UART/485

Communications Protocol

V1.4

1. Version revision record)

Serial Num	Description	Date	Version	Author
1	Initial Version	2019.06.11	V1.0	
2	Modification of address allocation	2020.11.8	V1.1	
3	Number of sections amending references	2020.12.22	V1.2	
4	General correction	28.06.2022	V1.3	
5	Update of the firmware of BMS	14.11.2023	V1.4	

1.(Physical layer)

1.1.UART

1. physical interface	UART
2. baud rate	9600 bps

2. (Communication Format)

3.Communication Format	9600,N,8,1
2. TTL Levels	The comunications is made using standard 5V logic levels, the bus is protected from Voltage below 100V in case of casualty

2. (Communication Address)

1. (Basic timing)

All messages are sent by the main host (the PC in the standard configuration), the BMS receive messages to determine whether the message address matches whit his address, only in the case of address match is allowed to return the requested data to the host.

2. (Address assignment)

Module	Address
BMS master	0x01
(Bluetooth APP)	0x80
GPRS	0x20
Main Computer	0x40

22. (Message Format)

Message from your Hardware to the BMS:

Start Flag (1 byte)	Pc Address (1 byte)	Data ID (1 byte)	Data Length (1 byte)	Data (8 byte)	Checksum (1 byte)
0xA5 (Fixed)	0x40 (Fixed)	Select from Section 3.1	0x08 (Fixed)	0x0000000000000000 (Fixed)	See Section 4

Message from BMS to your Hardware:

Start Flag (1 byte)	Pc Address (1 byte)	Data ID (1 byte)	Data Length (1 byte)	Data (8 byte)	Checksum (1 byte)
0xA5 (Fixed)	0x01 (Fixed)	Select from Section 3.1	0x08 (Fixed)	For the interpretation see Section 3.1	See Section 4

NOTE:

1) Is important to notice that every Message from PC to BMS can request only one type of Data in the section 3, if the users would like to know multiple Data they need to make multiple interrogation to the BMS System.
2) In the request Message from Main PC to the BMS System all the Data Field need to be initialize to 0x00

3.1. (Data Info and ID)

DATA	DATA ID	Send / Received	Note
Soc, Total Voltage, Current	0x90	Send	Byte 0~Byte 7: Reserved
		Received	Byte 0~Byte 1: Cumulative total voltage (0.1 V) Byte 2~Byte 3: Gather total voltage (0.1 V) Byte 4~Byte 5: Current (30000 Offset ,0.1A) Byte 6~Byte 7: SOC (0.1%)
Maximum & Minimum Voltage	0x91	Send	Byte 0~Byte 7: Reserved
		Received	Byte 0~byte 1: Maximum cell voltage value (mV) Byte 2: N. of cell with Maximum voltage Byte 3~byte 4: Minimum cell voltage value (mV) Byte 5: N. of cell with Minimum voltage
Maximum & Minimum Temperature	0x92	Send	Byte 0~Byte 7: Reserved
		Received	Byte 0: Maximum temperature value (40 Offset ,°C) Byte 1: Maximum temperature cell N. Byte 2: Minimum temperature value (40 Offset ,°C) Byte 3: Minimum temperature cell N.
Charge & Discharge MOSFET Status	0x93	Send	Byte 0~Byte 7: Reserved

		Received	Byte 0: (0, 1, 2) State (0 stationary, 1 charge, 2 discharge) Byte 1: Charge MOS state Byte 2: Discharge MOS status Byte 3: BMS life 0~255 cycles) Byte 4~Byte 7: Remain capacity (mAH)
Status Information	0x94	Send	Byte 0~Byte 7: Reserved
		Received	Byte 1: N. of Temperature Byte 2: Charger status (0 disconnect 1 access) Byte 3: Load status (0 disconnect 1 access) Byte 4: Bit 0: DI1 state Bit 1: DI2 state Bit 2: DI3 state Bit 3: DI4 state Bit 4: DO1 state Bit 5: DO2 state Bit 6: DO3 state Bit 7: DO4 state Byte 5~Byte 7: Reserved
Single Cell Voltage	0x95	Send	Byte 0~Byte 7: Reserved
		Received	2byte, 96byte,The voltage of each monomer is 2 byte, according to the actual number of cell, the maximum 96 byte, is sent in 16 frames Byte 0: Frame number, starting from 0xFF Byte 1~byte 6: Cell voltage (1 mV) Byte 7: Reserved
Cell Temperature	0x96	Send	Byte 0~Byte 7: Reserved
		Received	1byte,21byte Each temperature accounts for 1 byte, according to the actual number of temperature send, the maximum 21 byte, send in 3 frames Byte 0: Frame number, starting at 0 Byte 1~byte 7: Cell temperature(40 Offset ,°C)
Cell Balance State	0x97	Send	Byte 0~Byte 7: Reserved
		Received	0: Closed 1: Open Bit 0: Cell 1 balance state ….. Bit 47: Cell 48 balance state Bit 48~Bit 63: Reserved
		Send	Byte 0~Byte 7: Reserved

