

BMS 与后台 MODBUS 通讯点表

| 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. 通信规范

1. This protocol is based on standard Modbus/RTU structure;
2. 本协议主要涉及对相关寄存器的解析以及规范基本读写方式,其余涉及通信的时序、延时时间、超时时间均以 Modbus/RTU 通讯协议为准;
3. EMS works as Master, BMS works as Slave;
4. BMS default address is 0x1;
5. Each data transfer speed shall not be slower than 300ms;
6. Default baud rate is 57600;

BUSINESS

2. Packet Basic Format

Application Specific Packet Basic Format:

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

Function Code Register

Here list the available function code registers with definition and function descriptions:

| Function Code | Definition | Function Descriptions |
|---------------|--------------------------|-----------------------------------|
| 03H | Read register | Read value from relevant register |
| 06H | Write to single Register | Modify value in single register |
| 10H | Write to multi Registers | Modify values in multi registers |

Check Code Register

采用标准 MODBUS 协议中的 16 位循环冗余校验码(CRC)算法,生成多项式为 $X^{15}+X^{13}+1$, 传输时低 8 位在前, 高 8 位在后。从报文首字节(即地址域)到 CRC 码之前的所有报文字节都参与 CRC 码的计算。

生成 CRC 校验码的具体流程如下:

- 1) 预置 1 个 16 位的 CRC 寄存器为 0xFFFF (全 1)。
- 2) 把数据帧中的第 1 个字节和 CRC 寄存器中的低 8 位进行异或运算,结果存回到 CRC 寄存器中。
- 3) 将 CRC 寄存器右移 1 位, 最高位填 0, 最低位移出并检测。
- 4) 如果最低位为 0, 重复第 3 步(下一次移位)。

如果最低位为 1, 将 CRC 寄存器和生成多项式进行异或运算。

- 5) 重复第 3 步和第 4 步, 直到 8 次移位完成, 这样数据帧中的 1 个字节就处理结束了。
- 6) 重复第 2 步到第 5 步, 把数据帧中所有字节就处理完毕。
- 7) 最终, CRC 寄存器中的数值就是所求的 16 位 CRC 校验码。

3. Function Code Description

Read Register(03H)

Enquiry PDU Format:

| Address | Function Code | Start Add | Start Add | Register Number | Register Number | Check Code |
|---------|---------------|-----------|-----------|-----------------------|---------------------|------------|
| | | High Add | Low Add | High Add High Byte | Low Add Low Byte | |
| 1B | 03H | 1B | 1B | 1B | 1B | 2B |

Response PDU Format:

| Address | Function Code | Bytes | Register Value | Check Code |
|---------|---------------|-------|----------------|------------|
| 1B | 03H | 1B | 2*NB | 2B |

Fault Response PDU Format:

| Address | Fault Code | Fault Type | Check Code |
|---------|------------|------------|------------|
| 1B | 83H | 1B | 2B |

Write to single register(06H)

Enquiry PDU Format:

| Address | Function Code | Register Add | Register Add | Register Value | Register Value | Check Code |
|---------|---------------|--------------|--------------|----------------|----------------|------------|
| | | High | Low | High | Low | |
| 1B | 06H | 1B | 1B | 1B | 1B | 2B |

Response PDU Format:

| Address | Function Code | Register Add | Register Add | Register Value | Check Code |
|---------|---------------|--------------|--------------|----------------|------------|
| | | High | Low | Value | |
| 1B | 06H | 1B | 1B | 2B | 2B |

Fault Response PDU Format:

| Address | Fault Code | Fault Type | Check Code |
|---------|------------|------------|------------|
| 1B | 86H | 1B | 2B |

Write to Multi Registers(10H)

Enquiry PDU Format:

| Add | Function Code | Start Add | Start Add | Register Numbers | Register Numbers | Bytes | Register Value | Check Code |
|-----|---------------|-----------|-----------|------------------|------------------|-------|----------------|------------|
| | | High | Low | High Byte | Low Byte | | | |
| 1B | 10H | 1B | 1B | 1B | 1B | 1B | 2*NB | 2B |

