NEW MPPT communication protocol V1.0

Hardware interface: RS485

Communication: Master-slave asynchronous multi-machine communication, Computer is the master device, MPPT is slave device, The maximum number of MPPT connections on the bus is 16 pcs.

Communication data format：

1、 In bytes, 10 bits per byte, includes 1 start bit、8 data bits (lower position first)、1 stop bit (ie 8, n, 1); Communication baud rate 1200bps，2400bps,4800bps,9600bps，it can be set by MPPT.

2、Each frame of data must be transmitted continuously, at least 3.5 characters before and after a frame of data, no more than 1.5 characters between data. In the program, the interval of 1.5 characters is judged as the basis for whether or not the data reception of one frame should be completed.

3、Data validation is performed using ADD8 CheckSum, the sum of all bytes is calculated, and the low byte data is used as the checksum. The data participating in the check is the entire content of one frame of data. (does not include the check value itself), the check value is placed in the last 1 byte of a frame of data.

4、Using a simplified protocol, the communication uses one transmission to exchange data, fixing the length of each frame of data. The format is: address + command + data + accumulate and check (take low byte).

5、The Master device queries the MPPT communication interval to be greater than or equal to 1 second.

A. Master device query MPPT command：0xA1

1、Command format sent by master device to MPPT (total 8 bytes) :

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	address	0x01~0XF0	MPPT address	Can be set in MPPT
1	Command type	0xA1	Query command	
2	Control code	0x01	Data	
3	Data 1	-	Meaningless，fill in 0	
4	Data 2	-	Meaningless，fill in 0	
5	Data 3	-	Meaningless，fill in 0	
6	Data 4	-	Meaningless，fill in 0	
7	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte6	CheckSum

2、MPPT feedback data format (total 93 bytes)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	address	0x01~0xF0	MPPT address	
1	Command type	0xA1	Query command	
2	Control code	0x01	Data	
3	Operating	0x00~0xF	Bit0：Operating	0=Normal；1= abnormal（Battery automatic

	status	F	status	recognition error）
			Bit1：Battery status	0=Normal；1= Over discharge protection
			Bit2：Fan status	0=Normal；1= Fan failure
			Bit3：Temperature status	0=Normal；1= Over temperature protection
			Bit4：DC output status	0=Normal；1=DC Output short/ Over current protection
			Bit5：Internal temperature 1 status	0=Normal；1= Fault
			Bit6：Internal temperature 2 status	0= Normal；1= Fault
			Bit7：External temperature 1 status	0= Normal；1= Fault
4	Charging status	0x00~0xFF	Bit 0：charging status	0= stop charging；1=charging
			Bit 1：Equal charge	1 effective
			Bit 2：track	1 effective
			Bit 3：Floating charge	1 effective
			Bit 4：Charging current limit	1 effective
			Bit 5：Charging derating	1 effective
			Bit 6：Remote control prohibits charging	1 effective
			Bit 7：PV overvoltage	1 effective
5	Control status	0x00~0x07	Bit0：Charging output relay	0=close；1= open
			Bit1：Load output	0=close；1=open
			Bit2：fan	0=close；1=open
			Bit3：spare	
			Bit4：Overcharge protection mark	0=Normal，1=Overcharge protection
			Bit5：Overvoltage protection mark	0=Normal，1=Overvoltage protection
			Bit6：spare	
			Bit7：spare	
6	Spare	-	--	Invariablenes 0
7	Spare	-	--	Invariablenes 0
8	Type of battery	0x01~0x03		0、Lead-acid maintenance free；1、Lead-acid Gel battery ；2、Lead-acid liquid；3、Lithium

