

This protocol is used for BMS8T, BMS16T and BMS24T to communicate with an external device through RS232 by UART. Open source code can be used as described on <https://github.com/Tobi177/venus-chargerybms>

1. Report cells voltage (main control board)

| Packet header | Command | Data length | Voltage per Cell                  |        |     |        | Wh           | Ah           | Check sum |
|---------------|---------|-------------|-----------------------------------|--------|-----|--------|--------------|--------------|-----------|
|               |         |             | No 1                              | No 2   | ... | No 24  |              |              |           |
| 2bytes        | 1byte   | 1byte       | 2bytes                            | 2bytes | ... | 2bytes | 4bytes       | 4bytes       | 1byte     |
| 24<br>24      | 56      | 3D          | The high byte first then low byte | ...    | ... | ...    | Low byte 1st | Low byte 1st |           |

2. Report measure value (main control board)

| Packet header | Command | Data length | Charge End voltage of cell        | Current Mode | Current | Battery Temp |        | SOC   | Discharge End voltage of cell     | Charge status | Discharge Status | Check sum |
|---------------|---------|-------------|-----------------------------------|--------------|---------|--------------|--------|-------|-----------------------------------|---------------|------------------|-----------|
|               |         |             |                                   |              |         | T1           | T2     |       |                                   |               |                  |           |
| 2bytes        | 1byte   | 1byte       | 2bytes                            | 1 byte       | 2bytes  | 2bytes       | 2bytes | 1byte | 2bytes                            | 1 byte        | 1 byte           | 1byte     |
| 24<br>24      | 57      | 0F          | The high byte first then low byte |              |         |              |        |       | The high byte first then low byte | 1 or 0        | 1 or 0           |           |

3. Report cells impedance (main control board)

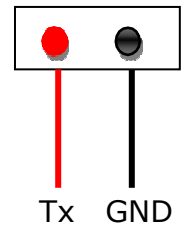
| Packet header | Command | Data length | Current Mode 1      | Current 1                         | Cell impedance                    |        |     |        | Check sum |
|---------------|---------|-------------|---------------------|-----------------------------------|-----------------------------------|--------|-----|--------|-----------|
|               |         |             |                     |                                   | No 1                              | No 2   | ... | No 24  |           |
| 2bytes        | 1byte   | 1byte       | 1 byte              | 2bytes                            | 2bytes                            | 2bytes | ... | 2bytes | 1byte     |
| 24<br>24      | 58      | 28          | Charge or discharge | The low byte first then high byte | The low byte first then high byte |        |     |        |           |

4. Notes:

|  | True Value (Float) | Formula to calculate Decimal values  | Hex values  |
|--|--------------------|--|---|
| Current (A)  | 22.8 A             | $((\text{byte } 1 \times 256) + (\text{byte } 2)) / 10$  | 00 AC   |
| Current 1 (A), It is instant current when measure cell impedance                           | 22.8 A             | $((\text{byte } 1) + (\text{byte } 2 \times 256)) / 10$  | E4 00   |
| Current mode   | 0 or 1 or 2        | Direct   | 00 (Discharge)<br>01 (Charge)<br>02 (Storage)   |
| Current mode 1 means battery is in charging or discharging when cell impedance is measured | 0 or 1             | Direct   | 00 (Discharge)<br>01 (Charge)   |
| Cell impedance (mΩ)  | 0.1mΩ              | $(\text{byte } 1) + (\text{byte } 2 \times 256)/10$  | 01 00   |
| Cell Voltages (V)  | 3.325 V            | $((\text{byte } 1 \times 256) + (\text{byte } 2)) / 1000$  | 0C FD   |
| Battery Temperatures (°C) <sup>(1)</sup>   | 13.1 °C            | $((\text{byte } 1 \times 256) + (\text{byte } 2)) / 10$  | 00 83   |
| Battery Capacity (Wh)  | 47578.742          | $((b1) + (b2 \times 256) + (b3 \times 256 \times 256) + (b4 \times 256 \times 256 \times 256))/1000$ | 76 FE D5 02   |
| Battery Capacity (Ah)  | 922.723            | $((b1) + (b2 \times 256) + (b3 \times 256 \times 256) + (b4 \times 256 \times 256 \times 256))/1000$ | 63 14 0E 00   |
| SOC (0-100%)   | 91%                | Direct   | 5B  |
| Charge status  | 0 or 1             | direct   | 1 : Over Charge Protection(P)<br>Voltage trigger, stop charging<br>0 : Over Charge Release(R)<br>Voltage Trigger, recovery charge             |
| Discharge status   | 0 or 1             | direct   | 1 : Over discharge Protection(P)<br>Voltage trigger, stop discharging<br>0 : Over discharge Release(R)<br>Voltage Trigger, recovery discharge |