Response PDU Format

| Add | Function Code | Start Add | Start Add | Register Numbers | Register Numbers | Check Code |
|-----|---------------|-----------|-----------|------------------|------------------|------------|
| | | High | Low | High Byte | Low Byte | |
| 1B | 10H | 1B | 1B | 1B | 1B | 2B |

Fault Response PDU Format

| Add | Fault Code | Fault Type | Check Code |
|-----|------------|------------|------------|
| 1B | 90H | 1B | 2B |

Fault Type Description

| Fault Value | Description |
|-------------|---|
| 01 | Function Code illegal |
| 02 | Register Address illegal |
| 03 | Register Value Numbers wrong or Illegal |
| 04 | Function Code Processing Abnormal |

4. Registers Definition

BMS Control Registers

| Address | Data Function | Attribute | Descriptions |
|---------|---|-----------|--|
| 0x1024 | EMS Communication Timeout | R/W | Unit: S, Default 90s |
| 0x1025 | EMS Address | R/W | Default: 1 |
| 0x1026 | EMS Baud Rate | R/W | 1:9600, 3:19200, 4:57600 Note: Only three above approval |
| 0x10C3 | One Key Parallel Switch for parallel multi clusters | R/W | 0x1: Switch On, 0x2: Shut Down Note: One Key to parallel all available clusters to DC Bus |
| 0x10C4 | 第一簇是否使用 Cluster #1 is usable | 读写 R/W | 0x1: usable, 0x2: unusable Note: When set it as unusable, the main contactor of this cluster will not be used and cannot be paralleled to DC Bus upon One Key Parallel Command, which is only applied when this cluster has fault and Master BMS can bypass this cluster to let all other useable clusters running. |

| | | | |
|--------|---------------------------------|-----------|------------------------------------|
| 0x10C5 | 第二簇是否使用 Cluster #2 is usable | 读写 R/W | Same as above |
| 0x10C6 | 第三簇是否使用 Cluster #3 is usable | 读写 R/W | Same as above |
| 0x10C7 | 第四簇是否使用 Cluster #4 is usable | 读写 R/W | Same as above |
| 0x10C8 | 第五簇是否使用 Cluster #5 is usable | 读写 R/W | Same as above |
| | | | |
| | | | |
| 0x2010 | Get Cluster #1 ShutDown | R/W | 0x0:Shut Down(Other Value Invalid) |
| 0x3010 | Get Cluster #2 ShutDown | R/W | 0x0:Shut Down(Other Value Invalid) |
| 0x4010 | Get Cluster #3 ShutDown | R/W | 0x0:Shut Down(Other Value Invalid) |
| 0x5010 | Get Cluster #4 ShutDown | R/W | 0x0:Shut Down(Other Value Invalid) |
| 0x6010 | Get Cluster #5 ShutDown | R/W | 0x0:Shut Down(Other Value Invalid) |

BMS System Running Status Registers

| Address | Data Function | Attribute | Descriptions |
|---------|--------------------------------|-----------|--|
| 0x1044 | System charge&discharge status | R | 0x0: Standby; 0x1: Discharge; 0x2: Charge |
| 0x1045 | System Total Current | R | Int 16 Signed Range: -500A~500A E.g. CUR=1234, relevant discharge current is 123.4A CUR=-1234, relevant charge current is 123.4A |
| 0x1046 | Reserved | R | |
| 0x1047 | System SOC | R | Range: 0%~100% |
| 0x1048 | System Running Status | R | 0: Normal (System can Charge and discharge) 1: Full (System can discharge, but cannot charge) 2: Empty (System can charge, but cannot discharge) 3: Standby (System cannot charge &discharge) 4: Shutdown (System cannot charge &discharge) |
| 0x1049 | System Total Voltage | R | E.g. VOL =6912, the relevant system voltage is 691.2V |

