# MOD-BUS protocol

|  |  |  |  |
| --- | --- | --- | --- |
| 版本号 | 修改内容 | 日期 | 作者 |
| V2.0 | 通信规范 | 2017-02-25 | 吴红宇 |
| V3.0 | 增加绝缘显示、温度报警区分充电和放电、增加从控故障报警 | 2017-04-25 | 吴红宇 |
| V3.2 | 增加BMS控制寄存器 | 2018-1-29 | 吴红宇 |

## 1. communication specification

1. This is based on Modbus/RTU
2. EMS is master, BMS is slave
3. BMS default address 0x0
4. Split time between messages can’t over 300ms
5. Default rate 57600；

## 2. Protocol format

#### Application message format

|  |  |  |  |
| --- | --- | --- | --- |
| Address | Function code | Data | Check code |
| 1B | 1B | NB | 2B |

#### Function codes

Function codes description：

|  |  |  |
| --- | --- | --- |
| Function code | Name | Description |
| 03H | Read | Read register value |
| 06H | Single write | Modify single register value |
| 10H | Multi write | Modify multi-register value |

## 3. Function code description

#### Read register(03H)

Request PDU format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Address | Function code | Start address high bit | Start address low bit | Register number high | Register number low | Check code |
| 1B | 03H | 1B | 1B | 1B | 1B | 2B |

Request PDU format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Address | Function code | Byte number | value | Check code |
| 1B | 03H | 1B | 2\*NB | 2B |

Error response PDF format

|  |  |  |  |
| --- | --- | --- | --- |
| Address | Error code | Error type | Check code |
| 1B | 83H | 1B | 2B |

#### Write single register(06H)

Request PDU format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Address | Function code | Register address high | Register address low | Register value high | Register value low | Check code |
| 1B | 06H | 1B | 1B | 1B | 1B | 2B |

Response PDU format

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Address | Function code | Register address high | Register address low | Register value | Check code |
| 1B | 06H | 1B | 1B | 2B | 2B |

Error response PDU format

|  |  |  |  |
| --- | --- | --- | --- |
| Address | Error code | Error type | Check code |
| 1B | 86H | 1B | 2B |

#### Multi write register (10H)

Request PDU format

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Address | Function code | Start address high | start address low bit | Register number high byte high bit | register number low byte low bit | bytes | Register value | Check code |
| 1B | 10H | 1B | 1B | 1B | 1B | 1B | 2\*NB | 2B |

Response PDU FORMAT

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ADDRESS | FUNCTION CODE | START ADDRESS HIGH | START ADDRESS LOW | Register number high byte high bit | register number low byte low bit | CHECK CODE |
| 1B | 10H | 1B | 1B | 1B | 1B | 2B |

ERROR RESPONSE PDU FORMAT

|  |  |  |  |
| --- | --- | --- | --- |
| ADDRESS | ERROR CODE | ERROR TYPE | CHECK CODE |
| 1B | 90H | 1B | 2B |

#### ERROR TYPE DEFINE

|  |  |
| --- | --- |
| **ERROR VALUE** | **DESCRIPTION** |
| 01 | FUNCTION CODE NOT AVILATION |
| 02 | ILLEGAL REGISTER ADDRESS |
| 03 | REGISTER VALUE NUMBER NOT RIGHT OR ILLEGAL |
| 04 | FUNCTION CODE DEALING ERROR |

## 4. REGISTER DEFINE

### BMS CONTROL REGISTER

|  |  |  |  |
| --- | --- | --- | --- |
| **ADDRESS** | **NAME** | **PROFILE** | **DESCRIPTION** |
| 0x1017 | 一键并网开关  One Key Parallel Switch | 读写  RW | 0x1:启动 START，0x2:结束 STOP  启动一键并网后BMS会将断网的支路依次并联回主回路 |
| 0x1018 | 第一簇是否使用  Cluster 1 is use | 读写  RW | 0x1:使用 ENABLE,0x2:不使用 DISABLE  当设置为“不使用”时，该簇接触器会断开，并且后续并网时该簇不再执行并网操作，该操作仅限改支路故障无法恢复，为了不影响系统运行时方可使用 |
| 0x1019 | 第二簇是否使用  Cluster 2 is use | 读写  RW | 同上  SAME AS ABOVE |
| 0x101A | 第三簇是否使用  Cluster 3 is use | 读写  RW | 同上 |
| 0x101B | 第四簇是否使用  Cluster 4 is use | 读写  RW | 同上 |
| 0x101C | 第五簇是否使用  Cluster 5 is use | 读写  RW | 同上 |
| 0x101F | 系统绝缘一级门限  System insulation level 1 | 读写  RW | 单位unit：Ω/V |
| 0x1020 | 系统绝缘二级门限  System insulation level 2 | 读写  RW | 单位：Ω/V |
| 0x1022 | EMS通信超时时间  EMS communication timeout time | 读写  RW | 单位unit：S，default 90 |
| 0x1023 | EMS地址  Ems address | 读写  RW | 默认为0  Default 0 |
| 0x2010 | 第一簇主正接触器  Rack 1 positive contactor | 读写 | 0x0:断开stop（其他值无效） |
| 0x3010 | 第二簇主正接触器  Rack 2 positive contactor | 读写 | 0x0:断开stop（其他值无效） |
| 0x4010 | 第三簇主正接触器  Rack 3 positive contactor | 读写 | 0x0:断开stop（其他值无效） |
| 0x5010 | 第四簇主正接触器  Rack 4 positive contactor | 读写 | 0x0:断开stop（其他值无效） |
| 0x6010 | 第五簇主正接触器  Rack 5 positive contactor | 读写 | 0x0:断开stop（其他值无效） |

### BMS system status register

|  |  |  |  |
| --- | --- | --- | --- |
| Address | **Name** | **Define** | Description |
| 0x1044 | 系统充放电状态  System charge/discharge status | 只读  Read only | 0x0:静置 static；0x1:放电 discharge；0x2:充电 charge |
| 0x1045 | 系统总电流  System current | Read only | Int16  范围：-500A～500A  例：CUR=1234,discharge:123.4A  CUR=-1234, charge: 123.4A |
| 0x1046 | 保留  Reserve | 只读 |  |
| 0x1047 | 系统SOC  System soc | 只读 | 范围：0%～100% |
| 0x1048 | 系统运行状态  System running status | 只读 | 0：正常normal（系统可以放电，可以充电allow discharge and charge）  1：充满fully charged（系统可以放电，不能充电allow discharge, deny charge）  2：放空 discharge empty（系统可以充电，不能放电allow charge, deny discharge）  3：待机standby（系统不能放电，不能充电deny discharge, deny charge）  4：停机 stopped（系统不能放电，不能充电deny discharge, deny charge） |
| 0x1049 | 系统总电压  System total voltage | 只读 | 例：VOL =6912，对应电压为691.2V |
| 0x104A | 系统绝缘值  System insulation | 只读 | 所有支路最小值  Min insulation |
| 0x104E | 系统最大充电电流  System max charge current | 只读 | 单位unit：0.1A |
| 0x104F | 系统最大放电电流  System max discharge current | 只读 | 单位：0.1A |
| 0x1081 | 总控报警寄存器  Master alarm register | 只读 | Bit5-bit15:保留 reserve  Bit4:系统绝缘二级告警 system insulation alarm level 2  Bit3:系统绝缘一级告警system insulation alarm level 1  Bit2:PCS/EMS控制失效报警  PCS/EMS control fail alarm  Bit1:PCS/EMS通讯故障报警  PCS/EMS communication failure alarm  Bit0:与主控通信故障  communication error with Submaster |
| 0x1082 | 主控通讯故障报警  Submaster communication fault | 只读 | Bit4:主控5通讯故障submaster5 communication fault  Bit3:主控4通讯故障submaster4 communication fault  Bit2:主控3通讯故障submaster3 communication fault  Bit1:主控2通讯故障submaste2 communication fault  Bit0:主控1通讯故障submaster1 communication fault |
| 0x1083 | 第一簇无法并网原因  Reason of start of rack1 | 只读 | Bit5:存在二级告警 level2 alarm  Bit4:PCS控制失效 pcs control fault  Bit3:与总控通信故障 communication with master error  Bit2:设备故障 device error  Bit1:簇与簇环流过大（大于4A）rack cycle over current  Bit0:簇与簇压差过大（大于50V）  Rack volt diff |
| 0x1084 | 第二簇无法并网原因  Reason of start of rack2 | 只读 | 同上 |
| 0x1085 | 第三簇无法并网原因  Reason of start of rack3 | 只读 | 同上 |
| 0x1086 | 第四簇无法并网原因  Reason of start of rack4 | 只读 | 同上 |
| 0x1087 | 第五簇无法并网原因  Reason of start of rack5 | 只读 | 同上 |

### Submaster status register

**Register address = basic address + offset address**

Basic address for each rack

|  |  |
| --- | --- |
| **Rack** | **Basic address** |
| Rack1 | 0X2000 |
| Rack2 | 0X3000 |
| Rack3 | 0X4000 |
| Rack4 | 0X5000 |
| Rack5 | 0X6000 |

Cluster X(X=1,2,3,4,5) mean rack 1,2,3,4,5

#### Single rack status

|  |  |  |
| --- | --- | --- |
| **Offset** | **Name** | **Description** |
| 0x0100 | 电池总电压  ClusterX Voltage | 例：VOL =6912，对应电压为691.2V |
| 0x0101 | 电池主回路电流  ClusterX Current | 16位有符号整型 范围：-500A～500A  例：CUR=1234，对应放电电流123.4A  CUR=-1234，对应充电电流123.4A |
| 0x0102 | 充放电指示  ClusterX Charge State | 0x0:静置；0x1:放电；0x2:充电 |
| 0x0103 | ClusterXSOC | 范围：0%～100% |
| 0x0104 | 健康度  ClusterXSOH | 范围：0%～100% |
| 0x0105 | 单体电压最高节电池序号  ClusterX Max Cell Voltage Id | 范围：1#～512# |
| 0x0106 | 单体最高电压值  ClusterX Max Cell Voltage | 例：VOL=3201，对应电压为3.201v |
| 0x0107 | 单体最低电压值电池序号  ClusterX Min Cell Voltage Id | 范围：1#～512# |
| 0x0108 | 单体最低电压值  ClusterX Min Cell Voltage | 例：VOL=3201，对应电压为3.201v |
| 0x0109 | 最高电池温度采样点序号  ClusterX Max Cell Temperature Id | 范围：1#～512# |
| 0x010A | 最高电池温度值  ClusterX Max Cell Temperature | 16位有符号整型 范围：-40～150℃  单位0.1℃ |
| 0x010B | 最低电池温度采样点序号  ClusterX Min Cell Temperature Id | 范围：1#～512# |
| 0x010C | 最低电池温度值  ClusterX Min Cell Temperature | 16位有符号整型 范围：-40～150℃  单位0.1℃ |

#### Alarm information, stopped information register

|  |  |  |
| --- | --- | --- |
| **Offset** | **Name** | **description** |
| 0x0140 | 二级报警  Alarm level 2 | Bit15:放电温度过低二级报警 discharge T low level 2  Bit14:放电温度过高二级报警 discharge T high level 2  Bit13：保留  Bit12：保留  Bit11:：保留  Bit10：极柱温度过高二级告警 GR T high alarm level 2  Bit9：保留  Bit8：保留  Bit7: 充电温度过低二级报警Cluster X Cell Temperature Low Alarm Level 2  Bit6: 充电温度过高二级报警Cluster X Cell Temperature High Alarm Level 2  Bit5: 放电过流二级报警Cluster X Discharge Current High Alarm Level 2  Bit4: 总电压欠压二级报警Cluster X Total Voltage Low Alarm Level 2  bit3: 单体欠压二级报警Cluster X Cell Voltage Low Alarm Level 2  bit2: 充电过流二级报警Cluster X Charge Current High Alarm Level 2  bit1: 总电压过压二级报警Cluster X Total Voltage High Alarm Level 2  bit0: 单体过压二级报警Cluster X Cell Voltage High Alarm Level 2  其中：0-正常 normal，1-报警有效 alarm |
| 0x0141 | 一级报警 | Bit15:放电温度过低一级报警 discharge T low level 1  Bit14:放电温度过高一级报警discharge T high level 1  Bit13：总电压差异过大一级报警  ClusterXTotal Voltage Diff High Alarm Level 1  Bit12：保留  Bit11: 单体差异过大一级告警  Cluster X Cell Voltage Diff High Alarm Level 1  Bit10: 极柱温度过高一级告警 GR T high alarm level 1  Bit9：温度差异过大一级报警 T diff alarm level 2  Bit8: SOC过低一级报警  ClusterXSOC Low Alarm Level 1  Bit7: 充电温度过低一级报警  Cluster X Cell Temperature Low Alarm Level 1  Bit6: 充电温度过高一级报警  Cluster X Cell Temperature High Alarm Level 1  Bit5: 放电过流一级报警  Cluster X Discharge Current High Alarm Level 1  Bit4: 总电压欠压一级报警  Cluster X Total Voltage Low Alarm Level 1  bit3: 单体欠压一级报警  Cluster X Cell Voltage Low Alarm Level 1  bit2: 充电过流一级报警  Cluster X Charge Current High Alarm Level 1  bit1: 总电压过压一级报警  Cluster X Total Voltage High Alarm Level 1  bit0: 单体过压一级报警  Cluster X Cell Voltage High Alarm Level 1  其中：0-正常 normal，1-报警有效 alarm |
| 0x0142 | 本支路运行状态  ClusterXRun State | 0x0：正常 normal  0x1：禁止充电deny charge  0x2：禁止放电 deny discharge  0x3：禁止充放 deny discharge and charge |

从控故障信息：

|  |  |  |
| --- | --- | --- |
| 0x0185 | 从控告警设备故障  Slave running status error code | Bit12:从控初始化失败  Bit12: Slave init error  Bit11:EEPROM故障  Bit11:EEPROM Error  Bit10:内网通信故障  Bit10:inner communication error  Bit9:温度采样线故障  Bit9:T sensor cable error  Bit8:均衡模块故障  Bit8:balance module error  Bit7:温度板模块故障  Bit7:T pcb error  Bit6:极耳温度故障  Bit6:GR T error  Bit5:温度传感器故障  Bit5:T sensor error  Bit4:温度采样故障  Bit4:T sensor error  Bit3:电压采样故障  Bit3:Volt sensor error  Bit2:LTC6803故障  Bit2:LTC6803 ERROR  Bit1:连接线故障  Bit1:connect cable error  Bit0:采样线故障  Bit0:sensor cable error  value：0-normal，1-error |

#### Voltage register

|  |  |  |
| --- | --- | --- |
| **offset** | **name** | **description** |
| 0x0800 | 当前组第1节电池电压  ClusterX Battery Voltage 1 | 例：VOL=3201，对应电压为3.201v； |
| … | … |
| 0x08D7 | 当前组第216节电池电压  ClusterX Battery Voltage 216 |

单体个数最大支持512串，具体串数以项目实际为准

#### Temperature register

|  |  |  |
| --- | --- | --- |
| **Offset** | **Name** | **Description** |
| 0x0C00 | 当前组第1个温度测量点温度值  ClusterXBatteryTemperature 1 | 16位有符号整型 范围：-40～150℃  单位0.1℃ |
| … | … |
| 0x0C6b | 当前组第108个温度测量点温度值  ClusterXBatteryTemperature 108 |

温度个数最大支持256个，具体串数以项目实际为准

注：以上寄存器若未指明数据类型的默认均为无符号整形