INFY POWER
英飞源技术

BEC/BEG Power Module
CAN Communication Protocol V1.03

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Ver	Update Reason	Remark	Author	Time
1.00	Release			2018-04-24
1.01	Add Command			2019-06-23
1.02	Address update	Address updated to First Floor, No.1 Building, Linoya Industrial Park, Tangtou No.1 Road, Shiyan, Bao'an District, Shenzhen		2020-07-15
	Modify Err	Modify describe Err 0x23 10/11;0x24 10/11/21		2020-07-15
	Add Command	ADD bidirectional DC/DC high side current set cmd		2020-08-18
1.03	Add Command	1. add DC Discharge cut-off voltage set cmd 2. add off grid inverter set and display cmd 3.add Reactive power setting type cmd 4. add Reactive power set cmd 5.add monitor send cmd interval time recommendations		2021-09-06

CONTENT

1. SUMMARIZE

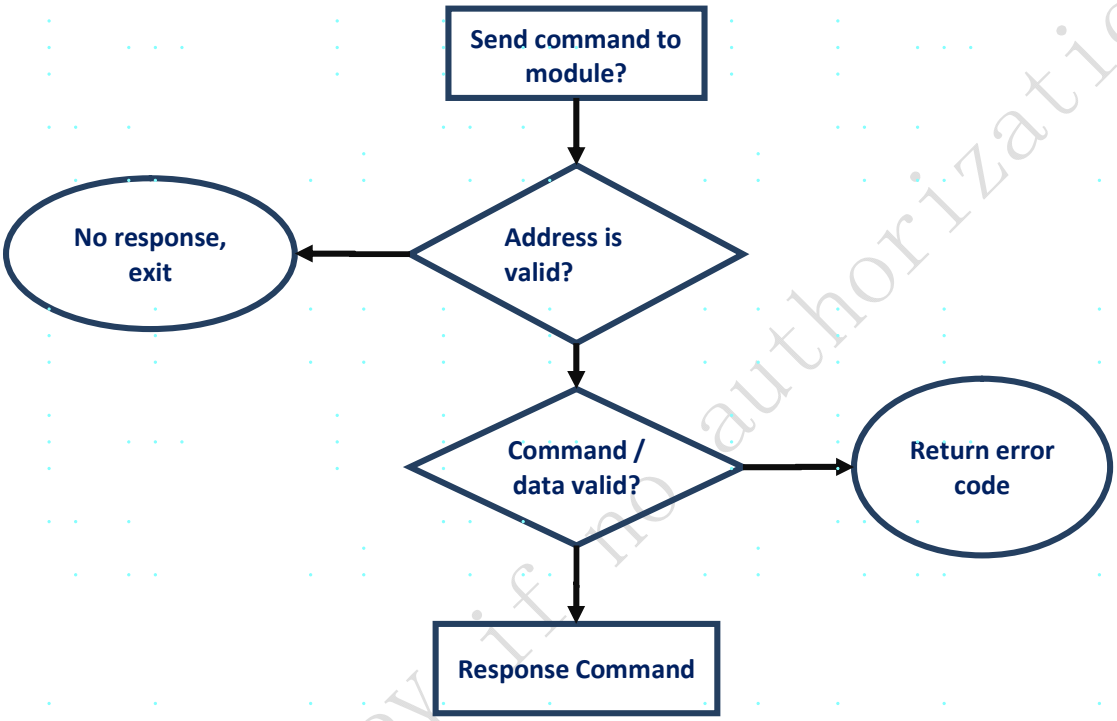
1.1 Bottom Level Protocol

It adopts the extended frame mode of the CAN bus, CAN2.0B.

The communicate BAUD rate is 125K.

CAN bus uses a linear bus terminated at each end with 120 Ω resistors.

1.2 Communication Procedure



1.3 DATA TYPE

Bit shall be sent in the descending order from MSB.

Byte shall be sent in ascending order from byte 0 (Little-endian / Intel type)

Data type includes fixed point number and floating point number.

1.3.1 FIXED POINT NUMBER

1～4 bytes length, detail format and send sequence refer to 2.3.