| | | | |
|--------|--|---|--|
| 0x104A | System Total Insulation Value | R | Minimum Insulation Value among all parallel clusters |
| 0x104E | System Maximum Charge Current | R | Unit: 0.1A |
| 0x104F | System Maximum Discharge Current | R | Unit: 0.1A |
| 0x1081 | Master BMS Alarm Registers | R | Bit3-bit15: Reserved Bit2: EMS Communication Failure Bit1: PCS Control Failure Bit0: PCS Communication Failure |
| 0x1082 | Sub Master Communication Failure Registers | R | Bit4: Sub-Master #5 Communication Failure Bit3: Sub-Master #4 Communication Failure Bit2: Sub-Master #3 Communication Failure Bit1: Sub-Master #2 Communication Failure Bit0: Sub-Master #1 Communication Failure |
| 0x1083 | Cluster #1 cannot be paralleled to DC Bus reasons | R | Bit5: Level2 Alarm existed Bit4: PCS Control Failure Bit3: Communication to Master BMS Failure Bit2: Hardware Failure Bit1: Too big circulating current among clusters(>4A) Bit0: Too big voltage different among clusters(>50V) |
| 0x1084 | Cluster #2 cannot be paralleled to DC Bus reasons | R | Same as above |
| 0x1085 | Cluster #3 cannot be paralleled to DC Bus reasons | R | Same as above |
| 0x1086 | Cluster #4 cannot be paralleled to DC Bus reasons | R | Same as above |
| 0x1087 | Cluster #5 cannot be paralleled to DC Bus reasons | R | Same as above |
| 0x1093 | <p>Pre-Alarm Summary</p> <p>Temperature Alarm can be used for current limitation, while all other alarms are just for alarm.</p> <p>Note: Alarm for all clusters</p> | R | <p>Bit15: Discharge less temperature alarm</p> <p>Bit14: Discharge over temperature alarm</p> <p>Bit13: System voltage difference too big alarm</p> <p>Bit12: Insulation Value too low alarm</p> <p>Bit11: Cell Voltage difference too big alarm</p> <p>Bit10: Power pole over temperature alarm</p> <p>Bit9: Temperature difference too big alarm</p> <p>Bit8: SOC too low alarm</p> <p>Bit7: Charge less temperature alarm</p> <p>Bit6: Charge over temperature alarm</p> <p>Bit5: Discharge over current alarm</p> <p>Bit4: System less voltage alarm</p> <p>bit3: Cell less voltage alarm</p> <p>bit2: Charge over current alarm</p> |

| | | | |
|--------|----------------------|---|---|
| | | | bit1: System over voltage alarm bit0: Cell over voltage alarm |
| 0x1094 | Level1 Alarm Summary | R | Bit15:Discharge Less Temperature Alarm[Level1] Bit14:Discharge Over Temperature Alarm[Level1] Bit13:System Voltage Difference too big alarm[Level1] Bit12:Insulation Value too low Alarm[Level1] Bit11:Cell Voltage Difference too big Alarm[Level1] Bit10:Power Pole Over Temperature Alarm[Level1] Bit9: Temperature Difference too big Alarm[Level1] Bit8: SOC too low Alarm [Level1] Bit7:Charge Less Temperature Alarm[Level1] Bit6:Charge Over Temperature Alarm[Level1] Bit5:Discharge Over Current Alarm[Level1] Bit4:System Less Voltage Alarm[Level1] bit3:Cell Less Voltage Alarm[Level1] bit2:Charge Over Current Alarm [Level1] bit1:System Over Voltage Alarm[Level1] bit0:Cell Less Voltage Alarm[Level1] |
| 0x1095 | Level2 Alarm Summary | R | Bit15:Discharge Less Temperature Alarm[Level2] Bit14:Discharge Over Temperature Alarm[Level2] Bit13:System Voltage Difference too big Alarm[Level2] Bit12:Insulation Value too low Alarm[Level2] Bit11:Cell Voltage difference too big Alarm[Level2] Bit10:Power Power Over Temperature Alarm[Level2] Bit9:Temperature Difference too big Alarm[Level2] Bit8: SOC too low alarm[Level2] Bit7:Charge Less Temperature Alarm[Level2] Bit6:Charge Over Temperature Alarm[Level2] Bit5:Discharge Over Current Alarm[Level2] Bit4:System Less Voltage Alarm[Level2] bit3:Cell Less Voltage Alarm[Level2] bit2:Charge Over Current Alarm[Level2] bit1:System Over Voltage Alarm[Level2] bit0:Cell Over Voltage Alarm[Level2] |