(1) Battery temperature is (signed int) 0xff21 NOT unsigned int. take a FF21 data from COM3 sample, the FF21 is (signed int) 0xff21 NOT unsigned int. the actual decimal data is -223 (65536-65313), then divided by 10, so the temperature is -22.3 celsius degree.

- Data length: From The packet header to check sum(include checksum), more details as below
- Checksum calculation: Sum all packet bytes and calc the sum mod 256
- Command 0X56 is sent every 2 seconds
- Command 0X57 is sent every 1 second
- Command 0X58 is sent every time the current change between charge & discharge



5. Hardware configuration:

- Please note that the TX signal from BMS is RS232 and is inverted
- The TX signal voltage level is +5V and -5V
- The 2-pin port labeled COM3 on the BMS is used to connect to an external reading device

6. Baud rate is 115200

**Warning,**

1. This communication protocol is used for BMS8T, BMS16T and BMS24T
2. The BMS only send out data, it DOESN'T receive any data
3. When using an external device to read the BMS, please correct communication protocol after main unit is updated
4. The GND of RS232 port of BMS cannot connect to cell 1- or battery negative which is in monitoring.

**About data length:**

**Command 56**, the effective data length depends on cell counts, each cell voltage is 2 bytes,

- for BMS24T , the data length is 3D (total 61 bytes), if connect 24S Battery to BMS24T, such as:

24 24 56 3D 01 DB 01 D0 04 80 08 79 08 88 08 92 08 7E 08 8D 08 69 08 6A 08 7A 08 6F 08 93 08 79 08 71 08 62 08 6E 08 79 08 79 08 60 08 7B 08 78 08 82 08 62 20 A1 07 00 10 27 00 00 83 TOTAL 61 bytes

if connect to 22S battery to BMS24T, the effective data length is 57 bytes, cell 23 and 24 ( 4 bytes) should be ignored.

- for BMS16T , the data length is 2D (total 45 bytes), if connect 8S Battery to BMS16T, the effective data length is 1D (29 bytes)
- for BMS8T , the data length is 1D (total 29 bytes), if connect 4S Battery to BMS8T, the effective data length is 15 ( 21 Bytes)

**Command 58**, for BMS8T, 16T, and 24T, the data length depends on cell counts, each cell impedance is 2 bytes,

- for 4S battery, the data length is 10 (16 bytes)
- for 8S battery, the data length is 18 (24 bytes)
- for 16S battery, the data length is 28 (40 bytes)
- for 24S battery, the data length is 38 (56 bytes)
- for 22S battery, the data length is 34 (52 bytes)

**Command 57**, the data length is always 13

Chargery Communication protocol by UART

Update history:

| Main unit version | Description   |
|-------------------|---|
| V1.21             | Add current mode send out - only send out positive current value even in discharge  |
| V1.22             | Add SOC send out  |
| V1.24             | Add Wh user setup and also Wh & Ah send out   |
| V1.25             | Add cell impedance measurement and also mΩ /current that measure impedance send out |
| V1.26             | Add Discharge End voltage of cell, and charge, discharge status send out            |

Example Hex data from BMS:

24 24 57 0F 0E 24 01 00 E6 00 81 00 84 5B 27  
 24 24 57 0F 0E 24 01 00 E4 00 81 00 84 5B 25  
 24 24 57 0F 0E 24 01 00 E1 00 83 00 84 5B 24  
 24 24 56 2D 0C FD 0D 04 0D 0D 02 0D 03 0D 04 0D 06 0D 01 0D 08 0D 02 0D 05 0C FE 0D 06 0C FB 0D 0F 0C FC 76 FE D5 02 63 14 0E 00 95  
 24 24 58 28 01 E4 00 01 00 03 00 03 00 03 00 02 00 03 00 00 00 00 00 01 00 01 00 01 00 00 00 05 00 02 00 03 00 03 00 CC  
 24 24 57 0F 0E 24 01 00 E4 00 83 00 84 5B 27  
 68 3A 3A 33 0D 0A

