent	Q(U) curve node2 percentage setting (U/Un)		U16	R/W	%
0x503E	Q(U) curve node3 percent	Q(U) curve node3 percentage setting (U/Un)		U16	R/W	%
0x503F	Q(U) curve node4 percent	Q(U) curve node4 percentage setting (U/Un)		U16	R/W	%
0x5040	Q(U) curve node1 value	Q(U) curve node1 value setting (Q/S)		U16	R/W	0.1%
0x5041	Q(U) curve node2 value	Q(U) curve node2 value setting (Q/S)		U16	R/W	0.1%
0x5042	Q(U) curve node3 value	Q(U) curve node3 value setting (Q/S)		U16	R/W	0.1%
0x5043	Q(U) curve node4 value	Q(U) curve node4 value setting (Q/S)		U16	R/W	0.1%
0x5044	Q(U) curve Type	Q(U) curve type setting, 0 : type A, 1 : type B		U16	R/W	
0x5045	Cosϕ(P) curve Lock-In	Cos(P) curve lock-in voltage setting		U16	R/W	0.1V
0x5046	Cosϕ(P) curve Lock-Out	Cos(P) curve lock-out voltage setting		U16	R/W	0.1V
0x5047	Q(U) curve Lock-In	Q(U) curve lock-in power percentage setting		U16	R/W	%
0x5048	Q(U) curve Lock-Out	Q(U) curve lock-out power percentage setting		U16	R/W	%
0x5049	Volt-Watt node1 voltage	Volt-Watt node1 voltage setting		U16	R/W	0.1V
0x504A	Volt-Watt node2 voltage	Volt-Watt node2 voltage setting		U16	R/W	0.1V
0x504B	Volt-Watt node3 voltage	Volt-Watt node3 voltage setting		U16	R/W	0.1V
0x504C	Volt-Watt node4 voltage	Volt-Watt node4 voltage setting		U16	R/W	0.1V
0x504D	Volt-Watt node1 power percent	Volt-Watt node1 power percent setting		U16	R/W	%
0x504E	Volt-Watt node2 power percent	Volt-Watt node2 power percent setting		U16	R/W	%
0x504F	Volt-Watt node3 power percent	Volt-Watt node3 power percent setting		U16	R/W	%
0x5050	Volt-Watt node4 power percent	Volt-Watt node4 power percent setting		U16	R/W	%
0x5051	Volt-Var node1 voltage	Volt-Var node1 voltage setting		U16	R/W	0.1V
0x5052	Volt-Var node2 voltage	Volt-Var node2 voltage setting		U16	R/W	0.1V
0x5053	Volt-Var node3 voltage	Volt-Var node3 voltage setting		U16	R/W	0.1V

