MXR Series Module
Communication Protocol V1.50

Contents

1 Overview

This protocol applies to Maxwell **MXR** Series charging modules.

Communication baud rate: 125 Kbps

2 Definition of Frame Format

2.1 Frame Format

Frame is the basic unit of information transmission. CAN 2.0B frame format is shown in the following table:

Items	Code
Start of Frame	sof (1 bit)
Arbitration Domain	**Identifier (11 bits)**
	SRR
	IDE
	Identifier (18 bits)
	RTR
Control Code	reseal (2 bits)
	Data Len (4 bits)
Data Domain	**data (8 bytes)**
Check Code	CRC (2 bits)
End of Frame	(7 bits)

The controllable parts used by actual users:

Identification domain	**Data Domain**			
29 Bits	**1 byte**	**1 byte**	.....	**1 byte**
Frame Header	Data (1-8 bytes)			

2.2 Frame Identifier - 29 Bits

28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PROTNO（9 bits）									PTP	DSTADDR (8 bits ）								SRCADDR (8 bits)								Group		

2.2.1 PROTNO

Default: PRONTO = 0x060

2.2.2 PTP

PTP = 1, point-to-point communication.

PTP = 0, broadcast communication.

2.2.3 DSTADDR

Destination Address:

Power module address range: 00~63;

The controlled address is fixed to: 0xF0;

Broadcast address: 0xFF;

Intra-group broadcast address: 0xFE

Extended group broadcast: Broadcast addresses for 8 groups and above:

0xFD (0group), 0xFC (1group), 0 xFB (2Group)...

And so on, DSTADDR = 0xFD - Group ;

The maximum number of extended groups that can be set is 60.

2.2.4 SRCADDR

Source address:

In all communication types, bit 3 ~ bit 10 are used to indicate source address on the bus.

Power module address range: 00~63

The controlled address is fixed at: 0xF0

2.2.5 Group

Module group number: 0~7

Extended group broadcast, group number setting: 0

2.3 Data Domain

2.3.1 Setting module parameters

Used to set module voltage, current, current limit, start up and shut down.

Transmit Frame Data Domain Format			
Byte 0	Byte 1	Byte 2 ~ Byte 3	Byte 4 ~ Byte 7
Function code	Reserved	Register Number	Data
03	00	See **Table1**	Data to be set (Refer to **Table1**)

Example: Setting module voltage

03	00	00 21	44 2F 00 00

0x442F0000 corresponds to the floating point format data: 700.0

Example: Setting the module current limit

03	00	00 22	3F 00 00 00

The floating point format data corresponding to 0x3F000000 is: 0.5 (the module current limit point is set in percentage).

The current limit point corresponding to the rated current of the module is1. Others are calculated proportionally.

Current limit point calculating method: Assuming the required current is 10A, rated current 20A, then the current limit = 10/20 = 0.5

Example: Set module start-up

03	00	00 30	00 00 00 00

Example: Set module shut-down

03	00	00 30	00 01 00 00

2.3.2 Read module data

Transmit Frame Data Domain Format			
Byte0	Byte1	Byte2~Byte3	Byte4~Byte7
Function code	Keep default	Register number	Keep default
10	00	See **Table 1**	00 00 00 00

Response Frame Data Domain Format			
Byte0	Byte1	Byte2~Byte3	Byte4~Byte7
The type of returned data	Error Code	Register Number	Keep default
41: Floating point No. 42: Integer	F0: Normal Others: Fault, discarded frame.	See **Table 1**	Returned data

Example: Read module voltage

Controller sending:

10	00	00 01	00 00 00 00

Module response:

41	F0	00 01	44 2F 00 00

0x41: The returned data is in floating point format

0xF0: Return frame is normal

0x0001: Register number

0x442F0000 corresponds to the floating point format data: 700.0

Example: Read module status

Controller sending:

10	00	00 40	00 00 00 00

Module response:

42	F0	00 40	00 00 01 00

0x42: The returned data is in integer format
0xF0: Return frame is normal
0x0040: Register number
0x00000100: See **Table 2**

3 Schedule

3.1 Data Type Analysis Table 1

Register (VALUETYPE)	**Data Description** (RMP)	**Data Format**	**Format description**
0x0001	Get module voltage	Floating point	
0x0002	Get module current	Floating point	
0x0003	Get module current limit point	Floating point	
0x0004	Get module DC Board temperature	Floating point	
0x0005	Get module input phase voltage (DC input voltage)	Floating point	
0x0008	Get module PFC0 Voltage (positive half bus)	Floating point	
0x000A	Get module PFC1 Voltage (negative half bus)	Floating point	
0x000B	Get module panel (ambient) temperature	Floating point	
0x000C	Get module AC Phase A voltage	Floating point	
0x000D	Get module AC Phase B voltage	Floating point	
0x000E	Get module AC Phase C voltage	Floating point	
0x0010	Get module PFC Board temperature	Floating point	
0x0011	Get module rated output power	Floating point	
0x0012	Get module rated output current	Floating point	

0x0017	Set module operating altitude	Integer	Unit: meter; Range: 1000~5000. No need to set if altitude is lower than 1000 (without derating). Set 5000 if higher than 5000 m. The setting value will be saved after power off.
0x001B	Set module output current value	Integer	Setting value is output current * 1024. For example: 10240 = 10A * 1024
0x001E	Set group number	Integer	Byte7, lower six bits (range 0~60) The remaining byte4 ~ byte6 and byte7, The upper two bits are zeros.
0x001F	Set module address allocation method	Integer	0x00000000: Automatic allocation 0x00010000: Dial setting (default)
0x0020	Set module output power	Floating point	0.1~1 For example: 0.1 corresponding to 0.1*20000W (rated power) = 2000W
0x0021	Set module output voltage	Floating point	
0x0022	Set module current limit	Floating point	
0x0023	Set the upper limit of the module output voltage	Floating point	That is, set the module output overvoltage point. Do not set it unless specially required.
0x0030	Shut down / Start up	Integer	0x00010000: Shut down ; 0x00000000: Start up
0x0031	Set module overvoltage reset	Integer	0x00000000: Disable; 0x00010000: Reset
0x003E	Set relevance permission of module output overvoltage protection	Integer	0x00000000: Enable; 0x00010000: Disable
0x0040	Read current alarm/status	Integer	**See Table 2**
0x0043	Read group number and dial-up address	Integer	The returned data high 16 bit (byte4~byte5) is the group number, return data low 16 bit (byte6~byte7) is the dial address
0x0044	Set module short circuit reset	Integer	0x00000000: Disable; 0x00010000: Reset
0x0046	Set module input mode	Integer	0x00000001: AC mode (default); 0x00000002: DC mode;
0x0048	Read input power	Integer	Unit:1W
0x004A	Read setting value of current altitude	Integer	Unit: meter (default 1000).
0x004B	Read the current module input working mode	Integer	0x00000001: Single-phase AC; 0x00000002: DC; 0x00000003: Three-phase AC; 0x00000005: Mode mismatch (Phase sequence error).
0x0054	Read node searial No. low bits (ID No.)	Integer	
0x0055	Read node searial No. high bits (ID No.)	Integer	
0x0056	Read DCDC version No.	Integer	The version number of the return data low 16 bit (byte6~byte7) refers to decimal numbers.
0x0057	Read PFC version No.	Integer	The version number of the return data low 16 bit (byte6~byte7) refers to decimal numbers.

3.2 Module Alarm Status Table

0: Invalid 1: Valid

Table 2 - Module Alarm Status	
Bit	Illustration
0	Module fault (red indicator lights on)
1	Module protection (yellow indicator lights on)
2	Reserved
3	Module internal SCI communication failure
4	Input mode detection error (or input wiring error)
5	The controlled input mode does not match the actual working mode
6	Reserved
7	DCDC overvoltage
8	PFC voltage abnormal (imbalance, overvoltage or undervoltage)
9	AC overvoltage
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	AC undervoltage
15	Reserved
16	CAN Communication failure
17	Current imbalance
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	DCDC on/off status. 0: On. 1: Off.
23	Module power limit
24	Temperature derating
25	AC power limit
26	Reserved
27	Fan failure
28	DCDC short circuit
29	Reserved
30	DCDC over temperature
31	DCDC output overvoltage

4 Commands Setting for Group Number and Address

Add commands to set group number and module address allocation mode. After successful setting, group number and address allocation mode will be updated and stored immediately (with power-off memory). ID in the return data will be updated instantly to the latest group number.

Group number setting instructions:

There are two ways to set the group number: DIP switch and communication setting, which correspond to automatic allocation mode and DIP switch address setting mode respectively. That is, when the module address allocation mode is selected as automatic allocation, the DIP switch is used to set the group number. Under this circumstance, the function of communication setting for group number will be invalid, and sending command will return a setting failure response; when the module address mode is selected as the DIP switch setting mode, the function of communication setting for group number will be effective!

The specific design routine is as follows:

Example: Set the module group number to 5 (0x05)

Setting command (data field):

03	00	00 1E	00 00 00 05

Response command for successful setting:

42	F0	00 1E	00 00 00 05

Response command for failure setting:

42	F2	00 1E	00 00 00 05

Example: Set the module address allocation mode to dial mode

Setting command (data field):

03	00	00 1F	00 01 00 00

Response command for successful setting:

42	F0	00 1F	00 01 00 00

Response command for failure setting:

42	F2	00 1F	00 01 00 00

5 Floating Point Data Description

Sequence of floating point number transmission: The storage format of floating point numbers is four bytes, it is transmitted after converted to HEX-ASCII code. When transmitted, four bytes are sent in the sequence of exponent code and sign bit, mantissa high bit, mantissa middle bit and mantissa low bit. Floating point numbers are in IEEE 32-bit standard format (Standard CLanguage floating point format) with a length of 32 bits, as shown below:

D31	D30 — D23	D22 — D16	D15 — D8	D7 — D0
Floating point signS	Exponent code E	Mantissa high bits	Mantissa middle bits	Mantissa low bits

If the exponent code is E, and the mantissa is M, then: floating point value = $\pm(1+M\times2^{-23}) \cdot 2^{E-127}$

The sign of a floating point number depends on the sign bit.

S=1 means the floating point number is negative; S=0 means the floating point number is positive.

For example, when 32-bit floating point numbers are 40H, A0H, 00H, 00H, which means S=0, E=129, $M=2^{21}$, then the floating point number is $(1+2^{21}\times2^{-23}) \cdot 2^{129-127}=5.0$.

Given a floating point number 60, corresponding 4 bytes ASCII code is: 42, 70, 00, 00. Transmit order on the bus is 42, 70, 00, 00.

Given a floating point number 1.2, corresponding 4 bytes ASCII code is: 3f, 99, 99, 9a. Transmit order on the bus is 3f, 99, 99, 9a.

6 Altitude Derating Instructions

When the module works in a high altitude area, the controller can set the current working altitude value. The effective setting range is 1000 meters to 5000 meters. The module will perform different degrees of derating according to the set altitude.

In principle, when the altitude is lower than 2000 meters, there is no need to set the altitude value. However considering that the air duct of the system may be blocked during long-term operation, it is recommended to set the actual altitude value when the module works at an altitude greater than 1000 meters.

Example: Set the module operating altitude to 3000 meters

Setting command (data field):

03	00	00 17	00 00 0B B8

Response command for successful setting:

42	F0	00 17	00 00 0B B8

Response command for failure setting:

42	F2	00 17	00 00 0B B8