Each Cluster Status Registers

Register Address= Base Address + Offset Address

Base Address of each cluster

| Cluster NO. | Base Address |
|-------------|--------------|
| Cluster #1 | 0X2000 |
| Cluster #2 | 0X3000 |
| Cluster #3 | 0X4000 |
| Cluster #4 | 0X5000 |
| Cluster #5 | 0X6000 |

Cluster X(X=1,2,3,4,5) represents Cluster #1/#2/#3/#4/#5

Single Cluster Control Registers (running without Master BMS)

| Offset Add | Data Function | Attribute | Descriptions |
|------------|---------------------------|-----------|--|
| 0x0010 | Pre-Charge Control | W | 0x1:Active pre-charge(switch on main contactor) 0x0:Shut down main contactor and pre-charge contactor |
| 0x000B | EMS Address | R/W | Default: 1 |
| 0x000C | EMS Baud Rate | R/W | 1:9600 3:19200 4:57600 Note: Only three above baud rates approval |
| 0x00F4 | EMS Communication timeout | R/W | Unit: S, Default: 90 |

Single Cluster Control Registers (General)

| Offset Add | Data Function | Attribute | Descriptions |
|------------|------------------------------------|-----------|-----------------|
| 0x00CC | System Total Capacity | R/W | Unit: Ah |
| 0x0015 | Set Cluster Address | R/W | From 0 |
| 0x00F3 | Cell Less Voltage Protection Value | R/W | Default: 2650mV |

Single Cluster Status Registers

| Offset Add | Data Function | Descriptions |
|------------|-------------------------|--|
| 0x0100 | Cluster#X Total Voltage | E.g. VOL =6912, relevant cluster total voltage is 691.2V |

| | | |
|--------|----------------------------------|---|
| 0x0101 | Cluster#X Current | Int 16 Signed, range: -500A~500A E.g. CUR=1234, relevant discharge current is 123.4A CUR=-1234, relevant charge current is 123.4A |
| 0x0102 | 充放电指示 ClusterX Charge State | 0x0: Standby; 0x1: Discharge; 0x2: Charge |
| 0x0103 | Cluster#XSOC | Range: 0%~100% |
| 0x0104 | Cluster#XSOH | Range: 0%~100% |
| 0x0105 | ClusterX Max Cell Voltage ID | Range: 1#~512# |
| 0x0106 | ClusterX Max Cell Voltage | E.g. VOL=3201, relevant cell voltage is 3.201v |
| 0x0107 | ClusterX Min Cell Voltage Id | Range: 1#~512# |
| 0x0108 | ClusterX Min Cell Voltage | E.g. VOL=3201, relevant cell voltage is 3.201v |
| 0x0109 | ClusterX Max Cell Temperature ID | Range: 1#~512# |
| 0x010A | ClusterX Max Cell Temperature | Int 16 Signed, range: -40~150°C Unit: 0.1°C |
| 0x010B | ClusterX Min Cell Temperature ID | Range: 1#~512# |