0x5054	Volt-Var node4 voltage	Volt-Var node4 voltage setting	U16	R/W	0.1V
0x5055	Volt-Var node1 Var percent	Volt-Var node1 reactive power percent setting	U16	R/W	0.1%
0x5056	Volt-Var node2 Var percent	Volt-Var node2 reactive power percent setting	U16	R/W	0.1%
0x5057	Volt-Var node3 Var percent	Volt-Var node3 reactive power percent setting	U16	R/W	0.1%
0x5058	Volt-Var node4 Var percent	Volt-Var node4 reactive power percent setting	U16	R/W	0.1%
Reserved					
Customization parameter					
0x5100	Reserve	Reserve		R/W	
0x5101	Regulation code	0x0001 : AU (澳洲 AS/NZS 4777.2/.3) 0x0002 : DE (德國 VDE 0126-1-1/A1) 0x0003 : TW (台灣 TW GRID) 0x0004 : DE (德國 VDE-AR-N 4105:2011) 0x0005 : JP (日本 JETGR0002-1-2.0) 0x0006 : IT (義大利 CEI 0-21) 0x0007 : SE (瑞典 Sweden Grid) 0x0008 : UK (英國 G83) 0x0009 : UL (美國 UL) 0x000A : TH(泰國 PEA) 0x000B : SE (瑞典 SWEDEN GRID) 2007 0x000C : NL (荷蘭 Netherlands Grid) 0x000D : TH (泰國 MEA) 0x000E : CN (中國 NB/T 32004) 0x000F : IN (印度 IEC61727) 0x0010 : AU (澳洲 AS/NZS 4777.2:2015) 0x0011 : NZ (澳洲 AS/NZS 4777.2:2015) 0x0012 : MX (墨西哥 IEEE1547) 0x0013 : UA (烏克蘭 VDE-AR-N 4105.) 0x0014 : TW (台灣 CNS 15382:2017) 0x0015 : DE (德國 VDE0126-1-1/08.13) 0x0016 : BR (巴西 ABNT NBR16149 2013) 0x0017 : CS (捷克 Czech EN 50160) 0x0018 : UK (英國 G59) 0x0019 : PT (葡萄牙 Portugal EN50438) 0x001A : ES (西班牙 Spain RD1699/RD413) 0x001B : ES (西班牙 Spain RD661/RD413/PO12.3) 0x001C : IT (義大利 CEI 0-21 ACEA) 0x001D : DE (德國 VDE-AR-N 4105:2018) 0x001E : BR (巴西 IEC61727) 0x001F : EU(歐洲 EN50549_1_2019)	U16	R/W	
0x5102	Single Tracker Detect Function	Single Tracker Detect enable/disable 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x5103	Reserve	Reserve		R/W	
0x5104	De-rating Watt Percent	De-rating watt percentage	U16	R/W	%

0x5105	Reserve	Reserve	U16	R/W	
0x5106	Mppt Shadow Manage	Mppt shadow manage 0x0000 : Disable 0x0001 : shadow manage	U16	R/W	
0x5107	Mppt Shadow Manage Interval Time	Mppt shadow manage interval time	U16	R/W	
0x5108	Reserve	Reserve		R/W	
0x5109	Reserve	Reserve		R/W	
0x510A	Reserve	Reserve		R/W	
0x510B	Reserve	Reserve		R/W	
0x510C	Reserve	Reserve		R/W	
0x510D	Reserve	Reserve		R/W	
0x510E	Islanding Check Function	Islanding check function enable/disable 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x510F	Reserve	Reserve		R/W	
0x5110	Reserve	Reserve		R/W	
0x5111	Reserve	Reserve		R/W	
0x5112	Reserve	Reserve		R/W	
0x5113	Reserve	Reserve		R/W	
0x5114	Reactive Power Percent	Reactive Power Percent (+) Positive : over-excited (lag, inductive) (-) Negative : under-excited (lead, capacitive)	S16	R/W	%
0x5115	Reserve	Reserve		R/W	
0x5116	Reserve	Reserve		R/W	
0x5117	Insulation Resistor Detect Function	Insulation detect function enable/disable 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x5118	Ground Current Detect Function	Ground current detect function enable/disable 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x5119	Reserve	Reserve		R/W	
0x511A	DC Current Offset Detect Function	DC current offset detect function enable/disable 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x511B	Inverter Repeat Control Function	Inverter repeat control function enable/disable 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x511C	Fan Control Function	Fan control function 0x0000 : Internal fan always on + External fan by temperature 0x0001 : Internal fan by temperature + External fan by temperature 0x0002 : Internal fan always on + External fan always on 0x0003 : Internal fan by temperature + External fan always on	U16	R/W	
0x511D	Grid high voltage load de-rating function	0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x511E	Grid voltage type	0x0000: L-N voltage 0x0001: L-L voltage	U16	R/W	
0x511F	PV Feed-in voltage	PV Feed-in voltage	U16	R/W	
0x5120	1 MPP input change to 2 MPP input	0x0000: Disable 0x0001: Enable	U16	R/W	
0x5121	Reactive Power Percent	(+) Positive : over-excited (lag, inductive)	S16	R/W	