Battery Failure Status	0x98	Received	0 -> No error 1 -> Error Byte 0: Bit 0: Cell volt high level 1 Bit 1: Cell volt high level 2 Bit 2: Cell volt low level 1 Bit 3: Cell volt low level 2 Bit 4: Sum volt high level 1 Bit 5: Sum volt high level 2 Bit 6: Sum volt low level 1 Bit 7: Sum volt low level 2 Byte 1:
			Bit 0: Chg temp high level 1 Bit 1: Chg temp high level 2 Bit 2: Chg temp low level 1 Bit 3: Chg temp low level 2 Bit 4: Dischg temp high level 1 Bit 5: Dischg temp high level 2 Bit 6: Dischg temp low level 1 Bit 7: Dischg temp low level 2 Byte 2: Bit 0: Chg overcurrent level 1 Bit 1: Chg overcurrent level 2 Bit 2: Dischg overcurrent level 1 Bit 3: Dischg overcurrent level 2 Bit 4: SOCSOC high level 1 Bit 5: SOCSOC high level 2 Bit 6: SOCSOC Low level 1 Bit 7: SOCSOC Low level 2 Byte 3: Bit 0: Diff volt level 1 Bit 1: Diff volt level 2 Bit 2: Diff temp level 1 Bit 3: Diff temp level 2 Bit 4~Bit 7: Reserved Byte 4: Bit 0: Chg MOS temp high alarm Bit 1: Dischg MOS temp high alarm Bit 2: MOS temp sensor err Bit 3: MOS temp sensor err Bit 4: MOS adhesion err Bit 5: MOS adhesion err Bit 6: MOS open circuit err Bit 7: MOS open circuit err Byte 5: Bit 0: AFE Bit 1: Voltage collect dropped Bit 2: Cell temp sensor err Bit 3: EEPROM err Bit 4: RTC err Bit 5: Precharge failure Bit 6: Communication failure Bit 7: Internal communication failure Byte 6: Bit 0: Current module fault Bit 1: Sum voltage detect fault Bit 2: Short circuit protect fault Bit 3: Low volt forbidden chg fault Bit 4-Bit 7: Reserved Byte 7: Fault code

4.1. (Checksum)

The last byte of the packet is a checksum, which is calculated by summing up all the rest of the bytes in the packet and truncating the result to one byte. (0xA5 + 0x01 + 0x90 + ... + 0xED = 0x30D = 0x0D).

5.1. (Physical Setup)

The User can check the Physical Setup on this Github page and find an open source library written in C for rapid prototyping

6.1. (Communication Example)

Example 1:
Message from your Hardware to the BMS:

Start Flag (1 byte)	Pc Address (1 byte)	Data ID (1 byte)	Data Length (1 byte)	Data (8 byte)	Checksum (1 byte)
0xA5 (Fixed)	0x40 (Fixed)	0x90	0x08 (Fixed)	0x0000000000000000 (Fixed)	0x7D

Message from BMS to your Hardware:

Start Flag (1 byte)	Pc Address (1 byte)	Data ID (1 byte)	Data Length (1 byte)	Data (8 byte)	Checksum (1 byte)
0xA5 (Fixed)	0x01 (Fixed)	0x90	0x08 (Fixed)	0x023A0000753001ED (8 bytes)	0x0D

Example 2:
Message from your Hardware to the BMS:

Start Flag (1 byte)	Pc Address (1 byte)	Data ID (1 byte)	Data Length (1 byte)	Data (8 byte)	Checksum (1 byte)
0xA5 (Fixed)	0x40 (Fixed)	0x91	0x08 (Fixed)	0x0000000000000000 (Fixed)	0x7E

Message from BMS to your Hardware:

Start Flag (1 byte)	Pc Address (1 byte)	Data ID (1 byte)	Data Length (1 byte)	Data (8 byte)	Checksum (1 byte)
0xA5 (Fixed)	0x01 (Fixed)	0x91	0x08 (Fixed)	0x023A0000753001ED (8 bytes)	0x0E