Data Conversion Example:

| Byte No:     | 1      | 2  | 3       | 4           | 5                                | 6   | 7      | 8  | 9      | 10 | 11     | 12 | 13     | 14 | 15     | 16 | 17     | 18 | 19     | 20 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--------------|--------|----|---------|-------------|----------------------------------|-----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Comment:     | Header |    | Command | Data Length | Cell 1                           |     | Cell 2 |    | Cell 3 |    | Cell 4 |    | Cell 5 |    | Cell 6 |    | Cell 7 |    | Cell 8 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|              | B1     | B2 | B1      | B1          | B1                               | B2  | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Hex:         | 24     | 24 | 56      | 2D          | 0C                               | FD  | 0D     | 04 | 0D     | 04 | 0D     | 02 | 0D     | 03 | 0D     | 04 | 0D     | 06 | 0D     | 01 | 0D | 08 | 0D | 02 | 0D | 05 | 0C | FE | 0D | 06 | 0C | FB | 0D | 0F | 0C | FC | 76 | FE | D5 | 02 | 63 | 14 | 0E | 00 | 95 |
| Decimal:     | 36     | 36 | 86      | 45          | 12                               | 253 | 13     | 4  | 13     | 4  | 13     | 2  | 13     | 3  | 13     | 4  | 13     | 6  | 13     | 1  | 13 | 4  | 13 | 3  | 13 | 3  | 13 | 3  | 13 | 4  | 13 | 3  | 13 | 3  | 13 | 3  | 13 | 6  | 13 | 1  | 13 | 1  | 13 | 1  |    |
| Float Value: | N/A    |    | N/A     | N/A         | ((byte 1 x 256) + (byte 2))/1000 |     |        |    |        |    |        |    |        |    |        |    |        |    |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

| 21                               | 22 | 23      | 24 | 25      | 26 | 27      | 28  | 29      | 30 | 31      | 32  | 33      | 34 | 35      | 36  | 37   | 38  | 39  | 40 | 41      | 42 | 43 | 44 | 45        |
|----------------------------------|----|---------|----|---------|----|---------|-----|---------|----|---------|-----|---------|----|---------|-----|--|-----|-----|----|---------|----|----|----|-----------|
| Cell 9                           |    | Cell 10 |    | Cell 11 |    | Cell 12 |     | Cell 13 |    | Cell 14 |     | Cell 15 |    | Cell 16 |     | Wh   |     |     |    | Ah      |    |    |    | Check Sum |
| B1                               | B2 | B1      | B2 | B1      | B2 | B1      | B2  | B1      | B2 | B1      | B2  | B1      | B2 | B1      | B2  | B1   | B2  | B3  | B4 | B1      | B2 | B3 | B4 | B1        |
| 0D                               | 08 | 0D      | 02 | 0D      | 05 | 0C      | FE  | 0D      | 06 | 0C      | FB  | 0D      | 0F | 0C      | FC  | 76   | FE  | D5  | 02 | 63      | 14 | 0E | 00 | 95        |
| 13                               | 8  | 13      | 2  | 13      | 5  | 12      | 254 | 13      | 6  | 12      | 251 | 13      | 15 | 12      | 252 | 118  | 254 | 213 | 2  | 99      | 20 | 14 | 0  | 149       |
| 3.336                            |    | 3.33    |    | 3.333   |    | 3.326   |     | 3.323   |    | 3.323   |     | 3.343   |    | 3.324   |     | 47578.742  |     |     |    | 922.723 |    |    |    | N/A       |
| ((byte 1 x 256) + (byte 2))/1000 |    |         |    |         |    |         |     |         |    |         |     |         |    |         |     | ((b1)+(b2*256)+(b3*256*256)+(b4*256*256*256))/1000 |     |     |    |         |    |    |    | N/A       |