1.3.2 FLOATING POINT NUMBER

The storage format of floating point number is 4-byte and the number will be sent after it is converted into HEX-ASCII code. The number is sending according to the sequence of sign bit, code, high bit of mantissa,middle Bits of mantissa and low bit of mantissa. The floating point number uses IEEE 32-bit standard floating point number format (standard floating point number format of C language), the length is 32-bit, and

the format is as shown below:

D31	D30—D23	D22—D16	D15—D8	D7—D0
Sign of floating pointnumber	code	high bit of mantissa	middle bit of mantissa	low bit of mantissa

If the code is E, mantissa is M, then: floating point number=$\pm(1+M\times2^{-23})\cdot2^{E-127}$.

Whether the floating point number is positive or negative is dependent on the value of sign bit (S). S=1 means the floating point number is negative, and S=0 means the floating point number is positive.

For example, if the 32-bit floating point number is 43H, FAH, 00H, and 00H (S=0, E=135, M=0x7A0000=61×2^{17}), the value of the floating point number is $(1+61\times2^{17}\times2^{-23})\times2^{135-127}$=500.

If the floating point number is 40.0, the 4-byte ASCII code is 42, 20, 00, 00, and the sending sequence is 42, 20, 00, 00.

If the floating point number is 2.40, the 4-byte ASCII code is 40, 19, 99, 9A, and the sending sequence is 40, 19, 99, 9A.

2. Application Frame Format & Data Definition

2.1 Frame Format

Frame is the basic unit of the information. The frame format is shown as the table below.

Description	Code
Start of frame	sof(1bit)
Arbitration field	Identifier (11bits)
	SRR
	IDE
	Extended Identifier (18bits)
	RTR
Control field	Reserved(2 bit)
	Data Len(4 bits)
Data field	Data(0~8bytes)
CRC field	CRC(16bits)
Ack field	Ack(2bits)
End of frame	(7bits)

The data length is 8 in this protocol. The controllable part is identifier field and data field：

Identifier	**Data**			
29 bits	**Byte 1**	**Byte 2**	**……**	**Byte 8**
Identifier	Data （8 Bytes）			

2.2 Identifier

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
Error code (3 bits)			Device No (4 bits)				Command No (6 bits)						Destination Address (8 bits)								Source Address (8 bits)							

Error code： Message error reason

Error code	Description
0x00	Normal
0x01	/
0x02	Command invalid
0x03	Data invalid
0x07	In start processing

Device No.:

Device No	Description
0x0A	Protocol between controller and single module
0x0B	Protocol between controller and module group

Command No：Detailed info refers to sector 2.3.

Destination address/Source Address：

It is a broadcast message if the module address in destination address is 0x3F, broadcast message don't need answer except reading and setting system information commands.

When the Device No. is 0x0A, the data from controller to module, the destination address is the module address.

When the Device No. is 0x0B, the data from controller to module, the destination address is the module group address.

If the command is system information commands with the Device No. is 0x0A, if the destination address is 0x3F, the Master module will feedback with the source address 0x3F to show it is system information feedback.

If the command is system information commands with the Device No. is 0x0B, the destination address is module group address, the Master module in this module group will feedback with the source address same to group address to show it is group system information feedback.

	destination/source address							
	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
module	Reserved(0,0)		Module address :00~0x3E Broadcast address:3F					
Controller	Controller address :0xF0~0xF8, default address:0xF0							

Supports up to 60 modules in parallel.

The module will get the automatic allocated address after power on.

The group number is determined by the dial on the panel.

If just have one group in the system, the dial should all switch to zero.

The power module address in the System/Group is distributed automaticly in the 0x07 err code Start processing and at this time it should not start the set and control logic.

2.3 Data field description

CMD	W/R	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x23	R	0x10	0x01			System DC side Voltag (mV)			
0x23	R	0x10	0x02			System DC side Total Current(mA)			
0x23	R	0x10	0x10					System Power module number	
0x23	R	0x11	0x01			Power module DC side Voltage (mV)			
0x23	R	0x11	0x02			Power module DC side current(mA)			
0x23	R	0x11	0x03			AC AB line Voltage (mV)			
0x23	R	0x11	0x04			AC BC line Voltage (mV)			
0x23	R	0x11	0x05			AC CA line Voltage (mV)			
0x23	R	0x11	0x06			Power module Ambient temperature (m℃)			
0x23	R	0x11	0x10				Power module status2	Power module status1	Power module status0
0x23	R	0x11	0x11				Inverter Status2	Inverter Status1	Inverter status0
0x23	R	0x11	0x20					module group number	
0x23	R	0x11	0x30			DC max output voltage (mV)			
0x23	R	0x11	0x31			DC min output voltage (mV)			
0x23	R	0x11	0x32			DC max output current (mA)			
0x23	R	0x11	0x33			DC rated output power (mW)			
0x23	R	0x21	0x01			AC A phase Voltage (mV)			
0x23	R	0x21	0x02			AC B phase Voltage (mV)			
0x23	R	0x21	0x03			AC C phase Voltage (mV)			
0x23	R	0x21	0x04			AC A phase current (mA)			
0x23	R	0x21	0x05			AC B phase current (mA)			
0x23	R	0x21	0x06			AC C phase current (mA)			
0x23	R	0x21	0x07			AC frequency (mHz)			
0x23	R	0x21	0x08			Total active power (mW)			
0x23	R	0x21	0x09			AC A phase active power (mW)			
0x23	R	0x21	0x0A			AC B phase active power (mW)			
0x23	R	0x21	0x0B			AC C phase active power (mW)			