| | | |
|--------|-----------------------------------|---|
| 0x010C | ClusterX Min Cell Temperature | Int 16 Signed, range: -40~150°C Unit: 0.1°C |
| 0x010D | Average Cell Voltage | Unit: mV |
| 0x010E | Cluster Insulation Value | Unit: KΩ |
| 0x010F | Cluster Maximum Charge Current | Unit: 0.1A |
| 0x0110 | Cluster Maximum Discharge Current | Unit: 0.1A |
| 0x0111 | Insulation Value at Positive Pole | Unit: KΩ |
| 0x0112 | Insulation Value at Negative Pole | Unit: KΩ |
| 0x0113 | Cluster Running Status | <p>0x0: 正常 Normal</p> <p>0x1: 充满 Full</p> <p>0x2: 放空 Empty</p> <p>0x3: 待机 Standby</p> <p>0x4: 停机 Stop</p> <p>Note:</p> <p>Standby↔Forbid charge and discharge, but main contactor switch on;</p> <p>Stop↔Forbid charge and discharge, while main contactor shutdown</p> |
| 0x0114 | Average Temperature Value | Unit: 0.1°C |
| 0x018b | Project ID | Project Firmware Version |
| 0x018c | Major Version | |
| 0x018d | Sub Version | |
| 0x018e | Modify Version | |

System Warning/Shut Down Status Registers

| Offset Address | Data Function | Descriptions |
|----------------|---|---|
| 0x0140 | Level2 Alarm (BMS Self-protect, main contactor shut down) | Bit15: Discharge Less Temperature Alarm[Level2] Bit14: Discharge Over Temperature Alarm[Level2] Bit13: Reserved Bit12: Insulation Failure Alarm [Level2] Bit11: Reserved Bit10: Power Pole Over Temperature Alarm[Level2] Bit9: Reserved Bit8: Reserved Bit7: Charge Less Temperature Alarm[Level2] Bit6: Charge Over Temperature Alarm[Level2] Bit5: Discharge Over Current Alarm[Level2] Bit4: System Less Voltage Alarm[Level2] bit3: Cell Less Voltage Alarm[Level2] bit2: Charge Over Current Alarm[Level2] bit1: System Over Voltage Alarm[Level2] bit0: Cell Over Voltage Alarm[Level2] 0-Normal, 1-Alarm Active |
| 0x0141 | Level1 Alarm (EMS Control to stop charge, discharge, charge&discharge) | Bit15: Discharge Less Temperature Alarm[Level1] Bit14: Discharge Over Temperature Alarm[Level1] Bit13: Reserved Bit12: Insulation Failure Alarm [Level1] Bit11: Reserved Bit10: Power Pole Over Temperature Alarm[Level1] Bit9: Reserved Bit8: Reserved Bit7: Charge Less Temperature Alarm[Level1] Bit6: Charge Over Temperature Alarm[Level1] Bit5: Discharge Over Current Alarm[Level1] Bit4: System Less Voltage Alarm[Level1] bit3: Cell Less Voltage Alarm[Level1] bit2: Charge Over Current Alarm[Level1] bit1: System Over Voltage Alarm[Level1] bit0: Cell Over Voltage Alarm[Level1] 0-Normal, 1-Alarm Active |
| 0x0142 | Pre-Alarm | Bit15: Discharge Less Temperature Alarm Bit14: Discharge Over Temperature Alarm Bit13: Total Voltage Difference too big Alarm |

| | | |
|---------------|---|---|
| | <p>Temperature Alarm will active current limitation</p> | <p>Bit12: Insulation Failure Alarm Bit11: Cell Voltage Difference too big Alarm Bit10: Power Pole Over Temperature Alarm Bit9: Temperature different too big Alarm Bit8: SOC too low Alarm Bit7: Charge Less Temperature Alarm Bit6: Charge Over Temperature Alarm Bit5: Discharge Over Current Alarm Bit4: System Less Voltage Alarm bit3: Cell Less Voltage Alarm bit2: Charge Over Current Alarm bit1: System Over Voltage Alarm bit0: Cell Over Voltage Alarm 0-Normal, 1-Alarm Active</p> |
| <p>0x01A5</p> | <p>Other Hardware Alarm Info</p> | <p>Bit0: Com. Failure to Master BMS Bit1: Com. Failure to Slave BMS Bit2: Com. Failure between Slave BMS and Temperature Sensors Board Bit3: Slave BMS Hardware Failure 0-Normal, 1-Alarm Active</p> |

Slave BMS Fault Message Registers

| | | |
|---------------|---|---|
| <p>0x0185</p> | <p>Slave BMS Hardware Fault Message</p> | <p>Bit12: Slave BMS Initialization Failure Bit11: EEPROM Fault Bit10: Internal COM Fault Bit9: Temperature Sensors Fault Bit8: Balance Module Fault Bit7: Temperature Board COM Fault Bit6: Power Pole Temperature Sensor Fault Bit5: Temperature Sensors Fault Bit4: Temperature Sensor Cables Fault Bit3: Voltage Sensors Fault Bit2: LTC6803 Fault Bit1: Power Cable Fault Bit0: Voltage Sensor Cables Fault 0-Normal, 1-Alarm Active</p> |
|---------------|---|---|

Voltage Registers

| Offset Address | Data Function | Descriptions |
|----------------|---|---|
| 0x0800 | NO. 1 Cell Voltage of Current Cluster ClusterX #1 Cell Voltage | E.g. VOL=3201, the relevant cell voltage is 3.201v; |
| ... | ... | |
| 0x08D7 | NO. 216 Cell Voltage of Current Cluster ClusterX #216 Cell Voltage | |

Maximum 512 Voltage sensors approval in one single cluster

Temperature Registers

| Offset Address | Data Function | Descriptions |
|----------------|--|--|
| 0x0C00 | NO. 1 Cell Temperature under current Cluster ClusterX #1 Cell Temperature | Int 16 Signed, Range: -40~150°C Unit: 0.1°C |
| ... | ... | |
| 0x0C6b | NO. 108 Cell Temperature under current Cluster ClusterX #108 Cell Temperature | |

Maximum 256 Temperature Sensors Approval in one Single Cluster

If not specify defined, the default data type of each register is unsigned int

WARN_LEVEL_ Pre Alarm(Pre Alarm Configuration Register R/W)

Start Up Offset Address: 0x0080

| Offset Add | Data Function | Unit | Description |
|------------|---|-------|--|
| 0x0080 | Cell Over Voltage Protection | mV | E.g. VOL=3201, relevant cell voltage is 3.201V; |
| 0x0081 | Cell Over Voltage Protection Recovery | | |
| 0x0082 | System Over Voltage Protection | 0.1V | E.g. VOL=6000, relevant system voltage is 600.0V; |
| 0x0083 | System Over Voltage Protection Recovery | | |
| 0x0084 | System Charge Over Current Protection | 0.1A | Range: 0.0A~500.0A E.g. CUR=123, the relevant charge current is 12.3A |
| 0x0085 | System Charge Over Current Protection Recovery | | |
| 0x0086 | Cell Less Voltage Protection | mV | E.g. VOL=3201, relevant cell voltage is 3.201V; |
| 0x0087 | Cell Less Voltage Protection Recovery | | |
| 0x0088 | System Less Voltage Protection | 0.1V | E.g. VOL=6000, relevant system voltage is 600.0V; |
| 0x0089 | System Under Voltage Protection Recovery | | |
| 0x008A | System Discharge Over Current Protection | 0.1A | Range: 0.0A~500.0A E.g. CUR=123, the relevant charge current is 12.3A |
| 0x008B | System Discharge Over Current Protection Recovery | | |
| 0x008C | Cell Charge Over Temperature Protection | 0.1°C | Int 16 Signed, Range: -40~140°C |
| 0x008D | Cell Charge Over Temperature Protection Recovery | | |
| 0x008E | Cell Charge Less Temperature Protection | 0.1°C | Int 16 Signed, Range: -40~140°C |
| 0x008F | Cell Charge Less Temperature Recovery | | |
| 0x0090 | SOC too low protection | 1% | Range: 0%~100% |
| 0x0091 | SOC too low protection recovery | | |
| 0x0092 | Reserved | - | |
| 0x0093 | Reserved | | |
| 0x0094 | Power Pole Over Temperature Protection | 0.1°C | Range: -40~140°C |

| | | | |
|--------|--|-------|--|
| 0x0095 | Power Pole Over Temperature Protection Recovery | | |
| 0x0096 | Insulation Abnormal Protection | Ω/V | |
| 0x0097 | Insulation Abnormal Protection Recovery | | |
| 0x0098 | Cell Voltage Difference too big Protection | mV | |
| 0x0099 | Cell Voltage Difference too big Protection Recovery | | |
| 0x009a | System Voltage Difference too big Protection | 0.1V | |
| 0x009b | System Voltage Difference too big Protection Recovery | | |
| 0x009c | Discharge Over Temperature Protection | 0.1°C | |
| 0x009d | Discharge Over Temperature Protection Recovery | | |
| 0x009e | Discharge Less Temperature Protection | | |
| 0x009f | Discharge Less Temperature Protection Recovery | | |
| 0x00a0 | Temperature difference too big Protection | | |
| 0x00a1 | Temperature difference too big Protection Recovery | | |

WARN_LEVEL1(Level1 warning registers R/W)

Start Up Offset Address: 0x0040

| Offset | Data Function | Unit | Description |
|--------|--|-------|---|
| 0x0040 | Cell Over Voltage Protection [Level1] | mV | E.g. VOL=3201, relevant cell voltage is 3.201V; |
| 0x0041 | Cell Over Voltage Protection Recovery [Level1] | | |
| 0x0042 | System Over Voltage Protection [Level1] | 0.1V | E.g. VOL=6000, relevant system voltage is 600.0V; |
| 0x0043 | System Over Voltage Protection Recovery [Level1] | | |
| 0x0044 | System Charge Over Current Protection [Level1] | 0.1A | Range: 0.0A~500.0A E.g. CUR=123, relevant charge current is 12.3A |
| 0x0045 | System Charge Over Current Recovery [Level1] | | |
| 0x0046 | Cell Less Voltage Protection [Level1] | mV | E.g. VOL=3201, relevant cell voltage is 3.201V; |
| 0x0047 | Cell Less Voltage Protection Recovery [Level1] | | |
| 0x0048 | System Less Voltage Protection [Level1] | 0.1V | E.g. VOL=6000, relevant system voltage is 600.0V; |
| 0x0049 | System Less Voltage Protection Recovery [Level1] | | |
| 0x004A | System Discharge Over Current Protection [Level1] | 0.1A | Range: 0.0A~500.0A E.g. CUR=123, relevant discharge current is 12.3A |
| 0x004B | System Discharge Over Current Protection Recovery [Level1] | | |
| 0x004C | Cell Charge Over Temperature Protection [Level1] | 0.1°C | Int16 Signed, Range: -40~140°C |
| 0x004D | Cell Charge Over Temperature Protection Recovery [Level1] | | |
| 0x004E | Cell Charge Less Temperature Protection [Level1] | 0.1°C | Int16 Signed, Range: -40~140°C |
| 0x004F | Cell Charge Less Temperature Protection Recovery [Level1] | | |
| 0x0050 | SOC too Low Protection | 1% | Range: 0%~100% |
| 0x0051 | SOC too Low Protection Recovery | | |
| 0x0052 | Reserved | - | |

| | | | |
|--------|---|-------|---------------------------|
| 0x0053 | Reserved | | |
| 0x0054 | Power Pole Over Temperature Protection [Level1] | 0.1°C | Range: -40~140°C |
| 0x0055 | Power Pole Over Temperature Protection Recovery [Level1] | | |
| 0x0056 | Insulation Abnormal Protection [Level1] | Ω/V | |
| 0x0057 | Insulation Abnormal Protection Recovery [Level1] | | |
| 0x0058 | Cell Voltage Different too big Protection [Level1] | mV | |
| 0x0059 | Cell Voltage Different too big Protection Recovery [Level1] | | |
| 0x005a | System Voltage Different too big Protection [Level1] | 0.1V | |
| 0x005b | System Voltage Different too big Protection Recovery [Level1] | | |
| 0x005c | Discharge Over Temperature Protection [Level1] | | |
| 0x005d | Discharge Over Temperature Protection Recovery [Level1] | | |
| 0x005e | Discharge Less Temperature Protection [Level1] | | |
| 0x005f | Discharge Less Temperature Protection Recovery [Level1] | 0.1°C | Int16S, Range : -40~140°C |
| 0x0060 | Temperature Difference Too Big Protection [Level1] | | |
| 0x0061 | Temperature Difference Too Big Protection Recovery [Level1] | | |

WARN_LEVEL2(Level2 Protection Register R/W)

Start Up Offset Address: 0x0400

| Offset Add | Data Function | Unit | Description |
|------------|--|-------|---|
| 0x0400 | Cell Over Voltage Protection [Level2] | mV | E.g. VOL=3201, relevant cell voltage is 3.201V; |
| 0x0401 | Cell Over Voltage Protection Recovery [Level2] | | |
| 0x0402 | System Over Voltage Protection [Level2] | 0.1V | E.g. VOL=6000, relevant system Voltage is 600.0V; |
| 0x0403 | System Over Voltage Protection Recovery [Level2] | | |
| 0x0404 | System Charge Over Current Protection [Level2] | 0.1A | Range: 0.0A~500.0A E.g. CUR=123, relevant charge current is 12.3A |
| 0x0405 | System Charge Over Current Protection Recovery [Level2] | | |
| 0x0406 | Cell Less Voltage Protection [Level2] | mV | E.g. VOL=3201, relevant cell voltage is 3.201V; |
| 0x0407 | Cell Less Voltage Protection Recovery [Level2] | | |
| 0x0408 | System Less Voltage Protection [Level2] | 0.1V | E.g. VOL=6000, relevant system voltage is 600.0V; |
| 0x0409 | System Less Voltage Protection Recovery [Level2] | | |
| 0x040A | System Discharge Over Current Protection [Level2] | 0.1A | Range: 0.0A~500.0A E.g. CUR=123, relevant discharge current is 12.3A |
| 0x040B | System Discharge Over Current Protection Recovery [Level2] | | |
| 0x040C | Cell Charge Over Temperature Protection [Level2] | 0.1°C | Int16 Signed, range: -40~140°C |
| 0x040D | Cell Charge Over Temperature Protection Recovery [Level2] | | |
| 0x040E | Cell Charge Less Temperature Protection [Level2] | 0.1°C | Int16 Signed, range -40~140°C |

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| 0x040F | Cell Charge Less Temperature Protection Recovery [Level2] | | |
| 0x0410 | SOC too Low Protection [Level2] | 1% | Range: 0%~100% |
| 0x0411 | SOC too Low Protection Recovery [Level2] | | |
| 0x0412 | Reserved | - | |
| 0x0413 | Reserved | | |
| 0x0414 | Power Pole Over Temperature Protection [Level2] | 0.1℃ | Range : -40~140℃ |
| 0x0415 | Power Pole Over Temperature Protection Recovery [Level2] | | |
| 0x0416 | Insulation Abnormal Protection [Level2] | Ω/V | |
| 0x0417 | Insulation Abnormal Protection Recovery [Level2] | | |
| 0x0418 | Cell Voltage Different too big Protection [Level2] | mV | |
| 0x0419 | Cell Voltage Different too big Protection Recovery [Level2] | | |
| 0x041a | System Voltage Difference too big Protection [Level2] | 0.1V | |
| 0x041b | System Voltage Difference too big Protection Recovery [Level2] | | |
| 0x041c | Discharge Over Temperature Protection [Level2] | 0.1℃ | |
| 0x041d | Discharge Over Temperature Protection Recovery [Level2] | | |
| 0x041e | Discharge Less Temperature Protection [Level2] | | |
| 0x041f | Discharge Less Temperature Protection Recovery [Level2] | | |

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| 0x0420 | Temperature Difference Too Big Protection [Level2] | | |
| 0x0421 | Temperature Difference Too Big Protection Recovery [Level2] | | |