| Byte No:     | 1      | 2  | 3       | 4           | 5    | 6                              | 7  | 8      | 9  | 10     | 11 | 12     | 13 | 14     | 15 | 16     | 17 | 18     | 19 |
|--------------|--------|----|---------|-------------|------|--------------------------------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|
| Comment:     | Header |    | Command | Data Length | Mode | Current                        |    | Cell 1 |    | Cell 2 |    | Cell 3 |    | Cell 4 |    | Cell 5 |    | Cell 6 |    |
|              | B1     | B2 | B1      | B1          | B1   | B1                             | B2 | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 | B1     | B2 |
| Hex:         | 24     | 24 | 58      | 28          | 01   | E4                             | 00 | 01     | 00 | 03     | 00 | 03     | 00 | 03     | 00 | 02     | 00 | 03     | 00 |
| Decimal:     | 36     | 36 | 88      | 40          | 1    | 228                            | 0  | 1      | 0  | 3      | 0  | 3      | 0  | 3      | 0  | 2      | 0  | 3      | 0  |
| Float Value: | N/A    |    | N/A     | N/A         | N/A  | ((byte 1) + (byte 2 x 256))/10 |    |        |    |        |    |        |    |        |    |        |    |        |    |

| 20                             | 21 | 22     | 23 | 24     | 25 | 26      | 27 | 28      | 29 | 30      | 31 | 32      | 33 | 34      | 35 | 36      | 37 | 38      | 39  | 40        |
|--------------------------------|----|--------|----|--------|----|---------|----|---------|----|---------|----|---------|----|---------|----|---------|----|---------|-----|-----------|
| Cell 7                         |    | Cell 8 |    | Cell 9 |    | Cell 10 |    | Cell 11 |    | Cell 12 |    | Cell 13 |    | Cell 14 |    | Cell 15 |    | Cell 16 |     | Check Sum |
| B1                             | B2 | B1     | B2 | B1     | B2 | B1      | B2 | B1      | B2 | B1      | B2 | B1      | B2 | B1      | B2 | B1      | B2 | B1      | B2  | B1        |
| 00                             | 00 | 00     | 00 | 01     | 00 | 01      | 00 | 01      | 00 | 00      | 00 | 05      | 00 | 02      | 00 | 03      | 00 | 03      | 00  | CC        |
| 0                              | 0  | 0      | 0  | 1      | 0  | 1       | 0  | 1       | 0  | 0       | 0  | 5       | 0  | 2       | 0  | 3       | 0  | 3       | 0   | 204       |
| 0.0                            |    | 0.0    |    | 0.1    |    | 0.1     |    | 0.1     |    | 0.0     |    | 0.5     |    | 0.2     |    | 0.3     |    | 0.3     |     | N/A       |
| ((byte 1) + (byte 2 x 256))/10 |    |        |    |        |    |         |    |         |    |         |    |         |    |         |    |         |    |         | N/A |           |

| Byte No:     | 1      | 2  | 3       | 4           | 5         | 6    | 7       | 8                              | 9      | 10   | 11     | 12   | 13  | 14        | 15 |
|--------------|--------|----|---------|-------------|-----------|------|---------|--------------------------------|--------|------|--------|------|-----|-----------|----|
| Comment:     | Header |    | Command | Data Length | EOC       | Mode | Current |                                | Temp 1 |      | Temp 2 |      | SOC | Check Sum |    |
|              | B1     | B2 | B1      | B1          | B1        | B2   | B1      | B2                             | B1     | B2   | B1     | B2   | B1  | B1        |    |
| Hex:         | 24     | 24 | 57      | 0F          | 0E        | 24   | 01      | 00                             | E4     | 00   | 83     | 00   | 84  | 58        | 27 |
| Decimal:     | 36     | 36 | 87      | 15          | 14        | 36   | 1       | 0                              | 228    | 0    | 131    | 0    | 132 | 91        | 39 |
| Float Value: | N/A    |    | N/A     | N/A         | 3.620     |      | 1       | 22.8                           |        | 13.1 |        | 13.2 |     | 91        | 39 |
| Formula:     | N/A    |    | N/A     | N/A         | Volt Form |      | N/A     | ((byte 1 x 256) + (byte 2))/10 |        |      |        |      | N/A | N/A       |    |