		(-) Negative : under-excited (lead, capacitive)			
0x5122	Manual MPPT mode	Manual MPPT mode function 0x0000: Disable 0x0001: Enable Relation with [0x5123]	U16	R/W	
0x5123	Manual MPPT mode PV fixed reference voltage value	Manual MPPT mode PV fixed reference voltage value, relation with [0x5122]	U16	R/W	
0x5124	Night reactive power function	Night reactive power function 0x0000 : Disable 0x0001 : Enable Relation with [0x5114], [0x5125], [0x5126], [0x5127]	U16	R/W	
0x5125	Night reactive power function start time	High Byte : Hour Low Byte : Minute Example : 1. Start time is 18:00, the value is 0x1200 2. Start time is 20:30, the value is 0x141E If the time reach the setting value, start the night reactive power function Relation with [0x5124]	U16	R/W	
0x5126	Night reactive power function end time	High Byte : Hour Low Byte : Minute Example : 1. End time is 23:30, the value is 0x171E 2. End time is 06:00, the value is 0x0600 If the time reach the setting value, stop the night reactive power function Relation with [0x5124]	U16	R/W	
0x5127	Night reactive power function end cause of the input power	If totally tracker power greater than this setting value, stop the night reactive power function Relation with [0x5124]	U16	R/W	W
0x5128	VPC automatic regulate power factor and derating function	VPC automatic regulation function 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x5129	Remote off when power gradient decrease to 0%	Off grid when power gradient decrease to 0% 0x0000 : Disable 0x0001 : Enable	U16	R/W	
0x512A	Active/Reactive control behavior when modbus communication loss	Active/Reactive control reference the different parameter when modbus communication loss 0x0000 : Continues to operate with the last received values (P: 0x3005; Q: 0x6010; PF: 0x600F) 0x0001 : Operate the pre-defined values from EEPROM (P: 0x30BB; Q_Mode: 0x5030; Q: 0x5121；PF:0x5131)	U16	R/W	
Reserved					
Control(Execute) command					
0x6000	Fan On	0x0000 : Fan off control 0x0001 : Fan on control	U16	R/W	
0x6001	Inverter Off	0x0000 : Inverter remote off control non-active 0x0001 : Inverter remote off control active	U16	R/W	
0x6002	Reserve	Reserve		R/W	
0x6003	Reserve	Reserve		R/W	

0x6004	Maximum power percent	Maximum output power percentage	U16	R/W	
0x6005	EEPROM saving	0x0000 : EEPROM saving non-active 0x0001 : EEPROM saving active	U16	R/W	
0x6006	EEPROM restore factory setting	0x0000 : EEPROM setting NOT to factory setting 0x0001 : EEPROM setting to factory setting	U16	R/W	
0x6007	Islanding check function	0x0000 : Islanding check disable 0x0001 : Islanding check enable	U16	R/W	
0x6008	Reset WIFI	0x0000 : Wi-Fi reset non-active 0x0001 : Wi-Fi reset active	U16	R/W	
0x6009	Clear the EEPROM history energy record	0x0000 : NOT clear the EEPROM history energy record 0x0001 : Clear the EEPROM history energy record	U16	R/W	
0x600A	Default Power Watt and Load Current Calibration factor	0x0000 : Non-active 0x0001 : Default power watt and load current calibration factor	U16	R/W	
0x600B	PVI in B/I mode	0x0000 : Non-active 0x0001 : Into B/I mode	U16	R/W	
0x600C	Grid voltage and frequency automatic test	0x0000 : Non-active 0x0001 : Active	U16	R/W	
0x600D	I-V curve scan	Write : 0x0000 : Non-active 0x0001 : Active Read : 0x0000 : Idle or had been read 0x0001 : Running 0x0002 : Finished	U16	R/W	
Reserved					
I-V Curve voltage and current data					
0x8000~ 0x803F	Tracker 1 voltage	Tracker 1 voltage	U16	R	0.1V
0x8040~ 0x807F	String 1-1 current	String 1-1 current	U16	R	0.01A
0x8080~ 0x80BF	String 1-2 current	String 1-2 current	U16	R	0.01A
0x80C0~ 0x80FF	String 1-3 current	String 1-3 current	U16	R	0.01A
0x8100~ 0x813F	String 1-4 current	String 1-4 current	U16	R	0.01A
0x8140~ 0x817F	Tracker 2 voltage	Tracker 2 voltage	U16	R	0.1V
0x8180~ 0x81BF	String 2-1 current	String 2-1 current	U16	R	0.01A
0x81C0~ 0x81FF	String 2-2 current	String 2-2 current	U16	R	0.01A
0x8200~ 0x823F	String 2-3 current	String 2-3 current	U16	R	0.01A
0x8240~ 0x827F	String 2-4 current	String 2-4 current	U16	R	0.01A
0x8280~ 0x82BF	Tracker 3 voltage	Tracker 3 voltage	U16	R	0.1V
0x82C0~ 0x82FF	String 3-1 current	String 3-1 current	U16	R	0.01A
0x8300~ 0x833F	String 3-2 current	String 3-2 current	U16	R	0.01A
0x8340~	String 3-3 current	String 3-3 current	U16	R	0.01A