				battery
9	Identification method	0x01~0x02		0、auto recognition；1、Manual setting
10	Number of batteries	0x01~0x08		1~8pcs battery
11	Load control method	0x01~0x03		0、shut down；1、automatic（Output when there is electricity）; 2、Time control on/off，3、Light control，4、remote control
12	Local address	0x01~0xF0	Remote communication local address	
13	Baud rate	0x01~0x04	Telecommunication communication rate	1、1200；2、2400；3、4800；4、9600
14	Spare	--	--	Don't care
15	Spare	--	--	Don't care
16	Rated voltage rating		High byte	Take 2 decimal places， 12.00V,24.00V,36.00V,48.00V,60.00V,72.00V 96V
17			Low byte	
18	Equal charge voltage Upper limit		High byte	Take 2 decimal places
19			Low byte	
20	Floating charge voltage upper limit		High byte	Take 2 decimal places
21			Low byte	
22	discharge voltage Lower limit		High byte	Take 2 decimal places
23			Low byte	
24	Hardware maximum charge current limit		High byte	User unchangeable parameters, take 2 decimal places
25			Low byte	
26	Maximum charge current limit		High byte	Take 2 decimal places,Set The setting value must be no greater than Hardware maximum charge current limit
27			Low byte	
28	Running charging current limit		High byte	User unchangeable parameters，Take 2 decimal places
29			Low byte	
30	PV voltage		High byte	Take 1 decimal place, such as： 0x0C43=1219，means PV voltage is 121.9V
31			Low byte	
32	Battery voltage		High byte	Take 2 decimal place, such as： 0x14FC=5372，means battery voltage is 53.72V
33			Low byte	
34	Charge current		High byte	Take 2 decimal place, such as: 0x11E2=4578, means Charge current is 45.78A
35			Low byte	

36	Internal temperature1		High byte	Take 1decimal place, such as: 0x022C=556，means temperature is 55.6℃
37			Low byte	
38	Internal temperature2		High byte	Canceled
39			Low byte	
40	External temperature1		High byte	Format is same with internal temperature1
41			Low byte	
42	Spare	--		Don't care
43	Spare	--	--	Don't care
44	Daily power generation			Power generation data, 4 bytes, high byte first, in watts, no Lcd board, this data is invalid
45				
46				
47				
48	Total power			Same as above
49				
50				
51				
52	Model code			Manufacturer equipment category self-encoding
53	Timed output time group flag			Bit0: Time control time group1（0=disable，1=enable） Bit1: Time control time group2（0=disable，1=enable）
54	Over-discharge recovery value		High byte	Take 2 decimal place
55			Low byte	
56	Battery overvoltage protection voltage		High byte	Same as above
57			Low byte	
58	Battery overvoltage recovery voltage		Same as above	Same as above
59				
60	Light control turns on PV voltage		Same as above	No decimal，use V as unit
61				
62	Light control turns off PV voltage		Same as above	Same as above
63				
64	Delay turn on time	0~999	High byte	use second as unit
65			Low byte	
66	Delay turn on time	Same as above	Same as above	Same as above
67				
68	Time control 1 turn-on time		hour，10th	
69			hour，1st	
70			minute，10th	

71			minute，1st	
72	Time control 1 turn-off time		Same as above	
73				
74				
75				
76	Time control 2 turn-on time		Same as above	
77				
78				
79				
80	Time control 2 turn-off time		Same as above	
81				
82				
83				
84	Spare			
85	Spare			
86	Spare			
87	Spare			
88	Spare			
89	Spare			
90	Spare			
91	Spare			
92	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte91	CheckSum

Note:

1、The byte data of the red mark is the running parameter of the MPPT, and the user can set it on the MPPT; the byte data of the green mark is the real-time data of the operation, and the user can select the corresponding data according to actual needs.

2、Example: For example, the user has 5 MPPTs connected to the bus, and the address is set to 1~5; when the host sends 0x01 0xA1 0x01 0x00 0x00 0x00 0x00 0xA3, the query address is No.1 MPPT, After receiving the query command verification, the MPPT sends the data shown in Table 2 to the host computer (52 bytes in total), and the MPPT of the remaining addresses does not respond after parsing the command without the local address, after receiving the query command verification, the MPPT sends the data to the host computer which are shown in Table 2 (52 bytes in total), and the MPPT of the remaining addresses does not respond after parsing the command is not the local address. (If you query No.3 MPPT, format is：0x03 0xA1 0x01 0x00 0x00 0x00 0x00 0xA5，And so on)

B. The Master device only queries the setting parameter command.：0AX2

1、Master device sends data format (8 bytes total)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x01~0XF0	MPPT address	Can be set in MPPT
1	Command type	0xA2	Query only set parameter command	
2	Control code	0x01	Data	

3	Data1	-	Meaningless，fill in 0	
4	Data 2	-	Meaningless，fill in 0	
5	Data 3	-	Meaningless，fill in 0	
6	Data 4	-	Meaningless，fill in 0	
7	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte6	Accumulate sum, take low byte

2、MPPT feedback data format (64 bytes total)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x01~0xF0	MPPT address	
1	Command type	0xA2	Query only set parameter command	
2	Control code	0x01	Data	
3	Type of battery	0x01~0x03		0、Lead-acid maintenance free；1、Lead acid colloid；2、Lead acid liquid；3、Lithium battery
4	Identification method	0x00~0x01		0、auto recognition；1、Manual setting
5	Number of batteries	0x01~0x08		1~8 pcs batteries
6	Load control method	0x01~0x03		0、off；1、Auto（Output when there is electricity）；2、Time control on/off，3、Light control
7	Local address	0x01~0xF0	Remote communication local address	
8	Baud rate	0x01~0x04	Remote communication rate	1、1200；2、2400；3、4800；4、9600
9	Rated voltage rating		High byte	Take 2 decimal places，12.00V,24.00V,36.00V,48.00V
10			Low byte	
11	Average charging voltage Upper limit		High byte	Take 2 decimal places
12			Low byte	
13	Floating charge voltage upper limit		High byte	Take 2 decimal places
14			Low byte	
15	Lower discharge voltage Lower limit		High byte	Take 2 decimal places
16			Low byte	
17	Hardware maximum charge current limit		High byte	User unchangeable parameters，Take 2 decimal places
18			Low byte	
19	Maximum		High byte	Take 2 decimal places

20	charge current limit		Low byte	
21	Running charging current limit		High byte	User unchangeable parameters，Take 2 decimal places
22			Low byte	
23	Model code			Manufacturer equipment category self-encoding
24	Timed output time group flag			Bit0: Time control time group 1（0=disable，1=enable） Bit1: Time control time group 2（0=disable，1=enable）
25	Over-discharge recovery value		High byte	Take 2 decimal places
26			Low byte	
27	Battery overvoltage protection voltage		High byte	Same as above
28			Low byte	
29	Battery overvoltage recovery voltage		Same as above	Same as above
30				
31	Light control turns on PV voltage		Same as above	No decimal，use “V” as unit
32				
33	Light control turns off PV voltage		Same as above	Same as above
34				
35	Delay turn on time	0~999	High byte	Use second as unit
36			Low byte	
37	Delay turn off time	Same as above	High byte	Same as above
38			Low byte	
39	Time control 1 turn-on time		hour，tens,4bits	No display board, this data is invalid
40			Hour, digits,4bits	
41			Minute, tens,4bits	
42			Minute, digits,4bits	
43	Time control 1 turn-off time		Same as above	Same as above
44				
45				
46				
47	Time control 2 turn-on time		Same as above	Same as above
48				
49				

50				
51 52 53 54	Time control 2 turn-off time		Same as above	Same as above
55	Spare			Invariablenes 0
56	Spare			
57	Spare			
58	Spare			
59	Spare			
60	Spare			
61	Spare			
62	Spare			
63	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte62	CheckSum

C. Master device only queries real-time data commands：0XA3

1、Master device sends data format (8 bytes total)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x01~0XF0	MPPT address	Can be set in MPPT
1	Command type	0xA3	Query only real-time data commands	
2	Control code	0x01	Data	
3	Data1	-	Meaningless，fill in 0	
4	Data 2	-	Meaningless，fill in 0	
5	Data 3	-	Meaningless，fill in 0	
6	Data 4	-	Meaningless，fill in 0	
7	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte6	Accumulate sum, take low byte

2、MPPT feedback data format (37 bytes total)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x01~0xF0	MPPT address	
1	Command type	0xA1	Query command	
2	Control code	0x01	Data	
3	Operating status	0x00~0xFF	Bit0：Operating status	0=normal；1= abnormal（Battery automatic recognition error）
			Bit1：Battery status	0=normal；1=overdischarging protection
			Bit2：Fan status	0=normal；1= Fan failure
			Bit3：Temperature	0=normal；1=over temperature

			status	protection
			Bit4：DC output status	0=normal；1= DC output short circuit protection
			Bit5：Internal temperature 1 state	0=normal；1=failure
			Bit6：Internal temperature 2 state	0=normal；1=failure
			Bit7：External temperature 1 state	0=normal；1=failure
4	Charging status	0x00~0xFF	Bit 0：charging status	0=stop charging；1=charging
			Bit 1：Equal charge	1 effective
			Bit 2：track	1 effective
			Bit 3：Floating charge	1 effective
			Bit 4：Charging current limit	1 effective
			Bit 5：Charging derating	1 effective
			Bit 6：Remote control prohibits charging	1 effective
			Bit 7：PV overvoltage	1 effective
5	Control state	0x00~0x07	Bit0：Charging output relay	0=off；1=on
			Bit1：Load output	0=off；1=on
			Bit2：fan	0=off；1=on
			Bit3：spare	
			Bit4：Overcharge protection mark	0=normal，1=overcharge protection
			Bit5：Overvoltage protection mark	0=normal，1=overvoltage protection
			Bit6：spare	
			Bit7：spare	
6	PV voltage		High byte	Take 1decimal places，such as：0x0C43=1219，means PV voltage is 121.9V
7			Low byte	
8	Battery voltage		High byte	Take 2 decimal places，such as：0x14FC=5372，means battery voltage is 53.72V
9			Low byte	
10	Charge current		High byte	Take 2 decimal places，such as：0x11E2=4578，means charge current is 45.78A
11			Low byte	
12	Internal temperature 1		High byte	Take 1 decimal places，such as：0x022C=556，means temperature is 55.6℃
13			Low byte	
14	Internal temperature 2		High byte	Calceled
15			Low byte	

16	External temperature 1		High byte	Format is same with internal temperature 1
17			Low byte	
18	Spare	--		
19	Spare	--	--	Invariablenes 0
20	Daily power generation			Total power data, 4 bytes, high byte first, in watts, no data board, this data is invalid
21				
22				
23				
24	Total power			Same as above
25				
26				
27				
28	Spare			Invariablenes 0
29	Spare			
30	Spare			
31	Spare			
32	Spare			
33	Spare			
34	Spare			
35	Spare			
36	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte35	CheckSum

D. Master device control command：0XC0（New control command）

1、Master device sends data format (8 bytes total)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x01~0XF0	MPPT address	Can be set in MPPT
1	Command type	0xC0	control commands	
2	Control code		0x01：Allow charging； 0x02：Forbid charging； 0x03：Remotely turn on DC output； 0x04：Remotely turn off DC output； 0x05 ： Buzzer alarm silencer（Re-trigger alarm with new fault）； 0x06：Turn on the backlight（Closed after 1 minute）；	
3	Data1	-	Meaningless，fill in 0	
4	Data2	-	Meaningless，fill in 0	
5	Data 3	-	Meaningless，fill in 0	
6	Data 4	-	Meaningless，fill in 0	
7	Check	0x00~0xFF	Byte0+ Byte 1…+ Byte6	CheckSum

	code			

1、 MPPT feedback data format

Execute the control command of the host computer and return the received control command data as it is.

E、Parameter setting command：0XD0

1、Master device sends data format (8 bytes total)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x01~0XF0	MPPT address	Can be set in MPPT
1	Command type	0xD0	Parameter setting command	
2	Parameter code	0x01~0xFF	Parameter code, representing parameters for different purposes	The parameter code is followed by 1~4 bytes, which is the data need to be set. The 1 byte data valid byte is data 4; the 2 byte data valid byte is data 3, 4; The 4 bytes data valid byte is data 1 , 2, 3, 4; more than 1 byte of data are high byte first.
			0x09: Battery type setting	1 byte of data，Data 1, 2, 3 meaningless, fill in 0. 0= Lead-acid maintenance free, 1= Lead acid colloid, 2= Lead acid liquid, 3=Lithium battery
			0x0A: Battery rated voltage setting	1 Byte data 0= auto recognition, take lead-acid battery 12V/pc as a standard, 1=12V,2=24V and so on.
			0x0C: DC output control mode	1 byte of data, Data 1, 2, 3 meaningless, fill in 0. 0=off, 1=auto，2=time control，3=light control, 4= remote control
			0x11: Controller model code	1 byte of data, 1~255, represents different models
			0x12: Time-controlled time group flag	1 byte of data Bit0: Time group 1 time control flag, 0=off, 1=on Bit1：Time group 2 time control flag，0=off, 1=on, No dashboard settings are invalid
			0x21: Charge voltage	2 byte parameter, data 3 high byte, data 4 low byte, data 1, 2 meaningless, fill in 0; With 2 valid decimals, battery type is set to Lithium battery charging voltage setting is invalid. Invalid setting in automatic recognition state.

			0x22: Floating charge	Same as above
			0x23: Battery low voltage protection voltage	Same as above
			0x25: Charging maximum current	Format is same as above, Can not set the maximum value exceeding the hardware current maximum limit.
			0x26: Low voltage recovery voltage	Same as above
			0x27: Battery overvoltage protection voltage	Same as above
			0x28: Battery overvoltage recovery voltage	Same as above
			0x29: Light control turns on PV voltage	2 byte parameter, no decimal, maximum 999
			0x2A: Light control turns off PV voltage	Same as above
			0x2B: Delay turn on time	2 byte parameter, use “second” as unit, in light control mode, delay the time of turning on DC output, when PV reach setting voltage ， maximum 999
			0x2C: Delay turn off time	Same as above
			0x2D: Time control 1 turn-on time	4 byte parameter，data1 hour is 10^{th}, data2 hour is 1^{st}, data3 minute is 10^{th}, data4 minute is 1^{st}, No dashboard settings are invalid.
			0x2E: Time control 1 turn-off time	Same as above
			0x2F: Time control 2 turn-on time	Same as above
			0x30: Time control 2 turn-off time	Same as above
3	Data 1	High byte		Different commands have different numbers of data, divided into 1, 2, 4 bytes of data, More than 1 byte of data is high byte first
4	Data 2			
5	Data 3			
6	Data 4	Low byte		
7	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte6	CheckSum

2、 MPPT feedback data format (correct setting)

Execute the Master device to write the model code command and return the received data as it is.

3，MPPT error feedback (8 bytes total)

No.(Byte)	Data Name		Numerical Range	Definition	Remarks

0	Address		0x01~0XF0	MPPT address	Can be set in MPPT
1	Error feedback		0XEE	Error feedback	
2	Error code			0x01: Current state cannot complete operation 0x02: Can not recognized parameter code 0x03: Parameter data overflow	
3	Original command code				Wrong command code
4	Original control code				Wrong control code
5	Spare	-			
6	Spare	-			
7	Check code		0x00~0xFF	Byte0+ Byte 1…+ Byte6	CheckSum

E. Master device sets baud rate command：0xDE

1、Master device sends data format (total 8 bytes)

No.(Byte)	Data Name	Numerical Range	Definition	Remarks
0	Address	0x00	Group control address, all devices on the same bus do this, No feedback data	The host computer can send this command at four acceptable communication rates in a time-sharing manner to change the device communication rate of the same bus, so that all devices are set to the same rate.
1	Command type	0xDE	Set baud rate command	
2	Control code	0x42	Control code	
3	Data1	0x01~0x04	Baud rate code	1=1200,2=2400,3=4800,4=9600bps
4	Data 2	-	Meaningless, fill in 0	
5	Data 3	-	Meaningless, fill in 0	
6	Data 4	-	Meaningless, fill in 0	
7	Check code		Byte0+ Byte 1…+ Byte6	CheckSum

2、Feedback data format

No feedback data.

F. Clock setting command：0XDF

1、Master device sends data format (8 bytes total)

No.(Byte)	Data	Numerical	Definition	Remarks

	Name	Range		
0	Address	0x00，0x01~0XF0	0x00 is group control，all controllers on the same bus accept this command and not feedback data.	Can be set in MPPT
1	Command type	0XDF	Set real-time clock commands	
2	Control code		Year(10^{th} and 1^{st})	Example: 0x12 means year 2018
3	Data1		Month	
4	Data2		Day	
5	Data 3		Hour	
6	Data 4		Minute	
7	Check code	0x00~0xFF	Byte0+ Byte 1…+ Byte6	CheckSum

2、MPPT feedback data format

Group control does not feedback, address 0x01~0xF0 feedbacks as it is.