CMD	W/R	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x23	R	0x21	0x0C			Total reactive power (mVA)			
0x23	R	0x21	0x0D			AC A phase reactive power(mVA)			
0x23	R	0x21	0x0E			AC B phase reactive power(mVA)			
0x23	R	0x21	0x0F			AC C phase reactive power(mVA)			
0x23	R	0x21	0x10			Total apparent power (mVA)			
0x23	R	0x21	0x11			AC A phase apparent power(mVA)			
0x23	R	0x21	0x12			AC B phase apparent power(mVA)			
0x23	R	0x21	0x13			AC C phase apparent power(mVA)			
0x23	R	0x41	0x01			PM DC high voltage side voltage (mV)			
0x23	R	0x41	0x02			PM DC high voltage side current (mA)			
0x24	W	0x10	0x01			System DC voltage (mV)			
0x24	W	0x10	0x02			System Total DC current (mA)			
0x24	W	0x11	0x01			Power module DC side voltage (mV)			
0x24	W	0x11	0x02			Power module DC side current (mA)			
0x24	W	0x11	0x10						module On/Off
0x24	W	0x11	0x20						Green Led blink
0x24	W	0x11	0x21						sleep
0x24	W	0x11	0x22						Walk-in enable
0x24	W	0x11	0x32			DC DisCharge cut-off voltage (mV)			
0x24	W	0x21	0x05			Power Factor adjust (0.001) Set Abs in (0.8,1)			
0x24	W	0x21	0x08			Set Reactive Power value (mVar)			
0x24	W	0x21	0x10						Working mode
0x24	W	0x21	0x17						Reactive Power Setting Type
0x24	W	0x21	0x20			Level 1 over voltage protection value (mV) (rated~2*rated)			
0x24	W	0x21	0x21			Level 1 over voltage protection time (ms) (1ms~10000s)			
0x24	W	0x21	0x22			Level 2 over voltage protection value (mV) (rated~2*rated)			
0x24	W	0x21	0x23			Level 2 over voltage protection time (ms) (1ms~10000s)			
0x24	W	0x21	0x24			Level 1 under voltage protection value (mV) (0.2*rated~rated)			
0x24	W	0x21	0x25			Level 1 under voltage protection time (ms) (1ms~10000s)			
0x24	W	0x21	0x26			Level 2 under voltage protection value (mV) (0.2*rated~rated)			
0x24	W	0x21	0x27			Level 2 under voltage protection time (ms) (1ms~10000s)			
0x24	W	0x21	0x28			Level 1 over frequence protection value (mHz) (rated~rated+5Hz)			
0x24	W	0x21	0x29			Level 1 over frequence protection time (ms) (1ms~10000s)			
0x24	W	0x21	0x2A			Level 2 over frequence protection value (mH) (rated~rated+5Hz)			

CMD	W/R	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x24	W	0x21	0x2B			Level 2 over frequence protection time (ms) (1ms～10000s)			
0x24	W	0x21	0x2C			Level 1 under frequence protection value (mHz) (rated-5Hz～rated)			
0x24	W	0x21	0x2D			Level 1 under frequence protection time (ms) (1ms～10000s)			
0x24	W	0x21	0x2E			Level 2 under frequence protection value /mHz (rated-5Hz～rated)			
0x24	W	0x21	0x2F			Level 2 under frequence protection time (ms) (1ms～10000s)			
0x24	W	0x21	0x30			Long time over voltage protection value /mV (rated～2*rated)			
0x24	W	0x21	0x31			Long time over voltage protection time (ms) (1ms～10000s)			
0x24	W	0x41	0x01			Power module DC high voltage side voltage/ mV			
0x24	W	0x41	0x02			Power module DC high voltage side current/ mA			

Command basic principle：

（1）CMD=0x23 denote reading the PM information，0x24 denote writingthe PM setting.