0x837F					
0x8380~ 0x83BF	String 3-4 current	String 3-4 current	U16	R	0.01A
0x83C0~ 0x83FF	Tracker 4 voltage	Tracker 4 voltage	U16	R	0.1V
0x8400~ 0x843F	String 4-1 current	String 4-1 current	U16	R	0.01A
0x8440~ 0x847F	String 4-2 current	String 4-2 current	U16	R	0.01A
0x8480~ 0x84BF	String 4-3 current	String 4-3 current	U16	R	0.01A
0x84C0~ 0x84FF	String 4-4 current	String 4-4 current	U16	R	0.01A

✓ Note [1]: Operation mode

Data	Description
0x00	Initial Mode(Power on Mode)
0x01	Wait Mode(Standby Mode)
0x02	Check Mode
0x03	Work Mode(Line Mode)
0x05	Fault Mode
0x07	Master flash Mode
0x08	Slave flash Mode

✓ Note [2]: Error message 1.

Each bit represents a fault condition.

Bit	Description
0	DC current injection is too high
1	Output relay test failed
2	Output DC sensor failed
3	Internal temperature is higher than 90°C
4	GFCI detector failed
5	DC input is shorted by controller for self-protection
6	AFD (Active Frequency Shifting) test failure
7	Fan fails
8	Bus under voltage
9	Bus over voltage
10	Internal communication loss
11	Master expect slave firmware version not correct
12	EEPROM fail
13	Consistent warning
14	Inverter over current
15	Bus soft start time out

✓ Note [3]: Error message 2.

Each bit represents a fault condition.

Bit	Description
0	AC voltage high
1	AC voltage low
2	AC absent
3	AC frequency high
4	AC frequency low
5	DC voltage high
6	PV insulation low
7	Ground current high
8	Reserved
9	Control power Vcc(+12V or +15V) too low (CPU comparator active)
10	SPD signal failure detect
11	Reserved
12	Reserved
13	Reserved
14	Arc fault detection

15	Reserved

✓ Note [4]: Error message 3.

Each bit represents a fault or warning condition.

Bit	Description
0	Reserved
1	Logger/E-Display EEPROM fail
2	Arc fault detection
3	Single tracker detect warning
4	Inverter output power too low warning
5~15	Reserved

✓ Note [5]:Load de-rating message

Every bit means one load de-rating condition

Bit	Description
0	Load de-rating based on NTC high temperature
1	Load de-rating based on PV input voltage
2	Load de-rating based on fan lock
3	Load de-rating based on soft start
4	Load de-rating based on grid high frequency
5	Load de-rating based on grid low voltage
6	Load de-rating based on P command
7	Load de-rating based on Q command
8	Load de-rating based on maximum output current
9	Load de-rating based on burn in mode
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved