SETMINI

Embedded DC power system background communication protocol

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1 Overview

Book « SETMINI The embedded DC power system background communication protocol (hereinafter referred to as the "Agreement") describes the protocol of the switching power supply monitoring system and its dedicated host computer-acquisition board for command control and data exchange.

2 Scope

《protocol》The main functions specified in：

The monitoring device (ie, the master node) controls the monitoring board (ie, the slave node) to complete the specified tasks by forwarding commands, such as acquiring and setting voltage, current, and alarm limit value data.

The communication process is performed in a half-duplex, variable-length, one-way response confirmation mode, and the monitoring device sends a forwarding command and a query command to the monitoring board. Each forwarding command and query command acts as a two-way communication process. If the response fails within 50 ms after the monitoring device issues the command (address mismatch, reception timeout, received response is not acknowledgment response, received checksum is incorrect, and receive length byte is illegal), the communication fails.

3 Special term

Monitoring device:	A device that monitors communication to display monitoring data and set monitoring board data, and represents the master node in the master-slave protocol.
Monitoring board:	the display and setting module of the monitoring system, used to communicate with the monitoring device, representing the slave node in the master-slave protocol
RS232：	A 3-wire serial communication standard that supports full-duplex serial short-range communication
Query command:	sent by the monitoring device to the monitoring board to obtain the target information.
Setting command:	Control the monitored parameters through the monitoring device

4 Physical interface

4.1 Serial communication port electrical standard

The monitoring board communicates with the monitoring device in RS232 half-duplex mode.

4.2 Information transmission method

Asynchronous mode, 1 start bit, 8 data bits, 1 stop bit, no parity bit.

a）Data transfer rate

9600BPS

b）Data encoding

Command using hexadecimal data

C）Read data frame format

The read command function code is 0x01, 0x02, 0x03, which supports reading the consecutive register address data once. The double-byte data is the high byte first and the low byte later.

0x01 function code read command frame format:

Serial number	1	2	3	4	5
Number of bytes	1	1	2	2	2
format	Communication device address	Function code 0x01	Register address	0x0001	CRC check

0x01 function code read command returns frame format:

Serial number	1	2	3	4
Number of bytes	1	1	2 bytes of data	2
format	Communication device address	0x01	Read data	CRC check

0x02 function code read command frame format:

Serial number	1	2	3	4	5
Number of bytes	1	1	2	2	2
format	Communication device address	Function code 0x02	Register address	Number of discrete data N	CRC check

0x02 function code read command returns frame format:

Serial number	1	2	3	4	5
Number of bytes	1	1	1	N% 8 bytes	2
format	Communication device address	0x02	The number of bytes returned	Read data	CRC check

0x03 function code read command frame format:

Serial number	1	2	3	4	5
Number of bytes	1	1	2	2	2
format	Communication device address	Function code 0x03	Register address	Read the number of registers	CRC check

0x03 function code read command returns frame format:

Serial number	1	2	3	4	5
Number of bytes	1	1	1	Number of registers *2	2

format	Communication device address	0x03	Number of data bytes = number of read registers *2	Read data	CRC check

d）Set the data frame format

There are three kinds of setting commands. The function codes are 0x05 and 0x06, and only one register can be set at a time. 0x10 supports setting the data of consecutive register addresses. The double-byte data is high byte first and low byte last.

Set a single register address command frame format:

Serial number	1	2	3	4	5
Number of bytes	1	1	2	2	2
format	Communication device address	Function code (0x05, 0x06)	Register address	Set data information	CRC check

Set the command to return. If the setting is successful, press the set command to return; otherwise, it will not return.

Set multiple register address command frame formats:

Serial number	1	2	3	4	5	6	7
Number of bytes	1	1	2	2	1	Set the number of bytes	2
format	Communication device address	Function 0x10	Register address	Set the number of registers	Set the number of bytes	Set data information	CRC check

Set the return data format, the setting is successful, there is a return command, the setting fails, no reply

Serial number	1	2	3	4	5
Number of bytes	1	1	2	2	2
format	Communication device address	Function code (0x10)	Register address	Set the number of bytes	CRC check

5 Communication method

The monitoring device and the monitoring board are in a master-slave relationship. The monitoring device is the master node and the monitoring board is the slave node. After receiving the data, the

monitoring board will parse the command and make a legal judgment on the data. If there is a problem with the format setting, the setting data is out of bounds, and the register is out of bounds, it is regarded as an illegal command, and the data is not returned. Otherwise, the data is returned in the return command format.

6 Register address

Communication device type and register range of monitoring device and monitoring board

Issue order function code	Register address range	Number of registers	meaning
0x01	0x1600~0x1601	1	Read state of charge
0x02	0x0000~0x007	1 byte	Read alarm information
	0x1000~0x101D	18	Read system setup parameters
	0x1100~0x110b	6	Reading system time
	0x1200~0x120b	6	Read specified equalization time
	0x2000~0x2019	13	Reading electrical parameters
	0x3000~0x30xx	Uncertain, set the number of modules * 2	Module parameters (current, voltage)
0x05	0x1600~0x 1601	1	Equal charge floating charge setting: 0000: float charge FF00: charge status
0x06	0x1000~0x101D		
0x10	0x1100~0x110b	6	Set system time
	0x1200~0x120b	6	Set the charge time

7 Register data

a）System parameter settings, please refer to Appendix C for detailed commands.

Features	function code	Register address	Description
Total module settings	0x06	0x1000~0x1001	
System voltage setting	0x06	0x1002~0x1003	Actual voltage value = set value / 100, Range value see note 0
Charge voltage setting	0x06	0x1004~0x1005	Actual voltage value = set value / 100, Range value see note 0

Current limit setting	0x06	0x1006~0x1007	Actual current value = set value / 100
Off voltage 1 setting	0x06	0x1008~0x1009	Actual voltage value = set value / 100, Range value see note 0
Reconnect voltage 1 setting	0x06	0x100a~0x100b	Actual voltage value = set value / 100, Range value see note 0
Off voltage 2 setting	0x06	0x100c~0x100d	Actual voltage value = set value / 100, Range value see note 0
Reconnect voltage 2 setting	0x06	0x100e~0x100f	Actual voltage value = set value / 100, Range value see note 0
Overvoltage setting	0x06	0x1010~0x1011	Actual voltage value = set value / 100, Range value see note 0
Undervoltage setting	0x06	0x1012~0x1013	Actual voltage value = set value / 100, Range value see note 0
Temperature compensation coefficient setting	0x06	0x1014~0x1015	
Temperature compensation starting point setting	0x06	0x1016~0x1017	
Battery temperature alarm value setting	0x06	0x1018~0x1019	Actual temperature alarm value = set value / 100
Equalization time setting	0x06	0x101a~0x101b	
Equalization interval setting	0x06	0x101c~0x101d	

b）Equal charge floating charge setting, please refer to Appendix C for detailed commands.

Features	function code	Register address	Description
Equal charge float setting	0x05	0x1600	0000: Floating charge FF00: Equal charge status
Switching machine setting	0x05	0x1602	0000: Boot FF00: Shutdown

c）System time and equalization time settings, please refer to Appendix C for detailed commands.

Features	function code	Register address	Description
Set system time	0x10	0x1100~0x110b	Hour, minute, second, year, month, day
Set the charge time	0x10	0x1200~0x120b	Hour, minute, second, year, month, day

If the system time is set to match the current system time, the change command will be treated as an invalid command; if the set charge time is the same as the current charge time, the change command will be treated as an invalid command.

d）Read the charging status. For detailed commands, please refer to Appendix C.

Features	function code	Register address	Description

Read state of charge	0x01	0x1600	0100: Floating charge 0101: Equal charge status

e）Read the alarm information. For detailed commands, please refer to Appendix C.

Features	function code	Register address	Description
Alarm information	0x02	0x0000~0x0007	Note 1

f）Read system setup parameter information. For detailed commands, please refer to Appendix C.

Features	function code	Register address	Description
Total number of modules read	0x03	0x1000~0x1001	
Read system setting voltage	0x03	0x1002~0x1003	Actual voltage value = read value / 100
Read equalization setting voltage	0x03	0x1004~0x1005	Actual voltage value = read value / 100
Read battery current limit	0x03	0x1006~0x1007	Actual battery current limit = read value / 100
Read off voltage 1	0x03	0x1008~0x1009	Actual voltage value = read value / 100
Read reconnection voltage 1	0x03	0x100a~0x100b	Actual voltage value = read value / 100
Read off voltage 2	0x03	0x100c~0x100d	Actual voltage value = read value / 100
Read reconnection voltage 2	0x03	0x100e~0x100f	Actual voltage value = read value / 100
Read the pressure value	0x03	0x1010~0x1011	Actual voltage value = read value / 100
Reading undervoltage	0x03	0x1012~0x1013	Actual voltage value = read value / 100
Read temperature compensation coefficient	0x03	0x1014~0x1015	
Read temperature compensation starting point	0x03	0x1016~0x1017	
Read battery temperature alarm value	0x03	0x1018~0x1019	Actual temperature alarm value = read value / 100
Read the average charge time	0x03	0x101a~0x101b	
Read equalization interval	0x03	0x101c~0x101d	
Read input overvoltage	0x03	0x101e~0x101f	
Read input undervoltage	0x03	0x1020~0x1021	
Reading frequency	0x03	0x1022~0x1023	Actual temperature alarm value = read value / 100

g）Read system time and equalization time. For detailed commands, please refer to Appendix C.

Features	function code	Register address	Description
Reading system time	0x03	0x1100~0x110b	Hour, minute, second, year, month, day
Read specified equalization time	0x03	0x1200~0x120b	Hour, minute, second, year, month, day

h）Read the electrical parameters. For detailed commands, please refer to Appendix C.

Features	function code	Register address	Description
Read system voltage	0x03	0x2000~0x2001	Actual voltage value = read value/100
Read battery current 1	0x03	0x2002~0x2003	Actual current value = read value/100
Read battery current 2	0x03	0x2004~0x2005	Actual current value = read value/100
Read module current	0x03	0x2006~0x2007	Actual current value = read value/100
Read load current	0x03	0x2008~0x2009	Actual current value = read value/100
Read battery temperature	0x03	0x200a~0x200b	Actual temp. value = read value/100
Mains 1 phase voltage	0x03	0x200c~0x200d	Actual voltage value = read value/100
Mains 2 phase voltage	0x03	0x200e~0x200f	Actual voltage value = read value/100
Mains 3-phase voltage	0x03	0x2010~0x2011	Actual voltage value = read value/100
Mains frequency	0x03	0x2012~0x2013	Actual freq. value = read value/100
Mains 1 phase current	0x03	0x2014~0x2015	Actual voltage value = read value/100
Mains 2 phase current	0x03	0x2016~0x2017	Actual voltage value = read value/100
Mains 3-phase current	0x03	0x2018~0x2019	Actual voltage value = read value/100

i）Read the electrical parameters. For detailed commands, please refer to Appendix C.

Features	function code	Register address	Description
Module 1 current	0x03	0x3000~0x3001	Actual current value = read value/100
Module 1 voltage	0x03	0x3002~0x3003	Actual temp value = read value / 100
Module 2 current	0x03	0x3004~0x3005	Actual current value = read value/100
Module 2 voltage	0x03	0x3006~0x3007	Actual temperature value = read value/100
Module 3 current	0x03	0x3008~0x3009	Actual current value = read value/100
Module 3 voltage	0x03	0x300a~0x300b	Actual temp. value = read value/100
Module 4 current	0x03	0x300c~0x300d	Actual current value = read value/100
Module 4 voltage	0x03	0x300e~0x300f	Actual temp value = read value/100
.....	.....	.....	
Module n current	0x03		Actual current value = read value/100
Module n voltage	0x03		Actual temp value = read value/100

Note 0:

There are five series of monitoring systems: 24V, 48V, 74V, 110V, 220V

The voltage range is: 24V (18~36.5), 48V (40~59), 74V (60~83), 110V (89~152), 220V (180~300)

The limit logic of each series range is: the set value cannot be greater than the maximum value in the range, and cannot be less than the minimum value within the range. Otherwise, the monitor sets the command as an illegal command and does not reply to the data; the larger value cannot be smaller than the smaller value, for example: Overvoltage and undervoltage settings, otherwise the monitor will set the command as an illegal command and will not reply to the data; the smaller value cannot be greater than the larger value, such as reconnecting the voltage and leaving the voltage, otherwise the monitoring will be illegal according to the setting command. Command and do not reply to data.

Note 1:

0x0000 Low voltage off 1 alarm 1: Alarm 0: Normal

0x0001 Low voltage off 2 alarm 1: Alarm 0: Normal

0x0002 DC power distribution unit 1 is disconnected 1: alarm 0: normal

0x0003 DC power distribution unit 2 is disconnected 1: alarm 0: normal

0x0004 DC power distribution unit 3 is disconnected 1: Alarm 0: Normal

0x0005 DC power distribution unit 4 is disconnected 1: Alarm 0: Normal

0x0006 Battery 1 is charged and discharged 1: Alarm 0: Normal

0x0007 Mains disconnection alarm 1: Alarm 0: Normal

Appendix A

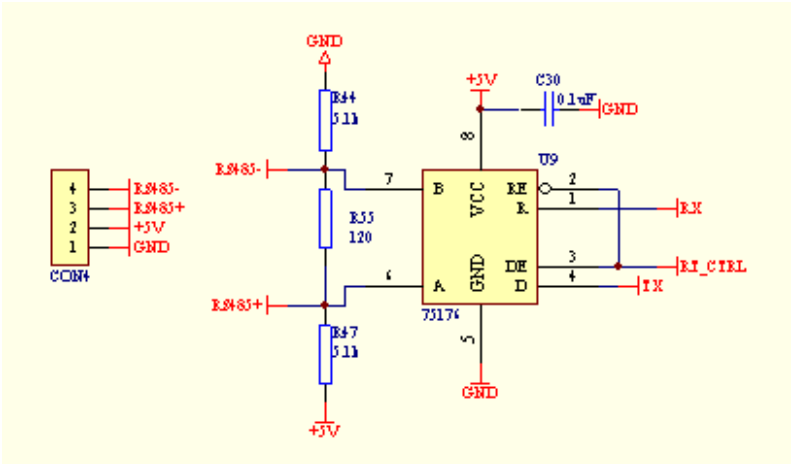
The information field is represented by 2 bytes per analog:

The analog quantity is multiplied by 100 as the information field to transmit data, with the high order byte first and the low order byte last. For example, if the current voltage of the system is 53.55V, the transmission data is 5355, and the actual transmission bytes are 0x53 and 0x55.

After the monitoring module receives and divides by 100, the actual analog data can be obtained.

Appendix B

Recommended RS485 circuit diagram and power supply method



a. In the circuit, CON4 is the communication interface of the upper computer to the module, GND and +5V provide communication power supply for monitoring by the rectifier module, and RS585+ and RS485- are communication differential signals.
b. GND, +5V for the host computer communication 485 power supply, TX, RX corresponding to the host computer's serial communication TTL level asynchronous transmission receiving port.
c. RT_CTRL is the enable control signal for the host computer to control RS485 reception and transmission.

Appendix C

Command example and response analysis

Send command function	send command	Reply command	Reply command parsing
Read state of charge	01 01 16 00 00 01 F9 82	01 01 01 00 51 88	0100: float charge, 0101: the charge status is currently floating state
Read alarm information	01 02 00 00 00 08 79 CC	01 02 01 03 E1 89	Low pressure off 1, 2 alarm
Read system setup parameters	01 03 10 00 00 12 C1 07	01 03 24 00 02 14 E6 16 12 03 E8 10 CC 11 94 11 94 12 5C 17 70 10 68 00 00 00 00 0F A0 00 0A 13 88 01 2C 00 55 13 EC 06 AB	Two modules, the system setting voltage is 53.50V, the average charging voltage is 56.5V, the battery current limiting value is 10A, the decoupling voltage 1 is 43V, the reconnection voltage 1 is 45V, the decoupling voltage 2 is 45V, and the reconnection voltage 2 is 47V. The overvoltage value is 60V, the undervoltage value is 42V, the temperature compensation coefficient is 0, the temperature compensation starting point is 0, the battery temperature alarm value is 40, the equalization time is 10A, the equalization interval is 5000 hours, and the input overvoltage is 300V, input

			undervoltage 85V, frequency 51Hz,
Total number of modules read	01 03 10 00 00 01 80 CA	01 03 02 00 02 39 85	The number of monitoring system modules is 2
Read system setting voltage	01 03 10 02 00 01 21 0A	01 03 02 14 E6 36 CE	System voltage is 53.5V
Read equalization setting voltage	01 03 10 04 00 01 C1 0B	01 03 02 16 12 36 29	The average charging voltage is 56.5V
Read battery current limit	01 03 10 06 00 01 60 CB	01 03 02 03 E8 B8 FA	Battery current limit is 10A
Read off voltage 1	01 03 10 08 00 01 01 08	01 03 02 10 CC B5 D1	Breakaway voltage 1 is 43V
Read reconnection voltage 1	01 03 10 0A 00 01 A0 C8	01 03 02 11 94 B5 BB	Reconnect voltage 1 is 45V
Read off voltage 2	01 03 10 0C 00 01 40 C9	01 03 02 11 94 B5 BB	Breakaway voltage 2 is 45V
Read reconnection voltage 2	01 03 10 0E 00 01 E1 09	01 03 02 12 5C B4 DD	Reconnect voltage 2 is 47V
Read the pressure value	01 03 10 10 00 01 81 0F	01 03 02 17 70 B6 50	Overvoltage value is 60V
Reading undervoltage	01 03 10 12 00 01 20 CF	01 03 02 10 68 B4 6A	Undervoltage is 42V
Read temperature compensation coefficient	01 03 10 14 00 01 C0 CE	01 03 02 00 00 B8 44	Temperature compensation coefficient is 0
Read temperature compensation starting point	01 03 10 16 00 01 61 0E	01 03 02 00 00 B8 44	Temperature compensation starting point is 0
Read battery temperature alarm value	01 03 10 18 00 01 00 CD	01 03 02 0F A0 BD CC	Battery temperature alarm value is 40
Read the average charge time	01 03 10 1A 00 01 A1 0D	01 03 02 00 0A 38 43	The charge time is 10A
Read equalization interval	01 03 10 1C 00 01 41 0C	01 03 02 13 88 B5 12	The equalization interval is 5000 hours
Read input overvoltage	01 03 10 1E 00 01 E0 CC	01 03 02 01 2C B8 09	Input overvoltage is 300V
Read input undervoltage	01 03 10 20 00 01 81 00	01 03 02 00 55 78 7B	Input undervoltage is 85V
Read alarm frequency	01 03 10 22 00 01 20 C0	01 03 02 13 EC B4 F9	Frequency is 51Hz
Read all electrical parameters	01 03 20 00 00 0D 8F CF	01 03 1A 10 C1 04 B0 00 00 04 B0 04 65 0A 14 60 7C 00 00 00 00	The system voltage is 42.89V, the battery current 1 is 12A, the battery current 2 is 0A,

		13 88 00 01 00 00 00 00 62 98	the module current is 12A, the load current is 11.25A, the battery temperature is 25.8, the A phase voltage is 247V, the BC phase voltage is 0V, and the mains frequency is 50Hz, phase A current is 0.01A, BC phase voltage is 0A
Read system voltage	01 03 20 00 00 01 8F CA	01 03 02 10 C1 74 14	The system voltage is 42.89V
Read battery current 1	01 03 20 02 00 01 2E 0A	01 03 02 04 B0 BB 30	The battery is 12A
Read battery current 2	01 03 20 04 00 01 CE 0B	01 03 02 00 00 B8 44	Current is 0A
Read module current	01 03 20 06 00 01 6F CB	01 03 02 04 B0 BB 30	Current is 12A
Read load current	01 03 20 08 00 01 0E 08	01 03 02 04 65 7A AF	Current is 11.25A
Read battery temperature	01 03 20 0A 00 01 AF C8	01 03 02 0A 14 BE EB	Temperature is 25.8
Reading the mains phase A voltage	01 03 20 0C 00 01 4F C9	01 03 02 60 7C 91 A5	Voltage is 247V
Reading the mains B phase voltage	01 03 20 0E 00 01 EE 09	01 03 02 00 00 B8 44	Voltage is 0 (single-phase input is not 0)
Reading the mains C-phase voltage	01 03 20 10 00 01 8E 0F	01 03 02 00 00 B8 44	Voltage is 0 (single-phase input is not 0)
Reading city frequency	01 03 20 12 00 01 2F CF	01 03 02 13 88 B5 12	Mains frequency is 50Hz
Reading the mains phase A current	01 03 20 14 00 01 CF CE	01 03 02 00 01 79 84	Current is 0.01A
Reading the mains B phase current	01 03 20 16 00 01 6E 0E	01 03 02 00 00 B8 44	Current is 0A
Reading the mains C phase current	01 03 20 18 00 01 0F CD	01 03 02 00 00 B8 44	Current is 0A
Read all module information of the system of 2 modules	01 03 30 00 00 04 4B 09	01 03 08 00 15 16 10 00 1C 16 0E 5C 41	Module 1 current is 0.21A, voltage is 56.48V; module 2 current is 0.28A, voltage is 56.46V
Read module 1 current	01 03 30 00 00 01 8B 0A	01 03 02 00 1C B9 8D	Current is 0.28A
Read module 1 voltage	01 03 30 02 00 01 2A CA	01 03 02 16 10 B7 E8	The voltage is 56.48V
Read module 2	01 03 30 04 00 01 CA CB	01 03 02 00 15 79 8B	Current is 0.21A

current			
Read module 2 voltage	01 03 30 06 00 01 6B 0B	01 03 02 16 0E 37 E0	The voltage is 56.46V
Set 1 module	01 06 10 00 00 01 4C CA	01 06 10 00 00 01 4C CA	Successful setup
Set the system voltage: 53.8V	01 06 10 02 15 04 23 99	01 06 10 02 15 04 23 99	Successful setup
Set the average charging voltage: 57.0 V	01 06 10 04 16 44 C2 98	01 06 10 04 16 44 C2 98	Successful setup
Set the battery current limit: 9A	01 06 10 06 03 84 6D 98	01 06 10 06 03 84 6D 98	Successful setup
Set the breakaway voltage 1: 42V	01 06 10 08 10 68 00 E6	01 06 10 08 10 68 00 E6	Successful setup
Set the reconnection voltage 1: 44V	01 06 10 0A 11 30 A1 4C	01 06 10 0A 11 30 A1 4C	Successful setup
Set the breakaway voltage 2: 44V	01 06 10 0C 11 30 41 4D	01 06 10 0C 11 30 41 4D	Successful setup
Set the reconnection voltage 2: 47V	01 06 10 0E 12 5C E0 50	01 06 10 0E 12 5C E0 50	Successful setup
Set the overvoltage value: 59V	01 06 10 10 17 0C 83 3A	01 06 10 10 17 0C 83 3A	Successful setup
Set the undervoltage value: 43V	01 06 10 12 10 CC 20 9A	01 06 10 12 10 CC 20 9A	Successful setup
Set the temperature compensation coefficient: 1	01 06 10 14 00 01 0C CE	01 06 10 14 00 01 0C CE	Successful setup
Set the temperature compensation starting point: 1	01 06 10 16 00 01 AD 0E	01 06 10 16 00 01 AD 0E	Successful setup
Set battery temperature alarm value: 42	01 06 10 18 10 68 01 23	01 06 10 18 10 68 01 23	Successful setup
Set the duration of the charge: 12	01 06 10 1A 00 0C AC C8	01 06 10 1A 00 0C AC C8	Successful setup
Set the	01 06 10 1C 13 87 01 9E	01 06 10 1C 13 87 01	Successful setup

equalization interval: 4999 hours		9E	
Set the input overvoltage value: 298V	01 06 10 1E 01 2A 6D 43	01 06 10 1E 01 2A 6D 43	Successful setup
Set the input undervoltage value: 87V	01 06 10 20 00 57 CD 3E	01 06 10 20 00 57 CD 3E	Successful setup
Set the alarm frequency: 21Hz	01 06 10 22 00 15 EC CF	01 06 10 22 00 15 EC CF	Successful setup
Set the system time: 2017-08-28 17:36:00	01 10 11 00 00 06 0c 00 11 00 24 00 00 07 E1 00 08 00 1C 90 15	01 10 12 00 00 0C C5 74	Successful setup
Set the float time: 2017-08-28 17:36:00	01 10 12 00 00 06 0c 00 11 00 24 00 00 07 E1 00 08 00 1C 60 E5	01 10 12 00 00 0C C5 74	Successful setup
Set equal charge	01 05 16 00 FF 00 88 72	01 05 16 00 FF 00 88 72	Successful setup
Setting up the float	01 05 16 00 00 00 C9 82	01 05 16 00 00 00 C9 82	Successful setup