（2）Byte0 =0x10 denote system basic information，Byte0 =0x11 denote single PM basic information，Byte0 =0x21 denote single PM AC side information，Byte0 =0x41 denote single bidirectional DC/DC PM basic information.

（3）blank part is reserved，default value is 0.

PM: Power module

2.4 Data field description

2.4.1 Reading data field

Command No	Description	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7
0x23	Read system information	0x10	0x01						
		0x10	0x02						
		0x10	0x10						
		NULL Note： Device No. is 0x0A, the destination address is broadcast address 0x3F; Device No. is 0x0B, the destination address is group No.							
	Answer	0x10	0x01			System DC Voltage（mV）			
		0x10	0x02			System DC total current（mA）			
		Note： Device No is 0x0A,module answer the total current of the system, the source address is 0x3F; Device No is 0x0B,module answer the total current of the group, the source address is group No.							
		0x10	0x10						Mdl numbers
		Note： Device No. is 0x0A,module answer the total system Mdl numbers; Device No. is 0x0B,module answer the Group Mdl numbers							

<table>
<tr><th rowspan="2">Command No</th><th rowspan="2">Description</th><th colspan="8">Data infomation</th></tr>
<tr><th>Byte0</th><th>Byte1</th><th>Byte2</th><th>Byte3</th><th>Byte 4</th><th>Byte 5</th><th>Byte 6</th><th>Byte 7</th></tr>
<tr><td></td><td>Case</td><td colspan="8">Ctrl Tx： 02 A3 3F F0 10 01 00 00 00 00 00 00——read system DC voltage
Mdl Ans：02 A3 F0 3F 10 01 00 00 00 0A AE 60——system DC voltage value is 700V

Ctri Tx： 02 A3 3F F0 10 02 00 00 00 00 00 00——read system DC current
Mdl Ans：02 A3 F0 3F 10 02 00 00 00 00 C3 50——system DC total current is 50A

Ctrl Tx： 02 E3 02 F0 10 10 00 00 00 00 00 00——read group 2 Mdl numbers
Mdl Ans：02 E3 F0 02 10 10 00 00 00 00 00 05——group 2 Mdl numbers is 5</td></tr>
<tr><td rowspan="9">0x23</td><td rowspan="2">Read Mdl N# infomation</td><td>0x11</td><td>0x01
0x02
0x03
0x04
0x05
0x06
0x10
0x11
0x20
0x30
0x31
0x32
0x33</td><td colspan="4"></td></tr>
<tr><td colspan="8">Blank is 0
Note：N is the destination address.</td></tr>
<tr><td rowspan="7">Answer</td><td colspan="8">Point to Point command, destination Mdl answer command;if group command, all the Mdl in Group answer r the current validate value.</td></tr>
<tr><td>0x11</td><td>0x01
0x02
0x03
0x04
0x05
0x06
0x30
0x31
0x32
0x33</td><td colspan="6">The correspond Mdl information</td></tr>
<tr><td colspan="8">Note：voltage unit is mV,current unit is mA, power unit is mW,temperature unit is m℃，</td></tr>
<tr><td>0x11</td><td>0x10</td><td colspan="2"></td><td>Mdl status2</td><td>Mdl status1</td><td>Mdl status0</td></tr>
<tr><td>0x11</td><td>0x11</td><td colspan="2"></td><td>Inverter statu 2</td><td>Inverter statu 1</td><td>Inverter statu 0</td></tr>
<tr><td colspan="8">Blank is 0, status of the bit meaning reference the 2.4.3</td></tr>
<tr><td>0x11</td><td>0x20</td><td colspan="3"></td><td colspan="2">Mdl group number</td></tr>
<tr><td colspan="8">Blank is 0,</td></tr>
<tr><td>Case</td><td colspan="8">Ctrl Tx： 02 A3 00 F0 11 01 00 00 00 00 00 00——read Mdl #0 DC side voltage
Mdl Ans：02 A3 F0 00 11 01 00 00 00 07 a1 20 ——Mdl #0 DC side voltage value is 500V

If the Mdl address is 0, and in the group 2, use the Group Device No. ask（all the Mdl in this group answerthe command with the Mdl address）

Ctrl Tx： 02 E3 02 F0 11 03 00 00 00 00 00 00——read group 2 Mdl AC line ABvoltage
Mdl Ans：02 E3 F0 00 11 03 00 00 00 04 BA F0——Group 2 Mdl(add is 0）answer VAB=310V</td></tr>
<tr><td rowspan="4">0x23</td><td rowspan="2">Read Mdl N# AC side infomation</td><td>0x21</td><td>0x01~0x13</td><td colspan="4"></td></tr>
<tr><td colspan="8">Blank is 0
Note：N is the destination address.</td></tr>
<tr><td rowspan="2">Answer</td><td colspan="8">Point to Point command, Mdl answer command;if group command, all the Mdl in Group answer the current validate value.</td></tr>
<tr><td>0x21</td><td>0x01~0x13</td><td colspan="2"></td><td colspan="3">The correspond Mdl information</td></tr>
<tr><td colspan="8">Note：voltage unit is mV,current unit is mA, power unit is mW,temperature unit is m℃,frequence unit is mHz</td></tr>
</table>

Command No	Description	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7
0x23	Case	Ctrl Tx： 02 A3 00 F0 21 04 00 00 00 00 00 00——read Mdl #0 A phase current information Mdl Ans：02 A3 F0 00 21 04 00 00 00 0013 88——Mdl #0 current is 5A If the Mdl address is 0, and in the group 2, use the Group Device No. command（all the Mdl in this group answer the command with the Mdl address） Ctrl Tx： 02 E3 02 F0 21 08 00 00 00 00 00 00——read group 2 Mdl total active power value Mdl Ans：02 E3 F0 00 21 08 00 00 00 E4 E1 C0——group 2 Mdl（add is 0）answer total active power is 15kW.							

2.4.2 Setting data field

Command No	Description	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7
0x24	Setting system all Mdl output	0x10	0x01			System DC voltage（mV）			
		0x10	0x02			System total DC current（mA）			
		Note： The destination address is 0x3F, if the device No.is 0x0A. The destination address is group No.,if the device No.is 0x0B. Voltage unit is mV,current unit is mA, and the current value is the all Mdls output current sum. If the group setting is changed, it must wait for 4s ,after this change then can send this order							
	Answer	Note： If it is broadcast command, only master Mdl answer the command, and the source address is 3F. If it is group command, only the master Mdl in group answer the command, and the source address is group number. The answer data is the current setting value.							
	Case	Ctrl Tx： 02 A4 3F F0 10 01 00 00 00 0A D5 70—setting the system DC voltage 710V. Mdl Ans：02 A4 F0 3F 10 01 00 00 00 0A D5 70—master Mdl answer the current setting voltage is 710V If the Mdl address is 0#, the group number is 2#，use the group device number setting , the master Mdl inthe group will answer Ctrl Tx： 02 E4 02 F0 10 02 00 00 00 00 13 88——setting group 2 Mdl total current is 5A Mdl Ans：02 E4 F0 02 10 02 00 00 00 00 13 88——master Mdl in group 2 answer the current setting value							
0x24	Setting single Mdl output	0x11	0x01			Mdl DC voltage（mV）			
		0x11	0x02			Mdl DC current（mA）			
		Note： If the device number is 0A, if the desitination address in the command is 3F, means broadcast command, no answer frame. if the desitination address in the command is single Mdl address, means P2P command, the certain Mdl receive and answer. If the device number is 0B, the desitination address in the command is group number. Voltage unit is mV,current unit is mA.							
	Answer	broadcast command has not answer frame, P2P command has the answer. If it is Group command , all Mdls in the group answer the current validate value.							
	Case	Ctrl Tx：02 A4 3F F0 11 01 00 00 00 0B 71 B0——setting all the Mdls voltage is 750V Mdl Ans：broadcast with no answer Ctrl Tx： 02 A4 00 F0 11 02 00 00 00 00 13 88——setting Mdl0# current is 5A Mdl Ans：02 A4 F0 00 11 02 00 00 00 00 13 88——Mdl0# answer the current setting value if the Mdl address is 0#, the group number is 2#，use the group device number setting , all Mdls in the group will answer with the Mdl address. Ctrl Tx： 02 E4 02 F0 11 01 00 00 00 0A D5 70——setting group 2 Mdls voltage is 710V Mdl Ans：02 E4 F0 00 11 01 00 00 00 0A D5 70——master Mdl (address is 0) in the group answer							

Command No	Description	Data infomation							
		Byte0	Byte1	Byte2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7
0x24	Settingall Mdlopen or close	0x11	0x10					On/off	
		0xA1:Off，0xA0:On Note： Broadcast command, no answer If the device number is 0x0A, the Mdl address is 0x3F for the destination address in the command If the device number is 0x0B, the destination address is the certain group number							
	Answer	broadcast command has no answer frame, P2P command has the answer. If it is Group command , all Mdls in the group answer the current validate value.							
	Case	Ctrl Tx：02 A4 3F F0 11 10 00 00 00 00 00 A1——setting all Mdls Off Mdl Ans：broadcast with no answer Ctrl Tx： 02 A4 00 F0 11 10 00 00 00 00 00 A0——setting Mdl0# On Mdl Ans：02 A4 F0 00 11 10 00 00 00 00 00 A0——Mdl0# answer the current command is On if the Mdl address is 0#, the group number is 2#，use the group device number setting , all Mdls in the group will answer with the Mdl address Ctrl Tx： 02 E4 02 F0 11 10 00 00 00 00 00 A1——setting group 2 Mdls Off Mdl Ans：02 E4 F0 00 11 10 00 00 00 00 00 A1——Mast Mdl in the group(address is 0) answer current command							
0x24	Setting MdlN green LED blink	0x11	0x20					Green led blink	
		Note： 0xA1 blink，0xA0 normal. N is in the destinaion address in the ID							
	Setting MdlNsleep	0x11	0x21					sleep	
		Note： 0xA1：sleep；0x A0：not sleep							
	Setting MdlNwalkin	0x11	0x22					Walkin enable	
		Note： 0xA1 enable walkin，0xA 0 forbit walkin							
	Answer	broadcast command has no answer frame, P2P command has the answer. If it is Group command , all Mdls in the group answer the current validate value.							
	Case	Example with the Mdl N# green LED blink: Ctrl Tx： 02 A4 3F F0 11 20 00 00 00 00 00 A1——setting all Mdls green LED bling Mdl Ans：broadcast with no answer Ctrl Tx： 02 A4 00 F0 11 20 00 00 00 00 00 A0——setting Mdl0# not blink Mdl Ans：02 A4 F0 00 11 20 00 00 00 00 00 A0——Mdl0# answer not blink if the Mdl address is 0#, the group number is 2#，use the group device number setting , all Mdls in the group will answer with the Mdl address Ctrl Tx： 02 E4 02 F0 11 20 00 00 00 00 00 A1——setting group Mdls blink Mdl Ans：02 E4 F0 00 11 20 00 00 00 00 00 A1——Mast Mdl (address is 0) answer blink							
0x24	DC DisCharge cut-off voltage	0x11	32			DC DisCharge cut-off voltage（mV）			
		Note： voltageunit is mV,just for inverter Dc Discharge cut-off voltage							
	Answer	broadcast command has not answer frame, P2P command has the answer. If it is Group command , all Mdls in the group answer the current validate value.							
	Case	Ctrl Tx： 02 A4 00 F0 11 32 00 00 00 04 93 E0——setting Mdl0# Dc Discharge cut-off voltage is 300V Mdl Ans：02 A4 F0 00 11 32 00 00 00 04 93 E0——Mdl0# answer the current setting value if the Mdl address is 0#, the group number is 2#，use the group device number setting , all Mdls in the group will answer with the Mdl address. Ctrl Tx： 02 E4 02 F0 11 32 00 00 00 0A D5 70——setting group 2 Mdls Dc Discharge cut-off voltage is 710V Mdl Ans：02 E4 F0 00 11 32 00 00 00 0A D5 70——master Mdl (address is 0) in the group answer							

<table>
<tr><th rowspan="2">Command No</th><th rowspan="2">Description</th><th colspan="8">Data infomation</th></tr>
<tr><th>Byte0</th><th>Byte1</th><th>Byte2</th><th>Byte3</th><th>Byte 4</th><th>Byte 5</th><th>Byte 6</th><th>Byte 7</th></tr>
<tr><td rowspan="4">0x24</td><td rowspan="2">Setting MdlNwarking mode</td><td>0x21</td><td>0x10</td><td colspan="3"></td><td colspan="2">Working mode</td></tr>
<tr><td colspan="8">Note：
0xA0-rectification（default）;
0xA1-grid connected inverter
0xA2-off grid inverter</td></tr>
<tr><td>Answer</td><td colspan="8">broadcast command has no answer frame, P2P command has the answer.
If it is Group command , all Mdls in the group answer the current validate value.</td></tr>
<tr><td>Case</td><td colspan="8">Ctrl Tx：02 A4 3F F0 21 10 00 00 00 00 00 A1——setting all Mdls is grid connected inverter working mode
Mdl Ans：broadcast command with no answer
Ctrl Tx：02 A4 00 F0 21 10 00 00 00 00 00 A0——setting Mdl0# is rectifier working mode
Mdl Ans：02 A4 F0 00 21 10 00 00 00 00 00 A0——Mdl0# answer current value</td></tr>
<tr><td rowspan="4">0x24</td><td rowspan="2">Setting the AC side protection value and time</td><td>0x21</td><td>0x20
~0x31</td><td colspan="3"></td><td colspan="2">All the setting value</td></tr>
<tr><td colspan="8">Note：protection value unit is mV，protection time is mS</td></tr>
<tr><td>Answer</td><td colspan="8">broadcast command has no answer frame, P2P command has the answer.
If it is Group command , all Mdls in the group answer the current validate value.</td></tr>
<tr><td>Case</td><td colspan="8">Ctrl Tx：02 A4 3F F0 21 20 00 00 00 03 D0 90—setting all Mdls level 1 over voltage protection point is 250V

Mdl Ans：broadcast with no answer

Ctrl Tx： 02 A4 00 F0 21 21 00 00 00 00 07 D0—setting Mdl0# level 1 over voltage protection time is 2S
Mdl Ans：02 A4 F0 00 21 21 00 00 00 00 07 D0—Mdl0# answer the current value</td></tr>
<tr><td rowspan="3">0x24</td><td rowspan="2">Set AC side Reactive Power value</td><td>0x21</td><td>0x08</td><td colspan="3"></td><td colspan="2">Set AC side Reactive Power value（mVar）</td></tr>
<tr><td colspan="8">Note：the unit is mVar</td></tr>
<tr><td>Answer</td><td colspan="8">broadcast command has no answer frame, P2P command has the answer.
If it is Group command , all Mdls in the group answer the current validate value.</td></tr>
<tr><td>Case</td><td colspan="8">Ctrl Tx： 02 A4 00 F0 21 08 00 00 00 0F 42 40—setting Mdl0# Reactive Power output 1000Var
Mdl Ans：02 A4 F0 00 21 08 00 00 00 0F 42 40—Mdl0# answer the current value</td></tr>
<tr><td rowspan="4">0x24</td><td rowspan="2">Set AC side Reactive Power Set Type</td><td>0x21</td><td>0x17</td><td colspan="3"></td><td colspan="2">Reactive Power setting Type</td></tr>
<tr><td colspan="8">Note:
Note: The bidirectional ACDC module provides different ways to set the reactive Power mode according to different customer usage habits, if you want to set the Ac reactive Power, you must first set this command to select the setting type mode, and then use the corresponding small class command to set.
This protocol can be ignored if there is no reactive power setup requirement.

0xA0: Reactive power output is not set (default)
0xA1: By setting Reactive power with the PF setup, the corresponding small class command is 0x21 05
0xA2: By setting Reactive power with reactive power,The corresponding small class command is 0x21 08</td></tr>
<tr><td>Answer</td><td colspan="8">broadcast command has no answer frame, P2P command has the answer.
If it is Group command , all Mdls in the group answer the current validate value.</td></tr>
<tr><td>Case</td><td colspan="8">Ctrl Tx：02 A4 3F F0 21 17 00 00 00 00 00 A0—setting all Mdls : don't set he reactive power output
Mdl Ans：broadcast with no answer

Ctrl Tx： 02 A4 00 F0 21 17 00 00 00 00 00 A2—setting Mdl0# : By setting the command with reactive Power ((0x21 08)) to set
Mdl Ans：02 A4 F0 00 21 21 00 00 00 00 00 A2—Mdl0# answer the current value

Ctrl Tx： 02 A4 00 F0 21 17 00 00 00 00 00 A1—setting Mdl0# : By setting the command with the PF setup (0x21 05) to set
Mdl Ans：02 A4 F0 00 21 17 00 00 00 00 00 A1—Mdl0# answer the current value</td></tr>
</table>

NOTES：

for the certain group command, the device number is 0x0B, the destination address is group number.

If the destination address is 3F, means to all groups, for the emergency situation to close all Mdls. The read command only support system data read, and the setting command only support system command and On/off command.

NOTES： if the frame identifier data is 0x0757F8XX, means the data is the Mdls inner datatransfer, need ignored by the upper controller.

2.4.3 ALARM/STATUS

	Inverter status 2	Inverter status 0	Module status 2	Module status 1	Module status 0
Bit7			1：Mdl PFC side off	1：Mdl communication interrupt alarm	
Bit6			1：input over voltage protection	1：WALK-IN enable	
Bit5			1：input low voltage alarm	1：ouput over voltage alarm	1:Mdl discharge abnormal
Bit4			1：3 phase input unbalance alarm	1：over temperature alarm	1: Mdl sleeping
Bit3			1：3 phase input phase lost alarm	1：Fan fault alarm	
Bit2			1：Mdl load sharing alarm	1：Mdl protection alarm	
Bit1			1：Mdl ID repeat alarm	1：Mdl fault alarm	
Bit0	1:offgrid inverter 0:grid inv	1：invert mode 0：rectifier mode	1：Mdl power limit status	1：Mdl DC side off status	1：output short current

3. BEC/BEG POWER MODULE APPLICATION AND PROTOCOL ATTENTION POINT

3.1 Mdl on/off control

After the upper controller send the Mdl turn on command，need keep the communication, like to send the setting command or read the system data command in series, if the Mdl cannot get the command from the upper controller more than 10s, the Mdl will have the communication fault alarm and trun off auotmaticly.

If the Mdl is on before the communication interrupt, when the communication recovery again, the Mdl will trun on automaticly and output the default setting output voltage and current. But if

the Mdl is offbefore the communication interrupt, when the communication recovery again, it will keep off till the new trun on command sent by the upper controller.

Communication interval time: the controller order interval time should between 50~200ms

3.2 Mdl working mode setting

Bidirectional power module can working in several mode, like rectification or grid connection inverter mode, this mode will storage into the EEPROM，before trun on the Mdl, the upper controller should do the mode setting firstly to keep the right current flow direction.

3.3 Mdl walk in

Walk in function can make the output current start from zero to rated in the appoint time to avoid the impact to the input source. The default time is 5S, and enable. The upper controller also can instead this function by send the current limit command step by step.

The standard Mdl turn on time sequence：Power on—setting the working mode—setting the Mdl output voltage and current—switch on the system output contactor—Mdl open.

The standard Mdl trun off sequence：Mdl close—switch off the system output contactor.

3.4 Mdl Output voltage and current setting

Different Mdl have different voltage and current setting scale, if the setting value exceed the Mdl accept scale, the command will not implement. And the value will still use the before valid setting value(if not setting before, will use the default value).

If the system has the Mdl protection and fault alarm, can by the command“02 A3xx F0 11 10 00 00 00 00 00 00”and“02 A3xx F011 11 00 00 00 00 00 00”（xx is the Mdl address）to get the Mdl status，this Mdl will not implement the open command，and will not been calculated as the part of the system total current average setting.

It can control the Mdl’s voltage and current by the command of system total current setting and voltage setting. To fit different control way，also can use the single Mdl control command to control the system total Mdls or Groups inner all Mdls or single Mdl’s voltage and current. the upper controller needs to select the right command to setting the ouput current.

3.5 Mdl sleep function

Sleeping function is used to improve the Mdl power transfer efficiency when the low

load.

the sleep command can be enable or disable ,The sleep Mdl is in the stand by status, and can not open by the turn on command. And also not join the total current calculate. So need to do the sleep setting before the current limit command send.

For example, the system has 6 Mdls, address is from 0 to 5, and the load requirement is 40A，If the upper controller want to let address 0 and 1 Mdls go into sleep mode to improve the efficience, need to send the command ”02 A4 00 F0 11 21 00 00 00 00 00 A1” and “02 A4 01 F0 11 21 00 00 00 00 00 A1” ahead to let the Mdl0 and Mdl1 to sleep, and then by the command of system total current to send 40A. and then send the system Mdls turn on command. This will let the Mdl 0 and 1 close, and Mdle 2~5 open，each Modle will output 10A, total 40A.

3.6 CAN communication hardware wiring

To avoid the disturb, system CAN wiring should far away from the power cable, and use the twisted pair cable with the shielding layer. And use the 120Ω matched resistance on the cable two ends.

The instructions interval of sending to module from monitoring is recommended to be 50 to 200ms , greater than 20ms.